

RP07

RP07 FCTNL TEST  
CZRJLBO

COPYRIGHT (c) 1983  
AH-F959B-MC  
FICHE 1 OF 1

APR 1984  
digital  
Made In USA

Table with multiple columns and rows of data, including headers like 'TEST NO.', 'TEST DATE', 'TEST TIME', 'TEST RESULT', and 'TEST STATUS'. The data is organized in a grid format.



.REM @

IDENTIFICATION  
-----

PRODUCT CODE: AC-F9588-MC  
PRODUCT NAME: CZRJLBO RP07 FUNCTIONAL TEST  
PRODUCT DATE: DECEMBER 1, 1983  
MAINTAINER: CX DIAGNOSTIC ENGINEERING  
AUTHOR: MIKE LEAVITT

THE INFORMATION IN THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE AND SHOULD NOT BE CONSTRUED AS A COMMITMENT BY DIGITAL EQUIPMENT CORPORATION. DIGITAL EQUIPMENT CORPORATION ASSUMES NO RESPONSIBILITY FOR ANY ERRORS THAT MAY APPEAR IN THIS DOCUMENT.

NO RESPONSIBILITY IS ASSUMED FOR THE USE OR RELIABILITY OF SOFTWARE ON EQUIPMENT THAT IS NOT SUPPLIED BY DIGITAL OR ITS AFFILIATED COMPANIES.

COPYRIGHT (C) 1983 BY DIGITAL EQUIPMENT CORPORATION

THE FOLLOWING ARE TRADEMARKS OF DIGITAL EQUIPMENT CORPORATION:

DIGITAL  
DEC

PDP  
DECUS

UNIBUS  
DECTAPE

MASSBUS

@



.REM @

TABLE OF CONTENTS  
-----

- 1.0 GENERAL INFORMATION
  - 1.1 PROGRAM ABSTRACT
  - 1.2 SYSTEM REQUIREMENTS
  - 1.3 RELATED DOCUMENTS AND STANDARDS
  - 1.4 DIAGNOSTIC HIERARCHY PREREQUISITES
  - 1.5 ASSUMPTIONS
- 2.0 OPERATING INSTRUCTIONS
  - 2.1 COMMANDS
  - 2.2 SWITCHES
  - 2.3 FLAGS
  - 2.4 HARDWARE QUESTIONS
  - 2.5 SOFTWARE QUESTIONS
  - 2.6 EXTENDED P-TABLE DIALOGUE
  - 2.7 QUICK STARTUP PROCEDURE
- 3.0 ERROR INFORMATION
- 4.0 PERFORMANCE AND PROGRESS REPORTS
- 5.0 TEST SUMMARIES



## 1.0 GENERAL INFORMATION

### 1.1 PROGRAM ABSTRACT

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

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

### 1.2 SYSTEM REQUIREMENTS

THIS PROGRAM WILL REQUIRE THE FOLLOWING SYSTEM HARDWARE:

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

### 1.3 RELATED DOCUMENTS AND STANDARDS

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

### 1.4 DIAGNOSTIC HIERARCY PREREQUISITES

RP07 FRONT END DIAGNOSTIC.  
RP07 PDP11 FORMATTER.

### 1.5 RESTRICTIONS

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

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

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



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

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

## 2.0 OPERATING INSTRUCTIONS

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

### 2.1 COMMANDS

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

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

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

### 2.2 SWITCHES

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

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



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

EXAMPLE OF SWITCH USAGE:

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

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

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

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

### 2.3 FLAGS

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

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



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

\* ERROR MESSAGES ARE DESCRIBED IN SECTION 3.1

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

/FLAGS:LOE:IER:BOE

#### 2.4 HARDWARE QUESTIONS

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

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

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

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

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

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

#### 2.5 SOFTWARE QUESTIONS

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



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

CHANGE DRIVE PARAMETER (L) N ?

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

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

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

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

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

! CUSTOMER DATA WILL BE OVERWRITTEN !

-----  
CONTINUE (L) ?

\*\* (TESTS 17,18)

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

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

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

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

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

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

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



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

\*USE RANDOM STALL TIMES (L) N ?

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

\* THAT QUESTION IS ASKED WHEN YES IS ANSWERED TO THE QUESTION.

\*\* INDICATES NOT PART OF THE DIALOGUE.

#### STALL DEFINITIONS

THERE ARE TWO DISTINCT STALLS :

1. SELECTABLE STALL, VIA SOFTWARE (SW) DIALOGUE: 10. MSEC OR RANDOM (1-64 MSEC) STALL TIME AFTER EVERY DRIVE FUNCTION IN NON-TIMING TESTS.
2. NON-SELECTABLE, 2 MSEC OR RANDOM STALL BETWEEN SEEKS IN TIMING TESTS 8. THRU 10.

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

#### NOTE

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

#### 2.6 EXTENDED P-TABLE DIALOGUE

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

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

# UNITS (D) ? 8<CR>

UNIT 1



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

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

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

UNIT 4  
CSR ADDRESS (0) ? 160000<CR>  
SUB-DEVICE # (0) ? 3<CR>  
Q-FACTOR (0) 0 ? <CR>

UNIT 5  
CSR ADDRESS (0) ? 160000<CR>  
SUB-DEVICE # (0) ? 4<CR>  
Q-FACTOR (0) 0 ? <CR>

UNIT 6  
CSR ADDRESS (0) ? 160000<CR>  
SUB-DEVICE # (0) ? 5<CR>  
Q-FACTOR (0) 0 ? <CR>

UNIT 7  
CSR ADDRESS (0) ? 160000<CR>  
SUB-DEVICE # (0) ? 6<CR>  
Q-FACTOR (0) 0 ? 1<CR>

UNIT 8  
CSR ADDRESS (0) 160000<CR>  
SUB-DEVICE # (0) ? 7<CR>  
Q-FACTOR (0) 1 ? <CR>

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

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

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

\* UNITS (0) ? 8<CR>

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



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

```
UNIT 7
CSR ADDRESS (0) ? 160000<CR>
SUB-DEVICE # (0) ? 6,7<CR>
Q-FACTOR (0) 0 ? 1<CR>
```

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

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

```
# UNITS (0) ? 8<CR>
UNIT 1
CSR ADDRESS (0) ? 160000<CR>
SUB-DEVICE # (0) ? 0-7<CR>
Q-FACTOR (0) 0 ? 0,1,0,....,1,1<CR>
```

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

## 2.7 QUICK START-UP PROCEDURE (XXDP+)

TO START-UP THIS PROGRAM:

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



6. ANSWER ALL THE HARDWARE QUESTIONS

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

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

### 3.0 ERROR INFORMATION

#### 3.1 TYPES OF ERROR MESSAGES

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

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

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

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

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

#### 3.2 ERROR PRINTOUT

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

EXAMPLE:

```
CZRXXX HRD ERR 00XXX ON UNITXX TSTXX SUBXX PCXXXXX  
RPO7 ADDRESSING ERROR (IAE AOE)  
CYL XXX. TRK XX. SEC XX. RPER2 (HEX) XXXX
```

```
DRIVE RPCS1 RPWC RPBA RPDA RPCS2 RPDS  
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX  
RPER1 RPAS RPLA RPD8 RPER2 RPER3 RPEC1 RPEC2  
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX  
RPOF RPDC RPCC RPER2 RPER3 RPEC1 RPEC2  
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX
```



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

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

### 3.3 SPECIFIC ERROR MESSAGES

#### INIT CODE ERRORS

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

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

WHERE 'N' IS THE DRIVE NUMBER THAT FAILED

#### NUMBERED ERROR LIST

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



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

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

```
CYL XXX. TRK XX. SEC XX. RPER2 (HEX) XXXX  
  
DRIVE RPCS1 RPWC RPBA RPDA RPCS2 RPDS  
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX  
RPER1 RPAS RPLA RPDB RPMR1 RPDT RPSN  
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX  
RPOF RPDC RPCC RPER2 RPER3 RPEC1 RPEC2  
XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX XXXXXX
```

EXCEPTIONS:

- (1) DRIVE N
- (2) DRV CYL TRK SEC  
XXX XXX XXX XXX  
GDCYL GDTRK GDSEC BDCYL BDTRK BDSEC  
XXX XXX XXX XXX XXX XXX
- (3) # OF OPERATIONS WITH A LOST REVOLUTION: XXXX  
XXXX OPERATIONS TIMED  
  
ALLOWABLE OPERATION TIME LIMIT  
MAX= XXXXX US
- (4) NO ADDITIONAL MESSAGES
- (5) TIMING TESTS 7, 14, 18:  
  
UNRECOVERABLE SEARCH ERROR  
ABORT TEST  
  
SEARCH FAILED AFTER 16 RETRIES  
ABORT TEST



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

POSITION ERROR: ABORT TEST

### 3.4 ERROR TYPE

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

1. 'SFT' - SOFT: THE FIRST LOST DISC REVOLUTION IN THE ADDRESS MARK DETECTION TESTS.
2. 'HRD' - HARD: ALL ERRORS, EXCEPT DEVICE FATAL ERRORS AND SOFT ERRORS.
3. 'DVC FTL' - DEVICE FATAL: AN ERROR THAT FAILS THE DEVICE; DEVICE NOT READY, NON-EXISTENT OR NOT AN RP07.

### 4.0 PERFORMANCE AND PROGRESS REPORTS

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

### 5.0 TEST SUMMARIES

#### TEST 1: RECAL TEST

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

#### NOTE

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

#### TEST 2: INCREMENTAL SEEK TEST

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

#### TEST 3: RANDOM SEEK TEST

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



TEST 4: RECAL/RANDOM SEEK TEST

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

TEST 5: SEEK DIFFERENTIAL TEST

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

1. 6 CYLINDER DIFFERENTIAL SEEK: FORCES A SLEW RATE CHANGE BY SEEKING FROM CYLINDER 0 TO 5, 1 TO 6, 2 TO 7, ... 624 TO 629, TO TEST THE POSITIONAL LOGIC.
2. 33 CYLINDER DIFFERENTIAL SEEK: WORST CASE SEEK OVERSHOOT TEST, FORCED BY SEEKING FROM CYLINDER 0 TO 32, 1 TO 33, 2 TO 34, ... 597 TO 629.
3. 400 CYLINDER DIFFERENTIAL SEEK: FORCES MAXIMUM ACCELERATION AND DECELERATION OF CARRIAGE ASSEMBLY, FORCED BY SEEKING FROM CYLINDER 0 TO 399, 1 TO 400, 2 TO 401, ... 230 TO 629.

TEST 6: OSCILLATING SEEK TEST

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

NOTE

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



MESSAGE.

TEST 7: ROTATIONAL SPEED TIMING TEST

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

TEST 8: ONE CYLINDER SEEK TIMING TEST

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

$$T \text{ (AVG)} = \frac{T_1 + T_2 + \dots + T_{629} + T_{629} + \dots + T_2 + T_1}{629 + 629}$$

WHERE TX IS THE SINGLE CYLINDER SEEK TIME.

TEST 9: AVERAGE SEEK TIME MEASUREMENT

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

$$T \text{ (AVG)} = \frac{2 \times [(T_1 \times 629) + (T_2 \times 628) + \dots + (T_{629} \times 1)]}{629 \times 629}$$

WHERE:

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

TEST 10: MAXIMUM SEEK TIMING TEST

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



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

TEST 11: MID TRANSFER SEEK TEST

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

TEST 12: ERROR REGISTER BIT TEST

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

TEST 13: OFFSET/RETURN TO CENTER LINE TEST

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

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

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

TEST 14: RANDOM READ TEST / ADDRESS MARK DETECTION TEST

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

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

TEST 15: FE CYLINDER ADDRESS TEST

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

TEST 16: FE CYLINDER WRITE AND WRITE-CHECK TEST



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

TEST 17: WRITE TEST

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

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

TEST 18: RANDOM WRITE TEST /ADDRESS MARK DETECTION TEST

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

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

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



.REM @

VERSION (CZRJL-A-0)

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

VERSION (CZRJL-B-0)

1. WHEN A BAD SECTOR ERROR (BSE) OCCURS DURING A WRITE CHECK COMMAND, THE MASSBUS DATA BUS PARITY (MDPE) BIT IS ALSO SET FOR SOME UNKNOWN REASON. TO REMEDY THIS PROBLEM, THE BSE BIT IS ALSO CHECKED AFTER THE MDPE BIT IS DETECTED AND IS TREATED AS A NORMAL BAD SECTOR.
2. MODIFIED THE PROGRAM TO REPORT THE SEEK TIMES OF THE TIMING TESTS (7-10,14,18), ONLY IF THE TEST FAILS A TIMING SPEC OR IF THE APPROPRIATE SOFTWARE QUESTION IS ANSWERED AFFIRMATIVE.
3. THE ADDRESS MARK TESTS (14 & 18) WILL NOW REPORT A LOST REVOLUTION ERROR AS IT OCCURS, INSTEAD OF WHEN THE TEST HAS COMPLETED.

@



1  
2  
270  
272  
298  
300 000000  
301 002000  
303  
305  
306  
307  
308  
309  
311  
319  
323 002000  
002000 103  
002001 132  
002002 122  
002003 112  
002004 114  
002005 000  
002006 000  
002007 000  
002010  
002010 102  
002011  
002011 060  
002012  
002012 000001  
002014  
002014 000060  
002016  
002016 041200  
002020  
002020 041316  
002022  
002022 002172  
002024  
002024 002204  
002026  
002026 074766  
002030  
002030 000000  
002032  
002032 000000  
002034  
002034 000000  
002036  
002036 000000  
002040  
002040 002124  
002042  
002042 000000  
002044  
002044 000000  
002046

```

; *LAST REVISION 25-MAY-83

.TITLE CZRJLBO RP07 FCTNL TEST
.SBTTL PROGRAM HEADER

.ENABL AMA,ABS
      =      2000

; **
; THE PROGRAM HEADER IS THE INTERFACE BETWEEN
; THE DIAGNOSTIC PROGRAM AND THE SUPERVISOR.
; --

```

```

L$NAME::          ;DIAGNOSTIC NAME
      .ASCII /C/
      .ASCII /Z/
      .ASCII /R/
      .ASCII /J/
      .ASCII /L/
      .BYTE 0
      .BYTE 0
      .BYTE 0

L$REV::          ;REVISION LEVEL
      .ASCII /B/

L$DEPO::         ;0
      .ASCII /O/

L$UNIT::        ;NUMBER OF UNITS
      .WORD T$PTHV

L$TIML::        ;LONGEST TEST TIME
      .WORD 60

L$HPCP::        ;PTR. TO H.W. PTABLE
      .WORD L$HARD

L$SPCP::        ;PTR. TO S.W. PTABLE
      .WORD L$SOFT

L$HPTP::        ;PTR. TO DEF. H.W. PTABLE
      .WORD L$HW

L$SPTP::        ;PTR. TO S.W. PTABLE
      .WORD L$SW

L$LADP::        ;DIAG. END ADDRESS
      .WORD L$LAST

L$STA::         ;RESERVED FOR APT STATS
      .WORD 0

L$CO::          ;
      .WORD 0

L$DTYP::        ;DIAGNOSTIC TYPE
      .WORD 0

L$APT::         ;APT EXPANSION
      .WORD 0

L$DTP::         ;PTR. TO DISPATCH TABLE
      .WORD L$DISPATCH

L$PRIO::        ;DIAGNOSTIC RUN PRIORITY
      .WORD 0

L$ENVI::        ;FLAGS DESCRIBE HOW IT WAS SETUP
      .WORD 0

L$EXP1::        ;EXPANSION WORD

```



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



1  
2  
3  
4  
5  
6  
7  
8 002122 000022  
002124  
002124 026762  
002126 027032  
002130 027140  
002132 027372  
002134 027606  
002136 030036  
002140 030144  
002142 031222  
002144 032212  
002146 033130  
002150 034004  
002152 034210  
002154 034436  
002156 034626  
002160 036144  
002162 036422  
002164 037010  
002166 037332  
9

.SBTTL DISPATCH TABLE

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

.WORD 18  
L\$DISPATCH:;  
.WORD T1  
.WORD T2  
.WORD T3  
.WORD T4  
.WORD T5  
.WORD T6  
.WORD T7  
.WORD T8  
.WORD T9  
.WORD T10  
.WORD T11  
.WORD T12  
.WORD T13  
.WORD T14  
.WORD T15  
.WORD T16  
.WORD T17  
.WORD T18



```

1      .SBTTL  DEFAULT HARDWARE P-TABLE
2
3
4      ;**
5      ; THE DEFAULT HARDWARE P-TABLE CONTAINS DEFAULT VALUES OF
6      ; THE TEST-DEVICE PARAMETERS.  THE STRUCTURE OF THIS TABLE
7      ; IS IDENTICAL TO THE STRUCTURE OF THE HARDWARE P-TABLES.
8      ;--
9      002170  000004      .WORD  L10000-L$HW/2
10     002172  000004      L$HW::
11     002172  176700      DFPTBL::
12     002174  000254      .WORD  176700      ;RPCS1 BASE REGISTER ADDRESS
13     002176  000240      .WORD  254        ;VECTOR ADDRESS
14     002200  000000      .WORD  240        ;BR LEVEL 5 DEVICE
15
16
17
18
19
20
21     002202      .WORD  0          ;DRIVE NUMBER

L10000:

```



```

1      .SBTTL  SOFTWARE P-TABLE
2
3
4      ;**
5      ; THE SOFTWARE P-TABLE CONTAINS THE VALUES OF THE PROGRAM
6      ; PARAMETERS THAT CAN BE CHANGED BY THE OPERATOR.
7      ;--
8      002202  000016      .WORD  L10001-L$SW/2
9      002204
10     002204  000000      L$SW::
11     002206  001165      SFPTBL::
12     002210  000001      FC:      .WORD  0      ;FIRST CYLINDER      ;TESTS: 2-4,6-8,11,13,14,17,18
13     002212  000000      LC:      .WORD  629.    ;LAST CYLINDER     ;TESTS: 2-4,6,8-10,14,17,18
14     002214  000037      IC:      .WORD  1      ;INCREMENT CYLINDER ;TESTS: 2
15     002216  000001      FT:      .WORD  0      ;FIRST TRACK       ;TESTS: 2-7,11,13,16,17
16     002220  000000      LT:      .WORD  31.    ;LAST TRACK        ;TESTS: 3-6,11,14,16-18
17     002222  000061      IT:      .WORD  1      ;INCREMENT TRACK   ;TESTS: 11,16,17
18     002224  030221      FS:      .WORD  0      ;FIRST SECTOR      ;TESTS: 2,5-7,13
19     002226      001      LS:      .WORD  49.    ;LAST SECTOR       ;TESTS: 5,6,14,18
20     002227      000      PAT:     .WORD  030221 ;WRITE DATA PATTERN ;TESTS: 16-18 (WORST CASE)
21     002230      000      REDHDR: .BYTE  1      ;READ HEADER AND DATA CMD FLAG - DEFAULT: YES - SEEK TESTS 2-6
22     002231      000      TIMTYP: .BYTE  0      ;TYPE TIME - DEFAULT: NO - TIMING TESTS 7-10,14,18
23      002232      000      TIMSTL: .BYTE  0      ;TIMING TESTS,STALL BETWEEN SEEKS: RANDOM INSTEAD OF 2 MSEC
24     002233      000      STALLF: .BYTE  0      ;STALL FLAG: AFTER EVERY DRIVE FUNCTION - DEFAULT: NO
25     002234      000      STALRD: .BYTE  0      ;NON-TIMING TESTS 1-6,11,14-18
26     002235      000      STOFLG: .BYTE  0      ;RANDOM STALL FLAG - DEFAULT: NO - PREREQUISITE: STALLF=1
27     002236      000      RANPAT: .BYTE  0      ;SOFTWARE TIMEOUT INHIBIT FLAG - DEFAULT: NO - ALL TESTS
28      002237      000      WRTALL: .BYTE  0      ;RANDOM WRITE PATTERN - DEFAULT: NO - TEST: 18
29     002238      000      CHANGE: .BYTE  0      ;WRITE DATA ALL OVER THE MEDIA FLAG - DEFAULT: NO
30      002239      000      ;TESTS: 17,18
31      002240      000      ;CHANGE DRIVE PARAMETER FLAG
32
33      .EVEN
34
35
36
37
38
39     002240      L10001:
    
```



12  
40  
50  
52  
53  
54  
55  
56  
57

.SBTTL GLOBAL EQUATES SECTION

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

; BIT DEFINITIONS

100000	BIT15== 100000
040000	BIT14== 40000
020000	BIT13== 20000
010000	BIT12== 10000
004000	BIT11== 4000
002000	BIT10== 2000
001000	BIT09== 1000
000400	BIT08== 400
000200	BIT07== 200
000100	BIT06== 100
000040	BIT05== 40
000020	BIT04== 20
000010	BIT03== 10
000004	BIT02== 4
000002	BIT01== 2
000001	BIT00== 1

001000	BIT9== BIT09
000400	BIT8== BIT08
000200	BIT7== BIT07
000100	BIT6== BIT06
000040	BIT5== BIT05
000020	BIT4== BIT04
000010	BIT3== BIT03
000004	BIT2== BIT02
000002	BIT1== BIT01
000001	BIT0== BIT00

; EVENT FLAG DEFINITIONS  
; EF32:EF17 RESERVED FOR SUPERVISOR TO PROGRAM COMMUNICATION

000040	EF.START== 32.	; START COMMAND WAS ISSUED
000037	EF.RESTART== 31.	; RESTART COMMAND WAS ISSUED
000036	EF.CONTINUE== 30.	; CONTINUE COMMAND WAS ISSUED
000035	EF.NEW== 29.	; A NEW PASS HAS BEEN STARTED
000034	EF.PWR== 28.	; A POWER-FAIL/POWER-UP OCCURRED

; PRIORITY LEVEL DEFINITIONS

000340	PRI07== 340
000300	PRI06== 300
000240	PRI05== 240
000200	PRI04== 200
000140	PRI03== 140
000100	PRI02== 100



000040	PRI01== 40
000000	PRI00== 0
	;
	;OPERATOR FLAG BITS
	;
000004	EVL== 4
000010	LOT== 10
000020	ADR== 20
000040	IDU== 40
000100	ISR== 100
000200	UAM== 200
000400	BOE== 400
001000	PNT== 1000
002000	PRI== 2000
004000	IXE== 4000
010000	IBE== 10000
020000	IER== 20000
040000	LOE== 40000
100000	HOE== 100000



```

1      .SBTTL  RHXX REGISTERS
2
3      ;CONTROL AND STATUS REGISTER 1 (RPCS1)
4
5      000100      IE      == 100      ;INTERRUPT ENABLE (BIT #6)
6      000200      RDY     == 200      ;READY (BIT #7)
7      000400      A16     == 400      ;HIGH ORDER BUS ADDRESS BIT (BIT #8)
8      001000      A17     == 1000     ;HIGH ORDER BUS ADDRESS BIT (BIT #9)
9      ;PSEL      == 2000     ;PORT SELECT (BIT #10)
10     020000      MCPE    == 20000    ;MASSBUS CONTROL BUS PARITY ERROR (BIT #13)
11     040000      TRE     == 40000    ;TRANSFER ERROR (BIT #14)
12     100000      MSSC    == 100000   ;SPECIAL CONDITION (BIT #15)
13
14
15     ;WORD COUNT REGISTER (RPWC)
16     ;(EACH BIT IS CALLED BY BIT NUMBER)
17
18
19     ;BUS ADDRESS REGISTER (RPBA)
20     ;(EACH BIT IS CALLED BY BIT NUMBER)
21
22
23     ;CONTROL AND STATUS REGISTER 2 (RPCS2)
24
25     ;US1       == 1      ;UNIT SELECT (BIT #0)
26     ;US2       == 2      ;UNIT SELECT (BIT #1)
27     ;US4       == 4      ;UNIT SELECT (BIT #2)
28     ;BAI       == 10     ;BUS ADDRESS INCREMENT INHIBIT (BIT #3)
29     ;MSPAT     == 20     ;MASSBUS PARITY TEST (BIT #4)
30     000040      CLR     == 40     ;CLEAR (BIT #5)
31     ;IR        == 100    ;INPUT READY (BIT #6)
32     ;OR        == 200    ;OUTPUT READY (BIT #7)
33     000400      MDPE    == 400    ;MASSBUS DATA BUS PARITY ERROR (BIT #8)
34     001000      MXF     == 1000   ;MISSED TRANSFER ERROR (BIT #9)
35     002000      MSPGE   == 2000   ;PROGRAM ERROR (BIT #10)
36     004000      NEM     == 4000   ;NON EXISTENT MEMORY (BIT #11)
37     010000      NED     == 10000  ;NON EXISTENT DRIVE (BIT #12)
38     020000      UPE     == 20000  ;UNIBUS PARITY ERROR (BIT #13)
39     040000      WCE     == 40000  ;WRITE CHECK ERROR (BIT #14)
40     100000      DLT     == 100000 ;DATA LATE (BIT #15)
41
42
43     ;DATA BUFFER REGISTER (RPDB)
44     ;(EACH BIT IS CALLED BY BIT NUMBER)
45
46
47     .SBTTL  RP07 REGISTERS
48
49     ;CONTROL AND STATUS 1 REGISTER. (#00)
50
51     ;GO        == 1      ;GO BIT (BIT #0)
52     ;F1        == 2      ;FUNCTION CODE BIT #1
53     ;F2        == 4      ;FUNCTION CODE BIT #2
54     ;F3        == 10     ;FUNCTION CODE BIT #3
55     ;F4        == 20     ;FUNCTION CODE BIT #4
56     ;F5        == 40     ;FUNCTION CODE BIT #5
57     004000      DVA     == 4000   ;DEVICE AVAILABLE (BIT #11)

```



```

58
59
60      ;DRIVE STATUS REGISTER (RPDS) (#01)
61
62      000001      OM      == 1      ;OFFSET MODE
63      000002      EWN     == 2      ;ERROR WARNING
64      000004      ILV     == 4      ;SECTOR INTERLEAVE MODE IS ENABLED TH. H.W
65      ;VV         == 100     ;VOLUME VALID (BIT #6)
66      ;DRY        == 200     ;DRIVE READY (BIT #7)
67      ;DPR        == 400     ;DRIVE PRESENT (BIT #8)
68      ;PGM        == 1000    ;PROGRAMABLE (BIT #9)
69      002000      LST     == 2000   ;LAST SECTOR TRANSFERRED (BIT #10)
70      ;WRL        == 4000    ;WRITE LOCK (BIT #11)
71      ;MOL        == 10000   ;MEDIUM ON-LINE (BIT #12)
72      ;PIP        == 20000   ;POSITIONING OPERATION IN PROGRESS (BIT #13)
73      040000      ERR     == 40000  ;COMPOSITE ERROR (BIT #14)
74      100000      ATA     == 100000 ;ATTENTION ACTIVE (BIT #15)
75
76
77      ;ERROR REGISTER #01 (RPER1) (#02)
78
79      000001      ILF     == 1      ;ILLEGAL FUNCTION (BIT #0)
80      000002      ILR     == 2      ;ILLEGAL REGISTER (BIT #1)
81      000004      RMR     == 4      ;REGISTER MODIFICATION REFUSED (BIT #2)
82      ;PAR        == 10      ;PARITY ERROR (BIT #3)
83      000020      FER     == 20     ;FORMAT ERROR (BIT #4)
84      000040      WCF     == 40     ;WRITE CLOCK FAIL (BIT #5)
85      000100      ECH     == 100    ;ECC HARD ERROR (BIT #6)
86      000200      HCE     == 200    ;HEADER COMPARE ERROR (BIT #7)
87      000400      HCRC    == 400    ;HEADER CRC ERROR (BIT #8)
88      001000      AOE     == 1000   ;ADDRESS OVERFLOW ERROR (BIT #9)
89      002000      IAE     == 2000   ;INVALID ADDRESS ERROR (BIT #10)
90      004000      WLE     == 4000   ;WRITE LOCK ERROR (BIT #11)
91      010000      DTE     == 10000  ;DRIVE TIMING ERROR (BIT #12)
92      020000      OPI     == 20000  ;OPERATION INCOMPLETE (BIT #13)
93      040000      UNS     == 40000  ;DRIVE UNSAFE (BIT #14)
94      100000      DCK     == 100000 ;DATA CHECK ERROR (BIT 15)
95
96
97      ;MAINTAINABILITY REGISTER #01 (RPMR1)(#03)
98
99      100000      DMD     == 100000  ;DIAGNOSTIC MODE
100
101
102      ;ATTENTION SUMMARY PSEUDO-REGISTER (RPAS) (#04)
103
104      ;AT0        == 1      ;DEVICE 0 (BIT #0)
105      ;AT1        == 2      ;DEVICE 1 (BIT #1)
106      ;AT2        == 4      ;DEVICE 2 (BIT #2)
107      ;AT3        == 10     ;DEVICE 3 (BIT #3)
108      ;AT4        == 20     ;DEVICE 4 (BIT #4)
109      ;AT5        == 40     ;DEVICE 5 (BIT #5)
110      ;AT6        == 100    ;DEVICE 6 (BIT #6)
111      ;AT7        == 200    ;DEVICE 7 (BIT #7)
112
113
114      ;DESIRED SECTOR/TRACK ADDRESS REGISTER (RPDA) (#05)

```



```

115      ;(EACH BIT IS CALLED BY BIT NUMBER)
116
117
118      ;DRIVE TYPE REGISTER (RPDT) (#06)
119
120      ;DT00    == 1           ;DRIVE TYPE NUMBER BIT 1
121      ;DT01    == 2           ;DRIVE TYPE NUMBER BIT 2
122      ;DT02    == 4           ;DRIVE TYPE NUMBER BIT 3
123      ;DT03    == 10          ;DRIVE TYPE NUMBER BIT 4
124      ;DT04    == 20          ;DRIVE TYPE NUMBER BIT 5
125      ;DT05    == 40          ;DRIVE TYPE NUMBER BIT 6
126      ;DT06    == 100        ;DRIVE TYPE NUMBER BIT 7
127      ;DT07    == 200        ;DRIVE TYPE NUMBER BIT 8
128      ;DT08    == 400        ;DRIVE TYPE NUMBER BIT 9
129      ;DRQ     == 4000       ;DRIVE REQUEST REQUIRED (BIT #11)
130      ;MOH     == 20000      ;MOVING HEAD (BIT #13)
131      ;TAP     == 40000      ;TAPE DRIVE (BIT #14)
132      ;NBA     == 100000     ;NOT BLOCK ADDRESSED (BIT #15)
133
134
135      ;LOOK-AHEAD REGISTER (RPLA) (#07)
136
137      ;SC0     == 100         ;SECTOR COUNT FIELD 0 (BIT #6)
138      ;SC1     == 200         ;SECTOR COUNT FIELD 1 (BIT #7)
139      ;SC2     == 400         ;SECTOR COUNT FIELD 2 (BIT #8)
140      ;SC3     == 1000        ;SECTOR COUNT FIELD 3 (BIT #9)
141      ;SC4     == 2000        ;SECTOR COUNT FIELD 4 (BIT #10)
142
143
144      ;RP07 ERROR REGISTER #02 (RPER2) (#10)
145
146      000400   WRYUNS == 400           ;WRITE OFF TRACK CENTER (WRITE UNSAFE)
147      001000   WOR     == 1000        ;WRITE OVERRUN ERROR
148      002000   RWU1    == 2000        ;W/R UNSAFE ERROR 1 (WRITE ERROR)
149      004000   RWU2    == 4000        ;W/R UNSAFE ERROR 2 (READ OR WRITE ERROR)
150      010000   RWU3    == 10000       ;W/R UNSAFE ERROR 3 (WRITE ERROR)
151      100000   PGE     == 100000     ;PROGRAM ERROR
152
153
154      ;RP07 ERROR REGISTER #03 (RPER3)
155
156      ;DGE     == 1           ;DIAGNOSTIC COMMAND
157      000010   DPE     == 10          ;DATA PARITY DURING WRITE
158      000020   SDF     == 20          ;SERDES DATA FAILURE
159      000040   DCU     == 40          ;DC LOW UNSAFE
160      000100   IXU     == 100         ;INDEX PULSE UNSAFE
161      000200   DVC     == 200         ;DRIVE CHECK
162      000400   PHF     == 400         ;TACH CALIBRATE FAILURE
163      001000   LCE     == 1000        ;LOST CYLINDER (POSITIONER IN GUARD BAND)
164      002000   LBC     == 2000        ;LOST BIT CLOCK
165      040000   SKI     == 40000       ;SEEK INCOMPLETE
166      100000   BSE     == 100000     ;BAD SECTOR
167
168
169      ;OFFSET REGISTER (RPOF) (#11)
170
171      002000   HCI     == 2000        ;HEADER COMPARE INHIBIT (BIT #10)

```



```

172      004000      ECI      == 4000      ;ERROR CORRECTION CODE INHIBIT (BIT #11)
173      010000      FMT16     == 10000     ;FORMAT BIT (BIT #12)
174      100000      CMOD      == 100000    ;COMMAND MODIFIER BIT (BIT #13)
175
176
177      ;DESIRED CYLINDER ADDRESS (RPDC) (#12)
178      ;(EACH BIT IS CALLED BY BIT NUMBER)
179
180
181      ;CURRENT CYLINDER ADDRESS (RPCC) (#13)
182      ;(EACH BIT IS CALLED BY BIT NUMBER)
183
184
185      ;SERIAL NUMBER REGISTER (RPSN) (#14)
186      ;(EACH IS CALLED BY BIT NUMBER)
187
188
189      ;ECC POSITION REGISTER (RPEC1) (#16)
190      ;(EACH BIT IS CALLED BY BIT NUMBER)
191
192
193      ;ECC PATTERN REGISTER (RPEC2) (#17)
194      ;(EACH BIT IS CALLED BY BIT NUMBER)
195
196
197      .SBTTL  RP07 DRIVER COMMANDS
198
199      000101      NOOP      == 101      ;NO OPERATION
200      000105      SEEK      == 105      ;SEEK
201      000107      RECAL     == 107      ;RECALIBRATE
202      000111      DRVCLR    == 111      ;DRIVE CLEAR
203      000113      RELSE     == 113      ;RELEASE
204      000115      OFFSET    == 115      ;OFFSET
205      000117      RTC       == 117      ;RETURN TO CENTER LINE
206      000121      READIN    == 121      ;READ IN PRESET
207      000131      SEARCH    == 131      ;SEARCH
208      000135      DIAG      == 135      ;DIAGNOSTIC MODE
209      000143      ILLCMD    == 143      ;ILLEGAL COMMAND
210      000151      WCKD      == 151      ;WRITE CHECK DATA
211      000153      WCKHD     == 153      ;WRITE CHECK HEADER AND DATA
212      000161      WRTDAT    == 161      ;WRITE DATA
213      000163      FMTRK     == 163      ;FORMAT TRACK
214      000165      WRTTD     == 165      ;WRITE TRACK DSCRIPTOR
215      000171      RDDAT     == 171      ;READ DATA
216      000173      RDHD      == 173      ;READ HEADER AND DATA
217      000175      RDTD      == 175      ;READ TRACK DSCRIPTOR
218
219      177400      SCTRWC    == -256.     ;DEFAULT WORD COUNT
220
221      ;THE FOLLOWING ARE SPECIAL DRIVER COMMANDS (NOT CONTROLLER COMMANDS)
222
223      000141      GETREG     == 141      ;READ RPCS1, RPWC, RPBA, RPDA AND STORE THEM AT ADDRESS
224      ;POINTED TO BY 'DPB'+6.
225      000145      MAINT      == 145      ;WRITE MAINTENANCE REGISTER RPMR1
226      000147      SETFORM    == 147      ;SET FORMAT PSEUDO-CMD: WRITE OFFSET REGISTER. SETFORM
227      ;FIRST READS RPOF, EXTRACT ITS LO BYTE, CHANGES ITS HI BYTE
228      ;PER 'DPB', MERGES BOTH BYTES TO WRITE RPOF. HENCE SETFORM

```



F3

229  
230  
231

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



```

1          .SBTTL  GLOBAL DATA SECTION
2
3          ;**
4          ; THE GLOBAL DATA SECTION CONTAINS DATA THAT ARE USED
5          ; IN MORE THAN ONE TEST.
6          ;--
7
8 002240 000000 TEMPO:: .WORD 0          ;TEMPORARY LOST REVOLUTION COUNT
9 002242 000001 TYTIME::.WORD 1         ;TYPE SEEK TIMES IF =1
10 002244 000001 ITCNT:: .WORD 1        ;TEST ITERATION COUNTER
11 002246 000000 ISRCNT:: .WORD 0       ;INTERRUPT SERVICE COUNTER
12 002250 002000 XTIMES:: .WORD 1024.   ;TEST ITERATION COUNT;          TESTS 14. & 18.
13 002252 000000 SRHSEC:: .WORD 0       ;SEARCH SECTOR;                TESTS 14. & 18.
14 002254 000000 TRGSEC:: .WORD 0       ;TARGET SECTOR;                TESTS 14. & 18.
15 002256 000000 DOTWO:: .WORD 0       ;USED TO FORCE TWO ITERATIONS OF AN OPERATION
16 002260 000000 CLKSTA:: .WORD 0      ;CLOCK STATUS (NO CLOCK= 0,KW11-P= 1 OR KW11-L= -1
17 002262 000000 BYPASS:: .WORD 0     ;BYPASS ROUTE ADR; SET IN CALL ERRABO
18
19 002264 000000 SVSTAT:: .WORD 0      ;CALLERS; CALL.A/B/C, DRVCAL, SRCHOO.
20
21 002266 001165 NC1:: .WORD 629.        ;LAST PHYSICAL CYL
22 002270 001166 NC2:: .WORD 630.        ;FIRST FE CYL
23 002272 000037 NT1:: .WORD 31.        ;LAST PHYSICAL TRK
24 002274 000061 NS1:: .WORD 49.        ;LAST PHYSICAL SEC
25
26 002276 000000 CYL.RD:: .WORD 0          ;CYLINDER READ
27 002300 000000 TRK.RD:: .WORD 0          ;TRACK READ
28 002302 000000 SEC.RD:: .WORD 0          ;SECTOR READ
29 002304 000000 CYL.DS:: .WORD 0          ;CYLINDER DESIRED
30 002306 000000 SEC.DS:: .WORD 0          ;SECTOR DESIRED
31 002310 000000 TRK.DS:: .WORD 0          ;TRACK DESIRED
32
33 002312 000000 TIM.UP:: .WORD 0          ;MINIMUM TIME
34 002314 000000 .WORD 0          ;NUMBER OF COUNTS BELOW MIN. LIMIT
35 002316 000000 .WORD 0          ;MAXIMUM TIME
36 002320 000000 .WORD 0          ;NUMBER OF COUNTS ABOVE MAX. LIMIT
37 002322 000000 000000 .WORD 0,0      ;TOTAL TIME OF ALL SEEKS
38 002326 000000 .WORD 0          ;NUMBER OF SEEKS PERFORMED
39
40 002330 000000 TIM.DN:: .WORD 0          ;MINIMUM TIME
41 002332 000000 .WORD 0          ;NUMBER OF COUNTS BELOW MIN. LIMIT
42 002334 000000 .WORD 0          ;MAXIMUM TIME
43 002336 000000 .WORD 0          ;NUMBER OF COUNTS ABOVE MAX. LIMIT
44 002340 000000 000000 .WORD 0,0      ;TOTAL TIME OF ALL SEEKS
45 002344 000000 .WORD 0          ;NUMBER OF SEEKS PERFORMED
46 002346 000000 TIM.PT:: .WORD 0          ;POINTS TO TABLE OF TIMES
47 002350 000000 WCEFLG:: .WORD 0          ;FATAL WRITE CHECK ERROR FLAG
48 002352 000000 DELTA:: .WORD 0          ;MEMORY SIZING SCRATCH LOCATION
49 002354 163400 TRKWC:: .WORD -<256.*25.> ;WORD COUNT FOR HALF A TRACK IN 16 BIT MODE
50 002356 000012 STALL1:: .WORD 10.        ;10 MILLISECONDS STALL
51 002360 000012 STALL2:: .WORD 10.        ;10 MILLISECONDS STALL
52
53          ;BIT TABLE
54 002362 000001 BITS:: .WORD BIT00
55 002364 000002 .WORD BIT01
56 002366 000004 .WORD BIT02
57 002370 000010 .WORD BIT03

```



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



```

1      .SBTTL  TIMING MESSAGE AND LIMITS TABLES
2
3      ;ROTATIONAL TEST TABLES FOR RP07 DRIVE
4      ;50HZ AND 60HZ TABLE
5
6 002442 004674  T7A::  .WORD  ROTATE      ;1ST MESSAGE
7 002444 000000      .WORD  0          ;2ND MESSAGE      (NONE)
8 002446 003103      .WORD  1603.       ;LO LIMIT        (16.515MS + 3%)
9 002450 003246      .WORD  1702.       ;HI LIMIT        (16.515MS - 3%)
10
11     ;SEEK TEST TABLES
12
13 002452 004736  TIMT10:: .WORD  ONECYL   ;1ST MESSAGE
14 002454 005204      .WORD  REV        ;2ND MESSAGE
15 002456 000000      .WORD  0          ;LO LIMIT        (NONE)
16 002460 000764      .WORD  500.       ;HI LIMIT        (5.0MS)
17
18 002462 005010  TIMT11:: .WORD  AVERGE   ;1ST MESSAGE
19 002464 005204      .WORD  REV        ;2ND MESSAGE
20 002466 000000      .WORD  0          ;LO LIMIT        (NONE)
21 002470 004374      .WORD  2300.     ;HI LIMIT        (23.0MS)
22
23 002472 005055  TIMT12:: .WORD  MXSEEK   ;1ST MESSAGE
24 002474 005204      .WORD  REV        ;2ND MESSAGE
25 002476 000000      .WORD  0          ;LO LIMIT        (NONE)
26 002500 010770      .WORD  4600.     ;HI LIMIT        (46.0MS)
27
28 002502 005122  T1418:: .WORD  MARK    ;1ST MESSAGE
29 002504 000000      .WORD  0          ;2ND MESSAGE      (NONE)
30 002506 000000      .WORD  0          ;LO LIMIT        (NONE)
31 002510 003246      .WORD  1702.     ;HI LIMIT        (16.515MS - 3%)

```



```

1      .SBTTL  TIMING LIMIT(S) TABLES
2
3      ;SPECS. MESSAGE TABLES FOR ROTATIONAL AND TIMING TESTS
4
5      ;ROTATIONAL MESSAGE AND LO/HI LIMITS
6      ;50HZ AND 60HZ TABLE
7
8 002512 005221  SP7::  .WORD  MSGLMT      ;LIMIT(S) MESSAGE
9 002514 003103      .WORD  1603.      ;LO LIMIT (16.515MS + 3%)
10 002516 003246     .WORD  1702.      ;HI LIMIT (16.515MS - 3%)
11
12     ;TIMING TEST MESSAGES AND LO/HI LIMITS
13
14 002520 005221  SP10:: .WORD  MSGLMT      ;LIMIT(S) MESSAGE
15 002522 000000      .WORD  0          ;NO LO LIMIT
16 002524 000764     .WORD  500.       ;HI LIMIT (5.0MS)
17
18 002526 005221  SP11:: .WORD  MSGLMT      ;LIMIT(S) MESSAGE
19 002530 000000      .WORD  0          ;NO LO LIMIT
20 002532 004374     .WORD  2300.      ;HI LIMIT (23.0MS)
21
22 002534 005221  SP12:: .WORD  MSGLMT      ;LIMIT(S) MESSAGE
23 002536 000000      .WORD  0          ;NO LO LIMIT
24 002540 010770     .WORD  4600.      ;HI LIMIT (46.0MS)
25
26 002542 005221  SP1418::.WORD  MSGLMT      ;LIMIT(S) MESSAGE
27 002544 000000      .WORD  0          ;NO LO LIMIT
28 002546 003246     .WORD  1702.      ;HI LIMIT (16.515MS - 3%)

```







58	002620	000	.BYTE	0	;(10) SECTOR ADDRESS OR
59					;FIRST REG. INDEX
60	002621	000	.BYTE	0	;(11) TRACK ADDRESS OR
61					;LAST REG. INDEX
62	002622	000000	.WORD	0	;(12) CYLINDER ADDRESS
63	002624	002754	.WORD	REG	;(14) ERROR TABLE POINTER
64					;POINTS TO THE FIRST OF TWENTY
65					;LOCATIONS OF WHERE THE DRIVER
66					;IS TO STORE THE RHXX/RP07
67					;REGISTERS ON AN ERROR. IF LEFT
68					;ZERO REGISTERS ARE NOT SAVED.
69	002626	000000	.WORD	0	;(16) STATUS/ERROR INDICATOR
70					;BIT15=1->ERROR OCCURRED
71					;BIT07=1->DONE
72					;BIT14-BIT09 AND BIT06-BIT03
73					;INDICATE TYPE OF ERROR
74					
75	002630	000	DTADPB: .BYTE	0	;(0) DRIVE NUMBER
76	002631	000	.BYTE	0	;(1) OFFSET VALUE OR FMT16, ECT, AND HCI
77	002632	000	.BYTE	0	;(2) COMMAND
78	002633	000	.BYTE	0	;(3) PSEL AND A17 AND A16
79	002634	000000	.WORD	0	;(4) WORD COUNT (MUST BE NEG.)
80	002636	042762	.WORD	DBUFF	;(6) BUFFER ADDRESS OR
81					;REGISTER TABLE POINTER
82	002640	000	.BYTE	0	;(10) SECTOR ADDRESS OR
83					;FIRST REG. INDEX
84	002641	000	.BYTE	0	;(11) TRACK ADDRESS OR
85					;LAST REG. INDEX
86	002642	000000	.WORD	0	;(12) CYLINDER ADDRESS
87	002644	002754	.WORD	REG	;(14) ERROR TABLE POINTER
88					;POINTS TO THE FIRST OF TWENTY
89					;LOCATIONS OF WHERE THE DRIVER
90					;IS TO STORE THE RHXX/RP07
91					;REGISTERS ON AN ERROR. IF LEFT
92					;ZERO REGISTERS ARE NOT SAVED.
93	002646	000000	.WORD	0	;(16) STATUS/ERROR INDICATOR
94					;BIT15=1->ERROR OCCURRED
95					;BIT07=1->DONE
96					;BIT14-BIT09 AND BIT06-BIT03
97					;INDICATE TYPE OF ERROR



```

1          .SBTTL  DRIVE AND REGISTER STORAGE
2
3 002650  000000          UNIT::  .WORD  0          ;USED TO SELECT A UNIT FOR TEST
4 002652  176700          RPADR::  .WORD  176700       ;CONTAINS RPCS1 BASE ADDRESS
5 002654  000254  000240  RPVEC::  .WORD  254,5*32.    ;CONTAINS VECTOR ADDRESS & BR LEVEL
6 002660  000050          RHEXT::  .WORD  50          ;CONTAINS RH70 OFFSET TO RPBAE
7 002662  000000          RHTYPE:: .WORD  0          ;CONTAINS RHXX TYPE; RH11= 0, RH70= 1
8 002664  000000          DRVNO::  .WORD  0          ;DRIVE NUMBER
9 002666  000000          DRVSN::  .WORD  0          ;STORAGE FOR EACH S/N DIGIT
10
11 002670  176700          RPCS1::  .WORD  176700       ;BASE ADDRESS USED FOR THE DRIVE
12 002672  176702          RPWC::   .WORD  176702       ;WORD COUNT REGISTER
13 002674  176704          RPBA::   .WORD  176704       ;BYTE ADDRESS REGISTER
14 002676  176706          RPDA::   .WORD  176706       ;DESIRED SECTOR/TRACK ADDRESS
15 002700  176710          RPCS2::  .WORD  176710       ;RP07 STATUS REGISTER
16 002702  176712          RPDS::   .WORD  176712       ;RP07 DRIVE STATUS
17 002704  176714          RPER1::  .WORD  176714       ;RP07 ERROR REGISTER #1
18 002706  176716          RPAS::   .WORD  176716       ;RP07 ATTENTION SUMMARY PSEUDO REGISTER
19 002710  176720          RPLA::   .WORD  176720       ;RP07 LOOK AHEAD REGISTER
20 002712  176722          RPDB::   .WORD  176722       ;RP07 DATA BUFFER
21 002714  176724          RPMR1::  .WORD  176724       ;RP07 MAINTENANCE REGISTER #1
22 002716  176726          RPDV::   .WORD  176726       ;DRIVE TYPE REGISTER
23 002720  176730          RPSN::   .WORD  176730       ;RP07 SERIAL NUMBER
24 002722  176732          RPOF::   .WORD  176732       ;RP07 OFFSET REGISTER
25 002724  176734          RPDC::   .WORD  176734       ;RP07 DESIRED CYLINDER
26 002726  176736          RPCC::   .WORD  176736       ;RP07 CURRENT CYLINDER
27 002730  176740          RPER2::  .WORD  176740       ;RP07 ERROR REGISTER #2
28 002732  176742          RPER3::  .WORD  176742       ;RP07 ERROR REGISTER #3
29 002734  176744          RPEC1::  .WORD  176744       ;RP07 ERROR POSITION
30 002736  176746          RPEC2::  .WORD  176746       ;RP07 ERROR PATTERN
31 002740  176750          RPBAE::  .WORD  176750       ;RH70 REGISTER
32 002742  176752          RPCS3::  .WORD  176752       ;RH70 REGISTER
33
34          ;ATTENTION BITS TABLE (ATABIT=8 BYTES)
35          ;THIS TABLE CONTAINS THE CORRESPONDING BIT TO EACH DRIVES
36          ;ATTENTION BIT
37
38 002744  001          ATABIT:: .BYTE  1          ;DRIVE 0
39 002745  002          .BYTE  2          ;DRIVE 1
40 002746  004          .BYTE  4          ;DRIVE 2
41 002747  010          .BYTE  10         ;DRIVE 3
42 002750  020          .BYTE  20         ;DRIVE 4
43 002751  040          .BYTE  40         ;DRIVE 5
44 002752  100          .BYTE  100        ;DRIVE 6
45 002753  200          .BYTE  200        ;DRIVE 7
46
47          ; STORAGE FOR DEVICE REGISTERS
48          ;
49 002754          REG::   .BLKW 22.          ;SAVE REGISTERS HERE
50

```







```

71 004736      045      116      045  ONECYL:: .ASCIZ /#N#AONE CYLINDER SEEK TIMES#N#A * FORWARD/
72 005010      045      116      045  AVERAGE:: .ASCIZ /#N#AAVERAGE SEEK TIMES#N#A * FORWARD/
73 005055      045      116      045  MXSEEK:: .ASCIZ /#N#AMAXIMUM SEEK TIMES#N#A * FORWARD/
74 005122      045      116      045  MARK:: .ASCIZ /#N#AADDRESS MARK DETECT TIMES#N#A * /
75 005167      045      101      040  FWD:: .ASCIZ /#A * FORWARD/
76 005204      045      101      040  REV:: .ASCIZ /#A * REVERSE/
77 005221      045      101      040  MSGLMT:: .ASCIZ /#A * LIMIT(S)/
78
79 005237      045      116      045  UNSMSG:: .ASCIZ /#N#ADRIIVE #01#A UNSAFE#N/
80 005270      045      116      045  NEDMSG:: .ASCIZ /#N#ADRIIVE #01#A NON-EXISTENT#N/
81 005327      045      116      045  OFLMSG:: .ASCIZ /#N#ADRIIVE #01#A OFF-LINE#N/
82 005362      045      116      045  NOTMSG:: .ASCIZ /#N#ADRIIVE #01#A NOT AN RP07#N/
83
84              .SBTTL GLOBAL ASCII MESSAGE SECTION
85
86 005420      122      110      130  EM1:: .ASCIZ /RHXX CONTROL BUS PARITY ERROR MCPE=1/
87 005465      122      110      130  EM2:: .ASCIZ /RHXX DATA BUS PARITY ERROR MDPE=1/
88 005527      122      110      130  EM3:: .ASCIZ /RHXX ILLEGAL CONDITIONS SET (NED,NEM,PGE,MXF)/
89 005605      127      122      111  EM4:: .ASCIZ /WRITE CHECK ERROR/
90 005627      104      101      124  EM5:: .ASCIZ /DATA LATE ERROR/
91 005647      104      122      111  EM6:: .ASCIZ /DRIVE PROGRAMMING ERROR (PGE)/
92 005705      114      117      123  EM7:: .ASCIZ /LOSTS BIT CLOCK (LBC)/
93
94 005733      127      122      111  EM11:: .ASCIZ /WRITE CLOCK FAILS/
95 005755      127      122      111  EM12:: .ASCIZ /WRITE LOCK ERROR/
96 005776      104      101      124  EM13:: .ASCIZ /DATA ERROR (DCK)/
97 006017      104      122      111  EM14:: .ASCIZ /DRIVE BUS PARITY ERROR (DPE)/
98 006054      111      114      114  EM15:: .ASCIZ /ILLEGAL CONDITIONS SET (ILF,ILR,RMR)/
99 006121      101      104      104  EM16:: .ASCIZ /ADDRESSING ERROR (IAE,AOE)/
100 006154     123      105      105  EM17:: .ASCIZ /SEEK ERROR (SKI,LCE)/
101
102 006201      103      114      117  EM20:: .ASCIZ @CLOCK (KW11-P) OVERFLOW IN TIMING TEST@
103 006250      105      101      122  EM21:: .ASCIZ /EARLY WARNING (EWN)/
104 006274      122      105      101  EM22:: .ASCIZ /READ & WRITE HEAD FAILS/
105 006324      104      101      124  EM23:: .ASCIZ /DATA FORMAT BIT ERROR (FER)/
106 006360      110      105      101  EM24:: .ASCIZ /HEADER INFORMATION ERROR (HCE)/
107 006417      104      122      111  EM25:: .ASCIZ @DRIVE HAS BECOME NON-EXISTENT@
108 006455      104      122      111  EM26:: .ASCIZ @DRIVE HAS NOT RESPONDED TO PORT REQUEST@
109 006525     123      117      106  EM27:: .ASCIZ @SOFTWARE TIMEOUT ON THIS DRIVE@
110
111 006564      106      101      124  EM30:: .ASCIZ @FATAL MASSBUS PARITY ERROR (MCPE=1 OR PAR=1)@
112 006641      117      106      106  EM31:: .ASCIZ @OFFLINE OR UNSAFE DRIVE REQUESTED@
113 006703      127      122      111  EM32:: .ASCIZ /WRITE-READY UNSAFE/
114 006726      104      103      040  EM33:: .ASCIZ /DC POWER UNSAFE/
115 006746      111      116      104  EM34:: .ASCIZ /INDEX UNSAFE/
116 006763      120      122      117  EM35:: .ASCIZ /PROCESSOR HANDSHAKE FAILURE/
117 007017      104      122      111  EM36:: .ASCIZ /DRIVE OFFLINE OR NOT AN RP07/
118
119 007054      117      120      105  EM41:: .ASCIZ /OPERATION INCOMPLETE (OPI)/
120 007107      111      115      120  EM42:: .ASCIZ /IMPROPER HEADER DATA/
121 007134      105      103      103  EM43:: .ASCIZ /ECC LOGIC FAILURE/
122 007156      115      111      123  EM44:: .ASCIZ /MISC DRIVE ERROR; RPER1, RPER2, RPER3/
123 007224      104      122      111  EM45:: .ASCIZ /DRIVE TIMING ERROR (DTE)/
124 007255      110      105      101  EM46:: .ASCIZ /HEADER CRC ERROR (HCRC)/
125 007305      125      116      103  EM47:: .ASCIZ /UNCORRECTABLE ECC ERROR/
126
127 007335      114      101      123  EM50:: .ASCIZ /LAST BLOCK TRANSF 'LBT' NOT SET AFTER READING LAST SECTOR/

```



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



```

1          .SBTTL GLOBAL ERROR REPORT SECTION
2
3          DH44::
4 007672   013746   002302   MOV      SEC.RD,-(SP)
   007676   013746   002300   MOV      TRK.RD,-(SP)
   007702   013746   002276   MOV      CYL.RD,-(SP)
   007706   012746   003105   MOV      @DH44A,-(SP)
   007712   012746   000004   MOV      @4,-(SP)
   007716   010600   000000   MOV      SP,RO
   007720   104414   000000   TRAP     C:PNTB
   007722   062706   000012   ADD      @12,SP
5 007726   013746   003014   MOV      REG+40,-(SP) ;PRINT RPER2 ERROR CODE IN HEX
6 007732   042716   177400   BIC      @177400,(SP)
7 007736   004737   011532   JSR      PC,OCTHEX
8 007742   012746   011674   MOV      @PSTACK+6,-(SP)
   007746   012746   011672   MOV      @PSTACK+4,-(SP)
   007752   012746   011670   MOV      @PSTACK+2,-(SP)
   007756   012746   011666   MOV      @PSTACK,-(SP)
   007762   012746   003154   MOV      @DH44D,-(SP)
   007766   012746   000005   MOV      @5,-(SP)
   007772   010600   000000   MOV      SP,RO
   007774   104414   000000   TRAP     C:PNTB
   007776   062706   000014   ADD      @14,SP
9
10 010002   012746   003203   MOV      @DH44E,-(SP) ;PRINT 'DRIVE RPCS1 RPWC RPBA RPDA RPCS2 RPS'
   010006   012746   000001   MOV      @1,-(SP)
   010012   010600   000000   MOV      SP,RO
   010014   104415   000000   TRAP     C:PNTX
   010016   062706   000004   ADD      @4,SP
11 010022   013746   002766   MOV      REG+12,-(SP)
   010026   013746   002764   MOV      REG+10,-(SP)
   010032   013746   002762   MOV      REG+06,-(SP)
   010036   013746   002760   MOV      REG+04,-(SP)
   010042   013746   002756   MOV      REG+02,-(SP)
   010046   013746   002754   MOV      REG,-(SP)
   010052   013746   002664   MOV      DRVNO,-(SP)
   010056   012746   003274   MOV      @DH44F,-(SP)
   010062   012746   000010   MOV      @10,-(SP)
   010066   010600   000000   MOV      SP,RO
   010070   104415   000000   TRAP     C:PNTX
   010072   062706   000022   ADD      @22,SP
12
13 010076   012746   003354   MOV      @DH44G,-(SP) ;PRINT 'RPER1 RPAS RPLA RPDB RPMR1 RPDT RPSN'
   010102   012746   000001   MOV      @1,-(SP)
   010106   010600   000000   MOV      SP,RO
   010110   104415   000000   TRAP     C:PNTX
   010112   062706   000004   ADD      @4,SP
14 010116   013746   003004   MOV      REG+30,-(SP)
   010122   013746   003002   MOV      REG+26,-(SP)
   010126   013746   003000   MOV      REG+24,-(SP)
   010132   013746   002776   MOV      REG+22,-(SP)
   010136   013746   002774   MOV      REG+20,-(SP)
   010142   013746   002772   MOV      REG+16,-(SP)
   010146   013746   002770   MOV      REG+14,-(SP)
   010152   012746   003445   MOV      @DH44H,-(SP)
   010156   012746   000010   MOV      @10,-(SP)
   010162   010600   000000   MOV      SP,RO

```



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



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



	010712	012746	000002		MOV	#2,-(SP)	
	010716	010600			MOV	SP,RO	
	010720	104414			TRAP	C\$PNTB	
	010722	062706	000006		ADD	#6,SP	
47							
48	010726	012746	003064		MOV	#CRLF,-(SP)	:CR-LF
	010732	012746	000001		MOV	#1,-(SP)	
	010736	010600			MOV	SP,RO	
	010740	104414			TRAP	C\$PNTB	
	010742	062706	000004		ADD	#4,SP	
49	010746			I.10005:			
	010746	104423			TRAP	C\$MSG	
50							

```

1      .SBTTL GLOBAL SUBROUTINES SECTION
2
3      ;*SAVE R0-R5
4      ;*CALL:
5      ;*      JSR      PC,SAVREG
6      SAVREG:
7      MOV      R0,-(SP)      ;;PUSH R0 ON STACK
8      MOV      R1,-(SP)      ;;PUSH R1 ON STACK
9      MOV      R2,-(SP)      ;;PUSH R2 ON STACK
10     MOV      R3,-(SP)      ;;PUSH R3 ON STACK
11     MOV      R4,-(SP)      ;;PUSH R4 ON STACK
12     MOV      R5,-(SP)      ;;PUSH R5 ON STACK
13     MOV      20(SP),-(SP)  ;;SAVE PUSHED PARAMETER
14     MOV      20(SP),-(SP)  ;;SAVE PC OF MAIN FLOW
15     MOV      20(SP),-(SP)  ;;SAVE PC OF SAVREG CALL
16     RTS      PC
17
18     ;*RESTORE R0-R5
19     ;*CALL:
20     ;*      JSR      PC,RESREG
21     RESREG:
22     MOV      (SP)+,20(SP)  ;;RESTORE PC OF RESREG CALL
23     MOV      (SP)+,20(SP)  ;;RESTORE PC OF MAIN FLOW
24     MOV      (SP)+,20(SP)  ;;RESTORE PUSHED PARAMETER
25     MOV      (SP)+,R5      ;;POP STACK INTO R5
26     MOV      (SP)+,R4      ;;POP STACK INTO R4
27     MOV      (SP)+,R3      ;;POP STACK INTO R3
28     MOV      (SP)+,R2      ;;POP STACK INTO R2
29     MOV      (SP)+,R1      ;;POP STACK INTO R1
30     MOV      (SP)+,R0      ;;POP STACK INTO R0
31     RTS      PC

```



```

1      ;AUTO SIZE FOR RH70 CONTROLLER AND DETERMINE IF IT IS JUMPERED FOR 22 OR
2      ;32 REGISTERS
3      ;CALL
4      ;      JSR      PC,SIZE70      ;CALL ROUTINE
5      ;
6      ;R5 MUST CONTAIN POINTER TO NEW RPCS1 BASE ADDRESS
7
9 011034 005037 002660      SIZE70: CLR      RHEXT      ;CLEAR RPBAE OFFSET
10 011040 005037 002662      CLR      RHTYPE     ;CLEAR RHXX TYPE REGISTER (RH11)
11 011044 013746 000004      MOV      ERRVEC,-(SP) ;SAVE CONTENTS OF ERROR VECTOR
12 011050 012737 011120 000004      MOV      #2$,ERRVEC  ;SETUP 'TRAP' RETURN ADDRESS
13 011056 011500      MOV      (R5),R0      ;GET RPCS1 ADDRESS
14 011060 062700 000050      ADD      #50,R0      ;GET REGISTER OFFSET FOR RH70
15 011064 012702 000012      MOV      #10.,R2     ;GET NUMBER OF REGISTERS TO CHECK
16 011070 005720      TST      (R0)+       ;TRAP IF NOT A VALID RPBAE
17 011072 005720      TST      (R0)+       ;TRAP IF NOT A VALID RPCS3
18 011074 012737 000050 002660      MOV      #50,RHEXT   ;LOAD OFFSET FOR RPBAE (22 REGISTER RH)
19 011102 005720      1$: TST      (R0)+       ;TRAP IF NOT A VALID REGISTER
20 011104 005302      DEC      R2          ;DONE WITH ALL 32 REGISTERS ?
21 011106 001375      BNE      1$         ;BR IF NO
22 011110 012737 000074 002660      MOV      #74,RHEXT   ;LOAD OFFSET FOR RPBAE (32 REGISTER RH)
23 011116 000403      BR      3$         ;
24 011120 012716 011126      2$: MOV      #3$, (SP)   ;SETUP RETURN ADDRESS
25 011124 000002      RTI
26
27 011126 011500      3$: MOV      (R5),R0     ;GET RPCS1 REGISTER
28 011130 013702 002660      MOV      RHEXT,R2    ;GET RPBAE REGISTER OFFSET
29 011134 001415      BEQ      4$         ;BR IF NONE
30 011136 060002      ADD      R0,R2      ;GET RPBAE REGISTER
31 011140 052710 001400      BIS      #A17!A16,(R0) ;SET EXTENDED ADDRESS BITS IN RPCS1
32 011144 022712 000003      CMP      #3,(R2)    ;ARE THE EXTENDED BITS SET IN RPBAE ?
33 011150 001007      BNE      4$         ;BR IF NO
34 011152 005012      CLR      (R2)       ;CLEAR EXTENDED ADDRESS BITS IN RPBAE
35 011154 011046      MOV      (R0),-(SP)  ;SAVE RPCS1 REG CONTENTS
36 011156 042726 176377      BIC      #C<A17!A16>,(SP)+ ;ARE THE EXTEND BITS CLEAR IN RPCS1 ?
37 011162 001002      BNE      4$         ;BR IF NO
38 011164 005237 002662      INC      RHTYPE     ;SET RHXX TYPE REGISTER (RH70)
39 011170 012637 000004      4$: MOV      (SP)+,ERRVEC ;RESTORE CONTENTS OF ERROR VECTOR
40 011174 000207      RTS      PC

```

```

1      ;          INTEGER DIVIDE ROUTINE
2      ;*THIS ROUTINE WILL DIVIDE A 32-BIT TWO'S COMPLEMENT INTEGER
3      ;*DIVIDEND BY A 16-BIT TWO'S COMPLEMENT INTEGER DIVISOR GIVING
4      ;*A 16-BIT TWO'S COMPLEMENT INTEGER QUOTIENT AND A 16-BIT REMAINDER.
5      ;*DIVISION WILL BE PERFORMED SO THAT THE REMAINDER IS OF THE
6      ;*SAVE SIGN AS THE DIVIDEND.
7      ;*CALL:
8      ;*      MOV      LOW DIVIDEND,-(SP)      ;;THE HIGH DIVIDEND MUST BE < 1/2
9      ;*      MOV      HIGH DIVIDEND,-(SP)    ; AS LARGE AS THE DIVISOR
10     ;*      MOV      DIVISOR,-(SP)
11     ;*      JSR      PC,$DIV
12     ;*      RETURN                      ;;QUOTIENT & REMAINDER ARE ON THE STACK
13     ;*      "V"=0    IMPLIES NO ERROR
14     ;*      "V"=1    IMPLIES ERROR OCCURRED
15     ;*      "C"=0    DIVIDE OVERFLOW OCCURRED
16     ;*      "C"=1    ATTEMPTED TO DIVIDE BY ZERO
17     ;*
18     ;*
19     ;*      STACK  NO ERROR      OVERFLOW      DIVIDE BY ZERO
20     ;*      -----
21     ;*      TOP    REMAINDER    ALL ZEROS      ALL ONES
22     ;*      +2    QUOTIENT      ALL ZEROS      ALL ONES
23
24
25     $DIV:  CLR      -(SP)      ;;CLEAR DIV STATUS WORD: RESERVED TO SET C AND V BITS
26     MOV      R0,-(SP)        ;;PUSH R0 ON STACK
27     MOV      R1,-(SP)        ;;PUSH R1 ON STACK
28     MOV      R2,-(SP)        ;;PUSH R2 ON STACK
29     MOV      R3,-(SP)        ;;PUSH R3 ON STACK
30     CLR      -(SP)          ;;SAVE A PLACE FOR SIGNS
31     MOV      #17,-(SP)       ;;SETUP THE ITERATION COUNTER
32     MOV      24(SP),R1       ;;PICKUP THE DIVIDEND
33     MOV      22(SP),R0
34     BPL      1$              ;;CHECK THE SIGN
35     DECB     3(SP)           ;;KEEP TRACK OF THE SIGN
36     NEG      R0              ;;AND NEGATE THE ORIGINAL
37     NEG      R1              ;;NUMBER
38     SBC      R0
39     1$:     MOV      20(SP),R2      ;;PICKUP THE DIVISOR
40     BLT      2$              ;;CHECK THE SIGN
41     BGT      3$              ;;DIVISOR OF 0 IS A NO-NO
42     BIS      #3,14(SP)       ;;SET "V" & "C" IN DIV STAT WORD
43     MOV      #1,R0           ;;SET REMAINDER TO ALL ONES
44     BR       7$              ;;EXIT
45     2$:     INC      2(SP)         ;;KEEP TRACK OF DIVISORS SIGN
46     BR       4$
47     3$:     NEG      R2              ;;NEGATE THE ORIGINAL NUMBER
48     4$:     CLC                    ;;CLEAR "C" IN PSW
49     BR       6$              ;;START FORMING QUOTIENT
50     5$:     ROL      R0              ;;POSITION MSB'S
51     MOV      R0,R3           ;;COPY
52     ADD      R2,R3           ;;COMPARE DIVIDEND & DIVISOR
53     BCC      6$              ;;BR IF DIVIDEND > DIVISOR
54     MOV      R3,R0           ;;REMAINDER AFTER THIS LOOP
55     6$:     ROL      R1              ;;QUOTIENT BIT ENTERS HERE
56     DEC      (SP)           ;;DONE?
57     BNE     5$              ;;BR IF NO
    
```



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

```

1      ;      INTEGER MULTIPLY ROUTINE
2      ;
3      ;*CALL
4      ;*      MOV      MULTIPLIER, -(SP)
5      ;*      MOV      MULTIPLICAND, -(SP)
6      ;*      JSR      PC, $MULT
7      ;*      RETURN      ;;PRODUCT IS ON THE STACK
8      ;*
9      ;*      STACK   PRODUCT
10     ;*      -----
11     ;*      TOP     LSB'S
12     ;*      +2     MSB'S
13
14 011420 010046      $MULT:  MOV      R0, -(SP)      ;;PUSH R0 ON STACK
15 011422 010146      MOV      R1, -(SP)      ;;PUSH R1 ON STACK
16 011424 010246      MOV      R2, -(SP)      ;;PUSH R2 ON STACK
17 011426 005046      CLR      -(SP)      ;;CLEAR THE SIGN KEY
18 011430 016601 000012  MOV      12(SP),R1      ;;GET THE MULTIPLICAND
19 011434 100002      BPL      1$      ;;BR IF PLUS
20 011436 005216      INC      (SP)      ;;SET THE SIGN KEY
21 011440 005401      NEG      R1      ;;MAKE THE MULTIPLICAND POSTIVE
22 011442 016602 000014  1$:  MOV      14(SP),R2      ;;GET THE MULTIPLIER
23 011446 100002      BPL      2$      ;;BR IF PLUS
24 011450 005316      DEC      (SP)      ;;UPDATE THE SIGN KEY
25 011452 005402      NEG      R2      ;;MAKE THE MULTIPLIER POSTIVE
26 011454 012746 000021  2$:  MOV      #17, -(SP)      ;;SET THE LOOP COUNT
27 011460 005000      CLR      R0      ;;SETUP FOR THE MULTIPLY LOOP
28 011462 103001 3$:  BCC      4$      ;;DON'T ADD IF MULTIPLICAND = 0
29 011464 060200      ADD      R2,R0
30 011466 006000 4$:  ROR      R0      ;;POSITION THE PARTIAL PRODUCT AND
31 011470 006001      ROR      R1      ;;THE MULTIPLICAND
32 011472 005316      DEC      (SP)      ;;HAS ALL BITS OF THE MULTIPLICAND BEEN DONE?
33 011474 001372      BNE      3$      ;;BR IF NO
34 011476 022616      CMP      (SP)+,(SP)      ;;SHOULD PRODUCT BE NEGATIVE?
35 011500 001403      BEQ      5$      ;;GO TO EXIT IF NO
36 011502 005400      NEG      R0      ;;YES--SO MAKE IT SO
37 011504 005401      NEG      R1
38 011506 005600      SBC      R0
39 011510 005726 5$:  TST      (SP)+      ;;CLEAR SIGN INFO. OFF OF STACK
40 011512 010066 000012  MOV      R0,12(SP)      ;;PUT THE PRODUCT ON THE STACK (MSB'S)
41 011516 010166 000010  MOV      R1,10(SP)      ;;LSB'S
42 011522 012602      MOV      (SP)+,R2      ;;POP STACK INTO R2
43 011524 012601      MOV      (SP)+,R1      ;;POP STACK INTO R1
44 011526 012600      MOV      (SP)+,R0      ;;POP STACK INTO R0
45 011530 000207      RTS      PC

```



```

1
2
3
4 011532 010146
5 011534 010246
6 011536 012700 011666
7 011542 012702 000004
8 011546 012701 000004
9 011552 005010
10 011554 006310
11 011556 000241
12 011560 006366 000006
13 011564 103002
14 011566 052710 000001
15 011572 005301
16 011574 003367
17 011576 005720
18 011600 005302
19 011602 003361
20 011604 012702 000004
21 011610 012700 011666
22 011614 005710
23 011616 003005
24 011620 012720 000060
25 011624 005302
26 011626 003372
27 011630 000412
28 011632 021027 000011
29 011636 101003
30 011640 062720 000060
31 011644 000402
32 011646 062720 000067
33 011652 005302
34 011654 003366
35 011656 012602
36 011660 012601
37 011662 012616
38 011664 000207
39
40 011666

```

```

;OCTAL TO HEXADECIMAL CONVERSION ROUTINE
OCTHEX: MOV R1,-(SP) ;SAVE R1
MOV R2,-(SP) ;SAVE R2
MOV #PSTACK,R0 ;SET UP THE BUFFER ADDRESS
MOV #4,R2 ;GET THE ITERATION VALUES
1$: MOV #4,R1 ;AND DUPLICATE FOR TWO LOOPS
CLR (R0) ;INITIALIZE THE BUFFER
2$: ASL (R0) ;MOVE THE PREVIOUS BIT(S) OVER
CLC ;CARRY = 0
ASL 6(SP) ;ROTATE A BIT FROM THE TEST VALUE
BCC 3$ ;IF ZERO, SKIP NEXT INSTRUCTION
BIS #BIT0,(R0) ;MARK THE BIT AS BEING SET
3$: DEC R1 ;ONE LESS ITERATION TO GO
BGT 2$ ;BUT NOT DONE UNTIL = 0!
TST (R0)+ ;NEXT BUFFER LOCATION
DEC R2 ;ONE LESS ITERATION TO-GO
BGT 1$ ;IF NOT ZERO, KEEP GOING!
MOV #4,R2 ;GET THE NEW ITERATION COUNT
MOV #PSTACK,R0 ;AND GET THE BUFFER ADDRESS AGAIN
4$: TST (R0) ;CONTENTS ZERO?
BGT 5$ ;IF NOT, SKIP NEXT
MOV #60,(R0)+ ;SET THIS CHARACTER = NULL
DEC R2 ;ONE LESS CHARACTER TO GO
BGT 4$ ;IF NOT ZERO, KEEP GOING
BR 8$ ;DONE, RETURN!
5$: CMP (R0),#11 ;ALPHA OR NUMERIC CHARACTER?
BHI 6$ ;IF > 11, ALPHA!
ADD #60,(R0)+ ;MAKE NUMERIC ASCII
BR 7$ ;AND GO-ON
6$: ADD #55.,(R0)+ ;MAKE HEX ASCII
7$: DEC R2 ;ONE LESS ITERATION TO-GO
BGT 5$ ;ONE LESS ITERATION, IF NOT ZERO
8$: MOV (SP)+,R2 ;RESTORE R2
MOV (SP)+,R1 ;AND R1
MOV (SP)+,(SP) ;MOVE STACK OVER INPUT VALUE
RTS PC ;AND RETURN
PSTACK: .BLKW 10. ;SOFTWARE PSEUDO STACK

```

```

1
2
3           ;SUBR TO GENERATE A PSEUDO RANDOM NUMBER
4           ;THE NUMBER IS RETURNED IN $RP1
5           ;THERE ARE 3 SEED VALUES THAT CAN BE SAVED
6           ;TO GENERATE THE PSEUDO RANDOM NUMBER
7 011712 010046
8 011714 013700 011774
9 011720 000241
10 011722 005337 011772
11 011726 006100
12 011730 006100
13 011732 063700 011772
14 011736 063700 011776
15 011742 010037 011774
16 011746 006100
17 011750 006100
18 011752 063700 011776
19 011756 006100
20 011760 006100
21 011762 010037 011776
22 011766 012600
23 011770 000207
24
25 011772 000000
26 011774 001233
27 011776 007622

RAND:  MOV    RO,-(SP)      ;SAVE RO
      MOV    $RP1,RO      ;GET A SEED
      CLC
      DEC    $RNCON ;
      ROL    RO
      ROL    RO
      ADD    $RNCON,RO
      ADD    $RP2,RO
      MOV    RO,$RP1
      ROL    RO
      ROL    RO
      ADD    $RP2,RO
      ROL    RO
      ROL    RO
      MOV    RO,$RP2
      MOV    (SP)+,RO      ;RESTORE RO
      RTS    PC

$RNCON: 0
$RP1:   1233
$RP2:   7622

```



```

1
2
3
4
5
6
7
8
9
10
11
12
13 012000 005037 002260
14 012004 005037 012244
15
16 012010 012700 000120
   012014 104462
   012016 010005
17
18 012020 103031
19
20
21
22 012022 010537 012220
23 012026 011537 012222
24 012032 011537 012224
25 012036 062737 000002 012224
26 012044 012537 012226
27 012050 062737 000004 012226
28 012056 005725
29 012060 012537 012230
30 012064 012537 012244
31 012070 012737 000001 002260
32 012076 004737 012246
33 012102 000423
34 012104
35 012104 012700 000114
   012110 104462
   012112 010005
36
37 012114 103036
38
39
40
41 012116 010537 012234
42 012122 012537 012236
43 012126 005725
44 012130 012537 012240
45 012134 012537 012244
46 012140 012737 177777 002260
47 012146 004737 012320
48
49
50
51 012152 012737 000024 012214 20:
52 012160 012737 047040 012216
53 012166 023727 012244 000062

```

```

; DETERMINE IF THERE IS A CLOCK ON SYSTEM. START THE CLOCK. "CLKSTA" WILL
; INDICATE THE CLOCK TYPE.
;   0= NO CLOCK
;   +1= KW11-P
;   -1= KW11-L
; THIS ROUTINE WILL ALSO SETUP "TICKMS" (TIME PER CLOCK TICK IN MILLISECONDS)
; AND "TICKUS" (TIME PER CLOCK TICK IN MICROSECONDS) AS PER LINE FREQUENCY.
; CALL
;   JSR   PC,ST.CLK      ; START THE CLOCK
;   RETURN
;
ST.CLK: CLR   CLKSTA      ; ASSUME "NO CLOCK"
        CLR   HERTZ      ; ASSUME "UNKNOWN" HERTZ
        MOV   @'P,R0     ; IS THERE A P-CLOCK PRESENT ?
        TRAP  C$CLCK
        MOV   R0,R5
        BCC  1$         ; GO TO 1$ IF NO
; SET P-CLOCK P-TABLE & START P-CLOCK
        MOV   R5,PCLKTB  ; SAVE P-CLOCK TABLE ADDRESS
        MOV   (R5),PKCS  ; GET 'CSR' ADDRESS
        MOV   (R5),PKB   ; MAKE PKB ADDRESS BY
        ADD   @2,PKB     ; ADDING 2
        MOV   (R5)+,PKC  ; MAKE PKC ADDRESS BY
        ADD   @4,PKC     ; ADDING 4
        TST  (R5)+      ; SKIP OVER 'BR LEVEL'
        MOV   (R5)+,PKV  ; GET 'VECTOR' ADDRESS
        MOV   (R5)+,HERTZ ; GET 'HERTZ' LINE FREQUENCY
        MOV   @1,CLKSTA  ; SET P-CLOCK FLAG
        JSR   PC,ST.PCLK ; START P-CLOCK AS A WATCH DOG TIMER
        BR   2$
1$:     MOV   @'L,R0     ; IS THERE A L-CLOCK PRESENT ?
        TRAP  C$CLCK
        MOV   R0,R5
        BCC  3$         ; GO TO 3$ IF NO
; SET L-CLOCK P-TABLE, START L-CLOCK
        MOV   R5,LCLKTB  ; SAVE L-CLOCK TABLE ADDRESS
        MOV   (R5)+,LKS  ; GET 'CSR' ADDRESS
        TST  (R5)+      ; SKIP OVER 'BR LEVEL'
        MOV   (R5)+,LKV  ; GET 'VECTOR' ADDRESS
        MOV   (R5)+,HERTZ ; GET 'HERTZ' LINE FREQUENCY
        MOV   @-1,CLKSTA ; L-CLOCK FLAG
        JSR   PC,ST.LCLK ; START L-CLOCK AS A WATCH DOG TIMER
; GET THE CLOCK TICK COUNT
2$:     MOV   @20.,TICKMS ; ASSUME 20.0 MSEC &
        MOV   @20000.,TICKUS ; 20000.0 USEC
        CMP  HERTZ,@50.   ; IS IT 50 HERTZ LINE FREQUENCY ?

```

```

54 012174 001406          BEQ      3$          ;BR IF YES
55 012176 012737 000020 012214      MOV      #16.,TICKMS      ;MUST BE 60HZ, 16.666 MSEC &
56 012204 012737 040432 012216      MOV      #16666.,TICKUS  ;16666.0 USEC
57 012212 000207          3$:      RTS      PC
58
59 012214 000020          TICKMS: .WORD 16.          ;16 MILLISECONDS PER CLOCK TICK
60 012216 040432          TICKUS: .WORD 16666.        ;16666 MICROSECONDS PER CLOCK TICK
61
62                          ;KW11-P CLOCK TABLE, CSR REG, PKB REG, PKC REG & VEC ADR
63
64 012220 000000          PCLKTB: .WORD 0          ;P-CLK TBL ADR
65
66 012222 172540          PKCS:  .WORD 172540       ;CONTROL & STATUS
67 012224 172542          PKB:   .WORD 172542       ;COUNT SET BFR
68 012226 172544          PKC:   .WORD 172544       ;COUNTER
69 012230 000104 000106  PKV:   .WORD 104,106      ;VECTOR
70
71                          ;KW11-L CLOCK TABLE, CSR REG & VEC ADR
72
73 012234 000000          LCLKTB: .WORD 0          ;L-CLK TBL ADR
74
75 012236 177546          LKS:   .WORD 177546       ;CONTROL & STATUS
76 012240 000100 000102  LKV:   .WORD 100,102      ;VECTOR
77
78 012244 000000          HERTZ: .WORD 0          ;60 HZ. OR 50 HZ. LINE FREQUENCY
79
80 012246          ST.PCLK:
81 012246 105737 002233      TSTB    STOFLG          ;ALLOW SOFTWARE TIMEOUTS ?
82 012252 001021          BNE     1$          ;NO--BRANCH
83
84 012254 012746 000300      MOV      #PRI06,-(SP)    ;SETUP VECTOR FOR P-CLOCK
85 012260 012746 012414      MOV      #KWSRV,-(SP)
86 012264 013746 012230      MOV      PKV,-(SP)
87 012270 012746 000003      MOV      #3,-(SP)
88 012274 104437          TRAP    C$SVEC
89 012276 062706 000010      ADD     #10,SP
90 012302 012777 000001 177714  MOV      #1,@PKB        ;COUNT ONE TICK
91 012310 012777 000115 177704  MOV      #115,@PKCS     ;"INT.EN.",COUNT DOWN", "MODE 1 (REPEAT)",
92
93 012316 000207          1$:      RTS      PC        ;"LINE FREQ", AND "RUN"
94
95                          ;RETURN
96
97                          ST.LCLK:
98 012320          TSTB    STOFLG          ;ALLOW SOFTWARE TIMEOUTS ?
99 012324 001016          BNE     1$          ;NO--BRANCH
100 012326 012746 000300      MOV      #PRI06,-(SP)   ;SETUP VECTOR FOR L-CLOCK
101 012332 012746 012414      MOV      #KWSRV,-(SP)
102 012336 013746 012240      MOV      LKV,-(SP)
103 012342 012746 000003      MOV      #3,-(SP)
104 012346 104437          TRAP    C$SVEC
105 012350 062706 000010      ADD     #10,SP
106 012354 012777 000100 177654  MOV      #100,@LKS     ;START THE KW11-L
107 012362 000207          1$:      RTS      PC        ;RETURN
108
109                          ;THIS ROUTINE IS USED TO STOP THE SYSTEM CLOCK
110                          ;CALL
111                          ; JSR      PC,STOPCK      ;CALL ROUTINE
    
```



```

101
102 012364 005737 002260      STOPCK: TST      CLKSTA      ;IS THERE A CLOCK AVAILABLE ?
103 012370 001410              BEQ      2$              ;BR IF NO
104 012372 100404              BMI      1$              ;BR IF L-CLOCK
105 012374 042777 000101 177620 BIC      #101,@PKCS      ;STOP THE P-CLOCK
106 012402 000403              BR       2$              ;
107 012404 042777 000100 177624 1$: BIC      #100,@LKS      ;STOP THE L-CLOCK
108 012412 000207              2$: RTS      PC
109
110
111      ;KW11 CLOCK INTERRUPT SERVICE ROUTINE
113 012414 013746 012214      KWSRV: MOV      TICKMS,-(SP) ;TIME PER TICK IN MILLISECONDS
114 012420 004737 024104      JSR      PC,RPTMR      ;COUNT THE ELAPSED TIME
115 012424
116 012424 000002      L10006: RTI
117
118
119      ;THIS SUBROUTINE IS USED TO RELOAD THE CLOCK FOR A 4 SECOND TIMEOUT DURING
120      ;A RECALIBRATE COMMAND
121
122
123 012426 042777 000101 177566 FORSEC: BIC      #101,@PKCS      ;STOP CLOCK
124 012434 017746 177570      MOV      @PKV,-(SP)      ;SAVE THE OLD CLOCK VECTOR ADDRESS
125
126 012440 012746 000300      MOV      @PRI06,-(SP)    ;SETUP VECTOR FOR P-CLOCK
127 012444 012746 012504      MOV      #1$,-(SP)
128 012450 013746 012230      MOV      PKV,-(SP)
129 012454 012746 000003      MOV      #3,-(SP)
130 012460 104437      TRAP     C$SVEC
131 012462 062706 000010      ADD      #10,SP
132 012466 012777 000360 177530 MOV      #240,@PKB      ;4 SEC DELAY AT LINE FREQ
133 012474 012777 000105 177520 MOV      #105,@PKCS      ;RUN AT LINE FREQ, DOWN MODE, IE=1
134 012502 000001      WAIT     ;WAIT FOR CLK INTER
135 012504 042777 000101 177510 1$: BIC      #101,@PKCS      ;STOP CLOCK
136 012512 012716 012520      MOV      #2$,(SP)      ;ADJUST FOR RETURN
137 012516
138 012516 000002      L10007: RTI
139
140 012520      2$:
141 012520 012746 000300      MOV      @PRI06,-(SP)    ;RESTORE OLD VECTOR ADDRESS FOR P-CLOCK
142 012524 012646      MOV      (SP)+,-(SP)
143 012526 013746 012230      MOV      PKV,-(SP)
144 012532 012746 000003      MOV      #3,-(SP)
145 012536 104437      TRAP     C$SVEC
146 012540 062706 000010      ADD      #10,SP
147 012544 005077 177454      CLR     @PKB      ;CLEAR CLK BFR COUNT
148 012550 000207      RTS      PC
149
150
151      ;ROUTINE TO PROVIDE A 2 MS STALL AFTER A SEEK OPERATION IN THE SEEK TIMING
152      ;TESTS. THIS STALL IS REQUIRED TO COMPENSATE FOR THE 'ACCESS READY' DELAY
153      ;IN THE RP07. THIS STALL TIME IS NOT INCLUDED IN THE CALCULATED SEEK TIMES.
154      ;CALL
155      ; JSR      PC,TWOMS
156      ; RETURN
157
158 012552 042777 000101 177442 TWOMS: BIC      #101,@PKCS      ;STOP THE P-CLOCK
159 012560 017746 177444      MOV      @PKV,-(SP)      ;SAVE THE OLD CLOCK VECTOR ADDRESS
160
161 012564 012746 000300      MOV      @PRI06,-(SP)    ;SETUP VECTOR FOR P-CLOCK
162 012570 012746 012656      MOV      #2$,-(SP)

```

```

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

```



```

1
2
3 ;ERROR ANALYSIS ROUTINE
4 ;R0 NOT USED
5 ;R1 DPB ADDRESS
6 ;R2 BASE ADDRESS OF SAVED REG'S TABLE
7 ;R3 TEMP STORAGE
8 ;R4
9 ;R5 LINK AND RET
10 ;
11 ; CALLING SEQ:
12 ; JSR R5,ERRANY
13 ; DPB
14 ; RET
15 ERRANY:
16 012766 010146 MOV R1,-(SP) ;;PUSH R1 ON STACK
17 012770 010246 MOV R2,-(SP) ;;PUSH R2 ON STACK
18 012772 010346 MOV R3,-(SP) ;;PUSH R3 ON STACK
19 012774 010446 MOV R4,-(SP) ;;PUSH R4 ON STACK
20 012776 005037 002264 CLR SVSTAT ;PROGRAM FLAGS: EACH BIT INDICATES ERROR TYPE
21 013002 012501 MOV (R5)+,R1 ;DPB ADDRESS
22 013004 016102 000014 MOV 14(R1),R2 ;ADDRESS OF SAVED REGISTER TABLE
23 013010 016237 000036 002276 MOV 36(R2),CYL.RD ;GET CURRENT CYLINDER
24 013016 116237 000006 002302 MOV 6(R2),SEC.RD ;GET CURRENT SECTOR
25 013024 116237 000007 002300 MOV 7(R2),TRK.RD ;GET CURRENT TRACK
26 013032 126127 000002 000150 CMPB 2(R1),#150 ;IF DATA TFR CMD
27 013040 002402 BLT 1#
28 013042 004737 014322 JSR PC,ADJUST ;THEN GET THE DECREMENTED SECTOR ADDRESS
29 013046 032712 020000 1# BIT #MCPE,(R2) ;MCPE ERROR ?
30 013052 001406 BEQ 2# ;BRANCH IF NOT
31 013054 104456 TRAP C#ERHRD
32 013056 000001 .WORD 1
33 013060 005420 .WORD EM1
34 013062 007672 .WORD DH44
35 013064 000137 014156 JMP 32# ;EXIT
36 013070 032762 020400 000010 2# BIT #MDPE!UPE,10(R2) ;DATA PARITY PROBLEM ?
37 013076 001414 BEQ 4# ;BRANCH IF NONE
38 013100 032762 100000 000042 BIT #BSE,42(R2) ;SEE IF BAD SECTOR DETECTED.
39 013106 001402 BEQ 3# ;BRANCH IF NOT, ELSE
40 013110 000137 014310 JMP 42# ;EXIT
41 013114 013114 104456 3# TRAP C#ERHRD
42 013116 000002 .WORD 2
43 013120 005465 .WORD EM2
44 013122 007672 .WORD DH44
45 013124 000137 014166 JMP 33# ;EXIT
46 013130 032762 017000 000010 4# BIT #NED!NEM!MSPGE!MXF,10(R2) ;ILLEGAL CONDITIONS ?
47 013136 001412 BEQ 5# ;BRANCH IF NONE
48 013140 032762 040000 000012 BIT #ERR,12(R2) ;ANY DRIVE ERROR ?
49 013146 001006 BNE 5# ;REPORT THE DRIVE ERROR
50 013150 104456 TRAP C#ERHRD
51 013152 000003 .WORD 3
52 013154 005527 .WORD EM3
53 013156 007672 .WORD DH44
54 013160 000137 014166 JMP 33# ;EXIT

```

```

44
45 013164 032762 040000 000010 5$: BIT #WCE,10(R2) ;ANY DATA PATTERN ERROR ?
46 013172 001406 BEQ 6$ ;BRANCH IF NONE
47 013174 104456 TRAP C$ERHRD
   013176 000004 .WORD 4
   013200 005605 .WORD EM4
   013202 007672 .WORD DH44
48 013204 000137 014166 JMP 33$ ;EXIT
49
50 013210 032762 100000 000010 6$: BIT #DLT,10(R2) ;ANY DATA LATE ERROR ?
51 013216 001406 BEQ 7$ ;BRANCH IF NONE
52 013220 104456 TRAP C$ERHRD
   013222 000005 .WORD 5
   013224 005627 .WORD EM5
   013226 007672 .WORD DH44
53 013230 000137 014166 JMP 33$ ;EXIT
54
55 013234 032762 040000 000012 7$: BIT #ERR,12(R2) ;ANY DRIVE ERROR ?
56 013242 001002 BNE 8$ ;BRANCH IF ANY
57 013244 000137 014310 JMP 42$ ;EXIT
58
59 013250 032762 100000 000040 8$: BIT #PGE,40(R2) ;DRIVE PROGRAMMING ERROR ?
60 013256 001406 BEQ 9$ ;BRANCH IF NONE
61 013260 104456 TRAP C$ERHRD
   013262 000006 .WORD 6
   013264 005647 .WORD EM6
   013266 007672 .WORD DH44
62 013270 000137 014176 JMP 34$ ;EXIT
63
64 013274 032762 002000 000042 9$: BIT #LBC,42(R2) ;LOST BIT CLOCK ?
65 013302 001406 BEQ 10$ ;BRANCH IF NONE
66 013304 104456 TRAP C$ERHRD
   013306 000007 .WORD 7
   013310 005705 .WORD EM7
   013312 007672 .WORD DH44
67 013314 000137 014206 JMP 35$ ;EXIT
68
69 013320 032762 000040 000014 10$: BIT #WCF,14(R2) ;WRITE CLOCK FAILS ?
70 013326 001406 BEQ 11$ ;BRANCH IF NONE
71 013330 104456 TRAP C$ERHRD
   013332 000013 .WORD 11
   013334 005733 .WORD EM11
   013336 007672 .WORD DH44
72 013340 000137 014206 JMP 35$ ;EXIT
73
74 013344 032762 004000 000014 11$: BIT #WLE,14(R2) ;WRITE LOCK ERROR ?
75 013352 001406 BEQ 12$ ;BRANCH IF NONE
76 013354 104456 TRAP C$ERHRD
   013356 000014 .WORD 12
   013360 005755 .WORD EM12
   013362 007672 .WORD DH44
77 013364 000137 014206 JMP 35$ ;EXIT
78
79 013370 032762 010000 000014 12$: BIT #DTE,14(R2) ;DATA ERROR ON DRIVE ?
80 013376 001042 BNE 17$ ;REPORT THE DRIVE TIMING ERROR
81 013400 032762 100000 000014 BIT #DCK,14(R2) ;ANY DATA ERROR ?
82 013406 001444 BEQ 18$ ;BRANCH IF NONE

```



```

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

```

```

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

```



```

151 014032 000137 014246          JMP      39$          ;EXIT
152
153 014036 032762 017400 000040 28$: BIT      #WRYUNS!WOR!RWU1!RWU2!RWU3,40(R2) ;WRITE AND READ UNSAFE ?
154 014044 001406          BEQ      29$          ;BRANCH IF NONE
155 014046 104456          TRAP    C$ERHRD
    014050 000040          .WORD  32
    014052 006703          .WORD  EM32
    014054 007672          .WORD  DH44
156 014056 000137 014256          JMP      40$          ;EXIT
157
158 014062 032762 000040 000042 29$: BIT      #DCU,42(R2)      ;DC LOW ?
159 014070 001406          BEQ      30$          ;BRANCH IF NONE
160 014072 104456          TRAP    C$ERHRD
    014074 000041          .WORD  33
    014076 006726          .WORD  EM33
    014100 007672          .WORD  DH44
161 014102 000137 014256          JMP      40$          ;EXIT
162
163 014106 032762 000100 000042 30$: BIT      #IXU,42(R2)      ;INDEX UNSAFE ?
164 014114 001406          BEQ      31$          ;BRANCH IF NONE
165 014116 104456          TRAP    C$ERHRD
    014120 000042          .WORD  34
    014122 006746          .WORD  EM34
    014124 007672          .WORD  DH44
166 014126 000137 014256          JMP      40$          ;EXIT
167
168 014132 032762 000400 000042 31$: BIT      #PHF,42(R2)      ;PROCESSOR HANDSHAKE FAILURE??
169 014140 001452          BEQ      41$          ;BRANCH IF NOT
170 014142 104456          TRAP    C$ERHRD
    014144 000043          .WORD  35
    014146 006763          .WORD  EM35
    014150 007672          .WORD  DH44
171 014152 000137 014256          JMP      40$
172
173 014156 052737 000001 002264 32$: BIS      #BIT0,SVSTAT      ;MCPE=1,RHXX A-SYNC CONTROL BUS PARITY
174 014164 000451          BR      42$
175
176 014166 052737 000002 002264 33$: BIS      #BIT1,SVSTAT      ;RHXX DATA BUS PARITY,ILLEGAL CONDITION
177 014174 000445          BR      42$          ;DATA LATE, WRITE CHECK.
178
179 014176 052737 000004 002264 34$: BIS      #BIT2,SVSTAT      ;PROGRAM ERROR: PROHIBITED COMMANDS
180 014204 000441          BR      42$          ;WERE EXECUTED (WRITE/READ TRACK DES.
181                                     ;FORMAT TRACK).
182
183 014206 052737 000010 002264 35$: BIS      #BIT3,SVSTAT      ;DRIVE CLOCK, TIMING, DATA ERROR
184 014214 000435          BR      42$          ;RETRY SHOULD BE ALLOWED.
185
186 014216 052737 000020 002264 36$: BIS      #BIT4,SVSTAT      ;ILLEGAL CONDITION ,DECODER, INTERFACE
187 014224 000431          BR      42$          ;PROBLEM
188
189 014226 052737 000040 002264 37$: BIS      #BIT5,SVSTAT      ;POSITIONING ERROR
190 014234 000425          BR      42$
191
192 014236 052737 000100 002264 38$: BIS      #BIT6,SVSTAT      ;MECHANICAL FAILURE : AIR, TEMP ETC.
193 014244 000421          BR      42$
194
195 014246 052737 000200 002264 39$: BIS      #BIT7,SVSTAT      ;HEADER INFORMATION ( HEADER FAILURE.

```

```

196 014254 000415          BR      42$          ;OR UNFORMAT TRACK )
197
198 014256 052737 000400 002264 40$:  BIS    #BIT8,SVSTAT  ;UNSAFE (READ/WRITE, INDEX, TACH)
199 014264 000411          BR      42$
200
201 014266 032762 100000 000042 41$:  BIT    #BSE,42(R2)   ;IF BAD SECTOR DETECTED,
202 014274 001005          BNE    42$          ;BRANCH WITHOUT REPORTING ERROR, ELSE
203 014276 104456          TRAP   C$ERHRD
      014300 000054          .WORD  44
      014302 007156          .WORD  EM44
      014304 007672          .WORD  DH44
204 014306 000763          BR      40$          ;EXIT
205 014310          42$:
      014310 012604          MOV    (SP)+,R4      ;;POP STACK INTO R4
      014312 012603          MOV    (SP)+,R3      ;;POP STACK INTO R3
      014314 012602          MOV    (SP)+,R2      ;;POP STACK INTO R2
      014316 012601          MOV    (SP)+,R1      ;;POP STACK INTO R1
206 014320 000205          RTS    R5

```



```

1      ;SUBROUTINE TO ADJUST THE SECTOR ADDRESS BECAUSE IT IS AUTOMATICALLY
2      ;INCREMENTED AT THE END OF A TRANSFER
3      ;CALL
4      ;
5      ;       JSR      PC,ADJUST      ;CALL ROUTINE
6 014322 005737 002302  ADJUST: TST      SEC.RD      ;SECTOR 0?
7 014326 001014                BNE      1$      ;BR IF NOT
8 014330 013737 002274 002302  MOV      NS1,SEC.RD ;MAKE IT LAST PHYSICAL SECTOR AND DECR TRACK
9 014336 005737 002300                TST      TRK.RD      ;LAST TRACK?
10 014342 001011                BNE      2$      ;BR IF NOT
11 014344 013737 002272 002300  MOV      NT1,TRK.RD ;MAKE IT LAST PHYSICAL TRACK AND DECR CYL
12 014352 005337 002276                DEC      CYL.RD      ;DECR CYL
13 014356 000405                BR       3$      ;EXIT
14 014360 005337 002302  1$: DEC      SEC.RD      ;
15 014364 000402                BR       3$      ;EXIT
16 014366 005337 002300  2$: DEC      TRK.RD      ;ADJUST TRACK
17 014372 000207  3$: RTS      PC
18
19      ;THIS ROUTINE WILL CALL THE RP07 DRIVER AND THEN WAIT ON THE FUNCTION
20      ;TO COMPLETE. IF AN ERROR OCCURS IT IS REPORTED.
21      ;CALL
22      ;
23      ;       FILL "DPB" WITH COMMAND INFORMATION
24      ;       JSR      R4,CALL.A
25      ;       RETURN
26 014374 004437 021122  CALL.A: JSR      R4,RP07      ;CALL RP07 DRIVER
27 014400 002550                DPB.A
28 014402 000774                BR       CALL.A
29 014404 005737 002566  1$: TST      DPB.A+16      ;DONE?
30 014410 001775                BEQ      1$      ;NO--LOOP
31 014412 100036                BPL      3$      ;BRANCH IF NO ERROR
32 014414 013737 002562 002304  MOV      DPB.A+12,CYL.DS ;CYLINDER
33 014422 113737 002561 002310  MOVB     DPB.A+11,TRK.DS ;TRACK
34 014430 113737 002560 002306  MOVB     DPB.A+10,SEC.DS ;SECTOR
35 014436 004537 015214                JSR      R5,ERRABO      ;CHECK THE ABORT CONDITION
36 014442 002550                DPB.A      ;PARAMETER BLOCK ADDRESS
37 014444 004537 012766                JSR      R5,ERRANY      ;DETECT ERROR
38 014450 002550                DPB.A
39 014452 022737 000200 002264  CMP      #BIT7,SVSTAT    ;HEADER ERROR?
40 014460 001013                BNE      3$      ;IF NOT MATCH, NO
41 014462 013746 002552                MOV      DPB.A+2,-(SP)
42 014466 112737 000107 002552  MOVB     #RECAL,DPB.A+2 ;SET UP FOR A RECAL COMMAND
43 014474 004437 021122                JSR      R4,RP07      ;ISSUE THE COMMAND
44 014500 002550                DPB.A      ;THIS BUFFER
45 014502 000240                NOP      ;FILLER FOR THE DRIVER
46 014504 012637 002552  3$: MOV      (SP)+,DPB.A+2
47 014510 000204                RTS      R4      ;RETURN
48
49      ;THIS ROUTINE IS THE SAME AS "CALL.A" EXCEPT FOR THE DPB USED AND IF
50      ;THE COMMAND IS A READ HEADER AND DATA THE HEADER (CYLINDER, TRACK,
51      ;AND SECTOR) READ IS CHECKED FOR VALIDITY.
52      ;CALL
53      ;
54      ;       FILL DPB
55      ;       JSR      R4,CALL.B
56      ;       RETURN
57 014512 004437 021122  CALL.B: JSR      R4,RP07      ;CALL DRIVER

```

```

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



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

```

1
2
3
4
5
6
7
8
9 015056 005037 002350
10 015062 004437 021122
11 015066 002630
12 015070 000772
13 015072 005737 002646
14 015076 001775
15 015100 100401
16 015102 000417
17 015104
18 015104 013737 002642 002304
    015112 113737 002641 002310
    015120 113737 002640 002306
19 015126 004537 015214
20 015132 002630
21 015134 004537 012766
22 015140 002630
23 015142
24 015142 105737 002231
25 015146 001403
26 015150 004437 015410
27 015154 002360
28 015156 000204
29
30
31
32
33
34
35 015160 004437 021122
36 015164 002630
37 015166 000774
38 015170 005737 002646
39 015174 001775
40 015176 100003
41 015200 004537 015214
42
43
44 015204 002630
45 015206 013702 002644
46 015212 000207

; THIS ROUTINE IS THE SAME AS "CALL.A" EXCEPT FOR THE DPB USED AND
; ON AN ERROR LOCATION "ERR.CT" IS EXAMINED. IF ERR.CT IS EQUAL TO
; $ERFLG EXIT IS TO THE NEXT TEST.
; CALL
;     FILL DPB
;     JSR     R4,DRVCAL
;     RETURN
DRVCAL: CLR     WCEFLG           ; CLEAR WRITE CHECK ERROR FLAG
        JSR     R4,RP07       ; CALL DRIVER
        DTADPB
        BR     DRVCAL
3$:    TST     DTADPB+16      ; DONE
        BEQ     3$           ; NO--LOOP
        BMI     1$           ; BR IF ERRORS
        BR     4$           ; NO ERRORS
1$:    MOV     DTADPB+12,CYL.DS ; CYLINDER
        MOVB   DTADPB+11,TRK.DS ; TRACK
        MOVB   DTADPB+10,SEC.DS ; SECTOR
        JSR     R5,ERRABO     ; CHECK THE ABORT CONDITION
        DTADPB               ; DATA BLOCK ADDRESS
        JSR     R5,ERRANY
        DTADPB
4$:    TSTB   STALLF         ; STALL ?
        BEQ     5$           ; NO--BRANCH
        JSR     R4,STALL     ; YES--CALL STALL ROUTINE
        .WORD  STALL2       ; STALL TIME POINTER
        RTS     R4
5$:

; SUBR TO EXECUTE A COMMAND STORED IN DTADPB.
; SIMILAR TO SUBR CALL.A EXCEPT THAT HARD AND SOFT ERRORS ARE NOT CHECKED
; I.E. NO CALL TO ERRANY.
EXECMD: JSR     R4,RP07       ; EXEC CMD
        DTADPB               ; DPB PTR
        BR     EXECMD       ; WAIT FOR Q NOT FULL
2$:    TST     DTADPB+16      ; DONE?
        BEQ     2$           ; WAIT FOR DONE
        BPL     3$           ; SKIP ON ERROR FREE DONE
        JSR     R5,ERRABO     ; ERROR: CHECK ABORT CONDITION
        DTADPB               ; EXIT TEST IF 'DPB'+16 SET WITH ERRORS:
        MOV     DTADPB+14,R2 ; 'DPB' PTR
        RTS     PC          ; FETCH AD OF SAVED REG TBL
    
```



06

```

1
2
3      ;THIS ROUTINE IS USED TO DETERMINE THE ABORT CONDITIONS OF
4      ;THE I/O ROUTINES
5      ;CALLING SEQ
6      ;      JSR      R5,ERRABO
7      ;      DPB      DATA BLOCK PAR ADDRESS
8      ;      NORMAL RET
9 015214 010146      ERRABO: MOV      R1,-(SP)      ;SAVE R1
10 015216 010246      MOV      R2,-(SP)      ;SAVE R2
11 015220 012501      MOV      (R5),R1      ;LOAD THE DPB ADDRESS
12 015222 016102 000014      MOV      14(R1),R2      ;ADDRESS OF SAVED REGISTER TABLE
13 015226 016237 000036 002276      MOV      36(R2),CYL.RD      ;GET CURRENT CYLINDER
14 015234 116237 000006 002302      MOV      6(R2),SEC.RD      ;GET CURRENT SECTOR
15 015242 116237 000007 002300      MOV      7(R2),TRK.RD      ;GET CURRENT TRACK
16 015250 016102 000016      MOV      16(R1),R2      ;R2 TEMP STORAGE
17 015254 032702 000002      BIT      @BIT1,R2      ;DRIVE BECOME NON-EXIST ?
18 015260 001405      BEQ      1$      ;BRANCH IF NOT
19 015262 104455      TRAP     C$ERDF
    015264 000031      .WORD   25
    015266 006417      .WORD   EM25
    015270 010702      .WORD   DM25
20 015272 000440      BR       5$
21 015274 032702 000004      1$: BIT      @BIT2,R2      ;EXIT
22 015300 001405      BEQ      2$      ;PORT REQUEST TIMEOUT ?
23 015302 104455      TRAP     C$ERDF      ;BRANCH IF NOT
    015304 000032      .WORD   26
    015306 006455      .WORD   EM26
    015310 007672      .WORD   DM44
24 015312 000430      BR       5$
25 015314 032702 001000      2$: BIT      @BIT9,R2      ;TIME OUT ON THIS DRIVE
26 015320 001405      BEQ      3$      ;BANCH IF NOT
27 015322 104455      TRAP     C$ERDF
    015324 000033      .WORD   27
    015326 006525      .WORD   EM27
    015330 007672      .WORD   DM44
28 015332 000420      BR       5$
29 015334 032702 006000      3$: BIT      @BIT10!BIT11,R2 ;EXIT
30 015340 001405      BEQ      4$      ;MASSBUS PARITY ERROR ?
31 015342 104455      TRAP     C$ERDF      ;BRANCH IF NOT
    015344 000036      .WORD   30
    015346 006564      .WORD   EM30
    015350 010702      .WORD   DM25
32 015352 000410      BR       5$
33 015354 032702 050000      4$: BIT      @BIT12!BIT14,R2 ;DRIVE UNSAFE OR OFFLINE
34 015360 001407      BEQ      6$      ;BRANCH IF NOT (OTHER ERROR CATLOG)
35 015362 104455      TRAP     C$ERDF
    015364 000037      .WORD   31
    015366 006641      .WORD   EM31
    015370 010702      .WORD   DM25
36 015372 000400      BR       5$
37 015374 013705 002262      5$: MOV      BYPASS,R5      ;THE ABORT ADDRESS
38 015400 012602      6$: MOV      (SP),R2      ;EXIT IF NO ABORT CONDITION
39 015402 012601      MOV      (SP),R1
40 015404 000205      RTS      R5      ;EXIT
41
42
    
```

```

43 ;ABORT RETURN ADDRESS FROM 'ERRABO' SUBR, VIA 'BYPASS', ON DEV FATAL ERROR
44
45 015406 ABOPAS: TRAP C#DCLN
   015406 104444
46
47
48 ;THIS ROUTINE WILL PROVIDE A STALL IN MILLISECONDS FOR A SPECIFIC
49 ;AMOUNT OF TIME IF STALRD = 0 OR A RANDOM AMOUNT OF TIME IF STALRD = 1.
50 ;STALL1 CONTAINS SPECIFIED TIME FOR TESTS 1-6, AND STALL2
51 ;CONTAINS THE TIME FOR TESTS 13-18.
52 ;CALL
53 ; JSR R4,STALL
54 ; TIME POINTER ;WHERE TO FIND THE STALL TIME
55
56 015410 013446 STALL: MOV @R4+,-(SP) ;PICKUP STALL TIME
57 015412 105737 002232 TSTB STALRD ;USE A RANDOM TIME ?
58 015416 001406 BEQ 1$ ;NO--BRANCH
59 015420 004737 011712 JSR PC,RAND ;YES--FORM RANDOM NUMBER
60 015424 013716 011774 MOV $RP1,(SP) ;AND USE IT FOR THE STALL TIME
61 015430 042716 177700 BIC #C77,(SP) ;BUT NEVER > 64 MILLISECONDS
62 015434 005046 1$: CLR -(SP) ;CLEAR TEMP. LOCATION
63 015436 162766 000001 000002 2$: SUB #1,2(SP) ;MORE STALL REQUIRED?
64 015444 103407 BLO 4$ ;NO--BRANCH
65 015446 012716 000144 MOV #100.,(SP) ;STALL FOR ABOUT 1 MILLISECOND
66 015452 005704 3$: TST R4 ;NOP TO KILL TIME
67 015454 005366 000000 DEC 0(SP) ;COUNT
68 015460 001374 BNE 3$ ;LOOP IF MORE COUNTS NEEDED
69 015462 000765 BR 2$
70 015464 022626 4$: CMP (SP)+,(SP)+ ;CLEAN OFF THE STACK
71 015466 000204 RTS R4 ;EXIT
72

```



```

1          ;ROUTINE TO SOFTWARE COMPARE HEADER ON IMPLIED SEEKS
2          ;CALL
3          :
4          :       JSR      R4,VERIFY
5          :       ADR POINTER          ;ADDRESS OF DPB+10 (SECTOR NUMBER)
6          :       ERR RETURN
7          :       RETURN
8 015470 010146          VERIFY: MOV      R1,-(SP)          ;SAVE R1
9 015472 012401          MOV      (R4)+,R1          ;GET ADDRESS OF DPB+10
10 015474 042737 150000 042762          BIC      @150000,DBUFF          ;STRIP FORMAT AND BAD SECTOR BITS FROM CYLINDER NUMBER
11 015502 023761 042762 000002          CMP      DBUFF,2(R1)          ;CYLINDER NUMBER OK?
12 015510 001003          BNE      1$          ;NO--BRANCH
13 015512 023711 042764          CMP      DBUFF+2,(R1)          ;YES--HOW ABOUT TRACK/SECTOR?
14 015516 001431          BEQ      3$          ;BRANCH IF GOOD
15 015520 013737 042762 002276 1$: MOV      DBUFF,CYL.RD          ;SAVE THE EXPECTED AND THE
16 015526 113737 042765 002300          MOVB     DBUFF+3,TRK.RD          ;RECIEVED CYLINDER, TRACK,
17 015534 113737 042764 002302          MOVB     DBUFF+2,SEC.RD          ;AND SECTOR
18 015542 112137 002306          MOVB     (R1)+,SEC.DS
19 015546 112137 002310          MOVB     (R1)+,TRK.DS
20 015552 011137 002304          MOV      (R1),CYL.DS
21 015556 005744          TST      -(R4)          ;MAKE IT TEST PC+4
22 015560 104456          TRAP     C$ERHRD
    015562 000052          .WORD   42
    015564 007107          .WORD   EM42
    015566 010366          .WORD   DH45
23 015570 012737 000107 002552 2$: MOV      @RECAL,DPB.A+2          ;LOAD RECALIBRATE ORDER CODE
24 015576 004437 014374          JSR      R4,CALL.A          ;GO EXECUTE THE COMMAND
25 015602 062704 000002          ADD      @2,R4          ;INCREMENT RETURN ADDRESS
26 015606 012601          MOV      (SP)+,R1          ;RESTORE R1
27 015610 000204          RTS      R4          ;EXIT

```

```

1
2
3
4
5
6
7
8
9
10 015612 005001
11 015614 012777 000040 165056
12 015622 005037 002640
13 015626 005037 002642
14 015632 012737 000107 002632
15 015640 004437 021122
16 015644 002630
17 015646 000433
18 015650 005737 002646
19 015654 001775
20 015656 100021
21 015660 013737 002642 002304
    015666 113737 002641 002310
    015674 113737 002640 002306
22 015702 004537 015214
23 015706 002630
24 015710 004537 012766
25 015714 002630
26 015716 005724
27 015720 000406
28 015722 012777 000000 164746
29 015730 012777 000000 164766
30 015736 000204
31
32
33
35 015740
36 015740
    015740 000002
37
38
39
40
41
42
43 015742 004737 010750
44 015746 012700 002312
45 015752 012701 002346
46 015756 005020
47 015760 020001
48 015762 103775
49 015764 012710 042762
50 015770 012737 077777 002312
51 015776 012737 077777 002330
52 016004 004737 011002
53 016010 000207
54
55

```

```

;THIS ROUTINE WILL PERFORM A "MASSBUS" INIT. FOLLOWED BY
;A "RECALIBRATE" ON THE DRIVE UNDER TEST.
;NOTE: THIS ROUTINE DESTROYS R1 AND R4
;CALL
;
;      JSR      R4,SRCH00      ;DO A MASSBUS INIT. AND RECAL
;      RETURN1   ;RETURN HERE IF NO ERROR
;      RETURN2   ;RETURN HERE ON ERROR
;
SRCH00: CLR      R1              ;INCASE OF ERROR (TYPTIM)
        MOV      @CLR,@RPCS2    ;MASSBUS INIT.
        CLR      DTADPB+10      ;TRACK=0; SECTOR=0
        CLR      DTADPB+12      ;CYLINDER =0
        MOV      @RECAL,DTADPB+2 ;COMMAND = RECALIBRATE
        JSR      R4,RP07        ;CALL THE DRIVER
        DTADPB    ;DPB POINTER
        BR       4$             ;BRANCH IF QUEUE FULL,NO SPACE
1$:     TST      DTADPB+16      ;WAIT ON DONE
        BEQ      1$
        BPL      3$             ;TAKE NORMAL EXIT IF NO ERROR
        MOV      DTADPB+12,CYL.DS ;CYLINDER
        MOV      DTADPB+11,TRK.DS ;TRACK
        MOV      DTADPB+10,SEC.DS ;SECTOR
        JSR      R5,ERRABO      ;CHECK ANY ABORT CONDITION
        DTADPB
        JSR      R5,ERRANY
        DTADPB
2$:     TST      (R4)+          ;ADJUST FOR ERROR EXIT
        BR       4$             ;GO TO THE EXIT
3$:     MOV      @0,@RPDA      ;TRACK AND SECTOR =0
        MOV      @0,@RPDC      ;CYLINDER = 0
4$:     RTS       R4            ;RETURN
;
;THIS IS AN RTI WHICH IS USED BY THE TIMING TESTS
DORTI: ;RETURN FROM INTERRUPT
L10011: RTI
;
;THIS ROUTINE WILL INITIALIZE THE TIMERS USED BY THE TIMING ROUTINE
;CALL
;
;      JSR      PC,STRTMR
;      RETURN
;
STRTMR: JSR      PC,SAVREG      ;SAVE R0-R5
        MOV      @TIM.UP,R0     ;START AT TIM.UP (MINIMUM)
        MOV      @TIM.PT,R1     ;STOP AT TIM.PT
1$:     CLR      (R0)+          ;CLEAR
        CMP      R0,R1          ;DONE?
        BLO     1$             ;NO--BRANCH
        MOV      @DBUFF,(R0)    ;SETUP POINTER
        MOV      @+CBIT15,TIM.UP ;SET MINIMUM TIME TO MAXIMUM
        MOV      @+CBIT15,TIM.DN ;POSITIVE NUMBER
        JSR      PC,RESREG      ;RESTORE R0-R5
        RTS       PC            ;RETURN
;
;THIS ROUTINE IS USED FOR MEASURE THE AVERAGE SEEK TIME

```



```

56 ;IN THE TEST 10
57 ;THE TIME IS MEASURED AS:
58 ;
59 ;
60 ;           (T1X629+T2X628+T3X627+T4X626.....)X2
61 ;           T  -----
62 ;                               629X629
63 ;
64 ; WHERE THE T1 IS THE SEEK TIME FROM CYLO TO CYL1
65 ; THE T2 IS THE SEEK TIME FROM CYLO TO CYL2 ,ETC.
66 ;THE COUNT2: ROUTINE WILL CALCULATE THE FOLLOWING SUMMATION:
67 ;
68 ;           (T1X629+T2X628+T3X627+.....) X 2
69 ;           T  -----
70 ;                               629
71 016012 012702 002312 COUNT2: MOV #TIM.UP,R2 ;COUNT UP TABLE
72 016016 005705 TST R5 ;COUNT UP CALCULATING ?
73 016020 001402 BEQ 1$ ;BRANCH IF SO
74 016022 012702 002330 MOV #TIM.DN,R2 ;LOAD THE COUNT DOWN TABLE
75 016026 010146 1$: MOV R1,-(SP) ;COEFFICIENT 629,628,627,..... ETC.
76 016030 017746 174172 MOV @PKC,-(SP) ;MEASURED TIME INTERVAL
77 016034 004737 011420 JSR PC,$MULT ;TIME INTERVAL X COEFFICIENT
78 016040 016666 000002 177776 MOV 2(SP),-2(SP) ;SWAP THE LSB , MSB OF THE PRODUCTION
79 016046 011666 000002 MOV (SP),2(SP) ;
80 016052 016616 177776 MOV -2(SP),(SP) ; FOR THE CALLING SEQ OF $DIV ROUTINE
81 016056 013746 002206 MOV LC,-(SP) ;DIVIDED BY 629 (TOTOL # OF SEEKS)
82 016062 006216 ASR (SP) ; DIVIDEC BY 629/2
83 016064 005216 INC (SP) ;ROUND UP THE FRACTION
84 016066 004737 011176 JSR PC,$DIV ;TIME X COEFFICIENT/TOTAL # OF SEEKS
85 016072 006126 ROL (SP)+ ;REMAINDER OVER 0.5 ?
86 016074 100001 BPL 2$ ;BRANCH IF NOT
87 016076 005216 INC (SP) ;ROUND UP
88 016100 062662 000010 2$: ADD (SP)+,10(R2) ;LSB OF THE TOTAL SUM
89 016104 005562 000012 ADC 12(R2) ;MSB OF THE TOTAL SUM
90 016110 005262 000014 INC 14(R2) ;TOTAL SEEK COUNT
91 016114 017777 174106 164224 MOV @PKC,@TIM.PT ;SAVE THE TIME INTERVAL
92 016122 062737 000002 002346 ADD @2,TIM.PT ;ADJUST THE POINTER
93 016130 027712 174072 CMP @PKC,(R2) ;MINIMUM TIME
94 016134 002002 BGE 3$ ;BRANCH IF NOT
95 016136 017712 174064 MOV @PKC,(R2) ;LOAD THE NEW MINIMUM
96 016142 027763 174060 000004 3$: CMP @PKC,4(R3) ;LOWER THEN THE LIMIT ?
97 016150 002002 BGE 4$ ;BRANCH IF NOT
98 016152 005262 000002 INC 2(R2) ;UPDATE THE COUNTER IS SO
99 016156 027762 174044 000004 4$: CMP @PKC,4(R2) ;GREATER THAN THE MAXIMUM VALUE ?
100 016164 003403 BLE 5$ ;BRANCH IF NOT
101 016166 017762 174034 000004 MOV @PKC,4(R2) ;LOAD THE NEW MAXIMUM VALUE
102 016174 027763 174026 000006 5$: CMP @PKC,6(R3) ;OVER THE LIMIT
103 016202 003402 BLE 6$ ;BRANCH IF NOT
104 016204 005262 000006 INC 6(R2) ;UPDATE THE COUNT, IF SO
105 016210 000207 6$: RTS PC ;EXIT
106
107 ;THIS ROUTINE WILL ADD THE ELAPSED TIME TO THE AVERAGE COUNTER AND
108 ;MAINTAIN THE MINIMUM AND MAXIMUM TIMES.
109 ;NOTE: THIS ROUTINE DESTROYS R2
110 ;CALL
111 ; MOV #TP,R3 ;PARAMETER POINTER
112 ; MOV FLAG,R5 ;FLAG=0=COUNT UP
    
```

```

113 ; ; FLAG=-1=COUNT DOWN
114 ; JSR PC,COUNT
115 ; RETURN
116 ;
117 016212 012702 002312 COUNT: MOV #TIM.UP,R2 ;PICKUP THE "UP" POINTER
118 016216 005705 TST R5 ;USE IT?
119 016220 001402 BEQ 1$ ;YES--BRANCH
120 016222 012702 002330 MOV #TIM.DN,R2 ;NO--PICKUP "DOWN" POINTER
121 016226 027722 173774 1$: CMP @PKC,(R2)+ ;LESS THAN PREVIOUS LOW?
122 016232 002003 BGE 2$ ;NO--BRANCH
123 016234 017762 173766 177776 MOV @PKC,-2(R2) ;YES--SAVE IT
124 016242 027763 173760 000004 2$: CMP @PKC,4(R3) ;LESS THAN THE LOW LIMIT?
125 016250 002001 BGE 3$ ;NO--BRANCH
126 016252 005212 INC (R2) ;YES--COUNT IT
127 016254 005722 3$: TST (R2)+ ;ADVANCE THE POINTER
128 016256 027722 173744 CMP @PKC,(R2)+ ;GREATER THAN PREVIOUS HIGH?
129 016262 003403 BLE 4$ ;NO--BRANCH
130 016264 017762 173736 177776 MOV @PKC,-2(R2) ;YES--SAVE IT
131 016272 027763 173730 000006 4$: CMP @PKC,6(R3) ;GREATER THAN THE HIGH LIMIT?
132 016300 003401 BLE 5$ ;NO--BRANCH
133 016302 005212 INC (R2) ;YES--COUNT IT
134 016304 005722 5$: TST (R2)+ ;ADVANCE THE POINTER
135 016306 067722 173714 ADD @PKC,(R2)+ ;ADD THIS COUNT TO THE TOTAL
136 016312 005522 ADC (R2)+
137 016314 005212 INC (R2) ;COUNT THIS READING
138 016316 023727 002114 000022 CMP L$TEST,#18. ;DO NOT SAVE COUNTS IN MEMO IN 8 TO ALLOW
139 ; ; A WRITE-CHECK OPERATION AFTER THE TIMED WRITE
140 ; ; OTHERWISE WRITE DATA WILL BE DESTROYED AND A
141 ; ; WRITE CHECK ERROR WCE WILL RESULT IN RPCS2!
142 016324 001412 BEQ 6$
143 016326 022737 047706 002346 CMP #DBUFF+<4*629.>,TIM.PT ;SAVE THIS COUNT?
144 ; ; LAST CYLINDER X 4
145 016334 101406 BLOS 6$ ;NO--BRANCH
146 016336 017777 173664 164002 MOV @PKC,@TIM.PT ;YES--WELL SAVE IT THEN
147 016344 062737 000002 002346 ADD #2,TIM.PT ;ADVANCE THE POINTER
148 016352 000207 6$: RTS PC ;RETURN
149
150
151 ;THIS ROUTINE PRINTS THE SPEC OF ALL TIMING TESTS
152 ;CALL
153 ; JSR R4,SPTYP
154 ; TABLE ADDRESS
155 ;
156 ;TABLE: .WORD MESSAGE
157 ; .WORD MIN VALUE
158 ; .WORD MAX VALUE
159
160
161 016354 012402 SPTYP: MOV (R4)+,R2 ;THE TABLE ADDRESS
162 016356 005737 002242 TST TYTIME ;ALLOW TIME TO BE TYPED ?
163 016362 001447 BEQ 3$ ;BR IF NO
164 ;PRINT MESSAGE
165 016364 012246 MOV (R2)+,-(SP)
016366 012746 000001 MOV #1,-(SP)
016372 010600 MOV SP,R0
016374 104417 TRAP C$PNTF
016376 062706 000004 ADD #4,SP

```



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

```

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17 016504 012402
18 016506 010446
19 016510 012237 017264
20 016514 012205
21 016516 012203
22 016520 011202
23 016522 012704 002312
24 016526 004737 017634
25
26 016532 012737 000001 002242
27 016540 105737 002227
28 016544 001020
29 016546 005764 000002
30 016552 001403
31 016554 005737 017714
32 016560 001012
33 016562 005764 000006
34 016566 001403
35 016570 005737 017714
36 016574 001004
37 016576 005037 002242
38 016602 000137 017260
39
40 016606
    016606 013746 017264
    016612 012746 000001
    016616 010600
    016620 104417
    016622 062706 000004
41 016626 005764 000014
42 016632 001012
43 016634 012746 017615
    016640 012746 000001
    016644 010600
    016646 104417
    016650 062706 000004
44 016654 000137 017260
45 016660
    016660 012446
    016662 012746 017270
    016666 012746 000002

    ;; THIS ROUTINE IS USED TO TYPE THE MINIMUM,
    ;; MAXIMUM, AND AVERAGE TIMES FOR THE TIMING TESTS
    ;; IT WILL ALSO CHECK THE TIMES TO ENSURE
    ;; THEY ARE WITHIN TOLERANCE AND IF NOT FLAG THE BAD TIMES.
    ;; NOTE: THIS ROUTINE DESTROYS R2-R5
    ;; CALL
    ;;      JSR      R4, TYPTIM      ; GO REPORT THE TIMES
    ;;      TABLE   ; POINT TO THE PROPER TABLE
    ;;      RETURN
    ;;
    ;; TABLE: MSGADR1      ; ADDRESS OF ASCIZ MESSAGE NUMBER 1
    ;;           MSGADR2    ; ADDRESS OF ASCIZ MESSAGE NUMBER 2
    ;;           MIN. ALLOWED ; MINIMUM TIME ALLOWED
    ;;           MAX. ALLOWED ; MAXIMUM TIME ALLOWED
    TYPTIM: MOV      (R4)+, R2      ; PICKUP THE TABLE POINTER
            MOV      R4, -(SP)     ; ; PUSH R4 ON STACK
            MOV      (R2)+, 12$    ; ADDRESS OF 1ST MESSAGE
            MOV      (R2)+, R5     ; ADDRESS OF 2ND MESSAGE
            MOV      (R2)+, R3     ; PICKUP THE LO LIMIT
            MOV      (R2), R2      ; AND HI LIMIT VALUES.
            MOV      @TIM.UP, R4   ; GET ADDRESS OF UP TIMES STORAGE
            JSR      PC, CHKAVG    ; SEE IF AVERAGE BELOW/ABOVE SEEK TIMES SHOULD
            ; BE TYPED
            MOV      #1, TYTIME    ; ALLOW TIMES AND LIMITS TO BE TYPED
            TSTB     TIMTYP        ; ALWAYS TYPE THE TIMES ?
            BNE     3$             ; BR IF YES
            TST     2(R4)         ; ANY SEEKS BELOW THE LOW LIMIT
            BEQ     1$             ; BR IF NO
            TST     $$FLG        ; TYPE # OF SEEKS BELOW LIMIT?
            BNE     3$             ; BR IF YES
            1$: TST     6(R4)      ; ANY SEEKS ABOVE THE HIGH LIMIT
            BEQ     2$             ; BR IF NO
            TST     $$FLG        ; TYPE # OF SEEKS ABOVE LIMIT?
            BNE     3$             ; BR IF YES
            2$: CLR     TYTIME     ; NO TIMES OR LIMITS TO BE TYPED
            JMP     11$           ; NO--EXIT
            3$:
            MOV     12$, -(SP)
            MOV     #1, -(SP)
            MOV     SP, R0
            TRAP   C$PNTF
            ADD     #4, SP
            TST     14(R4)        ; DID ANY SEEKS OCCUR ?
            BNE     4$             ; BR IF YES
            MOV     @MSGNON, -(SP)
            MOV     #1, -(SP)
            MOV     SP, R0
            TRAP   C$PNTF
            ADD     #4, SP
            JMP     11$
            4$:
            MOV     (R4)+, -(SP)
            MOV     @MSGMIN, -(SP)
            MOV     #2, -(SP)
    
```



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

```

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

```



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

```

1      ;THIS ROUTINE GENERATES RANDOM CYLINDER, TRACK, AND SECTOR
2      ;ADDRESSES AND SAVES THEM IN THE DPB (DTADPB+10, 11 & DTADPB+12).
3      ;NOTE: THIS ROUTINE DESTROYS R1-R3
4      ;CALL
5      ;   JSR   R4,RANADR
6      ;   RETURN
7
8 017716 004737 011712  RANADR: JSR   PC,RAND      ;GENERATE A RANDOM NUMBER
9 017722 113701 011774  MOVB  $RP1,R1      ;FORM SECTOR IN R1
10 017726 042701 177700 BIC   #177700,R1   ;REDUCE SIZE TO <= 63
11
12      ;BINARY SEARCH FOR FS<=R1<=LS
13
14 017732 020137 002222 1$:  CMP   R1,LS      ;WHILE R1>LS DO R1=FS+(R1-FS)/2
15 017736 003407      BLE   2$
16 017740 163701 002220  SUB   FS,R1
17 017744 000241      CLC
18 017746 006001      ROR   R1
19 017750 063701 002220  ADD   FS,R1
20 017754 000766      BR    1$
21
22 017756 020137 002220 2$:  CMP   R1,FS      ;WHILE R1<FS DO R1=LS-(LS-R1)/2
23 017762 002011      BGE   3$
24 017764 013702 002222  MOV   LS,R2
25 017770 010203      MOV   R2,R3
26 017772 160102      SUB   R1,R2
27 017774 000241      CLC
28 017776 006002      ROR   R2
29 020000 160203      SUB   R2,R3
30 020002 010301      MOV   R3,R1
31 020004 000764      BR    2$
32
33 020006 110137 002640 3$:  MOVB  R1,DTADPB+10 ;SET RANDOM SECTOR IN DPB
34 020012 113701 011775  MOVB  $RP1+1,R1   ;FORM TRACK IN R1
35 020016 042701 177740 BIC   #177740,R1  ;REDUCE SIZE TO <= 31
36
37      ;BINARY SEARCH FOR FT<=R1<=LT
38
39 020022 020137 002214 4$:  CMP   R1,LT      ;WHILE R1>LT DO R1=FT+(R1-FT)/2
40 020026 003407      BLE   5$
41 020030 163701 002212  SUB   FT,R1
42 020034 000241      CLC
43 020036 006001      ROR   R1
44 020040 063701 002212  ADD   FT,R1
45 020044 000766      BR    4$
46 020046 020137 002212 5$:  CMP   R1,FT      ;WHILE R1<FT DO R1=LT-(LT-R1)/2
47 020052 002011      BGE   6$
48 020054 013702 002214  MOV   LT,R2
49 020060 010203      MOV   R2,R3
50 020062 160102      SUB   R1,R2
51 020064 000241      CLC
52 020066 006002      ROR   R2
53 020070 160203      SUB   R2,R3
54 020072 010301      MOV   R3,R1
55 020074 000764      BR    5$
56
57 020076 110137 002641 6$:  MOVB  R1,DTADPB+11 ;SET RANDOM TRACK IN DPB
    
```



```

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

```

```

1      .SBTTL  RP07 DRIVER
2
3      ;STORAGE FOR RPDS, RPER1, RPER2, AND RPER3
4
11 020200 000000 000000 000000 RPSTU0: .WORD 0,0,0,0      ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 0
    020210 000000 000000 000000 RPSTU1: .WORD 0,0,0,0      ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 1
    020220 000000 000000 000000 RPSTU2: .WORD 0,0,0,0      ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 2
    020230 000000 000000 000000 RPSTU3: .WORD 0,0,0,0      ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 3
    020240 000000 000000 000000 RPSTU4: .WORD 0,0,0,0      ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 4
    020250 000000 000000 000000 RPSTU5: .WORD 0,0,0,0      ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 5
    020260 000000 000000 000000 RPSTU6: .WORD 0,0,0,0      ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 6
    020270 000000 000000 000000 RPSTU7: .WORD 0,0,0,0      ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 7
16
17      ;TABLE OF DRIVE ACTIVE INDICATORS (DRVACT=8 BYTES)
18      ;DRVACT=0 IF DRIVE IS IDLE
19      ;DRVACT>0 IF DRIVE IS ACTIVE WITH A COMMAND
20      ;DRVACT<0 IF DRIVE IS ACTIVE WITH AN ERROR RECOVERY OPERATION
21
22 020300      000      DRVACT: .BYTE 0      ;DRIVE 0
23 020301      000      .BYTE 0      ;DRIVE 1
24 020302      000      .BYTE 0      ;DRIVE 2
25 020303      000      .BYTE 0      ;DRIVE 3
26 020304      000      .BYTE 0      ;DRIVE 4
27 020305      000      .BYTE 0      ;DRIVE 5
28 020306      000      .BYTE 0      ;DRIVE 6
29 020307      000      .BYTE 0      ;DRIVE 7
30
31      ;TABLE OF DRIVE STATUS INDICATORS (DRVSTA=8 BYTES)
32      ;DRVSTA=0 IF DRIVE IS OFFLINE OR NONEXISTENT
33      ;DRVSTA>0 IF DRIVE IS ONLINE
34      ;DRVSTA<0 IF DRIVE IS UNSAFE
35
36 020310      000      DRVSTA: .BYTE 0      ;DRIVE 0
37 020311      000      .BYTE 0      ;DRIVE 1
38 020312      000      .BYTE 0      ;DRIVE 2
39 020313      000      .BYTE 0      ;DRIVE 3
40 020314      000      .BYTE 0      ;DRIVE 4
41 020315      000      .BYTE 0      ;DRIVE 5
42 020316      000      .BYTE 0      ;DRIVE 6
43 020317      000      .BYTE 0      ;DRIVE 7
44
45      ;TABLE OF DRIVE TYPES (DRVTYP=8 BYTES)
46      ;DRVTYP=0 IF DRIVE IS NONEXISTENT (DRVSTA=0, ALSO)
47      ;DRVTYP=5 IF DRIVE IS RP07 MOVING HEAD OPTION
48      ;DRVTYP=4 IF DRIVE IS RP07 FIX HEAD OPTION
49      ;DRVTYP=-1 IF NOT RP07
50
51 020320      000      DRVTYP: .BYTE 0      ;DRIVE 0
52 020321      000      .BYTE 0      ;DRIVE 1
53 020322      000      .BYTE 0      ;DRIVE 2
54 020323      000      .BYTE 0      ;DRIVE 3
55 020324      000      .BYTE 0      ;DRIVE 4
56 020325      000      .BYTE 0      ;DRIVE 5
57 020326      000      .BYTE 0      ;DRIVE 6
58 020327      000      .BYTE 0      ;DRIVE 7
59
60      ;TABLE OF DUAL PORT INITIALIZATION INDICATORS
  
```



```

61                                     ;DPINT=0 IF INITIALIZATION IS NOT ACTIVE ON THE DRIVE
62                                     ;DPINT<0 IF INITIALIZATION IS IN PROGRESS
63
64 020330      000      DPINT:  .BYTE  0          ;DRIVE 0
65 020331      000          .BYTE  0          ;DRIVE 1
66 020332      000          .BYTE  0          ;DRIVE 2
67 020333      000          .BYTE  0          ;DRIVE 3
68 020334      000          .BYTE  0          ;DRIVE 4
69 020335      000          .BYTE  0          ;DRIVE 5
70 020336      000          .BYTE  0          ;DRIVE 6
71 020337      000          .BYTE  0          ;DRIVE 7
72
73                                     ;TABLE OF PENDING DUAL PORT REQUESTS
74                                     ;DPRQS=0 IF THAT A DUAL PORT REQUEST IS NOT PENDING FOR THAT DRIVE
75                                     ;DPRQS<0 IF THAT A DUAL PORT REQUEST IS PENDING FOR THAT DRIVE
76
77 020340      000      DPRQS:  .BYTE  0          ;DRIVE 0
78 020341      000          .BYTE  0          ;DRIVE 1
79 020342      000          .BYTE  0          ;DRIVE 2
80 020343      000          .BYTE  0          ;DRIVE 3
81 020344      000          .BYTE  0          ;DRIVE 4
82 020345      000          .BYTE  0          ;DRIVE 5
83 020346      000          .BYTE  0          ;DRIVE 6
84 020347      000          .BYTE  0          ;DRIVE 7
85
86                                     ;TRANSFER WAIT FLAG (TRNSWT=1 WORD)
87                                     ;THIS IS A ONE WORD QUEUE. IT WILL CONTAIN THE ADDRESS OF
88                                     ;"DPB" OF THE I/O OPERATION.
89
90 020350      000000      TRNSWT: .WORD  0
91
92                                     ;SEARCH WAIT KEYS (SRCHWT=1 WORD)
93                                     ;THIS IS A ONE WORD QUEUE THAT WILL CONTAIN A KEY FOR EACH OF
94                                     ;THE DRIVES THAT ARE PERFORMING A SEARCH COMMAND FOR THE I/O
95                                     ;REQUEST THAT IS AT THE TOP OF THEIR REQUEST QUEUE.
96                                     ;EACH DRIVE IS ASSIGNED ONE BIT, STARTING AT BIT00 FOR DRIVE 0.
97
98 020352      000000      SRCHWT: .WORD  0
99
100                                     ;RP07 DRIVER ACTIVE FLAG (ACTDRV=1 BYTE)
101                                     ;ACTDRV=0 IF DRIVER IS INACTIVE
102                                     ;ACTDRV>0 IF DRIVER IS ACTIVE
103
104 020354      000      ACTDRV: .BYTE  0
105
106                                     ;SOFTWARE TIMER ROUTINE ACTIVE FLAG (ACTSTR=1 BYTE)
107                                     ;ACTSTR=0 IF SOFTWARE TIMER ROUTINE IS INACTIVE
108                                     ;ACTSTR>0 IF SOFTWARE TIMER ROUTINE IS ACTIVE
109
110 020355      000      ACTSTR: .BYTE  0
111
112
113                                     ;TIMEOUT TABLE (TIMER=8 WORDS)
114                                     ;THIS TABLE CONTAINS THE TIME ALLOWED FOR AN OPERATION
115
116 020356      177777      TIMER:  .WORD  -1          ;DRIVE 0
117 020360      177777          .WORD  -1          ;DRIVE 1

```

118 020362 177777  
119 020364 177777  
120 020366 177777  
121 020370 177777  
122 020372 177777  
123 020374 177777  
124  
125  
126  
127  
128  
129 020376 177777

.WORD -1 ;DRIVE 2  
.WORD -1 ;DRIVE 3  
.WORD -1 ;DRIVE 4  
.WORD -1 ;DRIVE 5  
.WORD -1 ;DRIVE 6  
.WORD -1 ;DRIVE 7

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

DTUW: .WORD -1



```

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15 020400 004737 010750
16 020404 004737 012000
17
18 020410 104440
   020412 010046
19
20 020414 012700 000240
   020420 104441
21 020422 004737 025350
22 020426 012701 020200
23 020432 012702 020356
24 020436 005021
25 020440 020102
26 020442 103775
27 020444 012702 020376
28 020450 012721 177777
29 020454 020102
30 020456 101774
31 020460 005037 020310
32 020464 005037 020312
33 020470 005037 020314
34 020474 005037 020316
35
36 020500 013746 002656
   020504 012746 023046
   020510 013746 002654
   020514 012746 000003
   020520 104437
   020522 062706 000010
37 020526 012777 000040 162144
38 020534 013701 002664
39 020540 004437 020566
40 020544 000401
41 020546 000402
42
43 020550 105061 020310
44 020554
45 020554 012600
   020556 104441
46 020560 004737 011002
47 020564 000207
48
49

```

```

;RHXX/RP07 DRIVER INITIALIZATION CODE
;THIS ROUTINE WILL DETERMINE WHICH RP07 DRIVES ARE
;AVAILABLE FOR TESTING AND SET THE DRVSTA INDICATOR
;TO THE PROPER STATE FOR EACH DRIVE.
;NOTE: THIS ROUTINE CALLS DRVINT

;CALL
;
;      JSR      PC,RPINIT
;      RETURN
;
;NOTE: THE 'P' OR 'L' CLOCK MUST BE STARTED
;
RPINIT: JSR      PC,SAVREG      ;SAVE R0 - R5
        JSR      PC,ST.CLK    ;TURN ON THE CLOCK
        TRAP     C$GPRI       ;SAVE THE PRESENT PROCESSOR STATUS
        MOV      RO,-(SP)
        ;CHANGE THE PRIORITY TO 5
        MOV      #PRI05,RO
        TRAP     C$SPRI
        JSR      PC,CLRQUE    ;CLEAR ALL REQUEST QUEUES
        MOV      #RPSTU0,R1   ;FIRST ADDRESS TO BE CLEARED
        MOV      #TIMER,R2   ;LAST ADDRESS TO BE CLEARED
1$:     CLR      (R1)+        ;CLEAR
        CMP      R1,R2       ;ARE WE DONE?
        BLO     1$          ;BRANCH IF NO
        MOV      #DTUW,R2    ;LAST ADDRESS
2$:     MOV      #-1,(R1)+   ;INITIALIZE
        CMP      R1,R2       ;DONE?
        BLOS    2$          ;LOOP IF NO
        CLR     DRVSTA       ;SET ALL DRIVES TO OFFLINE
        CLR     DRVSTA+2
        CLR     DRVSTA+4
        CLR     DRVSTA+6
        ;SETUP RHXX/RP07 VECTOR
        MOV     RPVEC+2,-(SP)
        MOV     #ISRV,-(SP)
        MOV     RPVEC,-(SP)
        MOV     #3,-(SP)
        TRAP    C$SVEC
        ADD     #10,SP
        MOV     #CLR,@RPCS2
        MOV     DRVNO,R1
        JSR     R4,DRVINT     ;MASSBUS INIT
        BR     4$           ;GET SELECTED DRIVE
        BR     5$           ;INIT THE DRIVE
        BR     5$           ;'DVA' NOT SET OR PARITY ERROR
        BR     5$           ;NORMAL RETURN
4$:     CLRB    DRVSTA(R1)   ;SET DRIVE STATUS TO OFFLINE
5$:     MOV     (SP)+,RO     ;RESTORE THE PROCESSOR STATUS
        TRAP    C$SPRI
        JSR     PC,RESREG    ;RESTORE R0 - R5
        RTS     PC          ;BYE-BYE
;DRIVE INITIALIZATION ROUTINE

```

```

50                                     ; THIS ROUTINE DETERMINES IF A DRIVE EXIST AND IF IT IS
51                                     ; AN RP07. IF IT IS, A "READ-IN PRESET" IS ISSUED AND FMT16
52                                     ; IS SET TO A "1". THEN MOL, DPR, DRY, AND VV ARE CHECKED TO
53                                     ; INSURE THEY ARE ALL ON A "1". AND DEPENDING ON THEIR STATE,
54                                     ; DRVSTA IS SET TO THE PROPER CONDITION.
55                                     ; CALL
56                                     ;
57                                     ; MOV     #DRVNUM,R1      ; DRIVE NUMBER TO R1
58                                     ; JSR     R4,DRVINT      ; CALLED BY A JSR
59                                     ; RETURN1  ; ERROR OCCURRED (PARITY)
60                                     ; RETURN2  ; NORPAL RETURN
61                                     ;
62 020566 010546          DRVINT: MOV     R5,-(SP)      ; SAVE R5
63 020570 112761 177777 020330  MOVB   #-1,DPINT(R1) ; SET THE INITIAL FLAG
64 020576 006301          ASL     R1
65 020600 012761 003720 020356  MOV     #2000.,TIMER(R1) ; SET A 2 SECOND TIMER
66 020606 006201          ASR     R1                ; DRIVE ADDRESS
67 020610 105061 020310 10$: CLRB   DRVSTA(R1) ; START DRIVE STATUS AS OFFLINE
68 020614 105061 020320  CLRB   DRVSTYP(R1) ; CLEAR THE DRIVE TYPE INDICATOR
69 020620 010177 162054  MOV     R1,@RPCS2 ; SELECT A DRIVE
70 020624 112777 000111 162036  MOVB   #111,@RPCS1 ; DO A DRIVE CLEAR COMMAND (& SEIZE DRIVE)
71 020632 032777 010000 162040  BIT     #BIT12,@RPCS2 ; NONEXISTENT DRIVE?
72 020640 001403          BEQ     1$                ; NO---BRANCH
73 020642 004737 025004  JSR     PC,SET.IE ; GO SET "IE" WITHOUT A "TRE"
74 020646 000513          BR      6$                ; LEAVE THIS ROUTINE
75
76 020650 105061 020310 1$: CLRB   DRVSTA(R1) ; SET DRIVE STATUS TO OFFLINE
77 020654 032777 004000 162006  BIT     #BIT11,@RPCS1 ; SEE IF DRIVE AVAILABLE
78 020662 001004          BNE     22$                ; BRANCH IF DVA SET
79 020664 105761 020330  TSTB   DPINT(R1) ; SOFTWARE TIME OUT
80 020670 001347          BNE     10$                ; BRANCH IF NOT
81 020672 000501          BR      6$                ; OTHERWISE EXIT
82
83 020674 004437 024426 22$: JSR     R4,RD.RP ; READ THE DRIVE TYPE REG.
84 020700 000026          26
85 020702 021100          8$
86 020704 012605          MOV     (SP)+,R5 ; ERROR RETURN ADDRESS
87 020706 112761 000005 020320  MOVB   #5,DRVSTYP(R1) ; PUT DRIVE TYPE IN R5
88 020714 022705 020040  CMP     #20040,R5 ; SET RP07 INDICATOR
89 020720 001420          BEQ     2$                ; SINGLE PORT RP07
90 020722 022705 024040  BEQ     #24040,R5 ; BR IF YES
91 020726 001415          CMP     #24040,R5 ; DUAL PORT RP07
92 020730 112761 000004 020320  BEQ     2$                ; BR IF YES
93 020736 022705 020042  MOVB   #4,DRVSTYP(R1) ; SET RP07+ INDICATOR
94 020742 001407          CMP     #20042,R5 ; SINGLE PPRT RP07+
95 020744 022705 024042  BEQ     2$                ; BRANCH IF SO
96 020750 001404          CMP     #24042,R5 ; DUAL PORT RP07+
97 020752 112761 177777 020320  BEQ     2$                ; BRANCH IF SO
98 020760 000446          MOVB   #-1,DRVSTYP(R1) ; SET INDICATOR TO 'OTHER'
99                                     BR      6$                ; EXIT
100 020762 012746 000121 2$: MOV     #121,-(SP) ; DO A "READ-IN PRESET"
101 020766 004437 024520  JSR     R4,WRT.RP
102 020772 000000          0
103 020774 021100          8$
104 020776 012746 010000  MOV     #BIT12,-(SP) ; SET FMT16=1
105 021002 004437 024520  JSR     R4,WRT.RP
106 021006 000032          32

```



```

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

```

```

162 021206 010177 161466          MOV    R1,DRPCS2      ;SELECT THE DRIVE
163 021212 004437 025452          JSR    R4,DRVQUE     ;PUT THIS REQUEST IN QUEUE
164 021216 000452                   BR     9$            ;QUEUE IS FULL
165
166 021220 105761 020300          2$:   TSTB   DRVACT(R1) ;IS THIS DRIVE ACTIVE?
167 021224 001043                   BNE    8$            ;BR IF YES
168 021226 004737 021364          JSR    PC,OPT        ;CALL THE OPTIMIZER
169 021232 000440                   BR     8$
170 021234
171 021234 004737 022536          3$:   JSR    PC,CI7    ;GO HANDLE THE PARITY ERROR
172 021240 000435                   BR     8$
173
174 021242 004437 025452          4$:   JSR    R4,DRVQUE ;PUT REQUEST IN QUEUE
175 021246 000436                   BR     9$            ;QUEUE IS FULL
176
177 021250 012777 000000 161450    MOV    #0,DRPCC      ;WRITE THE CURRENT CYL REG
178 021256 032777 000100 161404    BIT    #BIT06,DRPCS1 ;IE BIT SET ?
179 021264 001023                   BNE    8$            ;YES
180 021266 004737 025004          JSR    PC,SET.IE    ;SET THE INTERRUPT
181 021272 000420                   BR     8$            ;RETURN
182
183 021274 105761 020310          5$:   TSTB   DRVSTA(R1) ;SEE IF DRIVE OFFLINE OR UNSAFE
184 021300 002412                   BLT    7$            ;BR IF UNSAFE
185 021302 012762 140000 000016    MOV    #BIT15!BIT14,16(R2) ;SET OFFLINE ERROR INDICATOR
186 021310 105761 020320          TSTB   DRVSTYP(R1) ;SEE IF OFFLINE OR NONEXISTENT
187 021314 001007                   BNE    8$            ;BR IF OFFLINE
188 021316 012762 100002 000016    MOV    #BIT15!BIT01,16(R2) ;REPORT DRIVE NONEXISTENT
189 021324 000403                   BR     8$            ;GO TO EXIT
190
191 021326 012762 110000 000016    6$:   MOV    #BIT15!BIT12,16(R2) ;DRIVE IS UNSAFE
192 021334 004737 011002          7$:   JSR    PC,RESREG   ;RESTORE R0 - R5
193 021340 005724                   TST   (R4)+          ;SETUP FOR NORMAL RETURN
194 021342 000402                   BR     10$           ;FINISH UP, THEN EXIT
195 021344 004737 011002          8$:   JSR    PC,RESREG   ;RESTORE R0 - R5
196 021350 005724                   TST   (R4)+          ;CORRECT THE RETURN ADDRESS
197 021352 105037 020354          9$:   CLR    ACTDRV    ;CLEAR "ACTIVE DRIVER" FLAG
198                                     ;RESTORE PRIORITY
199 021356 012600                   MOV    (SP)+,R0
200 021360 104441                   TRAP  C$SPRI
201 021362 000204                   RTS    R4            ;RETURN TO CALLER
202
203                                     ;OPTIMIZER-CALLED FOR A PARTICULAR DRIVE
204                                     ;
205                                     ;CALL
206                                     ;
207                                     ;
208 021364 004737 010750          OPT:  JSR    PC,SAVREG   ;SAVE R0 - R5
209 021370 104440                   TRAP  C$GPRI
210 021372 010046                   MOV    R0,-(SP)
211 021374 146137 002744 020352    BICB  ATABIT(R1),SRCHWT ;CLEAR LA SEACH FLAG
212 021402 105061 020340          CLR    DPRQS(R1)    ;RESET THE PORT REQ FLAG ****
213 021406 004737 025526          JSR    PC,GETREQ    ;GET "DPB" POINTER OF REQUEST
214 021412 005702                   TST   R2            ;IS THERE A REQUEST IN QUEUE?
215 021414 001472                   BEQ   7$            ;NO--BRANCH TO EXIT
216 021416 010177 161256          MOV    R1,DRPCS2    ;LOAD THE DRIVE ADDRESS *****
217 021422 012777 000111 161240    MOV    #111,DRPCS1 ;CLEAR THE DRIVE

```



```

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

```

```

1          ;COMMAND INITIATOR
2          ;
3          ;CALL
4          ;      MOV      #DRVNUM,R1      ;DRIVE NUMBER
5          ;      MOV      #DPB,R2        ;ADDRESS OF DPB
6          ;      JSR      PC,CI?         ;CI?= CI1,CI3, OR CI4
7          ;                               ;WHERE:
8          ;                               ;CI1=DATA TRANSFER
9          ;                               ;CI3=SEARCH REQUESTED BY DATA XFER
10         ;                               ;CI4=NOT DATA TRANSFER
11         ;
12 021630 004737 025550      CI1:  JSR      PC,POPQUE      ;REMOVE REQUEST FROM "DRIVES WAIT" QUEUE
13 021634 010237 020350      MOV      R2,TRNSWT      ;PUT REQ. IN TRANSFER WAIT QUEUE
14 021640 010203              MOV      R2,R3          ;DPB ADDRESS TO R3
15 021642 013704 002670      MOV      RPCS1,R4       ;RPCS1 ADDRESS
16 021646 010177 161026      MOV      R1,@RPCS2      ;SELECT DRIVE
17 021652 122762 000135 000002  CMPB     #DIAG,2(R2)     ;DIAGNOSTIC COMMAND ?
18 021660 001011              BNE     1$              ;BRANCH IF NOT
19 021662 016246 000004      MOV      4(R2),-(SP)    ;GET THE RT NUMBER, PARAMETERS
20 021666 052716 100000      BIS     #DMD,(SP)      ;SET THE GIAGNOSTIC MODE BIT
21 021672 004437 024520      JSR      R4,WRT.RP     ;WRITE THE RPMR1 REG
22 021676 000024              24
23 021700 022536              CI7
24 021702 000432              BR      2$              ;RETURN HERE ON ERROR
25         ;                               ;LOAD THE COMMAND AND EXIT
26 021704 062703 000004      1$:  ADD     #4,R3          ;DESIRED WORD COUNT
27 021710 062704 000002      ADD     #2,R4          ;RPWC ADDRESS
28 021714 012324              MOV     (R3)+,(R4)+    ;LOAD WORD COUNT
29 021716 012324              MOV     (R3)+,(R4)+    ;LOAD BUFFER ADDRESS
30 021720 012346              MOV     (R3)+,-(SP)    ;LOAD SECTOR AND TRACK
31 021722 004437 024520      JSR      R4,WRT.RP     ;CALL THE LOAD(WRITE) ROUTINE
32 021726 000006              6                      ;INDEX OF REGISTER TO LOAD
33 021730 022536              CI7
34 021732 012346              MOV     (R3)+,-(SP)    ;RETURN HERE ON ERROR
35 021734 004437 024520      JSR      R4,WRT.RP     ;LOAD CYLINDER ADDRESS
36 021740 000034              34
37 021742 022536              CI7
38 021744 032712 100000      BIT     #BIT15,(R2)    ;RETURN HERE ON ERROR
39 021750 001407              BEQ     2$              ;MAINTENANCE MODE FLAG BIT SET ?
40 021752 005046              CLR     -(SP)          ;BRANCH IF NOT
41 021754 052716 100000      BIS     #BIT15,(SP)    ;SET DMD BIT IN RPMR
42 021760 004437 024520      JSR      R4,WRT.RP     ;SET DMD BIT ONLY THE REST BITS MUST BE 0
43 021764 000024              24                      ;WRITE TO RPMR
44 021766 022536              CI7
45 021770 016246 000002      2$:  MOV     2(R2),-(SP)    ;RETURN HERE ON ERROR
46 021774 004437 024520      JSR      R4,WRT.RP     ;LOAD "COMMAND+GO", "A17&A16", AND "PSEL"
47 022000 000000              0
48 022002 022536              CI7
49 022004 010137 020376      MOV     R1,DTUW        ;RETURN HERE ON ERROR
50 022010 000137 022452      JMP     CI5            ;SET "DATA TRANSFER UNDERWAY"
51         ;
52 022014 013704 002670      CI3:  MOV     RPCS1,R4       ;RPCS1 ADDRESS
53 022020 010177 160654      MOV     R1,@RPCS2      ;SELECT DRIVE
54 022024 016246 000012      MOV     12(R2),-(SP)   ;DESIRED CYLINDER ADDRESS
55 022030 004437 024520      JSR      R4,WRT.RP
56 022034 000034              34
57 022036 022536              CI7                      ;RETURN HERE ON ERROR

```



```

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

```





```

172 022536          CI7:
173 022536 005702  1$:   TST      R2          ;ANYTHING IN QUEUE ?
174 022540 001001          BNE      2$          ;BRANCH IF QUEUE IS THERE
175 022542 000207          RTS      PC          ;OTHERWISE EXIT
176 022544 012762 104000 000016 2$:   MOV      #BIT15!BIT11,16(R2) ;SET "PARITY" ERROR INDICATOR
177
178 022552 012746 000111 CI7B:  MOV      #111,-(SP)      ;DO A "DRIVE CLEAR"
179 022556 004437 024520      JSR      R4,WRT.RP
180 022562 000000          O
181 022564 022624          CI8
182 022566 004737 025432 2$:   JSR      PC,EMPTYQ      ;RETURN HERE ON ERROR
183 022572 105061 020340      CLRB    DPRQS(R1)      ;EMPTY THE QUEUE
184 022576 105061 020300      CLRB    DRVACT(R1)     ;CLEAR THE PORT REQUEST FLAG
185 022602 020237 020350      CMP     R2,TRNSWT      ;DRIVE IS IDLE
186 022606 001005          BNE     1$             ;IF THIS DRIVE HAD AN I/O REQUEST
187 022610 005037 020350      CLR     TRNSWT         ;IN PROGRESS CLEAR ALL OF THE FLAGS
188 022614 012737 177777 020376      MOV     #-1,DTUW
189 022622 000207 1$:   RTS      PC
190
191 022624 004737 010750 CI8:   JSR      PC,SAVREG      ;SAVE R0 - R5
192 022630 005001          CLR     R1
193 022632 005003          CLR     R3
194 022634 105761 020300 1$:   TSTB   DRVACT(R1)     ;DRIVE ACTIVE?
195 022640 001003          BNE     22$           ;BRANCH IF IN ACTIVE
196 022642 105761 020340      TSTB   DPRQS(R1)      ;PORT REQUEST
197 022646 001443          BEQ     5$             ;BRANCH IF NOT
198 022650 013702 020350 22$:  MOV     TRNSWT,R2      ;GET THE "TRANSFER WAIT" QUEUE
199 022654 020137 020376      CMP     R1,DTUW        ;DID THIS DRIVE HAVE AN I/O IN PROGRESS?
200 022660 001402          BEQ     2$             ;BRANCH IF YES
201 022662 004737 025526          JSR     PC,GETREQ      ;GET THE DPB POINTER
202 022666 005702 2$:   TST     R2             ;QUEUE ENTRY FOR DRIVE ?
203 022670 001413          BEQ     4$             ;BR IF NOT
204 022672 032777 010000 160000      BIT     #BIT12,@RPCS2 ;'NED' SET ?
205 022700 001404          BEQ     3$             ;BR IF NOT
206 022702 012762 100002 000016      MOV     #BIT15!BIT01,16(R2) ;SET 'DRIVE NON-EXISTENT' INDICATOR
207 022710 000403          BR      4$             ;CONTINUE
208
209 022712 012762 102000 000016 3$:   MOV     #BIT15!BIT10,16(R2) ;SET "NON-CLEARABLE PARITY" ERROR INDICATOR
210 022720 012763 177777 020356 4$:   MOV     #-1,TIMER(R3) ;STOP THE TIMER
211 022726 105061 020300      CLRB   DRVACT(R1)     ;SET "DRIVE ACTIVE" TO IDLE
212 022732 105061 020340      CLRB   DPRQS(R1)      ;CLEAR PORT REQUEST FLAG
213 022736 020137 020376      CMP     R1,DTUW        ;IS THIS DRIVE SETUP FOR A TRANSFER
214 022742 001005          BNE     5$             ;BR IF NOT
215 022744 012737 177777 020376      MOV     #-1,DTUW        ;RESET THE INDICATOR
216 022752 005037 020350      CLR     TRNSWT         ;CLEAR THE TRANSFER QUEUE
217 022756 005201 5$:   INC     R1             ;MOVE TO THE NEXT DRIVE
218 022760 062703 000002      ADD     #2,R3
219 022764 042701 177770      BIC    #+C7,R1
220 022770 001321          BNE     1$             ;BRANCH IF MORE DRIVES
221 022772 012737 177777 020376      MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
222 023000 005037 020350      CLR     TRNSWT         ;CLEAR THE 'TRANSFER WAIT' QUEUE
223 023004 004737 025350      JSR     PC,CLRQUE      ;CLEAR ALL OF THE REQUEST QUEUES
224 023010 012777 000040 157662      MOV     #CLR,@RPCS2    ;DO A MASSBUS INIT.
225 023016 000406          BR      7$             ;CONTINUE
226
227 023020 004737 025432 6$:   JSR     PC,EMPTYQ      ;CLEAR THE DRIVE'S QUEUE
228 023024 105061 020310      CLRB   DRVSTA(R1)     ;SET DRIVE TO OFFLINE

```

229 023030 105061 020320  
230 023034 004737 025004  
231 023040 004737 011002  
232 023044 000207

78:

CLRB DRVTYP(R1)  
JSR PC,SET,IE  
JSR PC,RESREG  
RTS PC

;CLEAR THE DRIVE TYPE INDICATOR  
;SET "IE" WITHOUT "TRE"  
;RESTORE R0 - R5  
;RETURN



```

1
2
3
4
5 023046 112737 000001 020354 ISRV:  MOVB  #1,ACTDRV ;SET "ACTIVE DRIVER" FLAG
6 023054 005237 002246          INC  ISRCNT ;COUNT INTERRUPTS
7 023060 004737 010750          JSR  PC,SAVREG ;SAVE R0 - R5
8 023064 013701 020376          MOV  DTUW,R1 ;GET "DATA TRANSFER UNDERWAY" INDICATOR
9 023070 002403          BLT  1# ;BRANCH IF NO DATA TRANSFER UNDERWAY
10 023072 004737 023116         JSR  PC,TD ;CALL TRANSFER DONE
11 023076 000402          BR   2# ;EXIT
12 023100 004737 023304         1#: JSR  PC,SC ;CALL SPECIAL CONDITIONS
13 023104 004737 011002         2#: JSR  PC,RESREG ;RESTORE R0 - R5
14 023110 105037 020354         CLRB ACTDRV ;CLEAR "ACTIVE DRIVER" FLAG
15 023114          L10012: RTI
    023114 000002

16
17
18
19 023116 105061 020300          TD:  CLRB  DRVACT(R1) ;SET DRIVE ACTIVE INDICATOR TO IDLE
20 023122 012737 177777 020376      MOV  #-1,DTUW ;NO DATA TRANSFERS UNDERWAY
21 023130 006301          ASL  R1
22 023132 012761 177777 020356      MOV  #-1,TIMER(R1) ;CANCEL TIMEOUT
23 023140 006201          ASR  R1
24 023142 013702 020350          MOV  TRNSWT,R2 ;GET "DPB" ADDRESS FROM THE
25 023146 005037 020350          CLR  TRNSWT ;TRANSFER WAIT QUEUE--CLEAR QUEUE
26 023152 052762 000200 000016      BIS  #BIT07,16(R2) ;SET DONE
27 023160 010177 157514          MOV  R1,@RPCS2 ;SELECT THE DRIVE
28 023164 004437 024426          JSR  R4,RD.RP ;TRANSFER ERROR(TRE=1)?
29 023170 000000          O
30 023172 022536          CI7
31 023174 006126          ROL  (SP). ;RETURN HERE ON ERROR
32 023176 100424          BMI  3# ;BR IF YES
33 023200 004737 024644          JSR  PC,SVRHXX ;YES--SAVE THE REGISTERS
34 023204 122762 000135 000002      CMPB #135,2(R2) ;IE FROM DIAGNOSTIC COMMAND ?
35 023212 001003          BNE  1# ;BRANCH IF NOT
36 023214 116177 002744 157464      MOVB ATABIT(R1),@RPAS ;RESET THE ATA BIT
37 023222 004737 025526         1#: JSR  PC,GETREQ ;GET DPB POINTER
38 023226 005702          TST  R2 ;ENTRY FOR DRIVE ?
39 023230 001403          BEQ  2# ;BR IF NOT
40 023232 004737 021364          JSR  PC,OPT ;CALL OPTIMIZER
41 023236 000422          BR   SC ;CHECK OTHER DRIVES
42
43 023240 012777 000113 157422 2#: MOV  #113,@RPCS1 ;RELEASE THE DRIVE
44 023246 000416          BR   SC ;CHECK FOR OTHER DRIVES
45 023250 052762 100100 000016 3#: BIS  #BIT15:BIT06,16(R2) ;SET DATA ERROR FLAG
46 023256 004737 025432          JSR  PC,EMPTYQ ;EMPTY THE "DRIVE'S WAIT" QUEUE
47 023262 004737 024644          JSR  PC,SVRHXX ;SAVE THE RMX/RPO7 REGISTERS
48 023266 012777 040111 157374      MOV  #40111,@RPCS1 ;ISSUE A "DRIVE CLEAR"
49 023274 012777 000113 157366      MOV  #113,@RPCS1 ;ISSUE A RELEASE TO THE DRIVE
50 023302 000400          BR   SC ;CHECK FOR OTHER DRIVES
51
52
53
54 023304 117703 157376          SC:  MOVB  @RPAS,R3 ;READ "RPAS"
55 023310 001014          BNE  2# ;BRANCH IF ANY 'ATA' BITS SET
56 023312 004437 024426          JSR  R4,RD.RP ;READ CONTROL AND STATUS REGISTER
57 023316 000000          O

```

58	023320	022624		CIB			;RETURN HERE ON ERROR
59	023322	106126		ROLB	(SP),		;IS "IE"=1?
60	023324	100405		BMI	1#		;YES, NO DRIVES TO CHECK
61	023326	000240		NOP			
62	023330	000240		NOP			
63	023332	000240		NOP			
64	023334	004737	025004	JSR	PC,SET.IE		;SET INTERRUPT ENABLE
65	023340	000207		1#:	PC		;RETURN
66	023342	005046		2#:	-(SP)		;PROCESS ALL DRIVES THAT HAVE
67	023344	110316		MOVB	R3,(SP)		;AN "ATA"=1
68	023346	012703	000001	MOV	#1,R3		
69	023352	005001		CLR	R1		
70	023354	030316		SC3:	BIT R3,(SP)		;ATA=1?
71	023356	001005		BNE	SC5		;YES--BRANCH
72	023360	005201		SC4:	INC R1		;MOVE TO THE NEXT DRIVE
73	023362	106303		ASLB	R3		
74	023364	001373		BNE	SC3		;BRANCH IF MORE TO CHECK?
75	023366	005726		TST	(SP),		;CLEAN OFF THE STACK
76	023370	000207		RTS	PC		;RETURN TO USER
77	023372			SC5:			
78	023372	105761	020340	1#:	TSTB DPRQS(R1)		;PORT REQUEST OUTSTANDING ?
79	023376	001402		BEQ	2#		;BR IF NOT
80	023400	000137	023766	JMP	SC13		;START THE OUTSTANDING COMMAND
81	023404	105761	020310	2#:	TSTB DRVSTA(R1)		;CHECK THE DRIVE STATUS
82	023410	003011		BGT	5#		;BRANCH IF ONLINE
83	023412	004737	025526	JSR	PC,GETREQ		;GET DPB POINTER
84	023416	004737	024644	JSR	PC,SVRHXX		;SAVE THE RMXX/RP07 REGISTERS
85	023422	004737	023702	JSR	PC,SC12		;SAVE RPDS, RPER1, RPER3, AND RPER2
86							;ALSO DO A DRIVE INIT (DRVINT)
87	023426	105761	020310	TSTB	DRVSTA(R1)		;DID DRIVE COME ONLINE?
88	023432	003405		BLE	6#		;NO---BRANCH
89	023434	105761	020300	5#:	TSTB DRVACT(R1)		;DRIVE ACTIVE WITH COMMAND OR ERROR RECOVERY ?
90	023440	001035		BNE	SC6		;BR IF EITHER
91	023442	004737	023702	JSR	PC,SC12		;SAVE RPDS, RPER1, RPER3, AND RPER2
92							;ALSO DO A DRVINT
93	023446	105761	020310	6#:	TSTB DRVSTA(R1)		;CHECK ON DRIVE'S STATUS
94	023452	100421		BMI	7#		;BR IF UNSAFE
95	023454	006301		ASL	R1		
96	023456	006301		ASL	R1		
97	023460	006301		ASL	R1		
98	023462	016105	020204	MOV	RPSTU0+4(R1),R5		
99	023466	006201		ASR	R1		
100	023470	006201		ASR	R1		
101	023472	006201		ASR	R1		
102	023474	032705	020000	BIT	#BIT13,R5		;ADDRESS PLUG CHANGED
103	023500	001012		BNE	8#		;BRANCH IF SO
104	023502	012746	000111	MOV	#111,-(SP)		;DRIVE CLEAR
105	023506	004437	024520	JSR	R4,WRT.RP		;WRITE THE COMMAND INTO RPCS1
106	023512	000000		O			;REGISTER INDEX
107	023514	023562		SC8			;PARITY EXIT ADDRESS
108	023516	011605		7#:	MOV (SP),R5		;PICKUP (RPAS) BEFORE THE ERROR CALL
109	023520	000240		NOP			
110	023522	000240		NOP			
111	023524	000715		BR	SC4		;GO CHECK FOR MORE ATA'S
112							
113	023526	000240		8#:	NOP		
114	023530	000240		NOP			



```

115 023532 000712          BR      SC4          ;CHECK FOR MORE DRIVES
116
117 023534 006301          SC6:   ASL      R1          ;SETUP TO ADDRESS WORDS
118 023536 012761 177777 020356   MOV      #-1,TIMER(R1) ;STOP THE TIMER
119 023544 006201          ASR      R1          ;RESTORE THE DRIVE ADDRESS
120 023546 004737 025526   JSR      PC,GETREQ    ;GET THE DPB POINTER FROM THE QUEUE
121 023552 010177 157122   MOV      R1,@RPCS2    ;SELECT DRIVE
122 023556 000137 023612   JMP      SC11         ;PROCESS THE SEARCH
123 023562 105761 020300   SC8:   TSTB     DRVACT(R1) ;IS DRIVE IDLE?
124 023566 001405          BEQ      1$          ;YES--BRANCH
125 023570 004737 025526   JSR      PC,GETREQ    ;GET DPB POINTER
126 023574 004737 022536   JSR      PC,CI7      ;PROCESS THE PARITY ERROR
127 023600 000402          BR      2$          ;CONTINUE
128
129 023602 004737 022552   1$:   JSR      PC,CI7B   ;PROCESS THE UNCORRECTABLE PARITY ERROR
130 023606 000137 023360   2$:   JMP      SC4          ;CHECK MORE DRIVES
131
132 023612          SC11:
133 023612 105061 020300   1$:   CLRB     DRVACT(R1) ;SET DRIVE IDLE
134 023616 136137 002744 020352   BITB     ATABIT(R1),SRCHWT ;DOING A SEARCH OPERATION FOR
135                                     ;AN I/O COMMAND?
136 023624 001007          BNE     2$          ;BRANCH IF YES
137 023626 004737 025550   JSR      PC,POPQUE    ;REMOVE REQUEST FROM QUEUE
138 023632 052762 000200 000016   BIS     @BIT07,16(R2) ;SET "DONE" BIT
139 023640 004737 024644          JSR      PC,SVRHXX    ;YES--SAVE ALL OF THE RHXX/RP07 REG'S
140 023644 116177 002744 157034 2$:   MOVB     ATABIT(R1),@RPAS ;CLEAR ATTENTION BIT
141 023652 146137 002744 020352   BICB     ATABIT(R1),SRCHWT ;CLEAR IMPLIED SEEK SET
142 023660 006301          ASL      R1          ;WORD INDEX
143 023662 012761 177777 020356   MOV      #-1,TIMER(R1) ;STOP CLOCK
144 023670 006201          ASR      R1          ;RESTORE R1
145 023672 004737 021364   JSR      PC,OPT      ;START A REQUEST
146 023676 000137 023360   JMP      SC4          ;CHECK FOR MORE DRIVES
147
148 023702 010177 156772   SC12:  MOV      R1,@RPCS2    ;SELECT DRIVE
149 023706 006301          ASL      R1
150 023710 006301          ASL      R1
151 023712 006301          ASL      R1
152 023714 017761 156762 020200   MOV      @RPDS,RPSTUO(R1)
153 023722 017761 156756 020202   MOV      @RPER1,RPSTUO+2(R1)
154 023730 017761 156774 020204   MOV      @RPER2,RPSTUO+4(R1)
155 023736 017761 156770 020206   MOV      @RPER3,RPSTUO+6(R1)
156 023744 006201          ASR      R1
157 023746 006201          ASR      R1
158 023750 006201          ASR      R1
159 023752 004437 020566   JSR      R4,DRVINT   ;INIT. THE STATE OF THE DRIVE
160 023756 000401          BR      1$          ;TAKE ERROR EXIT
161 023760 000207          RTS      PC          ;RETURN
162
163 023762 005726          1$:   TST      (SP)+      ;CLEAR THE STACK
164 023764 000676          BR      SC8         ;PROCESS THE PARITY ERROR
165
166 023766          SC13:
167          ; ASL      R1          ;SETUP TO ADDRESS WORDS
168          ; MOV      #-1,TIMER(R1) ;STOP THE TIMER
169          ; ASR      R1          ;
170 023766 010177 156706   MOV      R1,@RPCS2    ;SELECT THE DRIVE
171 023772 116177 002744 156706   MOVB     ATABIT(R1),@RPAS ;CLEAR THE ATTENTION BIT
171 024000 105761 020330   1$:   TSTB     DPINT(R1)   ;INITIALIZING THE DRIVE ?

```

```

172 024004 001424          BEQ      2$          ;BR IF NOT
173 024006 105061 020330  CLRB    DPINT(R1)    ;CLEAR THE INIT INDICATOR
174 024012 004437 020566  JSR     R4,DRVINT    ;GO INIT THE DRIVE
175 024016 000240          NOP          ;DUMMY PARITY ERROR RETURN
176 024020 105761 020310  TSTB   DRVSTA(R1)   ;DRIVE ONLINE ?
177 024024 003014          BGT      2$          ;BR IF YES -- START ORDER
178 024026 005702          TST      R2          ;QUEUE ENTRY FOR THE DRIVE
179 024030 001423          BEQ      3$          ;BR IF NOT
180 024032 004737 025526  JSR     PC,GETREQ    ;GET DPB ADDRESS
181 024036 052762 140000 000016  BIS    #BIT15:BIT14,16(R2) ;INFORP USER THAT DRIVE OFFLINE
182 024044 004737 024644  JSR     PC,SVRHXX    ;SAVE THE REGISTERS
183 024050 004737 025550  JSR     PC,POPQUE    ;REMOVE THE QUEUE
184 024054 000411          BR       3$
185
186 024056 032777 000400 156616  2$:    BIT    #BIT8,@RPDS    ;DVA SET ?
187 024064 001003          BNE     4$          ;SET THEN CALL OPT
188          ;          ASL    R1
189          ;          MOV    #60000.,TIMER(R1);SET A 60. SECOND TIMER
190          ;          ASR    R1
191 024066 004737 025004  JSR     PC,SET.IE
192 024072 000402          BR       3$
193
194 024074 004737 021364  4$:    JSR     PC,OPT      ;START THE PENDING REQUEST
195 024100 000137 023360  3$:    JMP     SC4          ;PROCESS OTHER DRIVES
196
197          ;/RP07 TIMER ROUTINE
198          ;CALL
199          ;          MOV    #TIME,-(SP)    ;ELAPSED TIME IN MILLISECONDS ON THE STACK
200          ;          JSR     PC,RPTMR     ;CALL RP07 TIME ROUTINE
201
202 024104 005737 020354  RPTMR: TST    ACTDRV    ;CHECK "ACTDRV & ACTSTR"
203 024110 001031          BNE     4$          ;IF NON ZERO EXIT
204 024112 112737 000001 020355  MOVB   #1,ACTSTR    ;SET "ACTSTR"
205 024120 004737 010750  JSR     PC,SAVREG    ;SAVE R0 - R5
206 024124 005001          CLR     R1          ;START WITH DRIVE 0
207 024126 005003          CLR     R3
208 024130 005763 020356  1$:    TST    TIMER(R3)   ;IS THE TIMER RUNNING?
209 024134 002406          BLT    2$          ;BRANCH IF NO
210 024136 166663 000002 020356  SUB    2(SP),TIMER(R3) ;COUNT THE INTERVAL
211 024144 003002          BGT    2$          ;BR IF NO SOFTWARE TIMEOUT
212 024146 004737 024200  JSR     PC,STO      ;CALL SOFTWARE TIMEOUT ROUTINE
213 024152 005201  2$:    INC    R1          ;MOVE TO NEXT DRIVE
214 024154 005723          TST    (R3)+
215 024156 022701 000010  CMP    #8.,R1      ;OUT OF DRIVES?
216 024162 003362          BGT    1$          ;BRANCH IF NO
217 024164 004737 011002  3$:    JSR     PC,RESREG   ;RESTORE R0 - R5
218 024170 105037 020355  CLRB   ACTSTR      ;ZERO ACTIVE SOFTWARE TIMEOUT ROUTINE FLAG
219 024174 012616  4$:    MOV    (SP)+,(SP)  ;ADJUST THE STACK
220 024176 000207          RTS     PC          ;RETURN
221
222          ;SOFTWARE TIMEOUT ROUTINE
223          ;
224          ;NOTE: THIS ROUTINE MUST BE ENTERED AT PRIORITY 6
225          ;      OR GREATER
226          ;
227          ;CALL:  STO    #DRVNUM,R1    ;DRIVE NUMBER
228          ;

```



```

229 ; JSR PC,STO ;CALL
230 ; RETURN
231
232 STO: MOV R1,-(SP) ;SAVE R1-R4
233 MOV R2,-(SP) ;
234 MOV R3,-(SP) ;
235 MOV R4,-(SP) ;
236 MOV TRNSWT,R2 ;PICKUP THE TRANSFER QUEUE
237 CMP R1,DTUW ;TRANSFER UNDER WAY ON THIS DRIVE
238 BEQ 1$ ;BRANCH IF SO
239 TSTB DPINT(R1) ;DRIVE INITIALIZE ?
240 BNE 2$ ;BRANCH IF SO
241 TSTB DPRQS(R1) ;PROT REQUEST ?
242 BNE 3$ ;BRANCH IF SO
243 MOV #-1,TIMER(R3) ;STOP THE TIMER
244 JSR PC,GETREQ ;GET THE QUEUE
245 TST R2 ;EXIT IF NONE
246 BEQ 5$ ;
247 BIS #BIT15!BIT9,16(R2) ;TIME OUT OR LOST INTERRUPT
248 ;ON HOUSE KEEPING COMMANDS
249 BR 5$ ;EXIT
250 BIS #BIT15!BIT9,16(R2) ;TIME OUT ON DATA TRANSFER
251 JSR PC,SVRHXX ;READ ALL REGISTERS
252 CLRB DRVACT(R1) ;DRIVE SET TO IDLE
253 CLR TRNSWT ;CLEAR DATA TRANSFER QUEUE
254 MOV #-1,DTUW ;CLEAR THE TRANSFER DRIVE #
255 BR 5$ ;EXIT
256 CLRB DPINT(R1) ;CLEAR THE INITIALIZE INDICATOR
257 CLRB DRVSTA(R1) ;SET UNIT TO OFFLINE
258 MOV #-1,TIMER(R3) ;STOP THE TIMER
259 JSR PC,GETREQ ;GET THE DPB ADDRESS
260 TST R2 ;ANYTHING IN QUEUE
261 BEQ 5$ ;BRANCH IF NOT
262 BIS #BIT15!BIT14,16(R2) ;INFORM THE USER DRIVE NOT AVAILABLE
263 BR 5$ ;FINISH
264 MOV #-1,TIMER(R3) ;STOP THE TIMER
265 CLRB DPRQS(R1) ;CLEAR THE PORT REQUEST INDICATOR
266 JSR PC,GETREQ ;GET DPB ADDRESS
267 TST R2 ;ANYTHING IN QUEUE ?
268 BEQ 5$ ;BRANCH IF NONE
269 MOV #BIT15!BIT2,16(R2) ;INFORM USER OF PROT REQUEST TIMEOUT
270 JSR PC,SVRHXX ;READ ALL REGISTERS
271 JSR PC,EMPTYQ ;CANCEL ALL QUEUE REQ
272 MOV (SP)+,R4 ;RESTORE R4-R1
273 MOV (SP)+,R3
274 MOV (SP)+,R2
275 MOV (SP)+,R1
276 RTS PC ;EXIT
277
278 ;ROUTINE TO READ A RHXX/RP07 REGISTER
279 ;
280 ;CALL
281 ; JSR R4,RD.RP ;GO READ A REGISTER
282 ; INDEX ;REG. INDEX FROM BASE
283 ; ERRADR ;ERROR ADDRESS--PROCESS ERROR STARTING
284 ; ;AT THIS ADDRESS
285 ; RETURN ;CONTENTS OF REG. IS ON THE STACK

```

```

286
287 024426          ;RD.RP:
288 024426 011646   MOV      (SP),-(SP)      ;SAVE R4
289 024430 013746 002670   MOV      RPCS1,-(SP)      ;ADDRESS OF THE
290 024434 062416           ADD      (R4)+,(SP)      ;REG
291 024436 017666 000000 000004   MOV      @ (SP),4(SP)    ;READ THE CONTENTS OF THE REG
292 024444 013716 002670           MOV      RPCS1,(SP)      ;CHECK IF NON-EXIST DRIVE
293 024450 062716 000010           ADD      #10,(SP)       ;
294 024454 032776 010000 000000   BIT      #BIT12,@(SP)   ;NED BIT SET ?
295 024462 001004           BNE      1$             ;ERROR EXIT
296 024464 032777 020000 156176   BIT      #BIT13,@RPCS1 ;MCPE SET ?
297 024472 001406           BEQ      2$             ;EXIT
298 024474 016666 000002 000004 1$:   MOV      2(SP),4(SP)    ;MOVE THE R4 TO TOP OF STACK
299 024502 022626           CMP      (SP)+,(SP)+   ;CLEAR OFF THE STACK
300 024504 011404           MOV      (R4),R4 ;ERROR EXIT ADDRESS
301 024506 000403           BR       3$             ;EXIT
302 024510 062704 000002 2$:   ADD      #2,R4          ;NORMAL EXIT
303 024514 005726           TST      (SP)+         ;CLEAR OFF STACK
304 024516 000204 3$:   RTS      R4            ;EXIT
305
306          ;ROUTINE TO WRITE A REGISTER
307          ;
308          ;CALL
309          ;      MOV      DATA,-(SP)      ;DATA TO BE LOADED ON THE STACK
310          ;      JSR      R4,WRT.RP        ;CALL THE ROUTINE TO LOAD(WRITE) THE REG.
311          ;      INDEX      ERRADR        ;INDEX OF THE REGISTER TO BE LOADED
312          ;      ERRADR      ;ADDRESS TO RETURN TO ON AN ERROR
313          ;      RETURN      ;ERROR FREE RETURN
314
315 024520          WRT.RP:
316 024520 012446   MOV      (R4)+,-(SP)    ;FORMING THE REG ADDRESS
317 024522 001014           BNE      1$             ;BRANCH IF NOT RPCS1
318 024524 122766 000150 000004   CMPB     #150,4(SP)     ;DATA XTRNS COMMAND ?
319 024532 002410           BLT      1$             ;BRANCH IF NOT
320 024534 017746 156130           MOV      @RPCS1,-(SP)  ;READ RPCS1
321 024540 000316           SWAB     (SP)           ;MERG THE A17,A18,PSEL BITS
322 024542 042716 177770           BIC      #+C7,(SP)     ;CHOP OFF THE REST BITS FROM RPCS1
323 024546 111666 000007           MOVB    (SP),7(SP)     ;ATTACH A17,A18,PSEL TO COMMAND
324 024552 005726           TST      (SP)+         ;RESTORE STACK LEVEL
325 024554 063716 002670 1$:   ADD      RPCS1,(SP)    ;THE DEST REG ADDRESS
326 024560 016676 000004 000000   MOV      4(SP),@ (SP)  ;WRITE THE REGISTER
327 024566 013716 002670           MOV      RPCS1,(SP)    ;CHECK NED,PAR BITS
328 024572 062716 000010           ADD      #10,(SP)     ;
329 024576 032776 010000 000000   BIT      #BIT12,@(SP) ;NONE EXIST DRIVE ?
330 024604 001013           BNE      2$             ;BRANCH IF IT IS
331 024606 013716 002670           MOV      RPCS1,(SP)   ;ADDRESS RPER1
332 024612 062716 000014           ADD      #14,(SP)     ;
333 024616 032776 000010 000000   BIT      #BIT3,@(SP)  ;PAR SET ?
334 024624 001003           BNE      2$             ;BRANCH IF SO
335 024626 062704 000002           ADD      #2,R4        ;NORMAL RETURN
336 024632 000401           BR       3$             ;EXIT
337 024634 011404 2$:   MOV      (R4),R4      ;ERROR EXIT
338 024636 005726 3$:   TST      (SP)+         ;CLEAR OFF THE STACK
339 024640 012616           MOV      (SP)+,(SP)   ;MOVE R4 TO TOP OF STACK
340 024642 000204           RTS      R4            ;EXIT
341
342          ;ROUTINE TO SAVE THE RHXX/RP07 REGISTERS AS PER DPB+14

```



```

343
344 ;CALL
345 ; MOV #DPBNUM,R2 ;DPB POINTER TO R2
346 ; JSR PC,SVRHXX ;SAVE THE DRIVES REG'S (RHXX= RH11 OR RH70)
347
348 024644 SVRHXX:
024644 004737 010750 JSR PC,SAVREG ;;SAVE R0-R5
349 024650 005702 TST R2 ;QUEUE ENTRY FOR THE DRIVE ?
350 024652 001451 BEQ 7$ ;BR IF NONE
351 024654 111277 156020 MOV (R2),@RPCS2 ;SELECT DRIVE
352 024660 016203 000014 MOV 14(R2),R3 ;GET THE ERROR TABLE POINTER
353 024664 001444 BEQ 7$ ;EXIT IF NO ADDRESS
354 024666 005037 024722 CLR 3$ ;COUNTER & POINTER
355 024672 023727 024722 000022 1$: CMP 3$,#22 ;REACHED THE BUFFER REGISTER ?
356 024700 001006 BNE 2$ ;BR IF NOT
357 024702 032777 000200 155770 BIT #BIT07,@RPCS2 ;'OR' SET ?
358 024710 001002 BNE 2$ ;BR IF SET
359 024712 005023 CLR (R3)+ ;STORE RPDB AS ZEROES
360 024714 000405 BR 4$ ;CONTINUE
361
362 024716 004437 024426 2$: JSR R4,RD.RP ;READ THE SELECTED REGISTER
363 024722 000000 3$: .WORD 0 ;REGISTER INDEX
364 024724 024750 5$ ;ERROR RETURN ADDRESS
365 024726 012623 MOV (SP)+,(R3)+ ;STORE THE REGISTER CONTENTS
366 024730 023727 024722 000046 4$: CMP 3$,#46 ;REACHED THE END ?
367 024736 001406 BEQ 6$ ;BR IF YES
368 024740 062737 000002 024722 ADD #2,3$ ;INCREMENT THE REGISTER INDEX
369 024746 000751 BR 1$ ;CONTINUE READING THE REGISTERS
370
371 024750 004737 022536 5$: JSR PC,CI7 ;PROCESS THE UNCORRECTABLE PARITY ERROR
372 024754 005737 002662 6$: TST RHTYPE ;IS IT RH70 ?
373 024760 001406 BEQ 7$ ;IF EQ, NO
374 024762 013704 002652 MOV RPADR,R4 ;GET RPCS1 BASE ADDRESS
375 024766 063704 002660 ADD RHEXT,R4 ;POINT TO RPBAE
376 024772 012423 MOV (R4)+,(R3)+ ;STORE THE CONTENTS
377 024774 011413 MOV (R4),(R3) ;GET RPCS3
378 024776 7$:
024776 004737 011002 JSR PC,RESREG ;;RESTORE R0-R5
379 025002 000207 RTS PC ;RETURN
380
381 ;ROUTINE TO SET THE INTERRUPT WITHOUT GETTING A "TRE"
382 ;CALL
383 ; MOV #DRVNUM,R1 ;DRIVE NUMBER TO R1
384 ; JSR PC,SET.IE ;SET "IE"
385 ; RETURN
386
387 025004 010446 SET.IE: MOV R4,-(SP) ;SAVE R4
388 025006 013704 002670 MOV RPCS1,R4 ;PICKUP ADR OF RPCS1
389 025012 010177 155662 MOV R1,@RPCS2 ;SELECT DRIVE
390 025016 011446 MOV (R4),-(SP) ;READ RPCS1
391 025020 052716 040000 BIS #BIT14,(SP) ;SET THE "TRE" BIT OF THE WORD READ
392 025024 000316 SWAB (SP) ;ADJUST FOR DATO
393 025026 112714 000100 MOV #BIT06,(R4) ;SET "IE"
394 025032 032777 010000 155640 BIT #BIT12,@RPCS2 ;IS "NED"=1?
395 025040 001002 BNE 1$ ;YES--CLEAR "TRE"
396 025042 005726 TST (SP)+ ;CLEAN OFF THE STACK
397 025044 000402 BR 2$

```

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



```

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

```

1
2
3
4
5
6
7 025350 004737 010750
8 025354 012702 025056
9 025360 005022
10 025362 005022
11 025364 005022
12 025366 005022
13 025370 012703 000010
14 025374 012701 025126
15 025400 012122
16 025402 005303
17 025404 001375
18 025406 012703 000010
19 025412 012701 025126
20 025416 012122
21 025420 005303
22 025422 001375
23 025424 004737 011002
24 025430 000207
25
26
27
28
29
30
31
32 025432 105061 025056
33 025436 006301
34 025440 016161 025066 025106
35 025446 006201
36 025450 000207
37
38
39
40
41
42
43
44
45
46
47 025452 122761 000010 025056
48 025460 001421
49 025462 105261 025056
50 025466 006301
51 025470 010271 025066
52 025474 062761 000002 025066
53 025502 026161 025066 025130
54 025510 001003
55 025512 016161 025126 025066
56 025520 006201
57 025522 005724

;ROUTINE TO CLEAR ALL OF THE REQUEST QUEUES
;
;CALL
;
; JSR PC,CLRQUE
CLRQUE: JSR PC,SAVREG ;SAVE R0 - R5
MOV #QCNT,R2 ;ZERO THE QUEUE COUNTS
CLR (R2)+ ;DRIVES 0 & 1
CLR (R2)+ ;DRIVES 2 & 3
CLR (R2)+ ;DRIVES 4 & 5
CLR (R2)+ ;DRIVES 6 & 7
MOV #8,R3 ;MOVE THE STARTING
MOV #QSTART,R1 ;ADDRESS OF THE QUEUE INTO
1$: MOV (R1)+,(R2)+ ;THE QUEUE INPUT POINTER
DEC R3
BNE 1$
MOV #8,R3 ;MOVE THE STARTING ADDRESS
MOV #QSTART,R1 ;OF THE QUEUE INTO THE
2$: MOV (R1)+,(R2)+ ;QUEUE OUTPUT POINTER
DEC R3
BNE 2$
JSR PC,RESREG ;RESTORE R0 - R5
RTS PC

;EMPTY THE QUEUE SPECIFIED BY R1
;
;CALL
;
; MOV DRVNUM,R1 ;DRIVE NUMBER TO R1
; JSR PC,EMPTYQ
EMPTYQ: CLRB QCNT(R1) ;CLEAR NUMBER OF ITEMS IN QUEUE
ASL R1
MOV QINPT(R1),QOUTPT(R1) ;SET OUTPUT QUEUE POINTER=INPUT POINTER
ASR R1
RTS PC

;ROUTINE TO PUT A REQUEST IN QUEUE
;
;CALL
;
; MOV #DRVNUM,R1 ;DRIVE NUMBER
; MOV #DPB,R2 ;ADDRESS OF PARAMETER BLOCK
; JSR R4,DRVQUE ;GO PUT REQUEST IN QUEUE
; RETURN1 ;RETURN HERE IF QUEUE IS FULL
; RETURN2 ;RETURN HERE IF REQUEST IS IN QUEUE
DRVQUE: CMPB #10,QCNT(R1) ;IS QUEUE FULL?
BEQ 2$ ;BR IF YES-TAKE RETURN1
INCB QCNT(R1) ;INCREMENT QUEUE COUNT
ASL R1
MOV R2,QINPT(R1) ;PUT THIS REQUEST IN QUEUE
ADD #2,QINPT(R1) ;UPDATE THE QUEUE POINTER
CMP QINPT(R1),QSTOP(R1) ;TIME TO RESET THE POINTER
BNE 1$ ;BRANCH IF NO
MOV QSTART(R1),QINPT(R1) ;YES--RESET POINTER
1$: ASR R1
TST (R4)+ ;TAKE RETURN 2

```



```

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

```

12  
40  
42  
43  
44  
45  
46  
47 025616  
48  
60  
61 025616 000167  
025620 000000  
62  
74  
75  
76 025622  
025622 104425

```
.SBTTL REPORT CODING SECTION
; **
; THE REPORT CODING SECTION CONTAINS THE
; "PRINTS" CALLS THAT GENERATE STATISTICAL REPORTS.
; --
L$RPT::
      .WORD J$JMP
      .WORD L10013-2-.
      .EVEN
L10013: TRAP C$RPT
```



```

1
2
3
4
5
6
7
8 025624
9 025624 000000
10 025626 177777
11 025630 000006
13

```

```

.SBTTL PROTECTION TABLE

; **
; THIS TABLE IS USED BY THE RUNTIME SERVICES
; TO PROTECT THE LOAD MEDIA.
; --

L$PROT::
      0          ;P-TABLE OFFSET OF CSR
     -1         ;NOT A MASSBUS DEVICE
      6         ;P-TABLE OFFSET DRIVE #

```





```

49 026030 001406          BEQ      6#          ;BR IF NO
50 026032 013702 002660  MOV      RHEXT,R2      ;GET RPBAE OFFSET
51 026036 061502          ADD      (R5),R2      ;ADD BASE ADDRESS TO OFFSET
52 026040 010223          MOV      R2,(R3)+      ;SAVE NEW RPBAE
53 026042 005722          TST      (R2)+          ;ADD 2
54 026044 010213          MOV      R2,(R3)      ;SAVE NEW RPCS3
55
56 026046 022626          6#:    CMP      (SP)+,(SP)+    ;RESTORE STACK
57 026050 012537 002652  MOV      (R5)+,RPADR    ;SAVE RPCS1 BASE ADDRESS
58 026054 012537 002654  MOV      (R5)+,RPVEC    ;SAVE INTERRUPT VECTOR ADDRESS
59 026060 012537 002656  MOV      (R5)+,RPVEC+2  ;SAVE INTERRUPT PRIORITY
60 026064 011537 002664  MOV      (R5),DRVNO     ;SETUP DRIVE NUMBER FOR UNIT N
61
62 026070 004737 020400  JSR      PC,RPINIT     ;INITIALIZE THE SUB-SYSTEM
63 026074 013705 002664  MOV      DRVNO,R5      ;PICKUP DRIVE # AS AN INDEX
64 026100 105765 020310  TSTB    DRVSTA(R5)     ;CHECK DRIVE STATUS: IF NOT AVAILABLE, TRY ANOTHER DRIVE
65 026104 100443          BMI      9#           ;UNSAFE BRANCH
66 026106 001054          BNE      10#          ;DRIVE OK
67 026110 105765 020320  TSTB    DRVTP(R5)     ;NED + OFL ?
68 026114 001425          BEQ      8#           ;NED BRANCH: NON-EXISTENT DRV
69 026116 100012          BPL      7#           ;OFL BRANCH: OFF-LINE
70
71 026120 010546          MOV      R5,-(SP)
72 026122 012746 005362  MOV      @NOTMSG,-(SP)
73 026126 012746 000002  MOV      @2,-(SP)
74 026132 010600          MOV      SP,R0
75 026134 104417          TRAP    C#PNTF
76 026136 062706 000006  ADD      @6,SP
77 026142 000700          BR      3#           ;EXIT BLOCK
78 026144
79 026144 010546          7#:    MOV      R5,-(SP)
80 026146 012746 005327  MOV      @OFLMSG,-(SP)
81 026152 012746 000002  MOV      @2,-(SP)
82 026156 010600          MOV      SP,R0
83 026160 104417          TRAP    C#PNTF
84 026162 062706 000006  ADD      @6,SP
85 026166 000666          BR      3#           ;EXIT BLOCK
86 026170
87 026170 010546          8#:    MOV      R5,-(SP)
88 026172 012746 005270  MOV      @NEDMSG,-(SP)
89 026176 012746 000002  MOV      @2,-(SP)
90 026202 010600          MOV      SP,R0
91 026204 104417          TRAP    C#PNTF
92 026206 062706 000006  ADD      @6,SP
93 026212 000654          BR      3#           ;EXIT BLOCK
94 026214
95 026214 010546          9#:    MOV      R5,-(SP)
96 026216 012746 005237  MOV      @UNSMMSG,-(SP)
97 026222 012746 000002  MOV      @2,-(SP)
98 026226 010600          MOV      SP,R0
99 026230 104417          TRAP    C#PNTF
100 026232 062706 000006  ADD      @6,SP
101 026236 000642          BR      3#           ;DRV NOT AVAILABLE: TRY ANOTHER
102 026240
103 026240 005737 002260  10#:   TST      CLKSTA
104 026244 100061          BPL      EXINIT
105 026246 005237 025742  INC      2#          ;DRV IS OK! WHAT CLOCK TYPE?
                               ;P TYPE, OK!
                               ;UPDATE, CAN CLOCK MESSAGE BE TYPED ?

```

```

83 026252 001056          BNE      EXINIT          ;BR IF NO
84                                     ;PRINT 'NO P-CLOCK, TIMING TESTS WILL NOT BE EXECUTED'
85 026254 012746 004317  MOV      #NOCLK,-(SP)
      026260 012746 000001  MOV      #1,-(SP)
      026264 010600          MOV      SP,R0
      026266 104417          TRAP     C#PNTF
      026270 062706 000004  ADD      #4,SP
86 026274 000445          BR       EXINIT          ;SKIP NEXT INTERMEDIATE BRANCHING
87
88 026276          CONTIN:          ;SETUP RHXX/RP07 VECTOR
89 026276 013746 002656  MOV      RPVEC+2,-(SP)
      026302 012746 023046  MOV      #ISRVL,-(SP)
      026306 013746 002654  MOV      RPVEC,-(SP)
      026312 012746 000003  MOV      #3,-(SP)
      026316 104437          TRAP     C#SVEC
      026320 062706 000010  ADD      #10,SP
90 026324 004737 012000  JSR      PC,ST.CLK      ;START CLOCK
91 026330 104432          TRAP     C#EXIT
      026332 000320          .WORD   L10015-.
92
93 026334 004737 012364  ABORT:   JSR      PC,STOPCK      ;STOP THE CLOCK
94 026340 012777 000040 154332  MOV      #CLR,#RPCS2      ;MASSBUS INIT TO CLEAR IMPENDING INTERRUPTS
95 026346 005737 002260  TST      CLKSTA          ;RELEASE APPROPRIATE CLOCK VECTOR
96 026352 001410          BEQ      2$              ;NO CLOCK, SKIP
97 026354 100404          BMI      1$              ;L-CLK
98 026356 013700 012230  MOV      PKV,R0
      026362 104436          TRAP     C#CVEC
99 026364 000403          BR       2$              ;SKIP
100 026366          1$:
      026366 013700 012240  MOV      LKV,R0
      026372 104436          TRAP     C#CVEC
101 026374          2$:
      026374 013700 002654  MOV      RPVEC,R0
      026400 104436          TRAP     C#CVEC
102 026402 104444          TRAP     C#DCLN
103 026404 104432          TRAP     C#EXIT
      026406 000244          .WORD   L10015-.
104
105 026410 013737 002664 002550  EXINIT:  MOV      DRVNO,DPB.A      ;STUFF DRIVE NUMBER IN DPB TABLES
106 026416 013737 002664 002570  MOV      DRVNO,DPB.B
107 026424 013737 002664 002610  MOV      DRVNO,DPB.C
108 026432 013737 002664 002630  MOV      DRVNO,DTADPB
109
110                                     ;PRINT DRIVE SERIAL NUMBER
111
112 026440 012701 000004          MOV      #4,R1          ;4 DIGITS
113 026444 013777 002664 154226  MOV      DRVNO,#RPCS2      ;SELECT DRIVE
114 026452 013746 002664          MOV      DRVNO,-(SP)
      026456 012746 004403  MOV      #DSNMSG,-(SP)
      026462 012746 000002  MOV      #2,-(SP)
      026466 010600          MOV      SP,R0
      026470 104417          TRAP     C#PNTF
      026472 062706 000006  ADD      #6,SP
115 026476 017746 154216          MOV      #RPSN,-(SP)      ;FETCH S/N
116 026502 005002          3$:   CLR      R2              ;ZERO OUTPUT
117 026504 006116          ROL      (SP)            ;PUT NEXT DIGIT INTO R2
118 026506 006102          ROL      R2

```



```

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

```

1  
2  
3  
4  
5  
6  
7  
8  
9  
10 026654  
17 026654  
026654 104461

.SBTTL AUTODROP SECTION  
:  
:  
:++  
: THIS CODE IS EXECUTED IMMEDIATELY AFTER THE INITIALIZE CODE IF  
: THE "ADR" FLAG WAS SET. THE UNIT(S) UNDER TEST ARE CHECKED TO  
: SEE IF THEY WILL RESPOND. THOSE THAT DON'T ARE IMMEDIATELY  
: DROPPED FROM TESTING.  
:--  
:  
L\$AUTO::  
L10016: TRAP C\$AUTO



```

1          .SBTTL  CLEANUP CODING SECTION
2
3          ;**
4          ; THE CLEANUP CODING SECTION! CONTAINS THE CODING THAT IS PERFORMED
5          ; AFTER THE HARDWARE TESTS HAVE BEEN PERFORMED.
6          ;--
7
8 026656    L$CLEAN::
9
10 026656 012700 000340      MOV    #PRI07,R0      ;SET PRIORITY TO 7
    026662 104441          TRAP   C$SPRI
11 026664 012777 000040 154006  MOV    #CLR,@RPCS2    ;MASSBUS INIT TO CLEAR IMPENDING INTERRUPTS
12 026672 013777 002664 154000  MOV    DRVNO,@RPCS2   ;GET DRIVE NUMBER
13 026700 004737 012364      JSR    PC,STOPCK      ;STOP THE CLOCK
14 026704 005737 002260      TST   CLKSTA         ;RELEASE APPROPRIATE CLOCK VECTOR
15 026710 001410          BEQ   2$              ;NO CLOCK, SKIP
16 026712 100404          BMI   1$              ;L-CLK
17                                     ;P-CLK VECTOR RELEASE
18 026714 013700 012230      MOV    PKV,R0
    026720 104436          TRAP   C$CVEC
19 026722 000403          BR    2$
20                                     ;L-CLK VECTOR RELEASE
21 026724          1$:
    026724 013700 012240      MOV    LKV,R0
    026730 104436          TRAP   C$CVEC
22 026732          2$:
    026732 013700 002654      MOV    RPVEC,R0      ;RP07 VECTOR RELEASE
    026736 104436          TRAP   C$CVEC
23 026732 013700 002654      TRAP   C$EXIT
    026740 104432          .WORD  L10017-.
    026742 000002
24
25
26 026744          L10017:
    026744 104412          TRAP   C$CLEAN

```

```
1          .SBTTL  DROP UNIT SECTION
2
3
4          ;**
5          ; THE DROP-UNIT SECTION CONTAINS THE CODING THAT CAUSES A DEVICE
6          ; TO NO LONGER BE TESTED.
7          ;--
8 026746   L$DU::
17
18 026746 000167      .WORD  J$JMP
   026750 000000      .WORD  L10020-2-.
19
31          .EVEN
32
33 026752      L10020:
   026752 104453      TRAP   C$DU
```



```

1          .SBTTL  ADD UNIT SECTION
2
3
4          ;**
5          ; THE ADD-UNIT SECTION CONTAINS ANY CODE THE PROGRAMMER WISHES
6          ; TO BE EXECUTED IN CONJUNCTION WITH THE ADDING OF A UNIT BACK
7          ; TO THE TEST CYCLE.
8          ;--
9 026754   L$AU::
18
19 026754 000167   .WORD  J$JMP
   026756 000000   .WORD  L10021-2-.
20
32          .EVEN
33
34 026760   L10021:
   026760 104452   TRAP   C$AU

```

2  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45

.SBTTL HARDWARE TESTS

;\*IN THE DESCRIPTIONS OF THE BELOW TESTS THE VARIABLES USED  
;\*AND THEIR DEFAULT VALUES (UNLESS SPECIFIED OTHERWISE) ARE:

;*Mnemonic	VALUE	VARIABLE
;*-----	-----	-----
;*ITCNT	1	ITERATIONS
;*FC	0	FIRST CYLINDER ADDRESS
;*LC	629	LAST CYLINDER ADDRESS
;*IC	1	INCREMENT VALUE
;*NC OF NC1	FC+IC	NEW OR MODIFIED CYLINDER ADDRESS
;*NC2	LC-IC	NEW OR MODIFIED CYLINDER ADDRESS
;*FT	0	FIRST TRACK ADDRESS
;*LT	31.	LAST TRACK ADDRESS
;*IT	1	INCREMENT VALUE
;*NT	FT+IT	NEW OR MODIFIED TRACK ADDRESS
;*FS	0	FIRST SECTOR ADDRESS
;*LS	49.	LAST SECTOR ADDRESS

.SBTTL SEEK TESTS

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



1  
2  
37  
39  
40  
41  
42  
43  
44  
51  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68

.SBTTL TEST 1: RECALIBRATE TEST

```
;;*****  
;* THIS TEST WILL CAUSE THE DRIVE TO EXECUTE A RECALIBRATE  
;* COMMAND CYCLE AND THEN DO A READ HEADER AND DATA COMMAND  
;* TO VERIFY POSITION.  
;;*****
```

```
T1::      MOV      #10.,ITCNT      ;SET ITERATION COUNT  
TEST1:    MOVB     #RECAL,DPB.A+2  ;RECAL=COMMAND  
          CLR      DPB.B+10      ;SEC/TRK 0  
          CLR      DPB.B+12      ;CYL 0  
  
T1.1:     TRAP     C#BSUB  
          JSR      R4,CALL.A      ;GO EXECUTE THE COMMAND  
          JSR      R4,CALL.B      ;GO EXECUTE THE COMMAND  
          DEC      ITCNT          ;DONE ITERATIONS ?  
          BNE     TEST1          ;BR IF NO  
  
EXIT1:    L10023:  TRAP     C#ESUB  
L10022:   TRAP     C#ETST
```

```
026762 012737 000012 002244  
026770 112737 000107 002552  
026776 005037 002600  
027002 005037 002602  
027006 104402  
027010 004437 014374  
027014 004437 014512  
027020 005337 002244  
027024 001361  
027026 104403  
027030 104401
```

```

1      .SBTTL TEST 2: INCREMENT SEEK TEST
2
3
4      ;*****
5      ;* THIS TEST WILL COMMAND FORWARD SEEK CYCLES TO ADVANCE THE
6      ;* CYLINDER ADDRESS FROM "FC" TO "LC" BY THE INCREMENT "IC".
7      ;* WHEN THE RESULTANT CYLINDER ADDRESS (NC) EXCEEDS
8      ;* "LC" REVERSE SEEK CYCLES ARE INITIATED; STARTING
9      ;* AT THE LAST LEGAL "NC" AND DECREMENTING BY "IC"
10     ;* UNTIL "NC" IS LESS THAN "FC". AT THE COMPLETION OF EACH
11     ;* SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO
12     ;* ENSURE PROPER OPERATION.
13     ;*****
14     027032      T2::
15     027032 113737 002220 002600 1$: MOVB FS,DPB.B+10 ;FS
16     027040 113737 002212 002601      MOVB FT,DPB.B+11 ;FT
17     027046 013737 002204 002602      MOV FC,DPB.B+12 ;FC
18     027054      T2.11:
19     027054      T2.1:
20     027056 104402 004437 014512      TRAP C$BSUB
21     027062      L10025: JSR R4,CALL.B ;GO EXECUTE THE COMMAND
22     027064 104403      TRAP C$ESUB
23     027072 063737 002210 002602      ADD IC,DPB.B+12 ;MOVE TO NEXT CYLINDER
24     027072 023737 002206 002602      CMP LC,DPB.B+12 ;OUT OF CYLINDERS?
25     027100 002365      BGE T2.11 ;NO--BRANCH
26     027102 013737 002206 002602      MOV LC,DPB.B+12
27     027110      T2.21:
28     027110      T2.2:
29     027112 104402 004437 014512      TRAP C$BSUB
30     027116      L10026: JSR R4,CALL.B ;GO EXECUTE THE COMMAND
31     027116 104403      TRAP C$ESUB
32     027120 163737 002210 002602      SUB IC,DPB.B+12
33     027126 023737 002204 002602      CMP FC,DPB.B+12
34     027134 003765      BLE T2.21
35     027136      EXIT2:
36     027136      L10024: TRAP C$ETST
37     027136 104401
    
```



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53

.SBTTL TEST 3: RANDOM SEEK TEST

```

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

```

23 027140
24 027140 012737 000012 002244
25 027146 113737 002212 002601
26 027154 112737 000105 002552
27 027162 013737 002204 002602
28 027170 023737 002204 002206
29 027176 001423
33 027200 004737 011712
34 027204 013746 011774
35 027210 005046
36 027212 013746 002206
37 027216 005216
38 027220 163716 002204
39 027224 004737 011176
40 027230 062637 002602
41 027234 005726
45 027236 013737 002602 002562
46 027244 104402
47 027246 004437 014374
48 027252 104403
49 027254 104402
50 027256 113777 002550 153414
51 027264 017746 153420
52 027270 006316
53 027272 006316
  
```

```

T3::
  MOV #10.,ITCNT ;SET ITERATION COUNT
  MOVB FT,DPB.B+11 ;LOAD STARTING TRACK ADDRESS
  MOVB #SEEK,DPB.A+2 ;SEEK-COMMAND
TEST3: MOV FC,DPB.B+12 ;INITIAL CYLINDER ADDRESS
  CMP FC,LC ;CYLINDER LIMITS THE SAME ?
  BEQ T3.11 ;BR IF THEY ARE

;GENERATE A RANDOM CYLINDER
  JSR PC,RAND ;CYCLE THE RANDOM NUMBER GENERATOR
  MOV $RP1,-(SP) ;USE THE HIGH RANDOM NUMBER
  CLR -(SP) ;UPPER DIVIDEND
  MOV LC,-(SP) ;FORM THE DIVISOR
  INC (SP) ;INCREMENT
  SUB FC,(SP) ;SUBTRACT THE LOWER LIMIT
  JSR PC,$DIV ;DIVIDE
  ADD (SP)+,DPB.B+12 ;ADD THE REMAINDER TO THE INITIAL CYLINDER
  TST (SP)+ ;DISCARD THE QUOTIENT

;END OF RANDOM CYL GEN.
  MOV DPB.B+12,DPB.A+12 ;COPY NEW CYLINDER ADDRESS
T3.1: TRAP C#BSUB
T3.11: JSR R4,CALL.A ;GO EXECUTE THE COMMAND
L10030: TRAP C#ESUB
T3.2: TRAP C#BSUB
  MOVB DPB.A,$RPCS2 ;SELECT THE DRIVE
  MOV $RPLA,-(SP) ;GET THE LOOK AHEAD REGISTER
  ASL (SP) ;ALIGN THE SECTOR ADDRESS
  ASL (SP) ;ALIGN THE SECTOR ADDRESS
  
```

54	027274	000316				SWAB	(SP)		;PUT ADDRESS IN LOWER BYTE
55	027276	112637	002600			MOVB	(SP)+,DPB.B+10		;LOAD THE DPB
56	027302	013746	002274			MOV	NS1,-(SP)		;PUT LAST SECTOR ADDRESS ON THE STACK
57	027306	122637	002600			CMPB	(SP)+,DPB.B+10		;NEW SECTOR ADDRESS TOO LARGE ?
58	027312	103007				BHIS	2#		;BR IF NOT
59	027314	103403				BLO	1#		;BR IF ADDRESS IS 2 GREATER
60	027316	105037	002600			CLRB	DPB.B+10		;RESET TO SECTOR ADDRESS 0
61	027322	000403				BR	2#		;CONTINUE
62	027324	112737	000001	002600	1#:	MOVB	01,DPB.B+10		;RESET ADDRESS TO SECTOR 1
63	027332				2#:				
	027332	004437	014512			JSR	R4,CALL.B		;GO EXECUTE THE COMMAND
64	027336				L10031:				
	027336	104403				TRAP	C#ESUB		
65	027340	105237	002601			INCB	DPB.B+11		;INCREMENT THE TRACK ADDRESS
66	027344	123737	002601	002214		CMPB	DPB.B+11,LT		;MAXIMUM ?
67	027352	101703				BLOS	TEST3		;BR IF NOT
68	027354	113737	002212	002601		MOVB	FT,DPB.B+11		;RELOAD STARTING TRACK ADDRESS
69	027362	005337	002244		EXIT3:	DEC	ITCNT		;DONE ITERATIONS ?
70	027366	001275				BNE	TEST3		;BR IF NO
71	027370				L10027:				
	027370	104401				TRAP	C#ETST		



```

1      .SBTTL TEST 4: RECAL, RANDOM SEEK TEST
2
3
4      ;*****
5      ;* THIS TEST EXECUTES A RECAL COMMAND, THEN A SEEK IMPLIED IN A READ HEADER
6      ;* AND DATA COMMAND, TO A RANDOMLY SELECTED CYLINDER.
7      ;* THIS SEQUENCE IS REPEATED 10 TIMES.
8      ;* THE TRACK AD OF THE RANDOMLY SELECTED CYLINDER IS INCREMENTED BY ONE,
9      ;* STARING FROM FC, AT EACH TEST ITERATION.
10     ;* THE RANDOM CYLINDER IS GENERATED BY USING THE 'MOD' FUNCTION:
11     ;*      X MOD Y = X - (X DIV Y) * Y
12     ;* IF X,Y ARE INTEGERS WITH Y <> 0 THEN:
13     ;*      X MOD Y = REMAINDER OF X DIV Y
14     ;* THE ACTUAL OPERATION PERFORMED IS:
15     ;*      FC + $RP1 MOD (LC+1)-FC
16     ;* BY DOING:
17     ;*      CYL = FC + R
18     ;* WHERE R IS OBTAINED BY:
19     ;*      $RP1 DIV (LC+1)-FC = Q * R
20     ;* WHERE Q = QUOTIENT, R = REMAINDER, $RP1 = A RANDOM NUMBER FROM RAND CALL.
21     ;*****
22     027372      T4::
23     027372      012737      000012      002244      MOV      #10.,ITCNT      ;SET ITERATION COUNT
24     027400      113737      002212      002601      MOV      FT,DPB.B+11    ;LOAD STARTING TRACK ADDRESS
25     027406      112737      000107      002552      MOV      #RECAL,DPB.A+2 ;RECAL-COMMAND
26     027414      013737      002204      002602      TEST4:  MOV      FC,DPB.B+12 ;INITIAL CYLINDER ADDRESS
27
28     ;GENERATE A RANDOM CYLINDER
29
30     027422      004737      011712      JSR      PC,RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
31     027426      013746      011774      MOV      $RP1,-(SP)     ;USE THE HIGH RANDOM NUMBER
32     027432      005046      CLR      -(SP)          ;UPPER DIVIDEND
33     027434      013746      002206      MOV      LC,-(SP)       ;FORM THE DIVISOR
34     027440      005216      INC      (SP)           ;INCREMENT
35     027442      163716      002204      SUB      FC,(SP)        ;SUBTRACT THE LOWER LIMIT
36     027446      004737      011176      JSR      PC,$DIV        ;DIVIDE
37     027452      062637      002602      ADD      (SP)+,DPB.B+12 ;ADD THE REMAINDER TO THE INITIAL CYLINDER
38     027456      005726      TST      (SP)+          ;DISCARD THE QUOTENT
39
40     ;END OF RANDOM CYL GEN.
41     027460      T4.1:
42     027460      104402      TRAP     C#BSUB
43     027462      004437      014374      JSR      R4,CALL.A      ;GO EXECUTE THE COMMAND
44     027466      104403      L10033:
45     027470      T4.2:
46     027470      104402      TRAP     C#ESUB
47     027472      113777      002550      153200      MOV      DPB.A,$RPCS2   ;SELECT THE DRIVE
48     027500      017746      153204      MOV      $RPLA,-(SP)    ;GET THE LOOK AHEAD REGISTER
49     027504      006316      ASL      (SP)           ;ALIGN THE SECTOR ADDRESS
50     027506      006316      ASL      (SP)           ;ALIGN THE SECTOR ADDRESS
51     027510      000316      SWAB     (SP)           ;PUT ADDRESS IN LOWER BYTE
52     027512      112637      002600      1#:  MOV      (SP)+,DPB.B+10 ;LOAD THE DPB
53     027516      013746      002274      MOV      NS1,-(SP)      ;PUT LAST SECTOR ADDRESS ON THE STACK
54     027522      122637      002600      CMPB     (SP)+,DPB.B+10 ;NEW SECTOR ADDRESS TOO LARGE ?
55     027526      103007      BHIS     3#             ;BR IF NOT
56     027530      103403      BLO     2#             ;BR IF ADDRESS IS 2 GREATER
    
```

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



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47

.SBTTL TEST 5: DIFFERENTIAL SEEK TEST

```

*****
;* THIS TEST CONSISTS OF 3 SUBTESTS TO TEST THE HEAD POSITIONER AND SERVO
;* SYSTEM RESPONSE TO 3 UNIQUE DIFFERENTIAL SEEK PROFILES:
;* 1. 6 CYL DIF SEEK: FORCES A SLEW RATE CHANGE BY SEEKING FROM CYL 0 TO 5,
;* 2 TO 7, ... 624 TO 629, TO TEST THE POSITIONAL LOGIC.
;*
;* 2. 33 CYL DIF SEEK: WORST CASE SEEK OVERSHOOT TEST, FORCED BY SEEKING
;* FROM CYL 0 TO 32, 1 TO 33, 2 TO 34, ... 597 TO 629.
;*
;* 3. 400 CYL DIF SEEK: FORCES MAX ACCELERATION AND DECELERATION OF CARRIAGE
;* ASSEMBLY, FORCED BY SEEKING FROM CYL 0 TO 399, 1 TO 400, 2 TO 401, ...
;* 230 TO 629.
*****

```

```

17 027606
18 027606 113737 002220 002600
19 027614 113737 002212 002601
20 027622 113737 002222 002620
21 027630 113737 002214 002621
22
23
24
25 027636 005037 002602
26 027642 012737 000005 002622
27 027650
   027650 104402
28 027652
   027652 004437 014512
29 027656
   027656 104403
30 027660
   027660 104402
31 027662 004437 014674
32 027666
   027666 104403
33 027670 005237 002602
34 027674 005237 002622
35 027700 023737 002266 002622
36 027706 002361
37
38
39
40 027710 005037 002602
41 027714 012737 000040 002622
42 027722
   027722 104402
43 027724
   027724 004437 014512
44 027730
   027730 104403
45 027732
   027732 104402
46 027734 004437 014674
47 027740
   027740 104403

```

```

T5.:
  MOVB   FS,DPB.B+10      ;FIRST SEEK OF THE PAIR OF SEEKS READS FS, FT
  MOVB   FT,DPB.B+11
  MOVB   LS,DPB.C+10      ;SECOND SEEK OF THE PAIR OF SEEKS READS LS, LT
  MOVB   LT,DPB.C+11
;6 CYL DIFF SEEK
TEST5: CLR   DPB.B+12      ;FIRST SEEK STARTS AT 0
        MOV   #5,DPB.C+12 ;SECOND SEEK IS TO FIRST CYL + 5
T5.1:  TRAP  C#BSUB
T5.11: JSR   R4,CALL.B     ;GO EXECUTE THE COMMAND
L10036: TRAP  C#ESUB
T5.2:  TRAP  C#BSUB
        JSR   R4,CALL.C     ;GO EXECUTE THE COMMAND
L10037: TRAP  C#ESUB
        INC   DPB.B+12      ;NEXT CYL OF FIRST SEEK
        INC   DPB.C+12      ;NEXT CYL OF SECOND SEEK
        CMP   NC1,DPB.C+12  ;REACHED LAST USER CYL ON SECOND(LAST?) SEEK?
        BGE  T5.11         ;NOT YET, REPEAT ABOVE SEQ UNTIL OUT OF CYL
;33 CYL DIFF SEEK
T5.3:  CLR   DPB.B+12      ;FIRST SEEK STARTS AT 0
        MOV   #32.,DPB.C+12 ;SECOND SEEK IS TO FIRST CYL + 32.
T5.3:  TRAP  C#BSUB
T5.31: JSR   R4,CALL.B     ;GO EXECUTE THE COMMAND
L10040: TRAP  C#ESUB
T5.4:  TRAP  C#BSUB
        JSR   R4,CALL.C     ;GO EXECUTE THE COMMAND
L10041: TRAP  C#ESUB

```

```

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



```

1          .SBTTL TEST 6: OSCILLATING SEEK TEST
2
3          ;:*****
4          ;* THIS TEST PERFORMS A SERIES OF SEEK OPERATIONS TO CAUSE AN OSCILLATING
5          ;* MOVEMENT OF THE HEAD POSITIONER.
6          ;:*****
7
8 030036          T6::
9 030036 113737 002220 002600          MOVB FS,DPB.B+10          ;FS
10 030044 113737 002212 002601          MOVB FT,DPB.B+11          ;FT
11 030052 113737 002222 002620          MOVB LS,DPB.C+10          ;LS
12 030060 113737 002214 002621          MOVB LT,DPB.C+11          ;LT
13 030066 013737 002204 002602          TEST6: MOV FC,DPB.B+12          ;FC
14 030074 013737 002206 002622          MOV LC,DPB.C+12          ;LC
15 030102          T6.1:
16 030102 104402          TRAP C#BSUB
17 030104 004437 014512          T6.11: JSR R4,CALL.B          ;GO EXECUTE THE COMMAND
18 030110 104403          L10045: TRAP C#ESUB
19 030112 104402          T6.2: TRAP C#BSUB
20 030114 004437 014674          JSR R4,CALL.C          ;GO EXECUTE THE COMMAND
21 030120 104403          L10046: TRAP C#ESUB
22 030122 005237 002602          INC DPB.B+12
23 030126 005337 002622          DEC DPB.C+12
24 030132 023737 002622 002204          CMP DPB.C+12,FC          ;UNTIL
25 030140 002361          BGE T6.11
26 030142          EXIT6:
27 030142 104401          L10044: TRAP C#ETST

```

```

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23 030144
24 030144 005737 002260
25 030150 003002
26 030152 104432
   030154 001044
27 030156 004437 015612
28 030162 000402
29 030164 000137 031172
30
31 030170 005005
32 030172 012703 002442
33 030176 012701 000012
34 030202 004737 015742
35 030206 004737 012364
36
37 030212 012746 000300
   030216 012746 031032
   030222 013746 012230
   030226 012746 000003
   030232 104437
   030234 062706 000010
38
39 030240 012746 000000
   030244 012746 015740
   030250 013746 002654
   030254 012746 000003
   030260 104437
   030262 062706 000010
40 030266 013777 002204 152430
41 030274 013746 002220
42 030300 113766 002212 000001
43 030306 012677 152364
44 030312
   030312 104402
45 030314 005077 161704

```

.SBTTL TIMING TESTS

```

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

```

.SBTTL TEST 7: ROTATIONAL SPEED TIMING TEST

```

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

```

```

T7::
      TST      CLKSTA      ;KW11-P CLOCK?
      BGT      1$          ;YES--START TEST
      TRAP     C$EXIT
      .WORD    L10047-
1$:   JSR      R4,SRCH00   ;DO A MASSBUS INIT & RECAL
      BR       2$          ;RETURN HERE IF NO ERROR
      JMP      EXIT7       ;RETURN HERE IF ERROR

2$:   CLR      R5          ;COUNT UP
      MOV      @T7A,R3     ;TIMING LIMITS
TEST7: MOV      @10.,R1     ;TIME 10 SEARCHES
      JSR      PC,STRIMR   ;INITIALIZE THE TIMERS
      JSR      PC,STOPCK   ;STOP THE CLOCK
                               ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
      MOV      @PRI06,-(SP)
      MOV      @T7.7$,-(SP)
      MOV      PKV,-(SP)
      MOV      @3,-(SP)
      TRAP     C$SVEC
      ADD      @10,SP
                               ;SETUP RHXX/RP07 VECTOR
      MOV      @PRI00,-(SP)
      MOV      @DORTI,-(SP)
      MOV      RPVEC,-(SP)
      MOV      @3,-(SP)
      TRAP     C$SVEC
      ADD      @10,SP
      MOV      FC,@RPDC    ;FC
      MOV      FS,-(SP)    ;FS
      MOV      FT,1(SP)    ;FT
      MOV      (SP)+,@RPDA ;LOAD FT/FS

T7.1: TRAP     C$BSUB
T7.1$: CLR      @PKB      ;START COUNTING AT ZERO

```



```

46 030320 012777 000131 161674      MOV      #131,@PKCS      ;INT.EN., COUNT UP AT 100KHZ
47 030326 012777 000131 152334      MOV      #SEARCH,@RPCS1 ;START A SEARCH
48 030334 000001                WAIT                    ;WAIT ON INTERRUPT
49 030336 017746 161664                MOV      @PKC,-(SP)     ;SAVE THE CLOCK
50 030342 042777 000101 161652      BIC      #101,@PKCS     ;STOP THE CLOCK
51 030350 012677 161650                MOV      (SP)+,@PKB     ;AND RESTORE THE COUNTED VALUE
52 030354 032777 040000 152320      BIT      @BIT14,@RPDS   ;ERROR?
53 030362 001516                BEQ      T7.2$         ;NO--BRANCH
54 030364 004737 010750                JSR      PC,SAVREG      ;SAVE R0-R5
   030370 012702 002630                MOV      @DTADPB,R2    ;DPB POINTER
   030374 004737 024644                JSR      PC,SVRHXX     ;SAVE ALL THE RHXX/RP07 REGISTERS
   030400 012777 000040 152272      MOV      @CLR,@RPCS2   ;MASSBUS CLEAR
   030406 013777 002630 152264      MOV      DTADPB,@RPCS2 ;SELECT DRIVE
   030414 004737 011002                JSR      PC,RESREG     ;RESTORE R0-R5
55 030420 004537 012766                JSR      R5,ERRANY
56 030424 002630                DTADPB                    ;FIND OUT WHAT ERROR
57 030426                L10050:
   030426 104403                TRAP     C$ESUB
58 030430 032737 000210 002264      BIT      @BIT3!BIT7,SVSTAT ;RETRY ALLOWED ?
59 030436 001022                BNE      T7.44$       ;BRANCH IS SO
60 030440                T7.10$:
   030440 012746 004511                MOV      @SEAERR,-(SP)
   030444 012746 000001                MOV      #1,-(SP)
   030450 010600                MOV      SP,R0
   030452 104417                TRAP     C$PNTF
   030454 062706 000004                ADD      #4,SP
61 030460 012746 004614                MOV      @ABOTST,-(SP)
   030464 012746 000001                MOV      #1,-(SP)
   030470 010600                MOV      SP,R0
   030472 104417                TRAP     C$PNTF
   030474 062706 000004                ADD      #4,SP
62 030500 000137 031136                JMP      T7.8$
63
64 030504 012737 000020 002350      T7.44$: MOV      #16.,WCEFLG   ;RETRY 16 TIMES
65 030512 012777 000131 152150      1$:    MOV      #SEARCH,@RPCS1
66 030520 000001                WAIT                    ;WAIT FOR INTERRUPT
67 030522 032777 040000 152152      BIT      @BIT14,@RPDS   ;ANY ERROR ?
68 030530 001433                BEQ      T7.2$         ;EXIT IF NONE
69 030532 012777 000040 152140      MOV      @CLR,@RPCS2   ;MASSBUS CLEAR
70 030540 013777 002630 152132      MOV      DTADPB,@RPCS2 ;DRIVE ADDRESS
71 030546 005337 002350                DEC      WCEFLG        ;OVER RETRY LIMIT ?
72 030552 001357                BNE      1$           ;BRANCH IF NOT
73 030554                T7.20$:
   030554 012746 004550                MOV      @SEABAD,-(SP)
   030560 012746 000001                MOV      #1,-(SP)
   030564 010600                MOV      SP,R0
   030566 104417                TRAP     C$PNTF
   030570 062706 000004                ADD      #4,SP
74 030574 012746 004614                MOV      @ABOTST,-(SP)
   030600 012746 000001                MOV      #1,-(SP)
   030604 010600                MOV      SP,R0
   030606 104417                TRAP     C$PNTF
   030610 062706 000004                ADD      #4,SP
75 030614 000550                BR       T7.8$         ;EXIT
76 030616                T7.2:
   030616 104402                TRAP     C$BSUB
77 030620 005077 161400                T7.2$: CLR      @PKB      ;START THE COUNT AT ZERO

```

```

78 030624 012777 000131 152036      MOV      #SEARCH,@RPCS1 ;START A SEARCH
79 030632 012777 000131 161362      MOV      #131,@PKCS    ;START THE CLOCK
80 030640 000001                WAIT                    ;WAIT ON INTERRUPT
81 030642 017746 161360                MOV      @PKC,-(SP)    ;SAVE THE CLOCK
82 030646 042777 000101 161346      BIC      #101,@PKCS   ;STOP THE CLOCK
83 030654 012677 161344                MOV      (SP)+,@PKB   ;AND RESTORE THE COUNTED VALUE
84 030660 032777 040000 152014      BIT      @BIT14,@RPDS ;IS "ERR=1"?
85 030666 001453                BEQ      T7.3#        ;NO--BRANCH
86 030670 004737 010750                JSR      PC,SAVREG    ;;SAVE R0-R5
    030674 012702 002630                MOV      @DTADPB,R2  ;DPB POINTER
    030700 004737 024644                JSR      PC,SVRHXX   ;SAVE ALL THE RHXX/RP07 REGISTERS
    030704 012777 000040 151766      MOV      @CLR,@RPCS2 ;MASSBUS CLEAR
    030712 013777 002630 151760      MOV      DTADPB,@RPCS2 ;SELECT DRIVE
    030720 004737 011002                JSR      PC,RESREG   ;;RESTORE R0-R5
87 030724 004537 012766                JSR      R5,ERRANY  ;FIND OUT WHAT ERROR
88 030730 002630                DTADPB
89 030732                L10051:
    030732 104403                TRAP     C#ESUB
90 030734 032737 000210 002264      BIT      @BIT3!BIT7,SVSTAT ;RETRY ALLOWED ?
91 030742 001636                BEQ      T7.10#      ;BRANCH IF NOT, ABORT TEST
92 030744 012737 000020 002350      MOV      #16.,WCEFLG ;RETRY 16 TIMES
93 030752 012777 000131 151710 1# : MOV      #SEARCH,@RPCS1 ;START TO SEARCH
94 030760 000001                WAIT
95 030762 032777 040000 151712      BIT      @BIT14,@RPDS ;ANY ERROR
96 030770 001412                BEQ      T7.3#        ;BRANCH IF NONE
97 030772 012777 000040 151700      MOV      @CLR,@RPCS2 ;MASS BUS CLEAR
98 031000 013777 002630 151672      MOV      DTADPB,@RPCS2 ;LOAD THE DRIVE ADDRESS
99 031006 005337 002350                DEC      WCEFLG      ;DECREMENT THE RETRY COUNT
100 031012 001357                BNE     1#           ;BRANCH IF NOT OVER THE LIMIT
101 031014 000657                BR      T7.20#      ;EXIT
102
103 031016 004737 016212  T7.3# : JSR      PC,COUNT   ;UPDATE THE COUNT
104 031022 005301                DEC     R1           ;DONE?
105 031024 003444                BLE    T7.8#       ;YES--GO TO THE EXIT
106 031026 000137 030314                JMP    T7.1#       ;NO, LOOP
107
108 031032 004737 012426  T7.7# : JSR      PC,FORSEC  ;RESET TIMER TO 4 SEC. CHANGE CLK SERVICE AD
109                                ;DROP THE PRIORITY
110 031036 012700 000000                MOV     @PRI00,R0
    031042 104441                TRAP    C#SPRI
111 031044 004737 010750                JSR     PC,SAVREG    ;;SAVE R0-R5
    031050 012702 002630                MOV     @DTADPB,R2  ;DPB POINTER
    031054 004737 024644                JSR     PC,SVRHXX   ;SAVE ALL THE RHXX/RP07 REGISTERS
    031060 012777 000040 151612      MOV     @CLR,@RPCS2 ;MASSBUS CLEAR
    031066 013777 002630 151604      MOV     DTADPB,@RPCS2 ;SELECT DRIVE
    031074 016102 000014                MOV     14(R1),R2  ;ADDRESS OF SAVED REGISTER TABLE
    031100 016237 000036 002276      MOV     36(R2),CYL.RD ;GET CURRENT CYLINDER
    031106 116237 000006 002302      MOV     6(R2),SEC.RD ;GET CURRENT SECTOR
    031114 116237 000007 002300      MOV     7(R2),TRK.RD ;GET CURRENT TRACK
    031122 004737 011002                JSR     PC,RESREG   ;;RESTORE R0-R5
112 031126 104456                TRAP    C#ERHRD
    031130 000024                .WORD  20
    031132 006201                .WORD  EM20
    031134 007672                .WORD  DH44
113 031136                T7.8# :
    031136 012777 000040 151534      MOV     @CLR,@RPCS2 ;CLEAR THE MASSBUS
    031144 013777 002630 151526      MOV     DTADPB,@RPCS2 ;& SELECT DRIVE
    
```



114	031152	004737	012000		JSR	PC,ST,CLK		;INITIALIZE THE CLOCK
115	031156	004437	016504		JSR	R4,TYPTIM		;GO TYPE THE TIMES
	031162	002442			T7A			;POINTER
116	031164	004437	016354		JSR	R4,SPTYP		;TYPE THE SPECIFICATION VALUE
117	031170	002512			SP7			
118	031172			EXIT7:				;SETUP RHXX/RP07 VECTOR
119	031172	013746	002656		MOV	RPVEC+2,-(SP)		
	031176	012746	023046		MOV	#ISRV,-(SP)		
	031202	013746	002654		MOV	RPVEC,-(SP)		
	031206	012746	000003		MOV	#3,-(SP)		
	031212	104437			TRAP	C#SVEC		
	031214	062706	000010		ADD	#10,SP		
120	031220			L10047:				
	031220	104401			TRAP	C#ETST		

```

1          .SBTTL TEST 8: ONE CYLINDER SEEK TIMING TEST
2
3          ;;*****
4          ;* THIS TEST WILL COMMAND FORWARD SEEK CYCLES TO ADVANCE THE
5          ;* CYLINDER BY ONE FROM FC UNTIL THE INCREMENT IS GREATER THAN THE
6          ;* CYLINDER 'LC', THEN REVERSE SEEK TO CYLINDER 'FC', DO IT TWICE.
7          ;* THE TIME TO PERFORM EACH SEEK IS CHECKED TO ENSURE IT DOES NOT
8          ;* EXCEED THE MAXIMUM TIME PERMITTED FOR A ONE CYLINDER SEEK.
9          ;* THE TIME MUST BE LESS THAN 4MS.
10         ;;*****
11
12         031222          T8::
13         031222 005737 002260          TST      CLKSTA          ;KW11-P CLOCK?
14         031226 003002          BGT      1#          ;YES--START TEST
15         031230 104432          TRAP    C#EXIT
16         031234 004437 015612          .WORD   L10052-.
17         031240 000402          1#:    JSR      R4,SRCH00          ;DO A MASSBUS INIT. AND RECAL
18         031242 104432          BR      2#          ;NO ERROR RETURN
19         031244 000744          TRAP    C#EXIT
20         031246 012703 002452          .WORD   L10052-.
21         031252 005037 002256          2#:    MOV      #TIMT10,R3          ;PARAMETER POINTER
22         031256 013737 002204 002642  TEST8:  CLR      DOTWO          ;SET-UP FOR TWO ITERATIONS
23         031264 005737 002204          MOV      FC,DTADPB+12          ;START WITH BEGINNING CYLINDER
24         031270 001407          TST     FC          ;IF FC <> 0
25         031272 012737 000105 002632  BEQ     T8.5#          ;ELSE SKIP
26         031300          MOV      #SEEK,DTADPB+2          ;THEN SEEK TO FC BEFORE TIMING PORTION OF TEST
27         031302 104402          T8.1:  TRAP    C#BSUB
28         031306 004437 015056          JSR     R4,DRVCAL          ;SEEK TO FC
29         031310 005005          L10053: TRAP    C#ESUB
30         031312 004737 015742          T8.5#: CLR      R5          ;SET THE UP/DOWN SWITCH TO UP
31         031316 004737 012364          JSR     PC,STRMTR          ;INITIALIZE THE TIMERS
32         031322 012746 000300          JSR     PC,STOPCK          ;STOP THE CLOCK
33         031326 012746 032022          MOV     #PRI06,-(SP)          ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
34         031332 013746 012230          MOV     #T8.7#,-(SP)
35         031336 012746 000003          MOV     PKV,-(SP)
36         031342 104437          MOV     #3,-(SP)
37         031344 062706 000010          TRAP   C#SVEC
38         031350 012746 000000          ADD    #10,SP          ;SETUP RHXX/RP07 VECTOR
39         031354 012746 015740          MOV     #PRI00,-(SP)
40         031360 013746 002654          MOV     #DORTI,-(SP)
41         031364 012746 000003          MOV     RPVEC,-(SP)
42         031370 104437          MOV     #3,-(SP)
43         031372 062706 000010          TRAP   C#SVEC
44         031376 005237 002642          ADD    #10,SP
45         031402 023737 002642 002206          ;SEEK FORWARD: FC --> LC
46         031410 003063          T8.1#: INC     DTADPB+12          ;MOVE TO NEXT CYLINDER UP
47         031412 104402          CMP     DTADPB+12,LC          ;OUT OF CYLINDERS?
48         031414 005077 160604          BGT     T8.3#          ;YES, GO SEEK REVERSE
49         031416          T8.2:  TRAP    C#BSUB
50         031418          CLR     @PKB          ;START THE COUNTER AT ZERO
51         031420          ;*****
52         031422          ;*****
53         031424          ;*****
54         031426          ;*****
55         031428          ;*****
56         031430          ;*****
57         031432          ;*****
58         031434          ;*****
59         031436          ;*****
60         031438          ;*****
61         031440          ;*****
62         031442          ;*****
63         031444          ;*****
64         031446          ;*****
65         031448          ;*****
66         031450          ;*****
67         031452          ;*****
68         031454          ;*****
69         031456          ;*****
70         031458          ;*****
71         031460          ;*****
72         031462          ;*****
73         031464          ;*****
74         031466          ;*****
75         031468          ;*****
76         031470          ;*****
77         031472          ;*****
78         031474          ;*****
79         031476          ;*****
80         031478          ;*****
81         031480          ;*****
82         031482          ;*****
83         031484          ;*****
84         031486          ;*****
85         031488          ;*****
86         031490          ;*****
87         031492          ;*****
88         031494          ;*****
89         031496          ;*****
90         031498          ;*****
91         031500          ;*****
92         031502          ;*****
93         031504          ;*****
94         031506          ;*****
95         031508          ;*****
96         031510          ;*****
97         031512          ;*****
98         031514          ;*****
99         031516          ;*****
100        031518          ;*****
101        031520          ;*****
102        031522          ;*****
103        031524          ;*****
104        031526          ;*****
105        031528          ;*****
106        031530          ;*****
107        031532          ;*****
108        031534          ;*****
109        031536          ;*****
110        031538          ;*****
111        031540          ;*****
112        031542          ;*****
113        031544          ;*****
114        031546          ;*****
115        031548          ;*****
116        031550          ;*****
117        031552          ;*****
118        031554          ;*****
119        031556          ;*****
120        031558          ;*****
121        031560          ;*****
122        031562          ;*****
123        031564          ;*****
124        031566          ;*****
125        031568          ;*****
126        031570          ;*****
127        031572          ;*****
128        031574          ;*****
129        031576          ;*****
130        031578          ;*****
131        031580          ;*****
132        031582          ;*****
133        031584          ;*****
134        031586          ;*****
135        031588          ;*****
136        031590          ;*****
137        031592          ;*****
138        031594          ;*****
139        031596          ;*****
140        031598          ;*****
141        031600          ;*****
142        031602          ;*****
143        031604          ;*****
144        031606          ;*****
145        031608          ;*****
146        031610          ;*****
147        031612          ;*****
148        031614          ;*****
149        031616          ;*****
150        031618          ;*****
151        031620          ;*****
152        031622          ;*****
153        031624          ;*****
154        031626          ;*****
155        031628          ;*****
156        031630          ;*****
157        031632          ;*****
158        031634          ;*****
159        031636          ;*****
160        031638          ;*****
161        031640          ;*****
162        031642          ;*****
163        031644          ;*****
164        031646          ;*****
165        031648          ;*****
166        031650          ;*****
167        031652          ;*****
168        031654          ;*****
169        031656          ;*****
170        031658          ;*****
171        031660          ;*****
172        031662          ;*****
173        031664          ;*****
174        031666          ;*****
175        031668          ;*****
176        031670          ;*****
177        031672          ;*****
178        031674          ;*****
179        031676          ;*****
180        031678          ;*****
181        031680          ;*****
182        031682          ;*****
183        031684          ;*****
184        031686          ;*****
185        031688          ;*****
186        031690          ;*****
187        031692          ;*****
188        031694          ;*****
189        031696          ;*****
190        031698          ;*****
191        031700          ;*****
192        031702          ;*****
193        031704          ;*****
194        031706          ;*****
195        031708          ;*****
196        031710          ;*****
197        031712          ;*****
198        031714          ;*****
199        031716          ;*****
200        031718          ;*****
201        031720          ;*****
202        031722          ;*****
203        031724          ;*****
204        031726          ;*****
205        031728          ;*****
206        031730          ;*****
207        031732          ;*****
208        031734          ;*****
209        031736          ;*****
210        031738          ;*****
211        031740          ;*****
212        031742          ;*****
213        031744          ;*****
214        031746          ;*****
215        031748          ;*****
216        031750          ;*****
217        031752          ;*****
218        031754          ;*****
219        031756          ;*****
220        031758          ;*****
221        031760          ;*****
222        031762          ;*****
223        031764          ;*****
224        031766          ;*****
225        031768          ;*****
226        031770          ;*****
227        031772          ;*****
228        031774          ;*****
229        031776          ;*****
230        031778          ;*****
231        031780          ;*****
232        031782          ;*****
233        031784          ;*****
234        031786          ;*****
235        031788          ;*****
236        031790          ;*****
237        031792          ;*****
238        031794          ;*****
239        031796          ;*****
240        031798          ;*****
241        031800          ;*****
242        031802          ;*****
243        031804          ;*****
244        031806          ;*****
245        031808          ;*****
246        031810          ;*****
247        031812          ;*****
248        031814          ;*****
249        031816          ;*****
250        031818          ;*****
251        031820          ;*****
252        031822          ;*****
253        031824          ;*****
254        031826          ;*****
255        031828          ;*****
256        031830          ;*****
257        031832          ;*****
258        031834          ;*****
259        031836          ;*****
260        031838          ;*****
261        031840          ;*****
262        031842          ;*****
263        031844          ;*****
264        031846          ;*****
265        031848          ;*****
266        031850          ;*****
267        031852          ;*****
268        031854          ;*****
269        031856          ;*****
270        031858          ;*****
271        031860          ;*****
272        031862          ;*****
273        031864          ;*****
274        031866          ;*****
275        031868          ;*****
276        031870          ;*****
277        031872          ;*****
278        031874          ;*****
279        031876          ;*****
280        031878          ;*****
281        031880          ;*****
282        031882          ;*****
283        031884          ;*****
284        031886          ;*****
285        031888          ;*****
286        031890          ;*****
287        031892          ;*****
288        031894          ;*****
289        031896          ;*****
290        031898          ;*****
291        031900          ;*****
292        031902          ;*****
293        031904          ;*****
294        031906          ;*****
295        031908          ;*****
296        031910          ;*****
297        031912          ;*****
298        031914          ;*****
299        031916          ;*****
300        031918          ;*****
301        031920          ;*****
302        031922          ;*****
303        031924          ;*****
304        031926          ;*****
305        031928          ;*****
306        031930          ;*****
307        031932          ;*****
308        031934          ;*****
309        031936          ;*****
310        031938          ;*****
311        031940          ;*****
312        031942          ;*****
313        031944          ;*****
314        031946          ;*****
315        031948          ;*****
316        031950          ;*****
317        031952          ;*****
318        031954          ;*****
319        031956          ;*****
320        031958          ;*****
321        031960          ;*****
322        031962          ;*****
323        031964          ;*****
324        031966          ;*****
325        031968          ;*****
326        031970          ;*****
327        031972          ;*****
328        031974          ;*****
329        031976          ;*****
330        031978          ;*****
331        031980          ;*****
332        031982          ;*****
333        031984          ;*****
334        031986          ;*****
335        031988          ;*****
336        031990          ;*****
337        031992          ;*****
338        031994          ;*****
339        031996          ;*****
340        031998          ;*****
341        032000          ;*****
342        032002          ;*****
343        032004          ;*****
344        032006          ;*****
345        032008          ;*****
346        032010          ;*****
347        032012          ;*****
348        032014          ;*****
349        032016          ;*****
350        032018          ;*****
351        032020          ;*****
352        032022          ;*****
353        032024          ;*****
354        032026          ;*****
355        032028          ;*****
356        032030          ;*****
357        032032          ;*****
358        032034          ;*****
359        032036          ;*****
360        032038          ;*****
361        032040          ;*****
362        032042          ;*****
363        032044          ;*****
364        032046          ;*****
365        032048          ;*****
366        032050          ;*****
367        032052          ;*****
368        032054          ;*****
369        032056          ;*****
370        032058          ;*****
371        032060          ;*****
372        032062          ;*****
373        032064          ;*****
374        032066          ;*****
375        032068          ;*****
376        032070          ;*****
377        032072          ;*****
378        032074          ;*****
379        032076          ;*****
380        032078          ;*****
381        032080          ;*****
382        032082          ;*****
383        032084          ;*****
384        032086          ;*****
385        032088          ;*****
386        032090          ;*****
387        032092          ;*****
388        032094          ;*****
389        032096          ;*****
390        032098          ;*****
391        032100          ;*****
392        032102          ;*****
393        032104          ;*****
394        032106          ;*****
395        032108          ;*****
396        032110          ;*****
397        032112          ;*****
398        032114          ;*****
399        032116          ;*****
400        032118          ;*****
401        032120          ;*****
402        032122          ;*****
403        032124          ;*****
404        032126          ;*****
405        032128          ;*****
406        032130          ;*****
407        032132          ;*****
408        032134          ;*****
409        032136          ;*****
410        032138          ;*****
411        032140          ;*****
412        032142          ;*****
413        032144          ;*****
414        032146          ;*****
415        032148          ;*****
416        032150          ;*****
417        032152          ;*****
418        032154          ;*****
419        032156          ;*****
420        032158          ;*****
421        032160          ;*****
422        032162          ;*****
423        032164          ;*****
424        032166          ;*****
425        032168          ;*****
426        032170          ;*****
427        032172          ;*****
428        032174          ;*****
429        032176          ;*****
430        032178          ;*****
431        032180          ;*****
432        032182          ;*****
433        032184          ;*****
434        032186          ;*****
435        032188          ;*****
436        032190          ;*****
437        032192          ;*****
438        032194          ;*****
439        032196          ;*****
440        032198          ;*****
441        032200          ;*****
442        032202          ;*****
443        032204          ;*****
444        032206          ;*****
445        032208          ;*****
446        032210          ;*****
447        032212          ;*****
448        032214          ;*****
449        032216          ;*****
450        032218          ;*****
451        032220          ;*****
452        032222          ;*****
453        032224          ;*****
454        032226          ;*****
455        032228          ;*****
456        032230          ;*****
457        032232          ;*****
458        032234          ;*****
459        032236          ;*****
460        032238          ;*****
461        032240          ;*****
462        032242          ;*****
463        032244          ;*****
464        032246          ;*****
465        032248          ;*****
466        032250          ;*****
467        032252          ;*****
468        032254          ;*****
469        032256          ;*****
470        032258          ;*****
471        032260          ;*****
472        032262          ;*****
473        032264          ;*****
474        032266          ;*****
475        032268          ;*****
476        032270          ;*****
477        032272          ;*****
478        032274          ;*****
479        032276          ;*****
480        032278          ;*****
481        032280          ;*****
482        032282          ;*****
483        032284          ;*****
484        032286          ;*****
485        032288          ;*****
486        032290          ;*****
487        032292          ;*****
488        032294          ;*****
489        032296          ;*****
490        032298          ;*****
491        032300          ;*****
492        032302          ;*****
493        032304          ;*****
494        032306          ;*****
495        032308          ;*****
496        032310          ;*****
497        032312          ;*****
498        032314          ;*****
499        032316          ;*****
500        032318          ;*****
501        032320          ;*****
502        032322          ;*****
503        032324          ;*****
504        032326          ;*****
505        032328          ;*****
506        032330          ;*****
507        032332          ;*****
508        032334          ;*****
509        032336          ;*****
510        032338          ;*****
511        032340          ;*****
512        032342          ;*****
513        032344          ;*****
514        032346          ;*****
515        032348          ;*****
516        032350          ;*****
517        032352          ;*****
518        032354          ;*****
519        032356          ;*****
520        032358          ;*****
521        032360          ;*****
522        032362          ;*****
523        032364          ;*****
524        032366          ;*****
525        032368          ;*****
526        032370          ;*****
527        032372          ;*****
528        032374          ;*****
529        032376          ;*****
530        032378          ;*****
531        032380          ;*****
532        032382          ;*****
533        032384          ;*****
534        032386          ;*****
535        032388          ;*****
536        032390          ;*****
537        032392          ;*****
538        032394          ;*****
539        032396          ;*****
540        032398          ;*****
541        032400          ;*****
542        032402          ;*****
543        032404          ;*****
544        032406          ;*****
545        032408          ;*****
546        032410          ;*****
547        032412          ;*****
548        032414          ;*****
549        032416          ;*****
550        032418          ;*****
551        032420          ;*****
552        032422          ;*****
553        032424          ;*****
554        032426          ;*****
555        032428          ;*****
556        032430          ;*****
557        032432          ;*****
558        032434          ;*****
559        032436          ;*****
560        032438          ;*****
561        032440          ;*****
562        032442          ;*****
563        032444          ;*****
564        032446          ;*****
565        032448          ;*****
566        032450          ;*****
567        032452          ;*****
568        032454          ;*****
569        032456          ;*****
570        032458          ;*****
571        032460          ;*****
572        032462          ;*****
573        032464          ;*****
574        032466          ;*****
575        032468          ;*****
576        032470          ;*****
577        032472          ;*****
578        032474          ;*****
579        032476          ;*****
580        032478          ;*****
581        032480          ;*****
582        032482          ;*****
583        032484          ;*****
584        032486          ;*****
585        032488          ;*****
586        032490          ;*****
587        032492          ;*****
588        032494          ;*****
589        032496          ;*****
590        032498          ;*****
591        032500          ;*****
592        032502          ;*****
593        032504          ;*****
594        032506          ;*****
595        032508          ;*****
596        032510          ;*****
597        032512          ;*****
598        032514          ;*****
599        032516          ;*****
600        032518          ;*****
601        032520          ;*****
602        032522          ;*****
603        032524          ;*****
604        032526          ;*****
605        032528          ;*****
606        032530          ;*****
607        032532          ;*****
608        032534          ;*****
609        032536          ;*****
610        032538          ;*****
611        032540          ;*****
612        032542          ;*****
613        032544          ;*****
614        032546          ;*****
615        032548          ;*****
616        032550          ;*****
617        032552          ;*****
618        032554          ;*****
619        032556          ;*****
620        032558          ;*****
621        032560          ;*****
622        032562          ;*****
623        032564          ;*****
624        032566          ;*****
625        032568          ;*****
626        032570          ;*****
627        032572          ;*****
628        032574          ;*****
629        032576          ;*****
630        032578          ;*****
631        032580          ;*****
632        032582          ;*****
633        032584          ;*****
634        032586          ;*****
635        032588          ;*****
636        032590          ;*****
637        032592          ;*****
638        032594          ;*****
639        032596          ;*****
640        032598          ;*****
641        032600          ;*****
642        032602          ;*****
643        032604          ;*****
644        032606          ;*****
645        032608          ;*****
646        032610          ;*****
647        032612          ;*****
648        032614          ;*****
649        032616          ;*****
650        032618          ;*****
651        032620          ;*****
652        032622          ;*****
653        032624          ;*****
654        032626          ;*****
655        032628          ;*****
656        032630          ;*****
657        032632          ;*****
658        032634          ;*****
659        032636          ;*****
660        032638          ;*****
661        032640          ;*****
662        032642          ;*****
663        032644          ;*****
664        032646          ;*****
665        032648          ;*****
666        032650          ;*****
667        032652          ;*****
668        032654          ;*****
669        032656          ;*****
670        032658          ;*****
671        032660          ;*****
672        032662          ;*****
673        032664          ;*****
674        032666          ;*****
675        032668          ;*****
676        032670          ;*****
677        032672          ;*****
678        032674          ;*****
679        032676          ;*****
680        032678          ;*****
681        032680          ;*****
682        032682          ;*****
683        032684          ;*****
684        032686          ;*****
685        032688          ;*****
686        032690          ;*****
687        032692          ;*****
688        032694          ;*****
689        032696          ;*****
690        032698          ;*****
691        032700          ;*****
692        032702          ;*****
693        032704          ;*****
694        032706          ;*****
695        032708          ;*****
696        032710          ;*****
697        032712          ;*****
698        032714          ;*****
699        032716          ;*****
700        032718          ;*****
701        032720          ;*****
702        032722          ;*****
703        032724          ;*****
704        032726          ;*****
705        032728          ;*****
706        032730          ;*****
707        032732          ;*****
708        032734          ;*****
709        032736          ;*****
710        032738          ;*****
711        032740          ;*****
712        032742          ;*****
713        032744          ;*****
714        032746          ;*****
715        032748          ;*****
716        032750          ;*****
717        032752          ;*****
718        032754          ;*****
719        032756          ;*****
720        032758          ;*****
721        032760          ;*****
722        032762          ;*****
723        032764          ;*****
724        032766          ;*****
725        032768          ;*****
726        032770          ;*****
727        032772          ;*****
728        032774          ;*****
729        032776          ;*****
730        032778          ;*****
731        032780          ;*****
732        032782          ;*****
733        032784          ;*****
734        032786          ;*****
735        032788          ;*****
736        032790          ;*****
737        032792          ;*****
738        032794          ;*****
739        032796          ;*****
740        032798          ;*****
741        032800          ;*****
742        032802          ;*****
743        032804          ;*****
744        032806          ;*****
745        032808          ;*****
746        032810          ;*****
747        032812          ;*****
748        032814          ;*****
749        032816          ;*****
750        032818          ;*****
751        032820          ;*****
752        032822          ;*****
753        032824          ;*****
754        032826          ;*****
755        032828          ;*****
756        032830          ;*****
757        032832          ;*****
758        032834          ;*****
759        032836          ;*****
760        032838          ;*****
761        032840         
```



```

43 031420 013777 002642 151276      MOV      DTADPB+12,@RPDC ;LOAD DESIRED CYLINDER
44 031426 012777 000105 151234      MOV      @SEEK,@RPCS1  ;START A SEEK
45 031434 012777 000131 160560      MOV      @131,@PKCS   ;START THE CLOCK
46 031442 000001                WAIT                ;WAIT ON INTERRUPT
47 031444 017746 160556                MOV      @PKC,-(SP)   ;GET THE CURRENT COUNT
48 031450 042777 000101 160544      BIC      @101,@PKCS   ;STOP THE CLOCK
49 031456 012677 160542                MOV      (SP)+,@PKB   ;AND RESTORE THE VALUE
50 031462 032777 040000 151212      BIT      @BIT14,@RPDS ;ANY DISK ERRORS?
51 031470 001426                BEQ      T8.2$        ;NO--BRANCH
52 031472 004737 010750                JSR      PC,SAVREG    ;;SAVE R0-R5
   031476 012702 002630                MOV      @DTADPB,R2  ;DPB POINTER
   031502 004737 024644                JSR      PC,SVRHXX   ;SAVE ALL THE RHXX/RP07 REGISTERS
   031506 012777 000040 151164      MOV      @CLR,@RPCS2 ;MASSBUS CLEAR
   031514 013777 002630 151156      MOV      DTADPB,@RPCS2 ;SELECT DRIVE
   031522 004737 011002                JSR      PC,RESREG   ;;RESTORE R0-R5
53 031526 004537 012766                JSR      R5,ERRANY   ;FIND OUT WHAT ERROR
54 031532 002630                DTADPB
55 031534                L10054:
   031534 104403                TRAP     C#ESUB
56 031536 032737 000040 002264      BIT      @BIT5,SVSTAT ;POSITION ERROR?
57 031544 001075                BNE      T8.9$        ;YES, ABORT TEST
58 031546 004737 016212      T8.2$: JSR      PC,COUNT    ;COUNT THIS SEEKS TIME
59 031552 004737 012552                JSR      PC,TWOMS    ;STALL TWO MILLISECONDS
60 031556 000707                BR       T8.1$        ;LOOP, SEEK FORWARD
61 031560 005337 002642      T8.3$: DEC      DTADPB+12 ;MOVE TO NEXT CYLINDER DOWN
62 031564 012705 177777                MOV      @-1,R5      ;SET UP/DOWN SWITCH TO DOWN
63
64
65                ;SEEK REVERSE: FC <-- LC
66 031570 005337 002642      T8.4$: DEC      DTADPB+12 ;MOVE TO NEXT CYLINDER DOWN
67 031574 023737 002642 002204      CMP      DTADPB+12,FC ;OUT OF CYLINDERS?
68 031602 002474                BLT      T8.6$        ;YES, EXIT LOOP
69 031604                T8.3:
   031604 104402                TRAP     C#BSUB
70 031606 005077 160412                CLR      @PKB        ;START THE COUNTER AT ZERO
71 031612 013777 002642 151104      MOV      DTADPB+12,@RPDC ;LOAD DESIRED CYLINDER
72 031620 012777 000105 151042      MOV      @SEEK,@RPCS1  ;START A SEEK
73 031626 012777 000131 160366      MOV      @131,@PKCS   ;START THE CLOCK
74 031634 000001                WAIT                ;WAIT ON INTERRUPT
75 031636 017746 160364                MOV      @PKC,-(SP)   ;GET THE CURRENT COUNT
76 031642 042777 000101 160352      BIC      @101,@PKCS   ;STOP THE CLOCK
77 031650 012677 160350                MOV      (SP)+,@PKB   ;AND RESTORE THE VALUE
78 031654 032777 040000 151020      BIT      @BIT14,@RPDS ;ANY DISK ERRORS?
79 031662 001437                BEQ      T8.10$       ;NO--BRANCH
80 031664 004737 010750                JSR      PC,SAVREG    ;;SAVE R0-R5
   031670 012702 002630                MOV      @DTADPB,R2  ;DPB POINTER
   031674 004737 024644                JSR      PC,SVRHXX   ;SAVE ALL THE RHXX/RP07 REGISTERS
   031700 012777 000040 150772      MOV      @CLR,@RPCS2 ;MASSBUS CLEAR
   031706 013777 002630 150764      MOV      DTADPB,@RPCS2 ;SELECT DRIVE
   031714 004737 011002                JSR      PC,RESREG   ;;RESTORE R0-R5
81 031720 004537 012766                JSR      R5,ERRANY   ;FIND OUT WHAT ERROR
82 031724 002630                DTADPB
83 031726                L10055:
   031726 104403                TRAP     C#ESUB
84 031730 032737 000040 002264      BIT      @BIT5,SVSTAT ;POSITION ERROR?
85 031736 001411                BEQ      T8.10$       ;NO, CONTINUE
86 031740                T8.9$:

```

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



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43

.SBTTL TEST 9: AVERAGE SEEK TIME MEASUREMENT TEST  
:\*\*\*\*\*  
: THIS TEST WILL MEASURE THE AVERAGE SEEK TIME AS FOLLOWS:  
:  
:  $2 \times [ (T1 \times 629) + (T2 \times 628) + (T3 \times 627) + \dots + (T629 \times 1) ]$   
: T (AVG) = -----  
:  $629 \times 629$   
:  
: WHERE: THE TN IS THE MEASURED TIME INTERVAL FOR SEEKING FROM  
: CYLINDER 0 TO CYLINDER N OR FROM CYL N TO CYL 0.  
: 2X629 IS THE TOTAL NUMBER OF SEEKS.  
:\*\*\*\*\*

032212  
032212 005737 002260  
032216 003002  
032220 104432  
032222 000702  
032224 004437 015612  
032230 000402  
032232 104432  
032234 000670  
032236 012703 002462  
032242 013701 002266  
032246 004737 015742  
032252 004737 012364  
032256 012746 000300  
032262 012746 032710  
032266 013746 012230  
032272 012746 000003  
032276 104437  
032300 062706 000010  
032304 012746 000000  
032310 012746 015740  
032314 013746 002654  
032320 012746 000003  
032324 104437  
032326 062706 000010  
032332 005037 033126  
032336 005237 033126  
032342 013777 033126 150354  
032350 005077 157650  
032354  
032354 104402  
032356 012777 000105 150304  
032364 012777 000131 157630  
032372 000001  
032374 017746 157626  
032400 042777 000101 157614  
032406 012677 157612  
032412 032777 040000 150262  
032420 001426  
032422 004737 010750  
032426 012702 002630

```
T9: :
      TST      CLKSTA      ;KW11-P CLOCK?
      BGT      1$          ;YES--START TEST
      TRAP     C$EXIT
      .WORD    L10056-
1$:   JSR      R4,SRCH00   ;DO A MASSBUS INIT & RECAL
      BR       2$          ;RETURN HERE IF NO ERROR
      TRAP     C$EXIT
      .WORD    L10056-
2$:   MOV      @TIMT11,R3  ;PARAMETER POINTER
TEST9: MOV      NC1,R1      ;COUNT AND COEFFICIENT
      JSR      PC,STRTHR   ;INIT. THE COUNTERS
      JSR      PC,STOPCK   ;STOP THE CLOCK
                               ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
      MOV      @PRI06,-(SP)
      MOV      @T9.7$,-(SP)
      MOV      PKV,-(SP)
      MOV      @3,-(SP)
      TRAP     C$SVEC
      ADD     @10,SP
                               ;SETUP RHXX/RP07 VECTOR
      MOV      @PRI00,-(SP)
      MOV      @DORTI,-(SP)
      MOV      RPVEC,-(SP)
      MOV      @3,-(SP)
      TRAP     C$SVEC
      ADD     @10,SP
T9.1$: CLR      INCCYL      ;INITIALIZE THE SEEK CYLINDER ADDRESS
      INC     INCCYL      ;INCREMENT THE SEEK CYLINDER ADDRESS
      MOV     INCCYL,@RPDC ;SEEK ADDRESS
      CLR     @PKB        ;START COUNT AT ZERO
T9.1: TRAP     C$BSUB
      MOV     @SEEK,@RPCS1 ;START A SEEK
      MOV     @131,@PKCS  ;START THE CLOCK
      WAIT
      MOV     @PKC,-(SP)  ;WAIT ON INTERRUPT
      BIC     @101,@PKCS  ;STORE THE COUNTED VALUE
      MOV     (SP),@PKB   ;STOP CLOCK
      BIT     @BIT14,@RPDS ;AND RESTORE THE COUNT
      BEQ    T9.2$       ;ERR=1?
      JSR    PC,SAVREG   ;NO--BRANCH
      MOV    @DTADPB,R2  ;SAVE R0-R5
                               ;DPB POINTER
```

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



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

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40

.SBTTL TEST 10: MAXIMUM SEEK TIMING TEST

```
*****
;* THIS TEST WILL COMMAND A FORWARD SEEK FROM CYLINDER 0 TO
;* CYLINDER 'LC', THEN A REVERSE SEEK FROM CYLINDER 'LC' TO
;* CYLINDER 0. BOTH SEEKS ARE TIMED AND CHECKED TO ENSURE
;* THEY ARE WITHIN THE TOLERANCE ALLOWED FOR THE MAXIMUM SEEK
;* TIME. THIS SEQUENCE IS REPEATED 512 TIMES (FOR
;* A TOTAL OF 1024 SEEKS). THE MAXIMUM SEEK TIME MUST BE LESS THAN
;* 46 MS. 'LC' DEFAULTS TO 629 (10)
;* FOR RP07'S.
*****
```

```
T10::
      TST      CLKSTA      ;KW11-P CLOCK
      BGT      1$          ;YES--START TEST
      TRAP     C$EXIT
      .WORD    L10061-
1$:   JSR      R4,SRCH00   ;DO A MASSBUS INIT & RECAL
      BR       2$          ;RETURN HERE IF NO ERROR
      TRAP     C$EXIT
      .WORD    L10061-
2$:   MOV      @TIMT12,R3  ;PARAMETER POINTER
TEST10: MOV      @512.,R1   ;REPEAT "0-'LC'-0" 512 TIMES
      JSR      PC,STRMR    ;INIT. THE TIMERS
      JSR      PC,STOPCK   ;STOP THE CLOCK
                               ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
      MOV      @PRI06,-(SP)
      MOV      @T10.7$,-(SP)
      MOV      PKV,-(SP)
      MOV      @3,-(SP)
      TRAP     C$SVEC
      ADD     @10,SP
                               ;SETUP RHXX/RP07 VECTOR
      MOV      @PRI00,-(SP)
      MOV      @DORTI,-(SP)
      MOV      RPVEC,-(SP)
      MOV      @3,-(SP)
      TRAP     C$SVEC
      ADD     @10,SP
T10.1: TRAP     C$BSUB
T10.1$: CLR      @PKB      ;START COUNTING FROM ZERO
      MOV     LC,@RPDC     ;MAXIMUM CYLINDER
      MOV     @SEEK,@RPCS1 ;START A SEEK
      MOV     @131,@PKCS   ;START THE CLOCK
      WAIT
      MOV     @PKC,-(SP)   ;WAIT ON INTERRUPT
      BIC    @101,@PKCS   ;SAVE THE CLOCK
      MOV     (SP)+,@PKB   ;STOP THE CLOCK
      BIT    @BIT14,@RPDS ;AND RESTORE THE COUNTED VALUE
      BEQ    T10.2$       ;ERR=1?
      JSR    PC,SAVREG    ;NO--BRANCH
      MOV     @DTADPB,R2  ;;;SAVE R0-R5
      JSR    PC,SVRHXX   ;DPB POINTER
      MOV     @CLR,@RPCS2 ;SAVE ALL THE RHXX/RP07 REGISTERS
      MOV     DTADPB,@RPCS2 ;MASSBUS CLEAR
                               ;SELECT DRIVE
```

```
033130
033130 005737 002260
033134 003002
033136 104432
033140 000642
033142 004437 015612
033146 000402
033150 104432
033152 000630
033154 012703 002472
033160 012701 001000
033164 004737 015742
033170 004737 012364
033174 012746 000300
033200 012746 033614
033204 013746 012230
033210 012746 000003
033214 104437
033216 062706 000010
033222 012746 000000
033226 012746 015740
033232 013746 002654
033236 012746 000003
033242 104437
033244 062706 000010
033250
033250 104402
033252 005077 156746
033256 013777 002206 147440
033264 012777 000105 147376
033272 012777 000131 156722
033300 000001
033302 017746 156720
033306 042777 000101 156706
033314 012677 156704
033320 032777 040000 147354
033326 001426
033330 004737 010750
033334 012702 002630
033340 004737 024644
033344 012777 000040 147326
033352 013777 002630 147320
```



```

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

```

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



```

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20 034004
21 034004 004737 020400
22 034010 004737 012364
23 034014 113737 002664 002630
24 034022 112737 000171 002632
25 034030 013737 002354 002634
26 034036 012737 042762 002636
27 034044 112737 000000 002640
28 034052 113737 002212 002641
29 034060 013737 002204 002642
30 034066 012737 002754 002644
31 034074 005037 002256
32 034100
   034100 104402
33 034102
   034102 004437 015056
34 034106 005737 002256
35 034112 100411
36 034114 005337 002256
37 034120 112737 000031 002640
38 034126 062737 177400 002634
39 034134 000762
40
41 034136 005037 002256
42 034142 105037 002640
43 034146 162737 177400 002634
44 034154
   034154 104403
45 034156 113702 002641
46 034162 063702 002216
47 034166 023702 002214
48 034172 101403
49 034174 110237 002641
50 034200 000740
51 034202 004737 020400
52 034206
   034206 104401

```

```

.SBTTL TEST 11: MID-TRANSFER SEEK TEST

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

T11::
  JSR PC,RPINIT      ;INITIALIZE THE SUB-SYSTEM
  JSR PC,STOPCK      ;STOP THE CLOCK
  MOV DRVNO,DTADPB   ;DRIVE ADDRESS
  MOV #RDDAT,DTADPB+2 ;READ-DATA COMMAND
  MOV TRKWC,DTADPB+4 ;ASSUME HALF FULL TRACK
  MOV #DBUFF,DTADPB+6 ;BUFFER ADDRESS
  MOV #0,DTADPB+10   ;SECTOR ADDR
  MOV FT,DTADPB+11   ;TRACK ADDR
  MOV FC,DTADPB+12   ;CYLINDER ADDRESS
  MOV #REG,DTADPB+14 ;RHXX/RP07 REGISTER
  CLR DOTWO          ;RESET 2 ITERATIONS CONTROL

T11.1:
  TRAP C#BSUB

T11.2#:
  JSR R4,DRVCAL      ;START A DATA TRANSFER
  TST DOTWO          ;DONE HALF TRACK TWICE?
  BMI 2#             ;YES, EXIT 2 ITERATIONS LOOP
  DEC DOTWO          ;NO, MARK 2ND ITERATION
  MOV #25.,DTADPB+10 ;TFR 2ND HALF OF TRACK
  ADD #-256.,DTADPB+4 ;YES, SET WC FOR 2ND HALF TRACK + 1 SECTOR
  BR T11.2#          ;LOOP TO TFR 2ND HALF TTRACK

1#:
  BR T11.2#

2#:
  CLR DOTWO          ;RESET PARAMETERS FOR 1ST LOOP
  CLRB DTADPB+10    ;RESTART AT SECTOR 0
  SUB #-256.,DTADPB+4 ;WC FOR 1ST HALF TRACK

L10065:
  TRAP C#ESUB

T11.5#:
  MOV DTADPB+11,R2   ;UPDATE THE TRACK ADDRESS
  ADD IT,R2          ;ADD THE DESIRED TRACK NUMBER
  CMP LT,R2          ;OVER THE TRACK LIMIT?
  BLOS EXIT11        ;BRANCH IF SO
  MOV R2,DTADPB+11  ;TO NEXT TRACK
  BR T11.2#          ;LOOP BACK

EXIT11:
  JSR PC,RPINIT

L10064:
  TRAP C#ETST

```

```

1          .SBTTL TEST 12: ERROR REGISTER BIT TEST
2
3          ;;*****
4          ;* THIS TEST FORCES LBT & AOE ERROR BITS THAT ARE NOT FULLY CHECKED BY THE
5          ;* MICRO DIAGNOSTICS
6          ;* LBT, AOE: READ THE LAST USER SECTOR WITH A WORD COUNT >256.
7          ;;*****
8
9 034210    T12::
10 034210 004737 020400      JSR    PC,RPINIT      ;INITIALIZE THE SUB-SYSTEM
11 034214 004737 012364      JSR    PC,STOPCK     ;STOP THE CLOCK
12 034220 113737 002664 002630  MOVB   DRVNO,DTADPB  ;DRIVE AD
13 034226 112737 000171 002632  MOVB   #RDDAT,DTADPB+2 ;SET READ CMD IN DPB
14 034234 012737 177400 002634  MOV    #SCTRWC,DTADPB+4 ;SET WORD COUNT TO READ ONE SECTOR
15 034242 012737 042762 002636  MOV    #DBUFF,DTADPB+6 ;DATA BUFFER
16 034250 113737 002274 002640  MOVB   NS1,DTADPB+10 ;SET LAST USER SECTOR IN DPB
17 034256 113737 002272 002641  MOVB   NT1,DTADPB+11 ;I.E., CYL 629, TRK 31, SEC 49
18 034264 013737 002266 002642  MOV    NC1,DTADPB+12
19 034272 012737 002754 002644  MOV    #REG,DTADPB+14 ;POINT TO RHXX/RP07 REG TABLE SAVED ON CMD DONE
20 034300
21 034300 104402
22 034302 004737 015160      T12.1: TRAP   C#BSUB
23 034306 032762 002000 000012  JSR    PC,EXECMD    ;EXEC CMD
24 034314 001005          BIT    #LST,12(R2)  ;LBT=1?
25 034316 104456          BNE   TST12        ;OK, SKIP
26 034320 000062          TRAP  C#ERHRD
27 034322 007335          .WORD 50
28 034324 000000          .WORD EM50
29 034326          .WORD 0
30 034326 104403
31 034330 032762 040000 000012  L10067: TRAP   C#ESUB
32 034336 001403          TST12: BIT    #ERR,12(R2) ;OTHER ERRORS?
33 034340 004537 012766          BEQ   1#          ;NO, SKIP
34 034344 002630          JSR   R5,ERRANY   ;YES, FLAG THEM
35 034346 062737 177400 002634  DTADPB
36 034354          1#: ADD    #SCTRWC,DTADPB+4 ;SET DPB TO READ BEYOND LAST SECTOR
37 034354 104402          T12.2: TRAP   C#BSUB
38 034356 004737 015160          JSR    PC,EXECMD    ;ATTEMPT TO READ PAST LAST SECTOR
39 034362 032762 001000 000014  BIT    #AOE,14(R2)  ;AOE=1?
40 034370 001005          BNE   TST12A      ;OK, SKIP
41 034372 104456          TRAP  C#ERHRD
42 034374 000063          .WORD 51
43 034376 007427          .WORD EM51
44 034400 000000          .WORD 0
45 034402          L10070: TRAP   C#ESUB
46 034404 042762 001000 000014  TST12A: BIC    #AOE,14(R2) ;CLEAR ERROR IN ERROR TABLE
47 034412 001005          BNE   1#          ;FLAG OTHER ERROR, IF ANY
48 034414 032762 000200 000042  BIT    #DVC,42(R2)  ;(ER2)(ER3) = 0 ?
49 034422 001001          BNE   1#          ;NO, FLAG OTHER ERRORS
50 034424 000403          BR    2#          ;SKIP ON (ER1)(ER2)(ER3) = 0
51 034426 004537 012766          1#: JSR   R5,ERRANY   ;FLAG ERRORS
52 034432 002630          DTADPB
53 034434          2#:
54 034434          EXIT12:
55 034434          L10066: TRAP   C#ETST
56 034434 104401
    
```



```

1          .SBTTL TEST 13: OFFSET/RETURN-TO-CENTER-LINE TEST
2
3
4          ;*****
5          ;*      ISSUE AN OFFSET COMMAND, PROCESS THE ATTENTION INTERRUPT AND CHECK FOR
6          ;*      ERRORS,VERIFY THE ASSERTION OF OM OF RPDS.
7          ;*      ISSUE THE RETURN TO CENTER LINE COMMAND, PROCESS THE ATTENTION INTERRUPT
8          ;*      AND CHECK FOR ERRORS, VERIFY THE RESETTING OF OM.
9          ;*****
10         T13::
11         034436 004737 020400          JSR      PC,RPINIT          ;INITIALIZE THE SUB-SYSTEM
12         034442 012737 000012 002244  MOV      #10.,ITCNT        ;SET ITERATION COUNT
13         034450 013737 002664 002630  TEST13: MOV      DRVNO,DTADPB ;GET DRIVE NUMBER
14         034456 113737 002220 002640  MOV      FS,DTADPB+10     ;OPERATE ON FS,FT,FC
15         034464 113737 002212 002641  MOV      FT,DTADPB+11
16         034472 013737 002204 002642  MOV      FC,DTADPB+12
17         034500 012737 002754 002644  MOV      #REG,DTADPB+14   ;POINTER TO RHXX/RP07 REG TABLE SAVED ON CMD DONE
18         034506 012737 000115 002632  MOV      #OFFSET,DTADPB+2 ;LOAD OFFSET CMD
19         034514
20         034514 104402          T13.1: TRAP     C#BSUB
21         034516 004437 015056          JSR      R4,DRVCAL        ;START A DATA TRANSFER
22         034522 013702 002644          MOV      DTADPB+14,R2     ;POINTER TO RHXX/RP07 REG TBL SAVED ON CMD DONE
23         034526 032762 000001 000012  BIT      #OM,12(R2)       ;OM = 1?
24         034534 001005          BNE     TST13            ;OK
25         034536 104456          TRAP     C#ERHRD
26         034540 000066          .WORD   54
27         034542 007547          .WORD   EM54
28         034544 000000          .WORD   0
29         034546          L10072: TRAP     C#ESUB
30         034546 104403
31         034550 012737 000117 002632  TST13: MOV      #RTC,DTADPB+2 ;LOAD RETURN TO CENTER LINE CMD
32         034556          T13.2:
33         034556 104402          TRAP     C#BSUB
34         034560 004437 015056          JSR      R4,DRVCAL        ;START A DATA TRANSFER
35         034564 013702 002644          MOV      DTADPB+14,R2     ;POINTER TO RHXX/RP07 REG TBL SAVED ON CMD DONE
36         034570 032762 000001 000012  BIT      #OM,12(R2)       ;OM = 0?
37         034576 001407          BEQ     T13.1#          ;OK
38         034600 104456          TRAP     C#ERHRD
39         034602 000067          .WORD   55
40         034604 007610          .WORD   EM55
41         034606 000000          .WORD   0
42         034610          L10073: TRAP     C#ESUB
43         034610 104403          TRAP     C#EXIT
44         034612 104432          .WORD   L10071-.
45         034614 000010
46         034616 005337 002244          T13.1#: DEC      ITCNT      ;DONE ITERATIONS ?
47         034622 001312          BNE     TEST13          ;BR IF NO
48         034624          EXIT13:
49         034624          L10071: TRAP     C#ETST
50         034624 104401
    
```

```

1      .SBTTL TEST 14: RANDOM READ TEST
2
3      ;*****
4      ;THIS TEST RANDOMLY SELECTS A SECTOR ADDRESS: CYL BETWEEN FC AND LC,
5      ;                                                    TRK BETWEEN FT AND LT,
6      ;                                                    SEC BETWEEN FS AND LS.
7      ;IF THERE IS NO P-CLOCK, IT THEN EXECUTES A READ DATA COMMAND TO 1 SECTOR
8      ;AFTER EACH READ-DATA COMMAND, THE PROGRAM VERIFIES THE
9      ;BUS, DATA AND VERIOUS RHXX/RP07 REGISTERS.
10     ;IF THERE IS A P-CLOCK,THE PROGRAM PERFORMS AN ADDRESS MARK DETECTION TEST:
11     ;IT VERIFIES THAT DATA CAN BE READ CORRECTLY WITHIN THE SAME DISC REVOLUTION
12     ;AS A SECTOR DETECTION. SEARCH FOR THE LOGICAL SECTOR PRECEDING THE SELECTED
13     ;SECTOR TO READ, THEN READ THE SELECTED SECTOR. TIME THE SEARCH DONE-READ DONE
14     ;TO BE WITHIN A DISC REVOLUTION. FLAG LOST REVOLUTIONS.
15     ;*****
16
17 034626      T14::
18 034626      013737      002250      002244      MOV      XTIMES,ITCNT      ;SET ITERATION COUNT
19 034634      005737      002260      TST      CLKSTA           ;P-CLK PRESENT?
20 034640      003036      BGT      TST14A           ;YES, EXEC RAND READ TEST + AD MARK DET
21 034642      004737      020400      JSR      PC,RPINIT        ;INITIALIZE THE SUB-SYSTEM
22 034646      004737      012364      JSR      PC,STOPCK        ;STOP THE CLOCK
23 034652      113737      002664      002630      MOVB     DRVNO,DTADPB     ;LOAD THE DRIVE ADDRESS
24 034660      112737      000171      002632      MOVB     @RDDAT,DTADPB+2  ;EXECUTE READ COMMAND
25 034666      012737      177400      002634      MOV      #-256.,DTADPB+4 ;WORD COUNT = 1 SECTOR
26 034674      012737      042762      002636      MOV      @DBUFF,DTADPB+6 ;BUFFER ADDRESS
27 034702      012737      002754      002644      MOV      @REG,DTADPB+14  ;RHXX/RP07 REGISTER TABLE
28
29 034710      004437      017716      TEST14: JSR      R4,RANADR   ;GENERATE A STARTING ADDRESS
30 034714      034714      104402      T14.1:  TRAP     C$BSUB
31 034716      004437      015056      JSR      R4,DRVCAL       ;START A DATA TRANSFER
32 034722      034722      104403      L10075: TRAP     C$ESUB
33 034724      005337      002244      EXIT14: DEC      ITCNT     ;DONE ITERATIONS ?
34 034730      001367      BNE      TEST14         ;BR IF NO
35 034732      104432      TRAP     C$EXIT
36 034734      001206      .WORD    L10074-.
37 034736      004437      015612      TST14A: JSR      R4,SRCH00 ;MASS BUS INIT & RECAL
38 034742      000402      BR       1$             ;NO RECAL ERROR, CONTINUE
39 034744      000137      036114      JMP      XIT14          ;EXIT ON RECAL ERROR
40
41 034750      004737      015742      1$:     JSR      PC,STRTMR   ;INIT THE TIMERS
42 034754      042777      000101      155240 BIC      #101,@PKCS     ;STOP THE P-CLOCK
43                                     ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
44 034762      012746      000300      MOV      @PRI06,-(SP)
45 034766      012746      035754      MOV      @T14.7$,-(SP)
46 034772      013746      012230      MOV      PKV,-(SP)
47 034776      012746      000003      MOV      #3,-(SP)
48 035002      104437      TRAP     C$SVEC
49 035004      062706      000010      ADD      #10,SP
50                                     ;SETUP RHXX/RP07 VECTOR
51 035010      012746      000000      MOV      @PRI00,-(SP)
52 035014      012746      015740      MOV      @DORTI,-(SP)
53 035020      013746      002654      MOV      RPVEC,-(SP)
54 035024      012746      000003      MOV      #3,-(SP)

```



```

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

```

```

95 035310 002630          DTADPB          ;FIND OUT WHAT ERROR
96 035312          L10076: TRAP          C$ESUB
   035312 104403          BIT          #BIT3!BIT7,SVSTAT          ;RETRY ALLOWED ?
97 035314 032737 000210 002264          BNE          1$          ;BRANCH IS SO
98 035322 001022          MOV          #SEAERR,-(SP)
99 035324 012746 004511          MOV          #1,-(SP)
   035330 012746 000001          MOV          SP,RO
   035334 010600          TRAP          C$PNTF
   035336 104417          ADD          #4,SP
100 035340 062706 000004          MOV          #ABOTST,-(SP)
   035344 012746 004614          MOV          #1,-(SP)
   035350 012746 000001          MOV          SP,RO
   035354 010600          TRAP          C$PNTF
   035356 104417          ADD          #4,SP
101 035360 062706 000004          JMP          T14.8$
102 035370          1$:
103 035370 012737 000020 002350          MOV          #16.,WCEFLG          ;RETRY 16 TIMES
104 035376 012777 000006 154620 2$:          MOV          #6,@PKB          ;ALLOW > 6 REVOLUTIONS PER SEARCH:
105
106          ;3 FOR IMPLIED MAX SEEK (46 MSEC OR ABOUT 3 REVOLUTIONS)
107          ;3 FOR WORST CASE SEARCH(SECT CMP ERR OR HDR CRC ERR)
108
109 035404 012777 000105 154610          MOV          #105,@PKCS          ;START P-CLOCK:IE,COUNT DOWN,LINE FREQ
110 035412 012777 000131 145250          MOV          #SEARCH,@RPCS1          ;START A SEARCH
111 035420 000001          WAIT          ;WAIT ON INTERRUPT
112 035422 017746 154600          MOV          @PKC,-(SP)          ;SAVE THE CLOCK
113 035426 042777 000101 154566          BIC          #101,@PKCS          ;STOP THE CLOCK
114 035434 012677 154564          MOV          (SP)+,@PKB          ;AND RESTORE THE COUNTED VALUE
115 035440 032777 040000 145234          BIT          #BIT14,@RPDS          ;ERROR?
116 035446 001433          BEQ          T14.11$          ;EXIT IF NONE
117 035450 012777 000040 145222          MOV          #CLR,@RPCS2          ;MASSBUS CLEAR
118 035456 013777 002630 145214          MOV          DTADPB,@RPCS2          ;DRIVE ADDRESS
119 035464 005337 002350          DEC          WCEFLG          ;OVER RETRY LIMIT ?
120 035470 001342          BNE          2$          ;BRANCH IF NOT
121 035472 012746 004550          MOV          #SEABAD,-(SP)
   035476 012746 000001          MOV          #1,-(SP)
   035502 010600          MOV          SP,RO
   035504 104417          TRAP          C$PNTF
   035506 062706 000004          ADD          #4,SP
122 035512 012746 004614          MOV          #ABOTST,-(SP)
   035516 012746 000001          MOV          #1,-(SP)
   035522 010600          MOV          SP,RO
   035524 104417          TRAP          C$PNTF
   035526 062706 000004          ADD          #4,SP
123 035532 000552          BR          T14.8$          ;EXIT
124 035534          T14.3:
   035534 104402          TRAP          C$BSUB
125 035536 013777 002640 145132  T14.11$: MOV          DTADPB+10,@RPDA          ;SET TRK/SECT TO READ
126 035544 005077 154454          CLR          @PKB          ;CLEAR P-CLK BUFFER COUNT
127 035550 012777 000171 145112          MOV          #RDDAT,@RPCS1          ;START A READ
128 035556 012777 000121 154436          MOV          #121,@PKCS          ;START THE CLOCK:IE=1,UP,SINGLE,10US
129 035564 000001          WAIT          ;WAIT ON INTERRUPT
130 035566 017746 154434          MOV          @PKC,-(SP)          ;SAVE THE CLOCK
131 035572 042777 000101 154422          BIC          #101,@PKCS          ;STOP THE CLOCK
132 035600 012677 154420          MOV          (SP)+,@PKB          ;AND RESTORE THE COUNTED VALUE
133 035604 032777 040000 145070          BIT          #BIT14,@RPDS          ;ERR=1?

```



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

```

162 036112 002542
163 036114
164 036114 013746 002656
    036120 012746 023046
    036124 013746 002654
    036130 012746 000003
    036134 104437
    036136 062706 000010
165 036142
    036142 104401

```

```

XIT14: SP1418 ;SETUP RHXX/RP07 VECTOR
      MOV RPVEC+2,-(SP)
      MOV @ISRV,-(SP)
      MOV RPVEC,-(SP)
      MOV @3,-(SP)
      TRAP C$SVEC
      ADD @10,SP
L10074: TRAP C$ETST

```



```

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19 036144
20 036144 004737 020400
21 036150 004737 012364
22 036154 012737 000012 002244
23 036162 113737 002664 002630
24 036170 012737 177400 002634
25 036176 012737 042762 002636
26 036204 012737 000000 002640
27 036212 013737 002270 002642
28 036220 013704 002664
29 036224 122764 000005 020320
30 036232 001411
31 036234 122764 000004 020320
32 036242 001405
33 036244 104455
    036246 000044
    036250 007017
    036252 010702
34 036254 104444
35 036256 052737 100000 002630 11:
36 036264 112737 000105 002632
37 036272
    036272 104402
38 036274 004437 015056
39 036300
    036300 104403
40 036302 005737 002646
41 036306 100437
42 036310
    036310 104402
43 036312 112737 000173 002632
44 036320 004437 015056
45 036324
    036324 104403
46 036326 005737 002646
47 036332 100425
48 036334 123737 002272 002641
49 036342 101403
50 036344 105237 002641

```

```

.SBTTL TEST 15: FE CYLINDER ADDRESSING TEST
;*****
; THIS TEST LOCATES THE FE CYLINDERS;
; THE FE CYLINDERS ARE CYL 630 AND 631.
;
; AT THE FIRST TEST CYCLE, THE TEST SETS
; "DMD" BIT OF THE RPMR REGISTER IN ORDER TO ACCESS
; FE CYLINDERS.
;
; THEN, THIS TEST EXECUTES READ HEADER AND DATA COMMANDS
; SEQUENTIALLY TO VERIFY THE ADDRESSING OF THE SECTOR 0
; OF EACH TRACK ( 0 TO 31 ) ON THE FIRST FE CYLINDER.
;
; AT THE SECOND TEST CYCLE,
; A SEEK COMMAND IS EXECUTED TO ACCESS THE SECOND FE CYLINDER.
;*****

```

```

T15::
      JSR      PC,RPINIT      ;INITIALIZE THE SUB-SYSTEM
      JSR      PC,STOPCK     ;STOP THE CLOCK
      MOV      #10.,ITCNT    ;SET ITERATION COUNT
TEST15: MOV      DRVNO,DTADPB  ;LOAD THE DRIVE ADDRESS INTO DPB
      MOV      #SCTRW,DTADPB+4 ;256 WORDS
      MOV      #DBUFF,DTADPB+6 ;BUFFER ADDRESS
      MOV      #0,DTADPB+10   ;TRACK 0, SECTOR 0
      MOV      NC2,DTADPB+12  ;ASSUME NO FIX HEAD OPTION
      MOV      DRVNO,R4       ;TO FIND OUT FIX HEAD OPTION
      CMP      #5,DRVYTP(R4) ;BRANCH IF NO FIX HEAD
      BEQ      11
      CMP      #4,DRVYTP(R4) ;DOES IT CONTAIN FIX HEAD
      BEQ      11             ;BRANCH IS SO
      TRAP     C#ERDF
      .WORD   36
      .WORD   EM36
      .WORD   DM25
      TRAP     C#DCLN
11:   BIS      #DMD,DTADPB    ;SET MAINTENACE MODE FLAG AT THE 2ND BYTE
      MOV      #SEEK,DTADPB+2 ;DO AN EXPLICIT SEEK
T15.1:
      TRAP     C#BSUB
      JSR      R4,DRVCL     ;START A DATA TRANSFER
L10101:
      TRAP     C#ESUB
      TST      DTADPB+16    ;ANY ERROR CONDITION EXISTS ?
      BMI      EXIT15      ;EXIT IF SO
T15.2:
      TRAP     C#BSUB
TST15: MOV      #RDHD,DTADPB+2 ;READ THE HEADER AND DATA
      JSR      R4,DRVCL     ;START A DATA TRANSFER
L10102:
      TRAP     C#ESUB
      TST      DTADPB+16    ;ANY ERROR
      BMI      EXIT15      ;EXIT IF SO
      CMP      NT1,DTADPB+11 ;LAST TRACK CHECKED ?
      BLOS    11           ;BRANCH IF NOT
      INCB    DTADPB+11

```

```

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

```



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53

```
.SBTTL TEST 16: FE CYLINDER WRITE AND WRITE CHECK TEST
;*****
;THIS TEST EXECUTES WRITE-DATA SEQUENTIALLY FROM TRACK FT TO TRACK LT
;ON THE FIRST FE CYLINDER WHICH IS ACCESSIBLE IN MAINTENANCE MODE.
;THE PARAMETERS ARE AS FOLLOWS:
;
;THE FULL TRACK TRANSFER IS MADE IN 2 PASSES:
; 1ST PASS, SECTORS: 00. THRU 24.
; 2ND PASS, SECTORS: 25. THRU 49.
;
; STARTING TRACK          = FT
; ENDING TRACK            = LT
; INCREMENT TRACK         = IT
; STARTING SECTOR         = FS
;*****
```

```
18 036422
19 036422 004737 020400
20 036426 113737 002664 002630
21 036434 013737 002354 002634
22 036442 012737 042762 002636
23 036450 113737 002212 002641
24 036456 013737 002270 002642
25 036464 012737 002754 002644
26 036472 105037 002631
27 036476 052737 100000 002630
28 036504 004737 012364
29
30 036510 005037 002256
31 036514 105037 002640
32 036520 013702 002224
33 036524 013703 002636
34 036530 013704 002634
35 036534 010223
36 036536 005204
37 036540 001375
38 036542
   036542 104402
39 036544 112737 000105 002632
40 036552 004437 015056
41 036556
   036556 104403
42 036560
   036560 104402
43 036562 112737 000161 002632
44 036570 004437 015056
45 036574 112737 000151 002632
46 036602 004437 015056
47 036606
   036606 104403
48 036610 005737 002256
49 036614 100406
50 036616 005337 002256
51 036622 112737 000031 002640
52 036630 000745
53
```

```
T16::
   JSR      PC,RPINIT      ;INITIALIZE THE SUB-SYSTEM
   MOV     DRVNO,DTADPB    ;LOAD THE DRIVE ADDRESS
   MOV     TRKWC,DTADPB+4  ;WORD COUNT = HALF TRACK
   MOV     #DBUFF,DTADPB+6 ;BUFFER ADDRESS
   MOV     FT,DTADPB+11    ;FIRST TRACK
   MOV     NC2,DTADPB+12   ;FIRST FE CYLINDER W/O FIX H
   MOV     #REG,DTADPB+14  ;SAVED RHXX/RP07 REGISTER
   CLRB    DTADPB+1        ;CLEAR THE HCI
   BIS     #DMD,DTADPB     ;SET THE MAINTENANCE MODE FLAG
   JSR     PC,STOPCK       ;STOP THE CLOCK

TEST16: CLR     DOTWO      ;RESET 2 ITERATIONS CONTROL
        CLRB    DTADPB+10  ;RESTART AT SECTOR 0
        MOV     PAT,R2      ;FILL THE DATA PATTERN
        MOV     DTADPB+6,R3 ;BUFFER ADDRESS
        MOV     DTADPB+4,R4 ;WORD COUNT
1$:     MOV     R2,(R3)+
        INC     R4
        BNE    1$          ;BRANCH IF PATTERN IS WRITTEN TO ALL BUFF LOC

T16.1: TRAP    C#BSUB
WRPAT: MOV     #SEEK,DTADPB+2 ;DO A SEEK FIRST
        JSR     R4,DRVCL    ;START A DATA TRANSFER

L10105: TRAP    C#ESUB

T16.2: TRAP    C#BSUB
        MOV     #WRDAT,DTADPB+2 ;WRITE DATA COMMAND
        JSR     R4,DRVCL    ;START A DATA TRANSFER
        MOV     #WCKD,DTADPB+2 ;CHANGE TO WRITE CHECK DATA COMMAND
        JSR     R4,DRVCL    ;START A DATA TRANSFER

L10106: TRAP    C#ESUB
        TST     DOTWO      ;DONE HALF TRACK TWICE?
        BMI    1$          ;YES, EXIT 2 ITERATIONS LOOP
        DEC     DOTWO      ;NO, MARK 2ND ITERATION
        MOV     #25.,DTADPB+10 ;TFR 2ND HALF OF TRACK
        BR     WRPAT       ;LOOP TO TFR 2ND HALF TRACK
```

```

54 036632 005037 002256      1$: CLR      DOTWO      ;RESET PARAMETERS FOR 1ST LOOP
55 036636 105037 002640      CLR      DTADPB+10    ;RESTART AT SECTOR 0
56 036642 013702 002224      2$: MOV      PAT,R2    ;COMPLEMENT THE PATTERN
57 036646 005102      COM      R2
58 036650 013703 002636      MOV      DTADPB+6,R3  ;BUFFER ADDRESS
59 036654 013704 002634      MOV      DTADPB+4,R4  ;WORD COUNT
60 036660 010223      3$: MOV      R2,(R3)+  ;FILL THE BUFFER WITH COMPLEMENT DATA
61 036662 005204      INC      R4
62 036664 001375      BNE     3$           ;BRANCH IF NOT DONE
63 036666      T16.3:
   036666 104402      TRAP     C$BSUB
64 036670 112737 000105 002632 WRPATN: MOV      #SEEK,DTADPB+2 ;SEEK COMMAND
65 036676 004437 015056      JSR      R4,DRVCAL    ;START A DATA TRANSFER
66 036702      L10107:
   036702 104403      TRAP     C$ESUB
67 036704      T16.4:
   036704 104402      TRAP     C$BSUB
68 036706 112737 000161 002632      MOV      #WRTDAT,DTADPB+2 ;WRITE DATA FIRST
69 036714 004437 015056      JSR      R4,DRVCAL    ;START A DATA TRANSFER
70 036720 112737 000151 002632      MOV      #WCKD,DTADPB+2 ;CHANGE TO WRITE-CHECK
71 036726 004437 015056      JSR      R4,DRVCAL    ;START A DATA TRANSFER
72 036732      L10110:
   036732 104403      TRAP     C$ESUB
73 036734 005737 002256      TST      DOTWO      ;DONE HALF TRACK TWICE?
74 036740 100406      BMI     1$           ;YES, EXIT 2 ITERATIONS LOOP
75 036742 005337 002256      DEC      DOTWO      ;NO, MARK 2ND ITERATION
76 036746 112737 000031 002640      MOV      #25.,DTADPB+10 ;TFR 2ND HALF OF TRACK
77 036754 000745      BR      WRPATN      ;2ND ITERATION
78
79 036756 113707 002641      1$: MOV      DTADPB+11,R2 ;UPDATE THE TRACK ADDRESS
80 036762 063702 002216      ADD      IT,R2
81 036766 110237 002641      MOV      R2,DTADPB+11
82 036772 023702 002214      CMP      LT,R2
83 036776 101244      BHI     TEST16
84 037000 042737 100000 002630 EXIT16: BIC      #DMD,DTADPB ;RESET THE MAINTENANCE FLAG
85 037006      L10104:
   037006 104401      TRAP     C$ETST

```



1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
28  
29  
30  
31  
32  
33  
34  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52

.SBTTL TEST 17: WRITE TEST

```

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

```

T17.:

```

JSR      PC,RPINIT      ;INITIALIZE THE SUB-SYSTEM
TSTB     WRTALL          ;DID OPERATOR WANT TO WRITE ON MEDIUM?
BNE      1$             ;BR IF YES
;NOTIFY OPERATOR THAT TEST WAS NOT RUN

MOV      L$TEST,-(SP)
MOV      @WRTENM,-(SP)
MOV      @2,-(SP)
MOV      SP,R0
TRAP     C$PNTF
ADD      @6,SP
CLR      R0              ;CLEAR R0 FOR TRAP
TRAP     C$EXIT
.WORD    L10111-.

1$:      MOVB     DRVNO,DTADPB ;DRIVE ADDRESS
MOV      TRKWC,DTADPB+4 ;HALF TRACK
MOV      @DBUFF,DTADPB+6 ;BUFFER ADDRESS
MOVB     @0,DTADPB+10 ;SECTOR ADDRESS
MOVB     FT,DTADPB+11 ;TRACK ADDRESS
MOV      FC,DTADPB+12 ;CYLINDER ADDRESS
MOV      @REG,DTADPB+14 ;THE SAVED REGISTER TABLE ADDRESS
CLR      DOTWO          ;RESET 2 ITERATION CONTROL
MOV      PAT,R2         ;PATTERN IN R2,FILL
MOV      DTADPB+6,R3    ;BUFFER ADDRESS
MOV      DTADPB+4,R4    ;TOTAL NUMBER OF WORD COUNT
2$:      MOV      R2,(R3)+ ;LOAD DATA PATTERN BUFFER
INC      R4             ;INCREMENT WORD COUNT
BNE      2$            ;BRANCH IF NOT DONE
JSR      PC,STOPCK      ;STOP THE CLOCK
CLR      R5             ;1ST PASS FLAG

T17.1:   TRAP     C$BSUB

```

```

037010
037010 004737 020400
037014 105737 002235
037020 001015
037022 013746 002114
037026 012746 004432
037032 012746 000002
037036 010600
037040 104417
037042 062706 000006
037046 005000
037050 104432
037052 000256
037054 113737 002664 002630
037062 013737 002354 002634
037070 012737 042762 002636
037076 112737 000000 002640
037104 113737 002212 002641
037112 013737 002204 002642
037120 012737 002754 002644
037126 005037 002256
037132 013702 002224
037136 013703 002636
037142 013704 002634
037146 010223
037150 005204
037152 001375
037154 004737 012364
037160 005005
037162 104402

```

```

53 037164 023727 002642 001165 TEST17: CMP      DTADPB+12,#629. ;IS THIS THE LAST USER CYLINDER ?
54 037172 001002                BNE      1$      ;BR IF NO
55 037174 005337 002642                DEC      DTADPB+12 ;DON'T WRITE ON LAST USER CYLINDER
56 037200 112737 000161 002632 1$:  MOVB    #WRDAT,DTADPB+2 ;WRITE DATA COMMAND
57 037206 004437 015056                JSR      R4,DRVCAL ;DO THE WRITE COMMAND
58 037212 112737 000151 002632        MOVB    #WCKD,DTADPB+2 ;DO THE WRITE CHECK COMMAND
59 037220 004437 015056                JSR      R4,DRVCAL ;DO THE WRITE CHECK COMMAND
60 037224                L10112:
   037224 104403                TRAP    C$ESUB
61 037226 005737 002256                TST     DOTWO
62 037232 100406                BMI     3$      ;DONE HALF TRACK TWICE?
63 037234 005337 002256                DEC     DOTWO   ;YES, EXIT 2 ITERATIONS LOOP
64 037240 112737 000031 002640        MOVB    #25.,DTADPB+10 ;NO, MARK 2ND ITERATION
65 037246 000746                BR      TEST17 ;GET STARTING SECTOR FOR 2ND HALF OF TRACK
66                                ;LOOP TO XFER 2ND HALF OF TRACK
67 037250 005037 002256                3$:  CLR     DOTWO ;RESET PARAMETERS FOR 1ST LOOP
68 037254 105037 002640                CLRB   DTADPB+10 ;RESTART AT SECTOR 0
69 037260 113702 002641                4$:  MOVB    DTADPB+11,R2 ;UPDATE THE TRACK ADDRESS
70 037264 063702 002216                ADD    IT,R2   ;INCREMENT BY THE SPECIFIED AMOUNT
71 037270 023702 002214                CMP    LT,R2  ;OVER THE LIMIT ?
72 037274 103403                BLO    5$     ;BRANCH IF SO
73 037276 110237 002641                MOVB   R2,DTADPB+11 ;UPDATE THE TRACK ADDRESS
74 037302 000730                BR     TEST17 ;LOOP BACK
75
76 037304 005705                5$:  TST     R5   ;IS IT 2ND PASS?
77 037306 001010                BNE    EXIT17 ;YES, EXIT
78 037310 005205                INC    R5     ;NO, FLAG 2ND PASS
79 037312 113737 002212 002641        MOVB   FT,DTADPB+11 ;RESET THE STARTING TRACK
80 037320 013737 002206 002642        MOV    LC,DTADPB+12 ;UPDATE THE CYLINDER ADDRESS TO LC
81 037326 000716                BR     TEST17 ;LOOP BACK
82
83 037330                EXIT17:
   037330                L10111:
   037330 104401                TRAP    C$ETST

```



```

1      .SBTTL TEST 18: RANDOM WRITE TEST
2
3      ;*****
4      ;THIS TEST EXECUTES WRITE + WRITE CHECK DATA RANDOMLY;
5      ;IN THE PACK AREA BONDED BY THE (STARTING CYLINDER, ENDING CYLINDER)
6      ;
7      ;           (STARTING TRACK, ENDING TRACK)
8      ;           (STARTING SECTOR, ENDING SECTOR)
9      ;THE TRANSFER SIZE IS ALWAYS EQUAL TO ONE SECTOR.
10     ;
11     ;IF THERE IS A P-CLOCK,THE PROGRAM PERFORMS AN ADDRESS MARK DETECTION TEST:
12     ;IT VERIFIES THAT DATA CAN BE WRITTEN CORRECTLY WITHIN THE SAME DISC REVOLUTION
13     ;AS A SECTOR DETECTION. SEARCH FOR THE SECOND LOGICAL SECTOR PRECEDING THE
14     ;SELECTED SECTOR TO WRITE, THEN WRITE THE SELECTED SECTOR. TIME THE SEARCH
15     ;DONE-WRITE DONE TO BE WITHIN A DISC REVOLUTION. FLAG LOST REVOLUTIONS.
16     ;
17     ;NOTE: CYLINDER 629. WILL NOT BE USED, IN ORDER TO PRESERVE THE BAD
18     ;       SECTOR FILE DATA.
19     ;
20     ;PARAMETERS:
21     ;   STARTING CYLINDER
22     ;   ENDING CYLINDER
23     ;   STARTING TRACK
24     ;   ENDING TRACK
25     ;   STARTING SECTOR
26     ;   ENDING SECTOR
27     ;   PATTERN
28     ;*****
29     037332
30     037332 004737 020400
31     037336 105737 002235
32     037342 001015
33
34     037344 013746 002114
35     037350 012746 004432
36     037354 012746 000002
37     037360 010600
38     037362 104417
39     037364 062706 000006
40     037370 005000
41     037372 104432
42     037374 001600
43
44     037376 013737 002250 002244 1$:
45     037404 113737 002664 002630
46     037412 012737 177400 002634
47     037420 012737 042762 002636
48     037426 012737 002754 002644
49     037434 013702 002634
50     037440 013703 002636
51     037444 013704 002224
52     037450 010423
53     037452 005202
54     037454 001375
55     037456 005737 002260
56     037462 003055
57     037464 004737 020400
58
59     T18::
60     JSR      PC,RPINIT      ;INITIALIZE THE SUB-SYSTEM
61     TSTB     WRTALL         ;DID OPERATOR WANT TO WRITE ON MEDIUM?
62     BNE      1$            ;BR IF YES
63     ;NOTIFY OPERATOR THAT TEST WAS NOT RUN
64
65     MOV      L$TEST,-(SP)
66     MOV      @WRTENM,-(SP)
67     MOV      #2,-(SP)
68     MOV      SP,R0
69     TRAP     C$PNTF
70     ADD      #6,SP
71     CLR      R0             ;CLEAR R0 FOR TRAP
72     TRAP     C$EXIT
73     .WORD    L10113-.
74
75     1$:
76     MOV      XTIMES,ITCNT   ;SET ITERATION COUNT
77     MOV      DRVNO,DTADPB   ;YES, PROCEED: SET UP THE PPARAMETERS
78     MOV      #-256.,DTADPB+4 ;WORD COUNT SET TO ONE SECTOR
79     MOV      @DBUFF,DTADPB+6 ;BUFFER ADDRESS
80     MOV      @REG,DTADPB+14 ;THE SAVED RHXX/RP07 REGISTER TABLE
81     MOV      DTADPB+4,R2    ;WORD COUNT
82     MOV      DTADPB+6,R3    ;BUFFER ADDRESS
83     MOV      PAT,R4         ;PATTERN
84
85     2$:
86     MOV      R4,(R3)+      ;FILL THE BUFFER WITH DEFAULT PATTERN
87     INC      R2            ;INCREMENT THE WORD COUNT
88     BNE      2$           ;LOOP IF NOT DONE
89     TST      CLKSTA        ;P-CLK PRESENT?
90     BGT      TST18A        ;YES, EXEC RAND WRT TST + AD MRK DET TST
91     JSR      PC,RPINIT     ;INITIALIZE THE SUB-SYSTEM
  
```

```

54
55 037470 004737 012364 TEST18: JSR PC,STOPCK ;STOP THE CLOCK
56 037474 004437 017716 1$: JSR R4,RANADR ;GENERATE THE RANDOM STARTING ADDRESS
57 ;MAKE SURE YOU DON'T WRITE IN THE BAD SEC FILE
58 037500 123727 002641 000037 CMPB DTADPB+11,#31. ;IS THIS THE LAST TRACK ?
59 037506 001004 BNE 2$ ;BR IF NO
60 037510 023727 002642 001165 CMP DTADPB+12,#629. ;IS THIS THE LAST USER CYLINDER ?
61 037516 001766 BEQ 1$ ;BR IF YES
62 037520 105737 002234 2$: TSTB RANPAT ;SELECT RANDOM PATTERN ?
63 037524 001413 BEQ 5$ ;BRANCH IF NOT
64 037526 013702 002634 MOV DTADPB+4,R2 ;WORD COUNT 2'S COMPLEMENT
65 037532 013703 002636 MOV DTADPB+6,R3 ;BUFFER ADDRESS
66 037536 004737 011712 3$: JSR PC,RAND ;GENERATE NEW RANDOM NUMBER
67 037542 013723 011774 4$: MOV $RP1,(R3)+ ;FILL THE BUFFER WITH RANDOM PATTERN
68 037546 062702 000001 ADD #1,R2 ;FINISH ?
69 037552 100773 BMI 4$ ;LOOP BACK , IF NOT DONE
70 037554 5$:
037554 T18.1:
037554 104402 TRAP C$BSUB
71 037556 112737 000161 002632 MOVB #WRTDAT,DTADPB+2 ;DO A WRITE DATA
72 037564 004437 015056 JSR R4,DRVCAL
73 037570 112737 000151 002632 MOVB #WCKD,DTADPB+2 ;DO A WRITE CHECK DATA
74 037576 004437 015056 JSR R4,DRVCAL
75 037602 L10114:
037602 104403 TRAP C$ESUB
76 037604 005337 002244 DEC ITCNT ;DONE ITERATIONS ?
77 037610 001327 BNE TEST18 ;BR IF NO
78 037612 EXIT18:
037612 104432 TRAP C$EXIT
037614 001360 .WORD L10113-.
79
80 037616 004437 015612 TST18A: JSR R4,SRCH00 ;MASS BUS INIT & RECAL
81 037622 000402 BR 1$ ;NO RECAL ERROR, CONTINUE
82 037624 000137 041146 JMP XIT18 ;EXIT ON RECAL ERROR
83 037630 004737 015742 1$: JSR PC,STRMR ;INIT THE TIMERS
84 037634 042777 000101 152360 BIC #101,#PKCS ;STOP THE P-CLOCK
85 ;SETUP VECTOR IN CASE OF CLOCK OVERFLOW
86 037642 012746 000300 MOV #PRI06,-(SP)
037646 012746 041006 MOV #T180FL,-(SP)
037652 013746 012230 MOV PKV,-(SP)
037656 012746 000003 MOV #3,-(SP)
037662 104437 TRAP C$SVEC
037664 062706 000010 ADD #10,SP
87 ;SETUP RHXX/RP07 VECTOR
88 037670 012746 000000 MOV #PRI00,-(SP)
037674 012746 015740 MOV #DORTI,-(SP)
037700 013746 002654 MOV RPVEC,-(SP)
037704 012746 000003 MOV #3,-(SP)
037710 104437 TRAP C$SVEC
037712 062706 000010 ADD #10,SP
89 037716 005005 CLR R5 ;SET COUNT-UP FLAG FOR COUNT SUBR
90 037720 005037 002240 CLR TEMPO ;CLEAR TEMPORARY LOST REVOLUTION COUNT
91
92 037724 105737 002234 TST18B: TSTB RANPAT ;SELECT RANDOM PATTERN ?
93 037730 001413 BEQ 2$ ;BRANCH IF NOT
94 037732 013702 002634 MOV DTADPB+4,R2 ;WORD COUNT 2'S COMPLEMENT
95 037736 013703 002636 MOV DTADPB+6,R3 ;BUFFER ADDRESS

```



```

96 037742 004737 011712      JSR      PC,RAND      ;GENERATE NEW RANDOM NUMBER
97 037746 013723 011774      1$:     MOV      $RP1,(R3)+ ;FILL THE BUFFER WITH RANDOM PATTERN
98 037752 062702 000001      ADD      #1,R2       ;FINISH ?
99 037756 100773              BMI      1$          ;LOOP BACK , IF NOT DONE
100
101                          ;REDUCE THE TARGET SECTOR BY 2, TO COMPUTE THE VALUE OF THE 2ND LOGICAL
102                          ;SECTOR.
103
104 037760 004437 017716      2$:     JSR      R4,RANADR ;GEN A RAND ADR: CYL, TRK, SEC
105                          ;MAKE SURE YOU DON'T WRITE IN THE BAD SEC FILE
106 037764 123727 002641 000037  CMPB     DTADPB+11,#31. ;IS THIS THE LAST TRACK ?
107 037772 001004              BNE      3$          ;BR IF NO
108 037774 023727 002642 001165  CMP      DTADPB+12,#629. ;IS THIS THE LAST USER CYLINDER ?
109 040002 001766              BEQ      2$          ;BR IF YES
110 040004 113701 002640      3$:     MOV      DTADPB+10,R1 ;GET TARGET SECTOR ADDRESS TO WRITE AND
111 040010 010137 002254      MOV      R1,TRGSEC   ;SAVE IT FOR LATER.
112 040014 032777 000004 142660  BIT      #ILV,$RPDS  ;IS INTERLEAVED SECTOR ENABLED ?
113 040022 001006              BNE      5$          ;BR IF YES
114 040024 162701 000002      SUB      #2,R1       ;BACKUP THE SECTOR ADDRESS FOR THE SEARCH
115 040030 002002              BGE      4$          ;BR IF < SECTOR 0
116 040032 062701 000062      ADD      #50.,R1    ;ADJUST FOR THE ADDRESS BEFORE SECTOR 0
117 040036 000411              BR       7$          ;EXIT
118
119 040040 005701      5$:     TST      R1          ;IS IT SECTOR ADDR 0 ?
120 040042 001405              BEQ      6$          ;BR IF YES
121 040044 162701 000031      SUB      #25.,R1    ;IS IT SECTOR ADDR 25 ?
122 040050 001002              BNE      6$          ;BR IF NO
123 040052 062701 000031      ADD      #25.,R1    ;ADJUST FOR THE ADDRESS BEFORE SECTOR 0
124 040056 062701 000030      6$:     ADD      #24.,R1    ;REDUCE THE TARGET SECTOR BY 2
125
126                          ;PREPARE TO SEARCH
127 040062      7$:     TRAP     C$BSUB
128 040062 010137 002252      MOV      R1,SRHSEC  ;SAVE SEARCH SECTOR FOR LATER
129 040070 013777 002642 142626  MOV      DTADPB+12,$RPDC ;CYL
130 040076 110146              MOV      R1,-(SP)   ;MERGE SECTOR
131 040100 113766 002641 000001  MOV      DTADPB+11,1(SP) ;AND TRK
132 040106 012677 142564      MOV      (SP)+,$RPDA ;LOAD TRK/SEC
133 040112 013777 002634 142552  MOV      DTADPB+4,$RPWC ;WRITE 1 SECTOR
134 040120 013777 002636 142546  MOV      DTADPB+6,$RPBA ;SET DATA BUFFER ADR
135 040126 012703 002502      MOV      #T1418,R3  ;TIMING LIMITS FOR COUNT SUBR
136 040132 012777 000006 152064  MOV      #6,$PKB    ;ALLOW > 6 REVOLUTIONS PER SEARCH:
137
138                          ;3 FOR IMPLIED MAX SEEK (46 MSEC OR ABOUT 3 REVOLUTIONS)
139                          ;3 FOR WORST CASE SEARCH(SECT CMP ERR OR HDR CRC ERR)
140
141 040140 012777 000105 152054  MOV      #105,$PKCS ;START P-CLOCK:IE=1.COUNT DOWN.LINE FREQ
142 040146 012777 000131 142514  MOV      #SEARCH,$RPCS1 ;START A SEARCH
143 040154 000001              WAIT     ;WAIT ON INTERRUPT
144 040156 017746 152044      MOV      $PKC,-(SP) ;SAVE THE CLOCK
145 040162 042777 000101 152032  BIC      #101,$PKCS ;STOP THE CLOCK
146 040170 012677 152030      MOV      (SP)+,$PKB ;AND RESTORE THE COUNTED VALUE
147 040174 032777 040000 142500  BIT      #BIT14,$RPDS ;ERROR?
148 040202 001534              BEQ      T1811$     ;NO--BRANCH
149 040204 004737 010750      JSR      PC,SAVREG  ;;SAVE R0-R5
149 040210 012702 002630      MOV      #DTADPB,R2 ;DPB POINTER

```

```

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

```



185	040522	000001			WAIT				;WAIT ON INTERRUPT
186	040524	017746	151476		MOV	@PKC,-(SP)			;SAVE THE CLOCK
187	040530	042777	000101	151464	BIC	#101,@PKCS			;STOP THE CLOCK
188	040536	012677	151462		MOV	(SP)+,@PKB			;AND RESTORE THE COUNTED VALUE
189	040542	032777	040000	142132	BIT	#BIT14,@RPDS			;ERR=1?
190	040550	001437			BEQ	T1812#			;NO--BRANCH
191	040552	004737	010750		JSR	PC,SAVREG			;SAVE R0-R5
	040556	012702	002630		MOV	@DTADPB,R2			;DPB POINTER
	040562	004737	024644		JSR	PC,SVRHXX			;SAVE ALL THE RHXX/RP07 REGISTERS
	040566	012777	000040	142104	MOV	@CLR,@RPCS2			;MASSBUS CLEAR
	040574	013777	002630	142076	MOV	DTADPB,@RPCS2			;SELECT DRIVE
	040602	004737	011002		JSR	PC,RESREG			;RESTORE R0-R5
192	040606	004537	012766		JSR	R5,ERRANY			;FIND OUT WHAT ERROR
193	040612	002630			DTADPB				
194	040614								
	040614	104403							
195	040616	032737	000040	002264	TRAP	C#ESUB			
196	040624	001411			BIT	#BIT5,SVSTAT			;POSITION ERROR?
197	040626	012746	004633		BEQ	T1812#			;NO, CONTINUE
	040632	012746	000001		MOV	#POSERR,-(SP)			
	040636	010600			MOV	#1,-(SP)			
	040640	104417			MOV	SP,R0			
	040642	062706	000004		TRAP	C#PNTF			
198	040646	000521			ADD	#4,SP			
199					BR	T18END			
200	040650	004737	016212						
201	040654	013746	002656		T1812#:	JSR	PC,COUNT		;COUNT TIME SEARCH DONE-WRITE DONE
	040660	012746	023046		MOV	RPVEC+2,-(SP)			
	040664	013746	002654		MOV	#ISRV,-(SP)			
	040670	012746	000003		MOV	RPVEC,-(SP)			
	040674	104437			MOV	#3,-(SP)			
	040676	062706	000010		TRAP	C#SVEC			
202	040702	112737	000151	002632	ADD	#10,SP			
203	040710	104404			MOVB	#WCKD,DTADPB+2			;DO A WRITE CHECK DATA CMD
204	040712	004437	015056		TRAP	C#BSEG			
205	040716				JSR	R4,DRVCAL			;DO RECALIBRATE
	040716	104405							
206	040720	023737	002320	002240	TRAP	C#ESEG			
207	040726	001406			CMP	TIM.UP+6,TEMPO			;ANY LOST REVOLUTIONS ?
208	040730	005237	002240		BEQ	1#			;BRANCH IF NO
209	040734	104455			INC	TEMPO			;UPDATE TEMPORARY LOST REVOLUTION COUNT
	040736	000064			TRAP	C#ERDF			
	040740	007521			.WORD	52			
	040742	010560			.WORD	EM52			
					.WORD	DH52			
210									
211	040744	023737	002326	002250	1#:	CMP	TIM.UP+14,XTIMES		;SETUP RHXX/RP07 VECTOR
212	040752	002057			BGE	T18END			;REPEATED 1024 TIMES?
213									;YES, CONCLUDE TEST
214	040754	013746	002656						;SETUP RHXX/RP07 VECTOR
	040760	012746	015740		MOV	RPVEC+2,-(SP)			
	040764	013746	002654		MOV	#DORTI,-(SP)			
	040770	012746	000003		MOV	RPVEC,-(SP)			
	040774	104437			MOV	#3,-(SP)			
	040776	062706	000010		TRAP	C#SVEC			
215	041002	000137	037724		ADD	#10,SP			
216					JMP	TST18B			;CONTINUE
217	041006	004737	012426		T180FL:	JSR	PC,FORSEC		;RESET TIMER TO 4 SEC. CHANGE CLK SERVICE AD

```

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



2  
13  
14  
42  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
67  
68  
69  
70  
71  
72  
76  
86

```

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

        .WORD L10117-L$HARD/2
L$HARD::                                ;PRINT 'RPCS1 ADRS?'

        .WORD  T$CODE
        .WORD  MSG1
        .WORD  T$LLOLIM
        .WORD  T$HILIM
                                           ;PRINT 'VECTOR ADRS?'

        .WORD  T$CODE
        .WORD  MSG2
        .WORD  T$LLOLIM
        .WORD  T$HILIM
                                           ;PRINT 'BR LEVEL?'

        .WORD  T$CODE
        .WORD  MSG3
        .WORD  340
        .WORD  T$LLOLIM
        .WORD  T$HILIM
                                           ;PRINT 'DRIVE #?'

        .WORD  T$CODE
        .WORD  MSG4
        .WORD  7
        .WORD  T$LLOLIM
        .WORD  T$HILIM
        .EVEN

L10117:
        .ASCIZ  /RPCS1 ADRS/
        .ASCIZ  /VECTOR ADRS/
        .ASCIZ  /BR LEVEL/
        .ASCIZ  /DRIVE #/

        .EVEN
    
```

```

041176 000022
041200
041200 000031
041202 041244
041204 160000
041206 177777
041210 001031
041212 041257
041214 000000
041216 000377
041220 002032
041222 041273
041224 000340
041226 000000
041230 000007
041232 003032
041234 041304
041236 000007
041240 000000
041242 000007
041244
041244      122      120      103  MSG1:
041257      126      105      103  MSG2:
041273      102      122      040  MSG3:
041304      104      122      111  MSG4:
    
```

```

1      .SBTTL  SOFTWARE PARAMETER CODING SECTION
2
3
4      ;**
5      ; THE SOFTWARE PARAMETER CODING SECTION CONTAINS MACROS
6      ; THAT ARE USED BY THE SUPERVISOR TO BUILD P-TABLES.  THE
7      ; MACROS ARE NOT EXECUTED AS MACHINE INSTRUCTIONS BUT ARE
8      ; INTERPRETED BY THE SUPERVISOR AS DATA STRUCTURES.  THE
9      ; MACROS ALLOW THE SUPERVISOR TO ESTABLISH COMMUNICATIONS
10     ; WITH THE OPERATOR.
11     ;--
12     041314  000116
13     041316
14     041316  015130
15     041320  041552
16     041322  000001
17
18     041324  056044
19
20     041326  000052
21     041330  041602
22     041332  001777
23     041334  000000
24     041336  001164
25
26     041340  001052
27     041342  041620
28     041344  001777
29     041346  000001
30     041350  001165
31
32     041352  002052
33     041354  041636
34     041356  001777
35     041360  000001
36     041362  001164
37
38     041364  003052
39     041366  041654
40     041370  000037
41     041372  000000
42     041374  000036
43
44     041376  004052
45     041400  041672
46     041402  000037
47     041404  000001
48     041406  000037
49
50     041410  005052
51     041412  041710
52     041414  000037
53     041416  000001
54     041420  000036
55
56     041422  006052
    
```

```

        .WORD  L10120-L$SOFT/2
L$SOFT::
        .WORD  T$CODE
        .WORD  PARMSG
        .WORD  1
        .WORD  T$CODE
        .WORD  T$CODE
        .WORD  FCMSG
        .WORD  1777
        .WORD  T$LOLIM
        .WORD  T$HILIM
        .WORD  T$CODE
        .WORD  LCMSG
        .WORD  1777
        .WORD  T$LOLIM
        .WORD  T$HILIM
        .WORD  T$CODE
        .WORD  ICMSG
        .WORD  1777
        .WORD  T$LOLIM
        .WORD  T$HILIM
        .WORD  T$CODE
        .WORD  FTMSG
        .WORD  37
        .WORD  T$LOLIM
        .WORD  T$HILIM
        .WORD  T$CODE
        .WORD  LTMSG
        .WORD  37
        .WORD  T$LOLIM
        .WORD  T$HILIM
        .WORD  T$CODE
        .WORD  ITMSG
        .WORD  37
        .WORD  T$LOLIM
        .WORD  T$HILIM
        .WORD  T$CODE
    
```

```

;PRINT 'CHANGE DRIVE PARAMETERS?'
;GO TO 1$ IF NO
;PRINT 'STARTING CYL?'
;PRINT 'ENDING CYL?'
;PRINT 'INCREMENT CYL?'
;PRINT 'STARTING TRK?'
;PRINT 'ENDING TRK?'
;PRINT 'INCREMENT TRK?'
;PRINT 'STARTING SEC?'
    
```



	041424	041726	.WORD	FMSG	
	041426	000077	.WORD	77	
	041430	000000	.WORD	T\$LOLIM	
	041432	000060	.WORD	T\$HILIM	
31					;PRINT 'ENDING SEC?'
32	041434	007052	.WORD	T\$CODE	
	041436	041744	.WORD	LMSG	
	041440	000077	.WORD	77	
	041442	000001	.WORD	T\$LOLIM	
	041444	000061	.WORD	T\$HILIM	
33					;PRINT 'DATA PATTERN?'
34	041446	010032	.WORD	T\$CODE	
	041450	041762	.WORD	PATMSG	
	041452	177777	.WORD	177777	
	041454	000000	.WORD	T\$LOLIM	
	041456	177777	.WORD	T\$HILIM	
35	041460				
37					;PRINT 'DO YOU WANT TO WRITE ANYWHERE ON MEDIA?'
38	041460	014120	.WORD	T\$CODE	
	041462	042000	.WORD	WRITMG	
	041464	000400	.WORD	400	
39					;GO TO 2\$ IF NO
40	041466	007044	.WORD	T\$CODE	
41					;PRINT '! CUSTOMER DATA WILL BE OVERWRITTEN !
42					;-----
43					; CONTINUE?'
44	041470	014120	.WORD	T\$CODE	
	041472	042047	.WORD	WRSAFM	
	041474	000400	.WORD	400	
46					;PRINT 'USE RANDOM DATA PATTERNS FOR RANDOM WRITE TE
ST?'					
47	041476	014130	.WORD	T\$CODE	
	041500	042202	.WORD	RPATMG	
	041502	000001	.WORD	1	
48	041504				;PRINT 'PERFORM READ HEADER & DATA DURING SEEKS?'
49	041504	011130	.WORD	T\$CODE	
	041506	042261	.WORD	RDHDMG	
	041510	000001	.WORD	1	
50					;PRINT 'TYPE TIME REPORTS?'
51	041512	011130	.WORD	T\$CODE	
	041514	042331	.WORD	TIMMSG	
	041516	000400	.WORD	400	
52					;PRINT 'INHIBIT SOFTWARE TIMEOUTS?'
53	041520	013130	.WORD	T\$CODE	
	041522	042353	.WORD	STOMSG	
	041524	000400	.WORD	400	
54					;PRINT 'TIMING TESTS, STALL BETWEEN SEEKS: RANDOM IN
STEAD OF 2 MSEC?'					
55	041526	012130	.WORD	T\$CODE	
	041530	042405	.WORD	STLTIM	
	041532	000001	.WORD	1	
56					;PRINT 'STALL AFTER EVERY DRIVE FUNCTION IN NON-TIMI
NG TESTS?'					
57	041534	012130	.WORD	T\$CODE	
	041536	042501	.WORD	STALMG	
	041540	000400	.WORD	400	
58					;GO TO 3\$ IF NO
59	041542	004044	.WORD	T\$CODE	
60	041544	013130	.WORD	T\$CODE	
	041546	042566	.WORD	STALRM	

```

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

```



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

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



SYMBOL TABLE	
G\$CNTD=	000200
G\$DELM=	000372
G\$DISP=	000003
G\$EXCP=	000400
G\$HILI=	000002
G\$LOLI=	000001
G\$NO	= 000000
G\$OFFS=	000400
G\$OFISI=	000376
G\$PRMA=	000001
G\$PRMD=	000002
G\$PRML=	000000
G\$RADA=	000140
G\$RADB=	000000
G\$RADD=	000040
G\$RADL=	000120
G\$RADO=	000020
G\$XFER=	000004
G\$YES	= 000010
HCE	= 000200 G
HCI	= 002000 G
HCRC	= 000400 G
HELP	= 000000
HERTZ	012244
HOE	= 100000 G
IAE	= 002000 G
IBE	= 010000 G
IC	002210
ICMSG	041636
IDU	= 000040 G
IE	= 000100 G
IER	= 020000 G
ILF	= 000001 G
ILLCMD=	000143 G
ILR	= 000002 G
ILV	= 000004 G
INCCYL	033126
ISR	= 000100 G
ISRCNT	002246 G
ISRV	023046
IT	002216
ITCNT	002244 G
ITMSG	041710
IXE	= 004000 G
IXU	= 000100 G
I\$AU	= 000041
I\$AUTO=	000041
I\$CLN	= 000041
I\$DU	= 000041
I\$HRD	= 000041
I\$INIT=	000041
I\$MOD	= 000041
I\$MSG	= 000041
I\$PROT=	000040
I\$PTAB=	000041
I\$PWR	= 000041
I\$RPT	= 000041
I\$SEG	= 000041
I\$SETU=	000041
I\$SFT	= 000041
I\$SRV	= 000041
I\$SUB	= 000041
I\$TST	= 000041
J\$JMP	= 000167
KWSRV	012414
LBC	= 002000 G
LC	002206
LCE	= 001000 G
LCLKTB	012234
LCMSG	041620
LDCMD	012724
LF	= 000012 G
LKS	012236
LKV	012240
LOE	= 040000 G
LOT	= 000010 G
LS	002222
LSMSG	041744
LST	= 002000 G
LT	002214
LTMSG	041672
L\$ACP	002110 G
L\$APT	002036 G
L\$AU	026754 G
L\$AUT	002070 G
L\$AUTO	026654 G
L\$CCP	002106 G
L\$CLEA	026656 G
L\$CO	002032 G
L\$DEPO	002011 G
L\$DESC	003036 G
L\$DESP	002076 G
L\$DEVP	002060 G
L\$DISP	002124 G
L\$DLY	002116 G
L\$DTP	002040 G
L\$DTYP	002034 G
L\$DU	026746 G
L\$DUT	002072 G
L\$DVTY	003030 G
L\$EF	002052 G
L\$ENVI	002044 G
L\$ETP	002102 G
L\$EXP1	002046 G
L\$EXP4	002064 G
L\$EXP5	002066 G
L\$HARD	041200 G
L\$HIME	002120 G
L\$HPCP	002016 G
L\$HPTP	002022 G
L\$HW	002172 G
L\$ICP	002104 G
L\$INIT	025632 G
L\$LADP	002026 G
L\$LAST	074766 G
L\$LOAD	002100 G
L\$LUN	002074 G
L\$MREV	002050 G
L\$NAME	002000 G
L\$PRIO	002042 G
L\$PROT	025624 G
L\$PRT	002112 G
L\$REPP	002062 G
L\$REV	002010 G
L\$RPT	025616 G
L\$SOFT	041316 G
L\$SPC	002056 G
L\$SPCP	002020 G
L\$SPTP	002024 G
L\$STA	002030 G
L\$SW	002204 G
L\$TEST	002114 G
L\$TIML	002014 G
L\$UNIT	002012 G
L10000	002202
L10001	002240
L10002	010364
L10003	010556
L10004	010700
L10005	010746
L10006	012424
L10007	012516
L10010	012670
L10011	015740
L10012	023114
L10013	025622
L10015	026652
L10016	026654
L10017	026744
L10020	026752
L10021	026760
L10022	027030
L10023	027026
L10024	027136
L10025	027062
L10026	027116
L10027	027370
L10030	027252
L10031	027336
L10032	027604
L10033	027466
L10034	027552
L10035	030034
L10036	027656
L10037	027666
L10040	027730
L10041	027740
L10042	030002
L10043	030012
L10044	030142
L10045	030110
L10046	030120
L10047	031220
L10050	030426
L10051	030732
L10052	032210
L10053	031306
L10054	031534
L10055	031726
L10056	033124
L10057	032464
L10060	032632
L10061	034002
L10062	033372
L10063	033536
L10064	034206
L10065	034154
L10066	034434
L10067	034326
L10070	034402
L10071	034624
L10072	034546
L10073	034610
L10074	036142
L10075	034722
L10076	035312
L10077	035656
L10100	036420
L10101	036300
L10102	036324
L10103	036376
L10104	037006
L10105	036556
L10106	036606
L10107	036702
L10110	036732
L10111	037330
L10112	037224
L10113	041174
L10114	037602
L10115	040246
L10116	040614
L10117	041244
L10120	041552
L10121	074772
L10123	075002
MAINT	= 000145 G
MARK	= 005122 G
MCPE	= 020000 G
MDPE	= 000400 G
MESG1	041244
MESG2	041257
MESG3	041273
MESG4	041304
MSGABV	017434
MSGAVG	017336
MSGBEL	017362
MSGLMT	005221 G
MSGMAX	017313
MSGMIN	017270
MSGNON	017615
MSGNUM	017506
MSGOPE	017563 G
MSGSEA	017533
MSPGE	= 002000 G
MSSC	= 100000 G
MXF	= 001000 G
MXSEEK	005055 G
NC1	002266 G
NC2	002270 G
NED	= 010000 G
NEDMSG	005270 G
NEM	= 004000 G
NOCLK	004317 G
NOOP	= 000101 G
NOTMSG	005362 G
NS1	002274 G
NT1	002272 G
OCTHEX	011532
OFFSET=	000115 G
OFLMSG	005327 G
OM	= 000001 G
ONECYL	004736 G
ONEFIL=	000001
OPI	= 020000 G
OPT	021364
O\$APTS=	000000
O\$AU	= 000000
O\$BGNR=	000000
O\$BGNS=	000001
O\$DU	= 000000
O\$ERRT=	000000
O\$GNSW=	000001
O\$POIN=	000001
O\$SETU=	000001
PARMSG	041552
PAT	002224
PATMSG	041762
PCLKTB	012220
PGE	= 100000 G
PHF	= 000400 G
PKB	012224
PKC	012226
PKCS	012222
PKV	012230
PNT	= 001000 G
POPQUE	025550
POSERR	004633 G
PRI	= 002000 G
PRI00	= 000000 G
PRI01	= 000040 G
PRI02	= 000100 G
PRI03	= 000140 G
PRI04	= 000200 G
PRI05	= 000240 G



PRI06 = 000300 G	RPLA 002710 G	STALMG 042501	TST13 034550	T##SW = 010001
PRI07 = 000340 G	RPMR1 002714 G	STALRD 002232	TST14A 034736	T##TES= 010113
PSTACK 011666	RPOF 002722 G	STALRM 042566	TST15 036312	T1 026762 G
QCNT 025056	RPSN 002720 G	STLTIM 042405	TST18A 037616	T1.1 027006
QDRV0 025150	RPSTU0 020200	STO 024200	TST18B 037724	T10 033130 G
QDRV1 025170	RPSTU1 020210	STOFLG 002233	TST18C 041132	T10.1 033250
QDRV2 025210	RPSTU2 020220	STOMSG 042353	TWOMS 012552	T10.1# 033252
QDRV3 025230	RPSTU3 020230	STOPCK 012364	TYPTIM 016504	T10.2 033416
QDRV4 025250	RPSTU4 020240	STRTMR 015742	TYTIME 002242 G	T10.2# 033404
QDRV5 025270	RPSTU5 020250	ST.CLK 012000	T\$ARGC= 000001	T10.3# 033572
QDRV6 025310	RPSTU6 020260	ST.LCL 012320	T\$CODE= 013130	T10.4# 033550
QDRV7 025330	RPSTU7 020270	ST.PCL 012246	T\$ERRN= 000024	T10.7# 033614
QINPT 025066	RPTMR 024104	SVCGBL = 000000	T\$EXCP= 000000	T10.8# 033720
QOUTPT 025106	RPVEC 002654 G	SVCINS= 000000	T\$FLAG= 000040	T11 034004 G
QSTART 025126	RPWC 002672 G	SVCSUB= 000000	T\$FREE= 075002	T11.1 034100
QSTOP 025130	RP07 021122	SVCTAG= 000000	T\$GMAN= 000000	T11.2# 034102
QTERP = 025350	RTC = 000117 G	SVCTST= 000000	T\$HILI= 177777	T11.5# 034156
RANADR 017716	RWU1 = 002000 G	SVRHXX 024644	T\$LAST= 000001	T12 034210 G
RAND 011712	RWU2 = 004000 G	SVSTAT 002264 G	T\$LOLI= 000000	T12.1 034300
RANPAT 002234	RWU3 = 010000 G	S\$LSYM= 010000	T\$LSYM= 010000	T12.2 034354
RDDAT = 000171 G	SAVREG 010750	TD 023116	T\$LTNO= 000022	T13 034436 G
RDHD = 000173 G	SC 023304	TEMPO 002240 G	T\$NEST= 177777	T13.1 034514
RDHDMG 042261	SCTRWC= 177400 G	TEST1 026770	T\$NSO = 000000	T13.1# 034616
RDTD = 000175 G	SC11 023612	TEST10 033160	T\$NS1 = 000005	T13.2 034556
RDY = 000200 G	SC12 023702	TEST13 034450	T\$NS2 = 000003	T14 034626 G
RD.RP 024426	SC13 023766	TEST14 034710	T\$PCNT= 000000	T14.1 034714
READIN= 000121 G	SC3 023354	TEST15 036162	T\$PTAB= 010122	T14.1# 035044
RECAL = 000107 G	SC4 023360	TEST16 036510	T\$PTHV= 000001	T14.2 035126
REDHDR 002226	SC5 023372	TEST17 037164	T\$PTNU= 000001	T14.3 035534
REG 002754 G	SC6 023534	TEST18 037470	T\$SAVL= 177777	T14.7# 035754
RELSE = 000113 G	SC8 023562	TEST3 027162	T\$SEGL= 177777	T14.8# 036060
RESREG 011002	SDF = 000020 G	TEST4 027414	T\$SEKO= 010000	T1410# 035126
REV 005204 G	SEABAD 004550 G	TEST5 027636	T\$SIZE= 000006	T1411# 035536
RHEXT 002660 G	SEAERR 004511 G	TEST6 030066	T\$SUBN= 000003	T1412# 035712
RHTYPE 002662 G	SEARCH= 000131 G	TEST7 030176	T\$TAGL= 177777	T1418 002502 G
RMR = 000004 G	SEC.DS 002306 G	TEST8 031252	T\$TAGN= 010124	T15 036144 G
ROTATE 004674 G	SEC.RD 002302 G	TEST9 032242	T\$TEMP= 000000	T15.1 036272
RPADR 002652 G	SEEK = 000105 G	TICKMS 012214	T\$TEST= 000022	T15.2 036310
RPAS 002706 G	SETFOR= 000147 G	TICKUS 012216	T\$TSTM= 177777	T15.3 036370
RPATMG 042202	SET.IE 025004	TIMER 020356	T\$TSTS= 000001	T16 036422 G
RPBA 002674 G	SFPTBL 002204 G	TIMMSG 042331	T\$#AU = 010021	T16.1 036542
RPBAE 002740 G	SIZE70 011034	TIMSTL 002230	T\$#AUT= 010016	T16.2 036560
RPCC 002726 G	SKI = 040000 G	TIMTYP 002227	T\$#CLE= 010017	T16.3 036666
RPCS1 002670 G	SNDIGT 004427 G	TIMT10 002452 G	T\$#DAT= 010123	T16.4 036704
RPCS2 002700 G	SPTYP 016354	TIMT11 002462 G	T\$#DU = 010020	T17 037010 G
RPCS3 002742 G	SP10 002520 G	TIMT12 002472 G	T\$#HAR= 010117	T17.1 037162
RPDA 002676 G	SP11 002526 G	TIM.DN 002330 G	T\$#HW = 010000	T18 037332 G
RPDB 002712 G	SP12 002534 G	TIM.PT 002346 G	T\$#INI= 010015	T18END 041112
RPDC 002724 G	SP1418 002542 G	TIM.UP 002312 G	T\$#MSG= 010005	T18OFL 041006
RPDS 002702 G	SP7 002512 G	TRE = 040000 G	T\$#PC = 000001	T18.1 037554
RPDT 002716 G	SRCHWT 020352	TRGSEC 002254 G	T\$#PRO= 010014	T18.2 040062
RPEC1 002734 G	SRCH00 015612	TRKWC 002354 G	T\$#PTA= 010122	T18.3 040472
RPEC2 002736 G	SRHSEC 002252 G	TRK.DS 002310 G	T\$#RPT= 010013	T1811# 040474
RPER1 002704 G	STALL 015410	TRK.RD 002300 G	T\$#SEG= 010000	T1812# 040650
RPER2 002730 G	STALLF 002231	TRNSWT 020350	T\$#SOF= 010120	T2 027032 G
RPER3 002732 G	STALL1 002356 G	TST12 034330	T\$#SRV= 010012	T2.1 027054
RPINIT 020400	STALL2 002360 G	TST12A 034404	T\$#SUB= 010116	T2.11 027054



T2.2	027110	T6	030036 G	T8.10\$	031762	T9.8\$	033042	WRTDAT=	000161 G
T2.21	027110	T6.1	030102	T8.2	031412	UAM =	000200 G	WRTEM	004432 G
T3	027140 G	T6.11	030104	T8.2\$	031546	UNIT =	002650 G	WRTTD =	000165 G
T3.1	027244	T6.2	030112	T8.3	031604	UNS =	040000 G	WRT.RP	024520
T3.11	027246	T7	030144 G	T8.3\$	031560	UNSMG	005237 G	WRYUNS=	000400 G
T3.2	027254	T7A	002442 G	T8.4\$	031570	UPE =	020000 G	XIT14	036114
T4	027372 G	T7.1	030312	T8.4\$	031570	VERIFY	015470	XIT18	041146
T4.1	027460	T7.1\$	030314	T8.5\$	031310	WCE =	040000 G	XTIMES	002250 G
T4.2	027470	T7.10\$	030440	T8.6\$	031774	WCEFLG	002350 G	X\$ALWA=	000000
T5	027606 G	T7.2	030616	T8.7\$	032022	WCF =	000040 G	X\$FALS=	000040
T5.1	027650	T7.2\$	030620	T8.8\$	032126	WCKD =	000151 G	X\$OFFS=	000400
T5.11	027652	T7.20\$	030554	T8.9\$	031740	WCKHD =	000153 G	X\$TRUE=	000020
T5.2	027660	T7.3\$	031016	T9	032212 G	WLE =	004000 G	\$DIV	011176
T5.3	027722	T7.44\$	030504	T9.1	032354	WOR =	001000 G	\$MULT	011420
T5.31	027724	T7.7\$	031032	T9.1\$	032336	WRITMG	042000	\$PATCH	042616 G
T5.4	027732	T7.8\$	031136	T9.2	032510	WRPAT	036544	\$RNCON	011772
T5.5	027774	T8	031222 G	T9.2\$	032476	WRPATN	036670	\$RP1	011774
T5.51	027776	T8.1	031300	T9.3\$	032666	WRSAFM	042047	\$RP2	011776
T5.6	030004	T8.1\$	031376	T9.4\$	032644	WRTALL	002235	\$FLG	017714
				T9.7\$	032710				

. ABS. 075002 000  
000000 001

ERRORS DETECTED: 0

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





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





DH44H	18-47#	19-14												
DH44I	18-48#	19-16												
DH44J	18-49#	19-17												
DH44K	18-50#	19-21												
DH44L	18-51#	19-22												
DH45	19-27#	31-22												
DH45A	18-53#	19-28												
DH45B	18-54#	19-29												
DH45C	18-55#	19-30												
DH45D	18-56#	19-31												
DH52	19-36#	63-148	67-209											
DH52A	18-58#	19-39												
DH52B	18-59#	19-40												
DIAG	12-208#	37-17												
DIAGMC	7-278	7-278												
DLT	12-40#	27-50												
DMD	12-99#	37-20	37-139	64-35	64-62	65-27	65-84							
DORTI	32-35#	56-39	57-34	58-29	59-28	63-46	67-88	67-214						
DOTWO	13-15#	57-20*	57-92	57-94*	60-31*	60-34	60-36*	60-41*	65-30*	65-48	65-50*	65-54*	65-73	65-75*
	66-43*	66-61	66-63*	66-67*										
DPB.A	16-3#	28-27	28-29	28-32	28-32	28-34	28-36	28-39	28-40*	28-42	28-44*	31-23*	44-105*	
	44-136*	44-137*	50-59*	52-26*	52-45*	52-50	53-25*	53-45						
DPB.B	16-27#	26-187*	26-190*	28-56	28-58	28-61	28-61	28-63	28-65	28-68	28-69*	28-71	28-73*	
	28-75	28-77	28-80	44-106*	50-60*	50-61*	51-15*	51-16*	51-17*	51-21*	51-22	51-24*	51-28*	51-29
	52-25*	52-27*	52-40*	52-45	52-55*	52-57	52-60*	52-62*	52-65*	52-66	52-68*	53-24*	53-26*	53-37*
	53-50*	53-52	53-55*	53-58*	53-61*	53-62	53-64*	54-18*	54-19*	54-25*	54-33*	54-40*	54-48*	54-55*
	54-63*	55-9*	55-10*	55-13*	55-21*									
DPB.C	16-51#	26-188*	26-191*	28-96	28-98	28-101	28-101	28-101	28-103	28-105	28-108	28-109*	28-111	28-113*
	28-116	28-118	28-121	44-107*	54-20*	54-21*	54-26*	54-34*	54-35	54-41*	54-49*	54-50	54-56*	54-64*
	54-65	55-11*	55-12*	55-14*	55-22*	55-23								
DPE	12-157#	27-101												
DPINT	35-64#	36-63*	36-79	36-130*	38-171	38-173*	38-239	38-256*						
DPRQS	35-77#	36-160	36-211*	36-243*	37-183*	37-196	37-212*	38-78	38-241	38-265*				
DRVACT	35-22#	36-166	37-157*	37-184*	37-194	37-211*	38-19*	38-89	38-123	38-133*	38-252*			
DRVCAL	29-9#	29-12	57-26	60-33	62-20	62-29	63-31	64-38	64-44	64-57	65-40	65-44	65-46	65-65
	65-69	65-71	66-57	66-59	67-72	67-74	67-204							
DRVCLR	12-202#													
DRVINT	36-39	36-62#	36-155	38-159	38-174									
DRVNO	17-8#	19-11	19-29	19-40	19-46	36-38	44-60*	44-63	44-105	44-106	44-107	44-108	44-113	44-114
	46-12	60-23	61-12	62-13	63-23	64-23	64-28	65-20	66-36	67-41				
DRVQUE	36-163	36-174	40-47#											
DRVSN	17-9#	44-126*	44-127											
DRVSTA	35-36#	36-31*	36-32*	36-33*	36-34*	36-43*	36-67*	36-76*	36-119*	36-124*	36-153	36-158	36-183	36-219
	36-223	37-228*	38-81	38-87	38-93	38-176	38-257*	44-64						
DRV TYP	35-51#	36-68*	36-87*	36-92*	36-97*	36-186	37-229*	44-67	64-29	64-31				
DSNMSG	18-62#	44-114												
DTADPB	16-75#	19-37	19-38	29-11	29-13	29-18	29-18	29-18	29-20	29-22	29-36	29-38	29-44	29-45
	32-12*	32-13*	32-14*	32-16	32-18	32-21	32-21	32-21	32-23	32-25	34-33*	34-57*	34-83*	44-108*
	56-54	56-54	56-56	56-70	56-86	56-86	56-88	56-98	56-111	56-111	56-113	57-21*	57-24*	57-38*
	57-39	57-43	57-52	57-52	57-54	57-61*	57-66*	57-67	57-71	57-80	57-80	57-82	57-91*	57-101
	57-101	57-103	58-43	58-43	58-45	58-63	58-63	58-65	58-81	58-81	58-85	59-40	59-40	59-42
	59-60	59-60	59-62	59-78	59-78	59-80	60-23*	60-24*	60-25*	60-26*	60-27*	60-28*	60-29*	60-30*
	60-37*	60-38*	60-42*	60-43*	60-45	60-49*	61-12*	61-13*	61-14*	61-15*	61-16*	61-17*	61-18*	61-19*
	61-29	61-30*	61-43	62-13*	62-14*	62-15*	62-16*	62-17*	62-18*	62-21	62-27*	62-30	63-23*	63-24*
	63-25*	63-26*	63-27*	63-54	63-73	63-75	63-93	63-93	63-95	63-118	63-125	63-135	63-135	63-137
	63-156	63-156	63-158	64-23*	64-24*	64-25*	64-26*	64-27*	64-35*	64-36*	64-40	64-43*	64-46	64-48











G\$DISP	7-278#													
G\$EXCP	7-278#													
G\$HILI	7-278#													
G\$LOLI	7-278#													
G\$NO	7-278#	69-38	69-44											
G\$OFFS	7-278#	68-55	68-57	68-59	68-61	69-14	69-18	69-20	69-22	69-24	69-26	69-28	69-30	69-32
	69-34	69-38	69-44	69-47	69-49	69-51	69-53	69-55	69-57	69-60				
G\$OFSI	7-278#	68-55	68-57	68-59	68-61	69-14	69-18	69-20	69-22	69-24	69-26	69-28	69-30	69-32
	69-34	69-38	69-44	69-47	69-49	69-51	69-53	69-55	69-57	69-60				
G\$PRMA	7-278#	68-55	68-57											
G\$PRMD	7-278#	68-59	68-61	69-18	69-20	69-22	69-24	69-26	69-28	69-30	69-32	69-34		
G\$PRML	7-278#	69-14	69-38	69-44	69-47	69-49	69-51	69-53	69-55	69-57	69-60			
G\$RADA	7-278#													
G\$RADB	7-278#													
G\$RADD	7-278#	69-18	69-20	69-22	69-24	69-26	69-28	69-30	69-32					
G\$RADL	7-278#	69-14	69-38	69-44	69-47	69-49	69-51	69-53	69-55	69-57	69-60			
G\$RADO	7-278#	68-55	68-57	68-59	68-61	69-34								
G\$XFER	7-278#	69-16	69-40	69-59										
G\$YES	7-278#	68-55	68-57	68-59	68-61	69-14	69-18	69-20	69-22	69-24	69-26	69-28	69-30	69-32
	69-34	69-47	69-49	69-51	69-53	69-55	69-57	69-60						
GETREG	12-223#	37-122												
GETREQ	36-212	37-201	38-37	38-83	38-120	38-125	38-180	38-244	38-259	38-266	40-68#			
HCE	12-86#	27-132	27-133	27-143										
HCI	12-171#													
HCRC	12-97#	27-132	27-133	27-143	27-145									
HELP	7-259#	7-273	7-295	7-312	7-326	8-10	9-15	10-32	11-4#	11-41	12-232	17-51	18-19	18-29
	18-137	18-149	19-51	40-94	40-103	40-110	42-4#	42-49	42-63	43-14	44-141	44-167	45-11	47-9
	47-20	48-10	48-21	49-5#	50-45	50-52	67-230	67-235	67-249	68-5#	68-77	68-87	69-63	69-104
	69-116	70-2												
HERTZ	26-14#	26-30#	26-45#	26-53	26-78#									
HOE	11-57#													
I\$AU	7-278#	48-9#	48-34#											
I\$AUTO	7-278#	45-10#	45-17#											
I\$CLN	7-278#	46-8#	46-24	46-26#										
I\$DU	7-278#	47-8#	47-33#											
I\$HRD	68-53#	68-62#												
I\$INIT	7-278#	44-8#	44-91	44-103	44-165	44-180#								
I\$MOD	7-278#	7-304	7-304#	10-40	10-40#	11-51	11-51#	41-1	41-1#	42-41	42-41#	48-35	48-35#	50-38
	50-38#	67-254	67-254#	68-43	68-43#	69-123	69-123#							
I\$MSG	7-278#	19-3#	19-25#	19-27#	19-34#	19-36#	19-43#	19-45#	19-49#					
I\$PROT	7-278#	43-8#												
I\$PTAB	7-278#	70-16	70-16#	70-21	70-21#									
I\$PWR	7-278#													
I\$RPT	7-278#	42-47#	42-76#											
I\$SEG	7-278#	50-57	50-62	51-14	51-18	51-25	52-23	52-46	52-49	53-22	53-41	53-44	54-17	54-27
	54-30	54-42	54-45	54-57	54-60	55-8	55-15	55-18	56-23	56-44	56-76	57-12	57-25	57-41
	57-69	58-15	58-34	58-52	59-14	59-29	59-49	60-20	60-32	61-9	61-20	61-31	62-10	62-19
	62-28	63-17	63-30	63-71	63-124	64-19	64-37	64-42	64-56	65-18	65-38	65-42	65-63	65-67
	66-25	66-52	67-29	67-70	67-127	67-180	67-203#	67-205#						
I\$SETU	7-278#	70-15	70-15#	70-16	70-22	70-22#								
I\$SFT	69-12#	69-71#												
I\$SRV	7-278#	26-112#	26-115#	26-130#	26-133#	26-165#	26-168#	32-34#	32-36#	38-4#	38-15#			
I\$SUB	7-278#	50-57	50-62	50-62#	50-67	50-67#	50-67#	51-14	51-18	51-18#	51-20	51-20#	51-20#	51-25
	51-25#	51-27	51-27#	51-27#	52-23	52-46	52-46#	52-48	52-48#	52-48#	52-49	52-49#	52-64	52-64#
	52-64#	53-22	53-41	53-41#	53-43	53-43#	53-43#	53-44	53-44#	53-60	53-60#	53-60#	54-17	54-27
	54-27#	54-29	54-29#	54-29#	54-30	54-30#	54-32	54-32#	54-32#	54-42	54-42#	54-44	54-44#	54-44#





L\$DESC	7-323	18-27#							
L\$DESP	7-323#								
L\$DEVP	7-323#								
L\$DISP	7-323	8-8#							
L\$DLY	7-323#								
L\$DTP	7-323#								
L\$DTYP	7-323#								
L\$DU	47-8#								
L\$DUT	7-323#								
L\$DVTY	7-323	18-17#							
L\$EF	7-323#								
L\$ENVI	7-323#								
L\$ETP	7-323#								
L\$EXP1	7-323#								
L\$EXP4	7-323#								
L\$EXP5	7-323#								
L\$HARD	7-323	68-53	68-53#						
L\$HIME	7-323#								
L\$HPCP	7-323#								
L\$HPTP	7-323#								
L\$HW	7-323	9-9	9-9#						
L\$ICP	7-323#								
L\$INIT	7-323	44-8#							
L\$LADP	7-323#								
L\$LAST	7-323	69-122#	70-22						
L\$LOAD	7-323#								
L\$LUN	7-323#								
L\$MREV	7-323#								
L\$NAME	7-323#								
L\$PRIO	7-323#								
L\$PROT	7-323	43-8#							
L\$PRT	7-323#								
L\$REPP	7-323#								
L\$REV	7-323#								
L\$RPT	42-47#								
L\$SOFT	7-323	69-12	69-12#						
L\$SPC	7-323#								
L\$SPCP	7-323#								
L\$SPTP	7-323#								
L\$STA	7-323#								
L\$SW	7-323	10-8	10-8#						
L\$TEST	7-323#	32-138	33-67	33-69	33-71	33-113	66-31	67-35	
L\$TIML	7-323#								
L\$UNIT	7-323#	44-34							
L10000	9-9	9-21#							
L10001	10-8	10-39#							
L10002	19-25#								
L10003	19-34#								
L10004	19-43#								
L10005	19-49#								
L10006	26-115#								
L10007	26-133#								
L10010	26-168#								
L10011	32-36#								
L10012	38-15#								
L10013	42-61	42-76#							

L10015	44-91	44-103	44-165	44-180#
L10016	45-17#			
L10017	46-24	46-26#		
L10020	47-18	47-33#		
L10021	48-19	48-34#		
L10022	50-68#			
L10023	50-67#			
L10024	51-31#			
L10025	51-20#			
L10026	51-27#			
L10027	52-71#			
L10030	52-48#			
L10031	52-64#			
L10032	53-67#			
L10033	53-43#			
L10034	53-60#			
L10035	54-67#			
L10036	54-29#			
L10037	54-32#			
L10040	54-44#			
L10041	54-47#			
L10042	54-59#			
L10043	54-62#			
L10044	55-25#			
L10045	55-17#			
L10046	55-20#			
L10047	56-26	56-120#		
L10050	56-57#			
L10051	56-89#			
L10052	57-15	57-18	57-110#	
L10053	57-27#			
L10054	57-55#			
L10055	57-83#			
L10056	58-18	58-21	58-92#	
L10057	58-46#			
L10060	58-66#			
L10061	59-17	59-20	59-87#	
L10062	59-43#			
L10063	59-63#			
L10064	60-52#			
L10065	60-44#			
L10066	61-45#			
L10067	61-25#			
L10070	61-36#			
L10071	62-35	62-38#		
L10072	62-25#			
L10073	62-34#			
L10074	63-35	63-165#		
L10075	63-32#			
L10076	63-96#			
L10077	63-138#			
L10100	64-63#			
L10101	64-39#			
L10102	64-45#			
L10103	64-58#			
L10104	65-85#			









QDRV1	39-15	39-26	39-35	39-47#										
QDRV2	39-16	39-27	39-36	39-48#										
QDRV3	39-17	39-28	39-37	39-49#										
QDRV4	39-18	39-29	39-38	39-50#										
QDRV5	39-19	39-30	39-39	39-51#										
QDRV6	39-20	39-31	39-40	39-52#										
QDRV7	39-21	39-32	39-41	39-53#										
QINPT	39-14#	40-34	40-51*	40-52*	40-53	40-55*								
QOUTPT	39-25#	40-34*	40-72	40-85	40-86*	40-87*	40-88	40-90*						
QSTART	39-34#	40-14	40-19	40-55	40-90									
QSTOP	39-35#	40-53	40-88											
QTERP	39-42	39-54#												
RANADR	34-8#	63-29	63-53	67-56	67-104									
RAND	25-7#	26-159	30-59	34-8	34-58	52-33	53-30	67-66	67-96					
RANPAT	10-26#	67-62	67-92											
RD.RP	36-83	36-108	36-114	37-98	37-113	37-128	38-28	38-56	38-287#	38-362				
RDDAT	12-215#	60-24	61-13	63-24	63-127									
RDHD	12-216#	26-187	26-188	28-75	28-116	64-43								
RDHDMG	69-49	69-93#												
RDTD	12-217#													
RDY	12-6#													
READIN	12-206#													
RECAL	12-201#	28-40	28-69	28-109	31-23	32-14	37-107	50-59	50-59	53-25	53-25			
REDHDR	10-19#	26-185												
REG	16-15	16-39	16-63	16-87	17-49#	19-5	19-11	19-11	19-11	19-11	19-11	19-11	19-14	19-14
	19-14	19-14	19-14	19-14	19-14	19-17	19-17	19-17	19-17	19-17	19-17	19-17	19-22	19-22
	60-30	61-19	62-17	63-27	65-25	66-42	67-44							
RELSE	12-203#													
RESREG	20-21#	32-52	36-46	36-192	36-195	36-255	37-231	38-13	38-217	38-378	40-23	56-54	56-86	56-111
	57-52	57-80	57-101	58-43	58-63	58-81	59-40	59-60	59-78	63-93	63-135	63-156	67-149	67-191
	67-220													
REV	14-14	14-19	14-24	18-76#										
RHEXT	17-6#	21-9*	21-18*	21-22*	21-28	38-375	44-50							
RHTYPE	17-7#	19-18	21-10*	21-38*	38-372	44-48								
RMR	12-81#	27-106												
ROTATE	14-6	18-70#												
RP07	28-26	28-41	28-55	28-70	28-95	28-110	29-10	29-35	32-15	36-144#				
RPADR	17-4#	38-374	44-57*											
RPAS	17-18#	36-113*	38-36*	38-54	38-140*	38-170*								
RPATMG	69-47	69-92#												
RPBA	17-13#	63-78*	67-134*											
RPBAE	17-31#													
RPCC	17-26#	36-177*	36-247*											
RPCS1	17-11#	36-70*	36-77	36-178	36-216*	36-250	37-15	37-52	37-77	38-43*	38-48*	38-49*	38-289	38-292
	38-296	38-320	38-325	38-327	38-331	38-388	44-37	56-47*	56-65*	56-78*	56-93*	57-44*	57-72*	58-35*
	58-55*	59-32*	59-52*	63-86*	63-110*	63-127*	67-142*	67-166*	67-183*					
RPCS2	17-15#	32-11*	36-37*	36-69*	36-71	36-162*	36-215*	37-16*	37-53*	37-78*	37-204	37-224*	38-27*	38-121*
	38-148*	38-169*	38-351*	38-357	38-389*	38-394	44-94*	44-113*	46-11*	46-12*	52-50*	53-45*	56-54*	56-54*
	56-69*	56-70*	56-86*	56-86*	56-97*	56-98*	56-111*	56-111*	56-113*	56-113*	57-52*	57-52*	57-80*	57-80*
	57-101*	57-101*	57-103*	57-103*	58-43*	58-43*	58-63*	58-63*	58-81*	58-81*	58-85*	58-85*	59-40*	59-40*
	59-60*	59-60*	59-78*	59-78*	59-80*	59-80*	63-93*	63-93*	63-117*	63-118*	63-135*	63-135*	63-156*	63-156*
	63-158*	63-158*	67-149*	67-149*	67-173*	67-174*	67-191*	67-191*	67-220*	67-220*	67-222*	67-222*		
RPCS3	17-32#													
RPDA	17-14#	32-28*	56-43*	63-76*	63-125*	67-132*	67-181*							
RPDB	17-20#													
RPDC	17-25#	32-29*	56-40*	57-43*	57-71*	58-32*	58-54*	59-31*	59-51*	63-73*	67-129*			

RPDS	17-16# 63-56	36-217 63-91	38-152 63-115	38-186 63-133	56-52 67-112	56-67 67-147	56-84 67-171	56-95 67-189	57-50	57-78	58-41	58-61	59-38	59-58	
RPDT	17-22#														
RPEC1	17-29#														
RPEC2	17-30#														
RPER1	17-17#	38-153													
RPER2	17-27#	38-154													
RPER3	17-28#	38-155													
RPINIT	36-15#	44-62	60-21	60-51	61-10	62-11	63-21	64-20	64-61	65-19	66-26	67-30	67-53		
RPLA	17-19#	52-51	53-46												
RPMR1	17-21#														
RPOF	17-24#														
RPSN	17-23#	44-115													
RPSTU0	35-11#	36-22	38-98	38-152*	38-153*	38-154*	38-155*								
RPSTU1	35-11#														
RPSTU2	35-11#														
RPSTU3	35-11#														
RPSTU4	35-11#														
RPSTU5	35-11#														
RPSTU6	35-11#														
RPSTU7	35-11#														
RPTMR	26-114	38-202#													
RPVEC	17-5# 57-109 67-201	36-36 57-109 67-201	36-36 58-29 67-214	36-147 58-83 67-214	44-58* 58-83 67-229	44-59* 58-91 67-229	44-89 58-91	44-89 59-28	44-101 59-86	46-23 59-86	56-39 63-46	56-119 63-164	56-119 63-164	57-34 67-88	
RPWC	17-12#	63-77*	67-133*												
RTC	12-205#	37-109	62-27												
RWU1	12-148#	27-153													
RWU2	12-149#	27-153													
RWU3	12-150#	27-153													
S\$LSYM	7-278# 45-17# 53-67# 57-27# 61-45# 65-66#	9-21# 46-26# 54-29# 57-55# 62-25# 65-72#	10-39# 47-33# 54-32# 57-83# 62-34# 65-85#	19-25# 48-34# 54-44# 57-110# 62-38# 66-60#	19-34# 50-67# 54-47# 58-46# 63-32# 66-83#	19-43# 50-68# 54-59# 58-66# 63-96# 67-75#	19-49# 51-20# 54-62# 58-92# 63-138# 67-152#	19-49# 51-27# 54-67# 59-43# 63-165# 67-194#	26-115# 51-31# 55-17# 59-63# 64-39# 67-203	26-133# 52-48# 55-20# 59-87# 64-45# 67-203	26-168# 52-64# 55-25# 60-44# 64-58# 67-203#	32-36# 52-71# 56-57# 60-52# 64-63# 67-247#	38-15# 53-43# 56-89# 61-25# 64-63# 68-62#	42-76# 53-60# 56-120# 61-36# 65-47# 69-71#	44-180# 53-60# 56-120# 61-36# 65-47# 69-71#
SAVREG	20-6# 57-80	32-43 57-101	36-15 58-43	36-149 58-63	36-208 58-81	37-191 59-40	38-7 59-60	38-205 59-78	38-348 63-93	40-7 63-135	56-54 63-156	56-86 67-149	56-111 67-191	57-52 67-220	
SC	38-12	38-41	38-44	38-50	38-54#										
SC11	38-122	38-132#													
SC12	38-85	38-91	38-148#												
SC13	38-80	38-166#													
SC3	38-70#	38-74													
SC4	38-72#	38-111	38-115	38-130	38-146	38-195									
SC5	38-71	38-77#													
SC6	38-90	38-117#													
SC8	38-107	38-123#	38-164												
SCTRWC	12-219#	61-14	61-30	64-24											
SDF	12-158#														
SEABAD	18-66#	56-73	63-121	67-177											
SEAERR	18-65#	56-60	63-99	67-155											
SEARCH	12-207#	37-70	37-80	56-47	56-65	56-78	56-93	63-86	63-110	67-142	67-166				
SEC.DS	13-30#	19-29	19-31	28-32*	28-61*	28-101*	29-18*	31-18*	32-21*						
SEC.RD	13-28# 67-220*	19-4	19-31	27-20*	28-6	28-8*	28-14*	30-14*	31-17*	56-111*	57-101*	58-81*	59-78*	63-156*	
SEEK	12-200#	26-190	26-191	37-88	52-26	52-26	57-24	57-44	57-72	58-35	58-55	59-32	59-52	64-36	











33-56	33-56	33-56	33-56	33-57	33-57	33-57	33-57	33-57	33-57	33-57	33-57	33-57	33-57
33-66	33-66	33-66	33-66	33-66	33-66	33-66	33-66	33-66	33-66	33-66	33-66	33-66	33-66
33-73	33-73	33-73	33-73	33-73	33-73	33-73	33-73	33-73	33-73	33-73	33-73	33-73	33-73
33-75	33-75	33-75	33-75	33-75	33-75	33-75	33-75	33-75	33-75	33-75	33-75	33-75	33-75
33-77	33-77	33-77	33-77	33-77	33-77	33-77	33-77	33-77	33-77	33-77	33-77	33-77	33-77
36-36	36-36	36-36	36-36	36-36	36-36	36-36	36-36	36-36	36-36	36-36	36-36	36-36	36-36
36-45	36-45	36-145	36-145	36-145	36-145	36-147	36-147	36-147	36-147	36-147	36-199	36-199	36-199
36-209	36-209	36-209	36-209	36-254	36-254	36-254	36-254	36-254	36-254	36-254	36-199	36-199	36-199
42-76	42-76	44-10	44-10	44-16	44-16	44-16	44-16	44-16	44-16	44-18	42-61	42-61	42-61
44-22	44-22	44-25	44-25	44-25	44-25	44-27	44-27	44-27	44-27	44-29	44-20	44-20	44-20
44-29	44-29	44-29	44-29	44-39	44-39	44-39	44-39	44-39	44-39	44-39	44-29	44-29	44-29
44-71	44-71	44-71	44-71	44-71	44-71	44-71	44-71	44-71	44-71	44-71	44-40	44-40	44-40
44-73	44-73	44-73	44-73	44-73	44-73	44-73	44-73	44-73	44-73	44-75	44-73	44-73	44-73
44-75	44-75	44-75	44-75	44-75	44-75	44-77	44-77	44-77	44-77	44-75	44-75	44-75	44-75
44-77	44-77	44-77	44-77	44-85	44-85	44-85	44-85	44-85	44-85	44-77	44-77	44-77	44-77
44-89	44-89	44-89	44-89	44-89	44-89	44-89	44-89	44-89	44-89	44-85	44-85	44-85	44-85
44-91	44-91	44-98	44-98	44-98	44-98	44-89	44-89	44-89	44-89	44-89	44-89	44-89	44-89
44-102	44-102	44-103	44-103	44-103	44-103	44-100	44-100	44-100	44-100	44-100	44-101	44-101	44-101
44-114	44-114	44-114	44-114	44-114	44-114	44-114	44-114	44-114	44-114	44-114	44-114	44-114	44-114
44-127	44-127	44-132	44-132	44-127	44-127	44-127	44-127	44-127	44-127	44-127	44-127	44-127	44-127
44-165	44-165	44-180	44-180	44-132	44-132	44-132	44-132	44-132	44-132	44-132	44-132	44-132	44-132
46-21	46-21	46-21	46-21	45-17	45-17	46-10	46-10	46-10	46-10	46-10	46-18	46-18	46-18
47-18	47-18	47-18	47-18	46-23	46-23	46-23	46-23	46-23	46-23	46-24	46-18	46-18	46-18
50-67	50-67	50-68	50-68	47-33	47-33	48-19	48-19	48-19	48-19	48-19	46-24	46-24	46-24
52-46	52-46	52-48	52-48	51-18	51-18	51-20	51-20	51-20	51-20	51-25	48-34	48-34	50-62
53-44	53-44	53-60	53-60	52-49	52-49	52-64	52-64	52-64	52-64	52-71	51-27	51-27	51-31
54-42	54-42	54-44	54-44	53-67	53-67	54-27	54-27	54-27	54-27	54-29	53-41	53-41	53-43
54-62	54-62	54-67	54-67	54-45	54-45	54-47	54-47	54-47	54-47	54-57	54-30	54-30	54-32
56-26	56-26	56-26	56-26	55-15	55-15	55-17	55-17	55-17	55-17	55-18	54-59	54-59	54-60
56-37	56-37	56-39	56-39	56-37	56-37	56-37	56-37	56-37	56-37	55-18	55-20	55-20	55-25
56-44	56-44	56-57	56-57	56-39	56-39	56-39	56-39	56-39	56-39	55-18	55-20	55-20	55-25
56-61	56-61	56-61	56-61	56-60	56-60	56-60	56-60	56-60	56-60	56-37	56-37	56-37	56-37
56-73	56-73	56-73	56-73	56-61	56-61	56-61	56-61	56-61	56-61	56-39	56-39	56-39	56-39
56-74	56-74	56-76	56-76	56-73	56-73	56-73	56-73	56-73	56-73	56-60	56-60	56-60	56-60
56-112	56-112	56-112	56-112	56-74	56-74	56-74	56-74	56-74	56-74	56-61	56-73	56-73	56-73
56-119	56-119	56-120	56-120	56-89	56-89	56-110	56-110	56-110	56-110	56-74	56-74	56-74	56-74
57-27	57-27	57-32	57-32	56-119	56-119	56-119	56-119	56-119	56-119	56-110	56-112	56-112	56-112
57-34	57-34	57-34	57-34	57-15	57-15	57-15	57-15	57-15	57-15	56-110	56-112	56-112	56-112
57-55	57-55	57-69	57-69	57-32	57-32	57-32	57-32	57-32	57-32	56-119	56-119	56-119	56-119
57-86	57-86	57-100	57-100	57-34	57-34	57-34	57-34	57-34	57-34	57-18	57-18	57-18	57-18
57-109	57-109	57-109	57-109	57-83	57-83	57-86	57-86	57-86	57-86	57-18	57-18	57-18	57-18
58-18	58-18	58-18	58-18	57-100	57-100	57-102	57-102	57-102	57-102	57-32	57-32	57-32	57-32
58-27	58-27	58-27	58-27	57-109	57-109	57-109	57-109	57-109	57-109	57-34	57-34	57-34	57-34
58-29	58-29	58-29	58-29	58-21	58-21	58-21	58-21	58-21	58-21	57-86	57-86	57-86	57-86
58-69	58-69	58-69	58-69	58-27	58-27	58-29	58-29	58-29	58-29	57-86	57-86	57-86	57-86
58-83	58-83	58-83	58-83	58-34	58-34	58-46	58-46	58-46	58-46	57-102	57-102	57-102	57-102
58-84	58-84	58-84	58-84	58-69	58-69	58-69	58-69	58-69	58-69	57-109	57-109	57-109	57-109
58-91	58-91	58-92	58-92	58-83	58-83	58-83	58-83	58-83	58-83	57-109	57-109	57-109	57-109
59-26	59-26	59-26	59-26	58-91	58-91	58-91	58-91	58-91	58-91	58-27	58-27	58-27	58-27
59-28	59-28	59-28	59-28	59-17	59-17	59-17	59-17	59-17	59-17	58-29	58-29	58-29	58-29
59-63	59-63	59-66	59-66	59-26	59-26	59-26	59-26	59-26	59-26	58-52	58-52	58-52	58-52
59-77	59-77	59-79	59-79	59-28	59-28	59-28	59-28	59-28	59-28	58-66	58-66	58-66	58-66
59-86	59-86	59-86	59-86	59-66	59-66	59-66	59-66	59-66	59-66	58-80	58-80	58-80	58-80
60-52	60-52	61-20	61-20	59-83	59-83	59-86	59-86	59-86	59-86	58-83	58-83	58-83	58-83
61-31	61-31	61-35	61-35	59-91	59-91	59-91	59-91	59-91	59-91	58-84	58-84	58-84	58-84
62-19	62-19	62-24	62-24	59-97	59-97	59-97	59-97	59-97	59-97	58-91	58-91	58-91	58-91
				59-17	59-17	59-17	59-17	59-17	59-17	59-20	59-20	59-20	59-20
				59-26	59-26	59-26	59-26	59-26	59-26	59-20	59-20	59-20	59-20
				59-28	59-28	59-28	59-28	59-28	59-28	59-26	59-26	59-26	59-26
				59-66	59-66	59-66	59-66	59-66	59-66	59-28	59-28	59-28	59-28
				59-79	59-79	59-79	59-79	59-79	59-79	59-43	59-43	59-43	59-43
				59-86	59-86	59-86	59-86	59-86	59-86	59-66	59-66	59-66	59-66
				61-24	61-24	61-24	61-24	61-24	61-24	59-77	59-77	59-77	59-77
				61-35	61-35	61-35	61-35	61-35	61-35	59-86	59-86	59-86	59-86
				62-24	62-24	62-24	62-24	62-24	62-24	60-32	60-32	60-32	60-32
										61-24	61-24	61-24	61-24
										61-36	61-36	61-36	61-36
										61-45	61-45	61-45	61-45
										62-25	62-25	62-25	62-25
										62-28	62-28	62-28	62-28



	62-33	62-33	62-33	62-33	62-33	62-33	62-33	62-33	62-33	62-34	62-34	62-35	62-35	62-35	62-35
	62-38	62-38	63-30	63-30	63-32	63-32	63-35	63-35	63-35	63-35	63-35	63-44	63-44	63-44	63-44
	63-44	63-44	63-44	63-44	63-44	63-44	63-44	63-44	63-44	63-46	63-46	63-46	63-46	63-46	63-46
	63-46	63-46	63-46	63-46	63-46	63-46	63-71	63-71	63-71	63-96	63-96	63-99	63-99	63-99	63-99
	63-99	63-99	63-99	63-99	63-99	63-99	63-100	63-100	63-100	63-100	63-100	63-100	63-100	63-100	63-100
	63-100	63-100	63-121	63-121	63-121	63-121	63-121	63-121	63-121	63-121	63-121	63-121	63-121	63-121	63-121
	63-122	63-122	63-122	63-122	63-122	63-122	63-122	63-122	63-122	63-124	63-124	63-138	63-138	63-138	63-138
	63-141	63-141	63-141	63-141	63-141	63-141	63-141	63-141	63-141	63-148	63-148	63-148	63-148	63-148	63-148
	63-148	63-148	63-155	63-155	63-155	63-155	63-157	63-157	63-157	63-157	63-157	63-157	63-157	63-157	63-157
	63-164	63-164	63-164	63-164	63-164	63-164	63-164	63-164	63-164	63-164	63-164	63-164	63-164	63-165	63-165
	64-33	64-33	64-33	64-33	64-33	64-33	64-33	64-33	64-33	64-34	64-34	64-37	64-37	64-39	64-39
	64-42	64-42	64-45	64-45	64-56	64-56	64-58	64-58	64-58	64-63	64-63	65-38	65-38	65-41	65-41
	65-42	65-42	65-47	65-47	65-63	65-63	65-66	65-66	65-66	65-67	65-67	65-72	65-72	65-85	65-85
	66-31	66-31	66-31	66-31	66-31	66-31	66-31	66-31	66-31	66-31	66-31	66-31	66-31	66-33	66-33
	66-33	66-33	66-52	66-52	66-60	66-60	66-83	66-83	66-83	67-35	67-35	67-35	67-35	67-35	67-35
	67-35	67-35	67-35	67-35	67-35	67-35	67-37	67-37	67-37	67-37	67-37	67-70	67-70	67-75	67-75
	67-78	67-78	67-78	67-78	67-86	67-86	67-86	67-86	67-86	67-86	67-86	67-86	67-86	67-86	67-86
	67-86	67-86	67-88	67-88	67-88	67-88	67-88	67-88	67-88	67-88	67-88	67-88	67-88	67-88	67-88
	67-127	67-127	67-152	67-152	67-155	67-155	67-155	67-155	67-155	67-155	67-155	67-155	67-155	67-155	67-155
	67-156	67-156	67-156	67-156	67-156	67-156	67-156	67-156	67-156	67-156	67-156	67-177	67-177	67-177	67-177
	67-177	67-177	67-177	67-177	67-177	67-177	67-178	67-178	67-178	67-178	67-178	67-178	67-178	67-178	67-178
	67-178	67-178	67-180	67-180	67-194	67-194	67-197	67-197	67-197	67-197	67-197	67-197	67-197	67-197	67-197
	67-197	67-197	67-201	67-201	67-201	67-201	67-201	67-201	67-201	67-201	67-201	67-201	67-201	67-201	67-201
	67-203	67-203	67-205	67-205	67-209	67-209	67-209	67-209	67-209	67-209	67-209	67-209	67-209	67-214	67-214
	67-214	67-214	67-214	67-214	67-214	67-214	67-214	67-214	67-214	67-214	67-214	67-219	67-219	67-219	67-219
	67-221	67-221	67-221	67-221	67-221	67-221	67-221	67-221	67-221	67-221	67-221	67-229	67-229	67-229	67-229
	67-229	67-229	67-229	67-229	67-229	67-229	67-247	67-247	67-247	67-247	67-247	67-247	67-247	67-247	67-247
	68-55	68-55	68-55	68-55	68-57	68-57	68-57	68-57	68-57	68-57	68-57	68-57	68-57	68-57	68-57
	68-59	68-59	68-59	68-59	68-59	68-59	68-59	68-59	68-59	68-61	68-61	68-61	68-61	68-61	68-61
	68-61	68-61	68-61	68-61	68-62	68-62	69-12	69-12	69-12	69-14	69-14	69-14	69-14	69-14	69-14
	69-16	69-16	69-18	69-18	69-18	69-18	69-18	69-18	69-18	69-18	69-18	69-18	69-18	69-20	69-20
	69-20	69-20	69-20	69-20	69-20	69-20	69-20	69-20	69-20	69-22	69-22	69-22	69-22	69-22	69-22
	69-22	69-22	69-22	69-22	69-24	69-24	69-24	69-24	69-24	69-24	69-24	69-24	69-24	69-24	69-24
	69-26	69-26	69-26	69-26	69-26	69-26	69-26	69-26	69-26	69-26	69-26	69-28	69-28	69-28	69-28
	69-28	69-28	69-28	69-28	69-28	69-28	69-30	69-30	69-30	69-30	69-30	69-30	69-30	69-30	69-30
	69-30	69-30	69-32	69-32	69-32	69-32	69-32	69-32	69-32	69-32	69-32	69-32	69-32	69-34	69-34
	69-34	69-34	69-34	69-34	69-34	69-34	69-34	69-34	69-34	69-38	69-38	69-38	69-38	69-38	69-38
	69-40	69-40	69-44	69-44	69-44	69-44	69-44	69-44	69-44	69-47	69-47	69-47	69-47	69-47	69-47
	69-49	69-49	69-49	69-49	69-49	69-49	69-51	69-51	69-51	69-51	69-51	69-51	69-51	69-53	69-53
	69-53	69-53	69-53	69-53	69-55	69-55	69-55	69-55	69-55	69-55	69-55	69-57	69-57	69-57	69-57
	69-57	69-57	69-59	69-59	69-60	69-60	69-60	69-60	69-60	69-60	69-60	69-71	69-71	69-122	69-122
	69-122	69-122	69-122	69-122	70-16	70-16	70-16	70-16	70-16	70-16	70-16	70-16	70-16	70-16	70-16
SVCSUB	7-278#	7-286#	50-62	50-62	50-62	51-18	51-18	51-18	51-18	51-25	51-25	51-25	52-46	52-46	52-46
	52-49	52-49	52-49	53-41	53-41	53-41	53-44	53-44	53-44	54-27	54-27	54-27	54-30	54-30	54-30
	54-30	54-42	54-42	54-42	54-45	54-45	54-45	54-45	54-45	54-57	54-57	54-60	54-60	54-60	55-15
	55-15	55-15	55-18	55-18	55-18	56-44	56-44	56-44	56-44	56-76	56-76	56-76	57-25	57-25	57-25
	57-41	57-41	57-41	57-69	57-69	57-69	58-34	58-34	58-34	58-52	58-52	58-52	59-29	59-29	59-29
	59-29	59-49	59-49	59-49	60-32	60-32	60-32	60-32	61-20	61-20	61-20	61-31	61-31	61-31	62-19
	62-19	62-19	62-28	62-28	62-28	63-30	63-30	63-30	63-30	63-71	63-71	63-71	63-124	63-124	63-124
	64-37	64-37	64-37	64-42	64-42	64-42	64-42	64-42	64-56	64-56	64-56	65-38	65-38	65-42	65-42
	65-42	65-63	65-63	65-63	65-67	65-67	65-67	65-67	66-52	66-52	66-52	67-70	67-70	67-70	67-127
	67-127	67-127	67-180	67-180	67-180	67-180	67-180	67-180	67-180	67-180	67-180	67-180	67-180	67-180	67-180
SVCTAG	7-278#	7-288#	9-21	9-21	9-21	10-39	10-39	10-39	10-39	19-25	19-25	19-25	19-34	19-34	19-34
	19-43	19-43	19-43	19-49	19-49	19-49	26-115	26-115	26-115	26-133	26-133	26-133	26-168	26-168	26-168
	26-168	32-36	32-36	32-36	38-15	38-15	38-15	38-15	42-76	42-76	42-76	44-180	44-180	44-180	45-17
	45-17	45-17	46-26	46-26	46-26	47-33	47-33	47-33	47-33	48-34	48-34	48-34	50-67	50-67	50-67



	50-68	50-68	50-68	51-20	51-20	51-20	51-27	51-27	51-27	51-31	51-31	51-31	52-48	52-48
	52-48	52-64	52-64	52-64	52-71	52-71	52-71	53-43	53-43	53-43	53-60	53-60	53-60	53-67
	53-67	53-67	54-29	54-29	54-29	54-32	54-32	54-44	54-44	54-44	54-47	54-47	54-47	54-47
	54-59	54-59	54-59	54-62	54-62	54-62	54-67	54-67	54-67	55-17	55-17	55-17	55-20	55-20
	55-20	55-25	55-25	55-25	56-57	56-57	56-57	56-89	56-89	56-89	56-120	56-120	56-120	57-27
	57-27	57-27	57-55	57-55	57-55	57-83	57-83	57-83	57-110	57-110	57-110	58-46	58-46	58-46
	58-66	58-66	58-66	58-92	58-92	58-92	59-43	59-43	59-43	59-63	59-63	59-63	59-87	59-87
	59-87	60-44	60-44	60-44	60-52	60-52	60-52	61-25	61-25	61-25	61-36	61-36	61-36	61-45
	61-45	61-45	62-25	62-25	62-25	62-34	62-34	62-34	62-38	62-38	62-38	63-32	63-32	63-32
	63-96	63-96	63-96	63-138	63-138	63-138	63-165	63-165	63-165	64-39	64-39	64-39	64-45	64-45
	64-45	64-58	64-58	64-58	64-63	64-63	64-63	65-41	65-41	65-41	65-47	65-47	65-47	65-66
	65-66	65-66	65-72	65-72	65-72	65-85	65-85	65-85	66-60	66-60	66-60	66-83	66-83	66-83
	67-75	67-75	67-75	67-152	67-152	67-152	67-194	67-194	67-194	67-205	67-205	67-205	67-247	67-247
SVCTST	67-247	68-62	68-62	68-62	69-71	69-71	69-71	70-16	70-16	70-16	70-21	70-21	70-21	70-21
	7-278#	7-285#	50-57	50-57	50-57	51-14	51-14	51-14	52-23	52-23	52-23	53-22	53-22	53-22
	54-17	54-17	54-17	55-8	55-8	55-8	56-23	56-23	56-23	57-12	57-12	57-12	58-15	58-15
	58-15	59-14	59-14	59-14	60-20	60-20	60-20	61-9	61-9	61-9	62-10	62-10	62-10	63-17
SVRHXX	63-17	63-17	64-19	64-19	64-19	65-18	65-18	65-18	66-25	66-25	66-25	67-29	67-29	67-29
	37-151	38-33	38-47	38-84	38-139	38-182	38-251	38-270	38-348#	56-54	56-86	56-111	57-52	57-80
	57-101	58-43	58-63	58-81	59-40	59-60	59-78	63-93	63-135	63-156	67-149	67-191	67-220	67-220
SVSTAT	13-19#	27-16*	27-173*	27-176*	27-179*	27-183*	27-186*	27-189*	27-192*	27-195*	27-198*	28-37	28-66	28-106
	56-58	56-90	57-56	57-84	58-47	58-67	59-44	59-64	63-97	63-139	67-153	67-195		
T\$AU	48-9#	48-19	48-34											
T\$AUT	45-10#	45-17												
T\$CLE	46-8#	46-24	46-26											
T\$DAT	70-16	70-16#	70-21											
T\$DU	47-8#	47-18	47-33											
T\$HAR	68-53	68-53#	68-62											
T\$HW	9-9	9-9#	9-21											
T\$INI	44-8#	44-91	44-103	44-165	44-180									
T\$MSG	19-3#	19-25	19-27#	19-34	19-36#	19-43	19-45#	19-49						
T\$PC	70-15#	70-22												
T\$PRO	43-8#													
T\$PTA	70-15#	70-16	70-16#											
T\$RPT	42-47#	42-61	42-76											
T\$SEG	67-203	67-203#	67-205	67-205#										
T\$SOF	69-12	69-12#	69-71											
T\$SRV	26-112#	26-115	26-130#	26-133	26-165#	26-168	32-34#	32-36	38-4#	38-15				
T\$SUB	50-62#	50-67	51-18#	51-20	51-25#	51-27	52-46#	52-48	52-49#	52-64	53-41#	53-43	53-44#	53-60
	54-27#	54-29	54-30#	54-32	54-42#	54-44	54-45#	54-47	54-57#	54-59	54-60#	54-62	55-15#	55-17
	55-18#	55-20	56-44#	56-57	56-76#	56-89	57-25#	57-27	57-41#	57-55	57-69#	57-83	58-34#	58-46
	58-52#	58-66	59-29#	59-43	59-49#	59-63	60-32#	60-44	61-20#	61-25	61-31#	61-36	62-19#	62-25
	62-28#	62-34	63-30#	63-32	63-71#	63-96	63-124#	63-138	64-37#	64-39	64-42#	64-45	64-56#	64-58
	65-38#	65-41	65-42#	65-47	65-63#	65-66	65-67#	65-72	66-52#	66-60	67-70#	67-75	67-127#	67-152
	67-180#	67-194												
T\$SW	10-8	10-8#	10-39											
T\$TES	50-57#	50-68	51-14#	51-31	52-23#	52-71	53-22#	53-67	54-17#	54-67	55-8#	55-25	56-23#	56-26
	56-120	57-12#	57-15	57-18	57-110	58-15#	58-18	58-21	58-92	59-14#	59-17	59-20	59-87	60-20#
	60-52	61-9#	61-45	62-10#	62-35	62-38	63-17#	63-35	63-165	64-19#	64-63	65-18#	65-85	66-25#
	66-33	66-83	67-29#	67-37	67-78	67-247								
T\$ARGC	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323#	7-323#	7-323#
	7-323#	7-323#	7-323#	19-4	19-4	19-4	19-4	19-4	19-4#	19-4#	19-4#	19-4#	19-8	19-8
	19-8	19-8	19-8	19-8	19-8#	19-8#	19-8#	19-8#	19-8#	19-10	19-10	19-10#	19-11	19-11
	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#
	19-11#	19-13	19-13	19-13#	19-14	19-14	19-14	19-14	19-14	19-14	19-14	19-14	19-14	19-14#
	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-16	19-16	19-16#	19-17	19-17	19-17	19-17



	19-17	19-17	19-17	19-17	19-17	19-17#	19-17#	19-17#	19-17#	19-17#	19-17#	19-17#	19-17#	19-21
	19-21	19-21#	19-22	19-22	19-22	19-22	19-22#	19-22#	19-22#	19-24	19-24	19-24#	19-28	19-28
	19-28#	19-29	19-29	19-29	19-29	19-29	19-29#	19-29#	19-29#	19-29#	19-29#	19-29#	19-30	19-30
	19-30#	19-31	19-31	19-31	19-31	19-31	19-31	19-31	19-31	19-31#	19-31#	19-31#	19-31#	19-31#
	19-31#	19-31#	19-33	19-33	19-33#	19-39	19-39	19-39#	19-40	19-40	19-40	19-40	19-40	19-40
	19-40	19-40#	19-40#	19-40#	19-40#	19-40#	19-40#	19-42	19-42	19-42#	19-46	19-46	19-46	19-46#
	19-46#	19-48	19-48	19-48#	32-165	32-165	32-165#	32-168	32-168	32-168	32-168#	32-168#	32-171	32-171
	32-171	32-171#	32-171#	32-173	32-173	32-173#	33-40	33-40	33-40#	33-43	33-43	33-43#	33-45	33-45
	33-45	33-45#	33-45#	33-50	33-50	33-50	33-50	33-50#	33-50#	33-50#	33-51	33-51	33-51	33-51#
	33-51#	33-56	33-56	33-56	33-56	33-56#	33-56#	33-56#	33-57	33-57	33-57#	33-66	33-66	33-66
	33-66#	33-66#	33-73	33-73	33-73	33-73#	33-73#	33-75	33-75	33-75	33-75#	33-75#	33-77	33-77
	33-77	33-77#	33-77#	44-29	44-29	44-29#	44-71	44-71	44-71	44-71#	44-71#	44-73	44-73	44-73
	44-73#	44-73#	44-75	44-75	44-75	44-75#	44-75#	44-77	44-77	44-77	44-77#	44-77#	44-85	44-85
	44-85#	44-114	44-114	44-114	44-114#	44-114#	44-127	44-127	44-127	44-127#	44-127#	44-132	44-132	44-132#
	56-60	56-60	56-60#	56-61	56-61	56-61#	56-73	56-73	56-73#	56-74	56-74	56-74#	57-86	57-86
	57-86#	58-69	58-69	58-69#	59-66	59-66	59-66#	63-99	63-99	63-99#	63-100	63-100	63-100#	63-121
	63-121	63-121#	63-122	63-122	63-122#	63-141	63-141	63-141#	66-31	66-31	66-31	66-31#	66-31#	67-35
	67-35	67-35	67-35#	67-35#	67-155	67-155	67-155#	67-156	67-156	67-156#	67-177	67-177	67-177#	67-178
	67-178	67-178#	67-197	67-197	67-197#									
T\$CODE	68-55	68-55	68-55	68-55#	68-55#	68-55#	68-57	68-57	68-57	68-57#	68-57#	68-57#	68-59	68-59
	68-59	68-59#	68-59#	68-59#	68-61	68-61	68-61#	68-61#	68-61#	68-61#	69-14	69-14	69-14	69-14#
	69-14#	69-14#	69-16	69-16	69-16	69-16	69-16	69-16#	69-16#	69-16#	69-16#	69-16#	69-18	69-18
	69-18	69-18#	69-18#	69-18#	69-20	69-20	69-20	69-20#	69-20#	69-20#	69-22	69-22	69-22	69-22#
	69-22#	69-22#	69-24	69-24	69-24	69-24#	69-24#	69-24#	69-24#	69-26	69-26	69-26#	69-26#	69-26#
	69-28	69-28	69-28	69-28#	69-28#	69-28#	69-30	69-30	69-30	69-30#	69-30#	69-30#	69-32	69-32
	69-32	69-32#	69-32#	69-32#	69-34	69-34	69-34	69-34#	69-34#	69-34#	69-38	69-38	69-38	69-38#
	69-38#	69-38#	69-40	69-40	69-40	69-40	69-40	69-40#	69-40#	69-40#	69-40#	69-40#	69-44	69-44
	69-44	69-44#	69-44#	69-44#	69-47	69-47	69-47	69-47#	69-47#	69-47#	69-49	69-49	69-49	69-49#
	69-49#	69-49#	69-51	69-51	69-51	69-51#	69-51#	69-51#	69-53	69-53	69-53	69-53#	69-53#	69-53#
	69-55	69-55	69-55	69-55#	69-55#	69-55#	69-57	69-57	69-57	69-57#	69-57#	69-57#	69-59	69-59
T\$ERRN	69-59	69-59	69-59	69-59	69-59#	69-59#	69-59#	69-59#	69-60	69-60	69-60	69-60#	69-60#	69-60#
	7-278#	27-27	27-27#	27-35	27-35#	27-42	27-42#	27-47	27-47#	27-52	27-52#	27-61	27-61#	27-66
	27-66#	27-71	27-71#	27-76	27-76#	27-87	27-87#	27-92	27-92#	27-95	27-95#	27-98	27-98#	27-103
	27-103#	27-108	27-108#	27-113	27-113#	27-118	27-118#	27-123	27-123#	27-128	27-128#	27-135	27-135#	27-140
	27-140#	27-147	27-147#	27-150	27-150#	27-155	27-155#	27-160	27-160#	27-165	27-165#	27-170	27-170#	27-203
	27-203#	30-19	30-19#	30-23	30-23#	30-27	30-27#	30-31	30-31#	30-35	30-35#	31-22	31-22#	56-112
	56-112#	57-102	57-102#	58-84	58-84#	59-79	59-79#	61-24	61-24#	61-35	61-35#	62-24	62-24#	62-33
T\$EXCP	62-33#	63-148	63-148#	63-157	63-157#	64-33	64-33#	67-209	67-209#	67-221	67-221#			
	68-55	68-55#	68-57	68-57#	68-59	68-59#	68-61	68-61#	69-18	69-18#	69-20	69-20#	69-22	69-22#
	69-24	69-24#	69-26	69-26#	69-28	69-28#	69-30	69-30#	69-32	69-32#	69-34	69-34#		
T\$FLAG	42-61	42-61#	42-61#	44-91	44-91	44-91#	44-91#	44-103	44-103	44-103#	44-103#	44-165	44-165#	44-165#
	44-165#	46-24	46-24	46-24#	46-24#	47-18	47-18#	47-18#	48-19	48-19#	48-19#	56-26	56-26#	56-26#
	56-26#	57-15	57-15	57-15#	57-15#	57-18	57-18	57-18#	57-18#	58-18	58-18	58-18#	58-18#	58-21
	58-21	58-21#	58-21#	59-17	59-17	59-17#	59-17#	59-20	59-20	59-20#	59-20#	62-35	62-35	62-35#
	62-35#	63-35	63-35	63-35#	63-35#	66-33	66-33	66-33#	66-33#	67-37	67-37	67-37#	67-37#	67-78
	67-78	67-78#	67-78#											
T\$FREE	69-122	70-22#												
T\$GMAN	7-278#													
T\$HILI	68-55	68-55#	68-57	68-57#	68-59	68-59#	68-61	68-61#	69-18	69-18#	69-20	69-20#	69-22	69-22#
	69-24	69-24#	69-26	69-26#	69-28	69-28#	69-30	69-30#	69-32	69-32#	69-34	69-34#		
T\$LAST	7-278#	69-122#	70-15											
T\$LOLI	68-55	68-55#	68-57	68-57#	68-59	68-59#	68-61	68-61#	69-18	69-18#	69-20	69-20#	69-22	69-22#
	69-24	69-24#	69-26	69-26#	69-28	69-28#	69-30	69-30#	69-32	69-32#	69-34	69-34#		
T\$LSYM	7-278	7-278#	9-21	10-39	19-25	19-34	19-43	19-49	26-115	26-133	26-168	32-36	38-15	42-76
	44-180	45-17	46-26	47-33	48-34	50-67	50-68	51-20	51-27	51-31	52-48	52-64	52-71	53-43
	53-60	53-67	54-29	54-32	54-44	54-47	54-59	54-62	54-67	55-17	55-20	55-25	56-57	56-89



	56-120	57-27	57-55	57-83	57-110	58-46	58-66	58-92	59-43	59-63	59-87	60-44	60-52	61-25
	61-36	61-45	62-25	62-34	62-38	63-32	63-96	63-138	63-165	64-39	64-45	64-58	64-63	65-41
	65-47	65-66	65-72	65-85	66-60	66-83	67-75	67-152	67-194	67-247	68-62	69-71		
T\$LTNO	69-122#													
T\$NEST	7-278#	7-304	7-304	7-304#	9-9	9-9	9-9#	9-21	9-21	9-21	9-21#	10-8	10-8	10-8#
	10-39	10-39	10-39	10-39#	10-40	10-40	10-40	10-40#	11-51	11-51	11-51#	19-3	19-3	19-3#
	19-25	19-25	19-25	19-25#	19-27	19-27	19-27#	19-34	19-34	19-34	19-34#	19-36	19-36	19-36#
	19-43	19-43	19-43	19-43#	19-45	19-45	19-45#	19-49	19-49	19-49	19-49#	26-112	26-112	26-112#
	26-115	26-115	26-115	26-115#	26-130	26-130	26-130#	26-133	26-133	26-133	26-133#	26-165	26-165	26-165#
	26-168	26-168	26-168	26-168#	32-34	32-34	32-34#	32-36	32-36	32-36	32-36#	38-4	38-4	38-4#
	38-15	38-15	38-15	38-15#	41-1	41-1	41-1#	41-1#	42-41	42-41	42-41#	42-47	42-47	42-47#
	42-76	42-76	42-76	42-76#	43-8	43-8	43-8#	43-12	43-12	43-12	43-12#	44-8	44-8	44-8#
	44-180	44-180	44-180	44-180#	45-10	45-10	45-10#	45-17	45-17	45-17	45-17#	46-8	46-8	46-8#
	46-26	46-26	46-26	46-26#	47-8	47-8	47-8#	47-33	47-33	47-33	47-33#	48-9	48-9	48-9#
	48-34	48-34	48-34	48-34#	48-35	48-35	48-35#	50-38	50-38	50-38	50-38#	50-57	50-57	50-57#
	50-62	50-62	50-62#	50-67	50-67	50-67	50-67#	50-68	50-68	50-68	50-68#	51-14	51-14	51-14#
	51-18	51-18	51-18#	51-20	51-20	51-20	51-20#	51-25	51-25	51-25#	51-27	51-27	51-27	51-27#
	51-31	51-31	51-31	51-31#	52-23	52-23	52-23#	52-46	52-46	52-46#	52-48	52-48	52-48	52-48#
	52-49	52-49	52-49#	52-64	52-64	52-64	52-64#	52-71	52-71	52-71#	52-71#	53-22	53-22	53-22#
	53-41	53-41	53-41#	53-43	53-43	53-43	53-43#	53-44	53-44	53-44#	53-60	53-60	53-60	53-60#
	53-67	53-67	53-67	53-67#	54-17	54-17	54-17#	54-27	54-27	54-27#	54-29	54-29	54-29	54-29#
	54-30	54-30	54-30#	54-32	54-32	54-32	54-32#	54-42	54-42	54-42#	54-44	54-44	54-44	54-44#
	54-45	54-45	54-45#	54-47	54-47	54-47	54-47#	54-57	54-57	54-57#	54-59	54-59	54-59	54-59#
	54-60	54-60	54-60#	54-62	54-62	54-62	54-62#	54-67	54-67	54-67#	55-8	55-8	55-8	55-8#
	55-15	55-15	55-15#	55-17	55-17	55-17	55-17#	55-18	55-18	55-18#	55-20	55-20	55-20	55-20#
	55-25	55-25	55-25	55-25#	56-23	56-23	56-23#	56-44	56-44	56-44#	56-57	56-57	56-57	56-57#
	56-76	56-76	56-76#	56-89	56-89	56-89	56-89#	56-120	56-120	56-120#	56-120#	57-12	57-12	57-12#
	57-25	57-25	57-25#	57-27	57-27	57-27	57-27#	57-41	57-41	57-41#	57-55	57-55	57-55	57-55#
	57-69	57-69	57-69#	57-83	57-83	57-83	57-83#	57-110	57-110	57-110#	57-110#	58-15	58-15	58-15#
	58-34	58-34	58-34#	58-46	58-46	58-46	58-46#	58-52	58-52	58-52#	58-66	58-66	58-66	58-66#
	58-92	58-92	58-92#	59-14	59-14	59-14	59-14#	59-29	59-29	59-29#	59-43	59-43	59-43	59-43#
	59-49	59-49	59-49#	59-63	59-63	59-63	59-63#	59-87	59-87	59-87#	59-87#	60-20	60-20	60-20#
	60-32	60-32	60-32#	60-44	60-44	60-44	60-44#	60-52	60-52	60-52#	60-52#	61-9	61-9	61-9#
	61-20	61-20	61-20#	61-25	61-25	61-25	61-25#	61-31	61-31	61-31#	61-36	61-36	61-36	61-36#
	61-45	61-45	61-45	61-45#	62-10	62-10	62-10#	62-19	62-19	62-19#	62-25	62-25	62-25	62-25#
	62-28	62-28	62-28#	62-34	62-34	62-34	62-34#	62-38	62-38	62-38#	62-38#	63-17	63-17	63-17#
	63-30	63-30	63-30#	63-32	63-32	63-32	63-32#	63-71	63-71	63-71#	63-96	63-96	63-96	63-96#
	63-124	63-124	63-124#	63-138	63-138	63-138	63-138#	63-165	63-165	63-165#	63-165#	64-19	64-19	64-19#
	64-37	64-37	64-37#	64-39	64-39	64-39	64-39#	64-42	64-42	64-42#	64-45	64-45	64-45	64-45#
	64-56	64-56	64-56#	64-58	64-58	64-58	64-58#	64-63	64-63	64-63#	64-63#	65-18	65-18	65-18#
	65-38	65-38	65-38#	65-41	65-41	65-41	65-41#	65-42	65-42	65-42#	65-47	65-47	65-47	65-47#
	65-63	65-63	65-63#	65-66	65-66	65-66	65-66#	65-67	65-67	65-67#	65-72	65-72	65-72	65-72#
	65-85	65-85	65-85	65-85#	66-25	66-25	66-25#	66-52	66-52	66-52#	66-60	66-60	66-60	66-60#
	66-83	66-83	66-83	66-83#	67-29	67-29	67-29#	67-70	67-70	67-70#	67-75	67-75	67-75	67-75#
	67-127	67-127	67-127#	67-152	67-152	67-152	67-152#	67-180	67-180	67-180#	67-194	67-194	67-194	67-194#
	67-203	67-203	67-203#	67-205	67-205	67-205	67-205#	67-247	67-247	67-247#	67-247#	67-254	67-254	67-254#
	67-254#	68-43	68-43	68-43#	68-53	68-53	68-53#	68-62	68-62	68-62#	68-62#	69-12	69-12	69-12#
	69-16	69-40	69-59	69-71	69-71	69-71	69-71#	69-123	69-123	69-123#	69-123#			
T\$NSO	7-304#	10-40	11-51#	41-1	42-41#	48-35	50-38#	67-254	68-43#	69-123				
T\$NS1	9-9#	9-21	10-8#	10-39	19-3#	19-25	19-27#	19-34	19-36#	19-43	19-45#	19-49	26-112#	26-115
	26-130#	26-133	26-165#	26-168	32-34#	32-36	38-4#	38-15	42-47#	42-76	43-8#	43-12	44-8#	44-180
	45-10#	45-17	46-8#	46-26	47-8#	47-33	48-9#	48-34	50-57#	50-68	51-14#	51-31	52-23#	52-71
	53-22#	53-67	54-17#	54-67	55-8#	55-25	56-23#	56-120	57-12#	57-110	58-15#	58-92	59-14#	59-87
	60-20#	60-52	61-9#	61-45	62-10#	62-38	63-17#	63-165	64-19#	64-63	65-18#	65-85	66-25#	66-83
	67-29#	67-247	68-53#	68-62	69-12#	69-16	69-40	69-59	69-71					
T\$NS2	50-62#	50-67	51-18#	51-20	51-25#	51-27	52-46#	52-48	52-49#	52-64	53-41#	53-43	53-44#	53-60



	54-27#	54-29	54-30#	54-32	54-42#	54-44	54-45#	54-47	54-57#	54-59	54-60#	54-62	55-15#	55-17
	55-18#	55-20	56-44#	56-57	56-76#	56-89	57-25#	57-27	57-41#	57-55	57-69#	57-83	58-34#	58-46
	58-52#	58-66	59-29#	59-43	59-49#	59-63	60-32#	60-44	61-20#	61-25	61-31#	61-36	62-19#	62-25
	62-28#	62-34	63-30#	63-32	63-71#	63-96	63-124#	63-138	64-37#	64-39	64-42#	64-45	64-56#	64-58
	65-38#	65-41	65-42#	65-47	65-63#	65-66	65-67#	65-72	66-52#	66-60	67-70#	67-75	67-127#	67-152
T\$PCNT	70-15#	70-16	70-16	70-16#										
T\$PTAB	70-16	70-16#												
T\$PTHV	7-323	70-22#												
T\$PTNU	7-278#	70-16	70-16#	70-22	70-22									
T\$SAVL	7-278#													
T\$SEGL	7-278#	67-203	67-203	67-203#	67-205	67-205	67-205	67-205	67-205#					
T\$SEKO	67-203#	67-205												
T\$SIZE	69-122	70-22#												
T\$SUBN	7-278#	50-57#	50-62	50-62	50-62#	51-14#	51-18	51-18	51-18#	51-25	51-25	51-25#	52-23#	52-46
	52-46	52-46#	52-49	52-49	52-49#	53-22#	53-41	53-41	53-41#	53-44	53-44	53-44#	54-17#	54-27
	54-27	54-27#	54-30	54-30	54-30#	54-42	54-42	54-42#	54-45	54-45	54-45#	54-57	54-57	54-57#
	54-60	54-60	54-60#	55-8#	55-15	55-15	55-15#	55-18	55-18	55-18#	56-23#	56-44	56-44	56-44#
	56-76	56-76	56-76#	57-12#	57-25	57-25	57-25#	57-41	57-41	57-41#	57-69	57-69	57-69#	58-15#
	58-34	58-34	58-34#	58-52	58-52	58-52#	59-14#	59-29	59-29	59-29#	59-49	59-49	59-49#	60-20#
	60-32	60-32	60-32#	61-9#	61-20	61-20	61-20#	61-31	61-31	61-31#	62-10#	62-19	62-19	62-19#
	62-28	62-28	62-28#	63-17#	63-30	63-30	63-30#	63-71	63-71	63-71#	63-124	63-124	63-124#	64-19#
	64-37	64-37	64-37#	64-42	64-42	64-42#	64-56	64-56	64-56#	65-18#	65-38	65-38	65-38#	65-42
	65-42	65-42#	65-63	65-63	65-63#	65-67	65-67	65-67#	66-25#	66-52	66-52	66-52#	67-29#	67-70
	67-70	67-70#	67-127	67-127	67-127#	67-180	67-180	67-180#						
T\$TAGL	7-278#													
T\$TAGN	7-278#	9-9	9-9	9-9#	10-8	10-8	10-8#	19-3	19-3	19-3#	19-27	19-27	19-27#	19-36
	19-36	19-36#	19-45	19-45	19-45#	26-112	26-112	26-112#	26-130	26-130	26-130#	26-165	26-165	26-165#
	32-34	32-34	32-34#	38-4	38-4	38-4#	42-47	42-47	42-47#	43-8	43-8	43-8#	44-8	44-8
	44-8#	45-10	45-10	45-10#	46-8	46-8	46-8#	47-8	47-8	47-8#	48-9	48-9	48-9#	50-57
	50-57	50-57#	50-62	50-62	50-62#	51-14	51-14	51-14#	51-18	51-18	51-18#	51-25	51-25	51-25#
	52-23	52-23	52-23#	52-46	52-46	52-46#	52-49	52-49	52-49#	53-22	53-22	53-22#	53-41	53-41
	53-41#	53-44	53-44	53-44#	54-17	54-17	54-17#	54-27	54-27	54-27#	54-30	54-30	54-30#	54-42
	54-42	54-42#	54-45	54-45	54-45#	54-57	54-57	54-57#	54-60	54-60	54-60#	55-8	55-8	55-8#
	55-15	55-15	55-15#	55-18	55-18	55-18#	56-23	56-23	56-23#	56-44	56-44	56-44#	56-76	56-76
	56-76#	57-12	57-12	57-12#	57-25	57-25	57-25#	57-41	57-41	57-41#	57-69	57-69	57-69#	58-15
	58-15	58-15#	58-34	58-34	58-34#	58-52	58-52	58-52#	59-14	59-14	59-14#	59-29	59-29	59-29#
	59-49	59-49	59-49#	60-20	60-20	60-20#	60-32	60-32	60-32#	61-9	61-9	61-9#	61-20	61-20
	61-20#	61-31	61-31	61-31#	62-10	62-10	62-10#	62-19	62-19	62-19#	62-28	62-28	62-28#	63-17
	63-17	63-17#	63-30	63-30	63-30#	63-71	63-71	63-71#	63-124	63-124	63-124#	64-19	64-19	64-19#
	64-37	64-37	64-37#	64-42	64-42	64-42#	64-56	64-56	64-56#	65-18	65-18	65-18#	65-38	65-38
	65-38#	65-42	65-42	65-42#	65-63	65-63	65-63#	65-67	65-67	65-67#	66-25	66-25	66-25#	66-52
	66-52	66-52#	67-29	67-29	67-29#	67-70	67-70	67-70#	67-127	67-127	67-127#	67-180	67-180	67-180#
	68-53	68-53	68-53#	69-12	69-12	69-12#	70-15	70-15	70-15#	70-16	70-16	70-16	70-16	70-16#
	70-16#													
T\$TEMP	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#
	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	9-21
	9-21#	10-39	10-39#	10-40	10-40#	19-25	19-25#	19-34	19-34#	19-43	19-43#	19-49	19-49#	26-115
	26-115#	26-133	26-133#	26-168	26-168#	32-36	32-36#	38-15	38-15#	41-1	41-1#	42-61	42-61#	42-76
	42-76#	43-12	43-12#	44-91	44-91#	44-103	44-103#	44-165	44-165#	44-180	44-180#	45-17	45-17#	46-24
	46-24#	46-26	46-26#	47-18	47-18#	47-33	47-33#	48-19	48-19#	48-34	48-34#	48-35	48-35#	50-67
	50-67#	50-68	50-68#	51-20	51-20#	51-27	51-27#	51-31	51-31#	52-48	52-48#	52-64	52-64#	52-71
	52-71#	53-43	53-43#	53-60	53-60#	53-67	53-67#	54-29	54-29#	54-32	54-32#	54-44	54-44#	54-47
	54-47#	54-59	54-59#	54-62	54-62#	54-67	54-67#	55-17	55-17#	55-20	55-20#	55-25	55-25#	56-26





T10.2\$	59-39	59-46#			
T10.3\$	59-59	59-65	59-68#		
T10.4\$	59-45	59-66#			
T10.7\$	59-26	59-75#			
T10.8\$	59-67	59-73	59-80#		
T11	8-8	60-20#			
T11.1	60-32#				
T11.2\$	60-33#	60-39	60-50		
T11.5\$	60-45#				
T12	8-8	61-9#			
T12.1	61-20#				
T12.2	61-31#				
T13	8-8	62-10#			
T13.1	62-19#				
T13.1\$	62-32	62-36#			
T13.2	62-28#				
T14	8-8	63-17#			
T14.1	63-30#				
T14.1\$	63-53#	63-151			
T14.2	63-71#				
T14.3	63-124#				
T14.7\$	63-44	63-153#			
T14.8\$	63-101	63-123	63-142	63-150	63-158#
T1410\$	63-71#				
T1411\$	63-92	63-116	63-125#		
T1412\$	63-134	63-140	63-144#		
T1418	14-28#	63-79	63-160	67-135	67-225
T15	8-8	64-19#			
T15.1	64-37#				
T15.2	64-42#				
T15.3	64-56#				
T16	8-8	65-18#			
T16.1	65-38#				
T16.2	65-42#				
T16.3	65-63#				
T16.4	65-67#				
T17	8-8	66-25#			
T17.1	66-52#				
T18	8-8	67-29#			
T18.1	67-70#				
T18.2	67-127#				
T18.3	67-180#				
T1811\$	67-148	67-172	67-181#		
T1812\$	67-190	67-196	67-200#		
T18END	67-157	67-179	67-198	67-212	67-222#
T18OFL	67-86	67-217#			
T2	8-8	51-14#			
T2.1	51-18#				
T2.11	51-18#	51-23			
T2.2	51-25#				
T2.21	51-25#	51-30			
T3	8-8	52-23#			
T3.1	52-46#				
T3.11	52-29	52-47#			
T3.2	52-49#				
T4	8-8	53-22#			



T4.1	53-41#								
T4.2	53-44#								
T5	8-8	54-17#							
T5.1	54-27#								
T5.11	54-28#	54-36							
T5.2	54-30#								
T5.3	54-42#								
T5.31	54-43#	54-51							
T5.4	54-45#								
T5.5	54-57#								
T5.51	54-58#	54-66							
T5.6	54-60#								
T6	8-8	55-8#							
T6.1	55-15#								
T6.11	55-16#	55-24							
T6.2	55-18#								
T7	8-8	56-23#							
T7.1	56-44#								
T7.1#	56-45#	56-106							
T7.10#	56-60#	56-91							
T7.2	56-76#								
T7.2#	56-53	56-68	56-77#						
T7.20#	56-73#	56-101							
T7.3#	56-85	56-96	56-103#						
T7.44#	56-59	56-64#							
T7.7#	56-37	56-108#							
T7.8#	56-62	56-75	56-105	56-113#					
T7A	14-6#	56-32	56-115						
T8	8-8	57-12#							
T8.1	57-25#								
T8.1#	57-38#	57-60	57-96						
T8.10#	57-79	57-85	57-88#						
T8.2	57-41#								
T8.2#	57-51	57-58#							
T8.3	57-69#								
T8.3#	57-40	57-61#							
T8.4#	57-66#	57-90							
T8.5#	57-23	57-28#							
T8.6#	57-68	57-91#							
T8.7#	57-32	57-98#							
T8.8#	57-87	57-93	57-103#						
T8.9#	57-57	57-86#							
T9	8-8	58-15#							
T9.1	58-34#								
T9.1#	58-31#	58-75							
T9.2	58-52#								
T9.2#	58-42	58-49#							
T9.3#	58-62	58-68	58-71#						
T9.4#	58-48	58-69#							
T9.7#	58-27	58-78#							
T9.8#	58-70	58-76	58-85#						
TD	38-10	38-19#							
TEMPO	13-8#	63-48*	63-145	63-147*	67-90*	67-206	67-208*		
TEST1	50-59#	50-66							
TEST10	59-22#								
TEST13	62-13#	62-37							











ENDMSG	1-500#	7-278#	19-25	19-34	19-43	19-49												
ENDPRO	1-512#	7-278#	43-12															
ENDPTA	1-520#	7-278#	70-21															
ENDRPT	1-529#	7-278#	42-76															
ENDSEG	1-541#	7-278#	67-205															
ENDSET	1-555#	7-278#	70-22															
ENDSFT	1-568#	7-278#	69-71															
ENDSRV	1-580#	7-278#	26-115	26-133	26-168	32-36	38-15											
ENDSUB	1-596#	7-278#	50-67	51-20	51-27	52-48	52-64	53-43	53-60	54-29	54-32	54-44	54-47	54-59				
	54-62	55-17	55-20	56-57	56-89	57-27	57-55	57-83	58-46	58-66	59-43	59-63	60-44	61-25				
	61-36	62-25	62-34	63-32	63-96	63-138	64-39	64-45	64-58	65-41	65-47	65-66	65-72	66-60				
	67-75	67-152	67-194															
ENDSW	1-614#	7-278#	10-39															
ENDTST	1-624#	7-278#	50-68	51-31	52-71	53-67	54-67	55-25	56-120	57-110	58-92	59-87	60-52	61-45				
	62-38	63-165	64-63	65-85	66-83	67-247												
EQUALS	1-642#	7-278#	11-57															
ER.NDX	7-142#	28-32	28-61	28-101	29-18	32-21												
ERRDF	1-714#	7-278#	30-19	30-23	30-27	30-31	30-35	63-148	64-33	67-209								
ERRHRD	1-718#	7-278#	27-27	27-35	27-42	27-47	27-52	27-61	27-66	27-71	27-76	27-87	27-92	27-95				
	27-98	27-103	27-108	27-113	27-118	27-123	27-128	27-135	27-140	27-147	27-150	27-155	27-160	27-165				
	27-170	27-203	31-22	56-112	57-102	58-84	59-79	61-24	61-35	62-24	62-33	63-157	67-221					
ERROR	1-722#	7-278#																
ERRSF	1-726#	7-278#																
ERRSOF	1-730#	7-278#																
ERRTBL	1-734#	7-278#																
ESCAPE	1-744#	7-278#																
EXIT	1-771#	7-278#	42-61	44-91	44-103	44-165	46-24	47-18	48-19	56-26	57-15	57-18	58-18	58-21				
	59-17	59-20	62-35	63-35	66-33	67-37	67-78											
FEQUAL	1-810#	7-278#																
GETBYT	1-824#	7-278#																
GETPRI	1-834#	7-278#	36-18	36-145	36-209													
GETWOR	1-829#	7-278#																
GMANIA	1-839#	7-278#																
GMANID	1-848#	7-278#																
GMANIL	1-859#	7-278#																
GPHARD	1-868#	7-278#	44-39															
GPRMA	1-874#	7-278#	68-55	68-57														
GPRMD	1-903#	7-278#	68-59	68-61	69-18	69-20	69-22	69-24	69-26	69-28	69-30	69-32	69-34					
GPRML	1-934#	7-278#	69-14	69-38	69-44	69-47	69-49	69-51	69-53	69-55	69-57	69-60						
HEADER	1-954#	7-278#	7-323															
INLOOP	1-962#	7-278#																
IOSETU	1-966#	7-278#																
IOSTAR	1-974#	7-278#																
KT11	1-982#	7-278#																
LASTAD	1-;47#	7-278#	69-122															
M#BYTE	1-D00#	7-278#	7-323	7-323	7-323	7-323#												
M#CHEC	1-E18#	7-278#	42-61	42-61#	44-91	44-91#	44-103	44-103#	44-165	44-165#	46-24	46-24#	47-18	47-18#				
	48-19	48-19#	56-26	56-26#	57-15	57-15#	57-18	57-18#	58-18	58-18#	58-21	58-21#	59-17	59-17#				
	59-20	59-20#	62-35	62-35#	63-35	63-35#	66-33	66-33#	67-37	67-37#	67-78	67-78#	67-78	67-78#				
M#CNT0	1-E82#	7-278#	68-55	68-55#	68-57	68-57#	68-59	68-59#	68-61	68-61#	69-14	69-14#	69-18	69-18#				
	69-20	69-20#	69-22	69-22#	69-24	69-24#	69-26	69-26#	69-28	69-28#	69-30	69-30#	69-32	69-32#				
	69-34	69-34#	69-38	69-38#	69-44	69-44#	69-47	69-47#	69-49	69-49#	69-51	69-51#	69-53	69-53#				
	69-55	69-55#	69-57	69-57#	69-60	69-60#												
M#COUN	1-D66#	7-278#	19-4	19-4	19-4	19-4#	19-8	19-8	19-8	19-8	19-8#	19-10	19-10#	19-11				
	19-11	19-11	19-11	19-11	19-11	19-11#	19-13	19-13#	19-14	19-14	19-14#	19-14	19-14	19-14				
	19-14	19-14	19-14#	19-16	19-16#	19-17	19-17	19-17	19-17	19-17	19-17#	19-17	19-17	19-21				



	19-21#	19-22	19-22	19-22#	19-24	19-24#	19-28	19-28#	19-29	19-29	19-29	19-29	19-29#	19-30
	19-30#	19-31	19-31	19-31	19-31	19-31	19-31	19-31#	19-33	19-33#	19-39	19-39#	19-40	19-40
	19-40	19-40	19-40	19-40#	19-42	19-42#	19-46	19-46#	19-48	19-48#	32-165	32-165#	32-168	32-168#
	32-171	32-171#	32-173	32-173#	33-40	33-40#	33-43	33-43#	33-45	33-45#	33-50	33-50#	33-50#	33-51
	33-51#	33-56	33-56	33-56#	33-57	33-57#	33-66	33-66#	33-73	33-73#	33-75	33-75#	33-77	33-77#
	44-29	44-29#	44-71	44-71#	44-73	44-73#	44-75	44-75#	44-77	44-77#	44-85	44-85#	44-114	44-114#
	44-127	44-127#	44-132	44-132#	56-60	56-60#	56-61	56-61#	56-73	56-73#	56-74	56-74#	57-86	57-86#
	58-69	58-69#	59-66	59-66#	63-99	63-99#	63-100	63-100#	63-121	63-121#	63-122	63-122#	63-141	63-141#
	66-31	66-31#	67-35	67-35#	67-155	67-155#	67-156	67-156#	67-177	67-177#	67-178	67-178#	67-197	67-197#
M\$DATA	1-867#	7-278#	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	18-17#	18-27	18-27#											18-17
M\$DECR	1-D29#	7-278#	9-21	9-21#	10-39	10-39#	10-40	10-40#	19-25	19-25#	19-34	19-34#	19-43	19-43#
	19-49	19-49#	26-115	26-115#	26-133	26-133#	26-168	26-168#	32-36	32-36#	38-15	38-15#	41-1	41-1#
	42-76	42-76#	43-12	43-12#	44-180	44-180#	45-17	45-17#	46-26	46-26#	47-33	47-33#	48-34	48-34#
	48-35	48-35#	50-67	50-67#	50-68	50-68#	51-20	51-20#	51-27	51-27#	51-31	51-31#	52-48	52-48#
	52-64	52-64#	52-71	52-71#	53-43	53-43#	53-60	53-60#	53-67	53-67#	54-29	54-29#	54-32	54-32#
	54-44	54-44#	54-47	54-47#	54-59	54-59#	54-62	54-62#	54-67	54-67#	55-17	55-17#	55-20	55-20#
	55-25	55-25#	56-57	56-57#	56-89	56-89#	56-120	56-120#	57-27	57-27#	57-55	57-55#	57-83	57-83#
	57-110	57-110#	58-46	58-46#	58-66	58-66#	58-92	58-92#	59-43	59-43#	59-63	59-63#	59-87	59-87#
	60-44	60-44#	60-52	60-52#	61-25	61-25#	61-36	61-36#	61-45	61-45#	62-25	62-25#	62-34	62-34#
	62-38	62-38#	63-32	63-32#	63-96	63-96#	63-138	63-138#	63-165	63-165#	64-39	64-39#	64-45	64-45#
	64-58	64-58#	64-63	64-63#	65-41	65-41#	65-47	65-47#	65-66	65-66#	65-72	65-72#	65-85	65-85#
	66-60	66-60#	66-83	66-83#	67-75	67-75#	67-152	67-152#	67-194	67-194#	67-205	67-205#	67-205#	67-205#
	67-247	67-247#	67-254	67-254#	68-62	68-62#	69-71	69-71#	69-123	69-123#	70-16	70-16#		
M\$DEFA	1-E70#	7-278#	68-55	68-55#	68-57	68-57#	68-59	68-59#	68-61	68-61#	69-14	69-14#	69-18	69-18#
	69-20	69-20#	69-22	69-22#	69-24	69-24#	69-26	69-26#	69-28	69-28#	69-30	69-30#	69-32	69-32#
	69-34	69-34#	69-38	69-38#	69-44	69-44#	69-47	69-47#	69-49	69-49#	69-51	69-51#	69-53	69-53#
	69-55	69-55#	69-57	69-57#	69-60	69-60#								
M\$ENDE	1-D74#	7-278#	9-21#	10-39#	10-40#	19-25#	19-34#	19-43#	19-49#	26-115#	26-133#	26-168#	32-36#	38-15#
	41-1#	42-76#	44-180#	45-17#	46-26#	47-33#	48-34#	48-35#	50-67#	50-68#	51-20#	51-27#	51-31#	52-48#
	52-64#	52-71#	53-43#	53-60#	53-67#	54-29#	54-32#	54-44#	54-47#	54-59#	54-62#	54-67#	55-17#	55-20#
	55-25#	56-57#	56-89#	56-120#	57-27#	57-55#	57-83#	57-110#	58-46#	58-66#	58-92#	59-43#	59-63#	59-87#
	60-44#	60-52#	61-25#	61-36#	61-45#	62-25#	62-34#	62-38#	63-32#	63-96#	63-138#	63-165#	64-39#	64-45#
	64-58#	64-63#	65-41#	65-47#	65-66#	65-72#	65-85#	66-60#	66-83#	67-75#	67-152#	67-194#	67-205#	67-247#
M\$ERRI	1-849#	7-278#	27-27	27-27#	27-35	27-35#	27-42	27-42#	27-47	27-47#	27-52	27-52#	27-61	27-61#
	27-66	27-66#	27-71	27-71#	27-76	27-76#	27-87	27-87#	27-92	27-92#	27-95	27-95#	27-98	27-98#
	27-103	27-103#	27-108	27-108#	27-113	27-113#	27-118	27-118#	27-123	27-123#	27-128	27-128#	27-135	27-135#
	27-140	27-140#	27-147	27-147#	27-150	27-150#	27-155	27-155#	27-160	27-160#	27-165	27-165#	27-170	27-170#
	27-203	27-203#	30-19	30-19#	30-23	30-23#	30-27	30-27#	30-31	30-31#	30-35	30-35#	31-22	31-22#
	56-112	56-112#	57-102	57-102#	58-84	58-84#	59-79	59-79#	61-24	61-24#	61-35	61-35#	62-24	62-24#
	62-33	62-33#	63-148	63-148#	63-157	63-157#	64-33	64-33#	67-209	67-209#	67-221	67-221#		
M\$ESCA	1-D06#	7-278#												
M\$ESCS	1-D10#	7-278#												
M\$EXCP	1-E01#	7-278#	68-55	68-55#	68-55#	68-57	68-57	68-57#	68-59	68-59	68-59#	68-61	68-61	68-61#
	69-18	69-18#	69-18#	69-20	69-20#	69-20#	69-22	69-22#	69-24	69-24#	69-24	69-24#	69-26	69-26#
	69-26#	69-28	69-28#	69-28#	69-30	69-30#	69-32	69-32#	69-32#	69-32#	69-34	69-34#	69-34#	
M\$EXIT	1-D14#	7-278#	42-61#	44-91	44-91#	44-103	44-103#	44-165	44-165#	46-24	46-24#	47-18#	48-19#	56-26
	56-26#	57-15	57-15#	57-18	57-18#	58-18	58-18#	58-21	58-21#	59-17	59-17#	59-20	59-20#	62-35
	62-35#	63-35	63-35#	66-33	66-33#	67-37	67-37#	67-78	67-78#					
M\$EXSE	1-D22#	7-278#	42-61#	44-91#	44-103#	44-165#	46-24#	47-18#	48-19#	56-26#	57-15#	57-18#	58-18#	58-21#
	59-17#	59-20#	62-35#	63-35#	66-33#	67-37#	67-78#							
M\$EXTJ	1-D18#	7-278#	42-61	42-61#	44-91#	44-103#	44-165#	46-24#	47-18	47-18#	48-19	48-19#	56-26#	57-15#
	57-18#	58-18#	58-21#	59-17#	59-20#	62-35#	63-35#	66-33#	67-37#	67-78#				



M\$GEN	1-D38#	7-278#	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#
	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#
	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#
	9-21	9-21#	10-8	10-8	10-8#	10-8#	10-39	10-39#	18-17	18-17#	18-27	18-27#	19-3	19-3#
	19-25	19-25#	19-27	19-27#	19-34	19-34#	19-36	19-36#	19-43	19-43#	19-45	19-45#	19-49	19-49#
	26-112#	26-115	26-115#	26-130#	26-133	26-133#	26-165#	26-168	26-168#	32-34#	32-36	32-36#	38-4#	38-15
	38-15#	42-47	42-47#	42-76	42-76#	43-8	43-8#	44-8	44-8#	44-180	44-180#	45-10	45-10#	45-17
	45-17#	46-8	46-8#	46-26	46-26#	47-8	47-8#	47-33	47-33#	48-9	48-9#	48-34	48-34#	50-57
	50-57#	50-62	50-62#	50-67	50-67#	50-68	50-68#	51-14	51-14#	51-18	51-18#	51-20	51-20#	51-25
	51-25#	51-27	51-27#	51-31	51-31#	52-23	52-23#	52-46	52-46#	52-48	52-48#	52-49	52-49#	52-64
	52-64#	52-71	52-71#	53-22	53-22#	53-41	53-41#	53-43	53-43#	53-44	53-44#	53-60	53-60#	53-67
	53-67#	54-17	54-17#	54-27	54-27#	54-29	54-29#	54-30	54-30#	54-32	54-32#	54-42	54-42#	54-44
	54-44#	54-45	54-45#	54-47	54-47#	54-57	54-57#	54-59	54-59#	54-60	54-60#	54-62	54-62#	54-67
	54-67#	55-8	55-8#	55-15	55-15#	55-17	55-17#	55-18	55-18#	55-20	55-20#	55-25	55-25#	55-23
	56-23#	56-44	56-44#	56-57	56-57#	56-76	56-76#	56-89	56-89#	56-120	56-120#	57-12	57-12#	57-25
	57-25#	57-27	57-27#	57-41	57-41#	57-55	57-55#	57-69	57-69#	57-83	57-83#	57-110	57-110#	58-15
	58-15#	58-34	58-34#	58-46	58-46#	58-52	58-52#	58-66	58-66#	58-92	58-92#	59-14	59-14#	59-29
	59-29#	59-43	59-43#	59-49	59-49#	59-63	59-63#	59-87	59-87#	60-20	60-20#	60-32	60-32#	60-44
	60-44#	60-52	60-52#	61-9	61-9#	61-20	61-20#	61-25	61-25#	61-31	61-31#	61-36	61-36#	61-45
	61-45#	62-10	62-10#	62-19	62-19#	62-25	62-25#	62-28	62-28#	62-34	62-34#	62-38	62-38#	63-17
	63-17#	63-30	63-30#	63-32	63-32#	63-71	63-71#	63-96	63-96#	63-124	63-124#	63-138	63-138#	63-165
	63-165#	64-19	64-19#	64-37	64-37#	64-39	64-39#	64-42	64-42#	64-45	64-45#	64-56	64-56#	64-58
	64-58#	64-63	64-63#	65-18	65-18#	65-38	65-38#	65-41	65-41#	65-42	65-42#	65-47	65-47#	65-63
	65-63#	65-66	65-66#	65-67	65-67#	65-72	65-72#	65-85	65-85#	66-25	66-25#	66-52	66-52#	66-60
	66-60#	66-83	66-83#	67-29	67-29#	67-70	67-70#	67-75	67-75#	67-127	67-127#	67-152	67-152#	67-180
	67-180#	67-194	67-194#	67-205	67-205#	67-247	67-247#	68-53	68-53#	68-62	68-62#	69-12	69-12#	69-71
	69-71#	69-122	69-122#	70-16	70-16#	70-21	70-21#							
M\$GENB	1-C38#	7-278#												
M\$GETS	1-D35#	7-278#	9-21	9-21#	10-39	10-39#	10-40	10-40#	19-25	19-25#	19-34	19-34#	19-43	19-43#
	19-49	19-49#	26-115	26-115#	26-133	26-133#	26-168	26-168#	32-36	32-36#	38-15	38-15#	41-1	41-1#
	42-76	42-76#	43-12	43-12#	44-180	44-180#	45-17	45-17#	46-26	46-26#	47-33	47-33#	48-34	48-34#
	48-35	48-35#	50-67	50-67#	50-68	50-68#	51-20	51-20#	51-27	51-27#	51-31	51-31#	52-48	52-48#
	52-64	52-64#	52-71	52-71#	53-43	53-43#	53-60	53-60#	53-67	53-67#	54-29	54-29#	54-32	54-32#
	54-44	54-44#	54-47	54-47#	54-59	54-59#	54-62	54-62#	54-67	54-67#	55-17	55-17#	55-20	55-20#
	55-25	55-25#	56-57	56-57#	56-89	56-89#	56-120	56-120#	57-27	57-27#	57-55	57-55#	57-83	57-83#
	57-110	57-110#	58-46	58-46#	58-66	58-66#	58-92	58-92#	59-43	59-43#	59-63	59-63#	59-87	59-87#
	60-44	60-44#	60-52	60-52#	61-25	61-25#	61-36	61-36#	61-45	61-45#	62-25	62-25#	62-34	62-34#
	62-38	62-38#	63-32	63-32#	63-96	63-96#	63-138	63-138#	63-165	63-165#	64-39	64-39#	64-45	64-45#
	64-58	64-58#	64-63	64-63#	65-41	65-41#	65-47	65-47#	65-66	65-66#	65-72	65-72#	65-85	65-85#
	66-60	66-60#	66-83	66-83#	67-75	67-75#	67-152	67-152#	67-194	67-194#	67-205	67-205#	67-205#	67-205#
	67-247	67-247#	67-254	67-254#	68-62	68-62#	69-16	69-16#	69-40	69-40#	69-59	69-59#	69-71	69-71#
	69-123	69-123#												
M\$GETT	1-B77#	7-278#	42-61#	44-91#	44-103#	44-165#	46-24#	47-18#	48-19#	56-26#	57-15#	57-18#	58-18#	58-21#
	59-17#	59-20#	62-35#	63-35#	66-33#	67-37#	67-78#	69-16	69-16#	69-40	69-40#	69-59	69-59#	
M\$GNGB	1-C02#	7-278#	7-304#	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#
	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#
	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#
	10-8	10-8	10-8#	11-51#	18-17	18-17#	18-27	18-27#	19-3	19-3#	19-27	19-27#	19-36	19-36#
	19-45	19-45#	26-112	26-112#	26-130	26-130#	26-165	26-165#	32-34	32-34#	38-4	38-4#	42-41#	42-47
	42-47#	43-8	43-8#	44-8	44-8#	45-10	45-10#	46-8	46-8#	47-8	47-8#	48-9	48-9#	50-38#



M\$GNIN	68-43#	68-53	68-53#	69-12	69-12#	69-122	69-122#	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	1-D49#	7-278#	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323	7-323
	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#
	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#
	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#	7-323#
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#	8-8#
	8-8#	8-8#	8-8#	8-8#	9-9	9-9#	10-8	10-8#	18-17	18-17	18-17#	18-17#	18-27	18-27
	18-27#	18-27#	19-4	19-4	19-4	19-4	19-4	19-4	19-4	19-4	19-4#	19-4#	19-4#	19-4#
	19-4#	19-4#	19-4#	19-8	19-8	19-8	19-8	19-8	19-8	19-8	19-8	19-8	19-8#	19-8#
	19-8#	19-8#	19-8#	19-8#	19-8#	19-8#	19-10	19-10	19-10	19-10	19-10	19-10	19-10#	19-10#
	19-10#	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11#	19-11#
	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#	19-11#
	19-13	19-13#	19-13#	19-13#	19-13#	19-14	19-14	19-14	19-14	19-14	19-14	19-14	19-14	19-14
	19-14	19-14	19-14	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#
	19-16	19-16	19-16	19-16	19-16	19-16#	19-16#	19-16#	19-16#	19-16#	19-16#	19-16#	19-16#	19-16#
	19-17	19-17	19-17	19-17	19-17	19-17	19-17	19-17#	19-17#	19-17#	19-17#	19-17#	19-17#	19-17#
	19-17#	19-17#	19-17#	19-17#	19-21	19-21	19-21	19-21	19-21	19-21#	19-21#	19-21#	19-21#	19-21#
	19-22	19-22	19-22	19-22	19-22	19-22	19-22#	19-22#	19-22#	19-22#	19-22#	19-22#	19-22#	19-22#
	19-24	19-24	19-24	19-24#	19-24#	19-24#	19-24#	19-25	19-25#	19-28	19-28	19-28	19-28	19-28
	19-28#	19-28#	19-28#	19-28#	19-29	19-29	19-29	19-29	19-29	19-29	19-29	19-29	19-29	19-29#
	19-29#	19-29#	19-29#	19-29#	19-29#	19-29#	19-29#	19-30	19-30	19-30	19-30	19-30	19-30#	19-30#
	19-30#	19-30#	19-31	19-31	19-31	19-31	19-31	19-31	19-31	19-31	19-31	19-31	19-31#	19-31#
	19-31#	19-31#	19-31#	19-31#	19-31#	19-31#	19-31#	19-31#	19-31#	19-31#	19-31#	19-31#	19-31#	19-31#
	19-33#	19-33#	19-33#	19-33#	19-34	19-34#	19-39	19-39	19-39	19-39	19-39	19-39	19-39#	19-39#
	19-39#	19-40	19-40	19-40	19-40	19-40	19-40	19-40	19-40	19-40	19-40	19-40	19-40#	19-40#
	19-40#	19-40#	19-40#	19-40#	19-40#	19-40#	19-42	19-42	19-42	19-42	19-42	19-42	19-42#	19-42#
	19-42#	19-43	19-43#	19-46	19-46	19-46	19-46	19-46	19-46	19-46#	19-46#	19-46#	19-46#	19-46#
	19-48	19-48	19-48	19-48	19-48	19-48#	19-48#	19-48#	19-48#	19-49	19-49#	26-16	26-16	26-16
	26-16#	26-16#	26-16#	26-18	26-18#	26-35	26-35	26-35	26-35#	26-35#	26-35#	26-37	26-37#	26-84
	26-84	26-84	26-84	26-84	26-84	26-84#	26-84#	26-84#	26-84#	26-84#	26-84#	26-94	26-94	26-94
	26-94	26-94	26-94	26-94#	26-94#	26-94#	26-94#	26-94#	26-94#	26-94#	26-94#	26-94	26-94	26-94
	26-126	26-126	26-126	26-126#	26-126#	26-126#	26-126#	26-126#	26-126#	26-115	26-115#	26-126	26-126	26-126
	26-135	26-135	26-135	26-135#	26-135#	26-135#	26-135#	26-135#	26-135#	26-133	26-133#	26-135	26-135	26-135
	26-155	26-155#	26-155#	26-155#	26-155#	26-155#	26-155#	26-155#	26-155#	26-155	26-155	26-155	26-155	26-155
	26-170	26-170#	26-170#	26-170#	26-170#	26-170#	26-170#	26-170#	26-168	26-168#	26-170	26-170	26-170	26-170
	27-27#	27-27#	27-35	27-35	27-35	27-35	27-35#	27-35#	27-35#	27-27	27-27	27-27	27-27#	27-27#
	27-42	27-42#	27-42#	27-42#	27-42#	27-42#	27-42#	27-42#	27-35#	27-35#	27-35#	27-35#	27-42	27-42
	27-47#	27-52	27-52	27-52	27-52	27-52#	27-47	27-47	27-47	27-47	27-47	27-47#	27-47#	27-47#
	27-61#	27-61#	27-61#	27-61#	27-61#	27-66	27-66	27-66	27-66	27-52#	27-52#	27-61	27-61	27-61
	27-71	27-71	27-71	27-71	27-71#	27-71#	27-71#	27-71#	27-66#	27-66#	27-66#	27-66#	27-66#	27-66#
	27-76#	27-76#	27-76#	27-76#	27-87	27-87	27-87	27-87	27-71#	27-76	27-76	27-76	27-76	27-76#
	27-92	27-92	27-92	27-92#	27-92#	27-92#	27-87#	27-87#	27-87#	27-87#	27-87#	27-87#	27-87#	27-92
	27-95#	27-95#	27-95#	27-98	27-98	27-98	27-92#	27-92#	27-95	27-95	27-95	27-95	27-95#	27-95#
	27-103	27-103	27-103#	27-103#	27-103#	27-103#	27-98#	27-98#	27-98#	27-98#	27-98#	27-98#	27-98#	27-103
	27-108#	27-108#	27-108#	27-108#	27-108#	27-108#	27-103#	27-103#	27-108	27-108	27-108	27-108	27-108#	27-108#
	27-118	27-118#	27-118#	27-118#	27-118#	27-118#	27-108	27-108	27-108	27-108	27-108	27-108#	27-108#	27-108#
	27-123#	27-128	27-128	27-128	27-128	27-128#	27-113#	27-113#	27-113#	27-113#	27-113#	27-113#	27-113#	27-113#
	27-135#	27-135#	27-135#	27-135#	27-135#	27-140	27-123	27-123	27-123	27-123	27-123	27-123#	27-123#	27-123#
	27-147	27-147	27-147	27-147	27-147#	27-147#	27-128#	27-128#	27-128#	27-128#	27-128#	27-135	27-135	27-135
	27-150#	27-150#	27-150#	27-150#	27-155	27-155	27-140	27-140	27-140	27-140	27-140#	27-140#	27-140#	27-140#
	27-160	27-160	27-160	27-160#	27-160#	27-160#	27-147#	27-147#	27-147#	27-150	27-150	27-150	27-150	27-150#
	27-165#	27-165#	27-165#	27-170	27-170	27-170	27-155	27-155	27-155	27-155#	27-155#	27-155#	27-155#	27-160
							27-165	27-165	27-165	27-165	27-165	27-165	27-165#	27-165#
							27-170	27-170	27-170#	27-170#	27-170#	27-170#	27-203	27-203







58-83#	58-83#	58-83#	58-83#	58-83#	58-84	58-84	58-84	58-84	58-84#	58-84#	58-84#	58-84#	58-84#	
58-91	58-91	58-91	58-91	58-91	58-91	58-91#	58-91#	58-91#	58-91#	58-91#	58-91#	58-91#	58-92	58-92#
59-17	59-17	59-17#	59-17#	59-20	59-20	59-20#	59-20#	59-26	59-26	59-26	59-26	59-26	59-26	59-26
59-26#	59-26#	59-26#	59-26#	59-26#	59-26#	59-28	59-28	59-28	59-28	59-28	59-28	59-28	59-28#	59-28#
59-28#	59-28#	59-28#	59-28#	59-29	59-29#	59-43	59-43#	59-49	59-49#	59-63	59-63#	59-66	59-66	59-66
59-66	59-66	59-66	59-66#	59-66#	59-66#	59-66#	59-77	59-77	59-77#	59-77#	59-79	59-79	59-79	59-79
59-79	59-79#	59-79#	59-79#	59-79#	59-79#	59-86	59-86	59-86	59-86	59-86	59-86	59-86#	59-86#	59-86#
59-86#	59-86#	59-86#	59-86#	59-87	59-87#	60-32	60-32#	60-44	60-44#	60-52	60-52#	61-20	61-20#	61-20#
61-24	61-24	61-24	61-24	61-24#	61-24#	61-24#	61-24#	61-24#	61-24#	61-25	61-25#	61-31	61-31#	61-35
61-35	61-35	61-35	61-35#	61-35#	61-35#	61-35#	61-35#	61-36	61-36#	61-45	61-45#	62-19	62-19#	62-19#
62-24	62-24	62-24	62-24	62-24#	62-24#	62-24#	62-24#	62-24#	62-24#	62-25	62-25#	62-28	62-28#	62-33
62-33	62-33	62-33	62-33#	62-33#	62-33#	62-33#	62-33#	62-34	62-34#	62-35	62-35#	62-35	62-35#	62-35#
62-38	62-38#	63-30	63-30#	63-32	63-32#	63-35	63-35	63-35#	63-35#	63-44	63-44	63-44	63-44	63-44
63-44	63-44	63-44#	63-44#	63-44#	63-44#	63-44#	63-44#	63-46	63-46	63-46	63-46	63-46	63-46	63-46
63-46#	63-46#	63-46#	63-46#	63-46#	63-46#	63-71	63-71#	63-96	63-96#	63-99	63-99	63-99	63-99	63-99
63-99	63-99#	63-99#	63-99#	63-99#	63-100	63-100	63-100	63-100	63-100	63-100#	63-100#	63-100#	63-100#	63-100#
63-121	63-121	63-121	63-121	63-121	63-121#	63-121#	63-121#	63-121#	63-121#	63-122	63-122	63-122	63-122	63-122
63-122#	63-122#	63-122#	63-122#	63-124	63-124#	63-138	63-138#	63-141	63-141	63-141	63-141	63-141	63-141	63-141#
63-141#	63-141#	63-141#	63-148	63-148	63-148	63-148	63-148#	63-148#	63-148#	63-148#	63-148#	63-155	63-155	63-155
63-155#	63-155#	63-157	63-157	63-157	63-157#	63-157#	63-157#	63-157#	63-157#	63-157#	63-157#	63-164	63-164	63-164
63-164	63-164	63-164	63-164#	63-164#	63-164#	63-164#	63-164#	63-164#	63-164#	63-165	63-165#	64-33	64-33	64-33
64-33	64-33#	64-33#	64-33#	64-33#	64-33#	64-34	64-34#	64-37	64-37#	64-39	64-39#	64-42	64-42#	64-42#
64-45	64-45#	64-56	64-56#	64-58	64-58#	64-63	64-63#	65-38	65-38#	65-41	65-41#	65-42	65-42#	65-42#
65-47	65-47#	65-63	65-63#	65-66	65-66#	65-67	65-67#	65-72	65-72#	65-85	65-85#	66-31	66-31	66-31
66-31	66-31	66-31	66-31	66-31#	66-31#	66-31#	66-31#	66-31#	66-31#	66-33	66-33	66-33#	66-33#	66-52
66-52#	66-60	66-60#	66-83	66-83#	67-35	67-35	67-35	67-35	67-35	67-35	67-35	67-35#	67-35#	67-35#
67-35#	67-35#	67-37	67-37	67-37#	67-37#	67-70	67-70#	67-75	67-75#	67-78	67-78	67-78#	67-78#	67-78#
67-86	67-86	67-86	67-86	67-86	67-86	67-86#	67-86#	67-86#	67-86#	67-86#	67-86#	67-88	67-88	67-88
67-88	67-88	67-88	67-88	67-88#	67-88#	67-88#	67-88#	67-88#	67-88#	67-127	67-127#	67-152	67-152#	67-152#
67-155	67-155	67-155	67-155	67-155	67-155#	67-155#	67-155#	67-155#	67-155#	67-156	67-156	67-156	67-156	67-156
67-156#	67-156#	67-156#	67-156#	67-177	67-177	67-177	67-177	67-177	67-177#	67-177#	67-177#	67-177#	67-177#	67-178
67-178	67-178	67-178	67-178	67-178#	67-178#	67-178#	67-178#	67-180	67-180#	67-194	67-194#	67-197	67-197	67-197
67-197	67-197	67-197	67-197#	67-197#	67-197#	67-197#	67-197#	67-201	67-201	67-201	67-201	67-201	67-201	67-201#
67-201#	67-201#	67-201#	67-201#	67-201#	67-203	67-203#	67-205	67-205#	67-209	67-209	67-209	67-209	67-209	67-209#
67-209#	67-209#	67-209#	67-209#	67-214	67-214	67-214	67-214	67-214	67-214	67-214#	67-214#	67-214#	67-214#	67-214#
67-214#	67-214#	67-219	67-219	67-219#	67-219#	67-221	67-221	67-221	67-221	67-221#	67-221#	67-221#	67-221#	67-221#
67-221#	67-229	67-229	67-229	67-229	67-229	67-229	67-229#	67-229#	67-229#	67-229#	67-229#	67-229#	67-229#	67-247
67-247#	68-53	68-53#	68-55	68-55	68-55	68-55#	68-55#	68-57	68-57	68-57	68-57	68-57#	68-57#	68-59
68-59	68-59	68-59	68-59	68-59#	68-61	68-61	68-61	68-61	68-61	68-61#	68-62	68-62#	69-12	69-12
69-12#	69-14	69-14	69-14	69-14#	69-16	69-16#	69-18	69-18	69-18	69-18	69-18	69-18#	69-20	69-20
69-20	69-20	69-20	69-20	69-20#	69-22	69-22	69-22	69-22	69-22	69-22#	69-24	69-24	69-24	69-24
69-24	69-24	69-24#	69-26	69-26	69-26	69-26	69-26	69-26#	69-28	69-28	69-28	69-28	69-28	69-28
69-28#	69-30	69-30	69-30	69-30	69-30	69-30#	69-32	69-32	69-32	69-32	69-32	69-32#	69-34	69-34
69-34	69-34	69-34	69-34	69-34#	69-38	69-38	69-38	69-38#	69-40	69-40#	69-44	69-44	69-44	69-44
69-44#	69-47	69-47	69-47	69-47#	69-49	69-49	69-49	69-49#	69-51	69-51	69-51	69-51#	69-53	69-53
69-53	69-53	69-53#	69-55	69-55	69-55	69-55#	69-57	69-57	69-57	69-57#	69-59	69-59#	69-60	69-60
69-60	69-60	69-60#	69-71	69-71#	69-122	69-122	69-122	69-122#	70-16	70-16	70-16#	70-16#		
M#GNLS	1-C13#	7-278#	67-205	67-205#										
M#GNSU	1-B98#	7-278#	50-62	50-62#	51-18	51-18#	51-25	51-25#	52-46	52-46#	52-49	52-49#	53-41	53-41#
	53-44	53-44#	54-27	54-27#	54-30	54-30#	54-42	54-42#	54-45	54-45#	54-57	54-57#	54-60	54-60#
	55-15	55-15#	55-18	55-18#	56-44	56-44#	56-76	56-76#	57-25	57-25#	57-41	57-41#	57-69	57-69#
	58-34	58-34#	58-52	58-52#	59-29	59-29#	59-49	59-49#	60-32	60-32#	61-20	61-20#	61-31	61-31#
	62-19	62-19#	62-28	62-28#	63-30	63-30#	63-71	63-71#	63-124	63-124#	64-37	64-37#	64-42	64-42#
	64-56	64-56#	65-38	65-38#	65-42	65-42#	65-63	65-63#	65-67	65-67#	66-52	66-52#	67-70	67-70#
M#GNTA	67-127	67-127#	67-180	67-180#										
	1-B90#	7-278#	9-21	9-21#	10-39	10-39#	19-25	19-25#	19-34	19-34#	19-43	19-43#	19-49	19-49#



	26-115	26-115#	26-133	26-133#	26-168	26-168#	32-36	32-36#	38-15	38-15#	42-76	42-76#	44-180	44-180#
	45-17	45-17#	46-26	46-26#	47-33	47-33#	48-34	48-34#	50-67	50-67#	50-68	50-68#	51-20	51-20#
	51-27	51-27#	51-31	51-31#	52-48	52-48#	52-64	52-64#	52-71	52-71#	53-43	53-43#	53-60	53-60#
	53-67	53-67#	54-29	54-29#	54-32	54-32#	54-44	54-44#	54-47	54-47#	54-59	54-59#	54-62	54-62#
	54-67	54-67#	55-17	55-17#	55-20	55-20#	55-25	55-25#	56-57	56-57#	56-89	56-89#	56-120	56-120#
	57-27	57-27#	57-55	57-55#	57-83	57-83#	57-110	57-110#	58-46	58-46#	58-66	58-66#	58-92	58-92#
	59-43	59-43#	59-63	59-63#	59-87	59-87#	60-44	60-44#	60-52	60-52#	61-25	61-25#	61-36	61-36#
	61-45	61-45#	62-25	62-25#	62-34	62-34#	62-38	62-38#	63-32	63-32#	63-96	63-96#	63-138	63-138#
	63-165	63-165#	64-39	64-39#	64-45	64-45#	64-58	64-58#	64-63	64-63#	65-41	65-41#	65-47	65-47#
	65-66	65-66#	65-72	65-72#	65-85	65-85#	66-60	66-60#	66-83	66-83#	67-75	67-75#	67-152	67-152#
	67-194	67-194#	67-247	67-247#	68-62	68-62#	69-71	69-71#	70-16	70-16#	70-21	70-21#		
M\$GNTE	1-B94#	7-278#	50-57	50-57#	51-14	51-14#	52-23	52-23#	53-22	53-22#	54-17	54-17#	55-8	55-8#
	56-23	56-23#	57-12	57-12#	58-15	58-15#	59-14	59-14#	60-20	60-20#	61-9	61-9#	62-10	62-10#
	63-17	63-17#	64-19	64-19#	65-18	65-18#	66-25	66-25#	67-29	67-29#				
M\$HAPT	1-A39#	7-278#	7-323	7-323#										
M\$HNAP	1-B24#	7-278#	7-323	7-323#										
M\$INCR	1-D26#	7-278#	7-304	7-304#	9-9	9-9	9-9#	9-9#	10-8	10-8	10-8#	10-8#	11-51	11-51#
	19-3	19-3	19-3#	19-3#	19-4#	19-8#	19-10#	19-11#	19-13#	19-14#	19-16#	19-17#	19-21#	19-22#
	19-24#	19-25#	19-27	19-27	19-27#	19-27#	19-28#	19-29#	19-30#	19-31#	19-33#	19-34#	19-36	19-36
	19-36#	19-36#	19-39#	19-40#	19-42#	19-43#	19-45	19-45	19-45#	19-45#	19-46#	19-48#	19-49#	26-16#
	26-35#	26-84#	26-94#	26-112	26-112	26-112#	26-112#	26-126#	26-130	26-130	26-130#	26-130#	26-135#	26-155#
	26-165	26-165	26-165#	26-165#	26-170#	27-27#	27-35#	27-42#	27-47#	27-52#	27-61#	27-66#	27-71#	27-76#
	27-87#	27-92#	27-95#	27-98#	27-103#	27-108#	27-113#	27-118#	27-123#	27-128#	27-135#	27-140#	27-147#	27-150#
	27-155#	27-160#	27-165#	27-170#	27-203#	30-19#	30-23#	30-27#	30-31#	30-35#	30-45#	31-22#	32-34	32-34
	32-34#	32-34#	32-165#	32-168#	32-171#	32-173#	33-40#	33-43#	33-45#	33-50#	33-51#	33-56#	33-57#	33-66#
	33-73#	33-75#	33-77#	36-18#	36-20#	36-36#	36-45#	36-145#	36-147#	36-199#	36-209#	36-254#	38-4	38-4
	38-4#	38-4#	42-41	42-41#	42-47	42-47	42-47#	42-47#	42-76#	43-8	43-8	43-8#	43-8#	44-8
	44-8	44-8#	44-8#	44-10#	44-16#	44-20#	44-25#	44-29#	44-39#	44-71#	44-73#	44-75#	44-77#	44-85#
	44-89#	44-91#	44-98#	44-100#	44-101#	44-102#	44-103#	44-114#	44-127#	44-132#	44-165#	44-180#	45-10	45-10
	45-10#	45-10#	45-17#	46-8	46-8	46-8#	46-8#	46-10#	46-18#	46-21#	46-23#	46-24#	46-26#	47-8
	47-8	47-8#	47-8#	47-32#	48-9	48-9	48-9#	48-9#	48-34#	50-38	50-38#	50-57	50-57	50-57
	50-57#	50-57#	50-57#	50-62	50-62	50-62	50-62#	50-62#	50-62#	50-67#	50-68#	51-14	51-14	51-14
	51-14#	51-14#	51-14#	51-18	51-18	51-18	51-18#	51-18#	51-18#	51-20#	51-25	51-25	51-25	51-25#
	51-25#	51-25#	51-27#	51-31#	52-23	52-23	52-23	52-23	52-23#	52-23#	52-46	52-46	52-46	52-46#
	52-46#	52-46#	52-48#	52-49	52-49	52-49	52-49#	52-49#	52-49#	52-64#	52-71#	53-22	53-22	53-22
	53-22#	53-22#	53-22#	53-41	53-41	53-41	53-41#	53-41#	53-41#	53-43#	53-44	53-44	53-44	53-44#
	53-44#	53-44#	53-60#	53-67#	54-17	54-17	54-17	54-17#	54-17#	54-17#	54-27	54-27	54-27	54-27#
	54-27#	54-27#	54-29#	54-30	54-30	54-30	54-30#	54-30#	54-30#	54-30#	54-32#	54-42	54-42	54-42#
	54-42#	54-42#	54-44#	54-45	54-45	54-45	54-45#	54-45#	54-45#	54-45#	54-47#	54-57	54-57	54-57#
	54-57#	54-57#	54-59#	54-60	54-60	54-60	54-60#	54-60#	54-60#	54-60#	54-62#	54-67#	55-8	55-8
	55-8#	55-8#	55-8#	55-15	55-15	55-15	55-15#	55-15#	55-15#	55-15#	55-17#	55-18	55-18	55-18#
	55-18#	55-18#	55-20#	55-25#	56-23	56-23	56-23	56-23#	56-23#	56-23#	56-23#	56-26#	56-37#	56-44
	56-44	56-44	56-44#	56-44#	56-44#	56-57#	56-60#	56-61#	56-73#	56-74#	56-76	56-76	56-76	56-76#
	56-76#	56-76#	56-89#	56-110#	56-112#	56-119#	56-120#	57-12	57-12	57-12	57-12#	57-12#	57-12#	57-15#
	57-18#	57-25	57-25	57-25	57-25#	57-25#	57-25#	57-27#	57-32#	57-34#	57-41	57-41	57-41	57-41#
	57-41#	57-41#	57-55#	57-69	57-69	57-69	57-69#	57-69#	57-69#	57-83#	57-86#	57-100#	57-102#	57-109#
	57-110#	58-15	58-15	58-15	58-15#	58-15#	58-15#	58-18#	58-21#	58-27#	58-29#	58-34	58-34	58-34
	58-34#	58-34#	58-34#	58-46#	58-52	58-52	58-52	58-52#	58-52#	58-52#	58-66#	58-69#	58-80#	58-83#
	58-84#	58-91#	58-92#	59-14	59-14	59-14	59-14#	59-14#	59-14#	59-17#	59-20#	59-26#	59-28#	59-29
	59-29	59-29	59-29#	59-29#	59-29#	59-43#	59-49	59-49	59-49	59-49#	59-49#	59-49#	59-63#	59-66#
	59-77#	59-79#	59-86#	59-87#	60-20	60-20	60-20	60-20#	60-20#	60-20#	60-32	60-32	60-32	60-32#
	60-32#	60-32#	60-44#	60-52#	61-9	61-9	61-9	61-9#	61-9#	61-9#	61-20	61-20	61-20	61-20#
	61-20#	61-20#	61-24#	61-25#	61-31	61-31	61-31	61-31#	61-31#	61-31#	61-35#	61-36#	61-45#	62-10
	62-10	62-10	62-10#	62-10#	62-19	62-19	62-19	62-19#	62-19#	62-19#	62-19#	62-24#	62-25#	62-28
	62-28	62-28	62-28#	62-28#	62-33#	62-34#	62-34#	62-35#	62-38#	63-17	63-17	63-17	63-17#	63-17#
	63-17#	63-30	63-30	63-30	63-30#	63-30#	63-30#	63-32#	63-35#	63-44#	63-46#	63-71	63-71	63-71



	63-71#	63-71#	63-71#	63-96#	63-99#	63-100#	63-121#	63-122#	63-124	63-124	63-124	63-124#	63-124#	63-124#
	63-138#	63-141#	63-148#	63-155#	63-157#	63-164#	63-165#	64-19	64-19	64-19	64-19#	64-19#	64-19#	64-33#
	64-34#	64-37	64-37	64-37	64-37#	64-37#	64-37#	64-39#	64-42	64-42	64-42	64-42#	64-42#	64-42#
	64-45#	64-56	64-56	64-56	64-56#	64-56#	64-56#	64-58#	64-63#	65-18	65-18	65-18	65-18#	65-18#
	65-18#	65-38	65-38	65-38	65-38#	65-38#	65-38#	65-41#	65-42	65-42	65-42	65-42#	65-42#	65-42#
	65-47#	65-63	65-63	65-63	65-63#	65-63#	65-63#	65-66#	65-67	65-67	65-67	65-67#	65-67#	65-67#
	65-72#	65-85#	66-25	66-25	66-25	66-25#	66-25#	66-25#	66-31#	66-33#	66-52	66-52	66-52	66-52#
	66-52#	66-52#	66-60#	66-83#	67-29	67-29	67-29	67-29#	67-29#	67-29#	67-35#	67-37#	67-70	67-70
	67-70	67-70#	67-70#	67-70#	67-75#	67-78#	67-86#	67-88#	67-127	67-127	67-127	67-127#	67-127#	67-127#
	67-152#	67-155#	67-156#	67-177#	67-178#	67-180	67-180	67-180	67-180#	67-180#	67-180#	67-194#	67-197#	67-201#
	67-203	67-203	67-203	67-203#	67-203#	67-203#	67-203#	67-205#	67-209#	67-214#	67-219#	67-221#	67-229#	67-247#
	68-43	68-43#	68-53	68-53	68-53#	68-53#	69-12	69-12	69-12#	69-12#	70-15	70-15#	70-16	70-16
	70-16	70-16#												
M\$IOSE	1-A00#	7-278#												
M\$LDRO	1-C42#	7-278#	26-16	26-16#	26-35	26-35#	36-20	36-20#	36-45	36-45#	36-147	36-147#	36-199	36-199#
	36-254	36-254#	44-16	44-16#	44-20	44-20#	44-25	44-25#	44-39	44-39#	44-98	44-98#	44-100	44-100#
	44-101	44-101#	46-10	46-10#	46-18	46-18#	46-21	46-21#	46-23	46-23#	56-110	56-110#	57-100	57-100#
	58-80	58-80#	59-77	59-77#	63-155	63-155#	67-219	67-219#						
M\$MASK	1-#71#	7-278#												
M\$MCHI	1-4#	7-278	7-278#	7-278#										
M\$MCLO	1-#24#	7-278	7-278#	7-278#										
M\$MSK1	1-#77#	7-278#												
M\$POP	1-B81#	7-278#	9-21	9-21#	10-39	10-39#	10-40	10-40#	19-25	19-25#	19-34	19-34#	19-43	19-43#
	19-49	19-49#	26-115	26-115#	26-133	26-133#	26-168	26-168#	32-36	32-36#	38-15	38-15#	41-1	41-1#
	42-76	42-76#	43-12	43-12#	44-180	44-180#	45-17	45-17#	46-26	46-26#	47-33	47-33#	48-34	48-34#
	48-35	48-35#	50-67	50-67#	50-68	50-68#	51-20	51-20#	51-27	51-27#	51-31	51-31#	52-48	52-48#
	52-64	52-64#	52-71	52-71#	53-43	53-43#	53-60	53-60#	53-67	53-67#	54-29	54-29#	54-32	54-32#
	54-44	54-44#	54-47	54-47#	54-59	54-59#	54-62	54-62#	54-67	54-67#	55-17	55-17#	55-20	55-20#
	55-25	55-25#	56-57	56-57#	56-89	56-89#	56-120	56-120#	57-27	57-27#	57-55	57-55#	57-83	57-83#
	57-110	57-110#	58-46	58-46#	58-66	58-66#	58-92	58-92#	59-43	59-43#	59-63	59-63#	59-87	59-87#
	60-44	60-44#	60-52	60-52#	61-25	61-25#	61-36	61-36#	61-45	61-45#	62-25	62-25#	62-34	62-34#
	62-38	62-38#	63-32	63-32#	63-96	63-96#	63-138	63-138#	63-165	63-165#	64-39	64-39#	64-45	64-45#
	64-58	64-58#	64-63	64-63#	65-41	65-41#	65-47	65-47#	65-66	65-66#	65-72	65-72#	65-85	65-85#
	66-60	66-60#	66-83	66-83#	67-75	67-75#	67-152	67-152#	67-194	67-194#	67-205	67-205#	67-205#	67-247
	67-247#	67-254	67-254#	68-62	68-62#	69-71	69-71#	69-123	69-123#					
M\$PRIN	1-#36#	7-278#	19-4	19-4#	19-8	19-8#	19-10	19-10#	19-11	19-11#	19-13	19-13#	19-14	19-14#
	19-16	19-16#	19-17	19-17#	19-21	19-21#	19-22	19-22#	19-24	19-24#	19-28	19-28#	19-29	19-29#
	19-30	19-30#	19-31	19-31#	19-33	19-33#	19-39	19-39#	19-40	19-40#	19-42	19-42#	19-46	19-46#
	19-48	19-48#	32-165	32-165#	32-168	32-168#	32-171	32-171#	32-173	32-173#	33-40	33-40#	33-43	33-43#
	33-45	33-45#	33-50	33-50#	33-51	33-51#	33-56	33-56#	33-57	33-57#	33-66	33-66#	33-73	33-73#
	33-75	33-75#	33-77	33-77#	44-29	44-29#	44-71	44-71#	44-73	44-73#	44-75	44-75#	44-77	44-77#
	44-85	44-85#	44-114	44-114#	44-127	44-127#	44-132	44-132#	56-60	56-60#	56-61	56-61#	56-73	56-73#
	56-74	56-74#	57-86	57-86#	58-69	58-69#	59-66	59-66#	63-99	63-99#	63-100	63-100#	63-121	63-121#
	63-122	63-122#	63-141	63-141#	66-31	66-31#	67-35	67-35#	67-155	67-155#	67-156	67-156#	67-177	67-177#
	67-178	67-178#	67-197	67-197#										
M\$PUSH	1-#31#	7-278#	7-304	7-304#	9-9	9-9#	10-8	10-8#	11-51	11-51#	19-3	19-3#	19-27	19-27#
	19-36	19-36#	19-45	19-45#	26-112	26-112#	26-130	26-130#	26-165	26-165#	32-34	32-34#	38-4	38-4#
	42-41	42-41#	42-47	42-47#	43-8	43-8#	44-8	44-8#	45-10	45-10#	46-8	46-8#	47-8	47-8#
	48-9	48-9#	50-38	50-38#	50-57	50-57#	50-62	50-62#	51-14	51-14#	51-18	51-18#	51-25	51-25#
	52-23	52-23#	52-46	52-46#	52-49	52-49#	53-22	53-22#	53-41	53-41#	53-44	53-44#	54-17	54-17#
	54-27	54-27#	54-30	54-30#	54-42	54-42#	54-45	54-45#	54-57	54-57#	54-60	54-60#	55-8	55-8#
	55-15	55-15#	55-18	55-18#	56-23	56-23#	56-44	56-44#	56-76	56-76#	57-12	57-12#	57-25	57-25#
	57-41	57-41#	57-69	57-69#	58-15	58-15#	58-34	58-34#	58-52	58-52#	59-14	59-14#	59-29	59-29#
	59-49	59-49#	60-20	60-20#	60-32	60-32#	61-9	61-9#	61-20	61-20#	61-31	61-31#	62-10	62-10#
	62-19	62-19#	62-28	62-28#	63-17	63-17#	63-30	63-30#	63-71	63-71#	63-124	63-124#	64-19	64-19#
	64-37	64-37#	64-42	64-42#	64-56	64-56#	65-18	65-18#	65-38	65-38#	65-42	65-42#	65-63	65-63#



M\$PUT	65-67	65-67#	66-25	66-25#	66-52	66-52#	67-29	67-29#	67-70	67-70#	67-127	67-127#	67-180	67-180#
	67-203	67-203	67-203#	68-43	68-43#	68-53	68-53#	69-12	69-12#	69-12#	69-12#	69-12#	69-12#	69-12#
	1-C72#	7-278#	19-4	19-4	19-4	19-4	19-4	19-4#	19-8	19-8	19-8	19-8	19-8	19-8
	19-8#	19-10	19-10	19-10#	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11#
	19-13	19-13	19-13#	19-14	19-14	19-14	19-14	19-14	19-14	19-14	19-14	19-14	19-14#	19-16
	19-16	19-16#	19-17	19-17	19-17	19-17	19-17	19-17	19-17	19-17	19-17	19-17#	19-21	19-21
	19-21#	19-22	19-22	19-22	19-22	19-22#	19-24	19-24	19-24#	19-28	19-28	19-28#	19-29	19-29
	19-29	19-29	19-29	19-29	19-29#	19-30	19-30	19-30#	19-31	19-31	19-31	19-31	19-31	19-31
	19-31	19-31	19-31#	19-33	19-33	19-33#	19-39	19-39	19-39#	19-40	19-40	19-40	19-40	19-40
	19-40	19-40	19-40#	19-42	19-42	19-42#	19-46	19-46	19-46#	19-46#	19-48	19-48	19-48#	26-84
	26-84	26-84	26-84	26-84#	26-94	26-94	26-94	26-94	26-94#	26-126	26-126	26-126	26-126	26-126#
	26-135	26-135	26-135	26-135	26-135#	26-155	26-155	26-155	26-155#	26-155	26-170	26-170	26-170	26-170#
	26-170#	32-165	32-165	32-165#	32-168	32-168	32-168	32-168#	32-171	32-171	32-171	32-171#	32-173	32-173
	32-173#	33-40	33-40	33-40#	33-43	33-43	33-43#	33-45	33-45	33-45	33-45#	33-50	33-50	33-50
	33-50	33-50#	33-51	33-51	33-51	33-51#	33-56	33-56	33-56	33-56	33-56#	33-57	33-57	33-57#
	33-66	33-66	33-66	33-66#	33-73	33-73	33-73	33-73#	33-75	33-75	33-75	33-75#	33-77	33-77
	33-77	33-77#	36-36	36-36	36-36	36-36	36-36#	44-29	44-29	44-29#	44-71	44-71	44-71	44-71#
	44-73	44-73	44-73	44-73#	44-75	44-75	44-75	44-75#	44-77	44-77	44-77	44-77#	44-85	44-85
	44-85#	44-89	44-89	44-89	44-89	44-89#	44-114	44-114	44-114#	44-127	44-127	44-127	44-127	44-127#
	44-132	44-132	44-132#	56-37	56-37	56-37	56-37	56-37#	56-39	56-39	56-39	56-39	56-39#	56-60
	56-60	56-60#	56-61	56-61	56-61#	56-73	56-73	56-73#	56-74	56-74	56-74#	56-119	56-119	56-119
	56-119	56-119#	57-32	57-32	57-32	57-32	57-32	57-32#	57-34	57-34	57-34	57-34#	57-86	57-86
	57-86#	57-109	57-109	57-109	57-109	57-109#	58-27	58-27	58-27	58-27	58-27#	58-29	58-29	58-29
	58-29	58-29#	58-69	58-69	58-69#	58-83	58-83	58-83	58-83	58-83#	58-91	58-91	58-91	58-91
	58-91#	59-26	59-26	59-26	59-26	59-26#	59-28	59-28	59-28	59-28	59-28#	59-66	59-66	59-66#
	59-86	59-86	59-86	59-86	59-86#	63-44	63-44	63-44	63-44	63-44#	63-46	63-46	63-46	63-46
	63-46#	63-99	63-99	63-99#	63-100	63-100	63-100#	63-121	63-121	63-121#	63-122	63-122	63-122#	63-141
	63-141	63-141#	63-164	63-164	63-164	63-164	63-164#	66-31	66-31	66-31	66-31#	67-35	67-35	67-35
	67-35#	67-86	67-86	67-86	67-86	67-86#	67-88	67-88	67-88	67-88	67-88#	67-155	67-155	67-155#
	67-156	67-156	67-156#	67-177	67-177	67-177#	67-178	67-178	67-178#	67-197	67-197	67-197#	67-201	67-201
	67-201	67-201	67-201#	67-214	67-214	67-214	67-214	67-214#	67-229	67-229	67-229	67-229#	67-229#	67-201
M\$PUT1	1-C81#	7-278#	19-4	19-4	19-4	19-4	19-4	19-4#	19-4#	19-4#	19-4#	19-4#	19-8	19-8
	19-8	19-8	19-8	19-8	19-8#	19-8#	19-8#	19-8#	19-8#	19-8#	19-8#	19-8#	19-10	19-10#
	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11	19-11#	19-11#	19-11#	19-11#	19-11#
	19-11#	19-11#	19-11#	19-11#	19-13	19-13	19-13#	19-13#	19-14	19-14	19-14	19-14	19-14	19-14
	19-14	19-14	19-14	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-14#	19-16	19-16
	19-16#	19-16#	19-17	19-17	19-17	19-17	19-17	19-17	19-17	19-17	19-17	19-17#	19-17#	19-17#
	19-17#	19-17#	19-17#	19-17#	19-17#	19-17#	19-21	19-21	19-21#	19-21#	19-22	19-22	19-22	19-22
	19-22#	19-22#	19-22#	19-22#	19-24	19-24	19-24#	19-24#	19-28	19-28	19-28#	19-28#	19-29	19-29
	19-29	19-29	19-29	19-29	19-29#	19-29#	19-29#	19-29#	19-29#	19-29#	19-30	19-30	19-30#	19-30#
	19-31	19-31	19-31	19-31	19-31	19-31	19-31	19-31	19-31	19-31#	19-31#	19-31#	19-31#	19-31#
	19-31#	19-31#	19-33	19-33	19-33#	19-33#	19-39	19-39	19-39#	19-39#	19-40	19-40	19-40	19-40
	19-40	19-40	19-40	19-40#	19-40#	19-40#	19-40#	19-40#	19-40#	19-40#	19-42	19-42	19-42#	19-42#
	19-46	19-46	19-46	19-46#	19-46#	19-46#	19-48	19-48	19-48#	19-48#	26-84	26-84	26-84	26-84
	26-84#	26-84#	26-84#	26-84#	26-94	26-94	26-94	26-94	26-94#	26-94#	26-94#	26-94#	26-126	26-126
	26-126	26-126	26-126#	26-126#	26-126#	26-126#	26-135	26-135	26-135	26-135	26-135#	26-135#	26-135#	26-135#
	26-155	26-155	26-155	26-155	26-155#	26-155#	26-155#	26-155#	26-170	26-170	26-170	26-170	26-170#	26-170#
	26-170#	26-170#	32-165	32-165	32-165#	32-165#	32-168	32-168	32-168	32-168#	32-168#	32-168#	32-171	32-171
	32-171	32-171#	32-171#	32-171#	32-173	32-173	32-173#	32-173#	33-40	33-40	33-40#	33-40#	33-43	33-43
	33-43#	33-43#	33-45	33-45	33-45	33-45#	33-45#	33-45#	33-50	33-50	33-50	33-50	33-50#	33-50#
	33-50#	33-50#	33-51	33-51	33-51	33-51#	33-51#	33-51#	33-56	33-56	33-56	33-56	33-56#	33-56#
	33-56#	33-56#	33-57	33-57	33-57#	33-57#	33-66	33-66	33-66	33-66#	33-66#	33-66#	33-73	33-73
	33-73	33-73#	33-73#	33-73#	33-75	33-75	33-75	33-75#	33-75#	33-75#	33-77	33-77	33-77	33-77#
	33-77#	33-77#	36-36	36-36	36-36	36-36	36-36#	36-36#	36-36#	36-36#	44-29	44-29	44-29#	44-29#
	44-71	44-71	44-71	44-71#	44-71#	44-71#	44-73	44-73	44-73	44-73#	44-73#	44-73#	44-75	44-75
	44-75	44-75#	44-75#	44-75#	44-77	44-77	44-77	44-77#	44-77#	44-77#	44-85	44-85	44-85#	44-85#



	44-89	44-89	44-89	44-89	44-89#	44-89#	44-89#	44-89#	44-114	44-114	44-114	44-114#	44-114#	44-114#
	44-127	44-127	44-127	44-127#	44-127#	44-127#	44-132	44-132	44-132#	44-132#	56-37	56-37	56-37	56-37
	56-37#	56-37#	56-37#	56-37#	56-39	56-39	56-39	56-39	56-39#	56-39#	56-39#	56-39#	56-60	56-60
	56-60#	56-60#	56-61	56-61	56-61#	56-61#	56-73	56-73	56-73#	56-73#	56-74	56-74	56-74#	56-74#
	56-119	56-119	56-119	56-119	56-119#	56-119#	56-119#	56-119#	56-119#	56-119#	57-32	57-32	57-32	57-32#
	57-32#	57-32#	57-34	57-34	57-34	57-34	57-34#	57-34#	57-34#	57-34#	57-86	57-86	57-86#	57-86#
	57-109	57-109	57-109	57-109	57-109#	57-109#	57-109#	57-109#	57-109#	57-109#	58-27	58-27	58-27#	58-27#
	58-27#	58-27#	58-29	58-29	58-29	58-29	58-29#	58-29#	58-29#	58-29#	58-69	58-69	58-69#	58-69#
	58-83	58-83	58-83	58-83	58-83#	58-83#	58-83#	58-83#	58-91	58-91	58-91	58-91	58-91#	58-91#
	58-91#	58-91#	59-26	59-26	59-26	59-26	59-26#	59-26#	59-26#	59-26#	59-28	59-28	59-28	59-28
	59-28#	59-28#	59-28#	59-28#	59-66	59-66	59-66#	59-66#	59-66#	59-66#	59-86	59-86	59-86#	59-86#
	59-86#	59-86#	63-44	63-44	63-44	63-44	63-44#	63-44#	63-44#	63-44#	63-46	63-46	63-46	63-46
	63-46#	63-46#	63-46#	63-46#	63-99	63-99	63-99#	63-99#	63-99#	63-99#	63-100	63-100	63-100#	63-100#
	63-121#	63-121#	63-122	63-122	63-122#	63-122#	63-141	63-141	63-141#	63-141#	63-164	63-164	63-164	63-164
	63-164#	63-164#	63-164#	63-164#	66-31	66-31	66-31	66-31#	66-31#	66-31#	67-35	67-35	67-35	67-35#
	67-35#	67-35#	67-86	67-86	67-86	67-86	67-86#	67-86#	67-86#	67-86#	67-88	67-88	67-88	67-88
	67-88#	67-88#	67-88#	67-88#	67-155	67-155	67-155#	67-155#	67-156	67-156	67-156#	67-156#	67-177	67-177
	67-177#	67-177#	67-178	67-178	67-178#	67-178#	67-197	67-197	67-197#	67-197#	67-201	67-201	67-201	67-201
	67-201#	67-201#	67-201#	67-201#	67-214	67-214	67-214	67-214	67-214#	67-214#	67-214#	67-214#	67-229	67-229
	67-229	67-229	67-229#	67-229#	67-229#	67-229#								
M\$RADI	1-D77#	7-278#	68-55	68-55#	68-57	68-57#	68-59	68-59#	68-61	68-61#	69-14	69-14#	69-18	69-18#
	69-20	69-20#	69-22	69-22#	69-24	69-24#	69-26	69-26#	69-28	69-28#	69-30	69-30#	69-32	69-32#
	69-34	69-34#	69-38	69-38#	69-44	69-44#	69-47	69-47#	69-49	69-49#	69-51	69-51#	69-53	69-53#
	69-55	69-55#	69-57	69-57#	69-60	69-60#								
M\$RBRO	1-C52#	7-278#												
M\$RNRO	1-C62#	7-278#	26-16	26-16#	26-35	26-35#	36-18	36-18#	36-145	36-145#	36-209	36-209#	44-39	44-39#
M\$SETS	1-D32#	7-278#	7-304	7-304#	9-9	9-9#	10-8	10-8#	11-51	11-51#	19-3	19-3#	19-27	19-27#
	19-36	19-36#	19-45	19-45#	26-112	26-112#	26-130	26-130#	26-165	26-165#	32-34	32-34#	38-4	38-4#
	42-41	42-41#	42-47	42-47#	43-8	43-8#	44-8	44-8#	45-10	45-10#	46-8	46-8#	47-8	47-8#
	48-9	48-9#	50-38	50-38#	50-57	50-57#	50-62	50-62#	51-14	51-14#	51-18	51-18#	51-25	51-25#
	52-23	52-23#	52-46	52-46#	52-49	52-49#	53-22	53-22#	53-41	53-41#	53-44	53-44#	54-17	54-17#
	54-27	54-27#	54-30	54-30#	54-42	54-42#	54-45	54-45#	54-57	54-57#	54-60	54-60#	55-8	55-8#
	55-15	55-15#	55-18	55-18#	56-23	56-23#	56-44	56-44#	56-76	56-76#	57-12	57-12#	57-25	57-25#
	57-41	57-41#	57-69	57-69#	58-15	58-15#	58-34	58-34#	58-52	58-52#	59-14	59-14#	59-29	59-29#
	59-49	59-49#	60-20	60-20#	60-32	60-32#	61-9	61-9#	61-20	61-20#	61-31	61-31#	62-10	62-10#
	62-19	62-19#	62-28	62-28#	63-17	63-17#	63-30	63-30#	63-71	63-71#	63-124	63-124#	64-19	64-19#
	64-37	64-37#	64-42	64-42#	64-56	64-56#	65-18	65-18#	65-38	65-38#	65-42	65-42#	65-63	65-63#
	65-67	65-67#	66-25	66-25#	66-52	66-52#	67-29	67-29#	67-70	67-70#	67-127	67-127#	67-180	67-180#
	67-203	67-203	67-203#	67-203#	68-43	68-43#	68-53	68-53#	69-12	69-12#				
M\$STAR	1-A33#	7-278#												
M\$SVC	1-C33#	7-278#	19-4	19-4#	19-8	19-8#	19-10	19-10#	19-11	19-11#	19-13	19-13#	19-14	19-14#
	19-16	19-16#	19-17	19-17#	19-21	19-21#	19-22	19-22#	19-24	19-24#	19-25	19-25#	19-28	19-28#
	19-29	19-29#	19-30	19-30#	19-31	19-31#	19-33	19-33#	19-34	19-34#	19-39	19-39#	19-40	19-40#
	19-42	19-42#	19-43	19-43#	19-46	19-46#	19-48	19-48#	19-49	19-49#	26-16	26-16#	26-35	26-35#
	26-84	26-84#	26-94	26-94#	26-126	26-126#	26-135	26-135#	26-155	26-155#	26-170	26-170#	27-27	27-35
	27-42	27-47	27-52	27-61	27-66	27-71	27-76	27-87	27-92	27-95	27-98	27-103	27-108	27-113
	27-118	27-123	27-128	27-135	27-140	27-147	27-150	27-155	27-160	27-165	27-170	27-203	30-19	30-23
	30-27	30-31	30-35	30-45	30-45#	31-22	32-165	32-165#	32-168	32-168#	32-171	32-171#	32-173	32-173#
	33-40	33-40#	33-43	33-43#	33-45	33-45#	33-50	33-50#	33-51	33-51#	33-56	33-56#	33-57	33-57#
	33-66	33-66#	33-73	33-73#	33-75	33-75#	33-77	33-77#	36-18	36-18#	36-20	36-20#	36-36	36-36#
	36-45	36-45#	36-145	36-145#	36-147	36-147#	36-199	36-199#	36-209	36-209#	36-254	36-254#	42-61#	42-76
	42-76#	44-10	44-10#	44-16	44-16#	44-20	44-20#	44-25	44-25#	44-29	44-29#	44-39	44-39#	44-71
	44-71#	44-73	44-73#	44-75	44-75#	44-77	44-77#	44-85	44-85#	44-89	44-89#	44-91	44-91#	44-98
	44-98#	44-100	44-100#	44-101	44-101#	44-102	44-102#	44-103	44-103#	44-114	44-114#	44-127	44-127#	44-132
	44-132#	44-165	44-165#	44-180	44-180#	45-17	45-17#	46-10	46-10#	46-18	46-18#	46-21	46-21#	46-23
	46-23#	46-24	46-24#	46-26	46-26#	47-18#	47-33	47-33#	48-19#	48-34	48-34#	50-62	50-62#	50-67



50-67#	50-68	50-68#	51-18	51-18#	51-20	51-20#	51-25	51-25#	51-27	51-27#	51-31	51-31#	52-46
52-46#	52-48	52-48#	52-49	52-49#	52-64	52-64#	52-71	52-71#	53-41	53-41#	53-43	53-43#	53-44
53-44#	53-60	53-60#	53-67	53-67#	54-27	54-27#	54-29	54-29#	54-30	54-30#	54-32	54-32#	54-42
54-42#	54-44	54-44#	54-45	54-45#	54-47	54-47#	54-57	54-57#	54-59	54-59#	54-60	54-60#	54-62
54-62#	54-67	54-67#	55-15	55-15#	55-17	55-17#	55-18	55-18#	55-20	55-20#	55-25	55-25#	56-26
56-26#	56-37	56-37#	56-39	56-39#	56-44	56-44#	56-57	56-57#	56-60	56-60#	56-61	56-61#	56-73
56-73#	56-74	56-74#	56-76	56-76#	56-89	56-89#	56-110	56-110#	56-112	56-112#	56-119	56-119#	56-120
57-15	57-15#	57-18	57-18#	57-25	57-25#	57-27	57-27#	57-32	57-32#	57-34	57-34#	57-41	57-41#
57-55	57-55#	57-69	57-69#	57-83	57-83#	57-86	57-86#	57-100	57-100#	57-102	57-102#	57-109	57-109#
57-110#	58-18	58-18#	58-21	58-21#	58-27	58-27#	58-29	58-29#	58-34	58-34#	58-46	58-46#	58-52
58-52#	58-66	58-66#	58-69	58-69#	58-80	58-80#	58-83	58-83#	58-84	58-84#	58-91	58-91#	58-92
59-17	59-17#	59-20	59-20#	59-26	59-26#	59-28	59-28#	59-29	59-29#	59-43	59-43#	59-49	59-49#
59-63	59-63#	59-66	59-66#	59-77	59-77#	59-79	59-79#	59-86	59-86#	59-87	59-87#	60-32	60-32#
60-44#	60-52	60-52#	61-20	61-20#	61-24	61-24#	61-25	61-25#	61-31	61-31#	61-35	61-35#	61-45
61-45#	62-19	62-19#	62-24	62-24#	62-25	62-25#	62-28	62-28#	62-33	62-33#	62-34	62-34#	62-38
62-38#	63-30	63-30#	63-32	63-32#	63-35	63-35#	63-44	63-44#	63-46	63-46#	63-71	63-71#	63-96
63-96#	63-99	63-99#	63-100	63-100#	63-121	63-121#	63-122	63-122#	63-124	63-124#	63-138	63-138#	63-141
63-141#	63-148	63-148#	63-155	63-155#	63-164	63-164#	63-165	63-165#	64-33	64-33#	64-34	64-34#	64-37
64-39	64-39#	64-42	64-42#	64-45	64-45#	64-56	64-56#	64-58	64-58#	64-63	64-63#	65-38	65-38#
65-41	65-41#	65-42	65-42#	65-47	65-47#	65-63	65-63#	65-66	65-66#	65-67	65-67#	65-72	65-72#
65-85	65-85#	66-31	66-31#	66-33	66-33#	66-52	66-52#	66-60	66-60#	66-83	66-83#	67-35	67-35#
67-37	67-37#	67-70	67-70#	67-75	67-75#	67-78	67-78#	67-86	67-86#	67-88	67-88#	67-127	67-127#
67-152	67-152#	67-155	67-155#	67-156	67-156#	67-177	67-177#	67-178	67-178#	67-180	67-180#	67-194	67-194#
67-197	67-197#	67-201	67-201#	67-203	67-203#	67-205	67-205#	67-209	67-209#	67-214	67-214#	67-219	67-219#
67-229	67-229#	67-247	67-247#										
M\$TLAB	1-C29#	7-278#	19-4#	19-8#	19-10#	19-11#	19-13#	19-14#	19-16#	19-17#	19-21#	19-22#	19-24#
	19-28#	19-29#	19-30#	19-31#	19-33#	19-34#	19-39#	19-40#	19-42#	19-43#	19-46#	19-48#	19-49#
	26-35#	26-84#	26-94#	26-126#	26-135#	26-155#	26-170#	27-27#	27-35#	27-42#	27-47#	27-52#	27-61#
	27-71#	27-76#	27-87#	27-92#	27-95#	27-98#	27-103#	27-108#	27-113#	27-118#	27-123#	27-128#	27-135#
	27-147#	27-150#	27-155#	27-160#	27-165#	27-170#	27-203#	30-19#	30-23#	30-27#	30-31#	30-35#	30-45#
	32-165#	32-168#	32-171#	32-173#	33-40#	33-43#	33-45#	33-50#	33-51#	33-56#	33-57#	33-66#	33-73#
	33-77#	36-18#	36-20#	36-36#	36-45#	36-145#	36-147#	36-199#	36-209#	36-254#	42-76#	44-10#	44-16#
	44-25#	44-29#	44-39#	44-71#	44-73#	44-75#	44-77#	44-85#	44-89#	44-91#	44-98#	44-100#	44-101#
	44-103#	44-114#	44-127#	44-132#	44-165#	44-180#	45-17#	46-10#	46-18#	46-21#	46-23#	46-24#	46-26#
	48-34#	50-62#	50-67#	50-68#	51-18#	51-20#	51-25#	51-27#	51-31#	52-46#	52-48#	52-49#	52-64#
	53-41#	53-43#	53-44#	53-60#	53-67#	54-27#	54-29#	54-30#	54-32#	54-42#	54-44#	54-45#	54-47#
	54-59#	54-60#	54-62#	54-67#	55-15#	55-17#	55-18#	55-20#	55-25#	56-26#	56-37#	56-39#	56-44#
	56-60#	56-61#	56-73#	56-74#	56-76#	56-89#	56-110#	56-112#	56-119#	56-120#	57-15#	57-18#	57-25#
	57-32#	57-34#	57-41#	57-55#	57-69#	57-83#	57-86#	57-100#	57-102#	57-109#	57-110#	58-18#	58-21#
	58-29#	58-34#	58-46#	58-52#	58-66#	58-69#	58-80#	58-83#	58-84#	58-91#	58-92#	59-17#	59-20#
	59-28#	59-29#	59-43#	59-49#	59-63#	59-66#	59-77#	59-79#	59-86#	59-87#	60-32#	60-44#	60-52#
	61-24#	61-25#	61-31#	61-35#	61-36#	61-45#	62-19#	62-24#	62-25#	62-28#	62-33#	62-34#	62-35#
	63-30#	63-32#	63-35#	63-44#	63-46#	63-71#	63-96#	63-99#	63-100#	63-121#	63-122#	63-124#	63-138#
	63-148#	63-155#	63-157#	63-164#	63-165#	64-33#	64-34#	64-37#	64-39#	64-42#	64-45#	64-56#	64-58#
	65-38#	65-41#	65-42#	65-47#	65-63#	65-66#	65-67#	65-72#	65-85#	66-31#	66-33#	66-52#	66-60#
	67-35#	67-37#	67-70#	67-75#	67-78#	67-86#	67-88#	67-127#	67-152#	67-155#	67-156#	67-177#	67-180#
	67-194#	67-197#	67-201#	67-203#	67-205#	67-209#	67-214#	67-219#	67-221#	67-229#	67-247#		
M\$TSTL	1-C21#	7-278#	19-4	19-4#	19-8	19-8#	19-10	19-10#	19-11	19-11#	19-13	19-13#	19-14
	19-16	19-16#	19-17	19-17#	19-21	19-21#	19-22	19-22#	19-24	19-24#	19-25	19-25#	19-28
	19-29	19-29#	19-30	19-30#	19-31	19-31#	19-33	19-33#	19-34	19-34#	19-39	19-39#	19-40
	19-42	19-42#	19-43	19-43#	19-46	19-46#	19-48	19-48#	19-49	19-49#	26-16	26-16#	26-35
	26-84	26-84#	26-94	26-94#	26-126	26-126#	26-135	26-135#	26-155	26-155#	26-170	26-170#	27-27
	27-27#	27-35	27-35#	27-35#	27-42	27-42#	27-42#	27-47	27-47#	27-47#	27-52	27-52#	27-61
	27-61#	27-61#	27-66	27-66#	27-66#	27-71	27-71#	27-71#	27-76	27-76#	27-76#	27-87	27-87#
	27-92	27-92#	27-92#	27-95	27-95#	27-95#	27-98	27-98#	27-98#	27-103	27-103#	27-103#	27-108
	27-108#	27-113	27-113#	27-113#	27-118	27-118#	27-118#	27-123	27-123#	27-123#	27-128	27-128#	27-135



27-135#	27-135#	27-140	27-140#	27-140#	27-147	27-147#	27-147#	27-150	27-150#	27-150#	27-155	27-155#	27-155#
27-160	27-160#	27-160#	27-165	27-165#	27-165#	27-170	27-170#	27-170#	27-203	27-203#	27-203#	30-19	30-19#
30-19#	30-23	30-23#	30-23#	30-27	30-27#	30-27#	30-31	30-31#	30-31#	30-35	30-35#	30-35#	30-45
30-45#	31-22	31-22#	31-22#	32-165	32-165#	32-168	32-168#	32-171	32-171#	32-173	32-173#	33-40	33-40#
33-43	33-43#	33-45	33-45#	33-50	33-50#	33-51	33-51#	33-56	33-56#	33-57	33-57#	33-66	33-66#
33-73	33-73#	33-75	33-75#	33-77	33-77#	36-18	36-18#	36-20	36-20#	36-36	36-36#	36-45	36-45#
36-145	36-145#	36-147	36-147#	36-199	36-199#	36-209	36-209#	36-254	36-254#	42-76	42-76#	44-10	44-10#
44-16	44-16#	44-20	44-20#	44-25	44-25#	44-29	44-29#	44-39	44-39#	44-71	44-71#	44-73	44-73#
44-75	44-75#	44-77	44-77#	44-85	44-85#	44-89	44-89#	44-91	44-91#	44-98	44-98#	44-100	44-100#
44-101	44-101#	44-102	44-102#	44-103	44-103#	44-114	44-114#	44-127	44-127#	44-132	44-132#	44-165	44-165#
44-180	44-180#	45-17	45-17#	46-10	46-10#	46-18	46-18#	46-21	46-21#	46-23	46-23#	46-24	46-24#
46-26	46-26#	47-33	47-33#	48-34	48-34#	50-62	50-62#	50-67	50-67#	50-68	50-68#	51-18	51-18#
51-20	51-20#	51-25	51-25#	51-27	51-27#	51-31	51-31#	52-46	52-46#	52-48	52-48#	52-49	52-49#
52-64	52-64#	52-71	52-71#	53-41	53-41#	53-43	53-43#	53-44	53-44#	53-60	53-60#	53-67	53-67#
54-27	54-27#	54-29	54-29#	54-30	54-30#	54-32	54-32#	54-42	54-42#	54-44	54-44#	54-45	54-45#
54-47	54-47#	54-57	54-57#	54-59	54-59#	54-60	54-60#	54-62	54-62#	54-67	54-67#	55-15	55-15#
55-17	55-17#	55-18	55-18#	55-20	55-20#	55-25	55-25#	56-26	56-26#	56-37	56-37#	56-39	56-39#
56-44	56-44#	56-57	56-57#	56-60	56-60#	56-61	56-61#	56-73	56-73#	56-74	56-74#	56-76	56-76#
56-89	56-89#	56-110	56-110#	56-112	56-112#	56-119	56-119#	56-120	56-120#	57-15	57-15#	57-18	57-18#
57-18#	57-25	57-25#	57-27	57-27#	57-32	57-32#	57-34	57-34#	57-41	57-41#	57-55	57-55#	57-69
57-69#	57-83	57-83#	57-86	57-86#	57-100	57-100#	57-102	57-102#	57-102#	57-109	57-109#	57-110	57-110#
58-18	58-18#	58-21	58-21#	58-27	58-27#	58-29	58-29#	58-34	58-34#	58-46	58-46#	58-52	58-52#
58-66	58-66#	58-69	58-69#	58-80	58-80#	58-83	58-83#	58-84	58-84#	58-84#	58-91	58-91#	58-92
58-92#	59-17	59-17#	59-20	59-20#	59-26	59-26#	59-28	59-28#	59-29	59-29#	59-43	59-43#	59-49
59-49#	59-63	59-63#	59-66	59-66#	59-77	59-77#	59-79	59-79#	59-79#	59-86	59-86#	59-87	59-87#
60-32	60-32#	60-44	60-44#	60-52	60-52#	61-20	61-20#	61-24	61-24#	61-24#	61-25	61-25#	61-31
61-31#	61-35	61-35#	61-35#	61-36	61-36#	61-45	61-45#	62-19	62-19#	62-24	62-24#	62-24#	62-25
62-25#	62-28	62-28#	62-33	62-33#	62-33#	62-34	62-34#	62-35	62-35#	62-38	62-38#	63-30	63-30#
63-32	63-32#	63-35	63-35#	63-44	63-44#	63-46	63-46#	63-71	63-71#	63-96	63-96#	63-99	63-99#
63-100	63-100#	63-121	63-121#	63-122	63-122#	63-124	63-124#	63-138	63-138#	63-141	63-141#	63-148	63-148#
63-148#	63-155	63-155#	63-157	63-157#	63-157#	63-164	63-164#	63-165	63-165#	64-33	64-33#	64-33#	64-34
64-34#	64-37	64-37#	64-39	64-39#	64-42	64-42#	64-45	64-45#	64-56	64-56#	64-58	64-58#	64-63
64-63#	65-38	65-38#	65-41	65-41#	65-42	65-42#	65-47	65-47#	65-63	65-63#	65-66	65-66#	65-67
65-67#	65-72	65-72#	65-85	65-85#	66-31	66-31#	66-33	66-33#	66-52	66-52#	66-60	66-60#	66-83
66-83#	67-35	67-35#	67-37	67-37#	67-70	67-70#	67-75	67-75#	67-78	67-78#	67-86	67-86#	67-88
67-88#	67-127	67-127#	67-152	67-152#	67-155	67-155#	67-156	67-156#	67-177	67-177#	67-178	67-178#	67-180
67-180#	67-194	67-194#	67-197	67-197#	67-201	67-201#	67-203	67-203#	67-205	67-205#	67-209	67-209#	67-209#
67-214	67-214#	67-219	67-219#	67-221	67-221#	67-221#	67-229	67-229#	67-247	67-247#			
M\$WORD	1-C94#	7-278#	7-323	7-323#	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8	8-8
	27-35	27-35	27-35	27-35#	27-42	27-42	27-42	27-42#	27-47	27-47	27-47	27-47	27-47#
	27-52	27-52#	27-61	27-61	27-61	27-61#	27-66	27-66	27-66	27-66#	27-71	27-71	27-71#
	27-76	27-76	27-76	27-76#	27-87	27-87	27-87	27-87#	27-92	27-92	27-92	27-92#	27-95
	27-95	27-95#	27-98	27-98	27-98	27-98#	27-103	27-103	27-103	27-103#	27-108	27-108	27-108#
	27-113	27-113	27-113	27-113#	27-118	27-118	27-118	27-118#	27-123	27-123	27-123	27-123#	27-128
	27-128	27-128#	27-135	27-135	27-135	27-135#	27-140	27-140	27-140	27-140#	27-147	27-147	27-147#
	27-150	27-150	27-150	27-150#	27-155	27-155	27-155	27-155#	27-160	27-160	27-160	27-160#	27-165
	27-165	27-165#	27-170	27-170	27-170	27-170#	27-203	27-203	27-203	27-203#	30-19	30-19	30-19#
	30-23	30-23	30-23	30-23#	30-27	30-27	30-27	30-27#	30-31	30-31	30-31	30-31	30-35
	30-35	30-35#	31-22	31-22	31-22	31-22#	42-61	42-61#	44-91#	44-103#	44-165#	46-24#	47-18
	48-19	48-19#	56-26#	56-112	56-112	56-112	56-112#	57-15#	57-18#	57-102	57-102	57-102#	58-18#
	58-21#	58-84	58-84	58-84	58-84#	59-17#	59-20#	59-79	59-79	59-79	59-79#	61-24	61-24
	61-24#	61-35	61-35	61-35	61-35#	62-24	62-24	62-24	62-24#	62-33	62-33	62-33	62-33#
	63-35#	63-148	63-148	63-148	63-148#	63-157	63-157	63-157	63-157#	64-33	64-33	64-33	64-33#
	67-37#	67-78#	67-209	67-209	67-209	67-209#	67-221	67-221	67-221	67-221#	68-55	68-55#	68-57
	68-59	68-59#	68-61	68-61#	69-14	69-14#	69-16	69-16#	69-18	69-18#	69-20	69-20#	69-22



