RP11E

DRIVE POSITIONING TEST

MD-11-DZRPZ-C

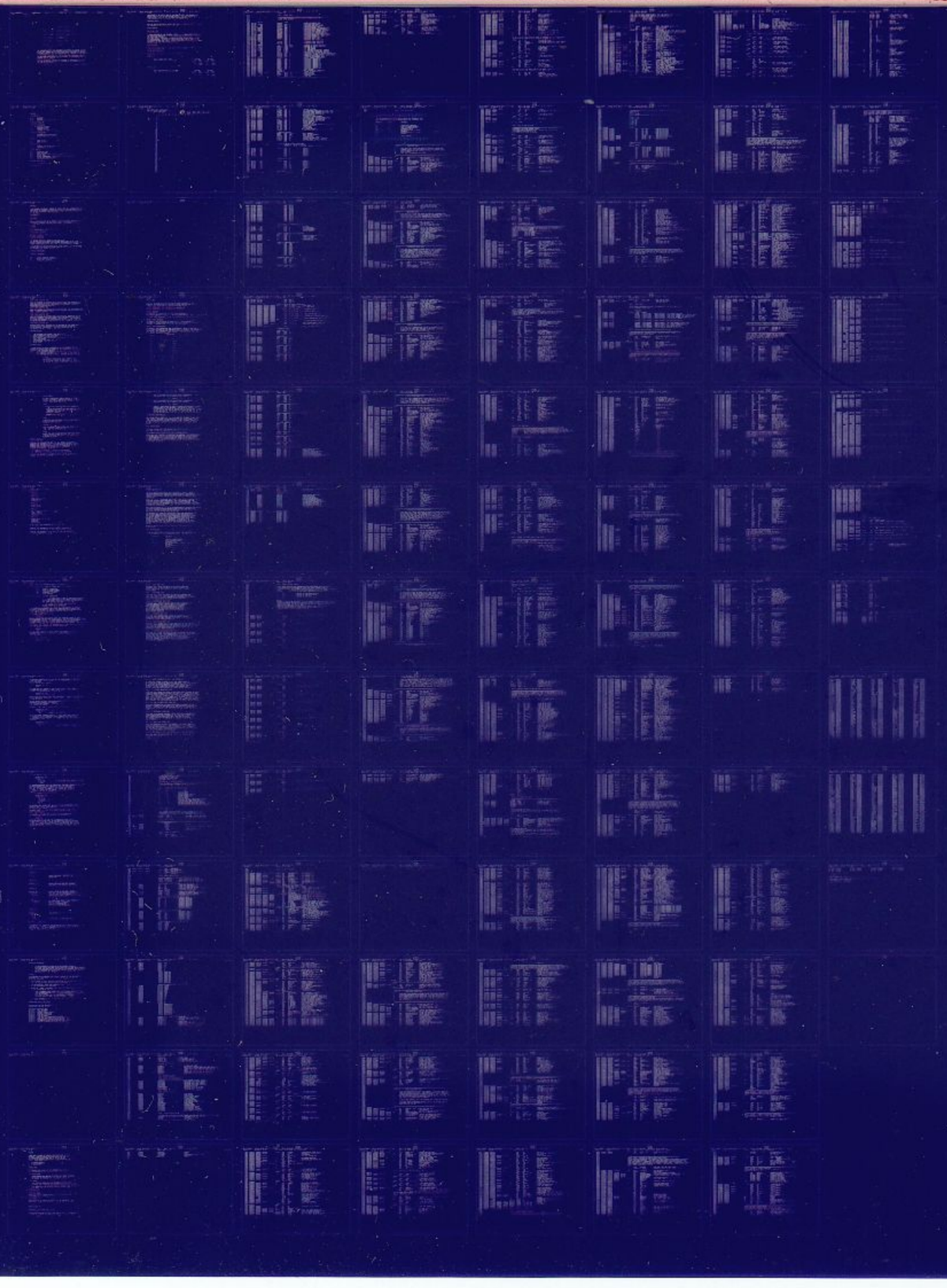
EP-DZRPZ-C-DL -C

FICHE 1 OF 1

DEC 1977

digital

MADE IN USA



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<u>I D E N T I F I C A T I O N</u>

PRODUCT CODE: MAINDEC-11-DZRPZ-C-D

PRODUCT NAME: RP11E DRIVE POSITIONING TEST

DATE CREATED: SEPTEMBER 1977

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: C. HESS

CONTENTS

1. ABSTRACT

THIS PROGRAM CONTAINS A SERIES OF TESTS THAT WILL ENSURE THAT THE DISK DRIVE IS CAPABLE OF PERFORMING SEEKS, THAT THE ACCESS TIMES ARE WITHIN TOLERANCE, AND THAT THE CYLINDER ADDRESSING CAPABILITY OF THE DRIVE IS FUNCTIONING PROPERLY.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11 COMPUTER WITH 8K OF MEMORY (WITH OR WITHOUT HARDWARE SWITCH REGISTER); CONSOLE TELETYPE; RP11E DISK CONTROLLER;
1 TO 8 RP02, RPR02, OR RP03 DISK DRIVES WITH FORMATTED PACKS.

2.2 STORAGE

THIS PROGRAM WILL LOAD AND RUN IN 8K.

2.3 PRELIMINARY PROGRAMS

MAINDEC-11-DZRPW - RP11E DISKLESS LOGIC TEST

3. LOADING PROCEDURE

*** BEFORE STARTING, REFER TO SECTION 5.***
THE PROGRAM MAY BE LOADED FROM EITHER PAPER TAPE OR AN 'XXDP' DEVICE. REFER TO EITHER THE STANDARD PROCEDURES FOR LOADING 'ABS' FORMAT PAPER TAPES OR TO THE 'XXDP' SYSTEM REFERENCE DOCUMENT.

THIS PROGRAM MAY BE INCLUDED IN AN 'XXDP' CHAIN. IF THE PROGRAM IS PART OF A CHAIN AND IS LOADED FROM AN RP02, RPR02, OR AN RP03, THE PROGRAM WILL BYPASS TESTING DRIVE 0.

4. STARTING PROCEDURE

4.1 STARTING ADDRESSES

200	NORMAL STARTING ADDRESS
204	SELECT OPERATING PARAMETERS
210	SELECT RP11 ADDRESS
214	COMBINATION OF 204 AND 210

4.1.1 START FROM LOCATION 200

WHEN THE PROGRAM IS STARTED FROM LOCATION 200, THE PROGRAM WILL TEST ALL AVAILABLE DRIVES (SEE SECTION 3. FOR DRIVE 0 EXCEPTION) USING TESTS 0 - 10, & 12, WITH DEFAULT PARAMETERS. PREVIOUS PARAMETER CHANGES ARE OVERLAYED.

4.1.2 START FROM LOCATION 204

WHEN THE PROGRAM IS STARTED FROM LOCATION 204, THE PARAMETERS ARE RESET TO THEIR DEFAULT VALUES, AND THE PROGRAM ENTERS CONVERSATIONAL MODE. REFER TO SECTION 4.3.2.

4.1.3 START FROM LOCATION 210

WHEN THE PROGRAM IS STARTED FROM LOCATION 210, OPERATION IS THE SAME AS THE START FROM 200, EXCEPT THAT THE PROGRAM ASKS FOR A NEW RP11E ADDRESS, VECTOR ADDRESS, AND PRIORITY. THE OPERATOR MAY ENTER NEW ADDRESS VALUES OR RETAIN THE OLD VALUES. THE TEST PARAMETERS ARE RESET TO THE DEFAULT VALUES. REFER TO SECTION 4.3.1.

4.1.4 START FROM LOCATION 214

PROGRAM START FROM LOCATION 214 IS THE SAME AS THE START FROM LOCATION 204 EXCEPT THAT THE OPERATOR MAY ENTER NEW RP11E ADDRESS, VECTOR ADDRESS, OR PRIORITY. THE TEST PARAMETERS ARE RESET TO THE DEFAULT VALUES. REFER TO SECTIONS 4.3.1 & 4.3.2.

4.2 OPERATOR ACTION

1. LOAD PROGRAM INTO MEMORY (SEE SECTION 3.)
2. LOAD A FORMATTED PACK INTO DRIVE(S) TO BE TESTED
3. BRING DRIVE(S) TO ONLINE STATE.
4. SET 'FORMAT' AND 'MAINTENANCE' SWITCHES ON THE RP11E CONTROL PANEL TO 'NORMAL'.
5. LOAD ADDRESS 200, 204, 210, OR 214.
6. SET SWITCHES (SEE SECTION 5.)
7. PRESS START.

4.3 PROGRAM ACTION

IN AN EFFORT TO ALLOW CONVERSATION WITH A PROGRAM FOR THE PURPOSE OF CONTROLLING ITS OPERATION AND PARAMETERS THE FOLLOWING CONSTRUCTIONS HAVE BEEN ADOPTED.

NOTE1: IN ALL EXAMPLES BRACKETS ARE USED FOR CLARITY AND ARE NOT TYPED BY THE USER.

NOTE2: THE CARRRIAGE RETURN TYPED BY THE USER IS INDICATED BY <CR> AND WILL BE ECHOED AS A "CARRIAGE RETURN-LINE FEED.

<.><CR> PERIOD

A STATEMENT TERMINATOR: WHEN TYPED AT THE END OF A LINE (LEGAL ON ALL LINES) IT TELLS THE PARAMETER STRING INTERPRETER (PSI) THIS IS THE END OF CHANGES TO THE CURRENT PARAMETER STRING.

<..><CR> PERIOD PERIOD

AN INPUT TERMINATOR: WHEN A PERIOD IS TYPED AFTER A "STATEMENT TERMINATOR PERIOD" IT TELLS THE PSI THIS IS THE END OF ALL CHANGES (LEGAL ON ALL LINES) BEGIN EXECUTION.

<,><CR> COMMA

A CONTINUATION INDICATOR AND FIELD SEPARATOR:

1) THIS IS THE CONSTRUCTION USED WHEN NOT USING A PERIOD: THAT IS TO SAY THE COMMA SAYS "TERMINATE THE LINE BUT NOT THE INPUT FOR PARAMETER CHANGES".

2) SEPARATE MULTIPLE ENTRIES ON THE SAME TEXT STRING, E.G., A,B,C,D.

</> SLASH

A MODIFICATION INDICATOR: AT ANY GIVEN PARAMETER STOP IF A SLASH IS TYPED IT SAYS "OPEN THIS PARAMETER FOR CHANGES".

<^U> CONTROL-U

DUMP THE PRESENT INPUT STRING AND START A NEW LINE. TYPED BY DEPRESSING THE "CONTROL KEY" (CTRL) AND THEN STRIKING THE "U".

<\> RUBOUT

DELETE THE LAST CHARACTER FROM THE INPUT STRING. TYPED BY STRIKING THE "RUBOUT" KEY. WHICH WILL BE ECHOED BY A BACKSLASH (\) FOLLOWED BY THE CHARACTER DELETED.

4.3.1 ADDRESS SELECTION

STARTING THE PROGRAM FROM 200 (8) WILL RESULT IN AUTOMATIC SELECTION OF THE DEFAULT RP11E VALUES OF BUS ADDRESS, VECTOR ADDRESS, AND PRIORITY LEVEL. IF THE DEFAULT VALUE OF THE BUS ADDRESS DOES NOT RESPOND (TIMES OUT) TO ADDRESSING, IT IS REPORTED AS AN ERROR. AFTER THE ERROR IS REPORTED, ONE OF TWO COURSES OF ACTION WILL BE TAKEN:

1. IF THERE IS A MONITOR -- RETURN TO THE MONITOR
2. IF THERE ISN'T A MONITOR -- ASK FOR NEW ADDRESSES

STARTING THE PROGRAM AT EITHER LOCATION 210 OR LOCATION 214 ALLOWS THE OPERATOR TO CHANGE THE RP11E BUS ADDRESS, THE VECTOR ADDRESS, AND (OR) THE PRIORITY.

4.3.1.1 ADDRESS SELECTION EXAMPLES

EXAMPLE #1

```
RPDS=176710/176300..
```

EXAMPLE #2

```
RPDS=176710/176300,
RHVEC=254/260,
RHPRIO=5/6..
```

EXAMPLE #3

```
RPDS=177200,
RHVEC=254/260..
```

EXAMPLE #4

```
RP11 FAILED TO RESPOND TO ADDRESSING
RPDS    ERR PC
176710  XXXXXX
RPDS=176710/176300..
```

EXAMPLE #5

```
RPDS=176710/1776\67\6300,
RHVEC=254,
RHPRIO=5,
RPDS=176300
```

4.3.2 DRIVE, TEST, AND PARAMETER SELECTION

STARTING THE PROGRAM AT 200 WILL RESULT IN AUTOMATIC SELECTION OF THE DRIVES TO TEST AND THE TESTS TO RUN.

STARTING THE PROGRAM AT 210 OR 214 ALLOWS THE OPERATOR TO SELECT THE DRIVE(S) TO BE TESTED, THE TESTS TO BE EXECUTED, AND THE PARAMETERS TO USE.

4.3.2.1 DRIVE, TEST, AND PARAMETER SELECTION DESCRIPTION

THE FOLLOWING IS A TABLE OF TERMS USED IN THE DESCRIPTION.

"R"	REPEATS (ITERATIONS)
"FC"	FIRST CYLINDER ADDRESS
"LC"	LAST CYLINDER ADDRESS
"IC"	INCREMENT CYLINDER
"TK"	TRACK ADDRESS

SPECIAL CASES OF CONTROL CHARACTERS

IF <.> IS TYPED WHILE A TEST IS OPEN FOR MODIFICATION (</>) AND OTHER TESTS IN THE "TEST COMMAND" STRING ARE TO BE OPENED, THEY WILL RECIEVE THE PARAMETERS OF THE TEST THAT IS OPEN WHEN <.> IS TYPED.

<,> IS ILLEGAL AS A "TEST" LINE TERMINATOR UNLESS A TEST IS TO BE OPENED.

ON STARTING THE PROGRAM ALL TESTS WILL RUN AGAINST ALL DRIVES IN A WORST CASE MANNER. BUT IF THE USER DESIRES TO SELECT THE DRIVES TO BE TESTED, THE TESTS TO BE EXECUTED, AND THE PARAMETERS TO BE USED HE ENTERS CONVERSATION MODE BY TYPING CONTROL C (↑C).

THE PROGRAM WILL RESPOND WITH:

```
DRIVE(S)=
```

WE WILL ASSUME FOR OUR EXAMPLE THAT THE OPERATOR WISHES TO TEST DRIVE #3 USING TESTS 2 THRU 7 AND TEST 11 AND DOES NOT DESIRE TO CHANGE THE PARAMETERS (INITIAL CYLINDER ADDRESS, FINAL CYLINDER ADDRESS, ETC.). THE USER WOULD TYPE "3<,>" WHICH SAYS "THIS IS THE END OF ANY CHANGES TO THIS LINE BUT TAKE ME DEEPER FOR MORE CHANGES", AND <CR> "TAKE IT."

FOR CLARITY THE LINE WILL BE REPEATED AS IT LOOKS AFTER USER RESPONSE WITH THE LINE BELOW IT ADDED, THE PROGRAMS RESPONSE:

```
DRIVE(S)=3,<CR>
TEST=
```

NOW THE USER INSERTS THE TEST NUMBERS HE DESIRES. IN THIS CASE HE WANTS TESTS 2 THRU 7 AND TEST 11 SO HE TYPES 2-7<,> (TO SEPERATE FIELD), 11<..> (END OF ANY CHANGES START EXECUTION), <CR> (TAKE IT).

IT NOW LOOKS LIKE THIS

```
DRIVE(S)=3,<CR>
TEST=2-7,11..<CR>
```

IN OUR NEXT EXAMPLE WE WILL ASSUME THE USER WISHES TO TEST DRIVE
4 AND RUN TESTS 1 AND 3 THRU 11 WITH THE PARAMETER FOR TESTS 3
AND 10 MODIFIED.
THIS IS HOW HE WOULD RESPOND:

```
DRIVE(S)=4,<CR>
TEST=
```

THE USER NOW WILL INSERT A LINE TO GET TESTS 1 AND 3 THRU 11
BUT REMEMBER HE WISHES TO "OPEN" TESTS 3 AND 10 FOR PARAMETER
CHANGES. THE ENTIRE ENTRY IS SHOWN BELOW:

```
DRIVE(S)=4,<CR>
TEST=1,3/4-7,10/11.<CR>
```

NOTICE THIS SAYS SELECT TEST ONE, CONTINUE<,>; SELECT TEST 3, OPEN</>;
SELECT TESTS 4-7, CONTINUE<,>; SELECT TEST 10, OPEN</>; SELECT TEST
11, END OF INPUT <.>.

THE PSI SCANS THE TEST STRING AND DETERMINES THAT TEST #1'S
PARAMETERS WILL REMAIN THE SAME BUT
TEST 3'S MUST BE CHANGED. THEREFORE, TEST
3 IS OPENED FOR CHANGE.

RESPONDS: <FOR CLARITY ENTIRE TRANSACTION REPEATED>

```
DRIVE(S)=4,<CR>
TEST=1,3/4-7,10/11.<CR>
  TEST 3
    R=X          ;WHERE X IS ITERATION
```

AS IN THE NORMAL MANNER TYPING A </> WILL OPEN THIS LINE FOR
MODIFICATION OF THE ITERATION COUNT, ENDING THE LINE WITH A
<.> (PERIOD) WOULD TERMINATE THE CHANGES FOR THIS TEST, AND AS
IN THE EXAMPLE SHOWN USING A <,> (COMMA) WILL GET US THE NEXT
PARAMETER.

```
DRIVE(S)=4,<CR>
TEST=1,3/4-7,10/11,<CR>
  TEST 3
    R=1,<CR>              ;DO NOT ALTER-BUT CONTINUE
    FC=N                  ;WHERE N IS FIRST CYLINDER ADDRESS
```

THE USER DOES NOT WISH TO CHANGE "FC" SO THE FOLLOWING ACTION IS TAKEN:

```
DRIVE(S)=4,<CR>
TEST=1,3/4-7,10/11.<CR>
  TEST 3
    R=1,<CR>                ;DO NOT ALTER THIS LINE BUT CONTINUE
    FC=0,<CR>               ;DO NOT ALTER THIS LINE BUT CONTINUE
    LC=202
```

THE PROGRAM RESPONDS WITH THE PREVIOUSLY ASSIGNED PARAMETER FOR LAST CYLINDER ADDRESS IN THIS CASE USING '202' AS THE EXAMPLE. THIS IS WHAT THE USER INTENDED TO MODIFY AND IS WHY HE OPENED TEST #3. HE WANTS TO CHANGE IT TO CYLINDER 20. THEREFORE HE TYPES </> (OPEN LINE FOR CHANGE), "20" (THE NEW VALUE), <.> (THIS IS THE END OF CHANGES FOR THIS DRIVE), <CR> (TAKE IT).
THE TOTAL TRANSACTION AND RESPONSE:

```
DRIVE(S)=4,<CR>
TEST=1,3/4-7,10/11.<CR>
  TEST 3
    R= 1,<CR>
    FC=0,<CR>
    LC= 202/20.<CR>
  TEST 10
    R=1
```

THE PROGRAM HAS LOADED TEST #3 WITH ITS NEW PARAMETERS, TESTS NUMBER 4 THRU 7 WITH THEIR PREVIOUSLY ASSIGNED PARAMETERS AND IS NOW WAITING FOR CHANGES TO TEST 10.

THE USER TYPES </> (OPEN THIS LINE FOR CHANGE), "10" (MAKE ITERATION COUNT 10), <.> (THIS IS THE END OF CHANGES TO THIS TEST) <CR> (TAKE IT).

THE PROGRAM NOW LOADS TEST 10 WITH THE NEW PARAMETERS, TEST 11 WITH PREVIOUSLY ASSIGNED PARAMETERS AND RESPONDS WITH:

```
DRIVE(S)=
```

SINCE THE USER DID NOT END THE CONVERSATION MODE WITH A <.> THE PROGRAM HAS LOOPED BACK TO THE BEGINNING LOOKING FOR MORE CHANGES. THAT IS TO SAY, AFTER THE ENTRY FOR DRIVE SELECTION A <,><CR> WILL CAUSE THE TEST MESSAGE TO BE REPEATED AND FURTHER CHANGES CAN BE MADE. HOWEVER, AT SOME POINT IN ORDER TO EXECUTE THE CHANGES MADE WE MUST NOTIFY THE PROGRAM WE ARE FINISHED BY TYPING <..>.

4.3.3.2 DRIVE, TEST, AND PARAMETER SELECTION EXAMPLES

EXAMPLE #1

```
DRIVE=4..<CR>              ;SELECT DRIVE #4, TERMINATE AND
                           ;BEGIN EXECUTION USING PREVIOUSLY ASSIGNED
                           ;PARAMETERS
```

EXAMPLE #2

```
DRIVE=0,<CR>               ;SELECT DRIVE #0 AND MAKE CHANGES "."
TEST=1-5..<CR>             ;RUN TEST 1 THRU 5 ONLY, USE DEFAULT
                           ;PARAMETERS AND TERMINATE AND EXECUTE ".."
```

EXAMPLE #3

```
DRIVE=2,<CR>               ;SELECT DRIVE #2 AND MAKE CHANGES "."
TEST=1-5,6/7/10/.<CR>      ;RUN TEST 1-5 WITH DEFAULT PARAMETERS, OPEN
  TEST 6                   ;TEST 6,7 AND 10 FOR CHANGES
    R=1,<CR>               ;LEAVE R AS IS MOVE TO NEXT PARAMETER
    FC=0/10.<CR>           ;SET "FC" CYLINDER ADDRESS TO 10 "." END CHANGES
                           ;TO TEST #6

  TEST 7
    R=1/50,<CR>            ;50 ITERATIONS, MOVE TO NEXT PARAMETER
    FC=0,<CR>              ;DO NOT CHANGE "FC" CYLINDER ADDRESS BUT CONTINUE "."
    LC=202/50..<CR>        ;TEST 10 IS STILL PENDING
                           ;AND WILL THEREFORE BE
                           ;SET TO THE SAME PARAMETERS
                           ;AS TEST 7 -- START EXECUTION
```

EXAMPLE #4

```
DRIVE=0,1,4,               ;TEST DRIVES 0,1, AND 4 IN SEQUENCE
TEST=0-5/                  ;CHANGE TEST 0-5
  TEST 0
    R=10,
    FC=0,
    LC=202/1..             ;CHANGE LAST CYLINDER FROM 202
                           ;TO 1 FOR TEST #0-5; START TESTING
```

4.4 'CONTROL C' OPERATION

THE OPERATOR MAY TERMINATE THE PROGRAM AT ANY TIME BY TYPING A 'CONTROL C'. 'CONTROL C' RETURNS THE PROGROM TO THE PARAMETER ENTRY ROUTINE. THE TEST PARAMETERS ARE NOT RESTORED TO THE DEFAULT VALUES BY THE 'CONTROL C' RETURN.
CONTROL G OPERATION (REFER TO SECTION 5.)

5. OPERATING PROCEDURE

IF THE DIAGNOSTIC IS RUN ON A CPU WITHOUT A SWITCH REGISTER THEN A SOFTWARE SWITCH REGISTER IS USED WHICH ALLOWS THE USER THE SAME SWITCH OPTIONS AS THE HARDWARE SWITCH REGISTER. IF THE HARDWARE SWITCH REGISTER DOES NOT EXIST OR IF ONE DOES AND IT CONTAINS ALL ONES (177777) THEN THE SOFTWARE SWITCH REGISTER (LOC. 176) IS USED.

CONTROL:

THIS PROGRAM ALSO SUPPORTS THE DYNAMIC LOADING OF THE SOFTWARE SWITCH REGISTER (LOC. 176) FROM THE TTY. THIS CAN BE ACCOMPLISHED BY DOING THE FOLLOWING:

1) TYPE CONTROL G (↑G); THIS WILL ALLOW THE TTY TO ENTER DATA INTO LOC. 176 AT SELECTED POINTS WITHIN THE PROGRAM.

2) THE MACHINE WILL THEN TYPE: SWR=XXXXXXNEW= (XXXXXX IS THE OCTAL CONTENTS OF THE SOFTWARE SWITCH REGISTER.)

3) AFTER THE ''NEW='' HAS BEEN TYPED THEN THE OPERATOR CAN DO ONE OF THE FOLLOWING AT THE TTY:

   A) TYPE A NUMBER TO BE LOADED INTO LOC. 176 FOLLOWED BY A (CR). (ONLY NUMBERS BETWEEN 0-7 WILL BE ACCEPTED AND ONLY 6 NUMBERS WILL BE ALLOWED) IF A (CR) IS THE FIRST KEY DEPRESSED THE SOFTWARE SWITCH REGISTER CONTENTS WILL NOT BE CHANGED.

   B) IF A CONTROL U (↑U) IS DEPRESSED THEN THE PROGRAM WILL SEND YOU BACK TO STEP 2.

5.1 OPERATIONAL SWITCH SETTINGS

WITH SW(15:0)=0 THE PROGRAM WILL PRINT OUT ON ERRORS AND CONTINUE IN TEST.

THE SWITCH SETTINGS ARE:
SW(15)=1...HALT ON ERROR
SW(14)=1...LOOP ON TEST
SW(13)=1...INHIBIT ERROR TYPEOUTS
SW(11)=1...INHIBIT ITERATIONS
SW(10)=1...RING BELL ON ERROR
SW(09)=1...LOOP ON ERROR
SW(06)=1...TYPE ALL RP11 REGISTERS IF ERROR
SW(04)=1...TYPE THE LONG SEEK TIME GRAPH (TEST #12)
SW(03)=1...PERFORM STALL BETWEEN SEEK ORDERS
SW(02)=1...USE RANDOM STALL VALUE BETWEEN SEEK ORDERS
SW(01)=1...PERFORM INCREMENTING STALL IN TEST 4
SW(00)=1...DO NOT CHECK POSITION AFTER SEEK ORDERS

M01

6. ERRORS

THERE ARE A NUMBER OF ERRORS THAT CAN OCCUR IN THIS PROGRAM. WHEN AN ERROR IS ENCOUNTERED THE CALL TO THE ERROR ROUTINE IS MADE AND IF SW<13> IS NOT SET AN ERROR MESSAGE PERTAINING TO THE ERROR WILL BE TYPED. EACH ERROR TYPE OUT WILL CONTAIN THE FOLLOWING:

1. AN ERROR MESSAGE
2. A DATA HEADER
3. A DATA STRING

6.1 ERROR TYPES

THE ERRORS THAT OCCUR IN THIS PROGRAM FALL INTO TWO (2) CATEGORIES DEFINED AND EXPLAINED AS FOLLOWS:

6.1.1 NON-FATAL ERROR

THESE ERRORS WILL BE DUE TO "DISK" OR "DATA" FAILURES WHICH WILL BE REPORTED AS THEY OCCUR. AFTER REPORTING THE ERROR THE PROGRAM WILL CONTINUE TESTING.

6.1.2 FATAL ERROR

THIS TYPE OF ERROR WILL BE THE RESULT OF ANY KIND OF ERROR THAT INHIBITS THE PROGRAM FROM TESTING THE DISK.

THIS ERROR WILL BE REPORTED WHEN IT OCCURS, THEN THE PROGRAM WILL ABORT THE TEST AND GO TO THE END OF PROGRAM.

6.2 ERROR RECOVERY

6.2.1 NON-FATAL ERROR

WHEN THIS TYPE OF ERROR OCCURS IT WILL BE REPORTED AND THE PROGRAM WILL CONTINUE IN TEST.

6.2.2 FATAL ERROR

WHEN THIS TYPE OF ERROR OCCURS IT WILL BE REPORTED. THE PROGRAM WILL ABORT THE TEST AND GO TO THE END OF PROGRAM.

7. RESTRICTIONS

7.1 SUBSYSTEMS WITH MIXED DRIVE TYPES

THE PROGRAM ASSUMES THAT ONLY ONE KIND OF DRIVE IS ATTACHED TO A SYSTEM (E.G. RP02'S & RPR02'S OR RP03'S). IF BOTH RP02'S

(AND RPR02'S) OR RP03'S ARE ON THE SAME SYSTEM, THE PROGRAM WILL ASSUME THAT ALL OF THE DRIVES ARE RP03'S. TO TEST DRIVES ON A MIXED SYSTEM, TEST ALL OF THE SAME KIND OF DRIVE AT ONE TIME. THE OTHER DRIVES ON THE CONTROLLER MUST BE POWERED DOWN.

7.2 FORMATTED PACKS

EACH OF THE DRIVES BEING TESTED MUST HAVE A FORMATTED PACK. (UNLESS THE PROGRAM IS RUN WITH SWITCH <00> SET.)

8. MISCELLANEOUS

8.1 EXECUTION TIME

TO MAKE ONE PASS OF THE PROGRAM (TESTS 0 - 7) TAKES APPROXIMATELY 1.8 HOURS FOR EACH RP02 OR RPR02 TESTED AND APPROXIMATELY 6.5 HOURS FOR EACH RP03 TESTED.
NOTE THAT TEST 7 REQUIRES 1.3 HOURS FOR RP02 DRIVES AND 5.4 HOURS FOR RP03 DRIVES. IN SPITE OF THE LENGTHY RUN TIME OF TEST 7, IT IS RECOMMENDED THAT TEST 7 BE RUN OCCASIONLLY TO VERIFY THE SUBTRACTER IN THE DISK DRIVE. TEST 7 HAS ALSO PROVEN TO BE A VALUABLE LONG TERM SEEK VERIFIER, ALSO.

8.2 STACK POINTER

STACK IS INITIALLY SET TO 1100 AND EXTENDS DOWNWARD IN MEMORY.

8.3 TIMING TEST PRINTOUTS

8.3.1 TIMING TEST (TESTS 10 & 11) PRINTOUT EXAMPLES

EXAMPLE #1

ONE CYLINDER SEEK TIMES
(SEEK TIME IS IN MICRO SECONDS)

FORWARD		REVERSE	
# OF SEEKS	SEEK TIME	# OF SEEKS	SEEK TIME
193	10000	60	10000
9	12500	142	12500

EXAMPLE #2

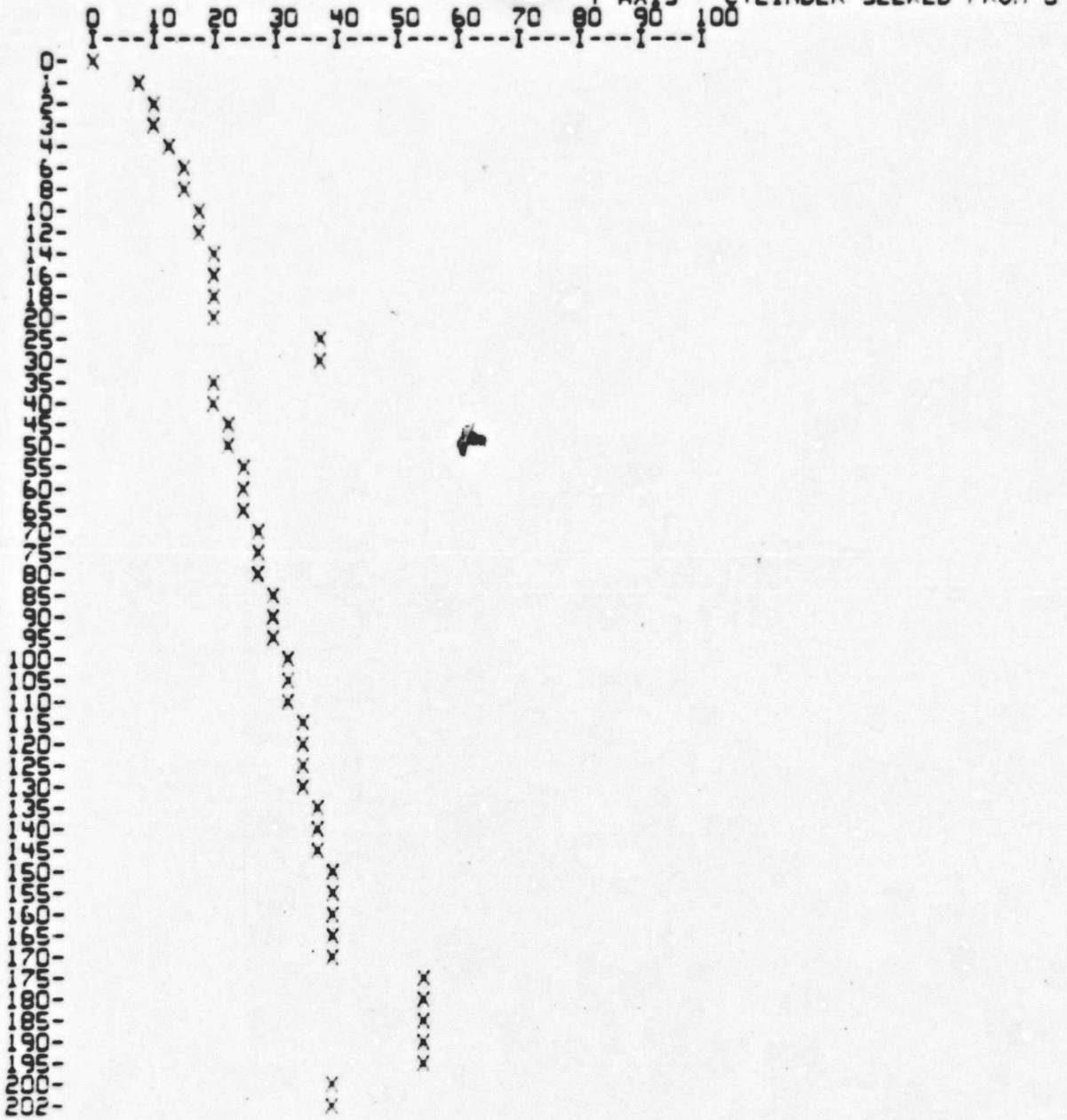
SEEK TIMES BETWEEN CYL 0 & 202
(SEEK TIME IS IN MICRO SECONDS)

FORWARD		REVERSE	
# OF SEEKS	SEEK TIME	# OF SEEKS	SEEK TIME
200	45000	156	45000
		44	60000

8.3.2 SEEK GRAPH TEST (TEST #12)
EXAMPLE: SMALL SEEK GRAPH (SWITCH <04> = 0)

SEEK TIME GRAPH

X AXIS - SEEK TIME - MILLI SECS
Y AXIS - CYLINDER SEEKED FROM 0



8.4 END OF TEST

WITH ALL SWITCHES ON A "0" AN "END OF PASS" MESSAGE WILL BE TYPED AT THE COMPLETION OF TESTING A DRIVE AND THE "END OF TEST" TYPEOUT WILL OCCUR WHEN ALL DRIVES HAVE BEEN TESTED.

8.5 DEFAULT ADDRESSES, TEST SEQUENCE, AND PARAMETERS

8.5.1 DEFAULT ADDRESS

THE PROGRAM IS LOADED FOR THE FOLLOWING ADDRESSES:
RP11E BUS ADDRESS - 176710 RP11E VECTOR ADDRESS - 254 RP11E PRIORITY - 5

TO ALTER THESE ADDRESSES, START THE PROGRAM AT LOCATION 210 OR 214.

8.5.2 DEFAULT TEST SEQUENCE

THE DEFAULT TEST SEQUENCE IS TESTS 0 - 7. THIS SEQUENCE IS RESTORED ANY TIME A START FROM 200, 204, 210, OR 214 IS INITIATED. 'CONTROL C' RESTART DOES NOT ALTER THE TEST SEQUENCE.

8.5.3 DEFAULT TEST PARAMETERS

THE DEFAULT TEST PARAMETERS ARE GIVEN BELOW. REFER TO SECTION 4.3.1 FOR A GLOSSARY OF THE MNEMONICS USED TO IDENTIFY THE PARAMETERS. THE DEFAULT TEST PARAMETERS ARE RESTORED WHEN A START AT 200, 204, 210, OR 214 IS INITIATED. THE 'CONTROL C' RESTART DOES NOT ALTER THE CURRENT PARAMETER VALUES.

	PARAMETERS				
TEST #	'R'	'FC'	'LC'	'IC'	'TK'
TEST 0	100	-	-	-	0
TEST 1	1000	0	MAXCYL	-	0
TEST 2	10	0	MAXCYL	1	0
TEST 3	10	0	NOTE 3	1	0
TEST 4	10	0	MAXCYL	1	0
TEST 5	10	0	MAXCYL	1	0
TEST 6	10	0	MAXCYL	1	0
TEST 7	1	0	MAXCYL	1	0
TEST 10	(SEE BELOW - NOTE 1)				
TEST 11	1	0	MAXCYL	-	-
TEST 12	(SEE BELOW - NOTE 2)				

NOTE 1: TEST 10 ASSUMES THE FOLLOWING DEFAULT PARAMETERS. THESE PARAMETERS CANNOT BE ALTERED BY THE OPERATOR.

1	0	MAXCYL	1	-

NOTE 2: TEST 12 ASSUMES THE FOLLOWING DEFAULT PARAMETERS. THESE PARAMETERS CANNOT BE ALTERED BY THE OPERATOR.

1	0	MAXCYL	1	-

NOTE 3: 'MAXCYL' USED ABOVE IS USED TO DENOTE THE MAXIMUM CYLINDER ADDRESS USED BY THE PROGRAM. THE VALUE OF 'MAXCYL' IS DETERMINED BY THE TYPE OF DRIVES USED ON THE SYSTEM. 'MAXCYL' IS 405 (10) IF THE DRIVES ARE RP03'S AND IS 202 (10) IF THE DRIVES ARE RP02'S. IN TEST 3, 'LC' WILL BE 128 (10) IF THE DRIVES ARE RP02'S AND 256 (10) IF THE DRIVES ARE RP03'S.

8.6 TIMING TEST RESTRICTIONS

THE TIMING TESTS (TESTS 10, 11, & 12) ARE NOT INTENDED TO BE 'PASS-FAIL' TESTS. BECAUSE A HIGH RESOLUTION CLOCK IS NOT USED, THE TIMES ARE APPROXIMATE AND ARE INTENDED TO BE A GENERAL INDICATION OF THE CONDITION OF THE DRIVE'S SERVO SYSTEM. NO ATTEMPT SHOULD BE MADE TO ADJUST THE SERVO SYSTEM USING THE OUTPUT FROM THESE TESTS.

8.7 POSITIONING CHECK

IF SW<00> IS NOT SET, THE PROGRAM WILL CHECK THE DISK'S POSITION AFTER EACH SEEK (EXCEPT IN TESTS 10, 11, & 12).

THE PROGRAM CHECKS POSITION IN THE FOLLOWING MANNER:

USING THE 'SOT' COUNTER TO DETERMINE THE ADDRESS, THE PROGRAM READS THE HEADER FROM THE NEXT SECTOR AND COMPARES THE CYLINDER ADDRESS IN THE HEADER AGAINST THE CYLINDER THE PROGRAM EXPECTED; IF THE CYLINDER ADDRESS IN THE HEADER DOESN'T AGREE WITH THE EXPECTED CYLINDER ADDRESS, THE PROGRAM REPORTS A POSITIONING ERROR AND ISSUES A HOME SEEK TO THE DRIVE. (THE PROGRAM ALSO CHECKS POSITION AFTER A HOME SEEK OPERATION.)

9. PROGRAM DESCRIPTION

THE RP11E DRIVE POSITIONING TEST CONTAINS 11 TESTS. TESTS 0 - 6 TEST THE OPERATION OF THE DRIVE'S SERVO SYSTEM. POSITIONING ACCURACY IS CHECKED BY READING A HEADER FROM THE DESTINATION CYLINDER USING A 'READ WITHOUT IMPLIED SEEK' INSTRUCTION AFTER THE SEEK TERMINATES.

TESTS 10, & 11, 12 MEASURE SEEK TIME. TEST 10 & 11 MEASURE THE TIME FOR SPECIFIC SEEK OPERATIONS; TEST 12 MEASURES THE TIME REQUIRED TO SEEK FROM CYLINDER 0 TO ALL OTHER CYLINDERS. TESTS 10 & 11 TYPE OUT THE MEASURED SEEK TIME IN MICROSECONDS WHILE TEST 12 PRODUCES A SEEK TIME GRAPH. IN THE SEEK TIMING TESTS, POSITIONING ACCURACY IS NOT CHECKED.

SEEK TIME IN TESTS 10, 11, & 12 IS DETERMINED BY COUNTING THE NUMBER OF SECTOR PULSES OCCURING BETWEEN START OF SEEK AND SEEK DONE. THE 'SOT' COUNTER IS USED AS THE REFERENCE IN THESE TESTS. THE RESOLUTION OF THE TIMING TESTS IS 2.5 MS.

THE PROGRAM WILL START BY IDENTIFING ITSELF AND DETERMINING ALL DRIVES THAT ARE AVAILABLE FOR TESTING. THEN BEGINNING WITH THE LOWEST NUMBERICAL DRIVE AND PROCEEDING IN SEQUENCIAL ORDER ALL OF THE DRIVES WILL BE TESTED. ONE PASS THROUGH THE TEST SEQUENCE (TESTS 0 - 7) WILL BE PERFORMED ON EACH DRIVE BEFORE MOVING TO THE NEXT DRIVE IN SEQUENCE. THE DRIVE TO BE TESTED WILL BE TYPED AT THE BEGINNING OF EACH PASS, AN "END OF PASS" MESSAGE WILL BE TYPED AT THE COMPLETION OF EACH PASS, AND AN "END OF TEST" MESSAGE WILL BE TYPED AFTER TESTING ALL DRIVES.

REFER TO THE FOLLOWING SECTION FOR A DETAILED DESCRIPTION OF EACH TEST.

9.1 TEST DESCRIPTIONS

IN THE DESCRIPTIONS OF THE FOLLOWING TESTS, THE VARIABLES USED AND THEIR DEFAULT VALUES (UNLESS SPECIFIED OTHERWISE) ARE:

MNEMONIC	VARIABLE
FC	FIRST CYLINDER ADDRESS
LC	LAST CYLINDER ADDRESS
IC	INCREMENT VALUE
NC OR NC1	NEW OR MODIFIED CYLINDER (FC+IC) ADDRRESS
NC2	NEW OR MODIFIED CYLINDER (LC-IC) ADDRESS
TK	TRACK ADDRESS

9.1.1 TEST 0 - HOME SEEK TEST

THIS TEST WILL CAUSE THE DRIVE TO EXECUTE A HOME SEEK COMMAND CYCLE. AT THE COMPLETION OF THE COMMAND, THE STATUS INDICATORS ARE CHECKED TO VERIFY THAT NO ERRORS HAVE OCCURED.

9.1.2 TEST 1 - SEEK/SEEK TEST

THIS TEST WILL CAUSE THE DRIVE TO EXECUTE A FORWARD SEEK CYCLE TO "LC" "LT" "LS" FOLLOWED BY A REVERSE SEEK CYCLE TO "FC" "FT" "FS". AT THE COMPLETION OF EACH SEEK, THE PROPER INDICATORS ARE EXAMINED TO INSURE PROPER OPERATION.

9.1.3 TEST 2 - INCREMENTAL SEEK TEST

THIS TEST WILL COMMAND FORWARD SEEK CYCLES TO ADVANCE THE CYLINDER ADDRESS FROM "FC" TO "LC" BY THE INCREMENT "IC". WHEN THE RESULTANT CYLINDER ADDRESS (NC) EXCEEDS "LC" REVERSE SEEK CYCLES ARE INITIATED; STARTING AT THE LAST LEGAL "NC" AND DECREMENTING BY "IC" UNTIL "NC" IS LESS THAN "FC". AT THE COMPLETION OF EACH SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO INSURE PROPER OPERATION.

9.1.4 TEST 3 - STEPPING SEEK TEST

THIS TEST WILL COMMAND SEEK CYCLES TO CYLINDER 0,1,2,4, 8, 16, 32, 64, AND 128 (AND 256 IF AN RP03). AT THE COMPLETION OF EACH SEEK COMMAND, THE PROPER INDICATORS ARE EXAMINED TO VERIFY PROPER OPERATION.

9.1.5 TEST 4 - OSCILLATING SEEK TEST

THIS TEST WILL COMMAND SEEK CYCLES FROM "FC" TO "NC" AND BACK TO "FC". "NC" STARTS AT "FC" AND INCREMENTS BY "IC" UP TO CYLINDER "LC", THEN IS DECREMENTED BY "IC" BACK TO CYLINDER "FC". AT THE COMPLETION OF EVERY SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO VERIFY PROPER OPERATION.

9.1.6 TEST 5 - CONVERGING/DIVERGING SEEK TEST

THIS TEST WILL CAUSE THE DRIVE TO EXECUTE FORWARD AND REVERSE SEEKS FROM "NC1" AND "NC2" RESPECTIVELY, "NC1" WILL BE INCREMENTED BY "IC" AND "NC2" WILL BE DECREMENTED BY "IC" UNTIL "NC1" IS GREATER THAN THE INITIAL VALUE OF "NC2" AND "NC2" IS LESS THAN THE INITIAL VALUE OF "NC1". AT THE COMPLETION OF EACH SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO VERIFY PROPER OPERATION. "NC1" AND "NC2" DEFAULT TO "FC" AND "LC" RESPECTIVELY.

9.1.7 TEST 6 - SERVO ADDRESSING LOGIC NOSE GENERATION

IN THIS TEST A SEEK IS DONE TO CYL "NC" THEN A SEEK TO NC+4 THEN NC+1 THEN NC+3 THEN NC+2 THEN NC+5. NOW "NC" IS UPDATED BY "IC" AND THE ABOVE SEQUENCE IS REPEATED UNITL "LC" IS EXCEEDED BY ANY OF THE ABOVE VALUES. THE INITIAL VALUE OF "NC" IS "FC". AT THE COMPLETION OF EACH SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO INSURE PROPER OPERATION.

9.1.8 TEST 7 - CYLINDER ADDRESSING TEST

THIS TEST WILL CAUSE THE DRIVE TO SEEK FROM EACH CYLINDER TO EVERY OTHER CYLINDER BETWEEN CYLINDERS "FC" AND "LC". SEEK CYCLES ARE COMMANDED FROM CYLINDER "NC" TO CYLINDER "NC1" AND BACK TO CYLINER "NC". "NC" AND "NC1" START AT "FC". "NC1" IS INCREMENTED BY "IC" UNTIL "NC1" IS EQUAL TO "LC"; WHEN "NC1" IS EQUAL TO "LC", IT IS RESET TO "FC" AND "NC" IS INCREMENTED BY "IC". THE CYCLE IS COMPLETE WHEN "NC" AND "NC1" BOTH EQUAL "LC". AT THE COMPLETION OF EACH SEEK COMMAND, THE INDICATORS ARE EXAMINED TO VERIFY PROPER OPERATION.

9.1.9 TEST 10 - ONE CYLINDER SEEK TIMER TEST

THIS TEST PERFORMS ONE CYLINDER SEEKS FROM CYLINDER 0 TO THE MAXIMUM CYLINDER FOR THE DRIVE (E.G. 202 FOR RP02'S AND 405 FOR RP03'S). THE SEEK TIMES ARE MEASURED RELATIVE TO THE SECTOR PULSES FROM THE DRIVE. THE TEST DISPLAYS THE FORWARD AND REVERSE TIMES.

9.1.10 TEST 11 - SEEK-SEEK TIMER TEST

THIS TEST IS A GENERAL PURPOSE TIMING TEST WHICH PERFORMS 200 ITERATIONS BETWEEN THE CYLINDER IN 'FC' AND THE CYLINDER IN 'LC'. BOTH FORWARD AND REVERSE SEEKS ARE TIMED AND DISPLAYED. THE SEEK TIMES DISPLAYED ARE RELATIVE TO THE SECTOR COUNTER. 'FC' DEFAULTS TO 0; 'LC' DEFAULTS TO 'MAXCYL' (202 IF RP02'S OR 405 IF RP03'S).

9.1.11 TEST 12 - SEEK TIME GRAPH TEST

THIS TEST PRODUCES TWO SEEK TIME GRAPHS. THE FIRST GRAPH IS TYPED IS SWITCH <04> IS 0. THIS GRAPH IS A PLOT OF SEEK TIME AGAINST CYLINDERS SEEKED TO FROM CYLINDER 0. THE CYLINDERS PLOTTED ARE: 0,1,2,3,4,6,8,10,12,14,16,18,20,25...100,105...MAXCYL. THE OTHER GRAPH WHICH IS PRODUCED (SWITCH <04> SET) IS TIME TO SEEK TO ALL CYLINDERS FROM CYLINDER 0.

IN BOTH SEEK GRAPHS, ONLY THE FORWARD SEEK TIMES ARE MEASURED.

THIS TEST USES THE SECTOR COUNTER ('SOT') IN THE RP11 AS THE TIME BASE FOR THE MEASURMENTS, USE OF THE 'SOT' PROVIDES A RESOLUTION OF 2.5 MS.

10. PROGRAM LISTING

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                                .TITLE  MD-11-DZRPZ-C, RP11E DRIVE POSITIONING TEST
                                ;*COPYRIGHT (C) 1975,1977
                                ;*DIGITAL EQUIPMENT CORP.
                                ;*MAYNARD, MASS. 01754
                                ;*
                                ;*PROGRAM BY C. HESS/F. ROEMER
                                ;*
                                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
                                ;*

                                .SBTTL  OPERATIONAL SWITCH SETTINGS
                                ;*
                                ;*      SWITCH                  USE
                                ;*      ------          --------------------
                                ;*        15            HALT ON ERROR
                                ;*        14            LOOP ON TEST
                                ;*        13            INHIBIT ERROR TYPEOUTS
                                ;*        11            INHIBIT ITERATIONS
                                ;*        10            BELL ON ERROR
                                ;*         9            LOOP ON ERROR
                                ;*         6            TYPE ALL THE RP11 REGISTERS IF ERROR
                                ;*         4            TYPE THE LONG SEEK TIME GRAPH
                                ;*         3            PERFORM STALL BETWEEN SEEK ORDERS
                                ;*         2            USE RANDOM STALL VALUE BETWEEN SEEK ORDERS
                                ;*         1            PERFORM INCREMENTING STALL IN TEST 4
                                ;*         0            DO NOT CHECK POSITION AFTER SEEK ORDERS

                                .SBTTL  TRAP CATCHER

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

                                .SBTTL  ACT11 HOOKS

                                ;;**************************************************************
                                ;HOOKS REQUIRED BY ACT11
 000200                                 $SVPC=.                         ;SAVE PC
 000046                                 .=46
 000046  007722                         $ENDAD                          ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
 000052                                 .=52
 000052  000000                         .WORD   0                       ;;2)SET LOC.52 TO ZERO
 000200                                 .=$SVPC                         ;; RESTORE PC

                                .SBTTL  STARTING ADDRESSES
 000200                                 .=200
                                ;*200 = NORMAL START
 000200  000137  002246                 JMP     @#START1
                                ;*204 = SELECT OPERATING PARAMETERS
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                    000204  000137  002270          JMP     @#START2
                                                ;*210 = SELECT RP11 ADDRESSES
                    000210  000137  002236          JMP     @#START3
                                                ;*214 = COMBINATION OF 204 AND 210
                    000214  000137  002260          JMP     @#START4

                                                .SBTTL  BASIC DEFINITIONS

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

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

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

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

                                                ;*"SWITCH REGISTER" SWITCH DEFINITIONS
                    100000                      SW15=   100000
                    040000                      SW14=   40000
                    020000                      SW13=   20000
                    010000                      SW12=   10000
                    004000                      SW11=   4000
                    002000                      SW10=   2000
                    001000                      SW09=   1000
                    000400                      SW08=   400
```

```
                    000200          SW07=   200
                    000100          SW06=   100
                    000040          SW05=   40
                    000020          SW04=   20
                    000010          SW03=   10
                    000004          SW02=   4
                    000002          SW01=   2
                    000001          SW00=   1
                                    .EQUIV  SW09,SW9
                                    .EQUIV  SW08,SW8
                                    .EQUIV  SW07,SW7
                                    .EQUIV  SW06,SW6
                                    .EQUIV  SW05,SW5
                                    .EQUIV  SW04,SW4
                                    .EQUIV  SW03,SW3
                                    .EQUIV  SW02,SW2
                                    .EQUIV  SW01,SW1
                                    .EQUIV  SW00,SW0

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

                                    ;*BASIC "CPU" TRAP VECTOR ADDRESSES
                    000004          ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
                    000010          RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
                    000014          TBITVEC=14              ;;"T" BIT
                    000014          TRTVEC= 14              ;;TRACE TRAP
                    000014          BPTVEC= 14              ;;BREAKPOINT TRAP (BPT)
                    000020          IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
                    000024          PWRVEC= 24              ;;POWER FAIL
                    000030          EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
```

```
                        TRAPVEC=34              ;;"TRAP" TRAP
                        TKVEC=  60              ;;TTY KEYBOARD VECTOR
                        TPVEC=  64              ;;TTY PRINTER VECTOR
                        PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR

                        ;OP CODE DEFINITIONS

                        CLEAR=1                         ;CONTROLLER CLEAR
                        WRTSEK=3                        ;WRITE WITH IMPLIED SEEK AND HEAD SELECTION
                        RDSEK=5                         ;READ WITH IMPLIED SEEK AND HEAD SELECT
                        WCKSEK=7                        ;WRITE CHECK WITH IMPLIIED SEEK AND HEAD SELECT
                        SEEK=11                         ;SEEK
                        WRITE=13                        ;WRITE (NO IMPLIED SEEK OR HEAD SELECT)
                        HOMSEK=15                       ;HOME SEEK
                        READ=17                         ;READ (NO IMPLIED SEEK OR HEAD SELECT)

                        ;RP11 REGISTER EQUATES

                        ;RPDS (DRIVE STATUS REGISTER)

                        ;ATTENTION BITS ARE REFERENCED BY BIT NUMBER (BIT00 - BIT07)
                        SUWP=400                        ;SELECTED UNIT WRITE PROTECTED
                        SUFU=1000                       ;SELECTED UNIT FILE UNSAFE
                        SUSU=2000                       ;SELECTED UNIT SEEK UNDERWAY
                        SUSI=4000                       ;SELECTED UNIT SEEK INCOMPLETE
                        HNF=10000                       ;HEADER NOT FOUND
                        SURP03=20000                    ;SELECTED UNIT IS AN RP03
                        SUOL=40000                      ;SELECTED UNIT IS ONLINE
                        SURDY=100000                    ;SELECTED UNIT IS READY

                        ;RPER (ERROR REGISTER)

                        DSKERR=1                        ;DISK ERROR
                        EOP=2                           ;END OF PACK
                        NXME=4                          ;NON-EXISTENT MEMORY
                        WCE=10                          ;WRITE CHECK ERROR
                        TIMEE=20                        ;TIMING ERROR
                        CSME=40                         ;CHECKSUM ERROR
                        WPE=100                         ;WORD PARITY ERROR
                        LPE=200                         ;LONGITUDINAL PARITY ERROR
                        MODERR=400                      ;MODE ERROR
                        FMTE=1000                       ;FORMAT ERROR
                        PROG=2000                       ;PROGRAM ERROR
                        NXS=4000                        ;NON-EXISTENT SECTOR
                        NXT=10000                       ;NON-EXISTENT TRACK
                        NXC=20000                       ;NON-EXSITENT CYLINDER
                        FUV=40000                       ;FILE UNSAFE VIOLATION
                        WPV=100000                      ;WRITE PROTECT VIOLATION

                        ;RPCS  (CONTROL REGISTER)

                        ;'GO' BIT AND FUNCTION BITS ARE LOADED TOGETHER AND ARE DEFINED ELSEWHERE.
                        ;EXTENDED MEMORY ADDRESS BITS ARE REFERED TO BY BIT NUMBER
                        IDE=100                         ;INTERRUPT ON DONE
                        RDY=200                         ;RP11 READY
                        ;DRIVE SELECT BITS ARE REFERED TO BY BIT NUMBER
```

```
1207    004000          HDR=4000                ;HEADER
1208    010000          MODE=10000              ;MODE
1209    020000          AIE=20000               ;ATIENTION INTERRUPT ENABLE
1210    040000          HE=40000                ;HARD ERROR
1211    100000          ERR=100000              ;ERROR
1212
1213
```

```
                        .SBTTL  COMMON TAGS

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

                001100          .=1100
001100                  $CMTAG:                         ;;START OF COMMON TAGS
001100  000000          $PASS:  .WORD   0               ;;CONTAINS PASS COUNT
001102  000             $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
001103  000             $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
001104  000000          $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000          $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
001110  000000          $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000          $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
001114  000             $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
001115  001             $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
001116  000000          $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120  000000          $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
001122  000000          $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
001124  000000          $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
001126  000000          $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
001130  000000                  .WORD   0               ;;RESERVED--NOT TO BE USED
001132  000000                  .WORD   0
001134  000             $AUTOB: .BYTE   0               ;;AUTOMATIC MODE INDICATOR
001135  000             $INTAG: .BYTE   0               ;;INTERRUPT MODE INDICATOR
001136  000000                  .WORD   0
001140  177570          SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
001142  177570          DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
001144  177560          $TKS:   177560                  ;;TTY KBD STATUS
001146  177562          $TKB:   177562                  ;;TTY KBD BUFFER
001150  177564          $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
001152  177566          $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
001154  000             $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001155  002             $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001156  012             $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001157  000             $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001160  000000          $REGAD: .WORD   0               ;;CONTAINS THE ADDRESS FROM
                                                        ;;WHICH ($REG0) WAS OBTAINED
001162  000000          $REG0:  .WORD   0               ;;CONTAINS (($REGAD)+0)
001164  000000          $REG1:  .WORD   0               ;;CONTAINS (($REGAD)+2)
001166  000000          $REG2:  .WORD   0               ;;CONTAINS (($REGAD)+4)
001170  000000          $REG3:  .WORD   0               ;;CONTAINS (($REGAD)+6)
001172  000000          $REG4:  .WORD   0               ;;CONTAINS (($REGAD)+10)
001174  000000          $REG5:  .WORD   0               ;;CONTAINS (($REGAD)+12)
001176  000000          $REG6:  .WORD   0               ;;CONTAINS (($REGAD)+14)
001200  000000          $REG7:  .WORD   0               ;;CONTAINS (($REGAD)+16)
001202  000000          $REG10: .WORD   0               ;;CONTAINS (($REGAD)+20)
001204  000000          $TMP0:  .WORD   0               ;;USER DEFINED
001206  000000          $TIMES: 0                       ;;MAX. NUMBER OF ITERATIONS
001210  000000          $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
001212  177607  000377    $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
001216  077             $QUES:  .ASCII  /?/             ;;QUESTION MARK
001217  015             $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001220  000012          $LF:    .ASCIZ  <12>            ;;LINE FEED
                        ;;**********************************************************************
```

```
1270   001222   000000                  CNTRLC: .WORD   0               ;CONTROL "C" FLAG
1271   001224   000000                  BUSADR: .WORD   0               ;GET ADDRESSES FROM THE ITY FLAG (0=NO, -1=YES)
1272   001226   000000                  INADR:  .WORD   0               ;CONTAINS INNER ADDRESS FOR TIMING TEST
1273   001230   000000                  OUTADR: .WORD   0               ;CONTAINS OUTER ADDRESS FOR TIMING TEST
1274   001232   000000                  DRVSEL: .WORD   0               ;DRIVES SELECTED FOR TESTING
1275   001234   000777                  TSTNMS: .WORD   777             ;RUN TESTS 0-10
1276   001236   000000                  MAXCYL: .WORD   0               ;MAXIMUM CYLINDER ADDRESS
1277   001240   000000                  DRVTYP: .WORD   0               ;CONTAINS A BIT FOR EACH RP03 DRIVE
1278                                                                    ;ON THE SYSTEM.  BIT00=DRIVE 0, ETC.
1279   001242   000000                  SPSAV:  .WORD   0               ;SAVE THE STACK POINTER HERE
1280   001244   000000                  BYPASS: .WORD   0               ;BYPASS CURRENT TEST ADDRESS
1281   001246   000000                  CHKDRV: .WORD   0               ;DRIVE UNDER TEST
1282   001250   000000                  DRVMSK: .WORD   0               ;DRIVE MASK BIT
1283   001252   000000                  DRVBAD: .WORD   0               ;CONTAINS BITS FOR UNSAFE OR OFFLINE DRIVES
1284   001254   000000                  CYL.CR: .WORD   0               ;CURRENT CYLINDER
1285   001256   000000                  TRK.RD: .WORD   0               ;TRACK READ
1286   001260   000000                  SEC.RD: .WORD   0               ;SECTOR READ
1287   001262   000000                  CYL.DS: .WORD   0               ;CYLINDER DESIRED
1288   001264   000000                  STR20X: .WORD   0               ;START FROM 200, 204, 210, 214 FLAG
1289
1290                                   ;CONSTANTS STORAGE
1291   001266   176710                  RPADR:  .WORD   176710          ;RP11 ADDRESS
1292   001270   000254                  RPVEC:  .WORD   254             ;RP11 VECTOR ADDRESS
1293   001272   000240                  RPPRIO: .WORD   5*32.           ;RP11 PRIORITY
1294   001274   000000                  STALL0: .WORD   0               ;VARIABLE STALL (TEST 4)
1295   001276   000031                  STALL1: .WORD   25.             ;25 MILLISECONDS STALL (TEST 0-6)
1296   001300   000000                  STALLG: .WORD   0               ;GENERAL STALL VALUE (VARIABLE)
1297   001302   000062                  MXSTAL: .WORD   50.             ;MAX INCREMENTING STALL ALLOWED IN TEST 4
1298                                           .EVEN
1299
1300                                   ;*TABLE OF DRIVE STATUS INDICATORS
1301                                           ;*DRVSTA>0 - DRIVE IS ONLINE
1302                                           ;*DRVSTA<0 - DRIVE IS OFFLINE, UNSAFE, OR AN RP03
1303
1304   001304   000                     DRVSTA: .BYTE   0               ;DRIVE 0
1305   001305   000                             .BYTE   0               ;DRIVE 1
1306   001306   000                             .BYTE   0               ;DRIVE 2
1307   001307   000                             .BYTE   0               ;DRIVE 3
1308   001310   000                             .BYTE   0               ;DRIVE 4
1309   001311   000                             .BYTE   0               ;DRIVE 5
1310   001312   000                             .BYTE   0               ;DRIVE 6
1311   001313   000                             .BYTE   0               ;DRIVE 7
1312
1313                                   ;ATTENTION BIT TABLE
1314
1315   001314   001                     ATABIT: .BYTE   1               ;DRIVE 0
1316   001315   002                             .BYTE   2               ;DRIVE 1
1317   001316   004                             .BYTE   4               ;DRIVE 2
1318   001317   010                             .BYTE   10              ;DRIVE 3
1319   001320   020                             .BYTE   20              ;DRIVE 4
1320   001321   040                             .BYTE   40              ;DRIVE 5
1321   001322   100                             .BYTE   100             ;DRIVE 6
1322   001323   200                             .BYTE   200             ;DRIVE 7
1323
1324                                   ;BIT TABLE
1325   001324   000001                  BITS:   .WORD   BIT00
```

```
1326   001326   000002                  .WORD   BIT01
1327   001330   000004                  .WORD   BIT02
1328   001332   000010                  .WORD   BIT03
1329   001334   000020                  .WORD   BIT04
1330   001336   000040                  .WORD   BIT05
1331   001340   000100                  .WORD   BIT06
1332   001342   000200                  .WORD   BIT07
1333   001344   000400                  .WORD   BIT08
1334   001346   001000                  .WORD   BIT09
1335   001350   002000                  .WORD   BIT10
1336   001352   004000                  .WORD   BIT11
1337   001354   010000                  .WORD   BIT12
1338   001356   020000                  .WORD   BIT13
1339   001360   040000                  .WORD   BIT14
1340   001362   100000                  .WORD   BIT15
1341
1342
1343                                   ;DRIVE OPERATION PARAMETER BLOCK
1344
1345   001364      000                  DPB:    .BYTE   0               ;OP CODE
1346   001365      000                          .BYTE   0               ;DRIVE ADDRESS
1347   001366   000000                          .WORD   0               ;CYLINDER ADDRESS
1348   001370      000                          .BYTE   0               ;SECTOR ADDRESS
1349   001371      000                          .BYTE   0               ;TRACK ADDRESS
1350
1351                                   ;COMMON STORAGE FOR TEST PARAMETER
1352   001372   000000                  PRM:    .WORD   0
1353   001374   000000                  RPT:    .WORD   0               ;REPEAT COUNTS FOR ALL TESTS
1354   001376   000000                  FC:     .WORD   0               ;FIRST CYLINDER
1355   001400   000000                  LC:     .WORD   0               ;LAST CYLINDER
1356   001402   000000                  IC:     .WORD   0               ;INCREMENT CYLINDER
1357   001404   000000                  TK:     .WORD   0               ;TRACK ADDRESS
1358
1359                                   ;TABLE OF PARAMETER POINTERS
1360   001406   001632                  PRMPT:  .WORD   PRM0
1361   001410   001640                          .WORD   PRM1
1362   001412   001654                          .WORD   PRM2
1363   001414   001670                          .WORD   PRM3
1364   001416   001704                          .WORD   PRM4
1365   001420   001720                          .WORD   PRM5
1366   001422   001734                          .WORD   PRM6
1367   001424   001750                          .WORD   PRM7
1368   001426   001764                          .WORD   PRM10
1369   001430   001770                          .WORD   PRM11
1370   001432   002000                          .WORD   PRM12
1371
1372                                   ;PARAMETER UPPER LIMIT
1373   001434   077777                  PRMLMT: .WORD   32767.          ;"R"
1374   001436   000312                          .WORD   202.            ;"FC"
1375   001440   000312                          .WORD   202.            ;"LC"
1376   001442   000312                          .WORD   202.            ;"IC"
1377   001444   000023                          .WORD   19.             ;"TK"
1378
1379                                   ;TABLE OF MESSAGE POINTERS
1380   001446   021420                  PRMMSG: .WORD   MSG.R
1381   001450   021422                          .WORD   MSG.FC
```

```
1382  001452  021425                          .WORD   MSG.LC
1383  001454  021430                          .WORD   MSG.IC
1384  001456  021433                          .WORD   MSG.TK
1385
1386                                  ;DEFAULT VALUES OF TESTS PARAMETERS
1387  001460  000021  000144  000000  DFLT:   .WORD   21,100.,0          ;HOME SEEK (T0)
1388  001466  000037  001750  000000          .WORD   37,1000.,0,202.,0,0  ;SEEK/SEEK (T1)
1389  001474  000312  000000  000000
1390  001502  000037  000010  000000          .WORD   37,10.,0,202.,1,0  ;INCREMENT SEEK (T2)
1391  001510  000312  000001  000000
1392  001516  000037  000010  000000          .WORD   37,10.,0,128.,1,0  ;STEPPING SEEK (T3)
1393  001524  000200  000001  000000
1394  001532  000037  000010  000000          .WORD   37,10.,0,202.,1,0  ;OSCILLATING SEEK (T4)
1395  001540  000312  000001  000000
1396  001546  000037  000010  000000          .WORD   37,10.,0,202.,1,0  ;CONVERGING/DIVERGING SEEK (T5)
1397  001554  000312  000001  000000
1398  001562  000037  000010  000000          .WORD   37,10.,0,202.,1,0  ;SERVO ADDRESSING LOGIC NOISE (T6)
1399  001570  000312  000001  000000
1400  001576  000037  000001  000000          .WORD   37,1,0,202.,1,0  ;CYLINDER ADDRESSING TEST (T7)
1401  001604  000312  000001  000000
1402  001612  000001  000001                  .WORD   1,1                ;ONE CYLINDER SEEK TIMER TEST (T10)
1403  001616  000007  000001  000000          .WORD   7,1,0,202.         ;SEEK-SEEK TIMER TEST (T11)
1404  001624  000312
1405  001626  000001  000001                  .WORD   1,1                ;SEEK TIME GRAPH TEST (T12)
1406
1407                                  ;PARAMETER TABLES
1408
1409                                  ;HOME SEEK (T0)
1410  001632  000021                  PRM0:   .WORD   21
1411  001634  000144                  RPT0:   .WORD   100.
1412  001636  000000                  TK0:    .WORD   0
1413
1414                                  ;SEEK-SEEK (T1)
1415  001640  000037                  PRM1:   .WORD   37
1416  001642  001750                  RPT1:   .WORD   1000.
1417  001644  000000                  FC1:    .WORD   0
1418  001646  000312                  LC1:    .WORD   202.
1419  001650  000000                  IC1:    .WORD   0
1420  001652  000000                  TK1:    .WORD   0
1421
1422                                  ;INCREMENT SEEK (T2)
1423  001654  000037                  PRM2:   .WORD   37
1424  001656  000012                  RPT2:   .WORD   10.
1425  001660  000000                  FC2:    .WORD   0
1426  001662  000312                  LC2:    .WORD   202.
1427  001664  000001                  IC2:    .WORD   1
1428  001666  000000                  TK2:    .WORD   0
1429
1430                                  ;STEPPING SEEK (T3)
1431  001670  000037                  PRM3:   .WORD   37
1432  001672  000012                  RPT3:   .WORD   10.
1433  001674  000000                  FC3:    .WORD   0
1434  001676  000200                  LC3:    .WORD   128.
1435  001700  000001                  IC3:    .WORD   1
1436  001702  000000                  TK3:    .WORD   0
1437
```

```
                                        ;OSCILLATING SEEK (T4)
001704  000037                          PRM4:   .WORD   37
001706  000012                          RPT4:   .WORD   10.
001710  000000                          FC4:    .WORD   0
001712  000312                          LC4:    .WORD   202.
001714  000001                          IC4:    .WORD   1
001716  000000                          TK4:    .WORD   0

                                        ;CONVERGING/DIVERGING SEEK (T5)
001720  000037                          PRM5:   .WORD   37
001722  000012                          RPT5:   .WORD   10.
001724  000000                          FC5:    .WORD   0
001726  000312                          LC5:    .WORD   202.
001730  000001                          IC5:    .WORD   1
001732  000000                          TK5:    .WORD   0

                                        ;SERVO ADDRESSING LOGIC NOISE GENERATOR (T6)
001734  000037                          PRM6:   .WORD   37
001736  000012                          RPT6:   .WORD   10.
001740  000000                          FC6:    .WORD   0
001742  000312                          LC6:    .WORD   202.
001744  000001                          IC6:    .WORD   1
001746  000000                          TK6:    .WORD   0

                                        ;CYLINDER ADDRESSING (T7)
001750  000037                          PRM7:   .WORD   37
001752  000001                          RPT7:   .WORD   1
001754  000000                          FC7:    .WORD   0
001756  000312                          LC7:    .WORD   202.
001760  000001                          IC7:    .WORD   1
001762  000000                          TK7:    .WORD   0

                                        ;ONE CYLINDER SEEK TIMER TEST (T10)
001764  000001                          PRM10:  .WORD   1
001766  000001                          RPT10:  .WORD   1

                                        ;SEEK-SEEK TIMING TEST (T11)
001770  000007                          PRM11:  .WORD   7
001772  000001                          RPT11:  .WORD   1
001774  000000                          FC11:   .WORD   0
001776  000312                          LC11:   .WORD   202.

                                        ;SEEK TIME GRAPH TEST (T12)
002000  000001                          PRM12:  .WORD   1
002002  000001                          RPT12:  .WORD   1

                                        ;SAVE THE RP11E REGISTERS HERE

002004  000000                          $RPDS:  .WORD   0               ;DRIVE STATUS REGISTER
002006  000000                          $RPER:  .WORD   0               ;ERROR REGISTER
002010  000000                          $RPCS:  .WORD   0               ;COMMAND & STATUS REGISTER
002012  000000                          $RPWC:  .WORD   0               ;WORD COUNT REGISTER
002014  000000                          $RPBA:  .WORD   0               ;BUFFER ADDRESS REGISTER
002016  000000                          $RPCA:  .WORD   0               ;CURRENT CYLINDER ADDRESS REGISTER
002020  000000                          $RPDA:  .WORD   0               ;TRACK-SECTOR ADDRESS REGISTER
002022  000000                          $RPM1:  .WORD   0               ;MAINTENANCE REGISTER #1
```

```
1494  002024  000000                  $SUCA:  .WORD   0               ;SELECTED UNIT CYLINDER ADDRESS REGISTER
1495  002026  000000                  $SILO:  .WORD   0               ;SILO REGISTER
1496
1497                                  ;REGISTER INDEX VALUES
1498
1499            000000                RPDS=00                         ;DRIVE STATUS REGISTER
1500            000002                RPER=02                         ;ERROR REGISTER
1501            000004                RPCS=04                         ;CONTROL REGISTER
1502            000006                RPWC=06                         ;WORD COUNT REGISTER
1503            000010                RPBA=10                         ;BUFFER ADDRESS REGISTER
1504            000012                RPCA=12                         ;CYLINDER ADDRESS REGISTER
1505            000014                RPDA=14                         ;SECTOR/TRACK ADDRESS REGISTER
1506            000016                RPM1=16                         ;MAINTENANCE REGISTER #1
1507            000020                RPM2=20                         ;MAINTENANCE REGISTER #2
1508            000022                RPM3=22                         ;MAINTENANCE REGISTER #3
1509            000024                SUCA=24                         ;SELECTED UNIT CYLINDER ADDRESS REGISTER
1510            000026                SILO=26                         ;SILO REGISTER
1511
1512
1513  002030  020040      040         BLNK13: .ASCII  /   /
1514  002033      040                 BLNK10: .ASCII  / /
1515  002034      040                 BLNK9:  .ASCII  / /
1516  002035      040                 BLNK8:  .ASCII  / /
1517  002036      040                 BLNK7:  .ASCII  / /
1518  002037      040                 BLNK6:  .ASCII  / /
1519  002040      040                 BLNK5:  .ASCII  / /
1520  002041      040                 BLNK4:  .ASCII  / /
1521  002042      040                 BLNK3:  .ASCII  / /
1522  002043      040                 BLNK2:  .ASCII  / /
1523  002044  000040                  BLNK1:  .ASCIZ  / /
1524
1525                                          .EVEN
```

```
                                .SBTTL  ERROR POINTER TABLE

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

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

002046                          $ERRTB:
                                ;*EM AND DH ARE ASCIZ MESSAGES, DT IS A STRING OF WORDS THAT POINT TO THE
                                ;*DATA TO BE TYPED AND DF IS A STRING OF DATA THAT TELL HOW THE DT WORDS
                                ;*ARE TO BE TYPED.  IF ANY OF THE POINTERS ARE NOT NEEDED FOR A PARTICULAR
                                ;*ERROR IT IS REPLACED WITH A ZERO.
                                ;*EACH OF THE ITEMS BELOW REFER TO THE ERROR NUMBER AND INDICATE
                                ;*THE INFORMATION THAT WILL BE TYPED WHEN THE ERROR OCCURS.
                                ;*UNLESS STATED OTHER ALL NUMBERS ARE OCTAL


                                ;ERROR 1

002046  021642                          EM1             ;RP11 FAILED TO RESPOND TO ADDRESSING
002050  022603                          DH1
002052  023336                          DT1
002054  023472                          DF1

                                ;ERROR 2

002056  021707                          EM2             ;DRIVE UNSAFE
002060  022620                          DH2
002062  023342                          DT2
002064  023476                          DF2

                                ;ERROR 3

002066  021724                          EM3             ;DRIVE OFFLINE
002070  022620                          DH2
002072  023342                          DT2
002074  023476                          DF2

                                ;ERROR 4

002076  021742                          EM4             ;DISK ERROR DURING TIMING TEST
002100  022620                          DH2
002102  023342                          DT2
002104  023476                          DF2

                                ;ERROR 5

002106  022001                          EM5             ;NO INTERRUPT FROM POSITIONING AFTER 1 SECOND
```

```
1582   002110  022620                  DH2
1583   002112  023342                  DT2
1584   002114  023476                  DF2
1585
1586                                   ;ERROR 6
1587
1588   002116  022056                  EM6             ;DISK ERROR AFTER POSITIONING
1589   002120  022620                  DH2
1590   002122  023342                  DT2
1591   002124  023476                  DF2
1592
1593                                   ;ERROR 7
1594
1595   002126  022113                  EM7             ;ATTN BIT NOT SET AFTER POSITIONING
1596   002130  022620                  DH2
1597   002132  023342                  DT2
1598   002134  023476                  DF2
1599
1600                                   ;ERROR 10
1601
1602   002136  022166                  EM10            ;DRIVE OFFLINE AFTER POSITIONING
1603   002140  022620                  DH2
1604   002142  023342                  DT2
1605   002144  023476                  DF2
1606
1607                                   ;ERROR 11
1608
1609   002146  022226                  EM11            ;'SUCA' NOT CORRECT AFTER POSITIONING
1610   002150  022675                  DH11
1611   002152  023356                  DT11
1612   002154  023502                  DF11
1613
1614                                   ;ERROR 12
1615
1616   002156  022273                  EM12            ;DISK ERROR WHILE VERIFYING POSITION
1617   002160  022762                  DH12
1618   002162  023374                  DT12
1619   002164  023506                  DF12
1620
1621                                   ;ERROR 13
1622
1623   002166  022337                  EM13            ;DISK POSITIONED TO WRONG CYLINDER
1624   002170  023057                  DH13
1625   002172  023414                  DT13
1626   002174  023512                  DF13
1627
1628                                   ;ERROR 14
1629
1630   002176  022401                  EM14            ;NO INTERRUPT FROM I/O AFTER 1 SECOND
1631   002200  022620                  DH2
1632   002202  023342                  DT2
1633   002204  023476                  DF2
1634
1635                                   ;ERROR 15
1636
1637   002206  022446                  EM15            ;SEEK INCOMPLETE
```

```
1638   002210  022620                  DH2
1639   002212  023342                  DT2
1640   002214  023476                  DF2
1641
1642                           ;ERROR 16
1643
1644   002216  022466                  EM16            ;DRIVE NOT READY AFTER POSITIONING
1645   002220  022620                  DH2
1646   002222  023342                  DT2
1647   002224  023476                  DF2
1648
1649                           ;ERROR 17
1650
1651   002226  022530                  EM17            ;DRIVE NOT READY/OFFLINE DURING TIMING TEST
1652   002230  022620                  DH2
1653   002232  023342                  DT2
1654   002234  023476                  DF2
1655
1656
```

```
                                .SBTTL  START OF PROGRAM

002236  012737  177777  001224  START3: MOV     #-1,@#BUSADR    ;GET BUSADR FLAG
002244  000402                  BR      STRTIA
002246  005037  001224          START1: CLR     @#BUSADR        ;CLR BUSADR FLAG
002252  005037  001222          STRTIA: CLR     @#CNTRLC        ;NO CONTROL "C"
002256  000411                  BR      START                   ;
002260  012737  177777  001224  START4: MOV     #-1,@#BUSADR    ;SET BUSADR FLAG
002266  000402                  BR      STRT2A
002270  005037  001224          START2: CLR     @#BUSADR        ;CLR BUSADR FLAG
002274  012737  177777  001222  STRT2A: MOV     #-1,@#CNTRLC    ;SET CONTROL "C" FLAG
002302  012737  177777  001264  START:  MOV     #-1,STR20X      ;SET START FLAG
002310  000005                  RESET
                                .SBTTL  INITIALIZE THE COMMON TAGS
                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
002312  012706  001100                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
002316  005026                  CLR     (R6)+                   ;;CLEAR MEMORY LOCATION
002320  022706  001140                  CMP     #SWR,R6 ;;DONE?
002324  001374                  BNE     .-6                     ;;LOOP BACK IF NO
002326  012706  001100                  MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                ;;INITIALIZE A FEW VECTORS
002332  012737  012524  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
002340  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
002346  012737  007742  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
002354  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
002362  012737  013164  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
002370  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
002376  005037  001206                  CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
002402  005037  001210                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
002406  112737  000001  001115          MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
002414  012737  002414  001106          MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
002422  012737  002422  001110          MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
                                ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
002430  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
002434  012737  002470  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
002442  012737  177570  001140          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
002450  012737  177570  001142          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
002456  022777  177777  176454          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
002464  001012                  BNE     66$                     ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                ;;AND  THE HARDWARE SWR IS NOT = -1
002466  000403                  BR      65$                     ;;BRANCH IF NO TIMEOUT
002470  012716  002476          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
002474  000002                  RTI
002476  012737  000176  001140  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
002504  012737  000174  001142          MOV     #DISPREG,DISPLAY
002512  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

002516  012700  001160                  MOV     #$REGAD,R0      ;FIRST ADDRESS
002522  005020                  1$:     CLR     (R0)+           ;CLEAR VARIABLE STORAGE
002524  022700  001212                  CMP     #$BELL,R0       ;DONE?
002530  001374                  BNE     1$                      ;NO--BRANCH
002532  005227  177777                  INC     #-1             ;FIRST START ?
002536  001036                  BNE     2$                      ;BR IF NOT
```

```
                                                CMP     @#42,@#46       ;ACT11 AUTO MODE?
                                                BEQ     2$              ;YES, SKIP TITLE PRINTOUT
                                                TYPE    ,68$            ;;TYPE ASCIZ STRING
                                                BR      67$             ;;GET OVER THE ASCIZ
                                        ;;68$:  .ASCIZ  <15><12>/MD-11-DZRPZ-C, RP11E DRIVE POSITIONING TEST/
                                        67$:
                                        2$:     JSR     PC,$TKINT       ;SETUP THE TTY KEYBOARD
                                                .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
                                                TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
                                                BNE     69$             ;;BRANCH IF YES
                                                CMP     $WR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
                                                BNE     70$             ;;BRANCH IF NO
                                                GTSWR                   ;;GET SOFT-SWR SETTINGS
                                                BR      70$
                                        69$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
                                        70$:
                                                MOV     #377,TSTNMS     ;SELECT TESTS 0-7
                                                MOV     #DFLT,R0        ;DEFAULT PARAMETERS POINTER
                                                MOV     #PRM0,R1        ;TABLE POINTER
                                                MOV     R1,R2           ;STOP ADDRESS
                                        3$:     MOV     (R0)+,(R1)+     ;MOVE DEFAULT PARAMETERS INTO
                                                CMP     R0,R2           ;RUN TIME TABLES ** DONE?
                                                BLO     3$              ;NO--BRANCH
                                                BR      SRTINT          ;FINISH SETUP
                                        START5: RESET                   ;'CONTROL C' RESET
                                                JSR PC,$TKINT
                                                MOV     #-1,CNTRLC      ;SET 'CONTROL C' SWITCH
                                        SRTINT: MOV     #PR7,TKVEC+2    ;SET TTY PRIORITY TO 7
                                                CLR     PS              ;SET PRIORITY TO ZERO
                                                CLR     DRVBAD          ;CLEAR OFFLINE/UNSAFE DRIVE BITS
                                                CLR     $TIMES          ;INITIALIZE NUMBER OF ITERATIONS
                                                CLR     $ESCAPE         ;CLEAR THE ESCAPE ON ERROR ADDRESS
                                                CLR     BYPASS          ;CLEAR THE BYPASS ADDRESS
                                                MOV     #1,$ICNT        ;PRESET ITERATION COUNT TO 1
                                                MOVB    #1,$ERMAX       ;ALLOW ONE ERROR PER TEST
                                                MOV     #.,$LPADR       ;INITIALIZE THE LOOP ADDRESS FOR SCOPE
                                                MOV     #.,$LPERR       ;SETUP THE ERROR LOOP ADDRESS
                                                JSR     PC,GETADR       ;CHECK RP11 ADDRESS
                                                JSR     PC,RPINIT       ;FIND OUT WHICH DRIVES ARE ON SYSTEM
                                                MOV     #202.,MAXCYL    ;ASSUME RP02'S
                                                TST     DRVTYP          ;WHICH DRIVES ?
                                                BEQ     1$              ;BR IF THEY REALLY WERE RP02'S
                                                MOV     #405.,MAXCYL    ;SET MAX CYLINDER FOR RP03'S
                                        1$:     MOV     MAXCYL,PRMLMT+2  ;UPDATE 'FC' LIMIT
                                                MOV     MAXCYL,PRMLMT+4  ;UPDATE 'LC' LIMIT
                                                TST     STR20X          ;COMING FROM A 'CONTROL C' RESTART ?
                                                BNE     9$              ;BR IF NOT
                                                JMP     START6          ;BYPASS 'LC' UPDATE AND DRIVE STATUS TYPEOUT
                                        9$:
                                                MOV     MAXCYL,LC1      ;SETUP MAX CYLINDER FOR TEST 1
                                                MOV     MAXCYL,LC2      ;SETUP MAX CYLINDER FOR TEST 2
                                                MOV     MAXCYL,LC4      ;SETUP MAX CYLINDER FOR TEST 4
                                                MOV     MAXCYL,LC5      ;SETUP MAX CYLINDER FOR TEST 5
                                                MOV     MAXCYL,LC6      ;SETUP MAX CYLINDER FOR TEST 6
                                                MOV     MAXCYL,LC7      ;SETUP MAX CYLINDER FOR TEST 7
                                                MOV     MAXCYL,LC11     ;SETUP MAX CYLINDER FOR TEST 11
```

```
 1769  003150  012737  000200  001674          MOV     #128.,LC3       ;ASSUME RP02
 1770  003156  005737  001240                  TST     DRVTYP          ;RP02 OR RP03 ?
 1771  003162  001403                          BEQ     2$              ;BR IF RP02'S
 1772  003164  012737  000400  001676          MOV     #256.,LC3       ;CHANGE VALUE FOR RP03
 1773  003172  005227  177777          2$:     INC     #-1             ;FIRST START ?
 1774  003176  001404                          BEQ     10$             ;BR IF IT IS
 1775  003200  032777  000200  175732          BIT     #SW07,@SWR      ;INHIBIT THE STATUS TYPEOUT
 1776  003206  001115                          BNE     START6          ;BR IF YES
 1777  003210                          10$:
 1778  003210  104401  003216                  TYPE    ,65$            ;;TYPE ASCIZ STRING
 1779  003214  000412                          BR      64$             ;;GET OVER THE ASCIZ
 1780                          ;;65$:  .ASCIZ  <15><12><12>/DRIVE STATUS:/<15><12><12>
 1781  003242                          64$:
 1782  003242  005001                          CLR     R1              ;CLEAR TABLE POINTER
 1783  003244  012702  000010                  MOV     #8.,R2          ;COUNTER
 1784  003250                          3$:
 1785  003250  010146                          MOV     R1,-(SP)        ;;SAVE R1 FOR TYPEOUT
 1786                                                                  ;;TYPE DRIVE NUMBER
 1787  003252  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
 1788  003254     001                          .BYTE   1               ;;TYPE 1 DIGIT(S)
 1789  003255     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
 1790  003256  105761  001304                  TSTB    DRVSTA(R1)      ;CHECK DRIVE'S STATUS
 1791  003262  001450                          BEQ     7$              ;DRIVE IS OFFLINE OR NON-EXISTENT
 1792  003264  100412                          BMI     4$              ;DRIVE IS UNSAFE
 1793  003266  104401  003274                  TYPE    ,67$            ;;TYPE ASCIZ STRING
 1794  003272  000406                          BR      66$             ;;GET OVER THE ASCIZ
 1795                          ;;67$:  .ASCIZ  /     ONLINE/
 1796  003310                          66$:
 1797  003310  000411                          BR      5$              ;
 1798  003312                          4$:
 1799  003312  104401  003320                  TYPE    ,69$            ;;TYPE ASCIZ STRING
 1800  003316  000406                          BR      68$             ;;GET OVER THE ASCIZ
 1801                          ;;69$:  .ASCIZ  /     UNSAFE/
 1802  003334                          68$:
 1803  003334  136137  001314  001240  5$:     BITB    ATABIT(R1),DRVTYP  ;SEE WHICH DRIVE TYPE
 1804  003342  001010                          BNE     6$              ;BR IF RP03
 1805  003344  104401  003352                  TYPE    ,71$            ;;TYPE ASCIZ STRING
 1806  003350  000404                          BR      70$             ;;GET OVER THE ASCIZ
 1807                          ;;71$:  .ASCIZ  /  RP02/
 1808  003362                          70$:
 1809  003362  000422                          BR      8$              ;
 1810  003364                          6$:
 1811  003364  104401  003372                  TYPE    ,73$            ;;TYPE ASCIZ STRING
 1812  003370  000404                          BR      72$             ;;GET OVER THE ASCIZ
 1813                          ;;73$:  .ASCIZ  /  RP03/
 1814  003402                          72$:
 1815  003402  000412                          BR      8$              ;
 1816  003404                          7$:
 1817  003404  104401  003412                  TYPE    ,75$            ;;TYPE ASCIZ STRING
 1818  003410  000407                          BR      74$             ;;GET OVER THE ASCIZ
 1819                          ;;75$:  .ASCIZ  /     OFFLINE/
 1820  003430                          74$:
 1821  003430  104401  001217          8$:     TYPE    ,$CRLF          ;CR-LF
 1822  003434  005201                          INC     R1              ;INCREMENT TABLE POINTER
 1823  003436  005302                          DEC     R2              ;DECREMENT THE COUNTER
 1824  003440  001303                          BNE     3$              ;CONTINUE
```

```
1825  003442  005037  001264          START6: CLR     STR20X          ;CLEAR MANUAL START FLAG
1826  003446  005737  001222                  TST     CNTRLC          ;CONTROL "C" START/RESTART?
1827  003452  001403                          BEQ     1$              ;NO--BRANCH
1828  003454  004737  017610                  JSR     PC,@#GT.PRM     ;YES--GET PARAMETERS
1829  003460  000416                          BR      5$
1830  003462  005037  001232          1$:     CLR     DRVSEL          ;NO DRIVES SELECTED
1831  003466  005000                          CLR     R0              ;DETERMINE THE DRIVES THAT
1832  003470  012701  000001                  MOV     #1,R1           ;ARE AVAILABLE FOR TESTING
1833  003474  105760  001304          2$:     TSTB    DRVSTA(R0)
1834  003500  003403                          BLE     3$
1835  003502  156037  001314  001232          BISB    ATABIT(R0),@#DRVSEL
1836  003510  005200                  3$:     INC     R0
1837  003512  106301                          ASLB    R1
1838  003514  001367                          BNE     2$
1839  003516                          5$:
1840  003516  104401  003524                  TYPE    ,65$            ;;TYPE ASCIZ STRING
1841  003522  000415                          BR      64$             ;;GET OVER THE ASCIZ
1842                                  ;;65$:  .ASCIZ  <15><12>/DRIVE(S) TO BE TESTED /
1843  003556                          64$:
1844  003556  005037  007656                  CLR     @#$ENDCT        ;DETERMINE PASSES TO MAKE AND
1845  003562  005000                          CLR     R0              ;THE DRIVES TO BE TESTED
1846  003564  013701  001232                  MOV     @#DRVSEL,R1     ;ANY DRIVES SELECTED?
1847  003570  001010                          BNE     9$              ;YES--BRANCH
1848  003572  104401  003600                  TYPE    ,67$            ;;TYPE ASCIZ STRING
1849  003576  000403                          BR      66$             ;;GET OVER THE ASCIZ
1850                                  ;;67$:  .ASCIZ  /NONE/
1851  003606                          66$:
1852  003606  000137  007474                  JMP     @#$EOP          ;GO TO END OF PROGRAM
1853  003612  005737  001222          9$:     TST     CNTRLC          ;CONTROL "C" START/RESTART ?
1854  003616  001010                          BNE     6$              ;BR IF NOT
1855  003620  005737  000042                  TST     42              ;UNDER MONITOR CONTROL ?
1856  003624  001405                          BEQ     6$              ;BR IF NOT
1857  003626  122737  000007  000041          CMPB    #7,41           ;LOADED BY RP02/RP03 ?
1858  003634  001001                          BNE     6$              ;BR IF NOT
1859  003636  006201                          ASR     R1              ;EXCLUDE DRIVE 0 FROM TESTING
1860  003640  006201                  6$:     ASR     R1              ;REPORT THE DRIVES TO BE TESTED
1861  003642  103013                          BCC     7$
1862  003644  005237  007656                  INC     @#$ENDCT        ;GIVE THIS DRIVE A PASS
1863  003650  010046                          MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
1864  003652  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
1865  003654     001                          .BYTE   1               ;;TYPE 1 DIGIT(S)
1866  003655     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
1867  003656  005701                          TST     R1              ;MORE DRIVES?
1868  003660  001406                          BEQ     8$              ;NO--BRANCH
1869  003662  104401  003670                  TYPE    ,69$            ;;TYPE ASCIZ STRING
1870  003666  000401                          BR      68$             ;;GET OVER THE ASCIZ
1871                                  ;;69$:  .ASCIZ  " "
1872  003672                          68$:
1873  003672  005200                  7$:     INC     R0              ;INCREMENT DRIVE NUMBER
1874  003674  000761                          BR      6$
1875  003676  013737  007656  007650  8$:     MOV     @#$ENDCT,@#$EOPCT
1876  003704  005037  001246          RSTRT1: CLR     CHKDRV          ;INIT. THE CHECK DRIVE KEY
1877  003710  012737  000001  001250          MOV     #1,DRVMSK       ;START TO CHECK DESIRED DRIVES
1878  003716  033737  001250  001232  RSTRT2: BIT     DRVMSK,DRVSEL   ;IS THIS DRIVE SELECTED?
1879  003724  001011          RSTRT3: BNE     DRVOK           ;YES--GO CHECK IF DRIVE IS READY FOR TESTING
1880  003726  005237  001246  RESTART:INC     CHKDRV          ;MOVE  TO NEXT DRIVE NUMBER
```

```
 1881  003732  106337  001250                ASLB    DRVMSK          ;POSITION THE MASK
 1882  003736  103367                        BCC     RSTRT2          ;BR IF MORE DRIVES
 1883  003740  043737  001252  001232        BIC     DRVBAD,DRVSEL   ;CLEAR SELECTION BITS FOR ANY OFFLINE/UNSAFE
 1884                                                                ;DRIVES
 1885  003746  000756                        BR      RSTRT1          ;CONTINUE WITH CYCLE
 1886  003750  013702  001246        DRVOK:  MOV     @#CHKDRV,R2     ;PICKUP THE DRIVE NUMBER
 1887  003754  110237  001365                MOVB    R2,DPB+1        ;LOAD DRIVE NUMBER
 1888  003760  104401  003766                TYPE    ,65$            ;;TYPE ASCIZ STRING
 1889  003764  000411                        BR      64$             ;;GET OVER THE ASCIZ
 1890                                  ;;65$:  .ASCIZ  <15><12><12>/TESTING DRIVE /
 1891  004010                          64$:
 1892  004010  010246                        MOV     R2,-(SP)        ;;SAVE R2 FOR TYPEOUT
 1893  004012  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
 1894  004014     001                        .BYTE   1               ;;TYPE 1 DIGIT(S)
 1895  004015     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
 1896  004016  104401  001217                TYPE    $CRLF
 1897  004022  013700  001266                MOV     RPADR,R0        ;RP11 ADDRESS
 1898  004026  016037  000012  001254        MOV     RPCA(R0),CYL.CR ;INITIALIZE CURRENT STORAGE
```

```
1899
1900                                    .SBTTL  **** TESTS ****
1901

        ;/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:
        ;/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:
        ;/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:/*\:

                ;*IN THE DESCRIPTIONS OF THE BELOW TESTS THE VARIABLES USED
                ;*AND THEIR DEFAULT VALUES (UNLESS SPECIFIED OTHERWISE) ARE:
                ;*
                ;*MNEMONIC       VALUE           VARIABLE
                ;*--------       -----           --------
                ;*
                ;*R              1               ITERATIONS (REPEATS)
                ;*FC             0               FIRST CYLINDER ADDRESS
                ;*LC             410             LAST CYLINDER ADDRESS
                ;*IC             1               INCREMENT VALUE
                ;*NC OR NC1      FC+IC           NEW OR MODIFIED CYLINDER
                ;*                               ADDRESS
                ;*NC2            LC-IC           NEW OR MODIFIED CYLINDER
                ;*                               ADDRESS
                ;*
                ;*TK             0               TRACK ADDRESS

        ;/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*
        ;/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*
        ;/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*/:\*

1928
1929
1930                            ;;*******************************************************************
1931                            ;*TEST 0         HOME SEEK TEST
1932
1933                            ;*      THIS TEST WILL CAUSE THE DRIVE TO EXECUTE A HOME SEEK
1934                            ;*      COMMAND CYCLE.  AT THE COMPLETION OF THE COMMAND, THE
1935                            ;*      STATUS INDICATORS ARE CHECKED TO VERIFY THAT NO ERRORS
1936                            ;*      HAVE OCCURED.
1937                            ;*      THIS TEST IS REPEATED 100 TIMES.
1938
1939                            ;;*******************************************************************
1940   004034                   TST0:
1941   004034   033737   001324   001234          BIT     @#BITS+<0*2>,TSTNMS ;DO THIS TEST?
1942   004042   001002                           BNE     64$                 ;YES--BRANCH
1943   004044   000137   004156                  JMP     TST1                ;NO--GO TO THE NEXT TEST
1944   004050   013737   001634   001206  64$:   MOV     @#RPTO,$TIMES       ;GET THE ITERATION COUNT
1945   004056   012737   004144   001106          MOV     #TEST0,@#$LPADR
1946   004064   012737   004034   001110          MOV     #TST0,@#$LPERR      ;SETUP THE ERROR LOOP ADDRESS
1947   004072   012737   000000   001102          MOV     #0,@#$TSTNM         ;SET UP TEST NUMBER AND
1948                                               ;CLEAR THE ERROR FLAG ($ERFLG)
1949   004100   013777   001102   175034          MOV     $TSTNM,@DISPLAY     ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
1950   004106   012737   004154   001244          MOV     #EXIT0,BYPASS       ;SETUP BYPASS ADDRESS
1951   004114   013700   001266                  MOV     RPADR,R0            ;RP11 ADDRESS
1952   004120   112737   000015   001364          MOVB    #HOMSEK,DPB         ;LOAD HOME SEEK OPCODE
1953   004126   005037   001366                  CLR     DPB+2               ;CYL ADDR ZERO
1954   004132   005037   001370                  CLR     DPB+4               ;CLEAR TRACK/SECTOR STORAGE
```

```
                                ;TKO,DPB+5      ;LOAD USER SPECIFIED TRACK
                        TESTO:  MOV     #STACK,SP       ;SET UP STACK POINTER
                                JSR     PC,SEEKS        ;DO THE SPECIFIED SEEK
                        EXITO:  SCOPE                   ;LOOP

                        ;;**********************************************************************
                        ;*TEST 1         SEEK/SEEK TEST

                        ;*      THIS TEST WILL CAUSE THE DRIVE TO EXECUTE A FORWARD SEEK
                        ;*      CYCLE TO "LC"  "LT"  "LS" FOLLOWED BY A REVERSE SEEK CYCLE TO
                        ;*      "FC"  "FT"  "FS".  AT THE COMPLETION OF EACH SEEK, THE PROPER
                        ;*      INDICATORS ARE EXAMINED TO INSURE PROPER OPERATION.

                        ;;**********************************************************************
                        TST1:
                                BIT     @#BITS+<1*2>,TSTNMS ;DO THIS TEST?
                                BNE     64$             ;YES--BRANCH
                                JMP     TST2            ;NO--GO TO THE NEXT TEST
                        64$:    MOV     @#RPT1,$TIMES   ;GET THE ITERATION COUNT
                                MOV     #TEST1,@#$LPADR
                                MOV     #TST1,@#$LPERR  ;SETUP THE ERROR LOOP ADDRESS
                                MOV     #1,@#$TSTNM     ;SET UP TEST NUMBER AND
                                                        ;CLEAR THE ERROR FLAG ($ERFLG)
                                MOV     $TSTNM,@DISPLAY  ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
                                MOV     #EXIT1,BYPASS   ;SETUP BYPASS ADDRESS
                                MOV     RPADR,R0        ;RP11 ADDRESS
                                MOVB    #SEEK,DPB       ;LOAD SEEK OPCODE
                                CLR     DPB+4           ;CLEAR SECTOR/TRACK ADDRESS
                                MOVB    TK1,DPB+5       ;LOAD USER SUPPLIED TRACK ADDRESS
                        TEST1:  MOV     #STACK,SP       ;SET THE STACK POINTER
                                MOV     FC1,DPB+2       ;STARTING CYLINDER
                                JSR     PC,SEEKS        ;SEEK TO FC
                                MOV     LC1,DPB+2       ;ENDING CYLINDER
                                JSR     PC,SEEKS        ;SEEK TO LC
                        EXIT1:  SCOPE                   ;LOOP

                        ;;**********************************************************************
                        ;*TEST 2         INCREMENTAL SEEK TEST

                        ;*      THIS TEST WILL COMMAND FORWARD SEEK CYCLES TO ADVANCE THE
                        ;*      CYLINDER ADDRESS FROM "FC" TO "LC" BY THE INCREMENT "IC".
                        ;*      WHEN THE RESULTANT CYLINDER ADDRESS (NC) EXCEEDS
                        ;*      "LC" REVERSE SEEK CYCLES ARE INITIATED; STARTING
                        ;*      AT THE LAST LEGAL "NC" AND DECREMENTING BY "IC"
                        ;*      UNTIL "NC" IS LESS THAN "FC". AT THE COMPLETION OF EACH
                        ;*      SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO
                        ;*      INSURE PROPER OPERATION.

                        ;;**********************************************************************
                        TST2:
                                BIT     @#BITS+<2*2>,TSTNMS ;DO THIS TEST?
                                BNE     64$             ;YES--BRANCH
                                JMP     TST3            ;NO--GO TO THE NEXT TEST
                        64$:    MOV     @#RPT2,$TIMES   ;GET THE ITERATION COUNT
                                MOV     #TEST2,@#$LPADR
                                MOV     #TST2,@#$LPERR  ;SETUP THE ERROR LOOP ADDRESS
```

```
2011  004352  012737  000002  001102          MOV     #2,@#$TSTNM     ;SET UP TEST NUMBER AND
2012                                                                  ;CLEAR THE ERROR FLAG ($ERFLG)
2013  004360  013777  001102  174554          MOV     $TSTNM,@DISPLAY  ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
2014  004366  012737  004504  001244          MOV     #EXIT2,BYPASS   ;SETUP BYPASS ADDRESS
2015  004374  013700  001266                  MOV     RPADR,R0        ;RP11 ADDRESS
2016  004400  112737  000011  001364          MOVB    #SEEK,DPB       ;LOAD SEEK OPCODE
2017  004406  005037  001370                  CLR     DPB+4           ;CLEAR SECTOR/TRACK ADDRESS
2018  004412  113737  001666  001371          MOVB    TK2,DPB+5       ;LOAD USER SUPPLIED TRACK ADDRESS
2019  004420  012706  001100          TEST2:  MOV     #STACK,SP       ;SET UP THE STACK POINTER
2020  004424  013737  001660  001366          MOV     FC2,DPB+2       ;STARTING CYLINDER
2021  004432  004737  014036          INCSK:  JSR     PC,SEEKS        ;SEEK TO FC
2022  004436  063737  001664  001366          ADD     IC2,DPB+2        ;MOVE TO NEXT CYLINDER
2023  004444  023737  001662  001366          CMP     LC2,DPB+2        ;OUT OF CYLINDERS?
2024  004452  002367                          BGE     INCSK           ;NO--BRANCH
2025  004454  013737  001662  001366          MOV     LC2,DPB+2       ;LOAD LC
2026  004462  004737  014036          DECSK:  JSR     PC,SEEKS        ;SEEK TO LC
2027  004466  163737  001664  001366          SUB     IC2,DPB+2
2028  004474  023737  001660  001366          CMP     FC2,DPB+2
2029  004502  003767                          BLE     DECSK
2030  004504  000004                  EXIT2:  SCOPE                   ;LOOP
2031
2032                                  ;;*****************************************************************
2033                                  ;*TEST 3         STEPPING SEEK TEST
2034
2035                                  ;*      THIS TEST WILL COMMAND SEEK CYCLES TO CYLINDER 0,1,2,4,
2036                                  ;*      8, 16, 32, 64, AND 128 (AND 256 IF AN RP03).  AT THE
2037                                  ;*      COMPLETION OF EACH SEEK COMMAND, THE PROPER INDICATORS ARE
2038                                  ;*      EXAMINED TO VERIFY PROPER OPERATION.
2039
2040                                  ;;*****************************************************************
2041  004506                          TST3:
2042  004506  033737  001332  001234          BIT     @#BITS+<3*2>,TSTNMS ;DO THIS TEST?
2043  004514  001002                          BNE     64$             ;YES--BRANCH
2044  004516  000137  004656                  JMP     TST4            ;NO--GO TO THE NEXT TEST
2045  004522  013737  001672  001206  64$:   MOV     @#RPT3,$TIMES   ;GET THE ITERATION COUNT
2046  004530  012737  004612  001106          MOV     #TEST3,@#$LPADR
2047  004536  012737  004506  001110          MOV     #TST3,@#$LPERR  ;SETUP THE ERROR LOOP ADDRESS
2048  004544  012737  000003  001102          MOV     #3,@#$TSTNM     ;SET UP TEST NUMBER AND
2049                                                                  ;CLEAR THE ERROR FLAG ($ERFLG)
2050  004552  013777  001102  174362          MOV     $TSTNM,@DISPLAY  ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
2051  004560  012737  004654  001244          MOV     #EXIT3,BYPASS   ;SETUP BYPASS ADDRESS
2052  004566  013700  001266                  MOV     RPADR,R0        ;RP11 ADDRESS
2053  004572  112737  000011  001364          MOVB    #SEEK,DPB       ;LOAD SEEK OPCODE
2054  004600  005037  001370                  CLR     DPB+4           ;CLEAR SECTOR/TRACK ADDRESS
2055  004604  113737  001702  001371          MOVB    TK3,DPB+5       ;LOAD USER SUPPLIED TRACK ADDRESS
2056  004612  012706  001100          TEST3:  MOV     #STACK,SP       ;SET UP THE STACK
2057  004616  013737  001674  001366          MOV     FC3,DPB+2       ;FC
2058  004624  004737  014036                  JSR     PC,SEEKS        ;SEEK TO FC
2059  004630  013701  001700                  MOV     IC3,R1          ;CYLINDER 1
2060  004634  010137  001366          1$:     MOV     R1,DPB+2        ;DESIRED CYLINDER
2061  004640  004737  014036                  JSR     PC,SEEKS        ;SEEK TO NC
2062  004644  006301                          ASL     R1              ;MOVE TO NEXT CYLINDER
2063  004646  020137  001676                  CMP     R1,LC3          ;DONE?
2064  004652  003770                          BLE     1$              ;NO--LOOP
2065  004654  000004                  EXIT3:  SCOPE
2066
```

```
                                ;;*****************************************************************
                                ;*TEST 4         OSCILLATING SEEK TEST
                                ;*
                                ;*      THIS TEST WILL COMMAND SEEK CYCLES FROM "FC" TO "NC" AND BACK
                                ;*      TO "FC".  "NC" STARTS AT "FC" AND INCREMENTS BY "IC" UP TO CYLINDER
                                ;*      "LC", THEN IS DECREMENTED BY "IC" BACK TO CYLINDER "FC".  AT THE
                                ;*      COMPLETION OF EVERY SEEK COMMAND THE PROPER INDICATORS ARE
                                ;*      EXAMINED TO VERIFY PROPER OPERATION.
                                ;*
                                ;*****************************************************************
004656                          TST4:
004656  033737  001334  001234          BIT     @#BITS+<4*2>,TSTNMS ;DO THIS TEST?
004664  001002                        BNE     64$                 ;YES--BRANCH
004666  000137  005220                JMP     TST5                ;NO--GO TO THE NEXT TEST
004672  013737  001706  001206  64$:   MOV     @#RPT4,$TIMES       ;GET THE ITERATION COUNT
004700  012737  004776  001106          MOV     #TEST4,@#$LPADR
004706  012737  004656  001110          MOV     #TST4,@#$LPERR      ;SETUP THE ERROR LOOP ADDRESS
004714  012737  000004  001102          MOV     #4,@#$TSTNM         ;SET UP TEST NUMBER AND
                                                                    ;CLEAR THE ERROR FLAG ($ERFLG)
004722  013777  001102  174212          MOV     $TSTNM,@DISPLAY     ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
004730  012737  005216  001244          MOV     #EXIT4,BYPASS       ;SETUP BYPASS ADDRESS
004736  013700  001266                  MOV     RPADR,R0            ;RP11 ADDRESS
004742  112737  000011  001364          MOVB    #SEEK,DPB           ;LOAD SEEK OPCODE
004750  005037  001370                  CLR     DPB+4               ;CLEAR SECTOR/TRACK ADDRESS
004754  113737  001716  001371          MOVB    TK4,DPB+5           ;LOAD USER SUPPLIED TRACK ADDRESS
004762  005002                        CLR     R2                  ;CLEAR STALL SWITCH (NO STALL)
004764  032777  000002  174146          BIT     #SW1,@SWR           ;STALL REQUIRED?
004772  001401                        BEQ     TEST4               ;NO--BRANCH
004774  005102                        COM     R2                  ;YES--SET SWITCH
004776  012706  001100          TEST4:  MOV     #STACK,SP           ;SET UP THE STACK POINTER
005002  013701  001710                  MOV     FC4,R1              ;SET NC TO FC
005006  005037  001274                  CLR     STALLO              ;START AT ZERO IF STALLS REQUIRED
005012  010137  001366          1$:     MOV     R1,DPB+2            ;NC
005016  004737  014036                  JSR     PC,SEEKS            ;SEEK TO NC
005022  005702                        TST     R2                  ;STALL?
005024  001403                        BEQ     2$                  ;NO--BRANCH
005026  004037  015576                  JSR     R0,STALL            ;YES-GO TO STALL ROUTINE
005032  001274                        .WORD   STALLO              ;TIME POINTER
005034  013737  001710  001366  2$:    MOV     FC4,DPB+2           ;FC
005042  004737  014036                  JSR     PC,SEEKS            ;SEEK TO FC
005046  005702                        TST     R2                  ;STALL?
005050  001413                        BEQ     3$                  ;NO--BRANCH
005052  004037  015576                  JSR     R0,STALL            ;YES--GO TO STALL ROUTINE
005056  001274                        .WORD   STALLO              ;TIME POINTER
005060  005237  001274                  INC     STALLO              ;UPDATE THE TIME
005064  023737  001302  001274          CMP     MXSTAL,STALLO       ;TIME TO BIG?
005072  003347                        BGT     1$                  ;NO--BRANCH
005074  005037  001274                  CLR     STALLO              ;YES--START OVER AT ZERO
005100  063701  001714          3$:     ADD     IC4,R1              ;MOVE TO NEXT CYLINDER
005104  020137  001712                  CMP     R1,LC4              ;LAST CYLINDER COMPLETED?
005110  003740                        BLE     1$                  ;NO--BRANCH
005112  013701  001712                  MOV     LC4,R1              ;SET NC TO LC
005116  010137  001366          4$:     MOV     R1,DPB+2            ;NC
005122  004737  014036                  JSR     PC,SEEKS            ;SEEK TO NC
005126  005702                        TST     R2                  ;STALL?
005130  001403                        BEQ     5$                  ;NO--BRANCH
```

```
                                                ;YES--GO TO STALL ROUTINE
                                                ;TIME POINTER
                                                 ;LC
                                                ;SEEK TO LC
                                                ;STALL?
                                                ;NO--BRANCH
                                                ;YES--GO TO STALL ROUTINE
                                                ;TIME POINTER
                                                ;UPDATE STALL TIME
                                                 ;TIME TOO BIG?
                                                ;NO--BRANCH
                                                ;YES--SET STALL TIME BACK TO ZERO
                                                ;NEXT CYLINDER
                                                ;DONE?
                                                ;NO--BRANCH
                                                ;LOOP

                                                ;;*****************************************************************
                                                ;*TEST 5         CONVERGING/DIVERGING SEEK TEST

                                                ;*       THIS TEST WILL CAUSE THE DRIVE TO EXECUTE FORWARD AND REVERSE
                                                ;*       SEEKS FROM "NC1" AND "NC2" RESPECTIVELY, "NC1" WILL BE INCREMENTED
                                                ;*       BY "IC" AND "NC2" WILL BE DECREMENTED BY "IC" UNTIL "NC1" IS
                                                ;*       GREATER THAN THE INITIAL VALUE OF "NC2" AND "NC2" IS
                                                ;*       LESS THAN THE INITIAL VALUE OF "NC1".  AT THE COMPLETION OF
                                                ;*       EACH SEEK COMMAND THE PROPER INDICATORS ARE EXAMINED TO
                                                ;*       VERIFY PROPER OPERATION.  "NC1" AND "NC2" DEFAULT TO
                                                ;*       "FC" AND "LC" RESPECTIVELY.

                                                ;;*****************************************************************
                                                ;T5T5:
                                                        ;YES--BRANCH
                                                        ;NO--GO TO THE NEXT TEST
                                                        ;GET THE ITERATION COUNT
                                                        ;SETUP THE ERROR LOOP ADDRESS
                                                        ;SET UP TEST NUMBER AND
                                                        ;CLEAR THE ERROR FLAG ($ERFLG)
                                                         ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
                                                ;SETUP BYPASS ADDRESS
                                                        ;RP11 ADDRESS
                                                        ;LOAD SEEK OPCODE
                                                        ;CLEAR SECTOR/TRACK ADDRESS
                                                        ;LOAD USER SUPPLIED TRACK ADDRESS
                                                ;T5T5:
                                                        ;START NC1 AT FC
                                                        ;START NC2 AT LC
                                                        ;NC1
                                                        ;SEEK TO NC1
                                                        ;NC2
                                                        ;SEEK TO NC1
                                                        ;NEXT NC1
                                                        ;NEXT NC2
                                                        ;DONE?
                                                        ;YES--BRANCH
```

```
2179  005376  020237  001724                    CMP     R2,FC5          ;?
2180  005402  002356                            BGE     1$              ;NO--BRANCH
2181  005404  000004                    EXIT5:  SCOPE                   ;LOOP
2182
2183                                      ;;*****************************************************************
2184                                      ;*TEST 6         SERVO ADDRESSING LOGIC NOISE GENERATOR
2185
2186                                      ;*      IN THIS TEST A SEEK IS DONE TO CYL "NC" THEN A SEEK TO
2187                                      ;*      NC+4 THEN NC+1 THEN NC+3 THEN NC+2 THEN NC+5.  NOW "NC" IS UPDATED
2188                                      ;*      BY "IC" AND THE ABOVE SEQUENCE IS REPEATED UNITL "LC" IS
2189                                      ;*      EXCEEDED BY ANY OF THE ABOVE VALUES.  THE INITIAL VALUE OF "NC"
2190                                      ;*      IS "FC".  AT THE COMPLETION OF EACH SEEK COMMAND THE
2191                                      ;*      PROPER INDICATORS ARE EXAMINED TO INSURE PROPER OPERATION.
2192
2193                                      ;;*****************************************************************
2194  005406                              TST6:
2195  005406  033737  001340  001234              BIT     @#BITS+<6*2>,TSTNMS ;DO THIS TEST?
2196  005414  001002                              BNE     64$             ;YES--BRANCH
2197  005416  000137  005640                      JMP     TST7            ;NO--GO TO THE NEXT TEST
2198  005422  013737  001736  001206    64$:     MOV     @#RPT6,$TIMES   ;GET THE ITERATION COUNT
2199  005430  012737  005512  001106              MOV     #TEST6,@#$LPADR
2200  005436  012737  005406  001110              MOV     #TST6,@#$LPERR  ;SETUP THE ERROR LOOP ADDRESS
2201  005444  012737  000006  001102              MOV     #6,@#$TSTNM     ;SET UP TEST NUMBER AND
2202                                              ;CLEAR THE ERROR FLAG ($ERFLG)
2203  005452  013777  001102  173462              MOV     $TSTNM,@DISPLAY ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
2204  005460  012737  005636  001244              MOV     #EXIT6,BYPASS   ;SETUP BYPASS ADDRESS
2205  005466  013700  001266                      MOV     RPADR,R0        ;RP11 ADDRESS
2206  005472  112737  000011  001364              MOVB    #SEEK,DPB       ;LOAD SEEK OPCODE
2207  005500  005037  001370                      CLR     DPB+4           ;CLEAR SECTOR/TRACK ADDRESS
2208  005504  113737  001746  001371              MOVB    TK6,DPB+5       ;LOAD USER SUPPLIED TRACK ADDRESS
2209  005512  012706  001100            TEST6:    MOV     #STACK,SP       ;SETUP STACK
2210  005516  013701  001740                      MOV     FC6,R1          ;PICKUP "FC"
2211  005522  013702  001742                      MOV     LC6,R2          ;FORM LAST CYLINDER THAT
2212  005526  162702  000005                      SUB     #5,R2           ;IS AVAILABLE FOR TESTING
2213  005532  020102                      1$:     CMP     R1,R2           ;LAST CYLINDER
2214  005534  003040                              BGT     EXIT6           ;YES--BRANCH
2215  005536  010137  001366                      MOV     R1,DPB+2        ;NC
2216  005542  004737  014036                      JSR     PC,SEEKS        ;SEEK TO NC
2217  005546  062737  000004  001366              ADD     #4,DPB+2        ;NC+4
2218  005554  004737  014036                      JSR     PC,SEEKS        ;SEEK TO NC+4
2219  005560  162737  000003  001366              SUB     #3,DPB+2        ;NC+1
2220  005566  004737  014036                      JSR     PC,SEEKS        ;SEEK TO NC+1
2221  005572  062737  000002  001366              ADD     #2,DPB+2        ;NC+3
2222  005600  004737  014036                      JSR     PC,SEEKS        ;SEEK TO NC+3
2223  005604  162737  000001  001366              SUB     #1,DPB+2        ;NC+2
2224  005612  004737  014036                      JSR     PC,SEEKS        ;SEEK TO NC+2
2225  005616  062737  000003  001366              ADD     #3,DPB+2        ;NC+5
2226  005624  004737  014036                      JSR     PC,SEEKS        ;SEEK TO NC+5
2227  005630  063701  001744                      ADD     IC6,R1
2228  005634  000736                              BR      1$
2229  005636  000004                    EXIT6:    SCOPE                   ;LOOP
2230
2231                                      ;;*****************************************************************
2232                                      ;*TEST 7         CYLINDER ADDRESSING TEST
2233
2234                                      ;*      THIS TEST WILL CAUSE THE DRIVE TO SEEK FROM EACH CYLINDER TO EVERY
```

```
                                        ;*      OTHER CYLINDER BETWEEN CYLINDERS "FC" AND "LC".  SEEK CYCLES ARE
                                        ;*      COMMANDED FROM CYLINDER "NC" TO CYLINDER "NC1" AND BACK TO CYLINER
                                        ;*      "NC".  "NC" AND "NC1" START AT "FC"  "NC1" IS INCREMENTED BY "IC"
                                        ;*      UNTIL "NC1" IS EQUAL TO "LC".  WHEN "NC1" IS EQUAL TO "LC", IT IS
                                        ;*      RESET TO "FC" AND "NC" IS INCREMENTED BY "IC".  THE CYCLE IS COMPLETE
                                        ;*      WHEN "NC" AND "NC1" BOTH EQUAL "LC".  AT THE COMPLETION OF EACH
                                        ;*      SEEK COMMAND, THE INDICATORS ARE EXAMINED TO VERIFY PROPER OPERATION.
                                        ;
                                        ;;*********************************************************************
005640                                  TST7:
005640  033737  001342  001234          BIT     @#BITS+<7*2>,TSTNMS ;DO THIS TEST?
005646  001002                          BNE     64$                 ;YES--BRANCH
005650  000137  006032                  JMP     TST10               ;NO--GO TO THE NEXT TEST
005654  013737  001752  001206  64$:    MOV     @#RPT7,$TIMES       ;GET THE ITERATION COUNT
005662  012737  005744  001106          MOV     #TEST7,@#$LPADR
005670  012737  005640  001110          MOV     #TST7,@#$LPERR      ;SETUP THE ERROR LOOP ADDRESS
005676  012737  000007  001102          MOV     #7,@#$TSTNM         ;SET UP TEST NUMBER AND
                                                                    ;CLEAR THE ERROR FLAG ($ERFLG)
005704  013777  001102  173230          MOV     $TSTNM,@DISPLAY     ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
005712  012737  006030  001244          MOV     #EXIT7,BYPASS       ;SETUP BYPASS ADDRESS
005720  013700  001266                  MOV     RPADR,R0            ;RP11 ADDRESS
005724  112737  000011  001364          MOVB    #SEEK,DPB           ;SETUP FOR SEEKING
005732  005037  001370                  CLR     DPB+4               ;CLEAR TRACK/SECTOR STORAGE
005736  113737  001762  001371          MOVB    TK7,DPB+5           ;LOAD USER SPECIFIED TRACK ADDRESS
005744  012706  001100          TEST7:  MOV     #STACK,SP           ;LOAD STACK POINTER
005750  013701  001754                  MOV     FC7,R1              ;START NC AT FC
005754  013702  001754                  MOV     FC7,R2              ;START NC1 AT FC
005760  010137  001366          1$:     MOV     R1,DPB+2            ;NC
005764  004737  014036                  JSR     PC,SEEKS            ;SEEK TO NC
005770  010237  001366                  MOV     R2,DPB+2            ;NC1
005774  004737  014036                  JSR     PC,SEEKS            ;SEEK TO NC1
006000  063702  001760                  ADD     IC7,R2              ;INCREMENT NC1
006004  023702  001756                  CMP     LC7,R2              ;EXCEEDED LC ?
006010  002363                          BGE     1$                  ;BR IF NOT
006012  013702  001754                  MOV     FC7,R2              ;RESET NC1
006016  063701  001760                  ADD     IC7,R1              ;INCREMENT NC
006022  023701  001756                  CMP     LC7,R1              ;EXCEEDED LC ?
006026  002354                          BGE     1$                  ;BR IF NOT
006030  000004                  EXIT7:  SCOPE                       ;LOOP ?

                                        ;;*********************************************************************
                                        ;*TEST 10       ONE CYLINDER SEEK TIMER TEST

                                        ;*      THIS TEST PERFORMS ONE CYLINDER SEEKS FROM CYLINDER 0 TO THE
                                        ;*      MAXIMUM CYLINDER FOR THE DRIVE (E.G. 202 FOR RP02'S AND 405 FOR
                                        ;*      RP03'S).  THE SEEK TIMES ARE MEASURED RELATIVE TO THE SECTOR
                                        ;*      PULSES FROM THE DRIVE.  THE TEST DISPLAYS THE FORWARD AND REVERSE
                                        ;*      TIMES.

                                        ;;*********************************************************************
006032                                  TST10:
006032  033737  001344  001234          BIT     @#BITS+<10*2>,TSTNMS ;DO THIS TEST?
006040  001002                          BNE     64$                 ;YES--BRANCH
006042  000137  006306                  JMP     TST11               ;NO--GO TO THE NEXT TEST
006046  013737  001766  001206  64$:    MOV     @#RPT10,$TIMES      ;GET THE ITERATION COUNT
006054  012737  006130  001106          MOV     #TEST10,@#$LPADR
```

```
 2291  006062  012737  006032  001110          MOV     #TST10,@#$LPERR  ;SETUP THE ERROR LOOP ADDRESS
 2292  006070  012737  000010  001102          MOV     #10.,@#$TSTNM    ;SET UP TEST NUMBER AND
 2293                                                                   ;CLEAR THE ERROR FLAG ($ERFLG)
 2294  006076  013777  001102  173036          MOV     $TSTNM,@DISPLAY  ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
 2295  006104  012737  006304  001244          MOV     #EXIT10,BYPASS   ;SETUP BYPASS ADDRESS
 2296  006112  013700  001266                  MOV     RPADR,R0         ;RP11 ADDRESS
 2297  006116  112737  000011  001364          MOVB    #SEEK,DPB        ;OPCODE FOR THE TEST
 2298  006124  005037  001370                  CLR     DPB+4            ;TRACK ADDRESS
```

```
 2299  006130  012706  001100          TEST10: MOV     #STACK,SP       ;RESTORE THE STACK POINTER
```

```
                                        JSR     PC,RESTOR       ;DO A HOME SEEK
                                        MOV     #FRWSTR,R4      ;FORWARD TIME STORAGE POINTER
                                        MOV     #1,DPB+2        ;SEEK TO THIS CYLINDER
                                1$:     JSR     PC,TIMSEK       ;START THE SEEK, AND TIME IT
                                        MOV     R3,(R4)+        ;STORE THE TIME
                                        INC     DPB+2           ;INCREMENT THE CYLINDER ADDRESS
                                        CMP     DPB+2,MAXCYL    ;AT THE MAXIMUM ?
                                        BLE     1$              ;BR IF NOT
                                        MOV     MAXCYL,DPB+2    ;SETUP TO SEEK BACK TO MINIMUM
                                        DEC     DPB+2           ;SEEK TO CYLINDER
                                        MOV     #RVSTR,R4       ;REVERSE TIME STORAGE POINTER
                                2$:     JSR     PC,TIMSEK       ;START THE SEEK, AND TIME IT
                                        MOV     R3,(R4)+        ;STORE THE TIME
                                        DEC     DPB+2           ;DECREMENT THE CYLINDER ADDRESS
                                        BPL     2$              ;BR IF NOT AT MINIMUM CYLINDER
                                        TYPE    ,65$            ;;TYPE ASCIZ STRING
                                        BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12><12>/ONE CYLINDER SEEK TIMES/
                                64$:
                                        MOV     MAXCYL,3$       ;NUMBER OF SEEKS PERFORMED
                                        JSR     R0,SORT         ;SORT AND TYPE OUT THE TIMES
                                3$:     .WORD   0               ;NUMBER OF TIMES GOES HERE
                                EXIT10: SCOPE                   ;LOOP ?

                                ;;*****************************************************************
                                ;*TEST 11       SEEK-SEEK TIMER TEST

                                ;*      THIS TEST IS A GENERAL PURPOSE TIMING TEST WHICH PERFORMS 200
                                ;*      ITERATIONS BETWEEN THE CYLINDER IN 'FC' AND THE CYLINDER IN 'LC'.
                                ;*      BOTH FORWARD AND REVERSE SEEKS ARE TIMED AND DISPLAYED.  THE
                                ;*      SEEK TIMES DISPLAYED ARE RELATIVE TO THE SECTOR COUNTER.
                                ;*      'FC' DEFAULTS TO 0; 'LC' DEFAULTS TO 'MAXCYL' (202 IF RP02'S OR
                                ;*      405 IF RP03'S).

                                ;;*****************************************************************
                                TST11:
                                        BIT     @#BITS+<11#2>,TSTNMS ;DO THIS TEST?
                                        BNE     64$             ;YES--BRANCH
                                        JMP     TST12           ;NO--GO TO THE NEXT TEST
                                64$:    MOV     @#RPT11,$TIMES  ;GET THE ITERATION COUNT
                                        MOV     #TEST11,@#$LPADR
                                        MOV     #TST11,@#$LPERR ;SETUP THE ERROR LOOP ADDRESS
                                        MOV     #11,@#$TSTNM    ;SET UP TEST NUMBER AND
                                                                ;CLEAR THE ERROR FLAG ($ERFLG)
                                        MOV     $TSTNM,@DISPLAY ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
                                        MOV     #EXIT11,BYPASS  ;SETUP BYPASS ADDRESS
                                        MOV     RPADR,R0        ;RP11 ADDRESS
                                        MOV     #SEEK,DPB       ;OPCODE FOR THE TEST
                                        CLR     DPB+4           ;CLEAR THE TRACK ADDRESS STORAGE
                                TEST11: MOV     #STACK,SP       ;RESTORE THE STACK POINTER
                                        JSR     PC,RESTOR       ;DO A HOME SEEK
                                        MOV     #201.,R1        ;ITERATION COUNT
                                        MOV     #RVSTR,R4       ;REVERSE TIME STORAGE POINTER
                                        MOV     #FRWSTR,R5      ;FORWARD TIME STORAGE POINTER
                                        MOV     FC11,DPB+2      ;POSITION THE DISK TO THE FIRST CYLINDER
                                        JSR     PC,TIMSEK       ;DO THE SEEK
```

```
2356  006442  013737  001776  001366  1$:     MOV     LC11,DPB+2      ;TIME TO THIS CYLINDER
2357  006450  004737  016526                  JSR     PC,TIMSEK       ;START THE SEEK AND TIME IT
2358  006454  010325                          MOV     R3,(R5)+        ;STORE THE TIME
2359  006456  013737  001774  001366          MOV     FC11,DPB+2      ;MINIMUM CYLINDER
2360  006464  004737  016526                  JSR     PC,TIMSEK       ;START THE SEEK AND TIME IT
2361  006470  010324                          MOV     R3,(R4)+        ;STORE THE TIME
2362  006472  005301                          DEC     R1              ;DECREMENT THE ITERATION COUNTER
2363  006474  001362                          BNE     1$              ;BR IF NOT FINISHED
2364  006476  104401  006504                  TYPE    ,65$            ;;TYPE ASCIZ STRING
2365  006502  000421                          BR      64$             ;;GET OVER THE ASCIZ
2366                                  ;;65$:   .ASCIZ  <15><12><12>/SEEK TIMES BETWEEN CYLINDERS /
2367  006546                          64$:
2368  006546  013746  001774                  MOV     FC11,-(SP)      ;PUT STARTING CYLINDER ADDRESS ON THE STACK
2369  006552  004737  013250                  JSR     PC,$$B2D        ;CONVERT IT TO DECIMAL
2370  006556  004737  013500                  JSR     PC,$$UPRS       ;TYPE IT
2371  006562  104401  006570                  TYPE    ,67$            ;;TYPE ASCIZ STRING
2372  006566  000402                          BR      66$             ;;GET OVER THE ASCIZ
2373                                  ;;67$:   .ASCIZ  / & /
2374  006574                          66$:
2375  006574  013746  001776                  MOV     LC11,-(SP)      ;PUT ENDING CYLINDER ADDRESS ON THE STACK
2376  006600  004737  013250                  JSR     PC,$$B2D        ;CONVERT IT TO DECIMAL
2377  006604  004737  013500                  JSR     PC,$$UPRS       ;TYPE IT
2378  006610  004037  015660                  JSR     R0,SORT         ;TYPE THE TIMES
2379  006614  000310                          .WORD   200.
2380  006616  000004                  EXIT11: SCOPE                   ;LOOP ?
2381
2382
2383                                  ;;*****************************************************************
2384                                  ;*TEST 12        SEEK TIME GRAPH TEST
2385
2386                                  ;*      THIS TEST PRODUCES TWO SEEK TIME GRAPHS.  THE FIRST GRAPH IS
2387                                  ;*      TYPED IS SWITCH <04> IS 0.  THIS GRAPH IS A PLOT OF SEEK TIME
2388                                  ;*      AGAINST CYLINDERS SEEKED TO FROM CYLINDER 0.  THE CYLINDERS
2389                                  ;*      PLOTTED ARE: 0,1,2,3,4,6,8,10,12,14,16,18,20,25...100,105...MAXCYL.
2390                                  ;*      THE OTHER GRAPH WHICH IS PRODUCED (SWITCH <04> SET) IS TIME TO
2391                                  ;*      SEEK TO ALL CYLINDERS FROM CYLINDER 0.
2392                                  ;*
2393                                  ;*      IN BOTH SEEK GRAPHS, ONLY THE FORWARD SEEK TIMES ARE MEASURED.
2394                                  ;*
2395                                  ;*      THIS TEST USES THE SECTOR COUNTER ('SOT') IN THE RP11 AS THE
2396                                  ;*      TIME BASE FOR THE MEASURMENTS, USE OF THE 'SOT' PROVIDES A
2397                                  ;*      RESOLUTION OF 2.5 MS.
2398
2399                                  ;;*****************************************************************
2400  006620                          TST12:
2401  006620  033737  001350  001234          BIT     @#BITS+<12*2>,TSTNMS ;DO THIS TEST?
2402  006626  001002                          BNE     64$             ;YES--BRANCH
2403  006630  000137  007474                  JMP     $EOP            ;NO--GO TO THE END OF THE PROGRAM
2404  006634  013737  002002  001206  64$:    MOV     @#RPT12,$TIMES  ;GET THE ITERATION COUNT
2405  006642  012737  006716  001106          MOV     #TEST12,@#$LPADR
2406  006650  012737  006620  001110          MOV     #TST12,@#$LPERR  ;SETUP THE ERROR LOOP ADDRESS
2407  006656  012737  000012  001102          MOV     #12,@#$TSTNM    ;SET UP TEST NUMBER AND
2408                                                                  ;CLEAR THE ERROR FLAG ($ERFLG)
2409  006664  013777  001102  172250          MOV     $TSTNM,@DISPLAY  ;LOAD THE TEST NUMBER INTO THE DISPLAY REGISTER
2410  006672  012737  007472  001244          MOV     #EXIT12,BYPASS  ;SETUP BYPASS ADDRESS
2411  006700  013700  001266                  MOV     RPADR,R0        ;RP11 ADDRESS
```

```
2412  006704  112737  000011  001364          MOVB    #SEEK,DPB       ;OPCODE FOR THE TEST
2413  006712  005037  001370                  CLR     DPB+4           ;CLEAR THE TRACK ADDRESS STORAGE
2414  006716  012706  001100          TEST12: MOV     #STACK,SP       ;INITIALIZE THE STACK POINTER
2415  006722  004737  015314                  JSR     PC,RESTOR       ;DO A HOME SEEK
2416  006726  012704  024040                  MOV     #FRWSTR,R4      ;STORE 'SEEK TIME' HERE
2417  006732  005001                          CLR     R1              ;CLEAR 'FC' STORAGE
2418  006734  005002                          CLR     R2              ;CLEAR 'NC' STORAGE
2419  006736  010237  001366          1$:     MOV     R2,DPB+2        ;ADDRESS OF NEW CYLINDER 'NC'
2420  006742  004737  016526                  JSR     PC,TIMSEK       ;SEEK TO 'NC' AND TIME IT
2421  006746  010324                          MOV     R3,(R4)+        ;STORE MEASURED SEEK TIME
2422  006750  010137  001366                  MOV     R1,DPB+2        ;'FC' ADDRESS
2423  006754  004737  016526                  JSR     PC,TIMSEK       ;RETURN TO 'FC'
2424  006760  005202                          INC     R2              ;INCREMENT 'NC'
2425  006762  023702  001236                  CMP     MAXCYL,R2       ;IS 'NC' AT MAXIMUM ?
2426  006766  002363                          BGE     1$              ;BR IF NOT
2427
2428                                  ;PLOT A GRAPH USING MEASURED SEEK TIMES
2429
2430  006770                          PLOT:
2431  006770  104401  006776                  TYPE    ,65$            ;;TYPE ASCIZ STRING
2432  006774  000412                          BR      64$             ;;GET OVER THE ASCIZ
2433                                  ;;65$:  .ASCIZ  <15><12><12>/SEEK TIME GRAPH/
2434  007022                          64$:
2435  007022  104401  007030                  TYPE    ,67$            ;;TYPE ASCIZ STRING
2436  007026  000421                          BR      66$             ;;GET OVER THE ASCIZ
2437                                  ;;67$:  .ASCIZ  <15><12>/X AXIS - SEEK TIME - MILLI SECS/
2438  007072                          66$:
2439  007072  104401  007100                  TYPE    ,69$            ;;TYPE ASCIZ STRING
2440  007076  000423                          BR      68$             ;;GET OVER THE ASCIZ
2441                                  ;;69$:  .ASCIZ  <15><12>/Y AXIS - CYLINDER SEEKED FROM 0/<15><12><12>
2442  007146                          68$:
2443  007146  104401  021473                  TYPE    ,GRPH1          ;TYPE THE GRAPH HEADING
2444  007152  032777  000020  171760          BIT     #SW4,@SWR       ;TYPE COMPLETE GRAPH?
2445  007160  001064                          BNE     CMPGRP          ;YES BRANCH; IF NOT, TYPE SMALL GRAPH
2446
2447                                  ;IN THE SMALL GRAPH, SEEK TIMES ARE PLOTTED ONLY FOR SELECTED CYLINDERS.
2448                                  ;THE CYLINDERS PLOTTED ARE: 0,1,2,3,4,6,8,10,12,14,16,18,20,25,30
2449                                  ;35,40...100,105...MAXCYL
2450
2451  007162  005000                  SMGRP:  CLR     R0
2452  007164  005037  024040                  CLR     FRWSTR          ;FORCE CYL 0 - CYL 0 SEEK TO ZERO TIME
2453  007170  104401  001217          1$:     TYPE    ,$CRLF          ;CR-LF
2454  007174  010046                          MOV     R0,-(SP)        ;TYPE THE MARKERS
2455  007176  104405                          TYPDS
2456  007200  104401  007206                  TYPE    ,65$            ;;TYPE ASCIZ STRING
2457  007204  000401                          BR      64$             ;;GET OVER THE ASCIZ
2458                                  ;;65$:  .ASCIZ  /-/
2459  007210                          64$:
2460  007210  010001                          MOV     R0,R1           ;FORM THE ADDRESS OF 'SEEK TIME'
2461  007212  006301                          ASL     R1
2462  007214  016103  024040                  MOV     FRWSTR(R1),R3   ;GET THE SEEK TIME
2463  007220  004737  007432                  JSR     PC,PLTPT        ;GO PLOT IT
2464  007224  022700  000004                  CMP     #4,R0           ;PLOTTED UPTO CYL 4?
2465  007230  003402                          BLE     2$              ;YES
2466  007232  005200                          INC     R0              ;INCREMENT BY 1
2467  007234  000755                          BR      1$
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2468  007236  022700  000024          2$:     CMP     #20.,R0         ;PAST CYLINDER 20 ?
2469  007242  003403                          BLE     3$              ;BR IF PAST 20
2470  007244  062700  000002                  ADD     #2,R0           ;INCREMENT BY 2
2471  007250  000747                          BR      1$
2472  007252  013746  001236          3$:     MOV     MAXCYL,-(SP)    ;CHECK FOR END
2473  007256  042716  000007                  BIC     #7,(SP)         ;CLEAR LOWER CYLINDER BITS
2474  007262  022600                          CMP     (SP)+,R0        ;ALMOST MAX CYL ?
2475  007264  003403                          BLE     4$              ;BR IF ALMOST AT MAX
2476  007266  062700  000005                  ADD     #5,R0           ;INCREMENT BY 5
2477  007272  000736                          BR      1$
2478  007274  023700  001236          4$:     CMP     MAXCYL,R0       ;PLOTTED ALL CYLS?
2479  007300  001412                          BEQ     6$              ;BR IF DONE
2480  007302  022737  000312  001236          CMP     #202.,MAXCYL    ;MAXCYL = 202. ?
2481  007310  001003                          BNE     5$              ;BR IF NOT
2482  007312  062700  000002                  ADD     #2,R0           ;INCREMENT TO CYLINDER 202
2483  007316  000724                          BR      1$
2484  007320  062700  000005          5$:     ADD     #5,R0           ;INCREMENT TO CYLINDER 405
2485  007324  000721                          BR      1$
2486  007326  000137  007472          6$:     JMP     EXIT12          ;GO TO THE NEXT TEST
2487
2488                                  ;IF SW 4 IS SET THE COMPLETE GRAPH IS PRINTED OUT. IT GIVES TIMES FOR
2489                                  ;SEEKS FROM CYLINDER 0 TO ALL OTHER CYLINDERS (0,1,2,3...MAXCYL).
2490
2491  007332  005000                  CMPGRP: CLR     R0              ;INITIALIZE COUNT
2492  007334  012701  177773                  MOV     #-5,R1          ;INITIALIZE COUNT FOR Y-AXIS MARKER
2493  007340  012702  024040                  MOV     #FRWSTR,R2      ;INITIALIZE POINTER TO SEEK TIMES
2494  007344  104401  001217                  TYPE    ,$CRLF
2495  007350  000404                          BR      3$
2496  007352  005201                  2$:     INC     R1              ;TYPE OUT Y-AXIS MARKER 'CYL #'
2497  007354  001005                          BNE     4$              ;IF REQUIRED
2498  007356  012701  177773                  MOV     #-5,R1          ;RESET INDEX
2499  007362  010046                  3$:     MOV     R0,-(SP)        ;TYPE 'CYL #' ON Y-AXIS
2500  007364  104405                          TYPDS                   ;(IN DECIMAL)
2501  007366  000402                          BR      5$
2502  007370  104401  002037          4$:     TYPE    ,BLNKS6         ;6 BLANKS
2503  007374                          5$:
2504  007374  104401  007402                  TYPE    ,65$            ;;TYPE ASCIZ STRING
2505  007400  000401                          BR      64$             ;;GET OVER THE ASCIZ
2506                                  ;;65$:  .ASCIZ  /-/
2507  007404                          64$:
2508  007404  012203                          MOV     (R2)+,R3        ;GET SEEK TIME
2509  007406  004737  007432                  JSR     PC,PLTPT        ;GO PLOT THE POINT
2510  007412  104401  001217                  TYPE    ,$CRLF
2511  007416  005200                          INC     R0              ;ALL DONE?
2512  007420  022700  001236                  CMP     #MAXCYL,R0      ;LAST CYLINDER ?
2513  007424  001352                          BNE     2$              ;IF NOT, GO BACK
2514  007426  000137  007472          6$:     JMP     EXIT12          ;GO TO THE NEXT TEST
2515
2516
2517                                  ;ROUTINE TO PLOT THE SEEK TIME ON THE GRAPH.  ENTER WITH R3 CONTAINING
2518                                  ;THE HORIZONTAL AXIS COORDINATE (I.E. SEEK TIME).
2519  007432  010546                  PLTPT:  MOV     R5,-(SP)        ;STORE R5
2520  007434  012705  000031                  MOV     #25.,R5         ;HORIZONTAL AXIS INDEX
2521  007440  162703  000372          1$:     SUB     #250.,R3        ;FIND OUT HOW MANY BLANKS TO
2522  007444  002404                          BLT     2$              ;INSERT TO PLOT THE POINT
2523                                                                  ;NOTE THE FIRST CELL = 0 MS
```

```
                                        TYPE    @BLNKS1         ;1 BLANK
                                        DEC     R5              ;AT THE END OF THE HORIZONTAL AXIS ?
                                        BPL     1$              ;BR IF NOT
                                2$:
                                        TYPE    @65$            ;;TYPE ASCIZ STRING
                                        BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  /X/
                                64$:
                                        MOV     (SP)+,R5        ;RESTORE R5
                                        RTS     PC

                                EXIT12: SCOPE                   ;LOOP ?


                                .SBTTL  END OF PASS ROUTINE

                                ;;**************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*INDICATE END-OF-PROGRAM AFTER 1 PASSES THRU THE PROGRAM
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO RESTART

                                $EOP:
                                        TYPE    @65$            ;;TYPE ASCIZ STRING
                                        BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12><12>/END OF PASS/
                                64$:
                                        TST     @#DRVSEL        ;ANY DRIVES SELECTED?
                                        BEQ     1$              ;NO--BRANCH
                                        TYPE    @67$            ;;TYPE ASCIZ STRING
                                        BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  / ON DRIVE/
                                66$:
                                        MOV     @#CHKDRV,-(SP)  ;;SAVE @#CHKDRV FOR TYPEOUT
                                        TYPOS                   ;;GO TYPE--OCTAL ASCII
                                        .BYTE   2               ;;TYPE 2 DIGIT(S)
                                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                        TYPE    @69$            ;;TYPE ASCIZ STRING
                                        BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$:  .ASCIZ  /   ERRORS DETECTED=/
                                68$:
                                        MOV     @#SERTTL,-(SP)  ;;SAVE @#SERTTL FOR TYPEOUT
                                        TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                1$:     CLR     @#SERTTL        ;ZERO ERROR TOTAL
                                        CLR     $TSTNM          ;;ZERO THE TEST NUMBER
                                        CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
                                        INC     $PASS           ;;INCREMENT THE PASS NUMBER
                                        BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
                                        DEC     (PC)+           ;;LOOP?
                                $EOPCT: .WORD   1
                                        BGT     $DOAGN          ;;YES
                                        MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
                                $ENDCT: .WORD   1
                                        $EOPCT
                                        TYPE    @65$            ;;TYPE ASCIZ STRING
                                        BR      64$             ;;GET OVER THE ASCIZ
```

```
                                        ;;65$:  .ASCIZ  <15><12>/END OF TEST/
                                        64$:
007706                                          TYPE    $ENULL          ;TYPE NULL CHARACTER
007706  104401  007736                $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
007712  013700  000042                        BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
007716  001405                                RESET                   ;;CLEAR THE WORLD
007720  000005                        $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
007722  004710                                NOP                     ;;SAVE ROOM
007724  000240                                NOP                     ;;FOR
007726  000240                                NOP                     ;;ACT11
007730  000240                        $DOAGN:
007732                                          JMP     @(PC)+          ;;RETURN
007732  000137                        $RTNAD: .WORD   RESTART
007734  003726                        $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
007736      377     377     000
007742                                          .EVEN

                                        .SBTTL  *** SUBROUTINES ***
                                        .SBTTL  ERROR HANDLER ROUTINE

                                        ;;**************************************************************************
                                        ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                        ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
                                        ;*AND GO TO TYPERR ON ERROR
                                        ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                        ;*SW15=1         HALT ON ERROR
                                        ;*SW13=1         INHIBIT ERROR TYPEOUTS
                                        ;*SW10=1         BELL ON ERROR
                                        ;*SW09=1         LOOP ON ERROR
                                        ;*CALL
                                        ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER

007742                                  $ERROR:
007742  104407                                  CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
007744  105237  001103                7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
007750  001775                                BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
007752  013777  001102  171162                MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
007760  032777  002000  171152                BIT     #BIT10,@SWR     ;;BELL ON ERROR?
007766  001402                                BEQ     1$              ;;NO - SKIP
007770  104401  001212                        TYPE    ,$BELL          ;;RING BELL
007774  005237  001112                1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
010000  011637  001116                        MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
010004  162737  000002  001116                SUB     #2,$ERRPC
010012  117737  171100  001114                MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
010020  032777  020000  171112                BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
010026  001004                                BNE     20$             ;;SKIP TYPEOUTS
010030  004737  010114                        JSR     PC,TYPERR       ;;GO TO USER ERROR ROUTINE
010034  104401  001217                        TYPE    ,$CRLF
010040                                  20$:
010040  005777  171074                2$:     TST     @SWR            ;;HALT ON ERROR
010044  100002                                BPL     3$              ;;SKIP IF CONTINUE
010046  000000                                HALT                    ;;HALT ON ERROR!
010050  104407                                CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
010052  032777  001000  171060        3$:     BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
010060  001402                                BEQ     4$              ;;BR IF NO
010062  013716  001110                        MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
010066  005737  001210                4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
```

```
2636  010072  001402                          BEQ     5$                ;;BR IF NONE
2637  010074  013716  001210                  MOV     $ESCAPE,(SP)      ;;FUDGE RETURN ADDRESS FOR ESCAPE
2638  010100                            5$:
2639  010100  023737  000042  000046          CMP     @#42,@#46                 ;ACT11 AUTO MODE?
2640  010106  001001                          BNE     6$                        ;NO, RETURN
2641  010110  000000                          HALT                              ;HALT ON ERROR
2642  010112  000002                    6$:   RTI                               ;RETURN
2643
2644                                    ;.*************************************************************************
2645                                    .SBTTL  TYPERR - TYPE ERROR ROUTINE
2646                                    ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE
2647                                    ;*WHICH ERROR IS TO BE REPORTED, IT THEN OBTAINS, FROM THE "ERROR
2648                                    ;*TABLE" ($ERRTB), AND REPORTS THE APPROPIATE INFORMATION
2649                                    ;*CONCERNING THE ERROR.
2650                                    ;CALL
2651                                    ;       JSR     PC,@#TYPERR
2652                                    ;       RETURN
2653
2654  010114  104412                    TYPERR: SAVREG                          ;SAVE R0-R5
2655  010116  005037  001204                    CLR     $TMPO                   ;CLEAR LOCATION FOR TEST NUMBER
2656  010122  113737  001102  001204           MOVB    $TSTNM,$TMPO            ;LOAD TEST NUMBER FOR TYPEOUT
2657  010130  005000                          CLR     R0                        ;CLEAR R0 FOR ERROR NUMBER
2658  010132  113700  001114                  MOVB    $ITEMB,R0               ;ERROR NUMBER
2659  010136  005300                          DEC     R0                        ;FORM INDEX FOR ERROR TABLE
2660  010140  006300                          ASL     R0
2661  010142  006300                          ASL     R0
2662  010144  006300                          ASL     R0
2663  010146  062700  002046            1$:   ADD     #$ERRTB,R0              ;FORM ADDRESS
2664  010152  012037  010166                  MOV     (R0)+,2$                ;GET ERROR MESSAGE (EM) POINTER
2665  010156  001412                          BEQ     3$                      ;BRANCH IF THERE ISN'T ONE
2666  010160  104401  001217                  TYPE    ,$CRLF                  ;"CARRIAGE RETURN - LINE FEED
2667  010164  104401                          TYPE
2668  010166  000000                    2$:   .WORD   0                       ;"EM" POINTER GOES HERE
2669  010170  032777  000100  170742          BIT     #SW06,@SWR              ;TYPE THE REGISTERS INSTEAD OF THE NORMAL
2670                                                                          ;'DH' & 'DT' LINES ?
2671  010176  001402                          BEQ     3$                      ;BR IF NOT
2672  010200  012700  023532                  MOV     #ETSP,R0                ;CHANGE MESSAGE BLOCK
2673  010204  012037  010220            3$:   MOV     (R0)+,4$                ;PICK UP DATA HEADER (DH) POINTER
2674  010210  001404                          BEQ     5$                      ;BRANCH IF NONE
2675  010212  104401  001217                  TYPE    ,$CRLF                  ;CARRIAGE RETURN-LINE FEED
2676  010216  104401                          TYPE
2677  010220  000000                    4$:   .WORD   0                       ;"DH" POINTER GOES HERE
2678  010222  012001                    5$:   MOV     (R0)+,R1                ;PICKUP DATA TABLE (DT) POINTER
2679  010224  001450                          BEQ     20$                     ;BRANCH IF NONE
2680  010226  005005                          CLR     R5                      ;SET INDENT SWITCH
2681  010230  012000                          MOV     (R0)+,R0                ;DATA FORMAT (DF) POINTER
2682  010232  012002                          MOV     (R0)+,R2                ;NUMBER OF DH'S TO TYPE
2683  010234  001441                          BEQ     17$                     ;BRANCH IF DH NUMBER IS 0
2684  010236  005105                          COM     R5                      ;NO INDENT
2685  010240  104401  001217                  TYPE    ,$CRLF                  ;CARRIAGE RETURN-LINE FEED
2686  010244  112003                    10$:  MOVB    (R0)+,R3                ;NUMBER OF DATA WORDS TO TYPE
2687  010246  112004                          MOVB    (R0)+,R4                ;AND HOW TO TYPE THEM
2688  010250  006004                    11$:  ROR     R4                      ;OCTAL OR DECIMAL?
2689  010252  103403                          BCS     12$                     ;DECIMAL--BRANCH
2690  010254  013146                          MOV     @(R1)+,-(SP)            ;;SAVE @(R1)+ FOR TYPEOUT
2691  010256  104402                          TYPOC                           ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
```

```
002692  010260  000402                    BR      13$
002693  010262                      12$:
002694  010262  013146                    MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
002695  010264  104405                    TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
002696  010266  005303              13$:  DEC     R3              ;MORE NUMBERS TO TYPE?
002697  010270  001403                    BEQ     14$             ;NO--BRANCH
002698  010272  104401  002043            TYPE    $BLNKS2         ;YES--TYPE SEPARATORS
002699  010276  000764                    BR      11$             ;LOOP
002700  010300  005302              14$:  DEC     R2              ;MORE DH'S?
002701  010302  003421                    BLE     20$             ;NO--BRANCH
002702  010304  104401  001217            TYPE    $CRLF           ;YES--START A NEW LINE
002703  010310  005105                    COM     R5              ;INDENT?
002704  010312  001002                    BNE     15$             ;NO--BRANCH
002705  010314  104401  002043            TYPE    $BLNKS2         ;YES--TYPE SPACES
002706  010320  012037  010326      15$:  MOV     @(R0)+,16$      ;GET NEXT DH
002707  010324  104401                    TYPE                    ;AND TYPE IT
002708  010326  000000              16$:  .WORD   0               ;DH POINTER GOES HERE
002709  010330  104401  001217            TYPE    $CRLF           ;CARRIAGE RETURN-LINE FEED
002710  010334  005705                    TST     R5              ;INDENT?
002711  010336  001342                    BNE     10$             ;NO--BRANCH
002712  010340  104401  002043      17$:  TYPE    $BLNKS2         ;YES--TYPE SPACES
002713  010344  000737                    BR      10$             ;LOOP
002714  010346  104413              20$:  RESREG                  ;RESTORE R0-R5
002715  010350  000207                    RTS     PC              ;RETURN
002716
002717
002718
002719                              .SBTTL  TYPE ROUTINE
002720
002721                              ;;*****************************************************************
002722                              ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
002723                              ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
002724                              ;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
002725                              ;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
002726                              ;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
002727                              ;*
002728                              ;*CALL:
002729                              ;*1) USING A TRAP INSTRUCTION
002730                              ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
002731                              ;*OR
002732                              ;*      TYPE
002733                              ;*      MESADR
002734                              ;*
002735
002736  010352  105737  001157      $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
002737  010356  100002                      BPL     1$              ;;BR IF YES
002738  010360  000000                      HALT                    ;;HALT HERE IF NO TERMINAL
002739  010362  000407                      BR      3$              ;;LEAVE
002740  010364  010046              1$:     MOV     R0,-(SP)        ;;SAVE R0
002741  010366  017600  000002              MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
002742  010372  112046              2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
002743  010374  001005                      BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
002744  010376  005726                      TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
002745  010400  012600              60$:    MOV     (SP)+,R0        ;;RESTORE R0
002746  010402  062716  000002      3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
002747  010406  000002                      RTI                     ;;RETURN
```

```
                                4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
                                        BEQ     8$
                                        CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
                                        BNE     5$
                                        TST     (SP)+           ;;POP  <CR><LF> EQUIV
                                        TYPE                    ;;TYPE A CR AND LF
                                        $CRLF
                                        CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
                                        BR      2$              ;;GET NEXT CHARACTER
                                5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
                                6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
                                        BNE     2$              ;;IF NO GO GET NEXT CHAR.
                                        MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
                                7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
                                        BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
                                        JSR     PC,$TYPEC       ;;GO TYPE A NULL
                                        DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
                                        BR      7$              ;;LOOP

                                ;HORIZONTAL TAB PROCESSOR

                                8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
                                9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
                                        BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
                                        BNE     9$              ;;TAB STOP
                                        TST     (SP)+           ;;POP SPACE OFF STACK
                                        BR      2$              ;;GET NEXT CHARACTER
                                $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
                                        BPL     $TYPEC
                                        MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
                                        CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
                                        BNE     1$              ;;BRANCH IF NO
                                        CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
                                        BR      $TYPEX          ;;EXIT
                                1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
                                        BEQ     $TYPEX          ;;BRANCH IF YES
                                        INCB    (PC)+           ;;COUNT THE CHARACTER
                                $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
                                $TYPEX: RTS     PC


                                .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE

                                ;;**************************************************************
                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                                ;*OCTAL (ASCII) NUMBER AND TYPE IT.
                                ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOS                   ;;CALL FOR TYPEOUT
                                ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                                ;*      .BYTE   M               ;;M=1 OR 0
                                ;*                                      ;;1=TYPE LEADING ZEROS
                                ;*                                      ;;0=SUPPRESS LEADING ZEROS
                                ;*
```

```
                                        ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                                        ;*$TYPOS OR $TYPOC
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                        ;*      TYPON                   ;;CALL FOR TYPEOUT
                                        ;*
                                        ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                        ;*      TYPOC                   ;;CALL FOR TYPEOUT
                                        
010572  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
010576  116637  000001  011015          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
010604  112637  011017                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
010610  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
010614  000406                          BR      $TYPON
010616  112737  000001  011015  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
010624  112737  000006  011017          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
010632  112737  000005  011014  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
010640  010346                          MOV     R3,-(SP)        ;;SAVE R3
010642  010446                          MOV     R4,-(SP)        ;;SAVE R4
010644  010546                          MOV     R5,-(SP)        ;;SAVE R5
010646  113704  011017                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
010652  005404                          NEG     R4
010654  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
010660  110437  011016                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
010664  113704  011015                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
010670  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
010674  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
010676  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
010700  000404                          BR      3$              ;;GO DO MSB
010702  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
010704  006105                          ROL     R5
010706  006105                          ROL     R5
010710  010503                          MOV     R5,R3
010712  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
010714  105337  011016                  DECB    $OMODE          ;;TYPE THIS DIGIT?
010720  100016                          BPL     7$              ;;BR IF NO
010722  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
010726  001002                          BNE     4$              ;;TEST FOR 0
010730  005704                          TST     R4              ;;SUPPRESS THIS 0?
010732  001403                          BEQ     5$              ;;BR IF YES
010734  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
010736  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
010742  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
010746  110337  011012                  MOVB    R3,8$           ;;SAVE FOR TYPING
010752  104401  011012                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
010756  105337  011014          7$:     DECB    $OCNT           ;;COUNT BY 1
010762  003347                          BGT     2$              ;;BR IF MORE TO DO
010764  002402                          BLT     6$              ;;BR IF DONE
010766  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
010770  000744                          BR      2$              ;;GO DO THE LAST DIGIT
010772  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
010774  012604                          MOV     (SP)+,R4        ;;RESTORE R4
010776  012603                          MOV     (SP)+,R3        ;;RESTORE R3
011000  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
```

```
                        MOV     (SP)+,(SP)
                        RTI                             ;;RETURN
                8$:     .BYTE   0                       ;;STORAGE FOR ASCII DIGIT
                        .BYTE   0                       ;;TERMINATOR FOR TYPE ROUTINE
                $OCNT:  .BYTE   0                       ;;OCTAL DIGIT COUNTER
                $OFILL: .BYTE   0                       ;;ZERO FILL SWITCH
                $OMODE: .WORD   0                       ;;NUMBER OF DIGITS TO TYPE

                .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

                ;;**************************************************************
                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
                ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
                ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
                ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
                ;*REPLACED WITH SPACES.
                ;*CALL:
                ;*      MOV     NUM,-(SP)               ;;PUT THE BINARY NUMBER ON THE STACK
                ;*      TYPDS                           ;;GO TO THE ROUTINE

011020          $TYPDS:
010046                  MOV     R0,-(SP)                ;;PUSH R0 ON STACK
010146                  MOV     R1,-(SP)                ;;PUSH R1 ON STACK
010246                  MOV     R2,-(SP)                ;;PUSH R2 ON STACK
010346                  MOV     R3,-(SP)                ;;PUSH R3 ON STACK
010546                  MOV     R5,-(SP)                ;;PUSH R5 ON STACK
012746  020200          MOV     #20200,-(SP)            ;;SET BLANK SWITCH AND SIGN
016605  000020          MOV     20(SP),R5               ;;GET THE INPUT NUMBER
100004                  BPL     1$                      ;;BR IF INPUT IS POS.
005405                  NEG     R5                      ;;MAKE THE BINARY NUMBER POS.
112766  000055  000001  MOVB    #'-,1(SP)               ;;MAKE THE ASCII NUMBER NEG.
005000          1$:     CLR     R0                      ;;ZERO THE CONSTANTS INDEX
012703  011234          MOV     #$DBLK,R3               ;;SETUP THE OUTPUT POINTER
112723  000040          MOVB    #' ,(R3)+               ;;SET THE FIRST CHARACTER TO A BLANK
005002          2$:     CLR     R2                      ;;CLEAR THE BCD NUMBER
016001  011224          MOV     $DTBL(R0),R1            ;;GET THE CONSTANT
160105          3$:     SUB     R1,R5                   ;;FORM THIS BCD DIGIT
002402                  BLT     4$                      ;;BR IF DONE
005202                  INC     R2                      ;;INCREASE THE BCD DIGIT BY 1
000774                  BR      3$
060105          4$:     ADD     R1,R5                   ;;ADD BACK THE CONSTANT
005702                  TST     R2                      ;;CHECK IF BCD DIGIT=0
001002                  BNE     5$                      ;;FALL THROUGH IF 0
105716                  TSTB    (SP)                    ;;STILL DOING LEADING 0'S?
100407                  BMI     7$                      ;;BR IF YES
106316          5$:     ASLB    (SP)                    ;;MSD?
103003                  BCC     6$                      ;;BR IF NO
116663  000001  177777  MOVB    1(SP),-1(R3)            ;;YES--SET THE SIGN
052702  000060          BIS     #'0,R2                  ;;MAKE THE BCD DIGIT ASCII
052702  000040          BIS     #' ,R2                  ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
110223                  MOVB    R2,(R3)+                ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
005720                  TST     (R0)+                   ;;JUST INCREMENTING
020027  000010          CMP     R0,#10                  ;;CHECK THE TABLE INDEX
002746                  BLT     2$                      ;;GO DO THE NEXT DIGIT
003002                  BGT     8$                      ;;GO TO EXIT
010502                  MOV     R5,R2                   ;;GET THE LSD
```

```
2916  011156  000764                    BR      6$                      ;;GO CHANGE TO ASCII
2917  011160  105726            8$:     TSTB    (SP)+                   ;;WAS THE LSD THE FIRST NON-ZERO?
2918  011162  100003                    BPL     9$                      ;;BR IF NO
2919  011164  116663  177777  177776    MOVB    -1(SP),-2(R3)           ;;YES--SET THE SIGN FOR TYPING
2920  011172  105013            9$:     CLRB    (R3)                    ;;SET THE TERMINATOR
2921  011174  012605                    MOV     (SP)+,R5                ;;POP STACK INTO R5
2922  011176  012603                    MOV     (SP)+,R3                ;;POP STACK INTO R3
2923  011200  012602                    MOV     (SP)+,R2                ;;POP STACK INTO R2
2924  011202  012601                    MOV     (SP)+,R1                ;;POP STACK INTO R1
2925  011204  012600                    MOV     (SP)+,R0                ;;POP STACK INTO R0
2926  011206  104401  011234            TYPE    ,$DBLK                  ;;NOW TYPE THE NUMBER
2927  011212  016666  000002  000004    MOV     2(SP),4(SP)             ;;ADJUST THE STACK
2928  011220  012616                    MOV     (SP)+,(SP)
2929  011222  000002                    RTI                             ;;RETURN TO USER
2930  011224  023420            $DTBL:  10000.
2931  011226  001750                    1000.
2932  011230  000144                    100.
2933  011232  000012                    10.
2934  011234  000004            $DBLK:  .BLKW   4
2935
2936                              .SBTTL  TTY INPUT ROUTINE
2937
2938                              ;;*****************************************************************
2939                              .ENABL  LSB
2940  011244  000000            $TKCNT: .WORD   0                       ;;NUMBER OF ITEMS IN QUEUE
2941  011246  000000            $TKQIN: .WORD   0                       ;;INPUT POINTER
2942  011250  000000            $TKQOUT: .WORD  0                       ;;OUTPUT POINTER
2943  011252  000001            $TKQSRT: .BLKB  1                       ;;TTY KEYBOARD QUEUE
2944          011253            $TKQEND=.
2945          011254                    .EVEN
2946
2947                              ;*TK INITIALIZE ROUTINE
2948                              ;*THIS ROUTINE WILL INITIALIZE THE TTY KEYBOARD INPUT QUEUE
2949                              ;*SETUP THE INTERRUPT VECTOR AND TURN ON THE KEYBOARD INTERRUPT
2950                              ;
2951                              ;*CALL:
2952                              ;*      JSR     PC,$TKINT
2953                              ;*      RETURN
2954                              ;
2955  011254  005037  011244    $TKINT: CLR     $TKCNT                  ;;CLEAR COUNT OF ITEMS IN QUEUE
2956  011260  012737  011252  011246    MOV     #$TKQSRT,$TKQIN         ;;MOVE THE STARTING ADDRESS OF THE
2957  011266  013737  011246  011250    MOV     $TKQIN,$TKQOUT          ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
2958  011274  012737  011324  000060    MOV     #$TKSRV,@#TKVEC         ;;INITIALIZE THE KEYBOARD VECTOR
2959  011302  012737  000200  000062    MOV     #200,@#TKVEC+2          ;;"BR" LEVEL 4
2960  011310  005777  167632            TST     @$TKB                   ;;CLEAR DONE FLAG
2961  011314  012777  000100  167622    MOV     #100,@$TKS              ;;ENABLE TTY KEYBOARD INTERRUPT
2962  011322  000207                    RTS     PC                      ;;RETURN TO CALLER
2963
2964                              ;*TK SERVICE ROUTINE
2965                              ;*THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT
2966                              ;*BY READING THE CHARACTER FROM THE INPUT BUFFER AND PUTTING
2967                              ;*IT IN THE QUEUE.
2968                              ;*IF THE CHARACTER IS A "CONTROL-C" (↑C) $TKINT IS CALLED AND
2969                              ;*UPON RETURN EXIT IS MADE TO THE "CONTROL-C" RESTART ADDRESS (START5)
2970                              ;
2971  011324  117746  167618    $TKSRV: MOVB    @$TKB,-(SP)             ;;PICKUP THE CHARACTER
```

```
2972  011330  042716  177600                    BIC     #^C177,(SP)     ;;STRIP THE JUNK
2973  011334  021627  000003                    CMP     (SP),#3         ;;IS IT A CONTROL C?
2974  011340  001007                            BNE     1$              ;;BRANCH IF NO
2975  011342  104401  012463                    TYPE    $CNTLC          ;;TYPE A CONTROL-C (^C)
2976  011346  004737  011254                    JSR     PC,$TKINT       ;;INIT THE KEYBOARD
2977  011352  005726                            TST     (SP)+           ;;CLEAN UP STACK
2978  011354  000137  002720                    JMP     START$          ;;CONTROL C RESTART
2979  011360  021627  000007            1$:     CMP     (SP),#7         ;;IS IT A CONTROL G?
2980  011364  001004                            BNE     2$              ;;BRANCH IF NO
2981  011366  022737  000176  001140            CMP     #SWREG,SWR      ;;IS SOFT-SWR SELECTED?
2982  011374  001500                            BEQ     6$              ;;GO TO SWR CHANGE
2983
2984  011376                             2$:
2985  011376  022737  000001  011244            CMP     #1,$TKCNT       ;;IS THE QUEUE FULL?
2986  011404  001004                            BNE     3$              ;;BRANCH IF NO
2987  011406  104401  001212                    TYPE    $BELL           ;;RING THE TTY BELL
2988  011412  005726                            TST     (SP)+           ;;CLEAN CHARACTER OFF OF STACK
2989  011414  000451                            BR      5$              ;;EXIT
2990  011416  021627  000023            3$:     CMP     (SP),#23        ;;IS IT A CONTROL-S?
2991  011422  001021                            BNE     32$             ;;BRANCH IF NO
2992  011424  005077  167514                    CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
2993  011430  005726                            TST     (SP)+           ;;CLEAN CHAR OFF STACK
2994  011432  105777  167506            31$:    TSTB    @$TKS           ;;WAIT FOR A CHAR
2995  011436  100375                            BPL     31$             ;;LOOP UNTIL ITS THERE
2996  011440  117746  167502                    MOVB    @$TKB,-(SP)     ;;GET THE CHARACTER
2997  011444  042716  177600                    BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
2998  011450  022627  000021                    CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
2999  011454  001366                            BNE     31$             ;;BRANCH IF NO
3000  011456  012777  000100  167460            MOV     #100,@$TKS      ;;REENABLE TTY KEYBOARD INTERRUPTS
3001  011464  000002                            RTI                     ;;RETURN
3002  011466  005237  011244            32$:    INC     $TKCNT          ;;COUNT THIS CHARACTER
3003  011472  021627  000140                    CMP     (SP),#140       ;;IS IT UPPER CASE?
3004  011476  002405                            BLT     4$              ;;BRANCH IF YES
3005  011500  021627  000175                    CMP     (SP),#175       ;;IS IT A SPECIAL CHAR?
3006  011504  003002                            BGT     4$              ;;BRANCH IF YES
3007  011506  042716  000040                    BIC     #40,(SP)        ;;MAKE IT UPPER CASE
3008  011512  112677  177530            4$:     MOVB    (SP)+,@$TKQIN   ;;AND PUT IT IN QUEUE
3009  011516  005237  011246                    INC     $TKQIN          ;;UPDATE THE POINTER
3010  011522  023727  011246  011253            CMP     $TKQIN,#$TKQEND ;;GO OFF THE END?
3011  011530  001003                            BNE     5$              ;;BRANCH IF NO
3012  011532  012737  011252  011246            MOV     #$TKQSRT,$TKQIN ;;RESET THE POINTER
3013  011540  000002                    5$:     RTI                     ;;RETURN
3014
3015                                      ;;**********************************************************************
3016                                      ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
3017                                      ;*ROUTINE IS ENTERED  FROM THE TRAP HANDLER, AND WILL
3018                                      ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP
3019                                      ;*CALL WHEN OPERATING IN TTY INTERRUPT MODE.
3020  011542  022737  000176  001140    $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED
3021  011550  001124                            BNE     15$             ;;EXIT IF NOT
3022  011552  105777  167366                    TSTB    @$TKS           ;;IS A CHAR WAITING?
3023  011556  100121                            BPL     15$             ;;IF NOT, EXIT
3024  011560  117746  167362                    MOVB    @$TKB,-(SP)     ;;YES
3025  011564  042716  177600                    BIC     #^C177,(SP)     ;;MAKE IT  7-BIT ASCII
3026  011570  021627  000007                    CMP     (SP),#7         ;;IS IT A CONTROL-G?
3027  011574  001300                            BNE     2$              ;;IF NOT, PUT IT IN THE TTY QUEUE
```

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                                                        ;;AND EXIT
                                                        ;;*****************************************************************
                                                        ;*CONTROL IS PASSED TO THIS POINT FROM EITHER THE TTY INTERRUPT SERVICE
                                                        ;*ROUTINE OR FROM THE SOFTWARE SWITCH REGISTER TRAP CALL, AS A RESULT OF A
                                                        ;*CONTROL-G BEING TYPED, AND THE SOFTWARE SWITCH REGISTER BEING SELECTED.
011576  123727  001134  000001  6$:     CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
011604  001674                          BEQ     2$              ;;BRANCH IF YES
011606  005726                          TST     (SP)+           ;;CLEAR CONTROL-G OFF STACK
011610  004737  011254                  JSR     PC,$TKINT       ;;FLUSH THE TTY INPUT QUEUE
011614  005077  167324                  CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
011620  112737  000001  001135          MOVB    #1,$INTAG       ;;SET INTERRUPT MODE INDICATOR

011626  104401  012475                  TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (↑G)
011632  104401  012502  $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
011636  013746  000176                  MOV     $WREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
011642  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
011644  104401  012513                  TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
011650  005046          19$:    CLR     -(SP)           ;;CLEAR COUNTER
011652  005046                  CLR     -(SP)           ;;THE NEW SWR
011654  105777  167264          7$:     TSTB    @$TKS           ;;CHAR THERE?
011660  100375                          BPL     7$              ;;IF NOT TRY AGAIN

011662  117746  167260                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
011666  042716  177600                  BIC     #↑C177,(SP)     ;;MAKE IT 7-BIT ASCII

011672  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL-C?
011676  001015                          BNE     9$              ;;BRANCH IF NOT
011700  104401  012463                  TYPE    ,$CNTLC         ;;YES, ECHO CONTROL-C (↑C)
011704  062706  000006                  ADD     #6,SP           ;;CLEAN UP STACK
011710  123727  001135  000001          CMPB    $INTAG,#1       ;;REENABLE TTY KEYBOARD INTERRUPTS?
011716  001003                          BNE     8$              ;;BRANCH IF NO
011720  012777  000100  167216          MOV     #100,@$TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
011726  000137  002720          8$:     JMP     START$          ;;CONTROL-C RESTART

011732  021627  000025          9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
011736  001005                          BNE     10$             ;;BRANCH IF NOT
011740  104401  012470                  TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (↑U)
011744  062706  000006          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
011750  000737                          BR      19$             ;;LET'S TRY IT AGAIN

011752  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
011756  001022                          BNE     16$             ;;BRANCH IF NO
011760  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
011764  001403                          BEQ     11$             ;;BRANCH IF YES
011766  016677  000002  167144          MOV     2(SP),@SWR      ;;SAVE NEW SWR
011774  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
012000  104401  001217          14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
012004  123727  001135  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
012012  001003                          BNE     15$             ;;BRANCH IF NOT
012014  012777  000100  167122          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
012022  000002          15$:    RTI                     ;;RETURN
012024  004737  010522          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
012030  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
```

```
3084  012034  002420                    BLT     18$                     ;;BRANCH IF YES
3085  012036  021627  000067            CMP     (SP),#67                ;;CHAR > 7?
3086  012042  003015                    BGT     18$                     ;;BRANCH IF YES
3087  012044  042726  000060            BIC     #60,(SP)+               ;;STRIP-OFF ASCII
3088  012050  005766  000002            TST     2(SP)                   ;;IS THIS THE FIRST CHAR
3089  012054  001403                    BEQ     17$                     ;;BRANCH IF YES
3090  012056  006316                    ASL     (SP)                    ;;NO, SHIFT PRESENT
3091  012060  006316                    ASL     (SP)                    ;;   CHAR OVER TO MAKE
3092  012062  006316                    ASL     (SP)                    ;;   ROOM FOR NEW ONE.
3093  012064  005266  000002    17$:    INC     2(SP)                   ;;KEEP COUNT OF CHAR
3094  012070  056616  177776            BIS     -2(SP),(SP)             ;;SET IN NEW CHAR
3095  012074  000667                    BR      7$                      ;;GET THE NEXT ONE
3096  012076  104401  001216    18$:    TYPE    ,$QUES                  ;;TYPE ?<CR><LF>
3097  012102  000720                    BR      20$                     ;;SIMULATE CONTROL-U
3098                            .DSABL  LSB
3099
3100
3101                            ;;**********************************************************************
3102                            ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
3103                            ;*CALL:
3104                            ;*      RDCHR                           ;;GET A CHARACTER FROM THE QUEUE
3105                            ;*      RETURN HERE                     ;;CHARACTER IS ON THE STACK
3106                            ;*                                      ;;WITH PARITY BIT STRIPPED OFF
3107                            ;
3108
3109  012104  011646    $RDCHR: MOV     (SP),-(SP)              ;;PUSH DOWN THE PC AND
3110  012106  016666  000004  000002    MOV     4(SP),2(SP)             ;;THE PS
3111  012114  005066  000004            CLR     4(SP)                   ;;GET READY FOR A CHARACTER
3112  012120  005046                    CLR     -(SP)                   ;;PUT NEW PS ON STACK
3113  012122  012746  012130            MOV     #64$,-(SP)              ;;PUT NEW PC ON  STACK
3114  012126  000002                    RTI                             ;;POP NEW PC AND PS
3115  012130                    64$:
3116  012130  005737  011244    1$:     TST     $TKCNT                  ;;WAIT ON A CHARACTER
3117  012134  001775                    BEQ     1$
3118  012136  005337  011244            DEC     $TKCNT                  ;;DECREMENT THE COUNTER
3119  012142  117766  177102  000004    MOVB    @$TKQOUT,4(SP)          ;;GET ONE CHARACTER
3120  012150  005237  011250            INC     $TKQOUT                 ;;UPDATE THE POINTER
3121  012154  023727  011250  011253    CMP     $TKQOUT,#$TKQEND        ;;DID IT GO OFF OF THE END?
3122  012162  001003                    BNE     2$                      ;;BRANCH IF NO
3123  012164  012737  011252  011250    MOV     #$TKQSRT,$TKQOUT        ;;RESET THE POINTER
3124  012172  000002            2$:     RTI                             ;;RETURN
3125                            ;;**********************************************************************
3126                            ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
3127                            ;*CALL:
3128                            ;*      RDLIN                           ;;INPUT A STRING FROM THE TTY
3129                            ;*      RETURN HERE                     ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
3130                            ;*                                      ;;TERMINATOR WILL BE A BYTE, OF ALL 0'S
3131
3132  012174  010346    $RDLIN: MOV     R3,-(SP)                ;;SAVE R3
3133  012176  005046            CLR     -(SP)                   ;;CLEAR THE RUBOUT KEY
3134  012200  012703  012430    1$:     MOV     #$TTYIN,R3              ;;GET ADDRESS
3135  012204  022703  012463    2$:     CMP     #$TTYIN+27.,R3          ;;BUFFER FULL?
3136  012210  101456                    BLOS    4$                      ;;BR IF YES
3137  012212  104410                    RDCHR                           ;;GO READ ONE CHARACTER FROM THE TTY
3138  012214  112613                    MOVB    (SP)+,(R3)              ;;GET CHARACTER
3139  012216  122713  000177    10$:    CMPB    #177,(R3)               ;;IS IT A RUBOUT
```

```
3140  012222  001022                        BNE     5$              ;;BR IF NO
3141  012224  005716                        TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
3142  012226  001007                        BNE     6$              ;;BR IF NO
3143  012230  112737  000134  012426        MOVB    #'\,9$          ;;TYPE A BACK SLASH
3144  012236  104401  012426                TYPE    ,9$
3145  012242  012716  177777                MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
3146  012246  005303                6$:     DEC     R3              ;;BACKUP BY ONE
3147  012250  020327  012430                CMP     R3,#$TTYIN      ;;STACK EMPTY?
3148  012254  103434                        BLO     4$              ;;BR IF YES
3149  012256  111337  012426                MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
3150  012262  104401  012426                TYPE    ,9$             ;;GO TYPE
3151  012266  000746                        BR      2$              ;;GO READ ANOTHER CHAR.
3152  012270  005716                5$:     TST     (SP)            ;;RUBOUT KEY SET?
3153  012272  001406                        BEQ     7$              ;;BR IF NO
3154  012274  112737  000134  012426        MOVB    #'\,9$          ;;TYPE A BACK SLASH
3155  012302  104401  012426                TYPE    ,9$
3156  012306  005016                        CLR     (SP)            ;;CLEAR THE RUBOUT KEY
3157  012310  122713  000025        7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
3158  012314  001003                        BNE     8$              ;;BR IF NO
3159  012316  104401  012470                TYPE    ,$CNTLU         ;;TYPE A CONTROL "U"
3160  012322  000726                        BR      1$              ;;GO START OVER
3161  012324  122713  000022        8$:     CMPB    #22,(R3)        ;;IS CHARACTER A "↑R"?
3162  012330  001011                        BNE     3$              ;;BRANCH IF NO
3163  012332  105013                        CLRB    (R3)            ;;CLEAR THE CHARACTER
3164  012334  104401  001217                TYPE    ,$CRLF          ;;TYPE A "CR" & "LF"
3165  012340  104401  012430                TYPE    ,$TTYIN         ;;TYPE THE INPUT STRING
3166  012344  000717                        BR      2$              ;;GO PICKUP ANOTHER CHACTER
3167  012346  104401  001216        4$:     TYPE    ,$QUES          ;;TYPE A '?'
3168  012352  000712                        BR      1$              ;;CLEAR THE BUFFER AND LOOP
3169  012354  111337  012426        3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
3170  012360  104401  012426                TYPE    ,9$
3171  012364  122723  000015                CMPB    #15,(R3)+       ;;CHECK FOR RETURN
3172  012370  001305                        BNE     2$              ;;LOOP IF NOT RETURN
3173  012372  105063  177777                CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
3174  012376  104401  001220                TYPE    ,$LF            ;;TYPE A LINE FEED
3175  012402  005726                        TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
3176  012404  012603                        MOV     (SP)+,R3        ;;RESTORE R3
3177  012406  011646                        MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
3178  012410  016666  000004  000002        MOV     4(SP),2(SP)     ;;       FIRST ASCII CHARACTER ON IT
3179  012416  012766  012430  000004        MOV     #$TTYIN,4(SP)
3180  012424  000002                        RTI                     ;;RETURN
3181  012426     000                9$:     .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
3182  012427     000                        .BYTE   0               ;;TERMINATOR
3183  012430  000033                $TTYIN: .BLKB   27.             ;;RESERVE 27. BYTES FOR TTY INPUT
3184  012463     136  006503  000012  $CNTLC: .ASCIZ  /↑C/<15><12>    ;;CONTROL "C"
3185  012470  052536  005015     000  $CNTLU: .ASCIZ  /↑U/<15><12>    ;;CONTROL "U"
3186  012475     136  006507  000012  $CNTLG: .ASCIZ  /↑G/<15><12>    ;;CONTROL "G"
3187  012502  005015  053523  020122  $MSWR:  .ASCIZ  <15><12>/SWR = /
3188  012510  020075     000
3189  012513     040  047040  053505  $MNEW:  .ASCIZ  /  NEW = /
3190  012520  036440  000040
3191
3192                                  .SBTTL  SCOPE HANDI ER ROUTINE
3193
3194                                  ;;**********************************************************************
3195                                  ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
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                        ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
                        ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
                        ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                        ;*SW14=1          LOOP ON TEST
                        ;*SW11=1          INHIBIT ITERATIONS
                        ;*SW09=1          LOOP ON ERROR
                        ;*CALL
                        ;*      SCOPE           ;;SCOPE=IOT

012524                  $SCOPE:
012524  104407                  CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
012526  032777  040000  166404  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
012534  001101                  BNE     $OVER           ;;YES IF SW14=1
                        ;*****START OF CODE FOR THE XOR TESTER*****
012536  000416          $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                        ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
012540  013746  000004          MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
012544  012737  012564  000004  MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
012552  005737  177060          TST     @#177060        ;;TIME OUT ON XOR?
012556  012637  000004          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
012562  000453                  BR      $SVLAD          ;;GO TO THE NEXT TEST
012564  022626          5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
012566  012637  000004          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
012572  000413                  BR      7$              ;;LOOP ON THE PRESENT TEST
012574                  6$:;*****END OF CODE FOR THE XOR TESTER*****
012574  105737  001103  2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
012600  001421                  BEQ     3$              ;;BR IF NO
012602  123737  001115  001103  CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
012610  101015                  BHI     3$              ;;BR IF NO
012612  032777  001000  166320  BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
012620  001404                  BEQ     4$              ;;BR IF NO
012622  013737  001110  001106  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
012630  000443                  BR      $OVER
012632  105037  001103  4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
012636  005037  001206          CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
012642  000415                  BR      1$              ;;ESCAPE TO THE NEXT TEST
012644  032777  004000  166266  3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
012652  001011                  BNE     1$              ;;BR IF YES
012654  005737  001100          TST     $PASS           ;;IF FIRST PASS OF PROGRAM
012660  001406                  BEQ     1$              ;;    INHIBIT ITERATIONS
012662  005237  001104          INC     $ICNT           ;;INCREMENT ITERATION COUNT
012666  023737  001206  001104  CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
012674  002021                  BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
012676  012737  000001  001104  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
012704  013737  012754  001206  MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
012712  105237  001102  $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
012716  011637  001106          MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
012722  011637  001110          MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
012726  005037  001210          CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
012732  112737  000001  001115  MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
012740  013777  001102  166174  $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
012746  013716  001106          MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
012752  000002                  RTI                     ;;FIXES PS
012754  000001          $MXCNT: 1                       ;;MAX. NUMBER OF ITERATIONS

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

```
                        ;;*****************************************************************
                        ;*SAVE R0-R5
                        ;*CALL:
                        ;*      SAVREG
                        ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
                        ;*
                        ;*TOP---(+16)
                        ;*  +2---(+18)
                        ;*  +4---R5
                        ;*  +6---R4
                        ;*  +8---R3
                        ;*+10---R2
                        ;*+12---R1
                        ;*+14---R0
                        ;
012756                  $SAVREG:
012756  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
012760  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
012762  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
012764  010346                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
012766  010446                  MOV     R4,-(SP)        ;;PUSH R4 ON STACK
012770  010546                  MOV     R5,-(SP)        ;;PUSH R5 ON STACK
012772  016646  000022          MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
012776  016646  000022          MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
013002  016646  000022          MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
013006  016646  000022          MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
013012  000002                  RTI
                        ;*RESTORE R0-R5
                        ;*CALL:
                        ;*      RESREG
013014                  $RESREG:
013014  012666  000022          MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
013020  012666  000022          MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
013024  012666  000022          MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
013030  012666  000022          MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
013034  012605                  MOV     (SP)+,R5        ;;POP STACK INTO R5
013036  012604                  MOV     (SP)+,R4        ;;POP STACK INTO R4
013040  012603                  MOV     (SP)+,R3        ;;POP STACK INTO R3
013042  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
013044  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
013046  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
013050  000002                  RTI

                        .SBTTL  INTEGER MULTIPLY ROUTINE

                        ;;*****************************************************************
                        ;*CALL
                        ;*      MOV     MULTIPLER,-(SP)
                        ;*      MOV     MULTIPLICAND,-(SP)
                        ;*      JSR     PC,@#$MULT
                        ;*      RETURN  ;;PRODUCT IS ON THE STACK
                        ;*
                        ;*      STACK   PRODUCT
                        ;*      -----   -------
```

```
                                        ;*      TOP     LSB'S
                                        ;*      +2      MSB'S
                                        $MULT:
013052                                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
013052  010046                                 MOV     R1,-(SP)        ;;PUSH R1 ON STACK
013054  010146                                 MOV     R2,-(SP)        ;;PUSH R2 ON STACK
013056  010246                                 CLR     -(SP)           ;;CLEAR THE SIGN KEY
013060  005046                                 MOV     12(SP),R1       ;;GET THE MULTIPLICAND
013062  016601  000012                         BPL     1$              ;;BR IF PLUS
013066  100002                                 INC     (SP)            ;;SET THE SIGN KEY
013070  005216                                 NEG     R1              ;;MAKE THE MULTIPLICAND POSTIVE
013072  005401                                 MOV     14(SP),R2       ;;GET THE MULTIPLIER
013074  016602  000014          1$:            BPL     2$              ;;BR IF PLUS
013100  100002                                 DEC     (SP)            ;;UPDATE THE SIGN KEY
013102  005316                                 NEG     R2              ;;MAKE THE MULTIPLIER POSTIVE
013104  005402                                 MOV     #17.,-(SP)      ;;SET THE LOOP COUNT
013106  012746  000021          2$:            CLR     R0              ;;SETUP FOR THE MULTIPLY LOOP
013112  005000                                 BCC     4$              ;;DON'T ADD IF MULTIPLICAND = 0
013114  103001                  3$:            ADD     R2,R0
013116  060200                  4$:            ROR     R0              ;;POSITION THE PARITIAL PRODUCT AND
013120  006000                                 ROR     R1              ;;THE MULTIPLICAND
013122  006001                                 DEC     (SP)            ;;HAS ALL BITS OF THE MULTIPLICAND BEEN DONE?
013124  005316                                 BNE     3$              ;;BR IF NO
013126  001372                                 CMP     (SP)+,(SP)      ;;SHOULD PRODUCT BE NEGATIVE?
013130  022616                                 BEQ     5$              ;;GO TO EXIT IF NO
013132  001403                                 NEG     R0              ;;YES--SO MAKE IT SO
013134  005400                                 NEG     R1
013136  005401                                 SBC     R0
013140  005600                                 TST     (SP)+           ;;CLEAR SIGN INFO. OFF OF STACK
013142  005726                  5$:            MOV     R0,12(SP)       ;;PUT THE PRODUCT ON THE STACK (MSB'S)
013144  010066  000012                         MOV     R1,10(SP)       ;;LSB'S
013150  010166  000010                         MOV     (SP)+,R2        ;;POP STACK INTO R2
013154  012602                                 MOV     (SP)+,R1        ;;POP STACK INTO R1
013156  012601                                 MOV     (SP)+,R0        ;;POP STACK INTO R0
013160  012600                                 RTS     PC
013162  000207

                                        .SBTTL  TRAP DECODER

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

013164  010046                  $TRAP:         MOV     R0,-(SP)        ;;SAVE R0
013166  016600  000002                         MOV     2(SP),R0        ;;GET TRAP ADDRESS
013172  005740                                 TST     -(R0)           ;;BACKUP BY 2
013174  111000                                 MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
013176  006300                                 ASL     R0              ;;POSITION FOR INDEXING
013200  016000  013220                         MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
013204  000200                                 RTS     R0              ;;GO TO ROUTINE

                                        ;;THIS IS USE TO HANDLE THE "GETPRI" MACRO
```

```
013206  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
013210  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
013216  000002                          RTI                     ;;RESTORE THE PSW

                                .SBTTL  TRAP TABLE

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

                                ;       ROUTINE
                                ;       -------
013220  013206                  $TRPAD: .WORD   $TRAP2
013222  010352                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
013224  010616                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
013226  010572                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
013230  010632                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
013232  011020                          $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)

013234  011632                          $GTSWR  ;;CALL=GTSWR    TRAP+6(104406)  GET SOFT-SWR SETTING

013236  011542                          $CKSWR  ;;CALL=CKSWR    TRAP+7(104407)  TEST FOR CHANGE IN SOFT-SWR
013240  012104                          $RDCHR  ;;CALL=RDCHR    TRAP+10(104410) TTY TYPEIN CHARACTER ROUTINE
013242  012174                          $RDLIN  ;;CALL=RDLIN    TRAP+11(104411) TTY TYPEIN STRING ROUTINE
013244  012756                          $SAVREG ;;CALL=SAVREG   TRAP+12(104412) SAVE R0-R5 ROUTINE
013246  013014                          $RESREG ;;CALL=RESREG   TRAP+13(104413) RESTORE R0-R5 ROUTINE

                                .SBTTL  SINGLE LENGTH BINARY TO DECIMAL ASCIZ ROUTINE

                                ;;**********************************************************************
                                ;*THIS ROUTINE WILL CONVERT A 16-BIT UNSIGNED BINARY NUMBER TO AN
                                ;*UNSIGNED DECIMAL ASCIZ NUMBER.
                                ;*CALL
                                ;*      MOV     NUMBER,-(SP)    ;;PUT BINARY NUMBER ON THE STACK
                                ;*      JSR     PC,@#$$B2D      ;;CALL
                                ;*      RETURN                  ;;ADDRESS OF THE 1ST ASCIZ CHAR.IS ON THE STACK

013250  016637  000002  013300  $$B2D:  MOV     2(SP),1$        ;;SAVE BINARY NUMBER
013256  012746  013300                  MOV     #1$,-(SP)       ;;SET POINTER
013262  004737  013304                  JSR     PC,@#$DB2D      ;;CALL DOUBLE LENGTH CONVERT
013266  062716  000005                  ADD     #5,(SP)         ;;ONLY ALLOW FIVE CHARACTERS
013272  012666  000002                  MOV     (SP)+,2(SP)     ;;PICKUP POINTER
013276  000207                          RTS     PC              ;;RETURN
013300  000000  000000          1$:     .WORD   0,0

                                .SBTTL  DOUBLE LENGTH BINARY TO DECIMAL ASCII CONVERT ROUTINE

                                ;;**********************************************************************
                                ;*THIS ROUTINE WILL CONVERT A 32-BIT BINARY NUMBER TO AN UNSIGNED
                                ;*DECIMAL (ASCII) NUMBER. THE SIGN OF THE BINARY NUMBER MUST BE
                                ;*POSITIVE.
                                ;*CALL
                                ;*      MOV     #PNTR,-(SP)     ;;POINTER TO LOW WORD OF BINARY NUMBER
                                ;*      JSR     PC,@#$DB2D
                                ;*      RETURN                  ;;THE FIRST ADDRESS OF ASCIZ
                                                                ;;IS ON THE STACK
```

```
3420
3421
3422  013304  104412                  $DB2D:  SAVREG                  ;;SAVE REGISTERS
3423  013306  016602  000002                  MOV     2(SP),R2        ;;PICKUP THE DATA POINTER
3424  013312  012700  013464                  MOV     #$DECVL,R0      ;;GET ADDRESS OF "$DECVL" STRING
3425  013316  010066  000002                  MOV     R0,2(SP)        ;;PUT ADDRESS OF ASCIZ STRING ON STACK
3426  013322  012201                          MOV     (R2)+,R1        ;;PICKUP THE BINARY NUMBER
3427  013324  012202                          MOV     (R2)+,R2
3428  013326  012737  000012  013402          MOV     #10.,4$         ;;SET UP TO DO 10 CONVERSIONS
3429  013334  012704  013414                  MOV     #$TNPWR,R4      ;;ADDRESS OF TEN POWER
3430  013340  012705  013416                  MOV     #$TNPWR+2,R5
3431  013344  005003                  1$:     CLR     R3              ;;CLEAR PARTIAL
3432  013346  161401                  2$:     SUB     (R4),R1         ;;SUBTRACT TEN POWER
3433  013350  005602                          SBC     R2
3434  013352  161502                          SUB     (R5),R2
3435  013354  002402                          BLT     3$              ;;BR IF TEN POWER TO LARGE
3436  013356  005203                          INC     R3              ;;ADD 1 TO PARTIAL
3437  013360  000772                          BR      2$              ;;LOOP
3438  013362  062401                  3$:     ADD     (R4)+,R1        ;;RESTORE SUBTRACTED VALUE
3439  013364  005502                          ADC     R2
3440  013366  062402                          ADD     (R4)+,R2
3441  013370  022525                          CMP     (R5)+,(R5)+     ;;MOVE TO NEXT TEN POWER
3442  013372  052703  000060                  BIS     #'0,R3          ;;CHANGE PARTIAL TO ASCII
3443  013376  110320                          MOVB    R3,(R0)+        ;;SAVE IT
3444  013400  005327                          DEC     (PC)+           ;;DONE?
3445  013402  000000                  4$:     .WORD   0
3446  013404  001357                          BNE     1$              ;;BR IF NO
3447  013406  105020                          CLRB    (R0)+           ;;TERMINATOR
3448  013410  104413                          RESREG                  ;;RESTORE REGISTERS
3449  013412  000207                          RTS     PC              ;;RETURN
3450  013414  145000                  $TNPWR: 145000                  ;;1.0E09
3451  013416  035632                          35632
3452  013420  160400                          160400                  ;;1.0E08
3453  013422  002765                          2765
3454  013424  113200                          113200                  ;;1.0E07
3455  013426  000230                          230
3456  013430  041100                          041100                  ;;1.0E06
3457  013432  000017                          17
3458  013434  103240                          103240                  ;;1.0E05
3459  013436  000001                          1
3460  013440  023420                          23420                   ;;1.0E04
3461  013442  000000                          0
3462  013444  001750                          1750                    ;;1.0E03
3463  013446  000000                          0
3464  013450  000144                          144                     ;;1.0E02
3465  013452  000000                          0
3466  013454  000012                          12                      ;;1.0E01
3467  013456  000000                          0
3468  013460  000001                          1                       ;;1.0E00
3469  013462  000000                          0
3470  013464  000014          $DECVL: .BLKB   12.                     ;;RESERVE STORAGE FOR ASCIZ STRING
3471
3472                  .SBTTL  TYPE NUMERICAL ASCIZ STRING SUPPRESS LEADING ZEROS
3473
3474                  ;;**********************************************************************
3475                  ;*THIS ROUTINE IS USED TO TYPE AN ASCIZ NUMBER SUPPRESSING THE
```

```
                                        ;*LEADING NUMBERS.
                                        ;*CALL
                                        ;*      MOV     #NUMADR,-(SP)   ;;FIRST ADDRESS OF ASCIZ STRING
                                        ;*      JSR     PC,@#$SUPRS
                                        $SUPRS: MOV     R0,-(SP)        ;;SAVE R0
013502  016600  000004                          MOV     4(SP),R0        ;;PICKUP THE POINTER
013506  105710                         1$:     TSTB    (R0)            ;;TERMINATEOR?
013510  001403                                 BEQ     2$              ;;BR IF YES
013512  122720  000060                         CMPB    #'0,(R0)+       ;;IS THIS AN ASCII "0" ?
013516  001773                                 BEQ     1$              ;;BR IF YES
013520  005300                         2$:     DEC     R0              ;;BACKUP BY "1"
013522  010037  013530                         MOV     R0,3$           ;;SAVE FOR TYPING
013526  104401                                 TYPE                    ;;GO TYPE
013530  000000                         3$:     .WORD   0               ;;ASCIZ POINTER GOES HERE
013532  012600                                 MOV     (SP)+,R0        ;;RESTORE R0
013534  012616                                 MOV     (SP)+,(SP)      ;;RESTORE THE STACK
013536  000207                                 RTS     PC              ;;RETURN

                                        .SBTTL  RANDOM NUMBER GENERATOR ROUTINE

                                        ;;**************************************************************
                                        ;*THIS ROUTINE IS A DOUBLE PRECISION PSEUDO RANDOM NUMBER GENERATOR
                                        ;*WITH A RANGE OF 0 TO 2(+33)-1.
                                        ;*CALL:
                                        ;*      JSR     PC,$RAND        ;;CALL THE ROUTINE
                                        ;*      RETURN                  ;;RETURN HERE THE RANDOM
                                        ;*                              ;;NUMBER WILL BE IN
                                        ;*                              ;;$HINUM,$LONUM

013540                                  $RAND:
013540  010046                                 MOV     R0,-(SP)        ;;PUSH R0 ON STACK
013542  010146                                 MOV     R1,-(SP)        ;;PUSH R1 ON STACK
013544  010246                                 MOV     R2,-(SP)        ;;PUSH R2 ON STACK
013546  013700  013640                         MOV     $LONUM,R0       ;;SET R0 WITH LOW
013552  013701  013636                         MOV     $HINUM,R1       ;;SET R1 WITH HIGH
013556  012702  177771                         MOV     #-7,R2          ;;SET SHIFT COUNT
013562  006300                         1$:     ASL     R0              ;;SHIFT R0 LEFT AND
013564  006101                                 ROL     R1              ;;ROTATE CARRY INTO R1 AND
013566  005202                                 INC     R2              ;;CHECK FOR DONE
013570  001374                                 BNE     1$              ;;CONTINUE SHIFT LOOP
013572  063700  013640                         ADD     $LONUM,R0       ;;ADD NUMBER TO MAKE X 129
013576  005501                                 ADC     R1              ;;PROPOGATE CARRY
013600  063701  013636                         ADD     $HINUM,R1       ;;ADD NUMBER TO MAKE X 129
013604  062700  001057                         ADD     #1057,R0        ;;ADD LOW CONSTANT
013610  005501                                 ADC     R1              ;;PROPOGATE CARRY
013612  062701  047401                         ADD     #47401,R1       ;;ADD HIGH CONSTANT
013616  010037  013640                         MOV     R0,$LONUM       ;;SAVE R0
013622  010137  013636                         MOV     R1,$HINUM       ;;SAVE R1
013626  012602                                 MOV     (SP)+,R2        ;;POP STACK INTO R2
013630  012601                                 MOV     (SP)+,R1        ;;POP STACK INTO R1
013632  012600                                 MOV     (SP)+,R0        ;;POP STACK INTO R0
013634  000207                                 RTS     PC              ;;RETURN
013636  176543                         $HINUM: .WORD   176543
013640  123456                         $LONUM: .WORD   123456
```

```
                                ;;*****************************************************************
                                .SBTTL  RPINIT - INITIALIZE THE RP11 & SEE WHICH DRIVES ARE AVAILABLE
                                ;*THIS ROUTINE CLEARS THE RP11 AND DETERMINES WHICH DRIVES ARE AVAILABLE.
                                ;*THE TABLE 'DRVSTA' IS LOADED TO REFLECT THE SYSTEM STATUS.
                                ;CALL
                                ;       JSR     PC,@#RPINIT
                                ;       RETURN

013642  104412                  RPINIT: SAVREG                          ;SAVE R0-R5
013644  013701  001270                  MOV     RPVEC,R1                ;VECTOR ADDRESS
013650  005021                          CLR     (R1)+                   ;SET INTERRUPT ADDRESS TO ZERO
013652  013711  001272                  MOV     RPPRIO,(R1)             ;RP11 PRIORITY
013656  005037  001240                  CLR     DRVTYP                  ;CLEAR DRIVE TYPE STORAGE
013662  005037  001304                  CLR     DRVSTA                  ;SET DRIVE STATUS TO OFFLINE
013666  005037  001306                  CLR     DRVSTA+2                ;SET DRIVE STATUS TO OFFLINE
013672  005037  001310                  CLR     DRVSTA+4                ;SET DRIVE STATUS TO OFFLINE
013676  005037  001312                  CLR     DRVSTA+6                ;SET DRIVE STATUS TO OFFLINE
013702  013700  001266                  MOV     RPADR,R0                ;PUT RP11 ADDRESS INTO R0
013706  012760  000001  000004          MOV     #CLEAR,RPCS(R0)         ;CLEAR THE RP11
013714  012760  000001  000004          MOV     #CLEAR,RPCS(R0)         ;CLEAR THE RP11 AGAIN
013722  012701  000007                  MOV     #7,R1                   ;'DRVSTA' TABLE INDEX
013726  110160  000005          1$:     MOVB    R1,RPCS+1(R0)   ;SELECT DRIVE
013732  032760  001000  000000          BIT     #SUFU,RPDS(R0)          ;SEE IF DRIVE UNSAFE
013740  001404                          BEQ     2$                      ;BR IF NOT UNSAFE
013742  112761  177777  001304          MOVB    #-1,DRVSTA(R1)          ;SET INDICATOR TO 'UNSAFE'
013750  000417                          BR      4$                      ;EXIT
013752  032760  040000  000000  2$:     BIT     #SUOL,RPDS(R0)          ;IS DRIVE ONLINE ?
013760  001422                          BEQ     5$                      ;BR IF NOT
013762  032760  004000  000000          BIT     #SUSI,RPDS(R0)          ;SEEK INCOMPLETE SET ?
013770  001004                          BNE     3$                      ;BR IF SET
013772  032760  100000  000000          BIT     #SURDY,RPDS(R0)         ;IS DRIVE READY ?
014000  001412                          BEQ     5$                      ;BR IF NOT
014002  112761  000001  001304  3$:     MOVB    #1,DRVSTA(R1)   ;SET DRIVE INDICATOR TO 'ONLINE'
014010  032760  020000  000000  4$:     BIT     #SURP03,RPDS(R0)        ;IS THE DRIVE AN RP03 ?
014016  001403                          BEQ     5$                      ;BR IF NOT
014020  156137  001314  001240          BISB    @TABIT(R1),DRVTYP       ;SET RP03 INDICATOR
014026  005301                  5$:     DEC     R1                      ;DECREMENT THE TABLE INDEX
014030  100336                          BPL     1$                      ;BR IF NOT FINISHED
014032  104413                          RESREG                          ;RESTORE R0-R5
014034  000207                          RTS     PC                      ;RETURN

                                ;;*****************************************************************
                                .SBTTL  SEEKS - INITIATE A DIRECT SEEK (OR HOME SEEK) OPERATION
                                ;*THIS ROUTINE INITIATES A SEEK OPERATION ON THE DRIVE ADDRESSED IN
                                ;*THE SECOND BYTE OF 'DPB'. 1 SECOND IS ALLOWED FOR THE SEEK
                                ;*TO COMPLETE; IF THE DRIVE HAS NOT INTERRUPTED ('AIE' IS SET)
                                ;*WITHIN THAT TIME, THE SUBSYSTEM IS RESET AND THE TESTING FOR THE
                                ;*DRIVE IS TERMINATED.
                                ;CALL
                                ;       JSR     PC,@#SEEKS
                                ;       RETURN

014036  104412                  SEEKS:  SAVREG                          ;SAVE R0-R5
014040  013737  001272  177776          MOV     RPPRIO,PSW              ;RP11 PRIORITY
014046  013700  001266                  MOV     RPADR,R0                ;RP11 BUS ADDRESS
```

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3588  014052  013746  001110                    MOV     $LPERR,-(SP)    ;SAVE OLD LOOP ON ERROR ADDRESS
3589  014056  012737  014064  001110            MOV     #SEEKS0,$LPERR  ;CHANGE LOOP ON ERROR ADDRESS
3590  014064  012760  000001  000004  SEEKS0:   MOV     #CLEAR,RPCS(R0)  ;CLEAR THE CONTROLLER
3591  014072  012760  000001  000004            MOV     #CLEAR,RPCS(R0)  ;CLEAR THE CONTROLLER
3592  014100  113760  001365  000005            MOVB    DPB+1,RPCS+1(R0)  ;SELECT THE DRIVE
3593  014106  013737  001366  001262            MOV     DPB+2,CYL,DS    ;DESIRED CYLINDER
3594  014114  013760  001366  000012            MOV     DPB+2,RPCA(R0)  ;LOAD CYLINDER ADDRESS
3595  014122  013760  001370  000014            MOV     DPB+4,RPDA(R0)  ;TRACK ADDRESS
3596  014130  012777  014314  165132            MOV     #SEEKS1,@RPVEC  ;INTERRUPT RETURN
3597  014136  013760  001364  000004            MOV     DPB,RPCS(R0)    ;START THE COMMAND
3598  014144  152760  000040  000005            BISB    #40,RPCS+1(R0)  ;SET ATTENTION INTERRUPT ENABLE
3599  014152  005037  177776                    CLR     PS              ;ALLOW RP11 INTERRUPTS
3600  014156  010637  001242                    MOV     SP,SPSAV        ;SAVE THE CURRENT STACK POINTER
3601  014162  012737  004704  001300            MOV     #2500.,STALLG   ;SET STALL VALUE TO 2500MS
3602  014170  004037  015572                    JSR     R0,STALLA       ;WAIT THE SPECIFIED VALUE
3603  014174  001300                            .WORD   STALLG          ;STALL VALUE STORAGE
3604  014176  004737  015164                    JSR     PC,SAVRP        ;OPERATION TIMED OUT, SAVE THE REGISTERS
3605  014202  032737  001000  002004            BIT     #SUFU,$RPDS     ;DRIVE UNSAFE ?
3606  014210  001403                            BEQ     1$              ;BR IF NOT
3607  014212  104002                            ERROR   2               ;DRIVE UNSAFE
3608  014214  000137  015272                    JMP     DSELCT          ;DESELECT THE DRIVE
3609  014220  032737  040000  002004  1$:       BIT     #SUOL,$RPDS     ;DRIVE STILL ONLINE ?
3610  014226  001003                            BNE     2$              ;BR IF IT IS
3611  014230  104010                            ERROR   10              ;DRIVE OFFLINE AFTER POSITIONING
3612  014232  000137  015272                    JMP     DSELCT          ;DESELECT THE DRIVE
3613  014236  032737  100000  002004  2$:       BIT     #SURDY,$RPDS    ;IS THE DRIVE READY ?
3614  014244  001003                            BNE     3$              ;BR IF THE DRIVE IS READY
3615  014246  104016                            ERROR   16              ;DRIVE NOT READY AFTER POSITIONING
3616  014250  000137  015272                    JMP     DSELCT          ;DESELCT THE DRIVE
3617  014254  104005                    3$:     ERROR   5               ;NO INTERRUPT FROM POSITIONING AFTER 1 SECOND
3618  014256  032737  000200  002010            BIT     #RDY,$RPCS      ;IS THE CONTROLLER READY ?
3619  014264  001011                            BNE     4$              ;BR IF IT IS
3620  014266  012760  000001  000004            MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
3621  014274  012760  000001  000004            MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
3622  014302  012777  000100  164634            MOV     #BIT6,@$TKS     ;RESTORE THE KEYBOARD INTERRUPT ENABLE
3623  014310  000177  164730            4$:     JMP     @BYPASS         ;TERMINATE THE PRESENT TEST
3624  014314  005037  177776  SEEKS1:   CLR     PSW             ;GO BACK TO PRIORITY 0
3625  014320  013706  001242                    MOV     SPSAV,SP        ;RESTORE THE STACK POINTER
3626  014324  013700  001266                    MOV     RPADR,R0        ;RP11 ADDRESS
3627  014330  004737  015164                    JSR     PC,SAVRP        ;SAVE THE RP11 REGISTERS
3628  014334  032737  004000  002004            BIT     #SUSI,$RPDS     ;SEEK INCOMPLETE ?
3629  014342  001416                            BEQ     SEEKS2          ;BR IF NOT
3630  014344  012737  014354  001210            MOV     #1$,$ESCAPE     ;ERROR 'ESCAPE' ADDRESS
3631  014352  104015                            ERROR   15              ;SEEK INCOMPLETE
3632  014354  005037  001210            1$:     CLR     $ESCAPE         ;CLEAR THE ESCAPE ADDRESS
3633  014360  004737  015314                    JSR     PC,RESTOR       ;DO A HOME SEEK TO CLEAR THE DRIVE
3634  014364  032777  001000  164546            BIT     #SWO9,@SWR      ;LOOPING ON ERROR ?
3635  014372  001452                            BEQ     SEEKS4          ;BR IF NOT
3636  014374  000177  164510                    JMP     @$LPERR         ;LOOP ON THE OPERATION
3637  014400  032737  100000  002010  SEEKS2:   BIT     #ERR,$RPCS      ;'ERROR' SET ?
3638  014406  001410                            BEQ     1$              ;BR IF NOT
3639  014410  104006                            ERROR   6               ;DRIVE ERROR AFTER POSITIONING
3640  014412  012760  000001  000004            MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
3641  014420  012760  000001  000004            MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
3642  014426  000415                            BR      SEEKS3          ;CHECK THE DISK'S POSITION
3643  014430  005001                    1$:     CLR     R1              ;CLEAR R1
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3644  014432  113701  001365                    MOVB    DPB+1,R1        ;DRIVE ADDRESS
3645  014436  136137  001314  002004            BITB    ATABIT(R1),$RPDS  ;ATTENTION BIT SET FOR THE DRIVE
3646  014444  001001                            BNE     2$              ;BR IF IT IS
3647  014446  104007                            ERROR   7               ;ATTENTION BIT NOT SET AFTER POSITIONING
3648  014450  023737  001366  002024  2$:       CMP     DPB+2,$SUCA     ;'SUCA' CORRECT ?
3649  014456  001401                            BEQ     SEEKS3          ;BR IF IT IS
3650  014460  104011                            ERROR   11              ;'SUCA' NOT CORRECT
3651  014462  004737  014554          SEEKS3:   JSR     PC,VERIFY       ;VERIFY THE DISK'S POSITION
3652  014466  000414                            BR      SEEKS4          ;AT THE CORRECT CYLINDER
3653  014470  122737  000015  001364            CMPB    #HOMSEK,DPB     ;DOING A HOME SEEK ?
3654  014476  001410                            BEQ     SEEKS4          ;BR IF YES, NO SENSE DOING A HOME SEEK AGAIN
3655  014500  004737  015314                    JSR     PC,RESTOR       ;DO A HOME SEEK
3656  014504  032777  001000  164426            BIT     #SW09,@SWR      ;LOOP ON THE OPERATION ?
3657  014512  001402                            BEQ     SEEKS4          ;BR IF NOT
3658  014514  000177  164370                    JMP     @$LPERR         ;LOOP
3659  014520  032777  000010  164412  SEEKS4:   BIT     #SW03,@SWR      ;STALL ?
3660  014526  001403                            BEQ     1$              ;BR IF NOT
3661  014530  004037  015576                    JSR     R0,STALL        ;STALL
3662  014534  001276                            .WORD   STALL1          ;25MS STALL
3663  014536  016037  000024  001254  1$:       MOV     SUCA(R0),CYL.CR ;CURRENT CYLINDER ADDRESS
3664  014544  012637  001110                    MOV     (SP)+,$LPERR    ;RESTORE THE LOOP ON ERROR ADDRESS
3665  014550  104413                            RESREG                  ;RESTORE R0-R5
3666  014552  000207                            RTS     PC              ;RETURN
3667
3668                                    ;*****************************************************************
3669                                    .SBTTL  VERIFY - ROUTINE TO VERIFY THE POSITION AFTER A SEEK
3670                                    ;*THIS ROUTINE VERIFIES THE POSITION OF THE DRIVE AFTER A SEEK
3671                                    ;*BY READING A HEADER AT THE DESTINATION CYLINDER.  THE HEADER
3672                                    ;*READ IS FROM THE SECTOR WHICH IS 2 SECTORS FROM THE ADDRESS IN
3673                                    ;*THE 'SOT' COUNTER.  THE CYLINDER FIELD FROM 'DPB+2' IS COMPARED
3674                                    ;*WITH THE CYLINDER FIELD FROM THE HEADER.
3675                                    ;CALL
3676                                    ;       JSR     PC,VERIFY
3677                                    ;       RETURN                  ;NORMAL RETURN
3678                                    ;       ERROR RETURN            ;CYLINDER FIELDS DID NOT COMPARE
3679
3680  014554  104412                    VERIFY: SAVREG                  ;SAVE R0-R5
3681  014556  013746  001110                    MOV     $LPERR,-(SP)    ;SAVE THE LOOP ON ERROR ADDRESS
3682  014562  032777  000001  164350            BIT     #SW0,@SWR       ;CHECK POSITION ?
3683  014570  001171                            BNE     VERFY1          ;BR IF NOT
3684  014572  012737  014600  001110            MOV     #VERFYO,$LPERR  ;LOOP ON ERROR ADDRESS
3685  014600  012737  177777  027172  VERFYO:   MOV     #-1,BUFFER+2    ;CLEAR CYLINDER STORAGE
3686  014606  013700  001266                    MOV     RPADR,R0        ;LOAD RP11 ADDRESS
3687  014612  016046  000014                    MOV     RPDA(R0),-(SP)  ;GET THE 'SOT'
3688  014616  042716  177417                    BIC     #^C360,(SP)     ;SAVE THE 'SOT' BITS
3689  014622  006216                            ASR     (SP)            ;RIGHT JUSTIFY THE BITS
3690  014624  006216                            ASR     (SP)            ;RIGHT JUSTIFY THE BITS
3691  014626  006216                            ASR     (SP)            ;RIGHT JUSTIFY THE BITS
3692  014630  006216                            ASR     (SP)            ;RIGHT JUSTIFY THE BITS
3693  014632  062716  000002                    ADD     #2,(SP)         ;FORM SECTOR ADDRESS FOR CHECK
3694  014636  022716  000012                    CMP     #10.,(SP)       ;SEE IF THE ADDRESS OVERFLOWED
3695  014642  101005                            BHI     2$              ;BR IF NOT
3696  014644  103402                            BLO     1$              ;BR IF ADDR IS 11.
3697  014646  005016                            CLR     (SP)            ;SET SECTOR ADDRESS TO ZERO
3698  014650  000402                            BR      2$              ;CONTINUE
3699  014652  012716  000001          1$:       MOV     #1,(SP)         ;SET SECTOR ADDRESS TO ONE
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3700  014656  012777  015026  164404  2$:     MOV     #4$,@RPVEC      ;INTERRUPT ADDRESS
3701  014664  112637  001370                  MOVB    (SP)+,DPB+4     ;PUT VALUE INTO THE DPB
3702  014670  113737  001370  001260          MOVB    DPB+4,SEC.RD    ;SELECTED SECTOR FOR ERROR MESSAGE
3703  014676  113737  001371  001256          MOVB    DPB+5,TRK.RD    ;TRACK FOR ERROR MESSAGE
3704  014704  013746  001364                  MOV     DPB,-(SP)       ;SETUP RPCS LOAD VALUE
3705  014710  112716  000017                  MOVB    #READ,(SP)      ;READ COMMAND CODE
3706  014714  052716  014100                  BIS     #MODE!HDR!IDE,(SP)  ;SET BITS FOR HEADER READ
3707  014720  012760  177775  000006          MOV     #-3,RPWC(R0)    ;LOAD WORD COUNT
3708  014726  012760  027170  000010          MOV     #BUFFER,RPBA(R0)  ;BUFFER ADDRESS
3709  014734  013760  001370  000014          MOV     DPB+4,RPDA(R0)  ;SECTOR ADDRESS
3710  014742  012660  000004                  MOV     (SP)+,RPCS(R0)  ;START THE ORDER
3711  014746  005037  177776                  CLR     PSW             ;SET PRIORITY BACK TO ZERO
3712  014752  010637  001242                  MOV     SP,SPSAV        ;SAVE THE CURRENT STACK POINTER
3713  014756  012737  004704  001300          MOV     #2500.,STALLG   ;SET STALL VALUE TO 2500MS
3714  014764  004037  015572                  JSR     R0,STALLA       ;WAIT THE SPECIFIED VALUE
3715  014770  001300                          .WORD   STALLG          ;STALL VALUE STORAGE
3716  014772  004737  015164                  JSR     PC,SAVRP        ;STORE THE RP11 REGISTERS
3717  014776  104014                          ERROR   14              ;NO INTERRUPT WITHIN 1 SECOND
3718  015000  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
3719  015006  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
3720  015014  012777  000100  164122          MOV     #BIT6,@STKS     ;SET TTY KEYBOARD INTERRUPT ENABLE
3721  015022  000177  164216                  JMP     @BYPASS         ;TERMINATE THE PRESENT TEST
3722  015026  005037  177776          4$:     CLR     PSW             ;SET PRIORITY TO ZERO
3723  015032  013706  001242                  MOV     SPSAV,SP        ;RESTORE STACK POINTER
3724  015036  004737  015164                  JSR     PC,SAVRP        ;STORE THE RP11 REGISTERS
3725  015042  013700  001266                  MOV     RPADR,R0        ;PUT RP11 ADDRESS INTO R0
3726  015046  032737  100000  002010          BIT     #ERR,$RPCS      ;DID THE ORDER TERMINTE WITH AN ERROR ?
3727  015054  001410                          BEQ     6$              ;BR IF NOT
3728  015056  104012                  5$:     ERROR   12              ;ERROR DURING POSITIONING VERIFICATION
3729  015060  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE ERROR
3730  015066  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
3731  015074  000427                          BR      VERFY1          ;BYPASS POSITIONING CHECK
3732  015076  000006                  6$:
3733  015076  006237  027172                  ASR     BUFFER+2        ;ALIGN CYLINDER ADDRESS FOR COMPARE
3734  015102  006237  027172                  ASR     BUFFER+2        ;ALIGN CYLINDER ADDRESS FOR COMPARE
3735  015106  006237  027172                  ASR     BUFFER+2        ;ALIGN CYLINDER ADDRESS FOR COMPARE
3736  015112  006237  027172                  ASR     BUFFER+2        ;ALIGN CYLINDER ADDRESS FOR COMPARE
3737  015116  006237  027172                  ASR     BUFFER+2        ;ALIGN CYLINDER ADDRESS FOR COMPARE
3738  015122  006237  027172                  ASR     BUFFER+2        ;ALIGN CYLINDER ADDRESS FOR COMPARE
3739  015126  023737  001366  027172          CMP     DPB+2,BUFFER+2  ;SEE IF CYLINDER ADDR FROM HEADER IS CORRECT
3740  015134  001407                          BEQ     VERFY1          ;BR IF OK
3741  015136  013737  027172  001126          MOV     BUFFER+2,$BDDAT ;CYLINDER ADDRESS FROM HEADER
3742  015144  104013                          ERROR   13              ;CYLINDER ADDRESS DOES NOT COMPARE
3743  015146  062766  000002  000002          ADD     #2,2(SP)        ;RETURN+2
3744  015154  012637  001110          VERFY1: MOV     (SP)+,$LPERR    ;RESTORE LOOP ON ERROR ADDRESS
3745  015160  104413                          RESREG                  ;RESTORE R0-R5
3746  015162  000207                          RTS     PC              ;RETURN
3747
3748                                  ;*****************************************************************
3749                                  .SBTTL  SAVRP - STORE THE RP11E REGISTERS
3750                                  ;*THIS ROUTINE STORES THE RP11E REGISTERS FOR USE BY THE PROGRAM.
3751                                  ;*THE PROGRAM DOES NOT USE THE 'LIVE' REGISTERS FOR ERROR DETERMINATION.
3752                                  ;CALL
3753                                  ;       JSR     PC,SAVRP
3754                                  ;       RETURN
3755
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3756  015164  010046                          SAVRP:  MOV     R0,-(SP)        ;SAVE R0
3757  015166  013700  001266                          MOV     RPADR,R0        ;RP11 ADDRESS
3758  015172  016037  000000  002004                  MOV     RPDS(R0),$RPDS  ;STORE RPDS
3759  015200  016037  000002  002006                  MOV     RPER(R0),$RPER  ;STORE RPER
3760  015206  016037  000004  002010                  MOV     RPCS(R0),$RPCS  ;STORE RPCS
3761  015214  016037  000006  002012                  MOV     RPWC(R0),$RPWC  ;STORE RPWC
3762  015222  016037  000010  002014                  MOV     RPBA(R0),$RPBA  ;STORE RPBA
3763  015230  016037  000012  002016                  MOV     RPCA(R0),$RPCA  ;STORE RPCA
3764  015236  016037  000014  002020                  MOV     RPDA(R0),$RPDA  ;STORE RPDA
3765  015244  016037  000016  002022                  MOV     RPM1(R0),$RPM1  ;STORE RPM1
3766  015252  016037  000024  002024                  MOV     SUCA(R0),$SUCA  ;STORE SUCA
3767  015260  016037  000026  002026                  MOV     SILO(R0),$SILO  ;STORE SILO
3768  015266  012600                                  MOV     (SP)+,R0        ;RESTORE R0
3769  015270  000207                                  RTS     PC              ;RETURN
3770
3771                                  ;;*****************************************************************
3772                                  .SBTTL  DSELCT - SETUP INDICATORS TO DEASSIGN AN UNSAFE/OFFLINE DRIVE
3773                                  ;*THIS ROUTINE SETS A BIT IN LOCATION 'DSELCT' WHICH IS USED TO DESELCT
3774                                  ;*AN UNSAFE/OFFLINE DRIVE WHICH WAS ASSIGNED BY THE OPERATOR FOR TESTING
3775                                  ;*OR WHICH WENT OFFLINE OR UNSAFE DURING TESTING.
3776                                  ;CALL
3777                                  ;       JMP     @#DSELCT
3778
3779  015272  013701  001246          DSELCT: MOV     CHKDRV,R1       ;GET DRIVE NUMBER
3780  015276  156137  001314  001252          BISB    ATABIT(R1),DRVBAD  ;USE AS INDEX TO LOAD ATA BIT FOR DRIVE
3781                                                                  ;IN DESELECT LOCATION.
3782  015304  005037  177776                  CLR     PSW             ;SET PRIORITY BACK TO ZERO
3783  015310  000137  007474                  JMP     @#SEOP          ;FORCE END OF PASS FOR THE DRIVE
3784
3785                                  ;;*****************************************************************
3786                                  .SBTTL  RESTOR - HOME SEEK ROUTINE
3787                                  ;*THIS ROUTINE PERFORMS A HOME SEEK ON THE SELECTED DRIVE.  THE ROUTINE
3788                                  ;*IS CALLED AFTER THE PROGRAM DETERMINES THAT THE DRIVE IS POSITIONED
3789                                  ;*INCORRECTLY AFTER A SEEK OR A UTILITY HOME SEEK OPERATION IS REQUIRED.
3790                                  ;CALL
3791                                  ;       JSR     PC,RESTOR
3792                                  ;       RETURN
3793
3794  015314  104412                  RESTOR: SAVREG                  ;SAVE R0-R5
3795  015316  013746  001110                  MOV     $LPERR,-(SP)    ;SAVE LOOP ON ERROR ADDRESS
3796  015322  012737  015334  001110          MOV     #1$,$LPERR      ;LOOP ON ERROR ADDRESS
3797  015330  013700  001266                  MOV     RPADR,R0        ;RP11 ADDRESS
3798  015334  012760  000001  000004  1$:     MOV     #CLEAR,RPCS(R0) ;CLEAR THE RP11
3799  015342  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
3800  015350  012777  015530  163712          MOV     #RESTR1,@RPVEC  ;INTERRUPT RETURN
3801  015356  013746  001364                  MOV     DPB,-(SP)       ;SETUP RPCS CONTENTS
3802  015362  112716  000015                  MOVB    #HOMSEK,(SP)    ;COMMAND CODE
3803  015366  052716  020000                  BIS     #AIE,(SP)       ;ATTENTION INTERRUPT ENABLE
3804  015372  012660  000004                  MOV     (SP)+,RPCS(R0)  ;START THE HOME SEEK
3805  015376  005037  177776                  CLR     PSW             ;SET PRIORITY TO ZERO
3806  015402  010637  001242                  MOV     SP,SPSAV        ;SAVE THE STACK POINTER
3807  015406  012737  004704  001300          MOV     #2500.,STALLG   ;SET STALL VALUE TO 2500MS
3808  015414  004037  015572                  JSR     R0,STALLA       ;WAIT THE SPECIFIED VALUE
3809  015420  001300                          .WORD   STALLG          ;STALL VALUE STORAGE
3810  015422  004737  015164                  JSR     PC,SAVRP        ;GET THE REGISTERS
3811  015426  032737  001000  002004          BIT     #SUFU,$RPDS     ;DRIVE UNSAFE ?
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                                        BEQ     2$              ;BR IF NOT
                                        ERROR   2               ;DRIVE UNSAFE
015434  001403
015436  104002
015440  000137  015272                  JMP     DSELCT          ;DESELECT THE DRIVE
015444  032737  040000  002004  2$:     BIT     #SUOL,$RPDS     ;IS THE DRIVE STILL ONLINE ?
015452  001003                          BNE     3$              ;BR IF IT IS
015454  104010                          ERROR   10              ;DRIVE OFFLINE AFTER POSITIONING
015456  000137  015272                  JMP     DSELCT          ;DESELECT THE DRIVE
015462  032737  100000  002004  3$:     BIT     #SURDY,$RPDS    ;IS THE DRIVE READY ?
015470  001003                          BNE     4$              ;BR IF IT IS
015472  104016                          ERROR   16              ;DRIVE NOT READY AFTER POSITIONING
015474  000137  015272                  JMP     DSELCT          ;DESELECT THE DRIVE
015500  104005                  4$:     ERROR   5               ;DRIVE HAS NOT INTERRUPTED WITHIN 1 SEC
015502  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
015510  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
015516  012777  000100  163420          MOV     #BIT6,@$TKS     ;SET INTERRUPT ENABLE FOR TTY KEYBOARD
015524  000177  163514                  JMP     @BYPASS         ;TERMINATE THE PRESENT TEST
015530  013706  001242          RESTR1: MOV     SPSAV,SP        ;RESTORE THE STACK POINTER
015534  005037  177776                  CLR     PSW             ;RESET THE PSW
015540  004737  015164                  JSR     PC,SAVRP        ;SAVE THE REGISTERS
015544  032737  004000  002004          BIT     #SUSI,$RPDS     ;SEEK INCOMPLETE ?
015552  001403                          BEQ     2$              ;BR IF NOT
015554  104015                          ERROR   15              ;SEEK INCOMPLETE
015556  000137  015272                  JMP     DSELCT          ;DESELECT THE DRIVE
015562  012637  001110          2$:     MOV     (SP)+,$LPERR    ;RESTORE THE LOOP ON ERROR ADDRESS
015566  104413                          RESREG                  ;RESTORE R0-R5
015570  000207                          RTS     PC              ;RETURN

                        ;.*****************************************************************
                        .SBTTL  STALL - USED TO STALL AFTER A DRIVE FUNCTION IS COMPLETE
                        ;*THIS ROUTINE WILL PROVIDE A STALL IN MILLISECONDS FOR A SPECIFIC
                        ;*AMOUNT OF TIME IF SWITCH 02 IS NOT SET OR A RANDOM AMOUNT OF TIME IF
                        ;*SWITCH 02 IS SET.
                        ;*STALL1 CONTAINS SPECIFIED TIME FOR TESTS 0-6.
                        ;CALL
                        ;       JSR     R0,@#STALL
                        ;       TIME POINTER            ;WHERE TO FIND THE STALL TIME
                        ;
                        ;       JSR     R0,@#STALLA     ;ENTER HERE TO BYPASS RANDOM STALL SELECTION
                        ;       TIME POINTER            ;WHERE TO FIND THE STALL TIME

015572  013046          STALLA: MOV     @(R0)+,-(SP)    ;PICKUP STALL TIME
015574  000413                  BR      STALLB          ;BYPASS RANDOM STALL CHECK
015576  013046          STALL:  MOV     @(R0)+,-(SP)    ;PICKUP STALL TIME
015600  032737  000004  163332          BIT     #SW2,@SWR       ;USE A RANDOM TIME?
015606  001406                          BEQ     STALLB          ;NO--BRANCH
015610  004737  013540                  JSR     PC,@#$RAND      ;YES--FORM RANDOM NUMBER
015614  013716  013640                  MOV     @#$LONUM,(SP)   ;AND USE IT FOR THE STALL TIME
015620  042716  177700                  BIC     #^C77,(SP)      ;BUT NEVER > 64 MILLISECONDS
015624  005046          STALLB: CLR     -(SP)           ;CLEAR TEMP. LOCATION
015626  162766  000001  000002  2$:     SUB     #1,2(SP)        ;MORE STALL REQUIRED?
015634  103407                          BLO     4$              ;NO--BRANCH
015636  012716  000620                  MOV     #400.,(SP)      ;STALL  TIME CONSTANT
015642  005700                  3$:     TST     R0              ;NOP TO KILL TIME
015644  005366  000000                  DEC     0(SP)           ;COUNT
015650  001374                          BNE     3$              ;LOOP IF MORE COUNTS NEEDED
015652  000765                          BR      2$
```

```
3868  015654  022626                  4$:     CMP     (SP)+,(SP)+     ;CLEAN OFF THE STACK
3869  015656  000200                          RTS     R0              ;EXIT
3870
3871
3872                                  ;*****************************************************************
3873                                  .SBTTL  SORT - ROUTINE TO SORT & PRINT SEEK TIMES
3874                                  ;*THIS ROUTINE DETERMINES THE NUMBER OF TIMES A PARTICULAR FORWARD OR REVERSE
3875                                  ;*SEEK TIME WAS OBTAINED.  THE SEEK TIMES ARE SORTED IN DECENDING SEQUENCE
3876                                  ;*AND THE NUMBER OF OCCURENCES OF A PARTICULAR SEEK TIME ARE TOTALED.  THE
3877                                  ;*THE ROUTINE WILL TYPEOUT ONLY THE LONGEST 5 SEEK TIMES.  FORWARD SEEK TIMES
3878                                  ;*ARE STORED IN A TABLE STARTING AT 'FRWSTR'; REVERSE SEEK TIMES ARE STORED
3879                                  ;*IN A TABLE STARTING AT 'RVSTR'.
3880                                  ;CALL
3881                                  ;       JSR     R0,SORT         ;SORT AND TYPE THE SEEK TIMES
3882                                  ;       NUMBER OF ITEMS         ;NUMBER OF ITEMS IN THE TABLE (405 MAX)
3883
3884  015660  012037  016126          SORT:   MOV     (R0)+,7$        ;GET THE ENTRY COUNT
3885  015664  104412                          SAVREG                  ;SAVE R0-R5
3886  015666  012705  177776                  MOV     #-2,R5          ;COUNT FOR FORWARD & REVERSE
3887  015672  012737  024040  001162          MOV     #FRWSTR,$REG0   ;INITIALIZE POINTER TO FORWARD SEEK TIMES
3888  015700  012737  024042  001164          MOV     #FRWSTR+2,$REG1  ;SECOND FORWARD SEEK TIME POINTER
3889  015706  012737  023540  001166          MOV     #BUFR4,$REG2
3890  015714  012737  023620  001170          MOV     #BUFR5,$REG3    ;INITIALIZE POINTER TO '# OF TIMES'
3891  015722  013700  001162          1$:     MOV     $REG0,R0        ;TYPE 'SEEK TIME'
3892  015726  013701  001164                  MOV     $REG1,R1
3893  015732  013702  016126                  MOV     7$,R2           ;NUMBER OF ITEMS IN THE TABLE
3894  015736  005003                          CLR     R3
3895  015740  021011                  2$:     CMP     (R0),(R1)       ;SORT THE ITEMS & PUT THEM
3896  015742  003404                          BLE     3$              ;IN DESCENDING ORDER
3897  015744  011004                          MOV     (R0),R4         ;LARGER ITEMS AT TOP OF LIST,
3898  015746  011110                          MOV     (R1),(R0)       ;SMALLER AT THE BOTTOM
3899  015750  010411                          MOV     R4,(R1)
3900  015752  005203                          INC     R3
3901  015754  005720                  3$:     TST     (R0)+
3902  015756  005721                          TST     (R1)+
3903  015760  005302                          DEC     R2
3904  015762  001366                          BNE     2$
3905  015764  005703                          TST     R3              ;SORTED ALL ITEMS?
3906  015766  001355                          BNE     1$              ;IF NOT LOOP BACK
3907  015770  013700  001162                  MOV     $REG0,R0        ;PTR TO 'SEEK TIME'
3908  015774  013701  001166                  MOV     $REG2,R1        ;SAVE 'SEEK TIME' HERE
3909  016000  013702  001170                  MOV     $REG3,R2        ;SAVE '# OF TIMES' HERE
3910  016004  010204                          MOV     R2,R4
3911  016006  005024                          CLR     (R4)+           ;CLR OUT 5 WORDS OF
3912  016010  005024                          CLR     (R4)+           ;'# OF TIMES'BUFR
3913  016012  005024                          CLR     (R4)+
3914  016014  005024                          CLR     (R4)+
3915  016016  005024                          CLR     (R4)+
3916  016020  012703  177773                  MOV     #-5,R3          ;SAVE ONLY 5 DIFFERENT 'SEEK TIMES'
3917  016024  011011                          MOV     (R0),(R1)       ;FIND OUT THE '# OF TIMES'
3918  016026  013703  016126                  MOV     7$,R3           ;EACH 'SEEK TIME' WAS
3919  016032  022011                  4$:     CMP     (R0)+,(R1)
3920  016034  001411                          BEQ     5$              ;OBTAINED
3921  016036  005721                          TST     (R1)+
3922  016040  016011  177776                  MOV     -2(R0),(R1)     ;SAVE 'SEEK TIME'
3923  016044  005722                          TST     (R2)+
```

```
                                                        MOV     #1,(R2)         ;KEEP '# OF TIMES'
                                                        DEC     R3
                                                        BEQ     6$
                                                        BR      4$
                                                5$:     INC     (R2)            ;INCREMENT '# OF TIMES'
                                                        DEC     R3              ;ALL DONE?
                                                        BNE     4$              ;IF NOT, GO BACK
                                                6$:     INC     R5              ;SORTED BOTH FORWARD & REVERSE ?
                                                        BEQ     GOTYPE          ;IF YES, TYPE THE VALUES
                                                        MOV     #RVSTR,$REG0    ;IF NOT, INITIALIZE POINTER TO REVERSE SEEK TIMES
                                                        MOV     #RVSTR+2,$REG1  ;SECOND REVERSE SEEK TIME POINTER
                                                        MOV     #BUFR6,$REG2    ;SAVE 'SEEK TIME'
                                                        MOV     #BUFR7,$REG3    ;SAVE '# OF TIMES' HERE
                                                        JMP     1$              ;GO BACK & DO SORTING FOR REVERSE SEEK TIMES

                                                7$:     .WORD   0               ;ITEMS IN TABLE COUNT HERE


                                                ;TYPEOUT THE HEADER FOR THE SEEK TIME RESULTS

                                                GOTYPE:
                                                        TYPE    ,65$            ;;TYPE ASCIZ STRING
                                                        BR      64$             ;;GET OVER THE ASCIZ
                                                ;;65$:  .ASCIZ  <15><12>/(SEEK TIME IS IN MICRO SECONDS)/
                                                64$:
                                                        TYPE    ,67$            ;;TYPE ASCIZ STRING
                                                        BR      66$             ;;GET OVER THE ASCIZ
                                                ;;67$:  .ASCIZ  <15><12><12>/     FORWARD          REVERSE/
                                                66$:
                                                        TYPE    ,69$            ;;TYPE ASCIZ STRING
                                                        BR      68$             ;;GET OVER THE ASCIZ
                                                ;;69$:  .ASCIZ  <15><12>/  # OF    SEEK  # OF    SEEK/
                                                68$:
                                                        TYPE    ,71$            ;;TYPE ASCIZ STRING
                                                        BR      70$             ;;GET OVER THE ASCIZ
                                                ;;71$:  .ASCIZ  <15><12>/  SEEKS    TIME  SEEKS    TIME/<15><12>
                                                70$:

                                                ;TYPEOUT THE '# OF SEEKS' & 'SEEK TIME' OBTAINED FOR EACH OF THOSE SEEKS

                                                TYPTIM: CLR     R0
                                                        CLR     R5
                                                1$:     TYPE    ,$CRLF
                                                        MOV     BUFR5(R0),-(SP) ;GET '# OF SEEKS'  IF NONE (0)
                                                        BEQ     3$              ;SKIP TYPING (FRWRD SEEK)
                                                        TYPDS                   ;GO TYPE OUT DECIMAL '# OF SEEKS'
                                                        TYPE
                                                        BLNKS2
                                                        MOV     BUFR4(R0),-(SP) ;GET 'SEEK TIME' FOR EACH OF
                                                        TYPDS                   ;OF THAT '# OF SEEKS'.  'GO
                                                                                ;TYPE OUT IN DECIMAL
                                                        TYPE    ,65$            ;;TYPE ASCIZ STRING
                                                        BR      64$             ;;GET OVER THE ASCIZ
                                                ;;65$:  .ASCIZ  /0/
                                                64$:
                                                2$:     MOV     BUFR7(R0),-(SP)  ;GET '# OF SEEKS'  IF NONE - 0
                                                        BEQ     4$              ;SKIP TYPING (REVRSE SEEK)
```

```
016434  005705                  TST     R5              ;'FORWARD' VALUE FOR THIS LINE ?
016436  001404                  BEQ     6$              ;BR IF YES
016440  104401  002035          TYPE    .BLNKS8         ;TYPE FILLER BLANKS
016444  104401  002036          TYPE    .BLNKS7
016450  104405              6$: TYPDS                   ;TYPE OUT IN DECIMAL
016452  104401  002043          TYPE    .BLNKS2         ;2 BLANKS
016456  016046  023700          MOV     BUFR6(R0),-(SP) ;GET 'SEEK TIME' & TYPE IT
016462  104405                  TYPDS                   ;OUT IN DECIMAL
016464  104401  016472          TYPE    ,67$            ;;TYPE ASCIZ STRING
016470  000401                  BR      66$             ;;GET OVER THE ASCIZ
                        ;;67$:  .ASCIZ  /0/
016474                  66$:
016474  000406                  BR      5$
016476  005726              3$: TST     (SP)+           ;POP STACK
016500  005205                  INC     R5
016502  000751                  BR      2$
016504  005726              4$: TST     (SP)+           ;POP STACK
016506  005705                  TST     R5
016510  001004                  BNE     7$
016512  005720              5$: TST     (R0)+           ;INCREMENT PTR TO TABLES
016514  020027  000012          CMP     R0,#10.         ;ALL DONE?
016520  001323                  BNE     1$              ;IF NOT GO BACK
016522  104413              7$: RESREG                  ;RESTORE R0-R5
016524  000200                  RTS     R0              ;RETURN

                        ;:*****************************************************************
                        .SBTTL  SEEK TIME MEASUREMENT ROUTINE
                        ;*THIS ROUTINE MEASURES THE TIME REQUIRED TO SEEK TO THE SPECIFIED CYLINDER.
                        ;*THE ROUTINE USES THE 'SOT' COUNTER IN THE CONTROLLER TO MEASURE THE SEEK
                        ;*TIME.  THE SEEK TIME MEASUREMENT IS BASED ON THE NUMBER OF SECTORS
                        ;*OCCURING BETWEEN SEEK START AND SEEK COMPLETE.  THE RESOLUTION OF THIS
                        ;*MEASUREMENT METHOD IS + OR - 2.5 MS (ONE SECTOR TIME).
                        ;CALL
                        ;       JSR     PC,TIMSEK       ;TIME THE SEEK TO THE CYLINDER IN DPB+2
                        ;       RETURN                  ;SEEK TIME IS RETURNED IN R3


016526  010046          TIMSEK: MOV     R0,-(SP)        ;SAVE R0
016530  010246                  MOV     R2,-(SP)        ;SAVE R2
016532  013746  001110          MOV     $LPERR,-(SP)    ;SAVE CURRENT LOOP ON ERROR ADDRESS
016536  012737  016550  001110  MOV     #TIMSK1,$LPERR  ;NEW LOOP ON ERROR ADDRESS
016544  013700  001266          MOV     RPADR,R0        ;RP11 BASE ADDRESS
016550  005003          TIMSK1: CLR     R3              ;R3 WILL BE USED TO COUNT THE DISK REVOLUTIONS
016552  012737  000062  001300  MOV     #50.,STALLG     ;SET STALL VALUE TO 50MS
016560  004037  015572          JSR     R0,STALLA       ;WAIT THE SPECIFIED VALUE
016564  001300                  .WORD   STALLG          ;STALL VALUE STORAGE
016566  016002  000014      1$: MOV     RPDA(R0),R2     ;READ THE SECTOR/TRACK REGISTER
016572  032702  000200          BIT     #BIT7,R2        ;WAIT FOR SECTOR 8, THEN START LOOKING
016576  001773                  BEQ     1$              ;FOR SECTOR 0.
016600  016002  000014      2$: MOV     RPDA(R0),R2     ;READ THE SECTOR REGISTER
016604  026002  000014          CMP     RPDA(R0),R2     ;WAS IT CHANGING ?
016610  001373                  BNE     2$              ;BR IF IT WAS
016612  032702  000360          BIT     #360,R2         ;WAIT FOR SEC 0, INDEX MARK
016616  001370                  BNE     2$              ;AS SOON AS IT IS AT SECTOR 0, START
                                                        ;A SEEK & BEGIN TIMING
016620  012777  017066  162442  MOV     #TIMSK2,@RPVEC  ;INTERRUPT ADDRESS
```

```
4036  016626  012760  000377  000000          MOV     #377,RPDS(R0)   ;CLEAR ANY ATTENTION BITS
4037  016634  013760  001366  000012          MOV     DPB+2,RPCA(R0)  ;LOAD CYLINDER ADDRESS
4038  016642  013746  001364                  MOV     DPB,-(SP)       ;SETUP COMMAND
4039  016646  052716  020000                  BIS     #IE,(SP)        ;SET ATTENTION INTERRUPT ENABLE
4040  016652  012660  000004                  MOV     (SP)+,RPCS(R0)  ;ISSUE A SEEK, START TIMING
4041  016656  005037  177776                  CLR     PSW             ;SET PRIORITY TO ZERO
4042  016662  016002  000014          3$:     MOV     RPDA(R0),R2     ;READ THE SECTOR REGISTER
4043  016666  026002  000014                  CMP     RPDA(R0),R2     ;WAS IT CHANGING ?
4044  016672  001373                          BNE     3$              ;BR IF IT WAS
4045  016674  032702  000360                  BIT     #360,R2         ;WAIT FOR SEC CNTR TO MOVE
4046  016700  001770                          BEQ     3$              ;FROM 0 TO 1
4047  016702  016002  000014          4$:     MOV     RPDA(R0),R2     ;READ THE SECTOR REGISTER
4048  016706  026002  000014                  CMP     RPDA(R0),R2     ;WAS IT CHANGING ?
4049  016712  001373                          BNE     4$              ;BR IF IT WAS
4050  016714  032702  000360                  BIT     #360,R2         ;WAIT FOR SECTOR 0
4051  016720  001370                          BNE     4$              ;BR IF NOT AT 0
4052  016722  005203                          INC     R3              ;COUNT A DISK REVOLUTION (25MS)
4053  016724  022703  000050                  CMP     #40.,R3         ;1 SECOND ELAPSED ?
4054  016730  003354                          BGT     3$              ;BR IF NOT
4055  016732  004737  015164                  JSR     PC,SAVRP        ;SAVE THE REGISTERS
4056  016736  032737  001000  002004          BIT     #SUFU,$RPDS     ;FILE UNSAFE ?
4057  016744  001403                          BEQ     5$              ;BR IF NOT
4058  016746  104002                          ERROR   2               ;REPORT DRIVE UNSAFE
4059  016750  000137  015272                  JMP     DSELCT          ;SETUP TO DESELECT THE DRIVE
4060  016754                          5$:
4061  016754  013737  002004  001126          MOV     $RPDS,$BDDAT    ;GET CONTENTS OF RPDS
4062  016762  012737  000000  001122          MOV     #RPDS,$BDADR  ;FORM REGISTER ADDRESS FOR ERROR MESSAGE
4063  016770  063737  001266  001122          ADD     RPADR,$BDADR  ;ADD RP11 BASE ADDRESS
4064  016776  012737  140000  001124          MOV     #SURDY!SUOL,$GDDAT  ;WHAT REGISTER SHOULD BE
4065  017004  013737  001126  001204          MOV     $BDDAT,$TMP0    ;MOVE REGISTER CONTENTS TO '$TMP0'
4066  017012  042737  037777  001204          BIC     #^C140000,$TMP0 ;SAVE THE SPECIFIED BITS
4067  017020  023737  001124  001204          CMP     $GDDAT,$TMP0    ;COMPARE THE BITS
4068  017026  001403                          BEQ     6$              ;BR IF OK
4069  017030  104017                          ERROR   17              ;NOT READY/OFFLINE DURING TIMING TEST
4070  017032  000137  015272                  JMP     DSELCT          ;DESELECT THE DRIVE
4071  017036  104005                  6$:     ERROR   5               ;NO INTERRUPT AFTER 1 SECOND
4072  017040  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
4073  017046  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
4074  017054  012777  000100  162062          MOV     #BIT06,@$TKS    ;SET KEYBOARD INTERRUPT ENABLE
4075  017062  000177  162156                  JMP     @BYPASS         ;TERMINATE THE TEST
4076  017066  012626                  TIMSK2: MOV     (SP)+,(SP)+     ;RESTORE THE STACK POINTER
4077  017070  016002  000014                  MOV     RPDA(R0),R2     ;SAVE RPDA
4078  017074  005037  177776                  CLR     PSW             ;SET PRIORITY TO ZERO
4079  017100  032702  000360                  BIT     #360,R2         ;AT SECTOR 0 ?
4080  017104  001001                          BNE     1$              ;BR IF NOT
4081  017106  005203                          INC     R3              ;INCREMENT THE REVOLUTION COUNTER
4082  017110  004737  015164          1$:     JSR     PC,SAVRP        ;STORE THE REGISTERS
4083  017114  032737  004000  002004          BIT     #SUSI,$RPDS     ;SEEK INCOMPLETE ?
4084  017122  001405                          BEQ     2$              ;BR IF NOT
4085  017124  104015                          ERROR   15              ;SEEK INCOMPLETE
4086  017126  004737  015314                  JSR     PC,RESTOR       ;DO A HOME SEEK
4087  017132  000177  162106                  JMP     @BYPASS         ;TERMINATE THE PRESENT TEST
4088  017136  032737  100000  000004  2$:     BIT     #ERR,RPCS       ;OTHER ERRORS ?
4089  017144  001412                          BEQ     SKDON           ;BR IF NOT
4090  017146  104004                          ERROR   4               ;REPORT ERROR DURING TIMING TEST
4091  017150  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
```

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 4092  017156  012760  000001  000004          MOV     #CLEAR,RPCS(R0) ;CLEAR THE CONTROLLER
 4093  017164  113760  001365  000005          MOVB    DPB+1,RPCS+1(R0)  ;RESELECT THE DRIVE
 4094  017172  042702  177417          SKDON:  BIC     #^C360,R2       ;CLEAR SECTOR/TRACK BITS - LEAVE THE 'SOT'
 4095  017176  006202                          ASR     R2              ;RIGHT JUSTIFY 'SOT'
 4096  017200  006202                          ASR     R2              ;RIGHT JUSTIFY 'SOT'
 4097  017202  006202                          ASR     R2              ;RIGHT JUSTIFY 'SOT'
 4098  017204  006202                          ASR     R2              ;RIGHT JUSTIFY 'SOT'
 4099  017206  012746  000010                  MOV     #10.,-(SP)              ;;PUT THE MULTIPLER ON THE STACK
 4100  017212  010346                          MOV     R3,-(SP)                ;;PUT THE MULTIPLICAND ON THE STACK
 4101  017214  004737  013052                  JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
 4102  017220  012616                          MOV     (SP)+,(SP)      ;;DISREGARD THE MSB'S
 4103  017222  012603                          MOV     (SP)+,R3                ;;GET THE LSB'S OF THE PRODUCT
 4104  017224  060203                          ADD     R2,R3           ;ADD PARTIAL SECTOR COUNT
 4105                                                                  ;NOTE THERE IS A SCALE FACTOR
 4106  017226  012746  000372                  MOV     #250.,-(SP)             ;;PUT THE MULTIPLER ON THE STACK
 4107  017232  010346                          MOV     R3,-(SP)                ;;PUT THE MULTIPLICAND ON THE STACK
 4108  017234  004737  013052                  JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
 4109  017240  012616                          MOV     (SP)+,(SP)      ;;DISREGARD THE MSB'S
 4110  017242  012603                          MOV     (SP)+,R3                ;;GET THE LSB'S OF THE PRODUCT
 4111
 4112                                  ;;*****************************************************************
 4113                                  ;SEEK TIME (IN US) = [(R3)X(10)+(R2)]X(250)X(10)
 4114                                  ;;*****************************************************************
 4115
 4116  017244  012637  001110                  MOV     (SP)+,$LPERR    ;RESTORE THE LOOP ON ERROR ADDRESS
 4117  017250  012602                          MOV     (SP)+,R2        ;RESTORE R2
 4118  017252  012600                          MOV     (SP)+,R0        ;RESTORE R0
 4119  017254  000207                          RTS     PC              ;RETURN
 4120
 4121                                  ;;*****************************************************************
 4122                                  .SBTTL  GETADR - GET BUS ADDRESS AND VECTOR ADDRESS
 4123                                  ;*THIS ROUTINE IS USED TO INSURE THE BUS ADDRESS
 4124                                  ;*OF THE RP11 IS SETUP TO READ THE PROPER VALUE.
 4125                                  ;*IT WILL ALSO READ THE ADDRESS FROM THE TTY IF
 4126                                  ;*REQUIRED.
 4127                                  ;NOTE: THIS ROUTINE DESTROYS R0-R4
 4128                                  ;CALL
 4129                                  ;
 4130                                  ;       JSR     PC,@#GETADR
 4131                                  ;       RETURN
 4132
 4133  017256  005737  001224  GETADR: TST     @#BUSADR        ;INPUT FROM TTY REQUESTED?
 4134  017262  001447                  BEQ     7$              ;NO--BRANCH
 4135  017264  005037  001224          CLR     @#BUSADR        ;YES--CLEAR THE REQUEST FLAG
 4136  017270  012700  001266  1$:     MOV     #RPADR,R0       ;FIRST ADDRESS
 4137  017274  012703  021440          MOV     #MRPCS,R3       ;"RPADR="
 4138  017300  011004                  MOV     (R0),R4         ;PRESENT RP11 ADDRESS
 4139  017302  004037  017460          JSR     R0,@#GETNUM     ;GET NEW RP11 ADDRESS
 4140  017306  000402                  BR      2$              ;COMMA
 4141  017310  000767                  BR      1$              ;PERIOD
 4142  017312  000430                  BR      5$              ;DOUBLE PERIOD
 4143  017314  010420          2$:     MOV     R4,(R0)+        ;SAVE NEW RHCS1
 4144  017316  012703  021450          MOV     #MRPVEC,R3      ;"RPVEC="
 4145  017322  011004                  MOV     (R0),R4         ;PRESENT RP11 VECTOR ADDRESS
 4146  017324  004037  017460          JSR     R0,@#GETNUM     ;GET NEW RPVEC
 4147  017330  000402                  BR      3$              ;COMMA
```

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                                        BR      1$              ;PERIOD
                                        BR      5$              ;DOUBLE PERIOD
                                3$:     MOV     R4,(R0)+        ;SAVE NEW RPVEC
017340  012703  021461                  MOV     #^RPPRI,R3      ;"RPPRIO="
017344  011004                          MOV     (R0),R4         ;PRESENT RP11 PRIORITY LEVEL
017346  006304                          ASL     R4              ;POSITION FOR TYPEOUT
017350  006304                          ASL     R4
017352  006304                          ASL     R4
017354  000304                          SWAB    R4
017356  004037  017460                  JSR     R0,@#GETNUM     ;GET NEW RPPRIO
017362  000402                          BR      4$              ;COMMA
017364  000401                          BR      4$              ;PERIOD
017366  000404                          BR      6$              ;DOUBLE PERIOD
017370  010210                  4$:     MOV     R2,(R0)         ;SAVE NEW RPPRIO
017372  000736                          BR      1$              ;LOOP
017374  010410                  5$:     MOV     R4,(R0)         ;SAVE INPUT
017376  000401                          BR      7$
017400  010210                  6$:     MOV     R2,(R0)         ;SAVE PRIORITY
017402  013701  000004          7$:     MOV     @#ERRVEC,R1     ;SAVE THE ERROR VECTOR
017406  012737  017426  000004          MOV     #8$,@#ERRVEC    ;SETUP FOR TRAP
017414  005777  161646                  TST     @RPADR          ;CHECK FOR RP11
017420  010137  000004                  MOV     R1,@#ERRVEC     ;RESTORE ERROR VECTOR
017424  000207                          RTS     PC              ;RETURN
017426  010137  000004          8$:     MOV     R1,@#ERRVEC     ;RESTORE ERROR VECTOR
017432  022626                          CMP     (SP)+,(SP)+     ;CLEAN OFF THE STACK
017434  104001                          ERROR   1               ;REPORT THE ERROR
017436  005737  000042                  TST     @#42            ;IS THERE A MONITOR?
017442  001712                          BEQ     1$              ;NO--GO ASK FOR ADDRESS
017444  005037  001232                  CLR     @#DRVSEL        ;YES--NO DRIVES SELECTED
017450  005037  007650                  CLR     @#$EOPCT        ;NO PASSES
017454  000137  007474                  JMP     @#$EOP          ;GO TO END OF PROGRAM

;;*****************************************************************
;.SBTTL  GETNUM - ROUTINE TO GET A NUMBER
;*THIS ROUTINE WILL TYPE AN ASCIZ MESSAGE AND THEN
;*INPUT AN ASCIZ STRING AND CHANGE THE STRING TO OCTAL
;*IF REQUIRED.
;*NOTE: THIS ROUTINE DESTROYS R1
;CALL
;       MOV     #ADR,R3         ;ADDRESS OF ASCIZ MESSAGE
;       MOV     #NUM,R4         ;OCTAL NUMBER
;       JSR     R0,@#GETNUM
;       RETURN1                 ;INPUT TERMINATED WITH A COMMA
;       RETURN2                 ;WITH A PERIOD
;       RETURN3                 ;WITH A DOUBLE PERIOD
;                               ;R4=INPUT NUMBER AND
;                               ;R2=R4*32 FOR ALL
;                               ;THREE RETURNS

017460  010337  017466  GETNUM: MOV     R3,2$           ;SAVE MESSAGE POINTER
017464  104401          1$:     TYPE                    ;TYPE THE MESSAGE
017466  000000          2$:     .WORD   0               ;MESSAGE POINTER GOES HERE
017470  010446                  MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
017472  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
017474  104411                  RDLIN                   ;READ AN ASCIZ STRING
017476  012601                  MOV     (SP)+,R1        ;ADDRESS OF FIRST CHARACTER
```

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4204  017500  004037  021044          JSR     R0,@#CK.CHR     ;CHECK ONE CHARACTER
4205  017504  017464                  1$                      ;ILLEGAL CHARACTER
4206  017506  017464                  1$                      ;CARRIAGE RETURN
4207  017510  017520                  3$                      ;"/"
4208  017512  017544                  7$                      ;","
4209  017514  017552                  8$                      ;"."
4210  017516  017464                  1$                      ;DIGIT 0-9
4211  017520                  3$:
4212  017520  004037  021300          JSR     R0,@#CK.NUM     ;CHECK THE NUMBER
4213  017524  017464                  1$                      ;ILLEGAL INPUT
4214  017526  017540                  6$                      ;TERMINATED WITH A ";"
4215  017530  017536                  5$                      ;TERMINATED WITH A ":"
4216  017532  017534                  4$                      ;TERMINATED WITH A ".."
4217  017534  005720          4$:     TST     (R0)+           ;DOUBLE PERIOD
4218  017536  005720          5$:     TST     (R0)+           ;SINGLE PERIOD
4219  017540  010204          6$:     MOV     R2,R4           ;COMMA--SAVE INPUT NUMBER
4220  017542  000414                  BR      10$             ;GO TO EXIT
4221  017544  105711          7$:     TSTB    (R1)            ;TERMINATOR AFTER A COMMA?
4222  017546  001346                  BNE     1$              ;NO--LOOP
4223  017550  000411                  BR      10$             ;YES--EXIT
4224  017552  105711          8$:     TSTB    (R1)            ;TERMINATOR AFTER A PERIOD?
4225  017554  001406                  BEQ     9$              ;YES--EXIT
4226  017556  122721  000056          CMPB    #'.,(R1)+       ;NO--DOUBLE PERIOD?
4227  017562  001340                  BNE     1$              ;NO--LOOP
4228  017564  105711                  TSTB    (R1)            ;YES--TERMINATOR?
4229  017566  001336                  BNE     1$              ;NO--LOOP
4230  017570  005720                  TST     (R0)+           ;DOUBLE PERIOD
4231  017572  005720          9$:     TST     (R0)+           ;PERIOD
4232  017574  010402          10$:    MOV     R4,R2           ;COMMA--POSITION THE
4233  017576  000302                  SWAB    R2              ;NUMBER IN CASE IT
4234  017600  006202                  ASR     R2              ;IS THE PRIORITY LEVEL
4235  017602  006202                  ASR     R2
4236  017604  006202                  ASR     R2
4237  017606  000200                  RTS     R0              ;EXIT
4238
4239                  ;;*****************************************************************
4240                  .SBTTL  GT.PRM - GET PARAMETERS
4241                  ;*THIS ROUTINE IS USED TO CHANGE OR MODIFY
4242                  ;*THE TEST PARAMETERS.  IT GIVES THE OPERATOR
4243                  ;*THE CAPABILITY OF SPECIFYING WHICH DRIVES TO TEST, WHICH
4244                  ;*TESTS TO RUN AND HOW MANY TIMES TO
4245                  ;*REPEAT EACH TEST
4246
4247  017610  104412  GT.PRM: SAVREG                          ;SAVE R0-R5
4248  017612  005037  001232  GT.PR1: CLR     DRVSEL          ;NO DRIVE SELECTED
4249  017616  104401  017624          TYPE    ,65$            ;;TYPE ASCIZ STRING
4250  017622  000406                  BR      64$             ;;GET OVER THE ASCIZ
4251
4252  017640          ;;65$:  .ASCIZ  <15><12>/DRIVE(S)=/
4253  017640  104411  64$:            RDLIN                   ;READ TTY
4254  017642  012601                  MOV     (SP)+,R1        ;ADDRESS OF ASCIZ STRING
4255  017644  004037  021044          JSR     R0,@#CK.CHR     ;CHECK ONE CHARACTER
4256  017650  017612                  GT.PR1                  ;ILLEGAL CHARACTER
4257  017652  017612                  GT.PR1                  ;CARRIAGE RETURN
4258  017654  017612                  GT.PR1                  ;"/"
4259  017656  017612                  GT.PR1                  ;"."
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4260  017660  017612                        GT.PR1          ;"."
4261  017662  017664                        1$              ;DIGIT 0-9
4262  017664  005301              1$:       DEC     R1
4263  017666                      2$:
4264  017666  012702  000007                MOV     #7.R2   ;UPPER LIMIT OF INPUT
4265  017672  004037  021120                JSR     R0,@#CK.DIG     ;CHECK THE DIGIT(S)
4266  017676  017612                        GT.PR1          ;ILLEGAL INPUT
4267  017700  017612                        GT.PR1          ;INPUT TO LARGE
4268  017702  017710                        3$              ;TERMINATED WITH A ","
4269  017704  017730                        4$              ;TERMINATED WITH A "/"
4270  017706  017730                        4$              ;TERMINATED WITH A "."
4271  017710  156237  001314  001232  3$:   BISB    ATABIT(R2),DRVSEL ;SET THE DRIVE SELECTED BIT
4272  017716  105741                        TSTB    -(R1)           ;WAS THE LINE TERMINATED?
4273  017720  001362                        BNE     2$              ;NO-GET THE NEXT DRIVE
4274  017722  005037  001234                CLR     @#TSTNMS        ;DESELECT ALL TESTS
4275  017726  000405                        BR      GTTST1          ;YES--SELECT TEST
4276  017730  156237  001314  001232  4$:   BISB    ATABIT(R2),DRVSEL ;SET THE SELECTED DRIVE BITS
4277  017736  104413              GT.PR2:   RESREG                  ;RESTORE R0-R5
4278  017740  000207                        RTS     PC              ;EXIT
4279
4280  017742                      GTTST1:
4281  017742  104401  017750                TYPE    ,65$            ;;TYPE ASCIZ STRING
4282  017746  000403                        BR      64$             ;;GET OVER THE ASCIZ
4283                              ;;65$:    .ASCIZ  /TEST=/
4284  017756                      64$:
4285  017756  104411                        RDLIN                   ;READ AN ASCIZ STRING
4286  017760  012601                        MOV     (SP)+,R1        ;POINTER TO R1
4287  017762  122711  000056                CMPB    #'.,(R1)        ;DOUBLE PERIOD?
4288  017766  001007                        BNE     1$              ;NO--BRANCH
4289  017770  122761  000056  000001        CMPB    #'.,1(R1)
4290  017776  001003                        BNE     1$
4291  020000  105761  000002                TSTB    2(R1)           ;"CR"?
4292  020004  001754                        BEQ     GT.PR2          ;YES--EXIT
4293  020006  005037  001234              1$:       CLR     TSTNMS          ;NO TEST SELECTED
4294  020012  005003                        CLR     R3              ;NO TEST TO BE OPENED
4295  020014  005004              GTTST2:   CLR     R4              ;NO TEST BITS SET
4296  020016  004037  020770                JSR     R0,@#CK.OCT     ;OCTAL DIGIT?
4297  020022  000460                        BR      GTTST4          ;NO--BRANCH
4298  020024  010205                        MOV     R2,R5           ;YES--SAVE IT
4299  020026  005201                        INC     R1              ;MOVE TO NEXT CHARACTER
4300  020030  004037  020770                JSR     R0,@#CK.OCT     ;OCTAL DIGIT
4301  020034  000405                        BR      1$              ;NO--BRANCH
4302  020036  005201                        INC     R1              ;MOVE TO NEXT CHARACTER
4303  020040  006305                        ASL     R5              ;SCALE HIGH DIGIT
4304  020042  006305                        ASL     R5
4305  020044  006305                        ASL     R5
4306  020046  060502                        ADD     R5,R2           ;COMBINE HIGH & LOW DIGITS
4307  020050  020227  000012              1$:       CMP     R2,#$TN-1       ;LEGAL TEST NUMBER?
4308  020054  003332                        BGT     GTTST1          ;NO--BRANCH
4309  020056  006302                        ASL     R2
4310  020060  016204  001324                MOV     BITS(R2),R4     ;SELECT TEST
4311  020064  121127  000055                CMPB    (R1),#'-        ;TEST STRING?
4312  020070  001035                        BNE     GTTST4          ;NO--BRANCH
4313  020072  005201                        INC     R1              ;YES--MOVE TO NEXT CHARACTER
4314  020074  004037  020770                JSR     R0,@#CK.OCT     ;OCTAL DIGIT?
4315  020100  000720                        BR      GTTST1          ;NO--BRANCH
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4316  020102  010205            MOV     R2,R5           ;YES--SAVE IT
4317  020104  005201            INC     R1              ;MOVE TO NEXT CHARACTER
4318  020106  004037  020770    JSR     R0,@#CK.OCT     ;OCTAL DIGIT?
4319  020112  000405            BR      2$              ;NO--BRANCH
4320  020114  005201            INC     R1              ;YES--MOVE TO NEXT CHARACTER
4321  020116  006305            ASL     R5              ;SCALE HIGH DIGIT
4322  020120  006305            ASL     R5
4323  020122  006305            ASL     R5
4324  020124  060502            ADD     R5,R2           ;COMBINE HIGH & LOW DIGIT
4325  020126  020227  000012    2$:     CMP     R2,#$TN-1       ;LEGAL TEST NUMBER?
4326  020132  003303            BGT     GT$ST1          ;NO--BRANCH
4327  020134  006302            ASL     R2
4328  020136  020462  001324            CMP     R4,BITS(R2)     ;IS THE FIRST NUMBER OF THE
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 4329
 4330  020142  002277                    BGE     GTTST1          ;STRING SMALLER THAN THE LAST?
 4331  020144  056204  001324  3$:       BIS     BITS(R2),R4     ;NO--BRANCH
 4332  020150  005742                    TST     -(R2)           ;YES--SET TEST SELECT BIT FOR SELECTED TESTS
 4333  020152  036204  001324            BIT     BITS(R2),R4     ;ADJUST POINTER
 4334  020156  001772                    BEQ     3$              ;DONE?
 4335  020160  000401                    BR      GTTST4          ;NO--BRANCH
 4336  020162  005201          GTTST3:   INC     R1              ;SKIP THE INCREMENT
 4337  020164  050437  001234  GTTST4:   BIS     R4,TSTNMS       ;MOVE TO NEXT CHARACTER
 4338                                                            ;SET SELECTED TEST BITS INTO
 4339  020170  121127  000056            CMPB    (R1),#'.        ;TEST SELECT WORD
 4340  020174  001420                    BEQ     GTTST5          ;"PERIOD"?
 4341  020176  005704                    TST     R4              ;YES--BRANCH
 4342  020200  001660                    BEQ     GTTST1          ;ANY TEST SELECTED THIS CYCLE?
 4343  020202  121127  000057            CMPB    (R1),#'/        ;NO--BRANCH
 4344  020206  001002                    BNE     1$              ;"OPEN"?
 4345  020210  050403                    BIS     R4,R3           ;NO--BRANCH
                                                                 ;YES--SET BITS FOR TEST TO OPEN
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4346  020212  000403                    BR      2$
4347  020214  121127  000054    1$:     CMPB    (R1),#',        ;"COMMA"?
4348  020220  001250                    BNE     GTTST1          ;NO--BRANCH
4349  020222  005201            2$:     INC     R1              ;MOVE TO NEXT CHARACTER
4350  020224  105711                    TSTB    (R1)            ;"CR"?
4351  020226  001272                    BNE     GTTST2          ;NO--GO GET NEXT CHARACTER
4352  020230  005703                    TST     R3              ;ANY TESTS TO OPEN?
4353  020232  001026                    BNE     OPNTST          ;YES--BRANCH
4354  020234  000642                    BR      GTTST1          ;NO--START AGAIN
4355  020236  005201    GTTST5: INC     R1                      ;MOVE TO NEXT CHARACTER
4356  020240  121127  000056            CMPB    (R1),#'.        ;"PERIOD"?
4357  020244  001410                    BEQ     GTTST6          ;YES--BRANCH
4358  020246  105711                    TSTB    (R1)            ;"CR"?
4359  020250  001402                    BEQ     1$              ;YES--BRANCH
4360  020252  000137  017742            JMP     GTTST1
4361  020256  005703    1$:     TST     R3                      ;ANY TEST TO BE OPENED?
4362  020260  001013                    BNE     OPNTST          ;YES--BRANCH
4363  020262  000137  017736            JMP     GT.PR2          ;NO--GO START TESTING
4364  020266  005201    GTTST6: INC     R1                      ;MOVE TO NEXT CHARACTER
4365  020270  105711                    TSTB    (R1)            ;"CR"?
4366  020272  001402                    BEQ     1$              ;YES--BRANCH
4367  020274  000137  017742            JMP     GTTST1          ;NO--GO ASK FOR TEST
4368  020300  005703    1$:     TST     R3                      ;ANY TEST TO BE OPENED?
4369  020302  001002                    BNE     OPNTST          ;YES--BRANCH
4370  020304  000137  017736            JMP     GT.PR2          ;NO--GO START TESTING
4371                    ;OPEN THE TEST FOR CHANGES
4372  020310  104412    OPNTST: SAVREG                          ;SAVE R0-R5
4373  020312  005027                    CLR     (PC)+           ;START WITH TEST 0
4374  020314  000000    OPN.CT: .WORD   0                       ;COUNT STORED HERE
4375  020316  000411                    BR      OPN.2           ;SKIP THE INCREMENT
4376  020320  005237  020314    OPN.1:  INC     OPN.CT          ;MOVE TO THE NEXT TEST
4377  020324  022737  000012  020314    CMP     #$TN-1,OPN.CT   ;TEST NUMBER TO BIG?
4378  020332  002003                    BGE     OPN.2           ;NO--OPEN THE NEXT TEST
4379  020334  104413                    RESREG                  ;RESTORE R0-R5
4380  020336  000137  017742            JMP     GTTST1          ;YES--GO ASK FOR MORE TESTS
4381  020342  013705  020314    OPN.2:  MOV     OPN.CT,R5       ;SETUP TO USE THE
4382  020346  006305                    ASL     R5              ;TEST NUMBER AS AN INDEX
4383  020350  036503  001324            BIT     BITS(R5),R3     ;OPEN THIS TEST?
4384  020354  001761                    BEQ     OPN.1           ;NO--MOVE TO NEXT TEST
4385  020356  104401  020364            TYPE    ,65$            ;;TYPE ASCIZ STRING
4386  020362  000404                    BR      64$             ;;GET OVER THE ASCIZ
4387                    ;;65$:  .ASCIZ  / TEST /
4388  020374            64$:
4389  020374  013746  020314            MOV     OPN.CT,-(SP)    ;;SAVE OPN.CT FOR TYPEOUT
4390                                                            ;;TEST NUMBER
4391  020400  104403                    TYPOS                   ;;GO TYPE--OCTAL ASCII
4392  020402    002                     .BYTE   2               ;;TYPE 2 DIGIT(S)
4393  020403    000                     .BYTE   0               ;;SUPPRESS LEADING ZEROS
4394  020404  104401  001217            TYPE    ,$CRLF          ;TYPE "CR" & "LF"
4395  020410  016500  001406            MOV     PRMPT(R5),R0    ;PICKUP PARAMETER POINTER
4396  020414  011046                    MOV     (R0),-(SP)      ;SAVE THE VARIABLE INDICATOR
4397  020416  012702  001372            MOV     #PRM,R2         ;FIRST ADDRESS OF TABLE
4398  020422  000405                    BR      2$
4399  020424  006216    1$:     ASR     (SP)                    ;CHECK FOR A VARIABLE
4400  020426  103403                    BCS     2$              ;GO MOVE THIS ONE
4401  020430  001404                    BEQ     OPNPRM          ;DONE
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4402  020432  005722                        TST     (R2)+           ;BUMP THE POINTER
4403  020434  000773                        BR      1$
4404  020436  012022                2$:     MOV     (R0)+,(R2)+     ;MOVE THIS VARIABLE INTO THE
4405  020440  000771                        BR      1$              ;COMMON AREA
4406  020442  013716  001372        OPNPRM: MOV     @#PRM,(SP)      ;GET THE VARIABLE INDICATOR
4407  020446  005004                        CLR     R4              ;ZERO THE INDEX
4408  020450  006216                1$:     ASR     (SP)            ;CHECK FOR A VARIABLE
4409  020452  103403                        BCS     3$              ;GO GET IT
4410  020454  001772                        BEQ     OPNPRM          ;OUT OF VARIABLES
4411  020456  005724                2$:     TST     (R4)+           ;UPDATE THE INDEX
4412  020460  000773                        BR      1$
4413  020462  104401  002043        3$:     TYPE    ,BLNKS2         ;TYPE SPACES
4414  020466  016437  001446  020476        MOV     PRMMSG(R4),4$   ;TYPE THE NAME OF THIS VARIABLE
4415  020474  104401                        TYPE
4416  020476  000000                4$:     .WORD   0
4417  020500  104401  021436                TYPE    ,MSG.EQ         ;TYPE "="
4418  020504  016446  001374                MOV     RPT(R4),-(SP)   ;PUT RPT(R4) ON THE STACK
4419  020510  004737  013250                JSR     PC,$SB2D        ;CONVERT RPT(R4)
4420  020514  004737  013500                JSR     PC,$SUPRS       ;TYPE RPT(R4)
4421  020520  104411                        RDLIN
4422  020522  012601                        MOV     (SP)+,R1        ;READ AN ASCIZ STRING
4423  020524  004037  021044                JSR     R0,@#CK.CHR     ;CHECK ONE CHARACTER
4424  020530  020462                        3$                      ;ILLEGAL CHARACTER
4425  020532  020462                        3$                      ;CARRIAGE RETURN
4426  020534  020600                        7$                      ;"/"
4427  020536  020544                        5$                      ;"."
4428  020540  020552                        6$                      ;"'"
4429  020542  020462                        3$                      ;DIGIT 0-9
4430  020544  105711                5$:     TSTB    (R1)            ;"CR"?
4431  020546  001345                        BNE     3$              ;NO--STAY ON THIS VARIABLE
4432  020550  000742                        BR      2$              ;YES--MOVE TO NEXT VARIABLE
4433  020552  105711                6$:     TSTB    (R1)            ;IS THERE A "CR" AFTER THE PERIOD?
4434  020554  001002                        BNE     64$             ;NO
4435  020556  000137  020634                JMP     OPN.N2          ;YES--GO CLOSE THIS TEST
4436  020562  122721  000056        64$:    CMPB    #'.,(R1)+       ;DOUBLE PERIOD?
4437  020566  001335                        BNE     3$              ;NO--GO ASK FOR THIS VARIABLE
4438  020570  105711                        TSTB    (R1)            ;YES--IS A "CR" AFTER THE DOUBLE PERIOD?
4439  020572  001333                        BNE     3$              ;NO--ASK FOR THIS VARIABLE AGAIN
4440  020574  000137  020652                JMP     OPN.X2          ;YES--CLOSE ALL TEST
4441  020600                        7$:
4442  020600  016402  001434                MOV     PRMLMT(R4),R2   ;UPPER LIMIT OF INPUT
4443  020604  004037  021120                JSR     R0,@#CK.DIG     ;CHECK THE DIGIT(S)
4444  020610  020462                        3$                      ;ILLEGAL INPUT
4445  020612  020462                        3$                      ;INPUT TO LARGE
4446  020614  020622                        8$                      ;TERMINATED WITH A "."
4447  020616  020630                        OPN.N1                  ;TERMINATED WITH A ":"
4448  020620  020646                        OPN.X1                  ;TERMINATED WITH A ".."
4449  020622  010264  001374        8$:     MOV     R2,RPT(R4)      ;SAVE THIS VARIABLE
4450  020626  000713                        BR      2$              ;MOVE TO NEXT VARIABLE
4451  020630  010264  001374        OPN.N1: MOV     R2,RPT(R4)      ;SAVE THIS VARIABLE
4452  020634  005726                OPN.N2: TST     (SP)+           ;CLEAN OFF THE STACK
4453  020636  004737  020710                JSR     PC,CLOSE        ;CLOSE THIS TEST
4454  020642  000137  020320                JMP     OPN.1           ;GO OPEN THE NEXT TEST
4455  020646  010264  001374        OPN.X1: MOV     R2,RPT(R4)      ;SAVE THIS VARIABLE
4456  020652  005726                OPN.X2: TST     (SP)+           ;CLEAN OFF THE STACK
4457  020654  004737  020710        1$:     JSR     PC,CLOSE        ;CLOSE THIS TEST
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4458  020660  005725                2$:     TST     (R5)+           ;UPDATE THE INDEX
4459  020662  020527  000034                CMP     R5,#16*2        ;INDEX TO BIG?
4460  020666  002404                        BLT     3$              ;NO--BRANCH
4461  020670  104413                        RESREG                  ;YES, RESTORE R0-R5
4462  020672  104413                        RESREG                  ;YES, RESTORE R0-R5
4463  020674  000137  017736                JMP     GT.PR2          ;GO TO EXIT
4464  020700  036503  001324        3$:     BIT     BITS(R5),R3     ;IS THIS TEST OPEN FOR CHANGE?
4465  020704  001363                        BNE     1$              ;YES--GO CLOSE IT
4466  020706  000764                        BR      2$              ;NO--MOVE TO NEXT TEST
4467  020710  104412                CLOSE:  SAVREG                  ;SAVE R0-R5
4468  020712  012700  001372                MOV     #PRM,R0         ;"FROM" ADDRESS
4469  020716  016501  001406                MOV     PRMPT(R5),R1    ;"TO" ADDRESS
4470  020722  012002                        MOV     (R0)+,R2        ;"FROM" INDICATOR
4471  020724  012103                        MOV     (R1)+,R3        ;"TO" INDICATOR
4472  020726  012704  000001                MOV     #1,R4           ;TEST BIT START A "RPT"
4473  020732  030402                1$:     BIT     R4,R2           ;PARAMETER TO BE MOVED?
4474  020734  001403                        BEQ     2$              ;NO--BRANCH
4475  020736  030403                        BIT     R4,R3           ;A PLACE TO PUT IT?
4476  020740  001404                        BEQ     3$              ;NO--BRANCH
4477  020742  011011                        MOV     (R0),(R1)       ;YES--MOVE "FROM" TO "TO"
4478  020744  030403                2$:     BIT     R4,R3           ;"TO" PARAMETER?
4479  020746  001401                        BEQ     3$              ;NO--BRANCH
4480  020750  005721                        TST     (R1)+           ;YES--UPDATE THE POINTER
4481  020752  005720                3$:     TST     (R0)+           ;UPDATE FROM POINTER
4482  020754  006304                        ASL     R4              ;POSITION THE TEST BIT
4483  020756  032704  002000                BIT     #BIT10,R4       ;DONE?
4484  020762  001763                        BEQ     1$              ;NO--BRANCH
4485  020764  104413                        RESREG                  ;YES, RESTORE R0-R5
4486  020766  000207                        RTS     PC              ;RETURN
4487                                ;;*******************************************************************
4488                                .SBTTL  CK.OCT -- CHECK FOR OCTAL CHARACTER
4489                                ;*THIS ROUTINE IS USED TO CHECK IF AN
4490                                ;*ASCII CHARACTER IS A DIGIT BETWEEN 0 AND 7.
4491                                ;CALL
4492                                ;       MOV     #ADR,R1         ;ADDRESS OF ASCII CHARACTER
4493                                ;       JSR     R0,@#CK.OCT     ;CHECK THE CHARACTER
4494                                ;       RETURN1                 ;CHARACTER IS NOT BETWEEN 0-7
4495                                ;       RETURN2                 ;CHARACTER IS IN R2 AS A
4496                                ;                               ;OCTAL DIGIT
4497
4498  020770  121127  000060        CK.OCT: CMPB    (R1),#'0        ;LESS THAN ZERO?
4499  020774  103407                        BLO     1$              ;YES -- BRANCH
4500  020776  121127  000067                CMPB    (R1),#'7        ;GREATER THAN SEVEN?
4501  021002  101004                        BHI     1$              ;YES -- BRANCH
4502  021004  111102                        MOVB    (R1),R2         ;GET THE CHARACTER
4503  021006  042702  177770                BIC     #^C7,R2         ;STRIP AWAY THE ASCII
4504  021012  005720                        TST     (R0)+           ;ADJUST FOR RETURN
4505  021014  000200                1$:     RTS     R0              ;RETURN
4506
4507                                ;;*******************************************************************
4508                                .SBTTL  CK.DEC -- CHECK FOR DECIMAL CHARACTER
4509                                ;*THIS ROUTINE IS USED TO CHECK AN ASCII CHARACTER
4510                                ;*AND DETERMINE IF IT IS A DIGIT BETWEEN 0 AND 9.
4511                                ;CALL
4512                                ;       MOV     #ADR,R1         ;ADDRESS OF ASCII CHARACTER
4513                                ;       JSR     R0,@#CK.DEC     ;CHECK THE CHARACTER
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                                ;       RETURN1                 ;NOT BETWEEN 0 AND 9
                                ;       RETURN2                 ;BETWEEN 0 AND 9
                                ;                               ;R2 = DIGIT
021016  121127  000060          CK.DEC: CMPB    (R1),#'0        ;LESS THAN ZERO?
021022  103407                          BLO     1$              ;YES -- BRANCH
021024  121127  000071                  CMPB    (R1),#'9                ;GREATER THAN NINE?
021030  101004                          BHI     1$              ;YES -- BRANCH
021032  111102                          MOVB    (R1),R2         ;GET THE CHARACTER
021034  042702  000060                  BIC     #'0,R2          ;STRIP AWAY THE ASCII
021040  005720                          TST     (R0)+           ;ADJUST FOR RETURN
021042  000200                  1$:     RTS     R0              ;RETURN

                                ;*******************************************************************
                                .SBTTL  CK.CHR -- CHECK CHARACTER
                                ;*THIS ROUTINE WILL CHECK AN ASCII CHARACTER TO
                                ;*DETERMINE WHAT IT IS.
                                ;CALL
                                ;       MOV     #ADR,R1         ;ADDRESS OF ASCII CHARACTER
                                ;       JSR     R0,@#CK.CHR     ;CHECK CHARACTER
                                ;       RETURN  ADR1            ;UNKNOWN CHARACTER
                                ;       RETURN  ADR2            ;CARRIAGE RETURN * (R1)=ADR+1
                                ;       RETURN  ADR3            ;SLASH * (R1)=ADR+1
                                ;       RETURN  ADR4            ;COMMA * (R1)=ADR+1
                                ;       RETURN  ADR5            ;PERIOD * (R1)=ADR+1
                                ;       RETURN  ADR6            ;DIGIT BETWEEN 0 AND 9.
                                ;                               ;R2 = DIGIT * (R1)=ADR+1
021044  105711                  CK.CHR: TSTB    (R1)            ;"CARRIAGE RETURN"?
021046  001420                          BEQ     4$              ;YES -- BRANCH
021050  121127  000057                  CMPB    (R1),#'/        ;"SLASH"?
021054  001414                          BEQ     3$              ;YES -- BRANCH
021056  121127  000054                  CMPB    (R1),#',        ;"COMMA"?
021062  001410                          BEQ     2$              ;YES -- BRANCH
021064  121127  000056                  CMPB    (R1),#'.        ;"PERIOD"?
021070  001404                          BEQ     1$              ;YES -- BRANCH
021072  004037  021016                  JSR     R0,@#CK.DEC     ;"DIGIT"?
021076  000406                          BR      5$              ;NO -- BRANCH
021100  005720                          TST     (R0)+           ;DIGIT BETWEEN 0-9
021102  005720                  1$:     TST     (R0)+           ;PERIOD
021104  005720                  2$:     TST     (R0)+           ;COMMA
021106  005720                  3$:     TST     (R0)+           ;SLASH
021110  005720                  4$:     TST     (R0)+           ;CARRIAGE RETURN
021112  005201                          INC     R1              ;MOVE POINTER TO NEXT CHARACTER
021114  011000                  5$:     MOV     (R0),R0         ;UNKNOWN CHARACTER
021116  000200                          RTS     R0              ;RETURN

                                ;*******************************************************************
                                .SBTTL  CK.DIG - CHECK DIGIT
                                ;*THIS ROUTINE CHECKS AN ASCII STRING FOR LEGAL
                                ;*CHARACTERS AND FORMS A DECIMAL VALUE BINARY NUMBER IN R2.
                                ;CALL
                                ;       MOV     #ADR,R1         ;ADDRESS OF ASCIZ STRING
                                ;       MOV     #NUM,R2         ;MAX. MAGNITUDE OF INPUT NUMBER
                                ;       JSR     R0,@#CK.DIG     ;CHECK DIGITS
                                ;       RETURN  ADR1            ;ILLEGAL CHARACTER -- R2=?
```

```
                                        ;       RETURN  ADR2            ;INPUT NUMBER TO LARGE -- R2=*
                                        ;       RETURN  ADR3            ;"COMMA" -- R2 = NUMBER
                                        ;       RETURN  ADR4            ;"PERIOD" -- R2 = NUMBER
                                        ;       RETURN  ADR5            ;"PERIOD-PERIOD" -- R2 = NUMBER
021120  010446                          CK.DIG: MOV     R4,-(SP)        ;SAVE R4
021122  010346                                  MOV     R3,-(SP)        ;SAVE R3
021124  010246                                  MOV     R2,-(SP)        ;SAVE THE MAX. SIZE ON THE STACK
021126  005002                                  CLR     R2              ;START WITH 0
021130  005003                                  CLR     R3
021132  005004                                  CLR     R4
021134  004037  021044                         JSR     R0,@#CK.CHR     ;CHECK ONE CHARACTER
021140  021264                                  BCS     8$              ;ILLEGAL CHARACTER
021142  021264                                  BCS     8$              ;CARRIAGE RETURN
021144  021264                                  BCS     8$              ;"/"
021146  021264                                  BCS     8$              ;"."
021150  021264                                  BCS     8$              ;"'"
021152  021154                                  BCS     1$              ;DIGIT 0-9
021154  006303                          1$:     ASL     R3              ;*2
021156  010346                                  MOV     R3,-(SP)        ;SAVE *2
021160  006303                                  ASL     R3              ;*4
021162  006303                                  ASL     R3              ;*8
021164  062603                                  ADD     (SP)+,R3        ;(*8)+(*2)=*10.
021166  060203                                  ADD     R2,R3           ;UPDATE THE INPUT NUMBER
021170  004037  021044                         JSR     R0,@#CK.CHR     ;CHECK ONE CHARACTER
021174  021264                                  BCS     8$              ;ILLEGAL CHARACTER
021176  021264                                  BCS     8$              ;CARRIAGE RETURN
021200  021264                                  BCS     8$              ;"/"
021202  021212                                  BCS     2$              ;"."
021204  021210                                  BCS     2$              ;"'"
021206  021154                                  BCS     1$              ;DIGIT 0-9
021210  005724                          2$:     TST     (R4)+           ;"PERIOD"
021212  005724                          3$:     TST     (R4)+           ;"COMMA"
021214  004037  021044                         JSR     R0,@#CK.CHR     ;CHECK ONE CHARACTER
021220  021264                                  BCS     8$              ;ILLEGAL CHARACTER
021222  021264                                  BCS     8$              ;CARRIAGE RETURN
021224  021264                                  BCS     8$              ;"/"
021226  021264                                  BCS     8$              ;"."
021230  021234                                  BCS     4$              ;"'"
021232  021244                                  BCS     5$              ;DIGIT 0-9
021234  005724                          4$:     TST     (R4)+           ;"PERIOD-PERIOD"
021236  105711                                  TSTB    (R1)            ;"CR"?
021240  001405                                  BEQ     6$              ;YES--BRANCH
021242  000410                                  BR      8$
021244  126127  177776  000054          5$:     CMPB    -2(R1),#',      ;WAS CHARACTER BEFORE THE DIGIT A COMMA?
021252  001004                                  BNE     8$              ;NO--EXIT
021254  020316                          6$:     CMP     R3,(SP)         ;INPUT TO LARGE?
021256  101001                                  BHI     7$              ;YES -- BRANCH
021260  060400                                  ADD     R4,R0           ;ADJUST RETURN ADDRESS
021262  005720                          7$:     TST     (R0)+
021264  010302                          8$:     MOV     R3,R2           ;NUMBER TO R2
021266  005726                                  TST     (SP)+           ;CLEAN MAX. SIZE OFF OF STACK
021270  012603                                  MOV     (SP)+,R3        ;RESTORE R3
021272  012604                                  MOV     (SP)+,R4        ;RESTORE R4
021274  011000                                  MOV     (R0),R0         ;GET RETURN ADDRESS
021276  000200                                  RTS     R0              ;RETURN
```

```
                                ;*****************************************************************
                                ;SBTTL  CK.NUM - CHECK NUMBER (OCTAL)
                                ;*THIS ROUTINE CHECKS AN ASCIZ STRING FOR LEGAL CHARACTERS
                                ;*AND FORMS AN OCTAL NUMBER IN R2
                                ;CALL
                                ;       MOV     #ADR,R1         ;ADDRESS OF ASCIZ STRING
                                ;       JSR     R0,@#CK.NUM     ;GO FORM THE NUMBER
                                ;       RETURN  ADR1            ;ILLEGAL CHARACTER IN THE INPUT STRING
                                ;       RETURN  ADR2            ;"COMMA"--R2=NUMBER
                                ;       RETURN  ADR3            ;"PERIOD"--R2=NUMBER
                                ;       RETURN  ADR4            ;"PERIOD-PERIOD"--R2=NUMBER

021300  010346                  CK.NUM: MOV     R3,-(SP)        ;SAVE R3
021302  005003                          CLR     R3              ;START NUMBER AT ZERO
021304  004037  020770                  JSR     R0,@#CK.OCT     ;OCTAL DIGIT?
021310  000440                          BR      6$              ;NO--BRANCH
021312  005201                  1$:     INC     R1              ;MOVE TO NEXT CHARACTER
021314  006303                          ASL     R3              ;FOR THE OCTAL NUMBER IN R3
021316  103435                          BCS     6$              ;DON'T LET IT GET TO BIG
021320  006303                          ASL     R3
021322  103433                          BCS     6$
021324  006303                          ASL     R3
021326  103431                          BCS     6$
021330  060203                          ADD     R2,R3
021332  004037  020770                  JSR     R0,@#CK.OCT     ;IS THIS AN OCTAL DIGIT?
021336  000401                          BR      2$              ;NO--FIND OUT WHAT IT IS
021340  000764                          BR      1$              ;YES--MAKE IT PART OF THE NUMBER
021342  010302                  2$:     MOV     R3,R2           ;SAVE THE OCTAL NUMBER
021344  005003                          CLR     R3              ;START WITH ZERO INDEX
021346  004037  021044                  JSR     R0,@#CK.CHR     ;CHECK ONE CHARACTER
021352  021412                          6$                      ;ILLEGAL CHARACTER
021354  021412                          6$                      ;CARRIAGE RETURN
021356  021412                          6$                      ;"/"
021360  021402                          5$                      ;"."
021362  021366                          3$                      ;","
021364  021412                          6$                      ;DIGIT 0-9
021366  005723                  3$:     TST     (R3)+           ;"PERIOD"
021370  121127  000056                  CMPB    (R1),#'.        ;"PERIOD-PERIOD"?
021374  001002                          BNE     5$              ;NO--BRANCH
021376  005201                          INC     R1              ;YES--ADVANCE THE POINTER
021400  005723                  4$:     TST     (R3)+           ;"PERIOD-PERIOD"
021402  005723                  5$:     TST     (R3)+           ;"COMMA"
021404  105711                          TSTB    (R1)            ;"CR"?
021406  001001                          BNE     6$              ;NO--BRANCH
021410  060300                          ADD     R3,R0           ;YES--SAVE THE OCTAL NUMBER
021412  012603                  6$:     MOV     (SP)+,R3        ;RESTORE R3
021414  011000                          MOV     (R0),R0         ;PICKUP EXIT ADDRESS
021416  000200                          RTS     R0              ;RETURN

                                .SBTTL  ASCIZ MESSAGES

021420  000122                  MSG.R:  .ASCIZ  /R/
021422  041506      000         MSG.FC: .ASCIZ  /FC/
021425      114     000103      MSG.LC: .ASCIZ  /LC/
```

```
021430  041511     000          MSG.IC: .ASCIZ  /IC/
021433     124  000113          MSG.TK: .ASCIZ  /TK/
021436  000075                  MSG.EQ: .ASCIZ  /=/
021440  005015  050122  030461  MRPCS:  .ASCIZ  <15><12>/RP11=/
021446  000075
021450  005015  050122  042526  MRPVEC: .ASCIZ  <15><12>/RPVEC=/
021456  036503     000
021461     015  051012  050120  MRPPRI: .ASCIZ  <15><12>/RPPRIO=/
021466  044522  036517     000

021473     040  020040  020040  GRPH1:  .ASCII  /       0   10  20  30  40  50  60  70  80  90  100/<15><12>
021500  020040  020060  020040
021506  030061  020040  030062
021514  020040  030063  020040
021522  030064  020040  030065
021530  020040  030066  020040
021536  030067  020040  030070
021544  020040  030071  020040
021552  030061  006460     012
021557     040  020040  020040          .ASCIZ  /       I---I---I---I---I---I---I---I---I---I---I/<15><12>
021564  020040  026511  026455
021572  026511  026455  026511
021600  026455  026511  026455
021606  026511  026455  026511
021614  026455  026511  026455
021622  026511  026455  026511
021630  026455  026511  026455
021636  006511  000012
                                        .EVEN


                                .SBTTL  ERROR HEADER (EM) MESSAGES

021642  050122  030461  043040  EM1:    .ASCIZ  @RP11 FAILED TO RESPOND TO ADDRESSING@
021650  044501  042514  020104
021656  047524  051040  051505
021664  047520  042116  052040
021672  020117  042101  051104
021700  051505  044523  043516
021706     000
021707     104  044522  042526  EM2:    .ASCIZ  @DRIVE UNSAFE@
021714  052440  051516  043101
021722  000105
021724  051104  053111  020105  EM3:    .ASCIZ  @DRIVE OFFLINE@
021732  043117  046106  047111
021740  000105
021742  051104  053111  020105  EM4:    .ASCIZ  @DRIVE ERROR DURING TIMING TEST@
021750  051105  047522  020122
021756  052504  044522  043516
021764  052040  046511  047111
021772  020107  042524  052123
022000     000
022001     116  020117  047111  EM5:    .ASCIZ  @NO INTERRUPT FROM POSITIONING AFTER 1 SECOND@
022006  042524  051122  050125
022014  020124  051106  046517
022022  050040  051517  052111
```

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4738  022030  047511  044516  043516
4739  022036  040440  052106  051105
4740  022044  030440  051440  041505
4741  022052  047117  000104
4742  022056  044504  045523  042440  EM6:    .ASCIZ  @DISK ERROR AFTER POSITIONING@
4743  022064  051122  051117  040440
4744  022072  052106  051105  050040
4745  022100  051517  052111  047511
4746  022106  044516  043516     000
4747  022113     103  051117  042522  EM7:    .ASCIZ  @CORRECT ATTN BIT NOT SET AFTER POSITIONING@
4748  022120  052103  040440  052124
4749  022126  020116  044502  020124
4750  022134  047516  020124  042523
4751  022142  020124  043101  042524
4752  022150  020122  047520  044523
4753  022156  044524  047117  047111
4754  022164  000107
4755  022166  051104  053111  020105  EM10:   .ASCIZ  @DRIVE OFFLINE AFTER POSITIONING@
4756  022174  043117  046106  047111
4757  022202  020105  043101  042524
4758  022210  020122  047520  044523
4759  022216  044524  047117  047111
4760  022224  000107
4761  022226  051447  041525  023501  EM11:   .ASCIZ  @'SUCA' NOT CORRECT AFTER POSITIONING@
4762  022234  047040  052117  041440
4763  022242  051117  042522  052103
4764  022250  040440  052106  051105
4765  022256  050040  051517  052111
4766  022264  047511  044516  043516
4767  022272     000
4768  022273     104  051511  020113  EM12:   .ASCIZ  @DISK ERROR WHILE VERIFYING POSITION@
4769  022300  051105  047522  020122
4770  022306  044127  046111  020105
4771  022314  042526  044522  054506
4772  022322  047111  020107  047520
4773  022330  044523  044524  047117
4774  022336     000
4775  022337     104  051511  020113  EM13:   .ASCIZ  @DISK POSITIONED TO WRONG CYLINDER@
4776  022344  047520  044523  044524
4777  022352  047117  042105  052040
4778  022360  020117  051127  047117
4779  022366  020107  054503  044514
4780  022374  042116  051105     000
4781  022401     116  020117  047111  EM14:   .ASCIZ  @NO INTERRUPT FROM I/O AFTER 1 SECOND@
4782  022406  042524  051122  050125
4783  022414  020124  051106  046517
4784  022422  044440  047457  040440
4785  022430  052106  051105  030440
4786  022436  051440  041505  047117
4787  022444  000104
4788  022446  042523  045505  044440  EM15:   .ASCIZ  @SEEK INCOMPLETE@
4789  022454  041516  046517  046120
4790  022462  052105  000105
4791  022466  051104  053111  020105  EM16:   .ASCIZ  @DRIVE NOT READY AFTER POSITIONING@
4792  022474  047516  020124  042522
4793  022502  042101  020131  043101
```

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022510  042524  020122  047520
022516  044523  044524  047117
022524  047111  000107
022530  051104  053111  020105  EM17:   .ASCIZ  @DRIVE NOT READY/OFFLINE DURING TIMING TEST@
022536  047516  020124  042522
022544  042101  027531  043117
022552  046106  047111  020105
022560  052504  044522  043516
022566  052040  046511  047111
022574  020107  042524  052123
022602     000
                                .SBTTL  DATA HEADER (DH) MESSAGES
022603     105  051122  050040  DH1:    .ASCIZ  @ERR PC  RPCS@
022610  020103  051040  041520
022616  000123
022620  042524  052123  021440  DH2:    .ASCIZ  @TEST #  ERR PC  DRIVE   RPDS    RPER    RPCS@
022626  020040  051105  020122
022634  041520  020040  051104
022642  053111  020105  020040
022650  050122  051504  020040
022656  020040  050122  051105
022664  020040  020040  050122
022672  051503     000
022675     124  051505  020124  DH11:   .ASCIZ  @TEST #  ERR PC  DRIVE FROM CYL DEST CYL SUCA    RPCA@
022702  020043  042440  051122
022710  050040  020103  042040
022716  044522  042526  043040
022724  047522  020115  054503
022732  020114  042504  052123
022740  041440  046131  051440
022746  041525  020101  020040
022754  051040  041520  000101
022762  042524  052123  021440  DH12:   .ASCIZ  @TEST #  ERR PC  DRIVE   RPDS    RPER    RPCS    RPCA    RPDA@
022770  020040  051105  020122
022776  041520  020040  051104
023004  053111  020105  020040
023012  050122  051504  020040
023020  020040  050122  051105
023026  020040  020040  050122
023034  051503  020040  020040
023042  050122  040503  020040
023050  020040  050122  040504
023056     000
023057     124  051505  020124  DH13:   .ASCIZ  @TEST #  ERR PC  DRIVE FROM CYL DEST CYL HDR CYL@
023064  020043  042440  051122
023072  050040  020103  042040
023100  044522  042526  043040
023106  047522  020115  054503
023114  020114  042504  052123
023122  041440  046131  044040
023130  051104  041440  046131
023136     000
023137     122  041520  020123  DH13A:  .ASCIZ  @RPCS    RPCA    RPDA    SUCA@
```

```
 4850  023144  020040  051040  041520
 4851  023152  020101  020040  051040
 4852  023160  042120  020101  020040
 4853  023166  051440  041525  000101
 4854  023174  042524  052123  021440  DHSP:   .ASCIZ  @TEST #  ERR PC  DRIVE   RPDS    RPER    RPCS    RPWC@
 4855  023202  020040  051105  020122
 4856  023210  041520  020040  051104
 4857  023216  053111  020105  020040
 4858  023224  050122  051504  020040
 4859  023232  020040  050122  051105
 4860  023240  020040  020040  050122
 4861  023246  051503  020040  020040
 4862  023254  050122  041527     000
 4863  023261     122  041120  020101  DHSPA:  .ASCIZ  @RPBA    RPCA    RPDA    RPM1    SUCA    SILO@
 4864  023266  020040  051040  041520
 4865  023274  020101  020040  051040
 4866  023302  042120  020101  020040
 4867  023310  051040  046520  020061
 4868  023316  020040  051440  041525
 4869  023324  020101  020040  051440
 4870  023332  046111  000117
 4871
 4872
 4873                                  .EVEN
 4874
 4875                                  .SBTTL  DATA TABLE (DT)
 4876
 4877  023336  001116  001266          DT1:    .WORD   $ERRPC,RPADR
 4878  023342  001204  001116  001246  DT2:    .WORD   $TMPO,$ERRPC,CHKDRV,$RPDS,$RPER,$RPCS
 4879  023350  002004  002006  002010
 4880  023356  001204  001116  001246  DT11:   .WORD   $TMPO,$ERRPC,CHKDRV,CYL.CR,CYL.DS,$SUCA,$RPCA
 4881  023364  001254  001262  002024
 4882  023372  002016
 4883  023374  001204  001116  001246  DT12:   .WORD   $TMPO,$ERRPC,CHKDRV,$RPDS,$RPER,$RPCS,$RPCA,$RPDA
 4884  023402  002004  002006  002010
 4885  023410  002016  002020
 4886  023414  001204  001116  001246  DT13:   .WORD   $TMPO,$ERRPC,CHKDRV,CYL.CR,CYL.DS,$BDDAT
 4887  023422  001254  001262  001126
 4888  023430  002010  002016  002020  DT13A:  .WORD   $RPCS,$RPCA,$RPDA,$SUCA
 4889  023436  002024
 4890  023440  001204  001116  001246  DTSP:   .WORD   $TMPO,$ERRPC,CHKDRV,$RPDS,$RPER,$RPCS,$RPWC
 4891  023446  002004  002006  002010
 4892  023454  002012
 4893  023456  002014  002016  002020  DTSPA:  .WORD   $RPBA,$RPCA,$RPDA,$RPM1,$SUCA,$SILO
 4894  023464  002022  002024  002026
 4895
 4896                                  .SBTTL  DATA FORMAT (DF) TABLE
 4897
 4898  023472  000001                  DF1:    .WORD   1               ;NUMBER OF DATA HEADERS
 4899  023474     002                          .BYTE   2               ;NUMBER OF WORDS IN DATA TABLE
 4900  023475     000                          .BYTE   0               ;BOTH NUMBERS ARE OCTAL
 4901
 4902  023476  000001                  DF2:    .WORD   1
 4903  023500     006                          .BYTE   6
 4904  023501     000                          .BYTE   0
 4905
```

```
4906  023502  000001          DF11:   .WORD   1
4907  023504      007                 .BYTE   7
4908  023505      000                 .BYTE   0
4909
4910  023506  000001          DF12:   .WORD   1
4911  023510      010                 .BYTE   8.
4912  023511      000                 .BYTE   0
4913
4914  023512  000002          DF13:   .WORD   2               ;2 DH'S TO BE TYPED
4915  023514      006                 .BYTE   6
4916  023515      000                 .BYTE   0
4917  023516  023137                  .WORD   DH13A
4918  023520      004                 .BYTE   4
4919  023521      000                 .BYTE   0
4920
4921  023522  000002          DFSP:   .WORD   2
4922  023524      007                 .BYTE   7
4923  023525      000                 .BYTE   0
4924  023526  023261                  .WORD   DHSPA
4925  023530      006                 .BYTE   6
4926  023531      000                 .BYTE   0
4927
4928                          .EVEN
4929
4930  023532  023174          ETSP:   .WORD   DHSP            ;MESSAGE BLOCK FOR SWITCH 6 TYPEOUTS
4931  023534  023440                  .WORD   DTSP
4932  023536  023522                  .WORD   DFSP
4933
4934  023540  000030          BUFR4:  .BLKW   24.             ;WORKING LOCATIONS FOR SEEK TIMER TEST
4935  023620  000030          BUFR5:  .BLKW   24.
4936  023700  000030          BUFR6:  .BLKW   24.
4937  023760  000030          BUFR7:  .BLKW   24.
4938  024040  000626          FRWSTR: .BLKW   406.
4939  025514  000626          RVSTR:  .BLKW   406.
4940          027170          BUFFER=.
4941
4942          000001          .END
```

```
AIE    = 020000
ATABIT   001314
BIT5     001324
BIT0   = 000001
BIT00  = 000001
BIT01  = 000002
BIT02  = 000004
BIT03  = 000010
BIT04  = 000020
BIT05  = 000040
BIT06  = 000100
BIT07  = 000200
BIT08  = 000400
BIT09  = 001000
BIT1   = 000002
BIT10  = 002000
BIT11  = 004000
BIT12  = 010000
BIT13  = 020000
BIT14  = 040000
BIT15  = 100000
BIT2   = 000004
BIT3   = 000010
BIT4   = 000020
BIT5   = 000040
BIT6   = 000100
BIT7   = 000200
BIT8   = 000400
BIT9   = 001000
BLNKS1   002044
BLNKS2   002043
BLNKS3   002042
BLNKS4   002041
BLNKS5   002040
BLNKS6   002037
BLNKS7   002036
BLNKS8   002035
BLNKS9   002034
BLNK10   002033
BLNK13   002030
BPTVEC=  000014
BUFFER=  027170
BUFR4    023540
BUFR5    023620
BUFR6    023700
BUFR7    023760
BUSADR   001224
BYPASS   001244
CHKDRV   001246
CKSWR  = 104407
CK.CHR   021044
CK.DEC   021016
CK.DIG   021120
CK.NUM   021300
CK.OCT   020770
CLEAR  = 000001
CLOSE    020710
CMPGRP   007332
CNTRLC   001222
CR     = 000015
CRLF   = 000200
CSME   = 000040
CYL.CR   001254
CYL.DS   001262
DDISP  = 177570
DECSK    004462
DFLT     001460
DFSP     023522
DF1      023472
DF11     023502
DF12     023506
DF13     023512
DF2      023476
DHSP     023174
DHSPA    023261
DH1      022603
DH11     022675
DH12     022762
DH13     023057
DH13A    023137
DH2      022620
DISPLA   001142
DISPRE   000174
DPB      001364
DRVBAD   001252
DRVMSK   001250
DRVOK    003750
DRVSEL   001232
DRVSTA   001304
DRVTYP   001240
DSELCT   015272
DSKERR=  000001
DSWR   = 177570
DTSP     023440
DTSPA    023456
DT1      023336
DT11     023356
DT12     023374
DT13     023414
DT13A    023430
DT2      023342
EMTVEC=  000030
EM1      021642
EM10     022166
EM11     022226
EM12     022273
EM13     022337
EM14     022401
EM15     022446
EM16     022466
EM17     022530
EM2      021707
EM3      021724
EM4      021742
EM5      022001
EM6      022056
EM7      022113
EOP    = 000002
ERR    = 100000
ERRVEC=  000004
ETSP     023532
EXIT0    004154
EXIT1    004312
EXIT10   006304
EXIT11   006616
EXIT12   007472
EXIT2    004504
EXIT3    004654
EXIT4    005216
EXIT5    005404
EXIT6    005636
EXIT7    006030
FC       001376
FC1      001644
FC11     001774
FC2      001660
FC3      001674
FC4      001710
FC5      001724
FC6      001740
FC7      001754
FMTE   = 001000
FRWSTR   024040
FUV    = 040000
GETADR   017256
GETNUM   017460
GOTYPE   016130
GRPH1    021473
GTSWR  = 104406
GTTST1   017742
GTTST2   020014
GTTST3   020162
GTTST4   020164
GTTST5   020236
GTTST6   020266
GT.PRM   017610
GT.PR1   017612
GT.PR2   017736
HDR    = 004000
HE     = 040000
HNF    = 010000
HOMSEK=  000015
HT     = 000011
IC       001402
IC1      001650
IC2      001664
IC3      001700
IC4      001714
IC5      001730
IC6      001744
IC7      001760
IDE    = 000100
INADR    001226
INCSK    004432
IOTVEC=  000020
LC       001400
LC1      001646
LC11     001776
LC2      001662
LC3      001676
LC4      001712
LC5      001726
LC6      001742
LC7      001756
LF     = 000012
LPE    = 000200
MAXCYL   001236
MODE   = 010000
MODERR=  000400
MRPCS    021440
MRPPRI   021461
MRPVEC   021450
MSG.EQ   021436
MSG.FC   021422
MSG.IC   021430
MSG.LC   021425
MSG.R    021420
MSG.TK   021433
MXSTAL   001302
NXC    = 020000
NXME   = 000004
NXS    = 004000
NXT    = 010000
OPNPRM   020442
OPNTST   020310
OPN.CT   020314
OPN.N1   020630
OPN.N2   020634
OPN.X1   020646
OPN.X2   020652
OPN.1    020320
OPN.2    020342
OUTADR   001230
PIRQ   = 177772
PIRQVE=  000240
PLOT     006770
PLTPT    007432
PRM      001372
PRMLMT   001434
PRMMSG   001446
PRMPT    001406
PRM0     001632
PRM1     001640
PRM10    001764
PRM11    001770
PRM12    002000
PRM2     001654
PRM3     001670
PRM4     001704
PRM5     001720
PRM6     001734
PRM7     001750
PROG   = 002000
PR0    = 000000
PR1    = 000040
PR2    = 000100
PR3    = 000140
PR4    = 000200
PR5    = 000240
PR6    = 000300
PR7    = 000340
PS     = 177776
PSW    = 177776
PWRVEC=  000024
RDCHR  = 104410
RDLIN  = 104411
RDSEK  = 000005
RDY    = 000200
READ   = 000017
RESREG=  104413
RESTAR   003726
RESTOR   015314
RESTR1   015530
RESVEC=  000010
RPADR    001266
RPBA   = 000010
RPCA   = 000012
RPCS   = 000004
RPDA   = 000014
RPDS   = 000000
RPER   = 000002
RPINIT   013642
RPM1   = 000016
RPM2   = 000020
RPM3   = 000022
```

```
RPPRIO  001272
RPT     001374
RPTO    001634
RPT1    001642
RPT10   001766
RPT11   001772
RPT12   002002
RPT2    001656
RPT3    001672
RPT4    001706
RPT5    001722
RPT6    001736
RPT7    001752
RPTVEC  001270
RPWC  = 000006
RSTRT1  003704
RSTRT2  003716
RSTRT3  003724
RVSTR   025514
R6    =%000006
R7    =%000007
SAVREG= 104412
SAVRP   015164
SEC.RD  001260
SEEK  = 000011
SEEKS   014036
SEEKS0  014064
SEEKS1  014314
SEEKS2  014400
SEEKS3  014462
SEEKS4  014520
SILO  = 000026
SKDON   017172
SMGRP   007162
SORT    015660
SPSAV   001242
SRTINT  002734
STACK = 001100
STALL   015576
STALLA  015572
STALLB  015624
STALLG  001300
STALLO  001274
STALL1  001276
START   002302
START1  002246
START2  002270
START3  002236
START4  002260
START5  002720
START6  003442
STKLMT= 177774
STRT1A  002252
STRT2A  002274
STR20X  001264
SUCA  = 000024
SUFU  = 001000
SUOL  = 040000
SURDY = 100000
SURP03= 020000
SUSI  = 004000
SUSU  = 002000
SUWP  = 000400
SWR     001140
SWREG   000176
SW0   = 000001
SW00  = 000001
SW01  = 000002
SW02  = 000004
SW03  = 000010
SW04  = 000020
SW05  = 000040
SW06  = 000100
SW07  = 000200
SW08  = 000400
SW09  = 001000
SW1   = 000002
SW10  = 002000
SW11  = 004000
SW12  = 010000
SW13  = 020000
SW14  = 040000
SW15  = 100000
SW2   = 000004
SW3   = 000010
SW4   = 000020
SW5   = 000040
SW6   = 000100
SW7   = 000200
SW8   = 000400
SW9   = 001000
TBITVE= 000014
TEST0   004144
TEST1   004262
TEST10  006130
TEST11  006404
TEST12  006716
TEST2   004420
TEST3   004612
TEST4   004776
TEST5   005324
TEST6   005512
TEST7   005744
TIMEE = 000020
TIMSEK  016526
TIMSK1  016550
TIMSK2  017066
TK      001404
TKVEC = 000060
TKO     001636
TK1     001652
TK2     001666
TK3     001702
TK4     001716
TK5     001732
TK6     001746
TK7     001762
TPVEC = 000064
TRAPVE= 000034
TRK.RD  001256
TRTVEC= 000014
TSTNMS  001234
TSTO    004034
TST1    004156
TST10   006032
TST11   006306
TST12   006620
TST2    004314
TST3    004506
TST4    004656
TST5    005220
TST6    005406
TST7    005640
TYPDS = 104405
TYPE  = 104401
TYPERR  010114
TYPOC = 104402
TYPON = 104404
TYPOS = 104403
TYPTIM  016364
VERFYO  014600
VERFY1  015154
VERIFY  014554
WCE   = 000010
WCKSEK= 000007
WPE   = 000100
WPV   = 100000
WRITE = 000013
WRTSEK= 000003
$AUTOB  001134
$BDADR  001122
$BDDAT  001126
$BELL   001212
$CHARC  010566
$CKSWR  011542
$CMTAG  001100
$CM1  = 000011
$CM2  = 000022
$CM3  = 000011
$CM4  = 000001
$CNTLC  012463
$CNTLG  012475
$CNTLU  012470
$CRLF   001217
$DBLK   011234
$DB2D   013304
$DECVL  013464
$DOAGN  007732
$DTBL   011224
$ENDAD  007722
$ENDCT  007656
$ENULL  007736
$EOP    007474
$EOPCT  007650
$ERFLG  001103
$ERMAX  001115
$ERROR  007742
$ERRPC  001116
$ERRTB  002046
$ERTTL  001112
$ESCAP  001210
$FILLC  001156
$FILLS  001155
$GDADR  001120
$GDDAT  001124
$GET42  007712
$GTSWR  011632
$HD   = 000000
$HINUM  013636
$ICNT   001104
$INTAG  001135
$ITEMB  001114
$LF     001220
$LONUM  013640
$LPADR  001106
$LPERR  001110
$MNEW   012513
$MSWR   012502
$MUL  = 000003
$MULT   013052
$MXCNT  012754
$NULL   001154
$NWTST= 000001
$OCNT   011014
$OMODE  011016
$OVER   012740
$PASS   001100
$QUES   001216
$RAND   013540
$RDCHR  012104
$RDLIN  012174
$RDSZ = 000033
$REGAD  001160
$REG0   001162
$REG1   001164
$REG10  001202
$REG2   001166
$REG3   001170
$REG4   001172
$REG5   001174
$REG6   001176
$REG7   001200
$RESRE  013014
$RPBA   002014
$RPCA   002016
$RPCS   002010
$RPDA   002020
$RPDS   002004
$RPER   002006
$RPM1   002022
$RPWC   002012
$RTNAD  007734
$SAVRE  012756
$SB2D   013250
$SCOPE  012524
$SETUP= 000107
$SILO   002026
$STUP = 177777
$SUCA   002024
$SUPRS  013500
$SVLAD  012712
$SVPC = 000200
$SWR  = 167000
$SWRMK= 000000
$TIMES  001206
$TKB    001146
$TKCNT  011244
$TKINT  011254
$TKQEN= 011253
$TKQIN  011246
$TKQOU  011250
$TKQSR  011252
$TKS    001144
$TKSRV  011324
$TMPO   001204
$TN   = 000013
$TNPWR  013414
$TPB    001152
$TPFLG  001157
$TPS    001150
$TRAP   013164
$TRAP2  013206
$TRP  = 000014
$TRPAD  013220
$TSTNM  001102
```

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$TTYIN  012430        $TYPEC  010522        $TYPON  010632        $$GET4= 000000
$TYPDS  011020        $TYPEX  010570        $TYPOS  010572        $OFILL  011015
$TYPE   010352        $TYPOC  010616        $XTSTR  012536        .       027170

. ABS.  027170  000

 ERRORS DETECTED:  0

 DSKW:DZRPZC,DSKW:DZRPZC/SOL=DSKW:SYSMAC.SML,DSKM:DZRPZC.P11
 RUN-TIME:  14 19 .6 SECONDS
 RUN-TIME RATIO:  144/34=4.1
 CORE USED:  35K  (69 PAGES)
```

L08