RK06

DISK DRIVE DIAG PART 2

MD-11-DZR6!-B

EP-DZR6I-B-DL-A

FICHE 1 OF 2

NOV 1976

digital

MADE IN USA

RK06

UNIBUS DIAG. PART 2

MD-11-DZR6I-B

EP-DZR6I-B-DL-A

FICHE 2 OF 2

NOV 1976

digital

MADE IN US

IDENTIFICATION

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

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1.0 ABSTRACT

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

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

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

*****CAUTION*****

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

2.0 REQUIREMENTS

2.1 HARDWARE

THE FOLLOWING HARDWARE IS REQUIRED TO RUN THE DISK DIAGNOSTIC:

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

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

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

2.2 PRELIMINARY TESTING & PROGRAMS

THE RK611 DISKLESS CONTROLLER DIAGNOSTICS (ALL PARTS) SHOULD

FIRST RUN SUCCESSFULLY FOLLOWED BY THE RK06 DRIVE DIAGNOSTIC- PART 1.

3.0 PROGRAM CONSIDERATIONS

3.1 PDP-11 FAMILY COMPATIBILITY

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

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

3.2 XXDP

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

CHAIN MODE OPERATION (MONITOR)

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

NOTE: THE DRIVE PRESENT CONDITION IS:

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

DUMP MODE OPERATION (MANUAL)

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

3.3 ACT/APT

THIS PROGRAM IS ACT COMPATIBLE. IT IS APT

COMPATABLE TO THE EXTENT THAT APT HOOKS WILL BE IN THE PROGRAM & WILL WORK THRU THE 'UPTON INTERFACE'.

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

AUTOMATIC MODE (MONITOR)

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

NOTE: THE DRIVE PRESENT CONDITION IS:

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

NOTE: SEVERAL APT CONSIDERATIONS ARE STILL TO BE DEFINED.

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

3.4 DUAL ACCESS

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

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

3.5 MEMORY MANAGEMENT

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

3.6 PARITY CHECK ENABLED

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

3.7 BAD SECTOR

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

3.8 EXECUTION TIME

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

TOTAL TIME: 2 MIN, 40 SEC

A BREAKDOWN OF THE MORE LENGTHY TESTS ARE SHOWN BELOW:

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

3.9 FAULT ISOLATION

FAULT ISOLATION WILL NOT BE PERFORMED FOR THE FIRST STAGE RELEASE BUT WILL BE INCLUDED FOR THE SECOND STAGE RELEASE.

3.10 ERROR CORRECTION AND FAILURE RATE ANALYSIS

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

3.11 DEFAULT UNIBUS ADDRESSES & VECTORS

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

	LOCATION	DEFAULT CONTENTS
RK06 BUSS ADDRESS	1264	177440
CONTROLLER INTERRUPT VECTOR	1334	210
CONTROLLER PRIORITY	1336	240
P-CLOCK STATUS REG	1340	172540
P-CLOCK SET BUFFER	1342	172542
P-CLOCK READ BUFFER	1344	172544
L-CLOCK STATUS REG	1346	177546
L-CLOCK INTERRUPT VECTOR	1350	100

P-CLOCK INTERRUPT VECTOR	1352	104
TTY KB STATUS REG	1144	177560
TTY KB BUFFER	1146	177562
TTY PRINTER STATUS REG	1150	177564
TTY PRINTER BUFFER	1152	177566

4.0 OPERATING PROCEDURE & CONTROL FUNCTIONS

4.1 PROGRAM LOADING

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

4.1.1 LOAD THE STARTING ADDRESS (SEE SEC 4.2).

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

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

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

4.1.4 PRESS 'START'

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

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

4.2 STARTING LOCATIONS

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

NOTE: THE DRIVE PRESENT CONDITION IS:

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

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

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

LOCATION 220 - STARTING ADDRESS TO INPUT TESTING PARAMETERS VIA THE INPUT DIALOGUE. BUSS ADDRESS & CONT. INTERRUPT VECTOR INPUTTED ONLY ON 1ST PASS.

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

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

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

4.3 SWITCH REGISTER

THE SWITCHES ARE USED TO PROVIDE CONTROL FUNCTIONS.

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

4.3.1 SW<15>

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

4.3.2 SW<14>

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

4.3.3 SW<13>

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

4.3.4 SW<12>

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

4.3.5 SW<11>

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

4.3.6 SW<10>

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

4.3.7 SW<09>

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

4.3.8 SW<08>

THIS SWITCH IS USED TO SELECT A PARTICULAR TEST (AS PER SW<00-7>) FOR EXECUTION AND SUBSEQUENT LOOPING. THUS IF

TEST 15 IS TO BE SELECTED THE SWITCH SETTING WOULD BE 000415. IT SHOULD BE NOTED THAT BEFORE SELECTING TEST 15, ALL THE PREVIOUS TESTS (1-14) WILL BE EXECUTED.

4.4 'SOFTWARE' SWITCH REGISTER

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

SWR = NNNNNN NEW =

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

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

4.5 INPUT DIALOGUE

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

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

4.5.1 DRIVE SELECTION

THE REQUEST WILL BE:

DRIVES TO BE TESTED:

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

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

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

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

4.5.2 BUS ADDRESS

THE REQUEST WILL BE:

TYPE IN BUSS ADDRESS IF NOT 177440

THE DEFAULT IS A CARRIAGE RETURN

4.5.3 CONTROLLER INTERRUPT VECTOR

THE REQUEST WILL BE:

TYPE IN CONTROLLER INTERRUPT VECTOR IF NOT 210

THE DEFAULT IS A CARRIAGE RETURN.

4.5.4 EXAMPLE OF PROGRAM DIALOGUE

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

```
UNIBUS RK06 DRIVE DIAGNOSTIC
   PART 2
MAINDEC-11-DZR6I-B-PB

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

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

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

```
WILL TEST DRIVES:
1
3

DRIVE 1

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

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

```
UNIBUS RK06 DRIVE DIAGNOSTIC
    PART 2
MAINDEC-11-DZR6I-B-PB

WILL TEST DRIVES:
0
1

DRIVE 0

DRIVE SERIAL NO. AAA
CARTRIDGE SERIAL NO. BBB

DRIVE 1

DRIVE SERIAL NO. CCC
CARTRIDGE SERIAL NO. DDD

END PASS #1


WILL TEST DRIVES:
0
1

DRIVE 0

DRIVE SERIAL NO. AAA
CARTRIDGE SERIAL NO. BBB

DRIVE 1

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

END PASS # 2

(ETC)

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

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

5.0 DRIVE DIAGNOSTIC FUNCTIONAL DESCRIPTION

5.1 GENERAL

A. WRITE TESTS

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

B. SERVO & SPINDLE TIMING TESTS

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

5.2 TEST DESCRIPTIONS

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

TEST 1 REFERENCE ALL CONTROLLER REGISTERS

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

TEST 2 SIZE THE BUSS

THIS TEST IS ENTERED ONLY IF 'DRIVE SELECTION' IS DEFAULTED

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

TEST 3 VERIFY OPERATOR DRIVE SELECTIONS

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

TEST 4 FIND NEXT DRIVE TO BE TESTED

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

TEST 5 PRINT DRIVE SERIAL NUMBER

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

TEST 6 SET VV WITH PACK COMMAND

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

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

THIS TEST VERIFIES THAT CYL 410, TRACK 2 CAN BE READ.
THIS AREA CONTAINS BAD SECTOR INFO WHICH IS WRITTEN BY THE
FACTORY DURING MANF. ALL BAD SECTOR INFO (BSE) WILL BE STORED
AT THIS TIME TO MASK FUTURE READ HEADER OR DATA ERROR PRINTOUTS.
IF BSE INFO CANNOT BE READ, OR IF AFTER READING THE BSE INFO

IT IS DETERMINED THAT AN ALIGNMENT CARTRIDGE IS USED,
A MESSAGE WILL BE TYPED INDICATING THAT ALL
FUTURE FORMAT AND READ-WRITE TESTS WILL BE BYPASSED.
THIS IS DONE SO AS NOT TO DESTROY BSE INFO OR AN ALIGNMENT PACK BY WRITING

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

****
WRITE TESTS
****

TEST 10 BASIC WRITE DATA TEST; 1 WORD

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

TEST 11 BASIC WRITE DATA TEST; FULL SECTOR

THIS TEST VERIFIES THE ABILITY OF THE DRIVE TO WRITE
A FULL SECTOR. ALL ZEROS ARE WRITTEN BY THE WRITE DATA COMMAND
& CHECKED BY A RD DATA COMMAND. A FURTHER CHECK IS PERFORMED
BY THE WRT CHK COMMAND.
THE ABOVE IS REPEATED FOR AN ALL ONES PATTERN.

TEST 12 20 SECTOR FORMAT TEST

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

TEST 13 TEST OFFSET & RTC LOGIC

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

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

TEST 14 TEST READ DATA AT ALL HEAD OFFSET POSITIONS

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

IF THERE ARE NO FAILURES AT ALL, THIS INDICATES THAT

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

AN APPROPRIATE MESSAGE WILL BE TYPED.

TEST 15 WRITE WITH HEADS OFFSET

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

TEST 16 TEST CURRENT CROSS-OVER CYLINDERS

THIS TEST VERIFIES THAT THE DRIVE CAN WRITE & READ OFF CURRENT CHANGE CYLINDERS X & Y IN THE FOLLOWING WAY:

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

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

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

TEST 17 TEST HEAD SWITCHING TIME

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

1. SECTOR 17 IS FIRST LOCATED AND A WRITE DATA COMMAND OF 512 WORDS TO SECTOR 21 IS ISSUED.
2. THE PROGRAM NOW KNOWS THAT THE DRIVE WILL NOT HAVE TO TRAVEL

A FULL REVOLUTION BEFORE FINDING SECTOR 21.
3. SINCE EACH SECTOR TAKES APPROX. 1.2MS, THE TIME BETWEEN THE START OF THE WRITE COMMAND (FROM SECTOR 21, HEAD 0; TO SECTOR 0, HEAD 1) AND CONTROLLER READY SHOULD BE APPROX 6MS

THE ABOVE IS REPEATED FOR HEAD SWITCHING BETWEEN 1 TO 2

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

TEST 20 DRIVE OFF TRACK TEST

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

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

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

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

TEST 21 TIME BETWEEN OUTER LIMIT TO HEADS HOME DURING UNLOAD

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

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

TEST 22 TEST LOW VELOCITY TIMES DURING LOADING

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

TIME 1: TIME BETWEEN HEADS HOME NEGATING & TRACK FOLL OK ASSERTING
EXPECTED TIME APPROX 500 MS

TIME 2: TIME BETWEEN OUTER LIMIT & INNER LIMIT

TIME IS MEASURED FROM TRACK FOLL OK (APPROX OUTER LIMIT)
TO REV (APPROX INNER LIMIT)
EXPECTED TIME APPROX 2 SEC

TIME 3: TIME BETWEEN INNER LIMIT & OUTER LIMIT

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

TEST 23 MEASURE ROTATIONAL SPEED

THIS TEST MEASURES INDEX TIMING BY:

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

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

THE TIME IS THE AVERAGE OF 100 READINGS.

TEST 24 MEASURE MAX SEEK TIME

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

TEST 25 MEASURE MIN SEEK TIME

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

TEST 26 MEASURE 137 CYLINDER SEEK TIME

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

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

TEST 27 MEASURE MAX VELOCITY OF HEADS

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

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

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

6.0 ERROR REPORTING

6.1 ERROR INTERPRETATION

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

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

NOTE

NO ERROR LOGGING OR OPERATION HISTORY IS PROVIDED.

6.2 ERROR PRINTOUT EXAMPLE

```
MESSAGE A0 ERROR
AT END OF HEAD LOADING

  TEST NO.  PC
  000014  013432
RKMR2   RKMR3   RKER    RKDS    RKCS1   RKCS2
140141  100000  000000  140101  040200  000101
  SHOULD BE
  150341

MESSAGE B1 ERROR
AFTER LIMIT DETECT

  TEST NO.  PC
  000023  023316
RKMR2   RKMR3   RKER    RKDS    RKCS1   RKCS2
045720  030001  000000  040000  040200  000100
  SHOULD BE
  045720  120001
```

IN THE FIRST EXAMPLE, RKMR2 (MESSAGE A0) DID NOT READ BACK CORRECTLY. THE CORRECT "SHOULD BE" CONTENTS IS UNDER 'RKMR2'.

IN THE 2ND EXAMPLE, RKMR3 (MESSAGE B1) DID NOT READ BACK CORRECTLY WITH THE CORRECT 'SHOULD BE' CONTENTS UNDER 'RKMR3'.

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

                        ;DEFINE SYSMAC MACROS

                        .MCALL  .HEADER,.SWRHI,.SWRLO,.EQUAT,.SETUP,.$CATCH,.$CMTAG
                        .MCALL  .$EOP,.$SCOPE,.$ERROR,.$TYPE,.$TYPOCT,.$SAVE
                        .MCALL  .$TYPDEC,.$READ,.$RDOCT,.$TRAP,.$DB2O,.$MULT
                        .MCALL  .$ACT11,.$APTHDR,.$APTYPE,.$DB2D,.$SB2D,.$SUPRS
167400                  $SWR=   167400                  ;DEFINE SWITCHES 15,14,13,11,10,9,8
000001                  $TN=    1                       ;SET FIRST TEST NO. TO 1


                        .TITLE  UNIBUS RK06 DRIVE DIAGNOSTIC  PART 2
                        ;*COPYRIGHT (C) 1976
                        ;*DIGITAL EQUIPMENT CORP.
                        ;*MAYNARD, MASS. 01754
                        ;*
                        ;*PROGRAM BY GARY PAPAZIAN
                        ;*
                        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        ;*PACKAGE (MAINDEC-11-DZQAC-C1),MAR 24, 1976.
                        ;*

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


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

```
                        .SBTTL  BASIC DEFINITIONS

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

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

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

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

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

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

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

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

                        .SBTTL  RK06 CONTROLLER REGISTER DEFINITION
```

```
                        ;       $BASE=177440
                        RKCS1=  0               ;CONTROL AND STATUS REGISTER 1
000002                  RKWC=   2               ;WORD COUNT REGISTER
000004                  RKBA=   4               ;BUS ADDRESS REGISTER
000006                  RKDA=   6               ;DESIRED TRACK SECTOR REGISTER
000010                  RKCS2=  10              ;CONTROL AND STATUS REGISTER 2
000012                  RKDS=   12              ;DRIVE STATUS REGISTER
000014                  RKER=   14              ;ERROR REGISTER
000016                  RKASOF= 16              ;ATTENTION SUMMARY AND OFFSET REGISTER
000020                  RKDC=   20              ;DESIRED CYLINDER REGISTER
000024                  RKDB=   24              ;DATA BUFFER
000026                  RKMR1=  26              ;MAINTENANCE REGISTER 1
000034                  RKMR2=  34              ;MAINTENANCE REGISTER 2 (MESSAGE LINE A)
000036                  RKMR3=  36              ;MAINTENANCE REGISTER 3 (MESSAGE LINE B)
000030                  RKECPS= 30              ;ECC POSITION INFORMATION
000032                  RKECPT= 32              ;ECC PATTERN INFORMATION

                        .SBTTL  CONTROL AND STATUS REGISTER 1 BITS (RKCS1:0)

                        ;       DRIVE COMMANDS

000001                  SELDRV= 1               ;SELECT DRIVE (GET STATUS)
000003                  PACK=   3               ;PACK ACKNOWLEDGE
000005                  CLEAR=  5               ;DRIVE CLEAR
000007                  UNLOAD= 7               ;UNLOAD
000011                  SRTSPL= 11              ;START SPINDLE
000013                  RECAL=  13              ;RECALIBRATE
000015                  OFFSET= 15              ;OFFSET
000017                  SEEK=   17              ;SEEK
000021                  RDDATA= 21              ;READ DATA
000023                  WRDATA= 23              ;WRITE DATA
000025                  RDHEAD= 25              ;READ HEADER
000027                  WRHEAD= 27              ;WRITE HEADER AND DATA
000031                  WRTCHK= 31              ;WRITE CHECK

000001                  GO=     BIT0            ;GO BIT
000100                  IE=     BIT6            ;INTERRUPT ENABLE
000200                  RDY=    BIT7            ;CONTROLLER READY
000400                  BA16=   BIT8            ;BUS ADDRESS BIT 16
001000                  BA17=   BIT9            ;BUS ADDRESS BIT 17
002000                  CDT=    BIT10           ;CONTROLLER DRIVE TYPE (0=RK06)
004000                  CTO=    BIT11           ;CONTROLLER TIMEOUT
010000                  CFMT=   BIT12           ;CONTROLLER DRIVE FORMAT (0=22 SECTOR, 1=20 SECTOR)
020000                  SPAR=   BIT13           ;SERCON PARITY ERROR DETECTED BY CONTROLLER
040000                  DI=     BIT14           ;DRIVE INTERRUPT
100000                  CERR=   BIT15           ;CONTROLLER ERROR
100000                  CCLR=   BIT15           ;CONTROLLER CLEAR

                        .SBTTL  CONTROL AND STATUS REGISTER 2 BITS (RKCS2:10)

000007                  DRVMSK= 7               ;MASK FOR DRIVE SELECTION CODE
000010                  RLS=    BIT3            ;DESELECT OR RELEASE DRIVE IN BITS 0-2
000020                  BAI=    BIT4            ;BUS ADDRESS INCREMENT INHIBIT
000040                  SCLR=   BIT5            ;SUBSYSTEM CLEAR CONTROLLER AND ALL DRIVES
```

```
                        IR=     BIT6            ;INPUT READY
                        OR=     BIT7            ;OUTPUT READY
                        UFE=    BIT8            ;UNIT FIELD ERROR
                        MDS=    BIT9            ;MULTIPLE DRIVE SELECT
                        PGE=    BIT10           ;PROGRAMMING ERROR
                        NEM=    BIT11           ;NON-EXISTENT MEMORY
                        NED=    BIT12           ;NON-EXISTENT DRIVE
                        UPE=    BIT13           ;UNIBUS PARITY ERROR
                        WCE=    BIT14           ;WRITE CHECK ERROR
                        DLT=    BIT15           ;DATA LATE ERROR

                .SBTTL  ERROR REGISTER BIT DEFINITION (RKER:14)

                        ILF=    BIT0            ;ILLEGAL FUNCTION CODE
                        SKI=    BIT1            ;SEEK INCOMPLETE
                        NXF=    BIT2            ;NON-EXECUTABLE FUNCTION
                        DRPAR=  BIT3            ;DRIVE DETECTED SERCON PARITY ERROR
                        FMTE=   BIT4            ;FORMAT ERROR
                        DTYE=   BIT5            ;DRIVE TYPE ERROR
                        ECH=    BIT6            ;ECC HARD
                        BSE=    BIT7            ;BAD SECTOR ERROR
                        HVRC=   BIT8            ;HEADER VRC ERROR
                        COE=    BIT9            ;CYLINDER ADDRESS OVERFLOW ERROR
                        IDAE=   BIT10           ;INVALID DISK ADDRESS ERROR: HEAD/CYL
                        WLE=    BIT11           ;WRITE LOCK ERROR
                        DTE=    BIT12           ;DRIVE TIMING ERROR
                        OPI=    BIT13           ;OPERATION (SEARCH) INCOMPLETE
                        UNS=    BIT14           ;DRIVE UNSAFE
                        DCK=    BIT15           ;DATA CHECK

                .SBTTL  STATUS REGISTER BIT DEFINITION (RKDS:12)

                        DRA=    BIT0            ;DRIVE AVAILABLE (CONTROLLER IS SET IF
                                                ;    THIS BIT IS RESET)
                        OFST=   BIT2            ;DRIVE OFFSET
                        ACLO=   BIT3            ;AC LOW
                        DCLO=   BIT4            ;DC LOW
                        DROT=   BIT5            ;DRIVE OFF TRACK
                        VV=     BIT6            ;VOLUME VALID
                        DRDY=   BIT7            ;DRIVE READY
                        DDT=    BIT8            ;DRIVE TYPE (0=RK06)
                        WRL=    BIT11           ;WRITE LOCK
                        PIP=    BIT13           ;POSITIONING IN PROGRESS
                        DSC=    BIT14           ;DRIVE STATUS CHANGE
                        SVAL=   BIT15           ;STATUS VALID

                .SBTTL  MAINTENANCE REGISTER 1 BIT DEFINITION (RKMR1:22)

                        MESMSK= 17              ;MESSAGE MASK
                        PAT=    BIT4            ;FORCE EVEN PARITY ON SERCON MESSAGE LINES
                        DMD=    BIT5            ;DIAGNOSTIC MODE
                        MSP=    BIT6            ;MAINTENANCE SECTOR PULSE
                        MIND=   BIT7            ;MAINTENANCE INDEX
                        MCLK=   BIT8            ;MAINTENANCE CLOCK
                        MERD=   BIT9            ;MAINTENANCE ENCODED READ DATA
                        MEWD=   BIT10           ;MAINTENANCE ENCODED WRITE DATA
```

```
                000040          D.DRA=  BIT5            ;DRIVE AVAILABLE
                000100          D.VV=   BIT6            ;VOLUME VALID
                000200          D.DRDY= BIT7            ;DRIVE READY
                000400          D.DDT=  BIT8            ;DRIVE TYPE (0=RK06)
                001000          D.FORM= BIT9            ;DRIVE FORMAT
                002000          D.OFF=  BIT10           ;OFFSET ON
                004000          D.WRL=  BIT11           ;WRITE LOCK
                010000          D.SPIN= BIT12           ;SPINDLE ON
                020000          D.PIP=  BIT13           ;POSITIONING IN PROGRESS
                040000          D.DSC=  BIT14           ;DRIVE STATUS CHANGE

                                .SBTTL  DEFINITION OF DRIVE STATUS BYTE 01 MESSAGE A (RKMR2:34)

                000020          D.TFOK= BIT4            ;TRACK FOLLOWING OK
                000040          D.HDHM= BIT5            ;HEADS HOME
                000100          D.BRHM= BIT6            ;BRUSHES HOME
                000200          D.DOOR= BIT7            ;DOOR INTERLOCKED
                000400          D.CART= BIT8            ;CARTRAGE INTERLOCK
                001000          D.SPOK= BIT9            ;SPEED OK
                002000          D.FWD=  BIT10           ;FORWARD
                004000          D.REV=  BIT11           ;REVERSE
                010000          D.LOAD= BIT12           ;HEADS LOADING
                020000          D.RTZ=  BIT13           ;RETURN TO ZERO
                040000          D.UNLD= BIT14           ;HEADS UNLOADING

                                .SBTTL  DEFINITION OF DRIVE STATUS BYTE 00 MESSAGE B (RKMR3:36)

                000040          D.IDAE= BIT5            ;INVALID DISK ADDRESS ERROR:HEAD/CYL
                000100          D.ACLO= BIT6            ;AC LOW
                000200          D.FLT=  BIT7            ;DRIVE FAULT
                000400          D.ILF=  BIT8            ;ILLEGAL FUNCTION CODE
                001000          D.PAR=  BIT9            ;DRIVE DETECTED SERCON PARITY ERROR
                002000          D.SKI=  BIT10           ;SEEK INCOMPLETE
                004000          D.WLE=  BIT11           ;WRITE LOCK ERROR
                010000          D.SPLS= BIT12           ;SPEED LOSS
                020000          D.DROT= BIT13           ;DRIVE OFF TRACK
                040000          D.UNS=  BIT14           ;R/W UNSAFE

                                .SBTTL  DEFINITION OF DRIVE STATUS BYTE 01 MESSAGE B (RKMR3:36)

                000020          D.SECT= BIT4            ;SECTOR ERROR
                000040          D.WCUR= BIT5            ;WRITE CURRENT AND NO WRITE GATE
                000100          D.WGAT= BIT6            ;WRITE GATE AND NO TRANSISTIONS
                000200          D.HDFL= BIT7            ;HEAD FAULT
                000400          D.MHD=  BIT8            ;MULTIPLE HEAD SELECT
                001000          D.XERR= BIT9            ;INDEX ERROR
                002000          D.TIB=  BIT10           ;TRIBIT ERROR
                004000          D.PLO=  BIT11           ;PLO ERROR
```

```
                        D.NMOV= BIT12                   ;SEEK AND NO MOTION
                        D.LIMD= BIT13                   ;LIMIT DETECT ON SEEK
                        D.SUNS= BIT14                   ;SERVO UNSAFE

                        .SBTTL  COMMON MASKS AND OTHER BITS: MESSAGE A (RKMR2:34)

                        M.DRV=  7                       ;DRIVE CODE, ALL BYTES
                        M.CDIF= 17760                   ;CYLINDER DIFF, BYTE 10
                        M.OFST= 17760                   ;OFFSET VALUE, BYTE 10
                        M.SER=  77770                   ;DRIVE SERIAL #, BYTE 11

                        .SBTTL  COMMON MASKS AND OTHER BITS: MESSAGE B (RKMR3:36)

                        M.ID=   3                       ;BYTE ID, ALL BYTES
                        M.CADD= 17760                   ;CYLINDER ADDRESS, BYTE 10
                        M.ALGN= BIT14                   ;ALIGN SIGN, BYTE 10
                        M.SECT= 760                     ;SECTOR COUNT, BYTE 11
                        M.HEAD= 7000                    ;HEAD DECODE, BYTE 11
                        M.PAR=  BIT15                   ;PARITY, MESS A/B, ALL BYTES
```

```
                                .SBTTL  TRAP CATCHER

                        000000          .=0
                                ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
                                ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
                        000174          .=174
000174  000000          DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
000176  000000          SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER
                                .SBTTL  STARTING ADDRESS(ES)
000200  000137  010710          JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM
                        000204          .=204
000204  000137  010604          JMP     BYWRT
                        000214          .=214
000214  000137  010624          JMP     BYTIM
                        000220          .=220
000220  000137  010564          JMP     PARSRT          ;INPUT ALL PARAMETERS & START TESTING
                        000224          .=224
000224  000137  010644          JMP     BYWRTA
                        000230          .=230
000230  000137  010666          JMP     BYTIMA

                        000240          .=240
000240  000137  054724          JMP     0.ODT           ;ENTER ODT11

                                .SBTTL  ACT11 HOOKS

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

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

001000                          $APTHD:
001000  000000          $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001002  001210          $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001004  000170          $TSTM:  .WORD   120.    ;;RUN TIM OF LONGEST TEST
```

```
  409  001006  000454                $PASTM: .WORD   300.     ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
  410  001010  000454                $UNITM: .WORD   300.     ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
  411  001012  000052                        .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
  412
```

```
                        .SBTTL  COMMON TAGS

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

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

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

```
                        ;;FATAL ERROR NUMBER
                        ;;TEST NUMBER
                        ;;PASS COUNT
                        ;;DEVICE COUNT
                        ;;I/O UNIT NUMBER
                        ;;MESSAGE ADDRESS
                        ;;MESSAGE LENGTH
                        ;;APT ENVIRONMENT TABLE
                        ;;ENVIRONMENT BYTE
                        ;;ENVIRONMENT MODE BITS
                        ;;APT SWITCH REGISTER
                        ;;USER SWITCHES
                        ;;CPU TYPE,OPTIONS
                        ;*  BITS 15-11=CPU TYPE
                        ;*          11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
                        ;*          11/70=06,PDQ=07,Q=10
                        ;*  BIT 10=REAL TIME CLOCK
                        ;*  BIT  9=FLOATING POINT PROCESSOR
                        ;*  BIT  8=MEMORY MANAGEMENT
                        ;;HIGH ADDRESS,M.S. BYTE
                        ;;MEM. TYPE,BLK#1
                        ;*  MEM.TYPE BYTE   --  (HIGH BYTE)
                        ;*          900 NSEC CORE=001
                        ;*          300 NSEC BIPOLAR=002
                        ;*          500 NSEC MOS=003
                        ;;HIGH ADDRESS,BLK#1
                        ;*  MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
                        ;;HIGH ADDRESS,M.S. BYTE
                        ;;MEM.TYPE,BLK#2
                        ;;MEM.LAST ADDRESS,BLK#2
                        ;;HIGH ADDRESS,M.S.BYTE
                        ;;MEM.TYPE,BLK#3
                        ;;MEM.LAST ADDRESS,BLK#3
                        ;;HIGH ADDRESS,M.S.BYTE
                        ;;MEM.TYPE,BLK#4
                        ;;MEM.LAST ADDRESS,BLK#4
                        ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
                        ;;INTERRUPT VECTOR#2BUS PRIORITY#2
                        ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
                        ;;DEVICE MAP
                        ;;CONTROLLER DESCRIPTION WORD#1
                        ;;CONTROLLER DESCRIPTION WORD#2
                        ;;DEVICE DESCRIPTOR WORD#0
                        ;;DEVICE DESCRIPTOR WORD#1
                        ;;DEVICE DESCRIPTOR WORD#2
                        ;;DEVICE DESCRIPTOR WORD#3
                        ;;DEVICE DESCRIPTOR WORD#4
                        ;;DEVICE DESCRIPTOR WORD#5
                        ;;DEVICE DESCRIPTOR WORD#6
                        ;;DEVICE DESCRIPTOR WORD#7
                        ;;DEVICE DESCRIPTOR WORD#8
                        ;;DEVICE DESCRIPTOR WORD#9
                        ;;DEVICE DESCRIPTOR WORD#10
                        ;;DEVICE DESCRIPTOR WORD#11
                        ;;DEVICE DESCRIPTOR WORD#12
                        ;;DEVICE DESCRIPTOR WORD#13
```

```
                001330  000000          $DDW14: .WORD   ADDW14  ;;DEVICE DESCRIPTOR WORD#14
                001332  000000          $DDW15: .WORD   ADDW15  ;;DEVICE DESCRIPTOR WORD#15

                001334                  $ETEND:

                        177440          ABASE=  177440          ;DEFAULT BUSS ADDRESS
                001334  000210          RKVEC:  210             ;DEFAULT CONTROLLER INTERRUPT VECTOR
                001336  000240          RKPRI:  PR5             ;PRIORITY
                001340  172540          PKS:    172540          ;P-CLOCK STATUS REG
                001342  172542          PKSB:   172542          ;P-CLOCK SET BUFFER
                001344  172544          PKRB:   172544          ;P-CLOCK READ BUFFER
                001346  177546          LKS:    177546          ;L-CLOCK STATUS REG.

                001350  000100          LCVEC:  100             ;L-CLOCK INTERRUPT VECTOR
                001352  000104          PCVEC:  104             ;P-CLOCK INTERRUPT VECTOR.

                        000114          MEMVEC= 114             ;MEMORY PARITY VECTOR
                        172100          MEMBAS= 172100          ;MEMORYB PARITY OPTION
                001354  000000          TRAPPC: 0               ;PC FOR MEM CHECK ENABLE TRAP

                001356  000000          PARAM:  0               ;1 FOR 220 START, NO DEFAULT
                001360  000000          BYPWRT: 0               ;1 FOR 204 OR 224 START
                001362  000000          BYPTIM: 0               ;1 FOR 210 OR 230 START
                001364  000000          FTITLE: 0               ;FLAG FOR PRINTING OUT 1ST PROGRAM TITLE

                001366  000000          DRVPTR: 0               ;CONTAINS THE POINTER TO THE DRIVE FLAG
                                                                ;(DRIV0-DRIV7) OF THE DRIVE TO BE CHECKED NEXT.
                001370  000000          FRCYL:  0               ;FROM CYLINDER
                001372  000000          TOCYL:  0               ;TO CYLINDER
                001374  000000          CCYL:   0               ;CURRENT CYL, USED IN N SQUARE TEST
                001376  000000          PCYL:   0               ;PREV CYL., USED IN N SQUARE TEST
                001400  000000          CALDIF: 0               ;CALC CYL DIFF USED IN N SQUARE TEST
                001402  000000          CYLDIF: 0               ;CYL DIFF, RIGHT JUSTIFIED FROM RKMR3
                001404  000000          CYLADD: 0               ;CYL ADDR, RIGHT JUSTIFIED FROM RKMR3
                001406  000000          CALADD: 0               ;CYL ADDR USED IN FHDTAB ROUTINE

                001410  000074          HZ:     60.             ;60 FOR 60 CPS
                                                                ;50 FOR 50 CPS
                001412  000000          COUNT:  0               ;LOADED TO 50 OR 60 TO COUNT TO 1 SEC
                                                                ;OR ANY OTHER NUMBER TO COUNT OFF FRACTIONAL SECOND
                001414  000000          SEC:    0               ;SECOND COUNTER
                001416  000000          TIMUP:  0               ;FLAG TO INDICATE TIME IS UP
                001420  000000          SECNT:  0               ;SECTOR COUNT
                001422  000000          PSEC:   0               ;PREVIOUS SECTOR
                001424  000000          ESEC:   0               ;EXPECTED SECTOR
                001426  000000          SECTOR: 0               ;SECTOR COUNT, RIGHT JUSTIFIED FROM RKMR3

                001430  000001          T1:     1               ;TIMEOUT CONSTANTS
                001432  000012          T10:    10.
                001434  000062          T50:    50.
                001436  000764          T500:   500.
                001440  000144          T100:   100.
                001442  011610          T5000:  5000.
                001444  141520          T50000: 50000.
```

```
                                ;CYLINDER NUMBERS USED IN
                                ;CURRENT CROSSOVER TEST
                                ;USED IN TIMING TESTS
                                ;LOOP CTR USED IN CALCLK
                                ;LOOP TIME IN USEC
                                ;LO ORDER FOR TIMING TESTS
                                ;HI ORDER FOR TIMING TESTS
                                ;LO ORDER FOR TIMING TESTS
                                ;Hi ORDER FOR TIMING TESTS
                                ;ACTUAL HEADER/DATA WORD
                                ;EXPECTED DATA WORD
                                ;SET WHEN WRITE CHECK ERROR ON OFFSET
                                ;HEAD NUMBER
                                ;SHIFTED HEAD# FOR FORMATTER ROUTINE
                                ;FORMAT TYPE
                                ;SHIFTED FORMAT FOR FORMATTER ROUTINE
                                ;WORD COUNT
                                ;ALL 0'S
                                ;0101 PATT
                                ;ALL 1'S
                                ;HEADER/DATA WORD
                                ;HEADER WORD FROM RKDB
                                ;CANNOT READ BSE INFO WHEN SET
                                ;LIMIT DETECT ERROR FLAG
                                ;CALCULATED HEADER WORD TABLE
                                ;FILLED AFTER READ HEADER CMD
                                ;ABOVE RHTAB SORTED STARTING FORM
                                ;SECTOR 0 BY SORT ROUTINE
                                ;20 SECTOR BSE INFO
                                ;22 SECTOR BSE INFO.
                                ;FILLED AFTER READ DATA CMD
                                ;INVALID CYLINDER ADDR
```

581	001446	000077	CYL:	63.	
582	001450	000177		127.	
583	001452	000277		191.	
584	001454	000377		255.	
585	001456	000477		319.	
586	001460	000577		383.	
587					
588	001462	000000	TIM1:	0	
589	001464	000000	TIM2:	0	
590	001466	000000	TIM3:	0	
591	001470	000000	TIM4:	0	
592					
593	001472	000000	LPCNT:	0	
594	001474	000000	LPTIM:	0	
595					
596	001476	000000	SUM:	0	
597	001500	000000		0	
598	001502	000000	SUM1:	0	
599	001504	000000		0	
600					
601	001506	000000	WD1:	0	
602	001510	000000	WD2:	0	
603					
604	001512	000000	OFFERR:	0	
605					
606					
607	001514	000000	HEAD:	0	
608	001516	000000	HD1:	0	
609	001520	000000	FORMAT:	0	
610	001522	000000	FMT1:	0	
611	001524	000000	WDCNT:	0	
612					
613	001526	000000	DATA0:	0	
614	001530	052525	DATA01:	52525	
615	001532	177777	DATA1:	177777	
616	001534	133467	DPAT1:	133467	
617	001536	070627	DPAT2:	70627	
618					
619	001540	000000	WORD:	0	
620	001542	000000	HDWD:	0	
621					
622	001544	000000	BSERR:	0	
623	001546	000000	LIMERR:	0	
624					
625	001550	000102	HDTAB:	.BLKW 66.	
626	001754	000102	RHTAB:	.BLKW 66.	
627	002160	000102	SRTTAB:	.BLKW 66.	
628					
629	002364	000400	BSE20:	.BLKW 256.	
630	003364	000400	BSE22:	.BLKW 256.	
631	004364	000400	RDTAB:	.BLKW 256.	
632					
633	005364	000633	INVCYL:	411.	
634	005366	000634		412.	
635	005370	000640		416.	
636	005372	000700		448.	

```
                        480.

005376  001  002  004  ATTN:  .BYTE 1,2,4,10,20,40,100,200    ;ATN 0-7 RESP.
005401  010  020  040
005404  100  200

                        .EVEN

                        .LIST   MD

                ;
                ;USE LOOP X TO OMIT SUBCLR
                ;

                .MACRO  LOOP    A
                        SCOP1
                        MOV     #STACK,SP       ;RESTORE STK PTR

                .IF     B       A
                        JSR     PC,SUBCLR
                        ERROR   24              ;CERR AFTER SCLR

                .ENDC
                .ENDM   LOOP

                ;
                ;A=MSG A0 ERROR#, B=MSG B0 ERROR#
                ;C=MSG A1 ERROR#, D=MSG B1 ERROR#
                ;
                ;E=<ERROR CONDITION DESCRIPTION>
                ;F=D.DSC AFTER ATTN OR 0 AFTER DRIVE CLEAR OR ANY IMPLIED SEEKS
                ;
                ;       NOTE: F CAN BE ANY BIT COMBINATION DESIRED
                ;
                .MACRO  CKWD12  A,B,C,D,E,F

                        MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
                        JSR     PC,GSTAT        ;GET LATEST STATUS
                        MOV     #<F!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
                        JSR     PC,CKMR2        ;CHECK MR2
                        ERROR   A               ;MSG A0 ERROR E
                        CLR     SBMR3
                        JSR     PC,CKMR3        ;CHECK MR3
                        ERROR   B               ;MSG B0 ERROR E

                        MOV     #CCLR,RKCS1(R5)
                        MOV     #1,RKMR1(R5)    ;SELECT WORD 1
                        JSR     PC,GSTAT
                        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
                        JSR     PC,CKMR2
                        ERROR   C               ;MSG A1 ERROR E
                        CLR     SBMR3
                        JSR     PC,CKMR3
                        ERROR   D               ;MSG B1 ERROR E

                .ENDM   CKWD12
```

```
                        ;
                        ;A=CYL DIFF/OFFSET ERROR#
                        ;B=CYL ADDR ERROR#
                        ;C=<ERROR CONDITION DESCRIPTION>
                        ;
                        .MACRO  CKWD3   A,B,C,?D,?E

                                MOV     #CCLR,RKCS1(R5)
                                JSR     PC,RDCYLD       ;READ CYL DIFF IN RKMR2
                                TST     CYLDIF
                                BEQ     D
                                ERROR   A               ;CYL DIFF/OFFSET NOT CLEARED C
                        D:      JSR     PC,RDCYLA       ;READ CYL ADDR IN RKMR3
                                TST     CYLADD
                                BEQ     E
                                ERROR   B               ;CYL ADDR NOT CLEARED C
                        E:

                        .ENDM   CKWD3

                        .MACRO  DRCLR   ?A

                                MOV     #CCLR,RKCS1(R5)
                                MOV     $UNIT,RKCS2(R5) ;DRIVE#
                                MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
                                MOV     T10,TEMP1       ;SETUP TIMEOUT
                                JSR     PC,FRDY         ;FIND RDY
                                ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
                                JSR     PC,TSTATN       ;TEST FOR ATTN
                                BR      A
                                ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
                        A:

                        .ENDM   DRCLR


                        ;
                        ;USE CALIB      X   TO OMIT CKWD12 & CKWD3
                        ;
                        .MACRO  CALIB   A,?C

                                MOV     #CCLR,RKCS1(R5)
                                MOV     $UNIT,RKCS2(R5)
                                MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
                                                        ;RESET CYL DIFF/OFFSET & CYL ADDR REG
                                                        ;IN RKMR2 & RKMR3 RESP.
                                MOV     T10,TEMP1       ;SETUP TIMEOUT
                                JSR     PC,FRDY         ;FIND RDY
                                ERROR   124             ;RDY NOT SET AFTER RECAL CMD

                                MOV     #1,RKMR1(R5)    ;SELECT WORD 1
                                JSR     PC,GSTAT
                                BIT     #D.RTZ,HMR2
                                BNE     C
                                ERROR   244             ;RTZ NOT SET DURING RECAL CMD
```

```
                        C:      MOV     T10,TEMP2       ;SETUP TIMEOUT
                                JSR     PC,FATT1        ;FIND ATTN
                                ERROR   55              ;NO ATTN AFTER RECAL CMD
                        .IF B   A
                                CKWD12  221,275,222,276,<AFTER RECAL CMD>,D.DSC
                                CKWD3   47,50,<AFTER RECAL CMD>
                        .ENDC
                                DRCLR

                        .ENDM   CALIB


                        ;
                        ; A=WRHEAD/<CFMT!WRHEAD>
                        ; USE WRHDR     <A>,X   TO OMIT CKWD12
                        ;
                        .MACRO  WRHDR   A,C,?D

                                MOV     #<A>,RKCS1(R5)  ;WRITE HEADER CMD
                                MOV     T50000,TEMP1    ;SETUP  TIMEOUT
                                JSR     PC,FRDY         ;FIND RDY
                                ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
                                JSR     PC,GSTAT        ;GET FRESH STATUS
                                BIT     #CERR,HCS1
                                BEQ     D
                                ERROR   201             ;CERR AFTER WRITE HEADER CMD
                                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
                                JMP     TIMING
                        D:
                        .IF B   C
                                CKWD12  277,267,300,270,<AFTER WRITE HEADER CMD>,0
                        .ENDC

                        .ENDM   WRHDR

                        ;
                        ; A=RDHEAD/<CFMT!RDHEAD>
                        ;USE RDHDR <A>,X TO OMIT CKWD12
                        ;
                        .MACRO  RDHDR   A,C,?D,?E

                                MOV     #RHTAB,R0
                                MOV     #<A>,RKCS1(R5)  ;READ HEADER CMD
                                MOV     T50000,TEMP1    ;SETUP  TIMEOUT
                                JSR     PC,FRDY         ;FIND RDY
                                ERROR   171             ;NO RDY AFTER READ HEADER CMD
                                BIT     #CERR,HCS1
                                BEQ     D
                                ERROR   174             ;CERR AFTER READ HEADER CMD
                                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING TESTS
                                JMP     TIMING

                        D:      MOV     RKDB(R5),(R0)+  ;1'ST WORD FROM SILO TO RHTAB
                                MOV     RKDB(R5),(R0)+  ;2'ND WORD
                                MOV     RKDB(R5),(R0)+  ;3'RD WORD
```

```
                        BIT     #DLT,RKCS2(R5)
                        BEQ     E
                        JSR     PC,GSTAT
                        ERROR   173             ;DLT AFTER READ HEADER CMD
                        TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING TESTS
                        JMP     TIMING
                E:
                .IF     B       C
                        NOP                     ;FILLED BY CKWD12 AT A LATER DATE
                .ENDC

                .ENDM   RDHDR


                .MACRO  HDCHK3  ?A

                        RDHDR   RDHEAD,X
                        CMP     RHTAB,TOCYL     ;CHECK WORD 0 ONLY, CYL#
                        BEQ     A               ;BR IF SAME
                        ERROR   51              ;WRONG CYL# ON HEADER
                A:

                .ENDM   HDCHK3

                ;
                ; A=TOCYL/FRCYL , B=HEAD#, C = 0 FOR 22 SECTOR, 1 FOR 20 SECTOR
                ;
                .MACRO  HDTBL   A,B,C

                        MOV     A,CALADD        ;SETUP
                        MOV     #B,HEAD         ;TO FILL
                        MOV     #C,FORMAT       ;HEADER
                        JSR     PC,FHDTAB       ;TABLE

                .ENDM   HDTBL

                ;
                ;QUICK SEEK.    ENTER WITH CYL# IN RKDC
                ;
                .MACRO  QKSEEK  ?A

                        MOV     #SEEK,RKCS1(R5) ;SEEK CMD
                        MOV     T50,TEMP1       ;SETUP TIMEOUT
                        JSR     PC,FRDY         ;FIND RDY
                        ERROR   131             ;NO RDY AFTER SEEK CMD

                        MOV     T50000,TEMP1    ;SETUP TIMEOUT
                        JSR     PC,FATT2        ;FIND ATTN
                        ERROR   132             ;NO ATTN AFTER SEEK CMD

                        BIT     #CERR,HCS1
                        BEQ     A
                        ERROR   210             ;CERR AFTER SEEK CMD

                A:
```

```
                        .ENDM   QKSEEK


                        ;
                        ;A=WRDATA/<CFMT!WRDATA>
                        ;USE WDATA <A>,X TO OMIT CKWD12
                        ;
                        .MACRO  WDATA   A,C,?D

                                MOV     #<A>, RKCS1(R5) ;WRITE DATA CMD
                                MOV     T50000, TEMP1   ;SETUP TIMEOUT
                                JSR     PC,FRDY         ;FIND RDY
                                ERROR   11              ;NO RDY AFTER WRITE DATA CMD
                                JSR     PC,GSTAT        ;GET FRESH STATUS
                                BIT     #CERR,HCS1
                                BEQ     D
                                ERROR   12              ;CERR AFTER WRITE DATA CMD
                                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
                                JMP     @TIMING

                        D:
                        .IF     B       C
                                CKWD12  52,23,53,25,<AFTER WRITE DATA CMD>,0
                        .ENDC
                        .ENDM   WDATA


                        ;
                        ;A=RDDATA/<CFMT!RDDATA>
                        ;USE RDATA      <A>,X TO OMIT CKWD12
                        ;
                        .MACRO  RDATA   A,C,?D,?E

                                MOV     #<A> ,RKCS1(R5) ;READ DATA CMD
                                MOV     T50000, TEMP1   ;SETUP TIMEOUT
                                JSR     PC,FRDY         ;FIND RDY
                                ERROR   13              ;NO RDY AFTER READ DATA CMD
                                JSR     PC,GSTAT        ;GET FRESH STATUS
                                BIT     #DCK,HER
                                BEQ     D
                                ERROR   21              ;DATA CHECK ERROR AFTER READ DATA CMD
                                                        ;ECC ERROR DETECTED
                                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
                                JMP     @TIMING

                        D:      BIT     #CERR,HCS1
                                BEQ     E
                                ERROR   14              ;CERR AFTER READ DATA CMD
                                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
                                JMP     @TIMING

                        E:
                        .IF     B       C
                                CKWD12  54,26,56,30,<AFTER READ DATA CMD>,0
                        .ENDC
```

```
                        .ENDM   RDATA


                        ;
                        ;A=WRTCHK/<CFMT!WRTCHK>
                        ;C=EXPECTED DATA FOR TYPEOUT
                        ;USE WRCHK      <A>,DATA0,X TO OMIT CKWD12
                        ;
                        .MACRO  WRCHK   A,C,D,?E,?F

                                MOV     #<A>,RKCS1(R5)  ;WRITE CHECK CMD
                                MOV     T50000, TEMP1   ;SETUP TIMEOUT
                                JSR     PC,FRDY         ;FIND RDY
                                ERROR   15              ;NO RDY AFTER WRITE CHECK CMD

                                JSR     PC,GSTAT        ;GET FRESH STATUS
                                BIT     #CERR,HCS1
                                BEQ     F

                                BIT     #WCE,HCS2       ;SEE IF WRITE CHECK ERROR
                                BEQ     E
                                MOV     RKDB(R5),WD1    ;ACTUAL WORD FOR TYPEOUT
                                MOV     C,WD2   ;EXPECTED WORD FOR TYPEOUT
                                JSR     PC,TRUERR       ;CHECK AGAINST BSE INFO
                                ERROR   16              ;WCE AFTER WRITE CMD
                                BR      F

                        E:      ERROR   22              ;CERR AFTER WRITE CHK CMD

                        F:
                        .IF     B       D
                                CKWD12  57,31,60,32,<AFTER WRITE CHECK CMD>,0
                        .ENDC

                        .ENDM   WRCHK


                        .MACRO  OFSET ?A

                                MOV     #A,$ESCAPE
                                MOV     #OFFSET,RKCS1(R5)   ;OFFSET CMD
                                MOV     T100,TEMP1      ;SETUP TIMEOUT
                                JSR     PC,FRDY
                                ERROR   33              ;NO RDY AFTER OFFSET CMD

                                CLR     RKMR1(R5)       ;GET WORD 0
                                JSR     PC,GSTAT
                                MOV     #<0.PIP!D.SPIN!D.OFF!D.VV!D.DRA>, SBMR2
                                JSR     PC,CKMR2        ;CHECK MR2
                                ERROR   35              ;MSG AO ERROR DURING OFFSET CMD

                                CLR     SBMR3
                                JSR     PC,CKMR3        ;CHECK MR3
                                ERROR   61              ;MSG BO ERROR DURING OFFSET CMD
```

```
                        MOV     #CCLR,RKCS1(R5)
                        MOV     #1,RKMR1(R5)    ;SELECT WORD 1
                        JSR     PC,GSTAT
                        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
                        JSR     PC,CKMR2
                        ERROR   36              ;MSG A1 ERROR DURING OFFSET

                        CLR     SBMR3
                        JSR     PC,CKMR3
                        ERROR   62              ;MSG B1 ERROR DURING OFFSET

                A:      CLR     $ESCAPE
                        MOV     T5000,TEMP1     ;SETUP TIMEOUT
                        JSR     PC,FATT2        ;FIND ATTN
                        ERROR   34              ;NO ATTN AFTER OFFSET CMD

                        CKWD12  260,261,37,40,<AFTER OFFSET CMD>,<D.DSC!D.OFF>

                .ENDM   OFSET


                ;
                ;A=CYL # TO GO TO
                ;B=FWD DIRECTION MSG
                ;C=REV DIRECTION MSG
                ;
                .MACRO  SKTIM   A,B,C

                        JSR     PC,CALCLK       ;CALIB TIME TO GO THRU 'LOOP'

                        CLR     R0              ;ITERATION COUNTER
                        CLR     SUM             ;LO WORD OF FOWARD SEEK TIME
                        CLR     SUM+2           ;HI WORD OF FOWARD SEEK TIME
                        CLR     SUM1            ;LO WORD OF REVERSE SEEK TIME
                        CLR     SUM1+2          ;HI WORD OF REVERSE SEEK TIME

                1$:     JSR     PC,SUBCLR
                        ERROR   24              ;CERR AFTER SCLR

                        MOV     #7$,$ESCAPE

                        MOV     #A,RKDC(R5)     ;SETUP FOR CYL A
                2$:     MOV     #SEEK,RKCS1(R5) ;SEEK CMD
                        MOV     T50,TEMP1
                        JSR     PC,FRDY         ;FIND RDY
                        ERROR   131             ;NO RDY AFTER SEEK CMD

                        CLR     LPCNT           ;COUNT PASSES THRU LOOP
                        MOV     $UNIT,R4
                        JSR     PC,FATT3        ;FIND ATTN AND STEP 'LPCNT'
                        ERROR   132             ;NO ATTN AFTER SEEK CMD

                        JSR     PC,GSTAT
                        BIT     #CERR,HCS1
                        BEQ     5$
                        ERROR   210             ;CERR AFTER SEEK CMD.
```

```
1029
1030                            5$:     MOV     LPCNT,$TMP0     ;FROM LOOP
1031                                    MOV     LPTIM,$TMP1     ;FROM CALCLK
1032                                    MULT    $TMP0,$TMP1
1033
1034                                    TST     RKDC(R5)
1035                                    BEQ     6$              ;BR IF THIS SEEK WAS REVERSE TO CYL 0
1036
1037                                    ADD     $TMP1,SUM       ;SUM UP FOWARD SEEK TIMES (LSB)
1038                                    ADC     SUM+2
1039                                    ADD     $TMP2,SUM+2     ;MSB
1040
1041                                    JSR     PC,SUBCLR
1042                                    ERROR   24              ;CERR AFTER SCLR
1043                                    BR      2$              ;SEEK TO CYL 0
1044
1045                            6$:     ADD     $TMP1,SUM1      ;SUM UP REVERSE SEEK TIMES (LSB)
1046                                    ADC     SUM1+2
1047                                    ADD     $TMP2,SUM1+2    ;MSB
1048
1049                                    INC     R0
1050                                    CMP     R0,#100.        ;ALL SEEKS DONE?
1051                                    BNE     1$              ;BR & REPEAT IF NO TO CYL A
1052
1053                                    TYPE    ,B              ;FOWARD SEEK TIME
1054                                    JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (FOWARD)
1055
1056                                    TYPE    ,C              ;REVERSE SEEK TIME
1057                                    MOV     SUM1,SUM        ;SETUP FOR
1058                                    MOV     SUM1+2,SUM+2    ;AVGTIM ROUTINE
1059                                    JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (REVERSE)
1060
1061                                    TYPE    ,$CRLF
1062                                    TYPE    ,$CRLF
1063                                    CLR     $ESCAPE
1064                                    SKIP    R,<GO TO NEXT TEST>
1065
1066                            7$:     CLR     $ESCAPE
1067                                    CALIB   X
1068
1069                            .ENDM   SKTIM
1070
1071                            .MACRO  EOPGM
1072
1073                                    SCOPE
1074                                    MOV     #STACK,SP
1075                                    INC     $DEVCT          ;INCR COUNT FOR # DRIVES CHECKED
1076                                    CMP     DRIVS,$DEVCT    ;ARE ALL DRIVES PRESENT TESTED?
1077                                    BEQ     $EOP1+2         ;BR IF YES
1078                                    JMP     NUDRV           ;ELSE TEST NEXT DRIVE PRESENT
1079                            $EOP1:  SCOPE
1080                            .ENDM   EOPGM
1081                            ;
1082                            ;A= ERROR #
1083                            ;B = ERROR CONDITION
1084                            ;
```

```
                                .MACRO  OFFDIR  A,B,?C,?D
                                        MOV     R2,RKASOF(R5)   ;REFRESH RKASOF

                                        BIT     #BIT7,R2
                                        BNE     C               ;BR IF NEG OFFSET

                                        JSR     PC,RDCYLD
                                        CMP     R2,CYLDIF       ;CHECK POS OFFSET
                                        BEQ     D
                                        ERROR   A               ;OFFSET IN RKMR2 NOT = RKASOF
                                        BR      D               ;B

                                C:      JSR     PC,RDCYLD
                                        CMP     R1,CYLDIF       ;CHECK NEG OFFSET
                                        BEQ     D
                                        ERROR   A               ;OFFSET IN RKMR2 NOT = RKASOF
                                                                ;B
                                D:
                                .ENDM   OFFDIR

                                ;
                                ;A&B=ERROR # & CYL #
                                ;C&D=ERROR # & CYL #
                                ;
                                .MACRO  AVGVEL  A,B,C,D,?E,?F,?G,?H

                                        MOV     T500,TEMP1
                                E:      JSR     PC,QKCYLD       ;READ CYL DIFF (NO SHIFTING)
                                        BIT     #BIT11,CYLDIF   ;CHECK BIT 7 (NO SHIFTING)
                                        BNE     F               ;BR IF SET
                                        DEC     TEMP1
                                        BNE     E
                                        ERROR   A               ;CANNOT FIND CYL B

                                F:      CLR     LPCNT
                                G:      JSR     PC,QKCYLD
                                        BIT     #BIT11,CYLDIF   ;CHECK BIT 7 (NO SHIFTING)
                                        BEQ     H

                                        JSR     PC,LOOP
                                        TST     LPCNT
                                        BNE     G
                                        ERROR   C               ;CANNOT FIND CYL D
                                H:
                                .ENDM   AVGVEL

                                        .NLIST  MD


                                ;
                                ;THE FOLLOWING ARE HOLDING REGISTERS FOR THE RK611 REGISTERS
                                ;THEY ARE LOADED AFTER RDY IS REC'D FROM WRDY ROUTINE.
                                ;

 005406  000000                 HCS1:   0                       ;HOLD RKCS1
 005410  000000                 HCS2:   0                       ;HOLD RKCS2
```

```
                                HWC:    0                       ;HOLD RKWC
                                HBA:    0                       ;ETC.
                                HDA:    0
                                HDS:    0
                                HER:    0
                                HASOF:  0
                                HDC:    0
                                HDB:    0
                                HMR1:   0
                                HMR2:   0
                                HMR3:   0
                                HPOS:   0
                                HPAT:   0

                                ;
                                ;THE FOLLOWING ARE "SHOULD BE" REGISTERS FOR THE ABOVE REGISTERS
                                ;
                                SBMR2:  0                       ;'SHOULD BE' FOR HMR2
                                SBMR3:  0                       ;ETC

                                TEMP1:  0                       ;TEMPORARY STORAGE.
                                TEMP2:  0
                                TEMP3:  0
                                TEMP4:  0
                                TEMP5:  0

                                ;
                                ;ALL THE FLAGS BELOW ARE CLEARED INITIALLY BY THE CLRFLG ROUTINE.
                                ;

                                DDUMP:  0                       ;FLAG - SET WHEN IN DDP DUMP MODE
                                DDPCH:  0                       ;FLAG - SET WHEN IN DDP CHAIN MODE
                                ACT11:  0                       ;FLAG - SET WHEN IN ACT11 MODE OF OPERATION
                                PPTP:   0                       ;FLAG - SET WHEN PROGRAM LOADED BY PAPER TAPE
                                DRIVS:  0                       ;CONTAINS THE NUMBER OF DRIVES PRESENT

                                ;THE FLAGS BELOW ARE SET TO 1 TO INDICATE THAT A PARTICULAR DRIVE
                                ;IS PRESENT AND IS TO BE TESTED.

                                DRIV0:  0                       ;FLAG SET TO 1 WHEN DRIVE 0 PRESENT
                                DRIV1:  0                       ;FOR DRIVE 1
                                DRIV2:  0                       ;FOR DRIVE 2
                                DRIV3:  0                       ;FOR DRIVE 3
                                DRIV4:  0                       ;FOR DRIVE 4
                                DRIV5:  0                       ;FOR DRIVE 5
                                DRIV6:  0                       ;FOR DRIVE 6
                                DRIV7:  0                       ;FOR DRIVE 7

                                LCLKF:  0                       ;L-CLOCK FLAG PRESENT FLAG
                                PCLKF:  0                       ;P-CLOCK FLAG PRESENT FLAG
                                DOTIM:  0                       ;SET IF EITHER CLOCK PRESENT FOR TIMING TESTS.
                                SIZFLG: 0                       ;SET IF DEFAULT DO SIZING IN TEST 1
```

```
                                .SBTTL  ERROR POINTER TABLE

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

005524                          $ERRTB:

                                ;ERROR 1
005524  046275                          EM2                     ;DR # IN RKCS2 CANNOT BE READ BACK CORRECTLY IN RKMR2
005526  051464                          DH1
005530  053676                          DT1
005532  054134                          DF1

                                ;ERROR 2
005534  046514                          EM5                     ;DETECTED MDS
005536  051464                          DH1
005540  053676                          DT1
005542  054134                          DF1

                                ;ERROR 3
005544  046535                          EM6                     ;DETECTED UFE
005546  051464                          DH1
005550  053676                          DT1
005552  054134                          DF1

                                ;ERROR 4
005554  046556                          EM7                     ;DETECTED DRA & NED RESET (WRONG PORT SELECTED?)
005556  051464                          DH1
005560  053676                          DT1
005562  054134                          DF1
                                ;ERROR 5
005564  046645                          EM8                     ;DR PRESENT BUT NOT SPECIFIED BY OPERATOR
005566  051464                          DH1
005570  053676                          DT1
005572  054134                          DF1

                                ;ERROR 6
005574  046721                          EM9                     ;DR NOT PRESENT BUT SPECIFIED BY OPERATOR
005576  051464                          DH1
005600  053676                          DT1
005602  054134                          DF1

                                ;ERROR 7
005604  046775                          EM10                    ;ABORT TEST, COULD NOT REFERENCE CONTROLLER REGISTER
005606  051464                          DH1
005610  053676                          DT1
005612  054134                          DF1
```

```
1249
1250
1251  005614  047060                ;ERROR 10
1252  005616  051464                      EM11                    ;DRA & NED BOTH SET
1253  005620  053676                      DH1
1254  005622  054134                      DT1
1255                                      DF1
1256  005624  047124                ;ERR 11
1257  005626  052525                      EM12                    ;NO RDY
1258  005630  053676                      DH27                    ;AFTER WRITE DATA CMD
1259  005632  054250                      DT1
1260                                      DF10
1261  005634  047520                ;ERR 12
1262  005636  052525                      EM21                    ;CERR SET
1263  005640  053676                      DH27
1264  005642  054250                      DT1
1265                                      DF10
1266  005644  047124                ;ERR 13
1267  005646  052475                      EM12                    ;NO RDY
1268  005650  053676                      DH26                    ;AFTER READ DATA CMD
1269  005652  054250                      DT1
1270                                      DF10
1271  005654  047520                ;ERR 14
1272  005656  052475                      EM21                    ;CERR SET
1273  005660  053676                      DH26
1274  005662  054250                      DT1
1275                                      DF10
1276  005664  047124                ;ERR 15
1277  005666  052610                      EM12                    ;NO RDY
1278  005670  053676                      DH32                    ;AFTER WRITE CHECK CMD
1279  005672  054250                      DT1
1280                                      DF10
1281  005674  050304                ;ERR 16
1282  005676  052610                      EM80                    ;WRITE CHECK ERROR SET
1283  005700  054016                      DH32                    ;AFTER WRITE CHECK CMD
1284  005702  054150                      DT6
1285                                      DF3
1286  005704  050343                ;ERR 17
1287  005706  053410                      EM81                    ;WRITE CHECK CMD NOT FUNCTIONING
1288  005710  051464                      DH52                    ;WITH INTENTIONAL MISCOMPARE
1289  005712  054250                      DH1
1290                                      DF10
1291  005714  050407                ;ERR 20
1292  005716  052475                      EM82                    ;READ DATA NOT COMPARE WITH WRITE DATA
1293  005720  054016                      DH26                    ;AFTER READ DATA CMD
1294  005722  054150                      DT6
1295                                      DF3
1296  005724  050461                ;ERR 21
1297  005726  052475                      EM83                    ;DATA CHECK ERROR
1298  005730  053676                      DH26
1299  005732  054250                      DT1
1300                                      DF10
1301  005734  047520                ;ERR 22
1302  005736  052610                      EM21                    ;CERR SET
1303  005740  053676                      DH32                    ;AFTER WRITE CHECK CMD
1304  005742  054250                      DT1
                                          DF10
```

```
1305
1306  005744  047435          ;ERR 23
1307  005746  052525                EM18            ;MSG B0 ERROR
1308  005750  053676                DH27            ;AFTER WRITE DATA CMD
1309  005752  054230                DT1
1310                           DF9
1311  005754  047520          ;ERROR 24
1312  005756  052345                EM21            ;CERR SET
1313  005760  053676                DH21            ;AFTER SCLR
1314  005762  054250                DT1
1315                           DF10
1316  005764  047477          ;ERR 25
1317  005766  052525                EM20            ;MSG B1 ERROR
1318  005770  053676                DH27
1319  005772  054230                DT1
1320                           DF9
1321  005774  047435          ;ERR 26
1322  005776  052475                EM18
1323  006000  053676                DH26            ;AFTER READ DATA CMD
1324  006002  054230                DT1
1325                           DF9
1326
1327  006004  047542          ;ERROR 27
1328  006006  052267                EM24            ;VOL VALID NOT SET
1329  006010  053676                DH19            ;AFTER PACK CMD
1330  006012  054250                DT1
1331                           DF10
1332  006014  047477          ;ERR 30
1333  006016  052475                EM20            ;MSG B1 ERROR
1334  006020  053676                DH26            ;AFTER READ DATA CMD.
1335  006022  054230                DT1
1336                           DF9
1337  006024  047435          ;ERR 31
1338  006026  052610                EM18            ;MSG B0 ERROR
1339  006030  053676                DH32            ;AFTER WRITE CHECK CMD
1340  006032  054230                DT1
1341                           DF9
1342  006034  047477          ;ERR 32
1343  006036  052610                EM20            ;MSG B1 ERROR
1344  006040  053676                DH32
1345  006042  054230                DT1
1346                           DF9
1347  006044  047124          ;ERR 33
1348  006046  052425                EM12            ;CONTR NOT READY
1349  006050  053722                DH24            ;AFTER OFFSET CMD
1350  006052  054264                DT2
1351                           DF11
1352  006054  047162          ;ERR 34
1353  006056  052425                EM13            ;NO ATTN
1354  006060  053722                DH24
1355  006062  054264                DT2
1356                           DF11
1357  006064  047414          ;ERR 35
1358  006066  053444                EM17            ;MSG A0 ERROR
1359  006070  053676                DH53            ;DURING OFFSET COMMAND
1360  006072  054210                DT1
                               DF8
```

```
1361
1362  006074  047456          ;ERR 36
1363  006076  053444                EM19                    ;MSG A1 ERROR
1364  006100  053676                DH53
1365  006102  054210                DT1
1366                           DF8
1367  006104  047456          ;ERR 37
1368  006106  052425                EM19                    ;MSG A1 ERROR
1369  006110  053676                DH24                    ;AFTER OFFSET CMD
1370  006112  054210                DT1
1371                           DF8
1372  006114  047477          ;ERR 40
1373  006116  052425                EM20                    ;MSG B1 ERROR
1374  006120  053676                DH24
1375  006122  054230                DT1
1376                           DF9
1377  006124  047204          ;ERR 41
1378  006126  051764                EM14                    ;UNEXP MEM PCRITY TRAP
1379  006130  053744                DH8                     ;TEST #, TRAP PC
1380  006132  054144                DT3
1381                           DF2
1382  006134  047745          ;ERR 42
1383  006136  052425                EM41                    ;CYL ADDR IN RKMR2 DID NOT REMAIN CLEARED
1384  006140  053676                DH24
1385  006142  054250                DT1
1386                           DF10
1387  006144  050516          ;ERR 43
1388  006146  052373                EM85
1389  006150  053722                DH22
1390  006152  054264                DT2
1391                           DF11
1392  006154  047242          ;ERR 44
1393  006156  051464                EM15                    ;WCE AT CYL 411,TRK 2, SEC 21
1394  006160  054114                DH1
1395  006162  054164                DT10
1396                           DF4
1397  006164  050516          ;ERR 45
1398  006166  053355                EM85                    ;OFFSET BIT IN RKMR2 CLEARED
1399  006170  053722                DH51                    ;AFTER SEEK TO SELF
1400  006172  054264                DT2
1401                           DF11
1402  006174  000000          ;ERR 46
1403  006176  000000                0
1404  006200  000000                0
1405  006202  000000                0
1406                           0
1407  006204  047640          ;ERROR 47
1408  006206  052216                EM39                    ;CYL DIFF/OFFSET IN RKMR2 NOT CLEARED
1409  006210  053676                DH17                    ;AFTER RECAL CMD
1410  006212  054250                DT1
1411                           DF10
1412  006214  047707          ;ERROR 50
1413  006216  052216                EM40                    ;CYL ADDR IN RKMR3 NOT CLEARED
1414  006220  053676                DH17                    ;AFTER RECAL COMD
1415  006222  054250                DT1
1416                           DF10
                               ;ERR 51
```

```
1417  006224  051040                EM93            ;WRONG CYL# IN HEADER WORD (MISPOSITION)
1418  006226  052452                DH25            ;AFTER SEEK CMD
1419  006230  054076                DT9
1420  006232  054350                DF20
1421                          ;ERR 52
1422  006234  047414                EM17            ;MSG AD ERROR
1423  006236  052525                DH27            ;AFTER WRITE DATA CMD
1424  006240  053676                DT1
1425  006242  054210                DF8
1426                          ;ERR 53
1427  006244  047456                EM19            ;MSG A1 ERROR
1428  006246  052525                DH27
1429  006250  053676                DT1
1430  006252  054210                DF8
1431                          ;ERR 54
1432  006254  047414                EM17            ;MSG AD ERROR
1433  006256  052475                DH26            ;AFTER READ DATA CMD
1434  006260  053676                DT1
1435  006262  054210                DF8
1436                          ;ERROR 55
1437  006264  047162                EM13            ;NO ATTN
1438  006266  052216                DH17            ;AFTER RECAL CMD
1439  006270  053676                DT1
1440  006272  054250                DF10
1441                          ;ERR 56
1442  006274  047456                EM19            ;MSG A1 ERROR
1443  006276  052475                DH26
1444  006300  053676                DT1
1445  006302  054210                DF8
1446                          ;ERR 57
1447  006304  047414                EM17            ;MSG AD ERROR
1448  006306  052610                DH32            ;AFTER WRITE CHECK CMD
1449  006310  053676                DT1
1450  006312  054210                DF8
1451                          ;ERR 60
1452  006314  047456                EM19            ;MSG A1 ERROR
1453  006316  052610                DH32
1454  006320  053676                DT1
1455  006322  054210                DF8
1456                          ;ERR 61
1457  006324  047435                EM18            ;MSG BD ERROR
1458  006326  053444                DH53            ;DURING OFFSET CMD
1459  006330  053676                DT1
1460  006332  054230                DF9
1461                          ;ERR 62
1462  006334  047477                EM20            ;MSG B1 ERROR
1463  006336  053444                DH53
1464  006340  053676                DT1
1465  006342  054230                DF9
1466                          ;ERR 63
1467  006344  000000                0
1468  006346  000000                0
1469  006350  000000                0
1470  006352  000000                0
1471                          ;ERR 64
1472  006354  050622                EM88            ;DID NOT FIND SECTOR 0 FROM INDEX
```

```
1473  006356  053472                    DH54                    ;AFTER FORMAT CHANGE AND READY REC'D
1474  006360  053676                    DT1
1475  006362  054250                    DF10
1476                              ;ERR 65
1477  006364  000000                    0
1478  006366  000000                    0
1479  006370  000000                    0
1480  006372  000000                    0
1481                              ;ERR 66
1482  006374  050051                    EM60                    ;NO HEAD HOME
1483  006376  052242                    DH18                    ;AFTER UNLOAD CMD
1484  006400  053676                    DT1
1485  006402  054250                    DF10
1486                              ;ERR 67
1487  006404  050663                    EM89                    ;HDS HOME NOT CLEARED
1488  006406  052005                    DH9                     ;DURING START SPIN CMD
1489  006410  053676                    DT1
1490  006412  054250                    DF10
1491                              ;ERROR 70
1492  006414  050723                    EM90                    ;TRACK FOLL OK NOT SET
1493  006416  052005                    DH9
1494  006420  053676                    DT1
1495  006422  054250                    DF10
1496                              ;ERR 71
1497  006424  050762                    EM91                    ;REV NOT SET
1498  006426  052005                    DH9
1499  006430  053676                    DT1
1500  006432  054250                    DF10
1501                              ;ERROR 72
1502  006434  051007                    EM92                    ;REV NOT CLEARED
1503  006436  052005                    DH9
1504  006440  053676                    DT1
1505  006442  054250                    DF10
1506                              ;ERR 73
1507  006444  047162                    EM13                    ;NO ATTN
1508  006446  052242                    DH18                    ;AFTER UNLOAD CMD
1509  006450  053722                    DT2
1510  006452  054264                    DF11
1511                              ;ERR 74
1512  006454  047162                    EM13                    ;NO ATTN
1513  006456  052060                    DH10                    ;AT END OF HEAD LOADING
1514  006460  053676                    DT1
1515  006462  054250                    DF10
1516                              ;ERR 75
1517  006464  047414                    EM17                    ;MSG A0 ERROR
1518  006466  052060                    DH10                    ;AT END OF HEAD LOADIG
1519  006470  053676                    DT1
1520  006472  054210                    DF8
1521                              ;ERR 76
1522  006474  047435                    EM18                    ;MSG B0 ERROR
1523  006476  052060                    DH10
1524  006500  053676                    DT1
1525  006502  054230                    DF9
1526                              ;ERR 77
1527  006504  047456                    EM19                    ;MSG A1 ERROR
1528  006506  052060                    DH10
```

```
1529  006510  053676                    DT1
1530  006512  054210                    DF8
1531                            ;ERR 100
1532  006514  047477                    EM20        ;MSG B1 ERROR
1533  006516  052060                    DH10
1534  006520  053676                    DT1
1535  006522  054230                    DF9
1536                            ;ERROR 101
1537  006524  051121                    EM94        ;OFFSET NOT CLEARED
1538  006526  053305                    DH47        ;AFTER READ HEADER WITH MOVEMENT
1539  006530  053676                    DT1
1540  006532  054250                    DF10
1541                            ;ERROR 102
1542  006534  051170                    EM95        ;FORMAT NOT SET
1543  006536  052525                    DH27        ;AFTER WRITE DATA CMD
1544  006540  053676                    DT1
1545  006542  054250                    DF10
1546                            ;ERR 103
1547  006544  051170                    EM95
1548  006546  052610                    DH32        ;AFTER WRITE CHECK CMD
1549  006550  053676                    DT1
1550  006552  054250                    DF10
1551                            ;ERR 104
1552  006554  047640                    EM39        ;OFFSET NOT RESET
1553  006556  053611                    DH57        ;AFTER WRITE CMD WITH OFFSET
1554  006560  053676                    DT1
1555  006562  054250                    DF10
1556                            ;ERR 105
1557  006564  047707                    EM40        ;CYL ADDR NOT 0
1558  006566  053611                    DH57
1559  006570  053676                    DT1
1560  006572  054250                    DF10
1561                            ;ERR 106
1562  006574  051224                    EM96        ;CANNOT FIND SECTOR 17
1563  006576  051464                    DH1
1564  006600  053676                    DT1
1565  006602  054134                    DF1
1566                            ;ERR 107
1567  006604  051252                    EM97        ;HEAD SWITCHING > 16MS
1568  006606  052525                    DH27        ;AFTER WRITE DTA CMD
1569  006610  053770                    DT5
1570  006612  054314                    DF15
1571                            ;ERR 110
1572  006614  051313                    EM98        ;CANNOT FIND CYL 128
1573  006616  052452                    DH25        ;AFTER SEEK CMD
1574  006620  053676                    DT1
1575  006622  054250                    DF10
1576                            ;ERR 111
1577  006624  051344                    EM99        ;CANNOT FIND CYL 256
1578  006626  052452                    DH25
1579  006630  053676                    DT1
1580  006632  054250                    DF10
1581                            ;ERR 112
1582  006634  051375                    EM100       ;DRIVE OFF TRACK SET
1583  006636  052525                    DH27        ;AFTER WRITE DATA CMD
1584  006640  053750                    DT4
```

```
1585  006642  054174                    DF6
1586                            ;ERR 113
1587  006644  047575                    EM36            ;CYL ADDR IN RKMR3 INCORRECT
1588  006646  052525                    DH27
1589  006650  053750                    DT4
1590  006652  054174                    DF6
1591                            ;ERROR 114
1592  006654  050561                    EM86            ;OFFSET IN RKMR2 NOT = RKASOF
1593  006656  052425                    DH24            ;AFTER OFFSET CMD
1594  006660  053722                    DT2
1595  006662  054264                    DF11
1596                            ;ERR 115
1597  006664  050561                    EM86
1598  006666  052373                    DH22            ;AFTER DRIVE CLEAR CMD
1599  006670  053722                    DT2
1600  006672  054264                    DF11
1601                            ;ERROR 116
1602  006674  047124                    EM12            ;CONT NOT RDY
1603  006676  052267                    DH19            ;AFTER PACK CMD
1604  006700  053676                    DT1
1605  006702  054250                    DF10
1606                            ;ERROR 117
1607  006704  047124                    EM12            ;CONT NOT RDY
1608  006706  052312                    DH20            ;AFTER SEL DR CMD
1609  006710  053676                    DT1
1610  006712  054250                    DF10
1611                            ;ERROR 120
1612  006714  047124                    EM12
1613  006716  052345                    DH21            ;AFTER SUBSYS CLEAR
1614  006720  053676                    DT1
1615  006722  054250                    DF10
1616                            ;ERROR 121
1617  006724  047124                    EM12
1618  006726  052005                    DH9             ;AFTER START SPINDLE CMD
1619  006730  053676                    DT1
1620  006732  054250                    DF10
1621                            ;ERROR 122
1622  006734  051432                    EM101           ;DID NOT GO TO CYL 10
1623  006736  052556                    DH30            ;AFTER READ HEADER CMD
1624  006740  053676                    DT1
1625  006742  054250                    DF10
1626                            ;ERROR 123
1627  006744  050561                    EM86            ;RKMR2 OFFSET NOT = RKASOF
1628  006746  053355                    DH51            ;AFTER SEEK TO SELF
1629  006750  053722                    DT2
1630  006752  054264                    DF11
1631                            ;ERROR 124
1632  006754  047124                    EM12
1633  006756  052216                    DH17            ;AFTER RECAL CMD
1634  006760  053676                    DT1
1635  006762  054250                    DF10
1636                            ;ERROR 125
1637  006764  000000                    0
1638  006766  000000                    0
1639  006770  000000                    0
1640  006772  000000                    0
```

```
1641                                    ;ERROR 126
1642  006774  000000                        0
1643  006776  000000                        0
1644  007000  000000                        0
1645  007002  000000                        0
1646                                    ;ERROR 127
1647  007004  000000                        0
1648  007006  000000                        0
1649  007010  000000                        0
1650  007012  000000                        0
1651                                    ;ERROR 130
1652  007014  000000                        0
1653  007016  000000                        0
1654  007020  000000                        0
1655  007022  000000                        0
1656                                    ;ERROR 131
1657  007024  047124                        EM12            ;NO RDY
1658  007026  052452                        DH25            ;AFTER SEEK CMD
1659  007030  053676                        DT1
1660  007032  054250                        DF10
1661                                    ;ERROR 132
1662  007034  047162                        EM13            ;NO ATTN
1663  007036  052452                        DH25
1664  007040  053676                        DT1
1665  007042  054250                        DF10
1666                                    ;ERROR 133
1667  007044  047414                        EM17            ;MSG A0 ERROR
1668  007046  052452                        DH25
1669  007050  053676                        DT1
1670  007052  054210                        DF8
1671                                    ;ERROR 134
1672  007054  047435                        EM18            ;MSG B0 ERROR
1673  007056  052452                        DH25
1674  007060  053676                        DT1
1675  007062  054230                        DF9
1676                                    ;ERROR 135
1677  007064  047456                        EM19            ;MSG A1 ERROR
1678  007066  052452                        DH25
1679  007070  053676                        DT1
1680  007072  054210                        DF8
1681                                    ;ERROR 136
1682  007074  047477                        EM20            ;MSG B1 ERROR.
1683  007076  052452                        DH25
1684  007100  053676                        DT1
1685  007102  054230                        DF9
1686                                    ;ERROR 137
1687  007104  047640                        EM39            ;CYL DIFF/OFFSET IN RKMR2 NOT CLEARED
1688  007106  052452                        DH25
1689  007110  053676                        DT1
1690  007112  054250                        DF10
1691                                    ;ERROR 140
1692  007114  000000                        0
1693  007116  000000                        0
1694  007120  000000                        0
1695  007122  000000                        0
1696                                    ;ERROR 141
```

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1697  007124  000000                    0
1698  007126  000000                    0
1699  007130  000000                    0
1700  007132  000000                    0
1701                            ;ERROR 142
1702  007134  000000                    0
1703  007136  000000                    0
1704  007140  000000                    0
1705  007142  000000                    0
1706                            ;ERROR 143
1707  007144  000000                    0
1708  007146  000000                    0
1709  007150  000000                    0
1710  007152  000000                    0
1711                            ;ERROR 144
1712  007154  000000                    0
1713  007156  000000                    0
1714  007160  000000                    0
1715  007162  000000                    0
1716                            ;ERROR 145
1717  007164  000000                    0
1718  007166  000000                    0
1719  007170  000000                    0
1720  007172  000000                    0
1721                            ;ERROR 146
1722  007174  000000                    0
1723  007176  000000                    0
1724  007200  000000                    0
1725  007202  000000                    0
1726                            ;ERROR 147
1727  007204  000000                    0
1728  007206  000000                    0
1729  007210  000000                    0
1730  007212  000000                    0
1731                            ;ERROR 150
1732  007214  000000                    0
1733  007216  000000                    0
1734  007220  000000                    0
1735  007222  000000                    0
1736                            ;ERROR 151
1737  007224  047124                    EM12        ;NO RDY
1738  007226  052373                    DH22        ;AFTER CLEAR CMD
1739  007230  053676                    DT1
1740  007232  054250                    DF10
1741                            ;ERROR 152
1742  007234  000000                    0
1743  007236  000000                    0
1744  007240  000000                    0
1745  007242  000000                    0
1746                            ;ERROR 153
1747  007244  000000                    0
1748  007246  000000                    0
1749  007250  000000                    0
1750  007252  000000                    0
1751                            ;ERROR 154
1752  007254  050016                    EM55        ;ATTN NOT CLEARED
```

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1753  007256  052373                        DH22
1754  007260  053722                        DT2
1755  007262  054264                        DF11
1756                              ;ERROR 155
1757  007264  000000                        0
1758  007266  000000                        0
1759  007270  000000                        0
1760  007272  000000                        0
1761                              ;ERROR 156
1762  007274  000000                        0
1763  007276  000000                        0
1764  007300  000000                        0
1765  007302  000000                        0
1766                              ;ERROR 157
1767  007304  000000                        0
1768  007306  000000                        0
1769  007310  000000                        0
1770  007312  000000                        0
1771                              ;ERROR 160
1772  007314  000000                        0
1773  007316  000000                        0
1774  007320  000000                        0
1775  007322  000000                        0
1776                              ;ERROR 161
1777  007324  000000                        0
1778  007326  000000                        0
1779  007330  000000                        0
1780  007332  000000                        0
1781                              ;ERROR 162
1782  007334  000000                        0
1783  007336  000000                        0
1784  007340  000000                        0
1785  007342  000000                        0
1786                              ;ERROR 163
1787  007344  000000                        0
1788  007346  000000                        0
1789  007350  000000                        0
1790
1791
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1800
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```

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1809
1810
1811  007352  000000                        0
1812                                ;ERROR 164
1813  007354  000000                        0
1814  007356  000000                        0
1815  007360  000000                        0
1816  007362  000000                        0
1817                                ;ERROR 165
1818  007364  000000                        0
1819  007366  000000                        0
1820  007370  000000                        0
1821  007372  000000                        0
1822                                ;ERROR 166
1823  007374  000000                        0
1824  007376  000000                        0
1825  007400  000000                        0
1826  007402  000000                        0
1827                                ;ERROR 167
1828  007404  000000                        0
1829  007406  000000                        0
1830  007410  000000                        0
1831  007412  000000                        0
1832                                ;ERROR 170
1833  007414  000000                        0
1834  007416  000000                        0
1835  007420  000000                        0
1836  007422  000000                        0
1837                                ;ERROR 171
1838  007424  047124                    EM12        ;NO RDY
1839  007426  052556                    DH30        ;AFTER READ HEADER CMD
1840  007430  053676                    DT1
1841  007432  054250                    DF10
1842                                ;ERROR 172
1843  007434  000000                        0
1844  007436  000000                        0
1845  007440  000000                        0
1846  007442  000000                        0
1847                                ;ERROR 173
1848  007444  050127                    EM63        ;DLT SET
1849  007446  052556                    DH30
1850  007450  053770                    DT5
1851  007452  054314                    DF15
1852                                ;ERROR 174
1853  007454  047520                    EM21        ;CERR SET
1854  007456  052556                    DH30
1855  007460  053770                    DT5
1856  007462  054314                    DF15
1857                                ;ERROR 175
1858  007464  047640                    EM39        ;CYL DIFF NOT CLEARED
1859  007466  052060                    DH10        ;AT END OF HEAD LOADING
1860  007470  053676                    DT1
1861  007472  054250                    DF10
1862                                ;ERROR 176
1863  007474  047707                    EM40        ;CYL ADDR NOT CLEARED.
1864  007476  052060                    DH10
```

```
1865  007500  053676                    DT1
1866  007502  054250                    DF10
1867                            ;ERROR 177
1868  007504  000000                    0
1869  007506  000000                    0
1870  007510  000000                    0
1871  007512  000000                    0
1872                            ;ERROR 200
1873  007514  047124                    EM12          ;NO RDY
1874  007516  052750                    DH39          ;AFTER WRITE HEADER CMD
1875  007520  053770                    DT5
1876  007522  054314                    DF15
1877                            ;ERROR 201
1878  007524  047520                    EM21          ;CERR SET
1879  007526  052750                    DH39
1880  007530  053770                    DT5
1881  007532  054314                    DF15
1882                            ;ERROR 202
1883  007534  050150                    EM65          ;READ HEADER ERROR
1884  007536  051464                    DH1
1885  007540  054036                    DT7
1886  007542  054304                    DF14
1887                            ;ERROR 203
1888  007544  047414                    EM17          ;MSG A0 ERROR
1889  007546  052642                    DH33          ;DURING SEEK CMD
1890  007550  053676                    DT1
1891  007552  054210                    DF8
1892                            ;ERROR 204
1893  007554  047435                    EM18          ;MSG B0 ERROR
1894  007556  052642                    DH33
1895  007560  053676                    DT1
1896  007562  054230                    DF9
1897                            ;ERROR 205
1898  007564  047456                    EM19          ;MSG A1 ERROR
1899  007566  052642                    DH33
1900  007570  053676                    DT1
1901  007572  054210                    DF8
1902                            ;ERROR 206
1903  007574  047477                    EM20          ;MSG B1 ERROR
1904  007576  052642                    DH33
1905  007600  053676                    DT1
1906  007602  054230                    DF9
1907                            ;ERROR 207
1908  007604  047575                    EM36          ;CYL ADDR IN RKMR3 INCORRECT
1909  007606  052452                    DH25          ;AFTER SEEK CMD
1910  007610  053750                    DT4
1911  007612  054174                    DF6
1912                            ;ERROR 210
1913  007614  047520                    EM21          ;CERR SET
1914  007616  052452                    DH25
1915  007620  053676                    DT1
1916  007622  054250                    DF10
1917                            ;ERROR 211
1918  007624  000000                    0
1919  007626  000000                    0
1920  007630  000000                    0
```

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1921  007632  000000                        0
1922                                ;ERROR 212
1923  007634  000000                        0
1924  007636  000000                        0
1925  007640  000000                        0
1926  007642  000000                        0
1927                                ;ERROR 213
1928  007644  000000                        0
1929  007646  000000                        0
1930  007650  000000                        0
1931  007652  000000                        0
1932                                ;ERROR 214
1933  007654  000000                        0
1934  007656  000000                        0
1935  007660  000000                        0
1936  007662  000000                        0
1937                                ;ERROR 215
1938  007664  000000                        0
1939  007666  000000                        0
1940  007670  000000                        0
1941  007672  000000                        0
1942                                ;ERROR 216
1943  007674  000000                        0
1944  007676  000000                        0
1945  007700  000000                        0
1946  007702  000000                        0
1947                                ;ERROR 217
1948  007704  000000                        0
1949  007706  000000                        0
1950  007710  000000                        0
1951  007712  000000                        0
1952                                ;ERROR 220
1953  007714  000000                        0
1954  007716  000000                        0
1955  007720  000000                        0
1956  007722  000000                        0
1957                                ;ERROR 221
1958  007724  047414                        EM17          ;MSG A0 ERROR
1959  007726  052216                        DH17
1960  007730  053676                        DT1
1961  007732  054210                        DF8
1962                                ;ERROR 222
1963  007734  047456                        EM19          ;MSG A1 ERROR
1964  007736  052216                        DH17
1965  007740  053676                        DT1
1966  007742  054210                        DF8
1967                                ;ERROR 223
1968  007744  000000                        0
1969  007746  000000                        0
1970  007750  000000                        0
1971  007752  000000                        0
1972                                ;ERROR 224
1973  007754  000000                        0
1974  007756  000000                        0
1975  007760  000000                        0
1976  007762  000000                        0
```

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 1977
 1978  007764  000000                ;ERROR 225
 1979  007766  000000                        0
 1980  007770  000000                        0
 1981  007772  000000                        0
 1982                                        0
 1983  007774  047124                ;ERROR 226
 1984  007776  052475                        EM12                    ;NO RDY
 1985  010000  053676                        DH26                    ;AFTER READ DATA CMD
 1986  010002  054250                        DT1
 1987                                        DF10
 1988  010004  047520                ;ERROR 227
 1989  010006  052475                        EM21                    ;CERR SET
 1990  010010  053770                        DH26
 1991  010012  054314                        DT5
 1992                                        DF15
 1993  010014  050107                ;ERROR 230
 1994  010016  052475                        EM62                    ;DTE SET
 1995  010020  053770                        DH26
 1996  010022  054314                        DT5
 1997                                        DF15
 1998  010024  050127                ;ERROR 231
 1999  010026  052475                        EM63                    ;DLT SET
 2000  010030  053770                        DH26
 2001  010032  054314                        DT5
 2002                                        DF15
 2003  010034  000000                ;ERROR 232
 2004  010036  000000                        0
 2005  010040  000000                        0
 2006  010042  000000                        0
 2007                                        0
 2008  010044  047351                ;ERROR 233
 2009  010046  053105                        EM16                    ;CANNOT READ BSE INFO
 2010  010050  053676                        DH42                    ;ON SECT 0,2,4,6,8
 2011  010052  054330                        DT1
 2012                                        DF17
 2013  010054  047351                ;ERROR 234
 2014  010056  053156                        EM16
 2015  010060  053676                        DH43                    ;ON SECT 1,3,5,7,9
 2016  010062  054330                        DT1
 2017                                        DF17
 2018  010064  050226                ;ERROR 235
 2019  010066  053226                        EM69                    ;ALIGN CARTRIDGE USED
 2020  010070  053676                        DH44                    ;WILL BYPASS FORMAT & ALL R/W TESTS
 2021  010072  054250                        DT1
 2022                                        DF10
 2023  010074  000000                ;ERROR 236
 2024  010076  000000                        0
 2025  010100  000000                        0
 2026  010102  000000                        0
 2027                                        0
 2028  010104  000000                ;ERROR 237
 2029  010106  000000                        0
 2030  010110  000000                        0
 2031  010112  000000                        0
 2032                                        0
                                     ;ERROR 240
```

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2033  010114  000000                    0
2034  010116  000000                    0
2035  010120  000000                    0
2036  010122  000000                    0
2037                            ;ERROR 241
2038  010124  000000                    0
2039  010126  000000                    0
2040  010130  000000                    0
2041  010132  000000                    0
2042                            ;ERROR 242
2043  010134  000000                    0
2044  010136  000000                    0
2045  010140  000000                    0
2046  010142  000000                    0
2047
2048                            ;ERROR 243
2049  010144  047575                    EM36            ;CYL ADDR IN RKMR3 INCORRECT
2050  010146  052452                    DH25            ;AFTER SEEK CMD
2051  010150  054056                    DT8
2052  010152  054174                    DF6
2053                            ;ERR 244
2054  010154  050257                    EM74            ;RTZ NOT SET
2055  010156  053060                    DH41            ;DURING RECAL CMD
2056  010160  053676                    DT1
2057  010162  054250                    DF10
2058                            ;ERR 245
2059  010164  000000                    0
2060  010166  000000                    0
2061  010170  000000                    0
2062  010172  000000                    0
2063                            ;ERR 246
2064  010174  000000                    0
2065  010176  000000                    0
2066  010200  000000                    0
2067  010202  000000                    0
2068                            ;ERR 247
2069  010204  000000                    0
2070  010206  000000                    0
2071  010210  000000                    0
2072  010212  000000                    0
2073                            ;ERR 250
2074  010214  000000                    0
2075  010216  000000                    0
2076  010220  000000                    0
2077  010222  000000                    0
2078                            ;ERR 251
2079  010224  000000                    0
2080  010226  000000                    0
2081  010230  000000                    0
2082  010232  000000                    0
2083                            ;ERR 252
2084  010234  000000                    0
2085  010236  000000                    0
2086  010240  000000                    0
2087  010242  000000                    0
2088                            ;ERR 253
```

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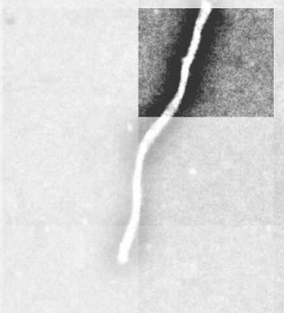
2089  010244  000000                    0
2090  010246  000000                    0
2091  010250  000000                    0
2092  010252  000000                    0
2093                            ;ERR 254
2094  010254  000000                    0
2095  010256  000000                    0
2096  010260  000000                    0
2097  010262  000000                    0
2098                            ;ERR 255
2099  010264  000000                    0
2100  010266  000000                    0
2101  010270  000000                    0
2102  010272  000000                    0
2103                            ;ERR 256
2104  010274  000000                    0
2105  010276  000000                    0
2106  010300  000000                    0
2107  010302  000000                    0
2108                            ;ERR 257
2109  010304  000000                    0
2110  010306  000000                    0
2111  010310  000000                    0
2112  010312  000000                    0
2113                            ;ERR 260
2114  010314  047414                    EM17            ;MSG AD ERROR
2115  010316  052425                    DH24            ;AFTER OFFSET CMD
2116  010320  053676                    DT1
2117  010322  054210                    DF8
2118                            ;ERR 261
2119  010324  047435                    EM18            ;MSG BD ERROR
2120  010326  052425                    DH24
2121  010330  053676                    DT1
2122  010332  054230                    DF9
2123                            ;ERR 262
2124  010334  000000                    0
2125  010336  000000                    0
2126  010340  000000                    0
2127  010342  000000                    0
2128                            ;ERR 263
2129  010344  000000                    0
2130  010346  000000                    0
2131  010350  000000                    0
2132  010352  000000                    0
2133                            ;ERR 264
2134  010354  000000                    0
2135  010356  000000                    0
2136  010360  000000                    0
2137  010362  000000                    0
2138                            ;ERR 265
2139  010364  047435                    EM18            ;MSG BD ERROR
2140  010366  052373                    DH22            ;AFTER DRIVE CLEAR CMD
2141  010370  053676                    DT1
2142  010372  054230                    DF9
2143                            ;ERR 266
2144  010374  047477                    EM20            ;MSG B1 ERROR
```

```
2145  010376  052373                    DH22
2146  010400  053676                    DT1
2147  010402  054230                    DF9
2148                          ;ERR 267
2149  010404  047435                    EM18          ;MSG BO ERROR
2150  010406  052750                    DH39          ;AFTER WRITE HEADER CMD
2151  010410  053676                    DT1
2152  010412  054230                    DF9
2153                          ;ERR 270
2154  010414  047477                    EM20          ;MSG B1 ERROR
2155  010416  052750                    DH39
2156  010420  053676                    DT1
2157  010422  054230                    DF9
2158                          ;ERR 271
2159  010424  000000                    0
2160  010426  000000                    0
2161  010430  000000                    0
2162  010432  000000                    0
2163                          ;ERR 272
2164  010434  000000                    0
2165  010436  000000                    0
2166  010440  000000                    0
2167  010442  000000                    0
2168                          ;ERR 273
2169  010444  047414                    EM17          ;MSG AO ERROR
2170  010446  052373                    DH22          ;AFTER DRV CLR CMD
2171  010450  053676                    DT1
2172  010452  054210                    DF8
2173                          ;ERR 274
2174  010454  047456                    EM19          ;MSG A1 ERROR
2175  010456  052373                    DH22
2176  010460  053676                    DT1
2177  010462  054210                    DF8
2178                          ;ERR 275
2179  010464  047435                    EM18          ;MSG BO ERROR
2180  010466  052216                    DH17          ;AFTER RECAL CMD
2181  010470  053676                    DT1
2182  010472  054230                    DF9
2183                          ;ERR 276
2184  010474  047477                    EM20          ;MSG B1 ERROR
2185  010476  052216                    DH17
2186  010500  053676                    DT1
2187  010502  054230                    DF9
2188                          ;ERR 277
2189  010504  047414                    EM17          ;MSG AO ERROR
2190  010506  052750                    DH39          ;AFTER WRITE HEADER CMD
2191  010510  053676                    DT1
2192  010512  054210                    DF8
2193                          ;ERR 300
2194  010514  047456                    EM19          ;MSG A1 ERROR
2195  010516  052750                    DH39
2196  010520  053676                    DT1
2197  010522  054210                    DF8
2198                          ;ERR 301
2199  010524  000000                    0
2200  010526  000000                    0
```

```
2201   010530   000000                    0
2202   010532   000000                    0
2203                             ;ERR 302
2204   010534   000000                    0
2205   010536   000000                    0
2206   010540   000000                    0
2207   010542   000000                    0
2208                             ;ERR 303
2209   010544   000000                    0
2210   010546   000000                    0
2211   010550   000000                    0
2212   010552   000000                    0
2213                             ;ERR 304
2214   010554   000000                    0
2215   010556   000000                    0
2216   010560   000000                    0
2217   010562   000000                    0
2218
```



```
                                        .SBTTL  PROGRAM SETUP

010564  012737  000001  001356  PARSRT: MOV     #1,PARAM        ;SET FLAG FOR 220 START
010572  005037  001360          CLR     BYPWRT
010576  005037  001362          CLR     BYPTIM
010602  000450                  BR      PRGSRT          ;START PROGRAM

010604  105037  001356  BYWRT:  CLRB    PARAM
010610  012737  000001  001360  MOV     #1,BYPWRT       ;BYPASS WRITE TESTS
010616  105037  001362          CLRB    BYPTIM
010622  000440                  BR      PRGSRT

010624  105037  001356  BYTIM:  CLRB    PARAM
010630  105037  001360          CLRB    BYPWRT
010634  012737  000001  001362  MOV     #1,BYPTIM       ;BYPASS TIMING TESTS
010642  000430                  BR      PRGSRT

010644  012737  000001  001356  BYWRTA: MOV     #1,PARAM
010652  012737  000001  001360          MOV     #1,BYPWRT
010660  105037  001362          CLRB    BYPTIM
010664  000417                  BR      PRGSRT

010666  012737  000001  001356  BYTIMA: MOV     #1,PARAM
010674  105037  001360          CLRB    BYPWRT
010700  012737  000001  001362          MOV     #1,BYPTIM
010706  000406                  BR      PRGSRT

010710  105037  001356  START:  CLRB    PARAM           ;CLEAR FOR 200 START
010714  005037  001360          CLR     BYPWRT
010720  005037  001362          CLR     BYPTIM
010724  000005          PRGSRT: RESET                   ;CLEAR ALL INT ENABLE & INIT
010726  012706  001100          MOV     #STACK,SP       ;SETUP STACK POINTER
010732  012746  000340          MOV     #PR7,-(SP)      ;PSW LOADED TO BE
010736  012746  010744          MOV     #1$,-(SP)       ;LSI-11 COMPATABLE
010742  000002                  RTI                     ;LOCKOUT ALL INTERRUPTS

010744          1$:
                .SBTTL  INITIALIZE THE COMMON TAGS
                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
010744  012706  001100          MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
010750  005026                  CLR     (R6)+           ;;CLEAR MEMORY LOCATION
010752  022706  001140          CMP     #SWR,R6 ;;DONE?
010756  001374                  BNE     .-6             ;;LOOP BACK IF NO
010760  012706  001100          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                ;;INITIALIZE A FEW VECTORS
010764  012737  036346  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
010772  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
011000  012737  036626  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
011006  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
011014  012737  042122  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
011022  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
011030  012737  036102  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
011036  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
011044  013737  031516  031510          MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
011052  005037  001174                  CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
```

```
2275  011056  005037  001176                CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
2276  011062  112737  000001  001115        MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
2277  011070  012737  011070  001106        MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
2278  011076  012737  011076  001110        MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
2279                                ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
2280                                ;;EQUAL TO A "-1" SETUP FOR A SOFTWARE SWITCH REGISTER.
2281  011104  013746  000004                MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
2282  011110  012737  011144  000004        MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
2283  011116  012737  177570  001140        MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
2284  011124  012737  177570  001142        MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
2285  011132  022777  177777  170000        CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
2286  011140  001012                        BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
2287                                                                ;;AND  THE HARDWARE SWR IS NOT = -1
2288  011142  000403                        BR      65$             ;;BRANCH IF NO TIMEOUT
2289  011144  012716  011152        64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
2290  011150  000002                        RTI
2291  011152  012737  000176  001140 65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
2292  011160  012737  000174  001142        MOV     #DISPREG,DISPLAY
2293  011166  012637  000004        66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
2294
2295  011172  005037  001216                CLR     $PASS           ;;CLEAR PASS COUNT
2296  011176  132737  000200  001231        BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
2297  011204  001403                        BEQ     67$             ;;YES,USE NON-APT SWITCH
2298  011206  012737  001232  001140        MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
2299  011214                        67$:
2300  011214  012737  011254  000004 MEMPAR: MOV     #1$,ERRVEC      ;SETUP TIMEOUT VECTOR
2301  011222  012737  000340  000006        MOV     #PR7,ERRVEC+2
2302
2303  011230  012737  000001  172100        MOV     #1,MEMBAS       ;LOAD REG TO DET IF
2304                                                                ;MEM CHECK ENABLE AVAIL
2305  011236  012737  036004  000114        MOV     #MEMERR,MEMVEC  ;LOAD VECTOR IF NO TIMEOUT
2306  011244  012737  000340  000116        MOV     #PR7,MEMVEC+2
2307  011252  000401                        BR      2$
2308
2309  011254  022626                1$:     CMP     (SP)+,(SP)+     ;ADJ STACK
2310  011256  012737  000006  000004 2$:     MOV     #ERRVEC+2,ERRVEC        ;RESTRRE TRAP CATCHER
2311  011264  005037  000006                CLR     ERRVEC+2
2312
2313  011270  004737  031604                JSR     PC,CLRFLG       ;CLEAR DDUMP THRU SIZFLG
2314  011274  005037  001220                CLR     $DEVCT
2315  011300  005037  001222                CLR     $UNIT
2316
2317                                ;
2318                                ;FIND OUT IF XXDP, ACT, APT; CHAIN OR DUMP MODE
2319                                ;
2320
2321  011304  005737  000042        START1: TST     42
2322  011310  001014                        BNE     1$              ;BR IF AUTO
2323  011312  004737  031624                JSR     PC,TITLE        ;MANUAL, TYPE PROG ID
2324  011316  123727  000041  000013        CMPB    41,#13          ;13=LOADED BY XXDP
2325  011324  001010                        BNE     2$
2326  011326  005237  005462                INC     DDUMP           ;SET RK06 DUMP MODE FLAG
2327  011332  104401  043062                TYPE    ,MSG2           ;REPLACE DRO PACK W/SCRATCH & DO<CR>
2328  011336  000137  011352                JMP     ST2
2329  011342  000137  011416        1$:     JMP     ST3
2330  011346  005237  005470        2$:     INC     PPTP            ;SET ACT/APT/PTP DUMP MODE FLAG
```

```
                                        ;
                                        ;CHECK IF ALL PARAMETERS DEFAULTED.  IF NOT, BEGIN INPUT DIALOGUE
                                        ;WITH OPERATOR.  THE REPLY TO 'DRIVES TO BE TESTED' SHOULD BE
                                        ;DRIVE NOS.  SEPERATED BY COMMAS & TERMINATED BY <CR>
                                        ;       EX:     DRIVES TO BE TESTED:  1,2,4<CR>
                                        ;
011352  005737  001356          ST2:    TST     PARAM
011356  001002                          BNE     1$              ;BR IF 220 START
011360  000137  011450                  JMP     ST4             ;200 START, DEFAULT & SIZE THE BUSS
011364  104401  043133          1$:     TYPE    ,MSG3           ;DRIVES TO BE TESTED
011370  004737  031644                  JSR     PC,GDRVS        ;GET DR NOS.
011374  104401  043165                  TYPE    ,MSG4           ;BUSS ADDR
011400  004737  032004                  JSR     PC,GBA          ;GET BA
011404  104401  043230                  TYPE    ,MSG5           ;CONT INT VECTOR
011410  004737  032032                  JSR     PC,GINT         ;GET INT VECTOR
011414  000427                          BR      ST5
                                        ;
                                        ;AUTO MODE
                                        ;CHECK IF LOADED BY XXDP OR OTHER.  SET FLAGS & NO INPUT DIALOGUE.
                                        ;DEFAULT ALL PARAMETERS.  TEST ONLY THOSE DRIVES THAT ARE READY
                                        ;ON THE BUSS
                                        ;
011416  123727  000041  000013  ST3:    CMPB    41,#13          ;13=LOADED BY XXDP
011424  001007                          BNE     1$
011426  005237  005464                  INC     DDPCH           ;SET RK06 CHAIN MODE FLAG
011432  004737  031624                  JSR     PC,TITLE
011436  104401  043343                  TYPE    ,MSG7           ;DRO NOT TSTD
011442  000402                          BR      ST4
011444  005237  005466          1$:     INC     ACT11           ;SET ACT AUTO FLAG.

011450  012737  177440  001264  ST4:    MOV     #177440,$BASE   ;DEFAULT VALUE
011456  012737  000210  001334          MOV     #210,RKVEC      ;DEFAULT VALUE
011464  004737  032064                  JSR     PC,SETINT
011470  005237  005522                  INC     SIZFLG          ;DO "SIZE THE BUSS" TEST

011474  012706  001100          ST5:    MOV     #STACK,SP       ;INIT STACK
011500  012746  000340                  MOV     #PR7,-(SP)      ;PSW LOADED TO BE
011504  012746  011512                  MOV     #5$,-(SP)       ;LSI-11 COMPATABLE
011510  000002                          RTI                     ;LOCKOUT ALL INTERRUPTS
011512  012737  005474  001366  5$:     MOV     #DRIVD,DRVPTR   ;SETUP
011520  005037  001220                  CLR     $DEVCT          ;NO. OF DRVS DONE
011524  005037  001222                  CLR     $UNIT           ;CURRENT DRV UNDER TEST
011530  012737  011576  000004          MOV     #1$,ERRVEC      ;SETUP TIMEOUT ERROR VECTOR
011536  005777  167604                  TST     @LKS            ;SEE IF L-CLOCK THERE
011542  005237  005514                  INC     LCLKF           ;PRESENT, SET FLAG.
011546  013700  001350                  MOV     LCVEC,R0        ;VECTOR ADDR
011552  012737  011640  000004          MOV     #2$,ERRVEC
011560  005777  167554                  TST     @PKS            ;SEE IF P-CLOCK THERE
011564  005237  005516                  INC     PCLKF           ;PRESENT, SET FLAG
011570  013700  001352                  MOV     PCVEC,R0        ;VECTOR ADDR
011574  000412                          BR      3$

```

```
2387  011576  022626                  1$:   CMP   (SP)+,(SP)+    ;L-CLOCK NOT THERE, CLEAR STACK
2388  011600  012737  011644  000004        MOV   #4$,ERRVEC
2389  011606  005777  167526              TST   @PKS             ;SEE IF P-CLOCK THERE
2390  011612  005237  005516              INC   PCLKF            ;PRESENT, SET FLAG
2391  011616  013700  001352              MOV   PCVEC,R0         ;VECTOR ADDR
2392  011622  005237  005520        3$:   INC   DOTIM            ;INDICATES TIMING TESTS CAN BE DONE
2393  011626  012720  035254              MOV   #CLOCK,(R0)+     ;SERVICE ROUTINE FOR CLOCKS
2394  011632  012710  000340              MOV   #PR7,(R0)
2395  011636  000407                     BR    TST1             ;;GO TO NEXT TEST
2396
2397  011640  022626              2$:   CMP   (SP)+,(SP)+    ;P-CLOCK NOT THERE, CLEAR STACK
2398  011642  000767                     BR    3$
2399
2400  011644  022626              4$:   CMP   (SP)+,(SP)+    ;NEITHER CLOCK THERE, CLEAR STACK
2401  011646  005037  005520              CLR   DOTIM            ;TIMING TESTS CANNOT BE DONE.
2402  011652  104401  043546              TYPE  ,MSG13           ;ALL TIMING TESTS BYPASSED
2403
2404
```

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

                                ;;*****************************************************************
                                ;*TEST 1         REFERENCE ALL CONTROLLER REGISTERS
                                ;*
                                ;*       THIS TEST VERIFIES THAT ALL THE CONTROLLER REGISTERS
                                ;*       CAN BE ACCESSED.  THE INABILITY  TO BE ACCESSED WILL
                                ;*       RESULT IN A TIMEOUT TRAP WITH  AN ERROR MESSAGE.  ANY
                                ;*       ERROR IN THIS TEST WILL RESULT IN ABORTING ALL OTHER
                                ;*       TESTS AND JUMPING TO  'END OF PASS'
                                ;*
                                ;;*****************************************************************
011656  000004               TST1:   SCOPE
011660  012737  000001  001174        MOV     #1,$TIMES       ;;DO 1 ITERATION
011666  012706  001100                MOV     #STACK,SP       ;RESTORE STK PTR

011672  012737  012010  000004        MOV     #1$,ERRVEC      ;SETUP TIMOUT ERROR VECTOR
011700  013705  001264                MOV     $BASE,R5        ;SETUP INDEX REG.
011704  005765  000000                TST     RKCS1(R5)       ;REFERENCE ALL THE
011710  005765  000010                TST     RKCS2(R5)       ;CONTROLLER REGISTERS
011714  005765  000002                TST     RKWC(R5)
011720  005765  000004                TST     RKBA(R5)
011724  005765  000006                TST     RKDA(R5)
011730  005765  000012                TST     RKDS(R5)        ;TIMEOUTS IN THIS SECTION
011734  005765  000014                TST     RKER(R5)        ;INDICATE THAT THE CONTROLLER
011740  005765  000016                TST     RKASOF(R5)      ;REGISTERS CANNOT BE READ.
011744  005765  000020                TST     RKDC(R5)        ;TESTING SHOULD NOT PROCEED
011750  005765  000024                TST     RKDB(R5)        ;UNTIL THIS IS REMEDIED.
011754  005765  000026                TST     RKMR1(R5)
011760  005765  000034                TST     RKMR2(R5)
011764  005765  000036                TST     RKMR3(R5)
011770  005765  000030                TST     RKECPS(R5)
011774  005765  000032                TST     RKECPT(R5)

012000  012737  035630  000004        MOV     #BADTMO,ERRVEC  ;SETUP TIMEOUT HANDLER
012006  000404                        BR      TST2            ;;GO TO NEXT TEST

012010  022626               1$:     CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
012012  104007                        ERROR   7               ;ABORT-COULD NOT REFERENCE CONTROLLER REGISTER
012014  000137  031462                JMP     $EOP1

                                ;;*****************************************************************
                                ;*TEST 2         SIZE THE BUSS
                                ;*
                                ;*       THIS TEST IS ENTERED ONLY IF 'DRIVE SELECTION' IS DEFAULTED
                                ;*       EITHER BY RUNNING IN THE AUTO MODE OR A 200 START IN THE
                                ;*       MANUAL MODE.
                                ;*       EVERY DRIVE FROM 0 THRU 7 IS ADDRESSED.
                                ;*       CONTROLLER ERROR (CERR) IS EXAMINED AND IF NOT SET, THE
                                ;*       DRIVE WILL BE TESTED.  IF SET, THE PROGRAM WILL BYPASS
                                ;*       TESTING THAT DRIVE ONLY IF THE ERROR WAS A RESULT OF
                                ;*       MDS, UFE OR NED BEING SET; OR BOTH NED & DRA RESET IN-
                                ;*       DICATING THE OTHER PORT IS ACCESSED.
```

```
2461                                    ;*
2462                                    ;;*****************************************************************
2463  012020  000004                    TST2:   SCOPE
2464  012022  012737  000001  001174            MOV     #1,$TIMES       ;;DO 1 ITERATION
2465  012030  012706  001100                    MOV     #STACK,SP       ;RESTORE STK PTR
2466
2467  012034  012765  000040  000010            MOV     #SCLR,RKCS2(R5) ;SUBSYSTEM CLEAR
2468  012042  013737  001432  005450            MOV     T10,TEMP1       ;SET TIMEOUT
2469  012050  004737  032102                    JSR     PC,FRDY         ;FIND RDY
2470  012054  104120                            ERROR   120             ;RDY NOT SET BY END OF SCLR
2471  012056  005737  005522                    TST     SIZFLG
2472  012062  001562                            BEQ     TST3            ;;DO NOT SIZE, GOTO NEXT TEST
2473  012064  104401  043452                    TYPE    ,MSG10          ;WILL TEST DRIVES
2474  012070  005037  005472                    CLR     DRIVS           ;# OF DRIVES PRESENT
2475  012074  005000                            CLR     R0              ;DRV ADDR
2476  012076  012701  005474                    MOV     #DRIV0,R1       ;DRV FLAG
2477  012102                            1$:
2478  012102  104415                            SCOP1
2479  012104  012706  001100                    MOV     #STACK,SP       ;RESTORE STK PTR
2480
2481  012110  012765  000040  000010            MOV     #SCLR,RKCS2(R5) ;SUBSYSTEM CLEAR
2482  012116  013737  001432  005450            MOV     T10,TEMP1       ;SET TIMEOUT
2483  012124  004737  032102                    JSR     PC,FRDY         ;FIND RDY
2484  012130  104120                            ERROR   120             ;RDY NOT SET BY END OF SCLR
2485  012132  010065  000010                    MOV     R0,RKCS2(R5)    ;SELECT THE DRIVE ADDR
2486  012136  012765  000001  000000            MOV     #SELDRV,RKCS1(R5) ;SELECT DRIVE CMD
2487  012144  013737  001432  005450            MOV     T10,TEMP1
2488  012152  004737  032102                    JSR     PC,FRDY         ;FIND RDY
2489  012156  104117                            ERROR   117             ;NO RDY AFTER SELECT DRIVE CMD.
2490  012160  032737  100000  005406            BIT     #CERR,HCS1
2491  012166  001046                            BNE     2$
2492  012170  013737  005434  005450            MOV     HMR2,TEMP1
2493  012176  042737  177770  005450            BIC     #^C<DRVMSK>,TEMP1
2494  012204  020037  005450                    CMP     R0,TEMP1        ;S/B SAME
2495  012210  001016                            BNE     3$
2496  012212  005700                            TST     R0
2497  012214  001003                            BNE     4$
2498  012216  005737  005464                    TST     DDPCH           ;SEE IF XXDP CHAIN MODE
2499  012222  001014                            BNE     5$
2500  012224  005237  005472            4$:     INC     DRIVS           ;INC DRIVE COUNT.
2501  012230  005211                            INC     (R1)            ;SET DRIVE PRESENT FLAG
2502  012232  104401  001205                    TYPE    ,$CRLF
2503  012236  010046                            MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
2504                                                                    ;;TYPE DR #
2505  012240  104403                            TYPOS                   ;;GO TYPE--OCTAL ASCII
2506  012242     001                            .BYTE   1               ;;TYPE 1 DIGIT(S)
2507  012243     000                            .BYTE   0               ;;SUPPRESS LEADING ZEROS
2508  012244  000403                            BR      5$
2509
2510  012246  004737  032512            3$:     JSR     PC,BYP          ;TYPE BYPASS DR #
2511  012252  104001                            ERROR   1               ;WRITTEN DR # DOES NOT MATCH RKMR2 DR #
2512
2513  012254  005721                    5$:     TST     (R1)+           ;SHIFT PTR TO NEXT DR. FLAG
2514  012256  005200                            INC     R0              ;INC DR #
2515  012260  022700  000010                    CMP     #8.,R0
2516  012264  001306                            BNE     1$              ;MORE LEFT.
```

```
2517  012266  005737  005472            TST     DRIVS
2518  012272  001054                    BNE     10$
2519  012274  104401  043537            TYPE    ,MSG12          ;NONE
2520  012300  000137  031462            JMP     $EOP1
2521
2522  012304  032737  001000  005410  2$:       BIT     #MDS,HCS2
2523  012312  001015                    BNE     6$
2524  012314  032737  000400  005410            BIT     #UFE,HCS2
2525  012322  001015                    BNE     7$
2526  012324  032737  000001  005420            BIT     #DRA,HDS
2527  012332  001015                    BNE     8$
2528  012334  032737  010000  005410            BIT     #NED,HCS2
2529  012342  001424                    BEQ     9$
2530  012344  000743                    BR      5$
2531
2532  012346  004737  032512          6$:       JSR     PC,BYP          ;TYPE BYP DR #
2533  012352  104002                    ERROR   2               ;MDS DETECTED
2534  012354  000737                    BR      5$
2535
2536  012356  004737  032512          7$:       JSR     PC,BYP
2537  012362  104003                    ERROR   3               ;UFE DETECTED
2538  012364  000733                    BR      5$
2539
2540  012366  032737  010000  005410  8$:       BIT     #NED,HCS2
2541  012374  001713                    BEQ     4$
2542  012376  104401  043657            TYPE    ,MSG15          ;DRV#
2543  012402  010046                    MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
2544                                                            ;;TYPE DR#
2545  012404  104403                    TYPOS                   ;;GO TYPE--OCTAL ASCII
2546  012406     001                    .BYTE   1               ;;TYPE 1 DIGIT(S)
2547  012407     000                    .BYTE   0               ;;SUPPRESS LEADING ZEROS
2548  012410  104010                    ERROR   10              ;DRA & NED BOTH SET
2549  012412  000720                    BR      5$
2550
2551  012414  004737  032512          9$:       JSR     PC,BYP
2552  012420  104004                    ERROR   4               ;NO DRA & NO NED = OTHER PORT SELECTED
2553  012422  000714                    BR      5$
2554  012424  000137  012754          10$:      JMP     NUDRV
2555
2556                                  ;;*****************************************************************
2557                                  ;*TEST 3        VERIFY OPERATOR DRIVE SELECTIONS
2558                                  ;*
2559                                  ;*      THIS TEST IS ENTERED ONLY IF DRIVE SELECTION IS NOT
2560                                  ;*      DEFAULTED.  EVERY DRIVE FROM 0 TO 7 IS ADDRESSED &
2561                                  ;*      CONTROLLER ERROR (CERR) IS EXAMINED. IF NOT SET, THE
2562                                  ;*      PROGRAM WILL ASSUME THE DRIVE IS PRESENT.  IT WILL THEN CHECK
2563                                  ;*      TO SEE THAT THE DRIVE WAS INPUTTED FOR TESTING.  IF NOT, IT WILL
2564                                  ;*      BE AN ERROR.  IF CERR WAS SET, THAT DRIVE WILL BE BYPASSED
2565                                  ;*      ONLY IF THE ERROR WAS A RESULT OF MDS OR UFE SET OR BOTH
2566                                  ;*      NED & DRA RESET (WRONG PORT).  IF CERR IS  A RESULT OF
2567                                  ;*      NED ONLY, IT IS CHECKED AGAINT THE INPUTTED INFOR TO
2568                                  ;*      VERIFY IT WAS NOT SPECIFIED.
2569                                  ;*
2570                                  ;;*****************************************************************
2571  012430  000004                  TST3:   SCOPE
2572  012432  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
```

```
2573  012440  012706  001100                  MOV     #STACK,SP          ;RESTORE STK PTR
2574  012444  005000                          CLR     R0                 ;DRIVE ADDR
2575  012446  012701  005474                  MOV     #DRIV0,R1          ;DRIVE FLAG
2576  012452                          1$:
2577  012452  104415                          SCOP1
2578  012454  012706  001100                  MOV     #STACK,SP          ;RESTORE STK PTR
2579
2580  012460  012765  000040  000010          MOV     #SCLR,RKCS2(R5)    ;SUBSYSTEM CLEAR
2581  012466  013737  001432  005450          MOV     T10,TEMP1          ;SET TIME OUT
2582  012474  004737  032102                  JSR     PC,FRDY            ;FIND RDY
2583  012500  104120                          ERROR   120                ;NO RDY AFTER SCLR
2584  012502  010065  000010                  MOV     R0,RKCS2(R5)       ;DRV ADDR
2585  012506  012765  000001  000000          MOV     #SELDRV,RKCS1(R5)  ;SELECT DRIVE CMD
2586  012514  013737  001432  005450          MOV     T10,TEMP1
2587  012522  004737  032102                  JSR     PC,FRDY            ;FIND RDY
2588  012526  104117                          ERROR   117                ;NO RDY AFTER SELECT DRIVE CMD.
2589  012530  032737  100000  005406          BIT     #CERR,HCS1
2590  012536  001036                          BNE     2$
2591  012540  013737  005434  005450          MOV     HMR2,TEMP1
2592  012546  042737  177770  005450          BIC     #^C<DRVMSK>,TEMP1
2593  012554  020037  005450                  CMP     R0,TEMP1           ;S/B SAME
2594  012560  001010                          BNE     3$
2595  012562  005711                  11$:    TST     (R1)
2596  012564  001417                          BEQ     5$
2597  012566  005721                  4$:     TST     (R1)+              ;SHIFT PTR TO NEXT DR FLAG
2598  012570  005200                          INC     R0                 ;INC DR#
2599  012572  022700  000010                  CMP     #8.,R0
2600  012576  001325                          BNE     1$                 ;MORE LEFT
2601  012600  000465                          BR      TST4               ;;GO TO NEXT TEST
2602
2603  012602  004737  032512          3$:     JSR     PC,BYP             ;TRY BYPASS DRIVE#
2604  012606  104001                          ERROR   1                  ;WRITTEN DR# DOES NOT MATCH RKMR2 DR#
2605  012610  005711                          TST     (R1)
2606  012612  001765                          BEQ     4$                 ;BRANCH IF NOT SPEC BY INPUT
2607  012614  005337  0u5472          12$:    DEC     DRIVS              ;DECREMENT TOTAL DRIVS
2608  012620  005011                          CLR     (R1)               ;CLEAR DRIVE FLAG
2609  012622  000761                          BR      4$
2610
2611  012624  004737  032512          5$:     JSR     PC,BYP
2612  012630  104005                          ERROR   5                  ;DR PRESENT BUT NOT SPECIFIED BY OPERATOR
2613  012632  000755                          BR      4$
2614
2615  012634  032737  001000  005410  2$:     BIT     #MDS,HCS2
2616  012642  001027                          BNE     6$
2617  012644  032737  000400  005410          BIT     #UFE,HCS2
2618  012652  001027                          BNE     7$
2619  012654  032737  000001  005420          BIT     #DRA,HDS
2620  012662  001005                          BNE     8$
2621  012664  032737  010000  005410          BIT     #NED,HCS2
2622  012672  001423                          BEQ     9$
2623  012674  000404                          BR      10$
2624  012676  032737  010000  005410  8$:     BIT     #NED,HCS2
2625  012704  001726                          BEQ     11$
2626  012706  005711                  10$:    TST     (R1)
2627  012710  001726                          BEQ     4$
2628
```

```
2629  012712  004737  032512          JSR     PC,BYP          ;TYPE BYPASS DRIVE#
2630  012716  104006                  ERROR   6
2631  012720  000735                  BR      12$
2632
2633  012722  004737  032512  6$:     JSR     PC,BYP          ;TYPE BYPASS DRIVE#
2634  012726  104002                  ERROR   2               ;MDS DETECTED
2635  012730  000762                  BR      8$
2636
2637  012732  004737  032512  7$:     JSR     PC,BYP
2638  012736  104003                  ERROR   3               ;UFE DETECTED
2639  012740  000756                  BR      8$
2640
2641  012742  004737  032512  9$:     JSR     PC,BYP
2642  012746  104004                  ERROR   4               ;DRA & NED RESET - OTHER PORT SELECTED
2643  012750  000752                  BR      8$
2644
2645  012752  001237                  BNE     1$              ;BRANCH IF MORE LEFT.
2646
2647
2648                                  ;
2649                                  ;THIS PART OF THE PROGRAM WILL BE REPEATED FOR EACH
2650                                  ;DRIVE PRESENT
2651                                  ;
2652                                  ;'$UNIT' CONTAINS THE ADDRESS OF THE DRIVE CURRENTLY
2653                                  ;UNDER TEST
2654
2655  012754          NUDRV:                          ;ENTER HERE FROM LAST TEST
2656
2657                                  ;;*****************************************************************
2658                                  ;*TEST 4       FIND NEXT DRIVE TO BE TESTED
2659                                  ;*
2660                                  ;*      THIS TEST FINDS THE NEXT DRIVE PRESENT & PUTS THAT
2661                                  ;*      ADDRESS IN '$UNIT'.
2662                                  ;*      THROUGHOUT THE FOLLOWING TESTS, THE DRIVE TESTED IS
2663                                  ;*      THE DRIVE WHOSE ADDRESS IS IN '$UNIT'.
2664                                  ;*
2665                                  ;;*****************************************************************
2666  012754  000004          TST4:   SCOPE
2667  012756  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
2668  012764  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
2669  012770  012737  000004  001214          MOV     #STN-1,$TESTN
2670  012776  012737  000004  001102          MOV     #STN-1,$TSTNM
2671
2672  013004  005737  005472                  TST     DRIVS           ;ANY DRIVES PRESENT?
2673  013010  001004                  BNE     4$              ;YES BRANCH
2674  013012  104401  044572          TYPE    ,MSG27          ;ALL DRIVES TESTED
2675  013016  000137  031462          JMP     $EOP1           ;NO, GO TO END
2676
2677  013022  013701  001366  4$:     MOV     DRVPTR,R1       ;ADDR OF NEXT DRIVE FLAG
2678  013026  005737  001220          TST     $DEVCT          ;IS FIRST DRIVE BEING CHECKED
2679  013032  001402                  BEQ     2$              ;YES, BRANCH
2680  013034  005237  001222  1$:     INC     $UNIT           ;INCR DRIVE ADDR TO NEXT DRIVE
2681  013040  005721          2$:     TST     (R1)+           ;IS DRIVE PRESENT?
2682  013042  001774                  BEQ     1$              ;NO,FIND NEXT DRIVE PRESENT
2683  013044  005737  005464          TST     DDPCH           ;DDP CHAIN MODE?
2684  013050  001403                  BEQ     3$              ;NO, BRANCH
```

```
2685  013052  005737  001222            TST     $UNIT           ;YES, IS IT DRIVE 0?
2686  013056  001766                    BEQ     1$              ;IF YES, DON'T TEST DR 0
2687  013060  010137  001366    3$:     MOV     R1,DRVPTR       ;STORE POINTER TO THE NEXT DR. FLAG
2688  013064  104401  043657            TYPE    ,MSG15          ;"DRIVE"
2689  013070  013700  001222            MOV     $UNIT,R0
2690  013074  010046                    MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
2691                                                            ;;DRIVE #
2692  013076  104403                    TYPOS                   ;;GO TYPE--OCTAL ASCII
2693  013100     001                    .BYTE   1               ;;TYPE 1 DIGIT(S)
2694  013101     000                    .BYTE   0               ;;SUPPRESS LEADING ZEROS
2695
2696  013102  104401  001205            TYPE    ,$CRLF
2697
2698  013106                    PFSRT:                          ;ENTER HERE FOR POWER FAIL RESTART
2699                                    ;;**************************************************************
2700                                    ;*TEST 5         PRINT DRIVE SERIAL NUMBER
2701                                    ;*
2702                                    ;*      THIS TEST READS & PRINTS THE DRIVE SERIAL # FROM MSG A, WORD 11
2703                                    ;*      IN BCD & IS PERFORMED ON THE 1ST PASS ONLY
2704                                    ;*
2705                                    ;;**************************************************************
2706  013106  000004            TST5:   SCOPE
2707  013110  012737  000001  001174    MOV     #1,$TIMES       ;;DO 1 ITERATION
2708  013116  012706  001100            MOV     #STACK,SP       ;RESTORE STK PTR
2709
2710  013122  005737  001216            TST     $PASS
2711  013126  001046                    BNE     TST6            ;;GO TO NEXT IF NOT FIRST PASS
2712  013130  004737  032570            JSR     PC,SUBCLR       ;DO SUBSYS CLEAR
2713  013134  104024                    ERROR   24              ;CERR AFTER SCLR
2714
2715  013136  104401  043671            TYPE    ,MSG16          ;DRIVE SERIAL NO.
2716  013142  012765  000003  000026    MOV     #3,RKMR1(R5)    ;SELECT BYTE 3
2717  013150  004737  032526            JSR     PC,GSTAT        ;GET STATUS
2718  013154  013701  005434            MOV     HMR2,R1         ;GET SERIAL #
2719  013160  012704  041406            MOV     #$OCTVL,R4      ;GET ADDR CHAR BUFF
2720  013164  010446                    MOV     R4,-(SP)        ;STORE ON STACK FOR $SUPRS
2721  013166  012703  000003            MOV     #3,R3           ;SETUP CHAR COUNT
2722  013172  006101                    ROL     R1              ;INITIALIZE BIT POSITIONS
2723  013174  006101                    ROL     R1
2724  013176  006101            1$:     ROL     R1              ;GET NEXT 4 BITS
2725  013200  006101                    ROL     R1
2726  013202  006101                    ROL     R1
2727  013204  006101                    ROL     R1
2728  013206  010100                    MOV     R1,R0           ;GET WORKING COPY
2729  013210  042700  177760            BIC     #177760,R0      ;CLEAR ALL BUT LOW 4 BITS
2730  013214  052700  000060            BIS     #60,R0          ;CONVERT TO ASCII DIGIT
2731  013220  110024                    MOVB    R0,(R4)+        ;PUT ASCII DIGIT INTO CHAR BUFF
2732  013222  005303                    DEC     R3
2733  013224  001364                    BNE     1$              ;BR IF ALL 3 CHARS NOT DONE
2734  013226  105014                    CLRB    (R4)            ;ELSE INSERT NULL TERMINATOR
2735
2736  013230  004737  041654            JSR     PC,$SUPRS       ;TYPE
2737  013234  104401  001205            TYPE    ,$CRLF
2738  013240  104401  001205            TYPE    ,$CRLF
2739
2740                            ;;**************************************************************
```

```
                                        ;*TEST 6        SET VV WITH PACK COMMAND
                                        ;*
                                        ;*      IF VV IS RESET, THE PACK COMMAND IS USED TO SET IT.
                                        ;*
                                        ;**********************************************************************
013244  000004                  TST6:   SCOPE
013246  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
013254  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR

013260  004737  032570                  JSR     PC,SUBCLR
013264  104024                          ERROR   24              ;CERR AFTER SCLR

013266  032737  000100  005434          BIT     #D.VV,HMR2
013274  001024                          BNE     TST7            ;;GO TO NEXT TEST IF VV SET

013276  104415                          SCOP1
013300  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR

013304  004737  032570                  JSR     PC,SUBCLR
013310  104024                          ERROR   24              ;CERR AFTER SCLR

013312  012765  000003  000000          MOV     #PACK,RKCS1(R5) ;CMD TO SET VV
013320  012737  000010  005450          MOV     #10,TEMP1
013326  004737  032102                  JSR     PC,FRDY         ;FIND RDY
013332  104116                          ERROR   116             ;RDY NOT SET AFTER PACK CMD

013334  032737  000100  005434          BIT     #D.VV,HMR2
013342  001001                          BNE     TST7            ;;GO TO NEXT TEST IF VV NOW SET
013344  104027                          ERROR   27              ;PACK DID NOT SET V.V.


                                        ;**********************************************************************
                                        ;*TEST 7        READ & SAVE BAD SECTOR INFO & TYPE PACK SERIAL #
                                        ;*
                                        ;*      THIS TEST VERIFIES THAT CYL 410, TRACK 2 CAN BE READ.
                                        ;*      THIS AREA CONTAINS BAD SECTOR INFO WHICH IS WRITTEN BY THE
                                        ;*      FACTORY DURING MANF.  ALL BAD SECTOR INFO (BSE) WILL BE STORED
                                        ;*      AT THIS TIME TO MASK FUTURE READ HEADER OR DATA ERROR PRINTOUTS.
                                        ;*      IF BSE INFO CANNOT BE READ, OR IF AFTER READING THE BSE INFO
                                        ;*      IT IS DETERMINED THAT AN ALIGNMENT CARTRIDGE IS USED,
                                        ;*      A MESSAGE WILL BE TYPED INDICATING THAT ALL
                                        ;*      FUTURE FORMAT AND READ-WRITE TESTS WILL BE BYPASSED.
                                        ;*      THIS IS DONE SO AS NOT TO DESTROY BSE INFO OR AN ALIGNMENT PACK BY WRITING
                                        ;*
                                        ;*      THE PACK SERIAL # IS TYPED IN OCTAL & FOR THE FIRST PASS ONLY.
                                        ;*
                                        ;**********************************************************************
013346  000004                  TST7:   SCOPE
013350  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
013356  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR

013362  004737  032570                  JSR     PC,SUBCLR
013366  104024                          ERROR   24              ;CERR AFTER SCLR
013370  005037  005452                  CLR     TEMP2           ;SECTOR CTR
013374  005037  005454                  CLR     TEMP3           ;0=22 SEC, 1=20 SEC, 2=DONE
```

```
2797  013400  005037  001544                CLR     BSERR           ;BSE INFO NO GOOD IF SET
2798
2799  013404  012765  003364  000004        MOV     #BSE22,RKBA(R5) ;BSE TABLE FOR 22 SECTOR FORMAT
2800  013412  012765  001000  000006        MOV     #1000,RKDA(R5)  ;HEAD 2, SECTOR 0
2801  013420  012765  000632  000020        MOV     #410.,RKDC(R5)  ;CYL 410
2802
2803  013426  012765  177400  000002  1$:   MOV     #-256.,RKWC(R5) ;LOAD WORD CT
2804  013434  012765  000021  000000        MOV     #RDDATA,RKCS1(R5);READ DATA COMMAND
2805  013442  013737  001444  005450        MOV     T50000,TEMP1    ;SETUP TIMEOUT
2806  013450  004737  032102                JSR     PC,FRDY         ;FIND RDY
2807  013454  104226                        ERROR   226             ;NO RDY AFTER READ DATA CMD
2808  013456  004737  032526                JSR     PC,GSTAT        ;GET FRESH DATA
2809  013462  032737  100000  005406        BIT     #CERR,HCS1
2810  013470  001416                        BEQ     3$
2811  013472  104227                        ERROR   227             ;CERR AFTER READ DATA CMD
2812  013474  005237  001544                INC     BSERR           ;SET BSE ERROR FLAG
2813  013500  032737  010000  005422        BIT     #DTE,HER
2814  013506  001401                        BEQ     2$
2815  013510  104230                        ERROR   230             ;DTE AFTER READ DATA CMD
2816  013512  032737  100000  005410  2$:   BIT     #DLT,HCS2
2817  013520  001404                        BEQ     4$
2818  013522  104231                        ERROR   231             ;DLT AFTER READ DATA CMD
2819  013524  000402                        BR      4$
2820
2821  013526  005037  001544          3$:   CLR     BSERR           ;BSE INFO OK
2822  013532  005737  001544          4$:   TST     BSERR           ;BSE READ OK?
2823  013536  001420                        BEQ     8$              ;BR IF YES
2824  013540  062765  000002  000006        ADD     #2,RKDA(R5)     ;TRY NEXT SECTOR
2825  013546  005237  005452                INC     TEMP2
2826  013552  023727  005452  000005        CMP     TEMP2,#5        ;READ ALL 5 SECTORS?
2827  013560  001322                        BNE     1$              ;BR IF NO
2828  013562  005737  005454                TST     TEMP3
2829  013566  001002                        BNE     6$
2830  013570  104233                        ERROR   233             ;CANT READ BSE ON SECTORS 0,2,4,6,8
2831  013572  000452                        BR      TST10           ;;GO TO NEXT TEST
2832  013574  104234                  6$:   ERROR   234             ;CANT READ BSE ON SECTORS 1,3,8,7,9
2833  013576  000450                        BR      TST10           ;;GO TO NEXT TEST
2834
2835  013600  012700  000006          8$:   MOV     #6,R0           ;SETUP FOR WORD 3 OF BSE INFO
2836  013604  016037  003364  005456        MOV     BSE22(R0),TEMP4 ;PULL OUT CARTRIDGE TYPE INFO.
2837  013612  001404                        BEQ     9$              ;BRANCH IF DATA CARTRIDGE
2838  013614  104235                        ERROR   235             ;ALIGNMENT CARTRIDGE USED
2839  013616  005237  001544                INC     BSERR           ;SET BSE ERROR FLAG
2840  013622  000417                        BR      10$
2841
2842  013624  005237  005454          9$:   INC     TEMP3
2843  013630  023727  005454  000002        CMP     TEMP3,#2
2844  013636  001411                        BEQ     10$
2845
2846  013640  005037  005452                CLR     TEMP2
2847  013644  012765  002364  000004        MOV     #BSE20,RKBA(R5) ;BSE TABLE FOR 20 SECTOR FORMAT
2848  013652  012765  001001  000006        MOV     #1001,RKDA(R5)  ;HEAD 2, SECTOR 1
2849  013660  000662                        BR      1$
2850
2851  013662  005737  001216         10$:   TST     $PASS
2852  013666  001014                        BNE     TST10           ;;GO TO NEXT TST IF NOT 1'ST PASS
```

```
2853  013670  104401  043715                  TYPE    ,MSG17          ;CART SERIAL #
2854  013674  012746  003364                  MOV     #BSE22.-(SP)
2855  013700  004737  041304                  JSR     PC,$DB2O        ;CONVERT DBL BINARY WORD TO OCTAL
2856  013704  004737  041654                  JSR     PC,$SUPRS       ;TYPE SERIAL #
2857  013710  104401  001205                  TYPE    ,$CRLF
2858  013714  104401  001205                  TYPE    ,$CRLF
2859
2860
2861                                  .SBTTL WRITE TESTS
2862
2863
2864                                  ;;*****************************************************************
2865                                  ;*TEST 10       BASIC WRITE DATA TEST; 1 WORD
2866                                  ;*
2867                                  ;*      THIS TEST VERIFIES THE ABILITY OF THE DRIVE TO WRITE JUST ONE WORD,
2868                                  ;*      ALL SECTORS ON CYL 0 ARE GIVEN IDENTICAL HEADERS &
2869                                  ;*      A WRITE COMMAND IS ISSUED. READ & WRITE CHECK COMMANDS ARE NOT
2870                                  ;*      PERFORMED. THIS TEST PROVIDES THE TIGHTEST POSSIBLE SCOPE LOOP
2871                                  ;*      FOR A WRITE ERROR.
2872                                  ;*
2873                                  ;;*****************************************************************
2874  013720  000004                  TST10:  SCOPE
2875  013722  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
2876  013730  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
2877
2878  013734  005737  001360                  TST     BYPWRT
2879  013740  001404                          BEQ     DOWRT
2880  013742  104401  044040                  TYPE    ,MSG19          ;BYPASSING WRITE PTESTS
2881  013746  000137  025264                  JMP     @TIMING
2882  013752                          DOWRT:
2883
2884  013752  005737  001544                  TST     BSERR           ;SEE IF ALIGN CART
2885  013756  001406                          BEQ     2$              ;BR IF NO
2886  013760  104401  045676                  TYPE    ,MSG40          ;BSE OR ALIGN CART USED
2887  013764  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS
2888  013770  000137  025264                  JMP     @TIMING
2889
2890  013774  004737  032570          2$:     JSR     PC,SUBCLR
2891  014000  104024                          ERROR   24              ;CERR AFTER SCLR
2892
2893  014002  012700  001550                  MOV     #HDTAB,R0       ;MAKE ALL CYL 0 HEADERS IDENTICAL
2894
2895  014006  005020                  1$:     CLR     (R0)+           ;HEADER WORD 0: CYL 0
2896  014010  012720  140000                  MOV     #140000,(R0)+   ;HEADER WORD 1: SECTOR 0
2897  014014  012720  140000                  MOV     #140000,(R0)+   ;HEADER WORD 2: XOR OF 1 & 2
2898
2899  014020  020027  001754                  CMP     R0,#HDTAB+132.  ;ALL HEADERS DONE? (22X6=132)
2900  014024  001370                          BNE     1$              ;BR IF NO
2901
2902  014026  012765  001550  000004          MOV     #HDTAB,RKBA(R5) ;HEADER TABLE
2903  014034  012765  177676  000002          MOV     #-66.,RKWC(R5)  ;WORD COUNT
2904
2905  014042  012765  000027  000000          MOV     #<WRHEAD>,RKCS1(R5)     ;WRITE HEADER CMD
2906  014050  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP  TIMEOUT
2907  014056  004737  032102                  JSR     PC,FRDY         ;FIND RDY
2908  014062  104200                          ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
```

```
2909  014064  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
2910  014070  032737  100000  005406          BIT     #CERR,HCS1
2911  014076  001405                          BEQ     64$
2912  014100  104201                          ERROR   201             ;CERR AFTER WRITE HEADER CMD
2913  014102  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
2914  014106  000137  025264                  JMP     @TIMING
2915  014112                          64$:
2916
2917
2918  014112  104415                          SCOP1
2919  014114  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
2920
2921  014120  004737  032570                  JSR     PC,SUBCLR
2922  014124  104024                          ERROR   24              ;CERR AFTER SCLR
2923
2924  014126  012765  001532  000004          MOV     #DATA1,RKBA(R5) ;DATA TO BE ALL 1'S
2925  014134  012765  177777  000002          MOV     #-1,RKWC(R5)    ;WORD COUNT=1
2926
2927
2928  014142  012765  000023  000000          MOV     #<WRDATA>,RKCS1(R5)     ;WRITE DATA CMD
2929  014150  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP TIMEOUT
2930  014156  004737  032102                  JSR     PC,FRDY         ;FIND RDY
2931  014162  104011                          ERROR   11              ;NO RDY AFTER WRITE DATA CMD
2932  014164  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
2933  014170  032737  100000  005406          BIT     #CERR,HCS1
2934  014176  001405                          BEQ     65$
2935  014200  104012                          ERROR   12              ;CERR AFTER WRITE DATA CMD
2936  014202  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
2937  014206  000137  025264                  JMP     @TIMING
2938
2939  014212                          65$:
2940
2941  014212  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
2942  014220  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS
2943  014224  012737  010340  005444          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
2944  014232  004737  035344                  JSR     PC,CKMR2        ;CHECK MR2
2945  014236  104052                          ERROR   52              ;MSG AD ERROR AFTER WRITE DATA CMD
2946  014240  005037  005446                  CLR     SBMR3
2947  014244  004737  035426                  JSR     PC,CKMR3        ;CHECK MR3
2948  014250  104023                          ERROR   23              ;MSG BD ERROR AFTER WRITE DATA CMD
2949
2950  014252  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
2951  014260  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
2952  014266  004737  032526                  JSR     PC,GSTAT
2953  014272  012737  001720  005444          MOV     #<0.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
2954  014300  004737  035344                  JSR     PC,CKMR2
2955  014304  104053                          ERROR   53              ;MSG A1 ERROR AFTER WRITE DATA CMD
2956  014306  005037  005446                  CLR     SBMR3
2957  014312  004737  035426                  JSR     PC,CKMR3
2958  014316  104025                          ERROR   25              ;MSG B1 ERROR AFTER WRITE DATA CMD
2959
2960
2961                          ;;*****************************************************************
2962                          ;*TEST 11       BASIC WRITE DATA TEST; FULL SECTOR
2963                          ;*
2964                          ;*      THIS TEST VERIFIES THE ABILITY OF THE DRIVE TO WRITE
```

```
                                        ;*      A FULL SECTOR.  ALL ZEROS ARE WRITTEN BY THE WRITE DATA COMMAND
                                        ;*      & CHECKED BY A RD DATA COMMAND.  A FURTHER CHECK IS PERFORMED
                                        ;*      BY THE WRT CHK COMMAND.
                                        ;*      THE ABOVE IS REPEATED FOR AN ALL ONES PATTERN.
                                        ;*
                                        ;**************************************************************************
014320  000004                TST11:  SCOPE
014322  012737  000001  001174        MOV     #1,$TIMES       ;;DO 1 ITERATION
014330  012706  001100                MOV     #STACK,SP       ;RESTORE STK PTR
014334  004737  032570                JSR     PC,SUBCLR
014340  104024                        ERROR   24              ;CERR AFTER SCLR

014342  012765  001550  000004        MOV     #HDTAB,RKBA(R5) ;RESTORE TO 22 SECTOR
014350  012765  177676  000002        MOV     #-66.,RKWC(R5)  ;STANDARD FORMAT
014356  005037  001372                CLR     TOCYL

014362  013737  001372  001406        MOV     TOCYL,CALADD    ;SETUP
014370  012737  000000  001514        MOV     #0,HEAD         ;TO FILL
014376  012737  000000  001520        MOV     #0,FORMAT       ;HEADER
014404  004737  033356                JSR     PC,FHDTAB       ;TABLE

014410  012765  000027  000000        MOV     #<WRHEAD>,RKCS1(R5)     ;WRITE HEADER CMD
014416  013737  001444  005450        MOV     T50000,TEMP1    ;SETUP  TIMEOUT
014424  004737  032102                JSR     PC,FRDY         ;FIND RDY
014430  104200                        ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
014432  004737  032526                JSR     PC,GSTAT        ;GET FRESH STATUS
014436  032737  100000  005406        BIT     #CERR,HCS1
014444  001405                        BEQ     64$
014446  104201                        ERROR   201             ;CERR AFTER WRITE HEADER CMD
014450  104401  044510                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
014454  000137  025264                JMP     TIMING
014460                        64$:

014460  104415                        SCOP1
014462  012706  001100                MOV     #STACK,SP       ;RESTORE STK PTR

014466  004737  032570                JSR     PC,SUBCLR
014472  104024                        ERROR   24              ;CERR AFTER SCLR

014474  012765  001526  000004        MOV     #DATA0,RKBA(R5) ;WRITE ALL 0'S
014502  013700  001526                MOV     DATA0,R0
014506  052765  000020  000010  1$:   BIS     #BAI,RKCS2(R5)
014514  012765  177400  000002        MOV     #-256.,RKWC(R5)

014522  012765  000023  000000        MOV     #<WRDATA>, RKCS1(R5)    ;WRITE DATA CMD
014530  013737  001444  005450        MOV     T50000, TEMP1   ;SETUP TIMEOUT
014536  004737  032102                JSR     PC,FRDY         ;FIND RDY
014542  104011                        ERROR   11              ;NO RDY AFTER WRITE DATA CMD
014544  004737  032526                JSR     PC,GSTAT        ;GET FRESH STATUS
014550  032737  100000  005406        BIT     #CERR,HCS1
014556  001405                        BEQ     65$
014560  104012                        ERROR   12              ;CERR AFTER WRITE DATA CMD
014562  104401  044510                TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
014566  000137  025264                JMP     TIMING
```

```
3021
3022  014572                              65$:
3023
3024  014572  012765  100000  000000        MOV   #CCLR,RKCS1(R5) ;CONTR CLEAR
3025  014600  004737  032526                JSR   PC,GSTAT        ;GET LATEST STATUS
3026  014604  012737  010340  005444        MOV   #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
3027  014612  004737  035344                JSR   PC,CKMR2        ;CHECK MR2
3028  014616  104052                        ERROR 52              ;MSG AO ERROR AFTER WRITE DATA CMD
3029  014620  005037  005446                CLR   SBMR3
3030  014624  004737  035426                JSR   PC,CKMR3        ;CHECK MR3
3031  014630  104023                        ERROR 23              ;MSG BO ERROR AFTER WRITE DATA CMD
3032
3033  014632  012765  100000  000000        MOV   #CCLR,RKCS1(R5)
3034  014640  012765  000001  000026        MOV   #1,RKMR1(R5)    ;SELECT WORD 1
3035  014646  004737  032526                JSR   PC,GSTAT
3036  014652  012737  001720  005444        MOV   #<0.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3037  014660  004737  035344                JSR   PC,CKMR2
3038  014664  104053                        ERROR 53              ;MSG A1 ERROR AFTER WRITE DATA CMD
3039  014666  005037  005446                CLR   SBMR3
3040  014672  004737  035426                JSR   PC,CKMR3
3041  014676  104025                        ERROR 25              ;MSG B1 ERROR AFTER WRITE DATA CMD
3042
3043  014700  104415                        SCOP1
3044  014702  012706  001100                MOV   #STACK,SP       ;RESTORE STK PTR
3045
3046  014706  004737  032570                JSR   PC,SUBCLR
3047  014712  104024                        ERROR 24              ;CERR AFTER SCLR
3048
3049  014714  012765  004364  000004        MOV   #RDTAB,RKBA(R5)
3050  014722  012765  177400  000002        MOV   #-256.,RKWC(R5)
3051
3052
3053  014730  012765  000021  000000        MOV   #<RDDATA>,RKCS1(R5)     ;READ DATA CMD
3054  014736  013737  001444  005450        MOV   TSOOOO,TEMP1    ;SETUP TIMEOUT
3055  014744  004737  032102                JSR   PC,FRDY         ;FIND RDY
3056  014750  104013                        ERROR 13              ;NO RDY AFTER READ DATA CMD
3057  014752  004737  032526                JSR   PC,GSTAT        ;GET FRESH STATUS
3058  014756  032737  100000  005422        BIT   #DCK,HER
3059  014764  001405                        BEQ   66$
3060  014766  104021                        ERROR 21              ;DATA CHECK ERROR AFTER READ DATA CMD
3061                                                              ;ECC ERROR DETECTED
3062  014770  104401  044510                TYPE  ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
3063  014774  000137  025264                JMP   @TIMING
3064
3065  015000  032737  100000  005406  66$:  BIT   #CERR,HCS1
3066  015006  001405                        BEQ   67$
3067  015010  104014                        ERROR 14              ;CERR AFTER READ DATA CMD
3068  015012  104401  044510                TYPE  ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
3069  015016  000137  025264                JMP   @TIMING
3070
3071  015022                              67$:
3072
3073  015022  012765  100000  000000        MOV   #CCLR,RKCS1(R5) ;CONTR CLEAR
3074  015030  004737  032526                JSR   PC,GSTAT        ;GET LATEST STATUS
3075  015034  012737  010340  005444        MOV   #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
3076  015042  004737  035344                JSR   PC,CKMR2        ;CHECK MR2
```

```
3077  015046  104054                        ERROR   54                ;MSG A0 ERROR AFTER READ DATA CMD
3078  015050  005037  005446                CLR     SBMR3
3079  015054  004737  035426                JSR     PC,CKMR3          ;CHECK MR3
3080  015060  104026                        ERROR   26                ;MSG B0 ERROR AFTER READ DATA CMD
3081
3082  015062  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
3083  015070  012765  000001  000026        MOV     #1,RKMR1(R5)      ;SELECT WORD 1
3084  015076  004737  032526                JSR     PC,GSTAT
3085  015102  012737  001720  005444        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3086  015110  004737  035344                JSR     PC,CKMR2
3087  015114  104056                        ERROR   56                ;MSG A1 ERROR AFTER READ DATA CMD
3088  015116  005037  005446                CLR     SBMR3
3089  015122  004737  035426                JSR     PC,CKMR3
3090  015126  104030                        ERROR   30                ;MSG B1 ERROR AFTER READ DATA CMD
3091
3092
3093
3094  015130  012701  004364                MOV     #RDTAB,R1
3095  015134  011137  001506        2$:     MOV     (R1),WD1          ;ACTUAL WORD FOR TYPEOUT
3096  015140  010037  001510                MOV     R0,WD2            ;EXPECTED DATA FOR TYPEOUT
3097
3098  015144  020021                        CMP     R0,(R1)+          ;COMPARE READ DATA TABLE AGAINST
3099  015146  001403                        BEQ     3$                ;THE 'SHOULD BE' VALUE
3100  015150  004737  033666                JSR     PC,TRUERR
3101  015154  104020                        ERROR   20                ;READ DATA DID NOT COMPARE WITH WRITE DATA
3102
3103  015156  020127  005364        3$:     CMP     R1,#RDTAB+512.
3104  015162  001364                        BNE     2$
3105
3106  015164  020037  001526                CMP     R0,DATA0
3107  015170  001401                        BEQ     4$
3108  015172  000407                        BR      5$
3109
3110  015174  012765  001532  000004  4$:   MOV     #DATA1,RKBA(R5) ;WRITE ALL 1'S
3111  015202  013700  001532                MOV     DATA1,R0
3112  015206  000137  014506                JMP     1$
3113
3114  015212                        5$:
3115  015212  104415                        SCOP1
3116  015214  012706  001100                MOV     #STACK,SP         ;RESTORE STK PTR
3117
3118  015220  004737  032570                JSR     PC,SUBCLR
3119  015224  104024                        ERROR   24                ;CERR AFTER SCLR
3120
3121  015226  052765  000020  000010        BIS     #BAI,RKCS2(R5)    ;THIS PORTION OF THE TEST CHECKS
3122  015234  012765  001532  000004        MOV     #DATA1,RKBA(R5)   ;OUT THE WRITE CHECK CMD
3123  015242  012765  177400  000002        MOV     #-256.,RKWC(R5)   ;ALL 1'S WERE PREVIOUSLY WRITTEN
3124
3125
3126  015250  012765  000031  000000        MOV     #<WRTCHK>,RKCS1(R5)     ;WRITE CHECK CMD
3127  015256  013737  001444  005450        MOV     T50000, TEMP1     ;SETUP TIMEOUT
3128  015264  004737  032102                JSR     PC,FRDY           ;FIND RDY
3129  015270  104015                        ERROR   15                ;NO RDY AFTER WRITE CHECK CMD
3130
3131  015272  004737  032526                JSR     PC,GSTAT          ;GET FRESH STATUS
3132  015276  032737  100000  005406        BIT     #CERR,HCS1
```

```
3133  015304  001417                          BEQ     69$
3134
3135  015306  032737  040000  005410          BIT     #WCE,HCS2       ;SEE IF WRITE CHECK ERROR
3136  015314  001412                          BEQ     68$
3137  015316  016537  000024  001506          MOV     RKDB(R5),WD1    ;ACTUAL WORD FOR TYPEOUT
3138  015324  013737  001532  001510          MOV     DATA1,WD2       ;EXPECTED WORD FOR TYPEOUT
3139  015332  004737  033666                  JSR     PC,TRUERR       ;CHECK AGAINST BSE INFO
3140  015336  104016                          ERROR   16              ;WCE AFTER WRITE CMD
3141  015340  000401                          BR      69$
3142
3143  015342  104022                  68$:    ERROR   22              ;CERR AFTER WRITE CHK CMD
3144
3145  015344                          69$:
3146
3147  015344  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
3148  015352  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS
3149  015356  012737  010340  005444          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2      ;SHOULD BE VALUE
3150  015364  004737  035344                  JSR     PC,CKMR2        ;CHECK MR2
3151  015370  104057                          ERROR   57              ;MSG AO ERROR AFTER WRITE CHECK CMD
3152  015372  005037  005446                  CLR     SBMR3
3153  015376  004737  035426                  JSR     PC,CKMR3        ;CHECK MR3
3154  015402  104031                          ERROR   31              ;MSG BO ERROR AFTER WRITE CHECK CMD
3155
3156  015404  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
3157  015412  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3158  015420  004737  032526                  JSR     PC,GSTAT
3159  015424  012737  001720  005444          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3160  015432  004737  035344                  JSR     PC,CKMR2
3161  015436  104060                          ERROR   60              ;MSG A1 ERROR AFTER WRITE CHECK CMD
3162  015440  005037  005446                  CLR     SBMR3
3163  015444  004737  035426                  JSR     PC,CKMR3
3164  015450  104032                          ERROR   32              ;MSG B1 ERROR AFTER WRITE CHECK CMD
3165
3166
3167
3168  015452  104415                          SCOP1
3169  015454  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
3170
3171  015460  004737  032570                  JSR     PC,SUBCLR
3172  015464  104024                          ERROR   24              ;CERR AFTER SCLR
3173
3174  015466  012765  001526  000004          MOV     #DATA0,RKBA(R5) ;SETUP TO CHECK AGAINST WRONG DATA
3175  015474  012765  177400  000002          MOV     #-256.,RKWC(R5)
3176
3177  015502  012765  000031  000000          MOV     #WRTCHK,RKCS1(R5)
3178  015510  012737  141520  005450          MOV     #50000.,TEMP1
3179  015516  004737  032102                  JSR     PC,FRDY
3180  015522  104015                          ERROR   15              ;NO RDY AFTER WRITE CHECK CMD
3181  015524  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
3182  015530  032737  040000  005410          BIT     #WCE,HCS2       ;EXPECT MISCOMPARE
3183  015536  001001                          BNE     6$
3184  015540  104017                          ERROR   17              ;WRITE CHECK CMD NOT FUNCTIONING
3185                                                                  ;WITH INTENTIONAL MISCOMPARE
3186  015542                          6$:
3187
3188  015542  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
```

```
                        JSR     PC,GSTAT        ;GET LATEST STATUS
                        MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
                        JSR     PC,CKMR2        ;CHECK MR2
                        ERROR   57              ;MSG A0 ERROR AFTER WRITE CHK CMD WITH INTENTIONAL ERROR
                        CLR     SBMR3
                        JSR     PC,CKMR3        ;CHECK MR3
                        ERROR   31              ;MSG B0 ERROR AFTER WRITE CHK CMD WITH INTENTIONAL ERROR

                        MOV     #CCLR,RKCS1(R5)
                        MOV     #1,RKMR1(R5)    ;SELECT WORD 1
                        JSR     PC,GSTAT
                        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
                        JSR     PC,CKMR2
                        ERROR   60              ;MSG A1 ERROR AFTER WRITE CHK CMD WITH INTENTIONAL ERROR
                        CLR     SBMR3
                        JSR     PC,CKMR3
                        ERROR   32              ;MSG B1 ERROR AFTER WRITE CHK CMD WITH INTENTIONAL ERROR


;;*****************************************************************
;*TEST 12        20 SECTOR FORMAT TEST
;*
;*      DATA IS WRITTEN ON A FULL TRACK IN 20 SECTOR FORMAT.
;*      MSG B0,B1 ARE CHECKED FOR ANY ERROR CONDITION
;*
;;*****************************************************************
TST12:  SCOPE
                        MOV     #1,$TIMES       ;;DO 1 ITERATION
                        MOV     #STACK,SP       ;RESTORE STK PTR
                        JSR     PC,SUBCLR
                        ERROR   24              ;CERR AFTER SCLR
                        MOV     #HDTAB,RKBA(R5) ;HEADER WORD TABLE
                        MOV     #-60.,RKWC(R5)  ;WORD COUNT FOR 20 SECTOR FMT
                        CLR     TOCYL


                        MOV     TOCYL,CALADD    ;SETUP
                        MOV     #0,HEAD         ;TO FILL
                        MOV     #1,FORMAT       ;HEADER
                        JSR     PC,FHDTAB       ;TABLE


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

                        SCOP1
                        MOV     #STACK,SP       ;RESTORE STK PTR
```

```
3245
3246  016016  004737  032570                  JSR     PC,SUBCLR
3247  016022  104024                          ERROR   24              ;CERR AFTER SCLR
3248
3249  016024  012765  001532  000004          MOV     #DATA1,RKBA(R5) ;WRITE ALL 1'S
3250  016032  052765  000020  000010          BIS     #BAI,RKCS2(R5)  ;BUSS ADDR INCR INHIBIT
3251  016040  012765  166000  000002          MOV     #-20.*256.,RKWC(R5)  ;DO FULL TRACK
3252
3253
3254  016046  012765  010023  000000          MOV     #<CFMT!WRDATA>, RKCS1(R5)       ;WRITE DATA CMD
3255  016054  013737  001444  005450          MOV     T50000, TEMP1   ;SETUP TIMEOUT
3256  016062  004737  032102                  JSR     PC,FRDY         ;FIND RDY
3257  016066  104011                          ERROR   11              ;NO RDY AFTER WRITE DATA CMD
3258  016070  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
3259  016074  032737  100000  005406          BIT     #CERR,HCS1
3260  016102  001405                          BEQ     65$
3261  016104  104012                          ERROR   12              ;CERR AFTER WRITE DATA CMD
3262  016106  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
3263  016112  000137  025264                  JMP     TIMING
3264
3265  016116                          65$:
3266  016116  012765  010001  000000          MOV     #<CFMT!SELDRV>,RKCS1(R5)
3267  016124  013737  001432  005450          MOV     T10,TEMP1
3268  016132  004737  032102                  JSR     PC,FRDY         ;FIND RDY
3269  016136  104117                          ERROR   117             ;RDY NOT FOUND AFTER SELDRV CMD
3270  016140  032737  001000  005434          BIT     #D.FORM,HMR2
3271  016146  001001                          BNE     1$
3272  016150  104102                          ERROR   102             ;FORMAT NOT SET
3273
3274  016152                          1$:
3275
3276  016152  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
3277  016160  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS
3278  016164  012737  010340  005444          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
3279  016172  004737  035344                  JSR     PC,CKMR2        ;CHECK MR2
3280  016176  104052                          ERROR   52              ;MSG AO ERROR AFTER WRITE DATA CMD
3281  016200  005037  005446                  CLR     SBMR3
3282  016204  004737  035426                  JSR     PC,CKMR3        ;CHECK MR3
3283  016210  104023                          ERROR   23              ;MSG BO ERROR AFTER WRITE DATA CMD
3284
3285  016212  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
3286  016220  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3287  016226  004737  032526                  JSR     PC,GSTAT
3288  016232  012737  001720  005444          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3289  016240  004737  035344                  JSR     PC,CKMR2
3290  016244  104053                          ERROR   53              ;MSG A1 ERROR AFTER WRITE DATA CMD
3291  016246  005037  005446                  CLR     SBMR3
3292  016252  004737  035426                  JSR     PC,CKMR3
3293  016256  104025                          ERROR   25              ;MSG B1 ERROR AFTER WRITE DATA CMD
3294
3295  016260  012765  166000  000002          MOV     #-20.*256.,RKWC(R5)
3296  016266  012765  001532  000004          MOV     #DATA1,RKBA(R5)
3297  016274  052765  000020  000010          BIS     #BAI,RKCS2(R5)
3298
3299  016302  012765  010031  000000          MOV     #<CFMT!WRTCHK>,RKCS1(R5)        ;WRITE CHECK CMD
3300  016310  013737  001444  005450          MOV     T50000, TEMP1   ;SETUP TIMEOUT
```

```
3301  016316  004737  032102                  JSR     PC,FRDY         ;FIND RDY
3302  016322  104015                          ERROR   15              ;NO RDY AFTER WRITE CHECK CMD
3303
3304  016324  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
3305  016330  032737  100000  005406          BIT     #CERR,HCS1
3306  016336  001417                          BEQ     67$
3307
3308  016340  032737  040000  005410          BIT     #WCE,HCS2       ;SEE IF WRITE CHECK ERROR
3309  016346  001412                          BEQ     66$
3310  016350  016537  000024  001506          MOV     RKDB(R5),WD1    ;ACTUAL WORD FOR TYPEOUT
3311  016356  013737  001532  001510          MOV     DATA1,WD2       ;EXPECTED WORD FOR TYPEOUT
3312  016364  004737  033666                  JSR     PC,TRUERR       ;CHECK AGAINST BSE INFO
3313  016370  104016                          ERROR   16              ;WCE AFTER WRITE CMD
3314  016372  000401                          BR      67$
3315
3316  016374  104022                  66$:    ERROR   22              ;CERR AFTER WRITE CHK CMD
3317
3318  016376                          67$:
3319
3320  016376  012765  010001  000000          MOV     #<CFMT!SELDRV>,RKCS1(R5)
3321  016404  013737  001432  005450          MOV     T10,TEMP1
3322  016412  004737  032102                  JSR     PC,FRDY         ;FIND RDY
3323  016416  104117                          ERROR   117             ;NO RDY AFTER SELDRV CMD
3324  016420  032737  001000  005434          BIT     #D.FORM,HMR2
3325  016426  001001                          BNE     2$
3326  016430  104103                          ERROR   103             ;FORMAT NOT SET
3327
3328  016432                          2$:
3329
3330  016432  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
3331  016440  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS
3332  016444  012737  010340  005444          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
3333  016452  004737  035344                  JSR     PC,CKMR2        ;CHECK MR2
3334  016456  104057                          ERROR   57              ;MSG A0 ERROR AFTER WRITE CHECK CMD
3335  016460  005037  005446                  CLR     SBMR3
3336  016464  004737  035426                  JSR     PC,CKMR3        ;CHECK MR3
3337  016470  104031                          ERROR   31              ;MSG B0 ERROR AFTER WRITE CHECK CMD
3338
3339  016472  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
3340  016500  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3341  016506  004737  032526                  JSR     PC,GSTAT
3342  016512  012737  001720  005444          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3343  016520  004737  035344                  JSR     PC,CKMR2
3344  016524  104060                          ERROR   60              ;MSG A1 ERROR AFTER WRITE CHECK CMD
3345  016526  005037  005446                  CLR     SBMR3
3346  016532  004737  035426                  JSR     PC,CKMR3
3347  016536  104032                          ERROR   32              ;MSG B1 ERROR AFTER WRITE CHECK CMD
3348
3349  016540  104415                          SCOP1
3350  016542  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
3351
3352  016546  004737  032570                  JSR     PC,SUBCLR
3353  016552  104024                          ERROR   24              ;CERR AFTER SCLR
3354
3355  016554  012765  001550  000004          MOV     #HDTAB,RKBA(R5) ;RESTORE CYL 0 TO 22 SECTOR FMT
3356  016562  012765  177676  000002          MOV     #-66.,RKWC(R5)
```

```
3357  016570  005037  001372                    CLR     TOCYL
3358
3359
3360  016574  013737  001372  001406            MOV     TOCYL,CALADD    ;SETUP
3361  016602  012737  000000  001514            MOV     #0,HEAD         ;TO FILL
3362  016610  012737  000000  001520            MOV     #0,FORMAT       ;HEADER
3363  016616  004737  033356                    JSR     PC,FHDTAB       ;TABLE
3364
3365
3366  016622  012765  000027  000000            MOV     #<WRHEAD>,RKCS1(R5)     ;WRITE HEADER CMD
3367  016630  013737  001444  005450            MOV     T50000,TEMP1    ;SETUP TIMEOUT
3368  016636  004737  032102                    JSR     PC,FRDY         ;FIND RDY
3369  016642  104200                            ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
3370  016644  004737  032526                    JSR     PC,GSTAT        ;GET FRESH STATUS
3371  016650  032737  100000  005406            BIT     #CERR,HCS1
3372  016656  001405                            BEQ     68$
3373  016660  104201                            ERROR   201             ;CERR AFTER WRITE HEADER CMD
3374  016662  104401  044510                    TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING TESTS
3375  016666  000137  025264                    JMP     @TIMING
3376  016672                          68$:
3377
3378
3379
3380                                  ;;*****************************************************************
3381                                  ;*TEST 13       TEST OFFSET & RTC LOGIC
3382                                  ;*
3383                                  ;*      THE HEADS ARE FIRST OFFSET BY OFFSET COMMANDS.
3384                                  ;*      THIS TEST CHECKS THE RTC LOGIC BY VERIFYING THAT THE
3385                                  ;*      'OFFSET ON' BIT (MSG A,DO) RESETS AND THE OFFSET REG
3386                                  ;*      BECOMES THE CYL DIFF INFO WHEN A SEEK CMD TO A
3387                                  ;*      DIFFERENT CYLINDER IS ISSUED
3388                                  ;*      IT ALSO TESTS THAT DRIVE CLEAR & SEEK TO SELF WILL NOT
3389                                  ;*      CLEAR THE 'OFFSET ON' BIT OR THE OFFSET REG.
3390                                  ;*      ALL OFFSET POSITIONS IN BOTH DIRECTIONS ARE CHECKED
3391                                  ;*
3392                                  ;*****************************************************************
3393  016672  000004                  TST13:  SCOPE
3394  016674  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
3395  016702  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
3396
3397  016706  012702  000001                  MOV     #1,R2           ;MIN POS OFFSET
3398
3399  016712  004737  032570          1$:     JSR     PC,SUBCLR
3400  016716  104024                          ERROR   24              ;CERR AFTER SCLR
3401
3402  016720  010265  000016                  MOV     R2,RKASOF(R5)   ;SET OFFSET
3403
3404  016724  012737  017060  001176          MOV     #64$,$ESCAPE
3405  016732  012765  000015  000000          MOV     #OFFSET,RKCS1(R5)   ;OFFSET CMD
3406  016740  013737  001440  005450          MOV     T100,TEMP1      ;SETUP TIMEOUT
3407  016746  004737  032102                  JSR     PC,FRDY
3408  016752  104033                          ERROR   33              ;NO RDY AFTER OFFSET CMD
3409
3410  016754  005065  000026                  CLR     RKMR1(R5)       ;GET WORD 0
3411  016760  004737  032526                  JSR     PC,GSTAT
3412  016764  012737  032140  005444          MOV     #<D.PIP!D.SPIN!D.OFF!D.VV!D.DRA>, SBMR2
```

```
3413  016772  004737  035344                JSR     PC,CKMR2        ;CHECK MR2
3414  016776  104035                       ERROR   35              ;MSG AO ERROR DURING OFFSET CMD
3415
3416  017000  005037  005446                CLR     SBMR3
3417  017004  004737  035426                JSR     PC,CKMR3        ;CHECK MR3
3418  017010  104061                       ERROR   61              ;MSG BO ERROR DURING OFFSET CMD
3419
3420  017012  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
3421  017020  012765  000001  000026        MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3422  017026  004737  032526                JSR     PC,GSTAT
3423  017032  012737  001720  005444        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3424  017040  004737  035344                JSR     PC,CKMR2
3425  017044  104036                       ERROR   36              ;MSG A1 ERROR DURING OFFSET
3426
3427  017046  005037  005446                CLR     SBMR3
3428  017052  004737  035426                JSR     PC,CKMR3
3429  017056  104062                       ERROR   62              ;MSG B1 ERROR DURING OFFSET
3430
3431  017060  005037  001176          64$:  CLR     $ESCAPE
3432  017064  013737  001442  005450        MOV     T5000,TEMP1     ;SETUP TIMEOUT
3433  017072  004737  032414                JSR     PC,FATT2        ;FIND ATTN
3434  017076  104034                       ERROR   34              ;NO ATTN AFTER OFFSET CMD
3435
3436
3437  017100  012765  100000  000000        MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
3438  017106  004737  032526                JSR     PC,GSTAT        ;GET LATEST STATUS
3439  017112  012737  052340  005444        MOV     #<D.DSC!D.OFF!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2   ;SHOULD BE VALUE
3440  017120  004737  035344                JSR     PC,CKMR2        ;CHECK MR2
3441  017124  104260                       ERROR   260             ;MSG AO ERROR AFTER OFFSET CMD
3442  017126  005037  005446                CLR     SBMR3
3443  017132  004737  035426                JSR     PC,CKMR3        ;CHECK MR3
3444  017136  104261                       ERROR   261             ;MSG BO ERROR AFTER OFFSET CMD
3445
3446  017140  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
3447  017146  012765  000001  000026        MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3448  017154  004737  032526                JSR     PC,GSTAT
3449  017160  012737  001720  005444        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3450  017166  004737  035344                JSR     PC,CKMR2
3451  017172  104037                       ERROR   37              ;MSG A1 ERROR AFTER OFFSET CMD
3452  017174  005037  005446                CLR     SBMR3
3453  017200  004737  035426                JSR     PC,CKMR3
3454  017204  104040                       ERROR   40              ;MSG B1 ERROR AFTER OFFSET CMD
3455
3456
3457  017206  004737  033074                JSR     PC,RDCYLA
3458  017212  005737  001404                TST     CYLADD
3459  017216  001401                       BEQ     17$
3460  017220  104042                       ERROR   42              ;CYL ADDR IN RKMR3 WAS NOT 0
3461                                                               ;AFTER OFFSET CMD FROM CYL 0
3462  017222                          17$:
3463  017222  010265  000016                MOV     R2,RKASOF(R5)   ;REFRESH RKASOF
3464
3465  017226  032702  000200                BIT     #BIT7,R2
3466  017232  001007                       BNE     65$             ;BR IF NEG OFFSET
3467
3468  017234  004737  032720                JSR     PC,RDCYLD
```

```
3469  017240  020237  001402            CMP     R2,CYLDIF       ;CHECK POS OFFSET
3470  017244  001410                    BEQ     66$
3471  017246  104114                    ERROR   114             ;OFFSET IN RKMR2 NOT = RKASOF
3472  017250  000406                    BR      66$             ;AFTER OFFSET CMD
3473
3474  017252  004737  032720    65$:    JSR     PC,RDCYLD
3475  017256  020137  001402            CMP     R1,CYLDIF       ;CHECK NEG OFFSET
3476  017262  001401                    BEQ     66$
3477  017264  104114                    ERROR   114             ;OFFSET IN RKMR2 NOT = RKASOF
3478                                                            ;AFTER OFFSET CMD
3479  017266            66$:
3480
3481  017266  012765  100000  000000    MOV     #CCLR,RKCS1(R5)
3482  017274  013765  001222  000010    MOV     $UNIT,RKCS2(R5) ;DRIVE#
3483  017302  012765  000005  000000    MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
3484  017310  013737  001432  005450    MOV     T10,TEMP1       ;SETUP TIMEOUT
3485  017316  004737  032102            JSR     PC,FRDY         ;FIND RDY
3486  017322  104151                    ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
3487  017324  004737  032266            JSR     PC,TSTATN       ;TEST FOR ATTN
3488  017330  000401                    BR      67$
3489  017332  104154                    ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
3490  017334            67$:
3491
3492  017334  012765  100000  000000    MOV     #CCLR,RKCS1(R5)
3493  017342  004737  032526            JSR     PC,GSTAT
3494  017346  032737  002000  005434    BIT     #D.OFF,HMR2
3495  017354  001001                    BNE     4$
3496  017356  104043                    ERROR   43              ;OFFSET BIT IN RKMR2 CLEARED
3497                                                            ;AFTER DRIVE CLEAR CMD & SELECT DRV CMD
3498  017360            4$:
3499
3500  017360  012765  100000  000000    MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
3501  017366  004737  032526            JSR     PC,GSTAT        ;GET LATEST STATUS
3502  017372  012737  012340  005444    MOV     #<D.OFF!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2 ;SHOULD BE VALUE
3503  017400  004737  035344            JSR     PC,CKMR2        ;CHECK MR2
3504  017404  104273                    ERROR   273             ;MSG AO ERROR AFTER DRIVE CLEAR CMD
3505  017406  005037  005446            CLR     SBMR3
3506  017412  004737  035426            JSR     PC,CKMR3        ;CHECK MR3
3507  017416  104265                    ERROR   265             ;MSG BO ERROR AFTER DRIVE CLEAR CMD
3508
3509  017420  012765  100000  000000    MOV     #CCLR,RKCS1(R5)
3510  017426  012765  000001  000026    MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3511  017434  004737  032526            JSR     PC,GSTAT
3512  017440  012737  001720  005444    MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3513  017446  004737  035344            JSR     PC,CKMR2
3514  017452  104274                    ERROR   274             ;MSG A1 ERROR AFTER DRIVE CLEAR CMD
3515  017454  005037  005446            CLR     SBMR3
3516  017460  004737  035426            JSR     PC,CKMR3
3517  017464  104266                    ERROR   266             ;MSG B1 ERROR AFTER DRIVE CLEAR CMD
3518
3519  017466  010265  000016            MOV     R2,RKASOF(R5)   ;REFRESH RKASOF
3520
3521  017472  032702  000200            BIT     #BIT7,R2
3522  017476  001007                    BNE     68$             ;BR IF NEG OFFSET
3523
3524  017500  004737  032720            JSR     PC,RDCYLD
```

```
3525  017504  020237  001402          CMP     R2,CYLDIF       ;CHECK POS OFFSET
3526  017510  001410                  BEQ     69$
3527  017512  104115                  ERROR   115             ;OFFSET IN RKMR2 NOT = RKASOF
3528  017514  000406                  BR      69$             ;AFTER DRIVE CLEAR CMD
3529
3530  017516  004737  032720  68$:    JSR     PC,RDCYLD
3531  017522  020137  001402          CMP     R1,CYLDIF       ;CHECK NEG OFFSET
3532  017526  001401                  BEQ     69$
3533  017530  104115                  ERROR   115             ;OFFSET IN RKMR2 NOT = RKASOF
3534                                                          ;AFTER DRIVE CLEAR CMD
3535  017532          69$:
3536
3537  017532  012765  000017  000000  MOV     #SEEK,RKCS1(R5) ;SEEK CMD
3538  017540  013737  001434  005450  MOV     T50,TEMP1       ;SETUP TIMEOUT
3539  017546  004737  032102          JSR     PC,FRDY         ;FIND RDY
3540  017552  104131                  ERROR   131             ;NO RDY AFTER SEEK CMD
3541
3542  017554  013737  001444  005450  MOV     T50000,TEMP1    ;SETUP TIMEOUT
3543  017562  004737  032414          JSR     PC,FATT2        ;FIND ATTN
3544  017566  104132                  ERROR   132             ;NO ATTN AFTER SEEK CMD
3545
3546  017570  032737  100000  005406  BIT     #CERR,HCS1
3547  017576  001401                  BEQ     70$
3548  017600  104210                  ERROR   210             ;CERR AFTER SEEK CMD
3549
3550  017602          70$:
3551
3552
3553  017602  032737  002000  005434  BIT     #D.OFF,HMR2
3554  017610  001001                  BNE     7$
3555  017612  104045                  ERROR   45              ;OFFSET BIT CLEARED IN RKMR2 AFTER SEEK TO SELF.
3556
3557  017614          7$:
3558  017614  010265  000016          MOV     R2,RKASOF(R5)   ;REFRESH RKASOF
3559
3560  017620  032702  000200          BIT     #BIT7,R2
3561  017624  001007                  BNE     71$             ;BR IF NEG OFFSET
3562
3563  017626  004737  032720          JSR     PC,RDCYLD
3564  017632  020237  001402          CMP     R2,CYLDIF       ;CHECK POS OFFSET
3565  017636  001410                  BEQ     72$
3566  017640  104123                  ERROR   123             ;OFFSET IN RKMR2 NOT = RKASOF
3567  017642  000406                  BR      72$             ;AFTER SEEK TO SELF
3568
3569  017644  004737  032720  71$:    JSR     PC,RDCYLD
3570  017650  020137  001402          CMP     R1,CYLDIF       ;CHECK NEG OFFSET
3571  017654  001401                  BEQ     72$
3572  017656  104123                  ERROR   123             ;OFFSET IN RKMR2 NOT = RKASOF
3573                                                          ;AFTER SEEK TO SELF
3574  017660          72$:
3575
3576  017660  004737  032570          JSR     PC,SUBCLR
3577  017664  104024                  ERROR   24              ;CERR AFTER SCLR
3578
3579  017666  C12737  000012  001372  MOV     #10.,TOCYL
3580  017674  012765  000012  000020  MOV     #10.,RKDC(R5)   ;SETUP CYL 10
```

```
3581                                                    ;DO ACTUAL IMPLIED SEEK TO CYL 10 TO VERIFY
3582                                                    ;OFFSET BIT IN RKMR2 CLEARED
3583
3584
3585  017702  012700  001754                  MOV     #RHTAB,R0
3586  017706  012765  000025  000000          MOV     #<RDHEAD>,RKCS1(R5)     ;READ HEADER CMD
3587  017714  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP  TIMEOUT
3588  017722  004737  032102                  JSR     PC,FRDY         ;FIND RDY
3589  017726  104171                          ERROR   171             ;NO RDY AFTER READ HEADER CMD
3590  017730  032737  100000  005406          BIT     #CERR,HCS1
3591  017736  001405                          BEQ     74$
3592  017740  104174                          ERROR   174             ;CERR AFTER READ HEADER CMD
3593  017742  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING TESTS
3594  017746  000137  025264                  JMP     @TIMING
3595
3596  017752  016520  000024          74$:    MOV     RKDB(R5),(R0)+  ;1'ST WORD FROM SILO TO RHTAB
3597  017756  016520  000024                  MOV     RKDB(R5),(R0)+  ;2'ND WORD
3598  017762  016520  000024                  MOV     RKDB(R5),(R0)+  ;3'RD WORD
3599
3600
3601  017766  032765  100000  000010          BIT     #DLT,RKCS2(R5)
3602  017774  001407                          BEQ     75$
3603  017776  004737  032526                  JSR     PC,GSTAT
3604  020002  104173                          ERROR   173             ;DLT AFTER READ HEADER CMD
3605  020004  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING TESTS
3606  020010  000137  025264                  JMP     @TIMING
3607  020014                          75$:
3608
3609  020014  023737  001754  001372          CMP     RHTAB,TOCYL     ;CHECK WORD 0 ONLY, CYL#
3610  020022  001401                          BEQ     73$             ;BR IF SAME
3611  020024  104051                          ERROR   51              ;WRONG CYL# ON HEADER
3612  020026                          73$:
3613
3614
3615  020026  032737  002000  005434          BIT     #D.OFF,HMR2
3616  020034  001401                          BEQ     9$
3617  020036  104101                          ERROR   101             ;OFFSET NOT CLEARED AFTER READ HEADER WITH MOVEMENT
3618
3619  020040  004737  033074          9$:     JSR     PC,RDCYLA
3620  020044  023727  001404  000012          CMP     CYLADD,#10.
3621  020052  001401                          BEQ     10$
3622  020054  104122                          ERROR   122             ;DID NOT GO TO CYL 10
3623
3624  020056  004737  032720          10$:    JSR     PC,RDCYLD
3625  020062  005737  001402                  TST     CYLDIF
3626  020066  001401                          BEQ     16$
3627  020070  104101                          ERROR   101             ;OFFSET NOT CLEARED IN RKMR2
3628
3629  020072  004737  032570          16$:    JSR     PC,SUBCLR
3630  020076  104024                          ERROR   24              ;CERR AFTER SCLR
3631
3632  020100  012765  000017  000000          MOV     #SEEK,RKCS1(R5) ;SEEK CMD
3633  020106  013737  001434  005450          MOV     T50,TEMP1       ;SETUP TIMEOUT
3634  020114  004737  032102                  JSR     PC,FRDY         ;FIND RDY
3635  020120  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
3636
```

```
3637  020122  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP TIMEOUT
3638  020130  004737  032414                  JSR     PC,FATT2        ;FIND ATTN
3639  020134  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
3640
3641  020136  032737  100000  005406          BIT     #CERR,HCS1
3642  020144  001401                          BEQ     76$
3643  020146  104210                          ERROR   210             ;CERR AFTER SEEK CMD
3644
3645  020150                          76$:
3646
3647
3648  020150  032702  000200                  BIT     #BIT7,R2        ;SEE IF DOING NEG OFFSETS
3649  020154  001014                          BNE     18$             ;BR IF YES
3650
3651  020156  005202                          INC     R2
3652  020160  020227  000061                  CMP     R2,#61          ;SEE IF JUST DID MAX POS OFFSET
3653  020164  001402                          BEQ     20$             ;BR IF YES
3654  020166  000137  016712                  JMP     1$              ;ELSE DO NEXT POS OFFSET
3655
3656  020172  012702  000201          20$:    MOV     #201,R2         ;SETUP NEG OFFSET FOR RKASOF
3657  020176  012701  000101                  MOV     #101,R1         ;SETUP NEG OFFSET OFOR MSG A
3658  020202  000137  016712                  JMP     1$              ;DO NEG OFFSET
3659
3660  020206  005201                  18$:    INC     R1
3661  020210  005202                          INC     R2
3662  020212  020227  000261                  CMP     R2,#261         ;SEE IF ALL NEG OFFSETS DONE
3663  020216  001402                          BEQ     TST14           ;;GO TO NEXT TST
3664  020220  000137  016712                  JMP     1$              ;DO ANOTHER
3665
3666                                  ;;*****************************************************************
3667                                  ;*TEST 14       TEST READ DATA AT ALL HEAD OFFSET POSITIONS
3668                                  ;*
3669                                  ;*      THIS TEST VERIFIES THAT THE HEAD OFFSET LOGIC IS OPERATIONAL BY
3670                                  ;*      WRITING ALL 1'S PATTERNS ON CYLINDER 0, HEAD 0. THEN
3671                                  ;*      PERFORMING READ DATA FROM CENTERLINE AND MOVING OUT + AND - OFFSET
3672                                  ;*      POSITIONS UNTIL A FAILURE OCCURES.  THE FAILING OFFSET POSITIONS
3673                                  ;*      ARE PRINTED OUT IF LESS THAN THE OFFSET TOLERANCE TO BE SPECIFIED.
3674                                  ;*      OFFSET CODES ARE ALSO VERIFIED BY READING MSG A, STATUS 00 & 10.
3675                                  ;*
3676                                  ;*      ALL HEADS ARE TESTED AT CYLINDER 0
3677                                  ;*      IF THERE ARE NO FAILURES AT ALL, THIS INDICATES THAT
3678                                  ;*
3679                                  ;*              A. HEADS DID NOT MOVE AT ALL
3680                                  ;*      OR      B. THE COMBINATION OF DISC SURFACE, HEADS, R/W AMP
3681                                  ;*                 ARE EXCEPTIONALLY GOOD.
3682                                  ;*
3683                                  ;*      AN APPROPRIATE MESSAGE WILL BE TYPED.
3684                                  ;*
3685                                  ;*****************************************************************
3686  020224  000004                  TST14:  SCOPE
3687  020226  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
3688  020234  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
3689
3690  020240  004737  032570                  JSR     PC,SUBCLR
3691  020244  104024                          ERROR   24              ;CERR AFTER SCLR
3692
```

```
3693  020246  012765  001532  000004          MOV     #DATA1,RKBA(R5) ;WRITE ALL 1'S
3694  020254  052765  000020  000010          BIS     #BAI,RKCS2(R5)  ;BUSS ADDR INCR INHIBIT
3695  020262  012765  177400  000002          MOV     #-256.,RKWC(R5) ;SECTOR 0 ONLY
3696                                                                  ;WILL DO AN IMPLIED SEEK TO CYL 0.
3697                                                                  ;WAS ON CYL 1 FROM LAST TEST
3698
3699  020270  012765  000023  000000          MOV     #<WRDATA>, RKCS1(R5)    ;WRITE DATA CMD
3700  020276  013737  001444  005450          MOV     T50000, TEMP1   ;SETUP TIMEOUT
3701  020304  004737  032102                  JSR     PC,FRDY         ;FIND RDY
3702  020310  104011                          ERROR   11              ;NO RDY AFTER WRITE DATA CMD
3703  020312  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
3704  020316  032737  100000  005406          BIT     #CERR,HCS1
3705  020324  001405                          BEQ     64$
3706  020326  104012                          ERROR   12              ;CERR AFTER WRITE DATA CMD
3707  020330  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
3708  020334  000137  025264                  JMP     TIMING
3709
3710  020340                          64$:
3711
3712  020340  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
3713  020346  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS
3714  020352  012737  010340  005444          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2      ;SHOULD BE VALUE
3715  020360  004737  035344                  JSR     PC,CKMR2        ;CHECK MR2
3716  020364  104052                          ERROR   52              ;MSG AO ERROR AFTER WRITE DATA CMD
3717  020366  005037  005446                  CLR     SBMR3
3718  020372  004737  035426                  JSR     PC,CKMR3        ;CHECK MR3
3719  020376  104023                          ERROR   23              ;MSG BO ERROR AFTER WRITE DATA CMD
3720
3721  020400  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
3722  020406  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3723  020414  004737  032526                  JSR     PC,GSTAT
3724  020420  012737  001720  005444          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3725  020426  004737  035344                  JSR     PC,CKMR2
3726  020432  104053                          ERROR   53              ;MSG A1 ERROR AFTER WRITE DATA CMD
3727  020434  005037  005446                  CLR     SBMR3
3728  020440  004737  035426                  JSR     PC,CKMR3
3729  020444  104025                          ERROR   25              ;MSG B1 ERROR AFTER WRITE DATA CMD
3730
3731  020446  012765  001532  000004          MOV     #DATA1,RKBA(R5)
3732  020454  052765  000020  000010          BIS     #BAI,RKCS2(R5)
3733  020462  012765  177400  000002          MOV     #-256.,RKWC(R5)
3734
3735  020470  012765  000031  000000          MOV     #<WRTCHK>,RKCS1(R5)     ;WRITE CHECK CMD
3736  020476  013737  001444  005450          MOV     T50000, TEMP1   ;SETUP TIMEOUT
3737  020504  004737  032102                  JSR     PC,FRDY         ;FIND RDY
3738  020510  104015                          ERROR   15              ;NO RDY AFTER WRITE CHECK CMD
3739
3740  020512  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
3741  020516  032737  100000  005406          BIT     #CERR,HCS1
3742  020524  001417                          BEQ     66$
3743
3744  020526  032737  040000  005410          BIT     #WCE,HCS2       ;SEE IF WRITE CHECK ERROR
3745  020534  001412                          BEQ     65$
3746  020536  016537  000024  001506          MOV     RKDB(R5),WD1    ;ACTUAL WORD FOR TYPEOUT
3747  020544  013737  001532  001510          MOV     DATA1,WD2       ;EXPECTED WORD FOR TYPEOUT
3748  020552  004737  033666                  JSR     PC,TRUERR       ;CHECK AGAINST BSE INFO
```

```
3749  020556  104016                        ERROR   16              ;WCE AFTER WRITE CMD
3750  020560  000401                        BR      66$
3751
3752  020562  104022              65$:      ERROR   22              ;CERR AFTER WRITE CHK CMD
3753
3754  020564                    66$:
3755
3756  020564  012765  100000  000000        MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
3757  020572  004737  032526                JSR     PC,GSTAT        ;GET LATEST STATUS
3758  020576  012737  010340  005444        MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
3759  020604  004737  035344                JSR     PC,CKMR2        ;CHECK MR2
3760  020610  104057                        ERROR   57              ;MSG AO ERROR AFTER WRITE CHECK CMD
3761  020612  005037  005446                CLR     SBMR3
3762  020616  004737  035426                JSR     PC,CKMR3        ;CHECK MR3
3763  020622  104031                        ERROR   31              ;MSG BO ERROR AFTER WRITE CHECK CMD
3764
3765  020624  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
3766  020632  012765  000001  000026        MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3767  020640  004737  032526                JSR     PC,GSTAT
3768  020644  012737  001720  005444        MOV     #<0.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3769  020652  004737  035344                JSR     PC,CKMR2
3770  020656  104060                        ERROR   60              ;MSG A1 ERROR AFTER WRITE CHECK CMD
3771  020660  005037  005446                CLR     SBMR3
3772  020664  004737  035426                JSR     PC,CKMR3
3773  020670  104032                        ERROR   32              ;MSG B1 ERROR AFTER WRITE CHECK CMD
3774
3775
3776
3777  020672  104401  043400                TYPE    ,MSG8           ;READ WITH OFFSET TEST
3778  020676  005001                        CLR     R1              ;HEAD #
3779
3780  020700  012700  000001        9$:     MOV     #1,R0           ;INIT OFFSET COUNTER
3781  020704  104401  043437                TYPE    ,MSG9           ;HEAD #
3782  020710  010146                        MOV     R1,-(SP)        ;;SAVE R1 FOR TYPEOUT
3783                                                                ;;TYPE HEAD #
3784  020712  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
3785  020714     001                        .BYTE   1               ;;TYPE 1 DIGIT(S)
3786  020715     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
3787  020716  104401  001205                TYPE    ,$CRLF
3788
3789  020722  005037  001512        1$:     CLR     OFFERR          ;WRITE CHECK ERROR FLAG
3790
3791  020726  004737  032570                JSR     PC,SUBCLR
3792  020732  104024                        ERROR   24              ;CERR AFTER SCLR
3793
3794  020734  010065  000016                MOV     R0,RKASOF(R5)   ;OFFSET VALUE
3795  020740  000301                        SWAB    R1
3796  020742  010165  000006                MOV     R1,RKDA(R5)     ;HEAD NO.
3797  020746  000301                        SWAB    R1
3798
3799  020750  012737  021104  001176        MOV     #67$,$ESCAPE
3800  020756  012765  000015  000000        MOV     #OFFSET,RKCS1(R5)  ;OFFSET CMD
3801  020764  012737  001440  005450        MOV     T100,TEMP1      ;SETUP TIMEOUT
3802  020772  004737  032102                JSR     PC,FRDY
3803  020776  104033                        ERROR   33              ;NO RDY AFTER OFFSET CMD
3804
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```
3805  021000  005065  000026                CLR     RKMR1(R5)          ;GET WORD 0
3806  021004  004737  032526                JSR     PC,GSTAT
3807  021010  012737  032140  005444        MOV     #<D.PIP!D.SPIN!D.OFF!D.VV!D.DRA>, SBMR2
3808  021016  004737  035344                JSR     PC,CKMR2           ;CHECK MR2
3809  021022  104035                        ERROR   35                 ;MSG AO ERROR DURING OFFSET CMD
3810
3811  021024  005037  005446                CLR     SBMR3
3812  021030  004737  035426                JSR     PC,CKMR3           ;CHECK MR3
3813  021034  104061                        ERROR   61                 ;MSG BO ERROR DURING OFFSET CMD
3814
3815  021036  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
3816  021044  012765  000001  000026        MOV     #1,RKMR1(R5)       ;SELECT WORD 1
3817  021052  004737  032526                JSR     PC,GSTAT
3818  021056  012737  001720  005444        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3819  021064  004737  035344                JSR     PC,CKMR2
3820  021070  104036                        ERROR   36                 ;MSG A1 ERROR DURING OFFSET
3821
3822  021072  005037  005446                CLR     SBMR3
3823  021076  004737  035426                JSR     PC,CKMR3
3824  021102  104062                        ERROR   62                 ;MSG B1 ERROR DURING OFFSET
3825
3826  021104  005037  001176        67$:    CLR     $ESCAPE
3827  021110  013737  001442  005450        MOV     T5000,TEMP1        ;SETUP TIMEOUT
3828  021116  004737  032414                JSR     PC,FATT2           ;FIND ATTN
3829  021122  104034                        ERROR   34                 ;NO ATTN AFTER OFFSET CMD
3830
3831
3832  021124  012765  100000  000000        MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
3833  021132  004737  032526                JSR     PC,GSTAT           ;GET LATEST STATUS
3834  021136  012737  052340  005444        MOV     #<D.DSC!D.OFF!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2  ;SHOULD BE VALUE
3835  021144  004737  035344                JSR     PC,CKMR2           ;CHECK MR2
3836  021150  104260                        ERROR   260                ;MSG AO ERROR AFTER OFFSET CMD
3837  021152  005037  005446                CLR     SBMR3
3838  021156  004737  035426                JSR     PC,CKMR3           ;CHECK MR3
3839  021162  104261                        ERROR   261                ;MSG BO ERROR AFTER OFFSET CMD
3840
3841  021164  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
3842  021172  012765  000001  000026        MOV     #1,RKMR1(R5)       ;SELECT WORD 1
3843  021200  004737  032526                JSR     PC,GSTAT
3844  021204  012737  001720  005444        MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
3845  021212  004737  035344                JSR     PC,CKMR2
3846  021216  104037                        ERROR   37                 ;MSG A1 ERROR AFTER OFFSET CMD
3847  021220  005037  005446                CLR     SBMR3
3848  021224  004737  035426                JSR     PC,CKMR3
3849  021230  104040                        ERROR   40                 ;MSG B1 ERROR AFTER OFFSET CMD
3850
3851
3852
3853  021232  012765  100000  000000        MOV     #CCLR,RKCS1(R5)
3854  021240  013765  001222  000010        MOV     $UNIT,RKCS2(R5) ;DRIVE#
3855  021246  012765  000005  000000        MOV     #CLEAR,RKCS1(R5)           ;DRIVE CLEAR CMD
3856  021254  013737  001432  005450        MOV     T10,TEMP1          ;SETUP TIMEOUT
3857  021262  004737  032102                JSR     PC,FRDY            ;FIND RDY
3858  021266  104151                        ERROR   151                ;NO RDY AFTER DRIVE CLEAR CMD
3859  021270  004737  032266                JSR     PC,TSTATN          ;TEST FOR ATTN
3860  021274  000401                        BR      68$
```

```
3861  021276  104154                        ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
3862  021300                          68$:
3863
3864  021300  012765  001532  000004        MOV     #DATA1,RKBA(R5)
3865  021306  052765  000020  000010        BIS     #BAI,RKCS2(R5)
3866  021314  012765  177400  000002        MOV     #-256.,RKWC(R5)
3867  021322  012765  000031  000000        MOV     #WRTCHK,RKCS1(R5)  ;WRITE CHECK CMD
3868  021330  012737  141520  005450        MOV     #50000.,TEMP1   ;SETUP TIMEOUT
3869  021336  004737  032102                JSR     PC,FRDY         ;FIND RDY
3870  021342  104015                        ERROR   15              ;NO RDY AFTER WRITE CHECK CMD
3871  021344  004737  032526                JSR     PC,GSTAT        ;GET FRESH STATUS
3872  021350  032737  040000  005410        BIT     #WCE,HCS2
3873  021356  001423                        BEQ     2$
3874
3875  021360  016537  000024  001506        MOV     RKDB(R5),WD1    ;GET MISCOMPARED WORD
3876  021366  004737  033666                JSR     PC,TRUERR       ;CHECK AGAINST BSE INFO
3877  021372  005237  001512                INC     OFFERR          ;BAD WRITE CHK ERROR=SET ERR FLG.
3878
3879  021376  005737  001512                TST     OFFERR
3880  021402  001411                        BEQ     2$
3881  021404  104401  045634                TYPE    ,MSG39          ;WRITE CHECK FAILURE AT OFFSET
3882  021410  010046                        MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
3883                                                                ;;TYPE OFFSET VALUE
3884  021412  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
3885  021414     006                        .BYTE   6               ;;TYPE 6 DIGITS
3886  021415     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
3887  021416  104401  001205                TYPE    ,$CRLF
3888  021422  104401  001205                TYPE    ,$CRLF
3889
3890  021426  032700  000200          2$:   BIT     #BIT7,R0        ;SEE IF OFFSET IS + OR -
3891  021432  001023                        BNE     5$              ;BR IF - OFFSET
3892
3893  021434  020027  000060                CMP     R0,#60
3894  021440  001412                        BEQ     4$
3895  021442  005737  001512                TST     OFFERR
3896  021446  001404                        BEQ     3$
3897  021450  012700  000200          8$:   MOV     #200,R0         ;SETUP FOR NEG OFFSET
3898  021454  000137  020722                JMP     1$
3899
3900  021460  005200                  3$:   INC     R0
3901  021462  000137  020722                JMP     1$
3902
3903  021466  005737  001512          4$:   TST     OFFERR
3904  021472  001366                        BNE     8$              ;DO NEG OFFSETS
3905  021474  104401  045476                TYPE    ,MSG37          ;NO WRITE CHECK ERROR AT MAX POS OFFSET
3906                                                                ;NOTE! EITHER HEADS DID NOT MOVE
3907                                                                ;OR READ/WRITE AMP IS EXCEPTIONALLY GOOD.
3908  021500  000763                        BR      8$              ;DO NEG OFFSETS
3909
3910  021502  020027  000260          5$:   CMP     R0,#260
3911  021506  001404                        BEQ     6$
3912  021510  005737  001512                TST     OFFERR
3913  021514  001076                        BNE     TST15           ;;GO TO NEXT TST
3914  021516  000760                        BR      3$
3915
3916  021520  005737  001512          6$:   TST     OFFERR
```

```
3917  021524  001002                          BNE     7$
3918  021526  104401  045554                  TYPE    ,MSG38          ;NO WRITE CHECK ERROR AT MAX NEG OFFSET
3919                                                                  ;NOTE! EITHER HEADS DID NOT MOVE
3920                                                                  ;OR READ/WRITE AMP IS EXECEPTIONALLY GOOD.
3921  021532                          7$:
3922
3923  021532  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
3924  021540  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
3925  021546  012765  000013  000000          MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
3926                                                                  ;RESET CYL DIFF/OFFSET & CYL ADDR REG
3927                                                                  ;IN RKMR2 & RKMR3 RESP.
3928  021554  013737  001432  005450          MOV     T10,TEMP1       ;SETUP TIMEOUT
3929  021562  004737  032102                  JSR     PC,FRDY         ;FIND RDY
3930  021566  104124                          ERROR   124             ;RDY NOT SET AFTER RECAL CMD
3931
3932  021570  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3933  021576  004737  032526                  JSR     PC,GSTAT
3934  021602  032737  020000  005434          BIT     #D.RTZ,HMR2
3935  021610  001001                          BNE     69$
3936  021612  104244                          ERROR   244             ;RTZ NOT SET DURING RECAL CMD
3937  021614  013737  001432  005452  69$:    MOV     T10,TEMP2       ;SETUP TIMEOUT
3938  021622  004737  032320                  JSR     PC,FATT1        ;FIND ATTN
3939  021626  104055                          ERROR   55              ;NO ATTN AFTER RECAL CMD
3940
3941  021630  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
3942  021636  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;DRIVE#
3943  021644  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
3944  021652  013737  001432  005450          MOV     T10,TEMP1       ;SETUP TIMEOUT
3945  021660  004737  032102                  JSR     PC,FRDY         ;FIND RDY
3946  021664  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
3947  021666  004737  032266                  JSR     PC,TSTATN       ;TEST FOR ATTN
3948  021672  000401                          BR      70$
3949  021674  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
3950  021676                          70$:
3951
3952
3953  021676  005201                          INC     R1              ;HEAD CTR
3954  021700  020127  000003                  CMP     R1,#3           ;SEE IF ALL HEADS DONE
3955  021704  001402                          BEQ     TST15           ;;BR IF YES
3956  021706  000137  020700                  JMP     9$              ;ELSE REPEAT ALL FOR NEXT HEAD
3957                                  ;;*****************************************************************
3958                                  ;*TEST 15       WRITE WITH HEADS OFFSET
3959                                  ;*
3960                                  ;*      THIS TEST VERIFIES THAT WHEN ATTEMPTING TO
3961                                  ;*      WRITE WITH HEADS OFFSET THAT THE OFFSET WILL CLEAR
3962                                  ;*      & THE DRIVE WILL WRITE
3963                                  ;*      SINCE THE WRITE COMMAND HAS AN IMPLIED RTC.
3964                                  ;*      THIS TEST IS PERFORMED FOR MAX POS & NEG OFFSETS ONLY
3965                                  ;*
3966                                  ;;*****************************************************************
3967  021712  000004                  TST15:  SCOPE
3968  021714  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
3969  021722  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
3970
3971  021726  012700  000260                  MOV     #260,R0         ;MAX NEG OFFSET
3972
```

```
3973  021732  004737  032570          1$:     JSR     PC,SUBCLR
3974  021736  104024                          ERROR   24              ;CERR AFTER SCLR
3975
3976  021740  010065  000016                  MOV     R0,RKASOF(R5)   ;SET OFFSET
3977
3978  021744  012737  022100  001176          MOV     #64$,$ESCAPE
3979  021752  012765  000015  000000          MOV     #OFFSET,RKCS1(R5)  ;OFFSET CMD
3980  021760  013737  001440  005450          MOV     T100,TEMP1      ;SETUP TIMEOUT
3981  021766  004737  032102                  JSR     PC,FRDY
3982  021772  104033                          ERROR   33              ;NO RDY AFTER OFFSET CMD
3983
3984  021774  005065  000026                  CLR     RKMR1(R5)       ;GET WORD 0
3985  022000  004737  032526                  JSR     PC,GSTAT
3986  022004  012737  032140  005444          MOV     #<0.PIP!0.SPIN!0.OFF!0.VV!0.DRA>, SBMR2
3987  022012  004737  035344                  JSR     PC,CKMR2        ;CHECK MR2
3988  022016  104035                          ERROR   35              ;MSG AO ERROR DURING OFFSET CMD
3989
3990  022020  005037  005446                  CLR     SBMR3
3991  022024  004737  035426                  JSR     PC,CKMR3        ;CHECK MR3
3992  022030  104061                          ERROR   61              ;MSG BO ERROR DURING OFFSET CMD
3993
3994  022032  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
3995  022040  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
3996  022046  004737  032526                  JSR     PC,GSTAT
3997  022052  012737  001720  005444          MOV     #<0.SPOK!0.CART!0.DOOR!0.BRHM!0.TFOK>,SBMR2
3998  022060  004737  035344                  JSR     PC,CKMR2
3999  022064  104036                          ERROR   36              ;MSG A1 ERROR DURING OFFSET
4000
4001  022066  005037  005446                  CLR     SBMR3
4002  022072  004737  035426                  JSR     PC,CKMR3
4003  022076  104062                          ERROR   62              ;MSG B1 ERROR DURING OFFSET
4004
4005  022100  005037  001176          64$:    CLR     $ESCAPE
4006  022104  013737  001442  005450          MOV     T5000,TEMP1     ;SETUP TIMEOUT
4007  022112  004737  032414                  JSR     PC,FATT2        ;FIND ATTN
4008  022116  104034                          ERROR   34              ;NO ATTN AFTER OFFSET CMD
4009
4010
4011  022120  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
4012  022126  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS
4013  022132  012737  052340  005444          MOV     #<0.DSC!0.OFF!0.SPIN!0.DRDY!0.VV!0.DRA>,SBMR2   ;SHOULD BE VALUE
4014  022140  004737  035344                  JSR     PC,CKMR2        ;CHECK MR2
4015  022144  104260                          ERROR   260             ;MSG AO ERROR AFTER OFFSET CMD
4016  022146  005037  005446                  CLR     SBMR3
4017  022152  004737  035426                  JSR     PC,CKMR3        ;CHECK MR3
4018  022156  104261                          ERROR   261             ;MSG BO ERROR AFTER OFFSET CMD
4019
4020  022160  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
4021  022166  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
4022  022174  004737  032526                  JSR     PC,GSTAT
4023  022200  012737  001720  005444          MOV     #<0.SPOK!0.CART!0.DOOR!0.BRHM!0.TFOK>,SBMR2
4024  022206  004737  035344                  JSR     PC,CKMR2
4025  022212  104037                          ERROR   37              ;MSG A1 ERROR AFTER OFFSET CMD
4026  022214  005037  005446                  CLR     SBMR3
4027  022220  004737  035426                  JSR     PC,CKMR3
4028  022224  104040                          ERROR   40              ;MSG B1 ERROR AFTER OFFSET CMD
```

```
4029
4030
4031
4032  022226  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
4033  022234  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;DRIVE#
4034  022242  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
4035  022250  013737  001432  005450          MOV     T10,TEMP1       ;SETUP TIMEOUT
4036  022256  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4037  022262  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
4038  022264  004737  032266                  JSR     PC,TSTATN       ;TEST FOR ATTN
4039  022270  000401                          BR      65$
4040  022272  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
4041  022274                          65$:
4042
4043
4044  022274  012765  001526  000004          MOV     #DATA0,RKBA(R5) ;WRITE ALL 0'S
4045  022302  052765  000020  000010          BIS     #BAI,RKCS2(R5)  ;BUS ADDR INCR INHIBIT
4046  022310  012765  177400  000002          MOV     #-256.,RKWC(R5) ;SECTOR 0 ONLY
4047
4048  022316  012765  000023  000000          MOV     #<WRDATA>,RKCS1(R5)     ;WRITE DATA CMD
4049  022324  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP TIMEOUT
4050  022332  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4051  022336  104011                          ERROR   11              ;NO RDY AFTER WRITE DATA CMD
4052  022340  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
4053  022344  032737  100000  005406          BIT     #CERR,HCS1
4054  022352  001405                          BEQ     66$
4055  022354  104012                          ERROR   12              ;CERR AFTER WRITE DATA CMD
4056  022356  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
4057  022362  000137  025264                  JMP     TIMING
4058
4059  022366                          66$:
4060
4061  022366  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
4062  022374  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS
4063  022400  012737  010340  005444          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2      ;SHOULD BE VALUE
4064  022406  004737  035344                  JSR     PC,CKMR2        ;CHECK MR2
4065  022412  104052                          ERROR   52              ;MSG AO ERROR AFTER WRITE DATA CMD
4066  022414  005037  005446                  CLR     SBMR3
4067  022420  004737  035426                  JSR     PC,CKMR3        ;CHECK MR3
4068  022424  104023                          ERROR   23              ;MSG BO ERROR AFTER WRITE DATA CMD
4069
4070  022426  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
4071  022434  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
4072  022442  004737  032526                  JSR     PC,GSTAT
4073  022446  012737  001720  005444          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
4074  022454  004737  035344                  JSR     PC,CKMR2
4075  022460  104053                          ERROR   53              ;MSG A1 ERROR AFTER WRITE DATA CMD
4076  022462  005037  005446                  CLR     SBMR3
4077  022466  004737  035426                  JSR     PC,CKMR3
4078  022472  104025                          ERROR   25              ;MSG B1 ERROR AFTER WRITE DATA CMD
4079
4080
4081  022474  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
4082  022502  004737  032720                  JSR     PC,RDCYLD       ;READ CYL DIFF IN RKMR2
4083  022506  005737  001402                  TST     CYLDIF
4084  022512  001401                          BEQ     67$
```

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4085  022514  104104                          ERROR   104             ;CYL DIFF/OFFSET NOT CLEARED AFTER WRITE CMD WITH OFFSET
4086  022516  004737  033074        67$:      JSR     PC,RDCYLA       ;READ CYL ADDR IN RKMR3
4087  022522  005737  001404                  TST     CYLADD
4088  022526  001401                          BEQ     68$
4089  022530  104105                          ERROR   105             ;CYL ADDR NOT CLEARED AFTER WRITE CMD WITH OFFSET
4090  022532                        68$:
4091
4092
4093  022532  104415                          SCOP1
4094  022534  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
4095
4096  022540  004737  032570                  JSR     PC,SUBCLR
4097  022544  104024                          ERROR   24              ;CERR AFTER SCLR
4098
4099
4100  022546  012765  001526  000004          MOV     #DATA0,RKBA(R5)
4101  022554  052765  000020  000010          BIS     #BAI,RKCS2(R5)
4102  022562  012765  177400  000002          MOV     #-256.,RKWC(R5)
4103
4104  022570  012765  000031  000000          MOV     #<WRTCHK>,RKCS1(R5)     ;WRITE CHECK CMD
4105  022576  013737  001444  005450          MOV     T50000, TEMP1   ;SETUP TIMEOUT
4106  022604  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4107  022610  104015                          ERROR   15              ;NO RDY AFTER WRITE CHECK CMD
4108
4109  022612  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
4110  022616  032737  100000  005406          BIT     #CERR,HCS1
4111  022624  001417                          BEQ     70$
4112
4113  022626  032737  040000  005410          BIT     #WCE,HCS2       ;SEE IF WRITE CHECK ERROR
4114  022634  001412                          BEQ     69$
4115  022636  016537  000024  001506          MOV     RKDB(R5),WD1    ;ACTUAL WORD FOR TYPEOUT
4116  022644  013737  001526  001510          MOV     DATA0,WD2       ;EXPECTED WORD FOR TYPEOUT
4117  022652  004737  033666                  JSR     PC,TRUERR       ;CHECK AGAINST BSE INFO
4118  022656  104016                          ERROR   16              ;WCE AFTER WRITE CMD
4119  022660  000401                          BR      70$
4120
4121  022662  104022                69$:      ERROR   22              ;CERR AFTER WRITE CHK CMD
4122
4123  022664                        70$:
4124
4125  022664  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
4126  022672  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS
4127  022676  012737  010340  005444          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
4128  022704  004737  035344                  JSR     PC,CKMR2        ;CHECK MR2
4129  022710  104057                          ERROR   57              ;MSG A0 ERROR AFTER WRITE CHECK CMD
4130  022712  005037  005446                  CLR     SBMR3
4131  022716  004737  035426                  JSR     PC,CKMR3        ;CHECK MR3
4132  022722  104031                          ERROR   31              ;MSG B0 ERROR AFTER WRITE CHECK CMD
4133
4134  022724  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
4135  022732  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
4136  022740  004737  032526                  JSR     PC,GSTAT
4137  022744  012737  001720  005444          MOV     #<0.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
4138  022752  004737  035344                  JSR     PC,CKMR2
4139  022756  104060                          ERROR   60              ;MSG A1 ERROR AFTER WRITE CHECK CMD
4140  022760  005037  005446                  CLR     SBMR3
```

```
4141  022764  004737  035426                  JSR     PC,CKMR3
4142  022770  104032                          ERROR   32              ;MSG B1 ERROR AFTER WRITE CHECK CMD
4143
4144
4145
4146  022772  020027  000260                  CMP     R0,#260
4147  022776  001004                          BNE     2$              ;BR IF JUST DID POS OFFSET
4148  023000  012700  000060                  MOV     #60,R0          ;ELSE SETUP FOR POS OFFSET
4149  023004  000137  021732                  JMP     1$
4150
4151  023010                          2$:
4152
4153  023010  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
4154  023016  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
4155  023024  012765  000013  000000          MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
4156                                                                  ;RESET CYL DIFF/OFFSET & CYL ADDR REG
4157                                                                  ;IN RKMR2 & RKMR3 RESP.
4158  023032  013737  001432  005450          MOV     T10,TEMP1       ;SETUP TIMEOUT
4159  023040  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4160  023044  104124                          ERROR   124             ;RDY NOT SET AFTER RECAL CMD
4161
4162  023046  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
4163  023054  004737  032526                  JSR     PC,GSTAT
4164  023060  032737  020000  005434          BIT     #D.RTZ,HMR2
4165  023066  001001                          BNE     71$
4166  023070  104244                          ERROR   244             ;RTZ NOT SET DURING RECAL CMD
4167  023072  013737  001432  005452  71$:    MOV     T10,TEMP2       ;SETUP TIMEOUT
4168  023100  004737  032320                  JSR     PC,FATT1        ;FIND ATTN
4169  023104  104055                          ERROR   55              ;NO ATTN AFTER RECAL CMD
4170
4171  023106  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
4172  023114  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;DRIVE#
4173  023122  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
4174  023130  013737  001432  005450          MOV     T10,TEMP1       ;SETUP TIMEOUT
4175  023136  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4176  023142  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
4177  023144  004737  032266                  JSR     PC,TSTATN       ;TEST FOR ATTN
4178  023150  000401                          BR      72$
4179  023152  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
4180  023154                          72$:
4181
4182
4183
4184                                  ;;*****************************************************************
4185                                  ;*TEST 16       TEST CURRENT CROSS-OVER CYLINDERS
4186                                  ;*
4187                                  ;*      THIS TEST VERIFIES THAT THE DRIVE CAN WRITE & READ OFF
4188                                  ;*      CURRENT CHANGE CYLINDERS X & Y IN THE FOLLOWING WAY:
4189                                  ;*
4190                                  ;*      SPIRAL WRITING IS PERFORMED FROM CYLINDER X TO CYLINDER Y
4191                                  ;*      WITH A DATA PATTERN FILLING THE ENTIRE 2 CYLINDERS.
4192                                  ;*
4193                                  ;*      A WRITE CHECK IS THEN PREFORMED TO VERIFY DATA WAS PROPERLY WRITTEN.
4194                                  ;*      THIS TEST IS PERFORMED FOR ALL 3 HEADS.
4195                                  ;*
4196                                  ;*      CYLINDER X:  63  127  191  255  319  383
```

```
                                        ;*      CYLINDER Y:  64  128  192  256  320  384
                                        ;*
                                        ;;*****************************************************************
023154  000004                  TST16:  SCOPE
023156  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
023164  012706  001100                  MOV     #STACK,SP
023170  012700  001446                  MOV     #CYL,R0         ;CYL ADDR TABLE
023174  004737  032570          1$:     JSR     PC,SUBCLR
023200  104024                          ERROR   24              ;CERR AFTER SCLR
023202  011065  000020                  MOV     (R0),RKDC(R5)   ;CYL #
023206  005065  000006                  CLR     RKDA(R5)        ;HEAD/SECTOR
023212  012765  001534  000004          MOV     #DPAT1,RKBA(R5) ;DATA PATTERN
023220  052765  000020  000010          BIS     #BAI,RKCS2(R5)  ;BUSS ADDR INCREMENT INHIBIT
023226  012765  076000  000002          MOV     #-6*22.*256.,RKWC(R5) ;WORD COUNT TO SPIRAL & FILL 2 CYLINDERS
023234  012765  000023  000000          MOV     #<WRDATA>,RKCS1(R5)     ;WRITE DATA CMD
023242  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP TIMEOUT
023250  004737  032102                  JSR     PC,FRDY         ;FIND RDY
023254  104011                          ERROR   11              ;NO RDY AFTER WRITE DATA CMD
023256  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
023262  032737  100000  005406          BIT     #CERR,HCS1
023270  001405                          BEQ     64$
023272  104012                          ERROR   12              ;CERR AFTER WRITE DATA CMD
023274  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMING
023300  000137  025264                  JMP     TIMING
023304                          64$:
023304  012765  100000  000000          MOV     #CCLR,RKCS1(R5) ;CONTR CLEAR
023312  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS
023316  012737  010340  005444          MOV     #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
023324  004737  035344                  JSR     PC,CKMR2        ;CHECK MR2
023330  104052                          ERROR   52              ;MSG AO ERROR AFTER WRITE DATA CMD
023332  005037  005446                  CLR     SBMR3
023336  004737  035426                  JSR     PC,CKMR3        ;CHECK MR3
023342  104023                          ERROR   23              ;MSG BO ERROR AFTER WRITE DATA CMD
023344  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
023352  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
023360  004737  032526                  JSR     PC,GSTAT
023364  012737  001720  005444          MOV     #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
023372  004737  035344                  JSR     PC,CKMR2
023376  104053                          ERROR   53              ;MSG A1 ERROR AFTER WRITE DATA CMD
023400  005037  005446                  CLR     SBMR3
023404  004737  035426                  JSR     PC,CKMR3
023410  104025                          ERROR   25              ;MSG B1 ERROR AFTER WRITE DATA CMD
023412  011065  000020                  MOV     (R0),RKDC(R5)
023416  005065  000006                  CLR     RKDA(R5)        ;HEAD/SECTOR
023422  012765  001534  000004          MOV     #DPAT1,RKBA(R5)
023430  052765  000020  000010          BIS     #BAI,RKCS2(R5)
023436  012765  076000  000002          MOV     #-6*22.*256.,RKWC(R5)
```

```
4253
4254  023444  012765  000031  000000          MOV   #<WRTCHK>,RKCS1(R5)     ;WRITE CHECK CMD
4255  023452  013737  001444  005450          MOV   T50000, TEMP1   ;SETUP TIMEOUT
4256  023460  004737  032102                  JSR   PC,FRDY         ;FIND RDY
4257  023464  104015                          ERROR 15              ;NO RDY AFTER WRITE CHECK CMD
4258
4259  023466  004737  032526                  JSR   PC,GSTAT        ;GET FRESH STATUS
4260  023472  032737  100000  005406          BIT   #CERR,HCS1
4261  023500  001417                          BEQ   66$
4262
4263  023502  032737  040000  005410          BIT   #WCE,HCS2       ;SEE IF WRITE CHECK ERROR
4264  023510  001412                          BEQ   65$
4265  023512  016537  000024  001506          MOV   RKDB(R5),WD1    ;ACTUAL WORD FOR TYPEOUT
4266  023520  013737  001534  001510          MOV   DPAT1,WD2       ;EXPECTED WORD FOR TYPEOUT
4267  023526  004737  033666                  JSR   PC,TRUERR       ;CHECK AGAINST BSE INFO
4268  023532  104016                          ERROR 16              ;WCE AFTER WRITE CMD
4269  023534  000401                          BR    66$
4270
4271  023536  104022                  65$:    ERROR 22              ;CERR AFTER WRITE CHK CMD
4272
4273  023540                          66$:
4274
4275  023540  012765  100000  000000          MOV   #CCLR,RKCS1(R5) ;CONTR CLEAR
4276  023546  004737  032526                  JSR   PC,GSTAT        ;GET LATEST STATUS
4277  023552  012737  010340  005444          MOV   #<0!D.SPIN!D.DRDY!D.VV!D.DRA>,SBMR2     ;SHOULD BE VALUE
4278  023560  004737  035344                  JSR   PC,CKMR2        ;CHECK MR2
4279  023564  104057                          ERROR 57              ;MSG AD ERROR AFTER WRITE CHECK CMD
4280  023566  005037  005446                  CLR   SBMR3
4281  023572  004737  035426                  JSR   PC,CKMR3        ;CHECK MR3
4282  023576  104031                          ERROR 31              ;MSG BD ERROR AFTER WRITE CHECK CMD
4283
4284  023600  012765  100000  000000          MOV   #CCLR,RKCS1(R5)
4285  023606  012765  000001  000026          MOV   #1,RKMR1(R5)    ;SELECT WORD 1
4286  023614  004737  032526                  JSR   PC,GSTAT
4287  023620  012737  001720  005444          MOV   #<D.SPOK!D.CART!D.DOOR!D.BRHM!D.TFOK>,SBMR2
4288  023626  004737  035344                  JSR   PC,CKMR2
4289  023632  104060                          ERROR 60              ;MSG A1 ERROR AFTER WRITE CHECK CMD
4290  023634  005037  005446                  CLR   SBMR3
4291  023640  004737  035426                  JSR   PC,CKMR3
4292  023644  104032                          ERROR 32              ;MSG B1 ERROR AFTER WRITE CHECK CMD
4293
4294
4295  023646  022027  000577          3$:     CMP   (R0)+,#383.     ;ALL CYLINDERS DONE?
4296  023652  001402                          BEQ   4$              ;BR IF YES
4297  023654  000137  023174                  JMP   1$              ;ELSE REPEAT
4298
4299  023660                          4$:
4300
4301  023660  012765  100000  000000          MOV   #CCLR,RKCS1(R5)
4302  023666  013765  001222  000010          MOV   $UNIT,RKCS2(R5)
4303  023674  012765  000013  000000          MOV   #RECAL,RKCS1(R5)        ;RECAL CMD
4304                                          ;RESET CYL DIFF/OFFSET & CYL ADDR REG
4305                                          ;IN RKMR2 & RKMR3 RESP.
4306  023702  013737  001432  005450          MOV   T10,TEMP1       ;SETUP TIMEOUT
4307  023710  004737  032102                  JSR   PC,FRDY         ;FIND RDY
4308  023714  104124                          ERROR 124             ;RDY NOT SET AFTER RECAL CMD
```

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023716  012765  000001  000026          MOV     #1,RKMR1(R5)     ;SELECT WORD 1
023724  004737  032526                  JSR     PC,GSTAT
023730  032737  020000  005434          BIT     #D.RTZ,HMR2
023736  001001                          BNE     67$
023740  104244                          ERROR   244              ;RTZ NOT SET DURING RECAL CMD
023742  013737  001432  005452  67$:    MOV     T10,TEMP2        ;SETUP TIMEOUT
023750  004737  032320                  JSR     PC,FATT1         ;FIND ATTN
023754  104055                          ERROR   55               ;NO ATTN AFTER RECAL CMD

023756  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
023764  013765  001222  000010          MOV     $UNIT,RKCS2(R5)  ;DRIVE#
023772  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
024000  013737  001432  005450          MOV     T10,TEMP1        ;SETUP TIMEOUT
024006  004737  032102                  JSR     PC,FRDY          ;FIND RDY
024012  104151                          ERROR   151              ;NO RDY AFTER DRIVE CLEAR CMD
024014  004737  032266                  JSR     PC,TSTATN        ;TEST FOR ATTN
024020  000401                          BR      68$
024022  104154                          ERROR   154              ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
024024                          68$:




                                ;;*****************************************************************
                                ;*TEST 17        TEST HEAD SWITCHING TIME
                                ;*
                                ;*       TESTS THE ABILITY TO SWITCH HEADS IN LESS THEN 10MS WHEN HEADS SPIRAL.
                                ;*
                                ;*       1. SECTOR 17 IS FIRST LOCATED AND A WRITE DATA COMMAND OF 512 WORDS
                                ;*          TO SECTOR 21 IS ISSUED.
                                ;*       2. THE PROGRAM NOW KNOWS THAT THE DRIVE WILL NOT HAVE TO TRAVEL
                                ;*          A FULL REVOLUTION BEFORE FINDING SECTOR 21.
                                ;*       3. SINCE EACH SECTOR TAKES APPROX. 1.2MS, THE TIME BETWEEN
                                ;*          THE START OF THE WRITE COMMAND (FROM SECTOR 21, HEAD 0; TO
                                ;*          SECTOR 0, HEAD 1) AND CONTROLLER READY SHOULD BE APPROX 6MS
                                ;*
                                ;*       THE ABOVE IS REPEATED FOR HEAD SWITCHING BETWEEN 1 TO 2
                                ;*
                                ;*       THIS TEST IS BYPASSED IF NEITHER L OR P CLOCK IS PRESENT
                                ;*
                                ;;*****************************************************************
024024  000004                  TST17:  SCOPE
024026  012737  000001  001174          MOV     #1,$TIMES        ;;DO 1 ITERATION
024034  012706  001100                  MOV     #STACK,SP

024040  005737  005520                  TST     DOTIM            ;BYPASS THIS TEST IF
024044  001001                          BNE     1$               ;NEITHER L OR P CLOCK PRESENT
024046  000461                          BR      TST20            ;;GO TO NEXT TEST

024050  012737  000025  005460  1$:     MOV     #25,TEMP5        ;HEAD 0, SECTOR 21 TO BE PUT IN RKDA
024056  004737  032570          2$:     JSR     PC,SUBCLR
024062  104024                          ERROR   24               ;CERR AFTER SCLR

024064  004737  033144                  JSR     PC,FSEC17        ;FIND SECTOR 17
024070  104116                          ERROR   116              ;CANNOT FIND SECTOR 17
024072  000447                          BR      TST20            ;;GO TO NEXT TEST
```

```
4365
4366  024074  012765  001530  000004          MOV     #DATA01,RKBA(R5) ;DATA 0101
4367  024102  052765  000020  000010          BIS     #BAI,RKCS2(R5)  ;BUSS ADDR INCREMENT INHIBIT
4368  024110  012765  177000  000002          MOV     #-512.,RKWC(R5) ;WORD COUNT
4369  024116  013765  005460  000006          MOV     TEMP5,RKDA(R5)  ;HEAD & SECTOR
4370  024124  012765  000023  000000          MOV     #WRDATA,RKCS1(R5) ;WRITE DATA CMD
4371
4372  024132  012737  001050  005450          MOV     #1050,TEMP1     ;THIS DELAY JUST OK FOR 11/50
4373  024140  004737  032474                  JSR     PC,DLY          ;DO DELAY
4374
4375  024144  032765  000200  000000  7$:     BIT     #RDY,RKCS1(R5)  ;LOOK FOR CONTROLLER READY
4376  024152  001004                          BNE     8$
4377  024154  004737  032102                  JSR     PC,FRDY         ;FIND RDY AND GET FRESH STATUS
4378  024160  104011                          ERROR   11              ;NO RDY AFTER SEL DRV CMD
4379  024162  104107                          ERROR   107             ;HEAD SWITCHING LONGER THAN DELAY
4380
4381  024164  004737  035310          8$:     JSR     PC,CLKOF        ;TURN CLOCK INTR OFF.
4382
4383  024170  023727  005460  000425          CMP     TEMP5,#425      ;HEAD 1,SECTOR 21 DONE?
4384  024176  001405                          BEQ     TST20           ;;GO TO NEXT TEST
4385  024200  012737  000425  005460          MOV     #425,TEMP5
4386  024206  000137  024056                  JMP     2$              ;ELSE REPEAT FOR HEAD 1, SECTOR 21
4387
4388                                  ;;*****************************************************************
4389                                  ;*TEST 20       DRIVE OFF TRACK TEST
4390                                  ;*
4391                                  ;*      THIS TEST CHECKS FOR SERVO OSCILLATIONS DURING SETTLING TIME BEYOND
4392                                  ;*      THE ALLOTED 3MS.
4393                                  ;*
4394                                  ;*      1.  INITIALLY, EVERY CYLINDER IS FORMATTED WITH IDENTICAL HEADERS
4395                                  ;*          (UNIQUE TO EACH CYLINDER)
4396                                  ;*      2.  A FULL SECTOR WRITE COMMAND IS ISSUED BY A SINGLE CYL SEEK FROM 0 TO 1.
4397                                  ;*          AS HEADERS ARE IDENTICAL, THE NEXT SECTOR TO COME UNDER THE
4398                                  ;*          HEADS WILL IMMEDIATELY BE WRITTEN.
4399                                  ;*      3.  IF THERE IS OSCILLATION SENSED BY READING THE TRIBITS,
4400                                  ;*          DRIVE OFF TRACK ERROR WILL SET.
4401                                  ;*
4402                                  ;*      IN THIS MANNER OSCILLATING SEEKS ARE PERFORMED BETWEEN ALL MAJOR CYLINDERS.
4403                                  ;*      100 OSCILLATIONS ARE PERFORMED AT EACH MAJOR CYLINDER
4404                                  ;*      BEFORE DOING THE NEXT CYLINDER
4405                                  ;*
4406                                  ;*****************************************************************
4407  024212  000004                  TST20:  SCOPE
4408  024214  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
4409  024222  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
4410  024226  005037  001372                  CLR     TOCYL
4411  024232  012737  100000  005460          MOV     #BIT15,TEMP5
4412
4413  024240  004737  032570          1$:     JSR     PC,SUBCLR
4414  024244  104024                          ERROR   24              ;CERR AFTER SCLR
4415
4416  024246  012700  001550                  MOV     #HDTAB,R0       ;FORMAT HEADERS ON ALL MAJOR CYL.
4417
4418  024252  013720  001372          2$:     MOV     TOCYL,(R0)+     ;HEADER WORD 0: CYL #
4419  024256  012720  140000                  MOV     #140000,(R0)+   ;HEADER WORD 1: ALL SECTOR 0
4420  024262  012710  140000                  MOV     #140000,(R0)    ;HEADER WORD 2: XOR OF 0 & 1
```

```
4421  024266  053720  001372                  BIS     TOCYL,(R0)+     ;ADD CYL # TO WORD 2
4422
4423  024272  020027  001754                  CMP     R0,#HDTAB+132.  ;ALL 22 SECTORS DONE? (22X6=132)
4424  024276  001365                          BNE     2$              ;BR IF NO
4425
4426  024300  012765  001550  000004          MOV     #HDTAB,RKBA(R5)
4427  024306  012765  177676  000002          MOV     #-66.,RKWC(R5)
4428  024314  013765  001372  000020          MOV     TOCYL,RKDC(R5)
4429
4430  024322  012765  000027  000000          MOV     #<WRHEAD>,RKCS1(R5)     ;WRITE HEADER CMD
4431  024330  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP TIMEOUT
4432  024336  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4433  024342  104200                          ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
4434  024344  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
4435  024350  032737  100000  005406          BIT     #CERR,HCS1
4436  024356  001405                          BEQ     64$
4437  024360  104201                          ERROR   201             ;CERR AFTER WRITE HEADER CMD
4438  024362  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
4439  024366  000137  025264                  JMP     @TIMING
4440  024372                          64$:
4441
4442
4443  024372  006137  005460                  ROL     TEMP5           ;SET CARRY ONLY ONCE
4444  024376  006137  001372                  ROL     TOCYL           ;SELECT NEXT MAJOR CYL
4445  024402  023727  001372  001000          CMP     TOCYL,#1000     ;ALL MAJOR CYL FORMATTED?
4446  024410  001313                          BNE     1$              ;BR IF NO
4447  024412  005065  000020                  CLR     RKDC(R5)        ;SETUP TO RETURN TO CYL 0
4448
4449  024416  012765  000017  000000          MOV     #SEEK,RKCS1(R5) ;SEEK CMD
4450  024424  013737  001434  005450          MOV     T50,TEMP1       ;SETUP TIMEOUT
4451  024432  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4452  024436  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
4453
4454  024440  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP TIMEOUT
4455  024446  004737  032414                  JSR     PC,FATT2        ;FIND ATTN
4456  024452  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
4457
4458  024454  032737  100000  005406          BIT     #CERR,HCS1
4459  024462  001401                          BEQ     65$
4460  024464  104210                          ERROR   210             ;CERR AFTER SEEK CMD
4461
4462  024466                          65$:
4463
4464  024466  012737  025024  001176          MOV     #11$,$ESCAPE
4465  024474  005000                          CLR     R0              ;ITERATION COUNTER
4466  024476  012737  000001  001372          MOV     #1,TOCYL        ;SETUP TO CYL #
4467  024504  005037  001370                  CLR     FRCYL
4468
4469  024510  104415                          SCOP1
4470  024512  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
4471
4472  024516  013737  001372  001400          MOV     TOCYL,CALDIF    ;SETUP FOR ERROR PRINTOUT
4473
4474  024524  004737  032570          3$:     JSR     PC,SUBCLR
4475  024530  104024                          ERROR   24              ;CERR AFTER SCLR
4476
```

```
4477  024532  013765  001372  000020          MOV     TOCYL,RKDC(R5)  ;GO TO CYL #
4478  024540  012765  001532  000004          MOV     #DATA1,RKBA(R5) ;ALL 1'S
4479  024546  052765  000020  000010          BIS     #BAI,RKCS2(R5)
4480  024554  012765  177400  000002          MOV     #-256.,RKWC(R5) ; SECTOR TO BE ALL 1'S
4481
4482  024562  012765  000023  000000          MOV     #WRDATA,RKCS1(R5) ;WRITE DATA CMD
4483  024570  013737  001444  005450          MOV     T50000,TEMP1
4484  024576  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4485  024602  104011                          ERROR   11              ;NO RDY AFTER WRITE DATA CMD.
4486
4487  024604  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
4488  024610  032737  020000  005436          BIT     #D.DROT,HMR3    ;SEE IF DRIVE OFF TRACK
4489  024616  001401                          BEQ     5$
4490  024620  104112                          ERROR   112             ;DRIVE OFF TRACK AFTER WRITE DATA CMD
4491
4492  024622  032737  100000  005406  5$:     BIT     #CERR,HCS1
4493  024630  001401                          BEQ     6$
4494  024632  104012                          ERROR   12              ;CERR SET AFTER WRITE DATA CMD
4495
4496  024634  004737  033074          6$:     JSR     PC,RDCYLA
4497  024640  023737  001404  001372          CMP     CYLADD,TOCYL
4498  024646  001401                          BEQ     7$
4499  024650  104113                          ERROR   113             ;CYL ADDR IN RKMR3 NOT = RKDC
4500
4501  024652                          7$:
4502  024652  104415                          SCOP1
4503  024654  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
4504
4505  024660  004737  032570                  JSR     PC,SUBCLR
4506  024664  104024                          ERROR   24              ;CERR AFTER SCLR
4507
4508                                          ;RETURN TO CYL 0
4509  024666  012765  001532  000004          MOV     #DATA1,RKBA(R5)
4510  024674  052765  000020  000010          BIS     #BAI,RKCS2(R5)
4511  024702  012765  177400  000002          MOV     #-256.,RKWC(R5)
4512
4513  024710  012765  000023  000000          MOV     #WRDATA,RKCS1(R5)
4514  024716  013737  001444  005450          MOV     T50000,TEMP1
4515  024724  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4516  024730  104011                          ERROR   11              ;NO RDY AFTER WRITE DATA CMD
4517
4518  024732  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
4519  024736  032737  020000  005436          BIT     #D.DROT,HMR3
4520  024744  001401                          BEQ     8$
4521  024746  104112                          ERROR   112             ;DRIVE OFF TRACK AFTER WRITE DATA CMD
4522
4523  024750  032737  100000  005406  8$:     BIT     #CERR,HCS1
4524  024756  001401                          BEQ     9$
4525  024760  104012                          ERROR   12              ;CERR AFTER WRITE DATA CMD
4526
4527  024762  004737  033074          9$:     JSR     PC,RDCYLA
4528  024766  005737  001404                  TST     CYLADD
4529  024772  001401                          BEQ     10$
4530  024774  104042                          ERROR   42              ;NOT BACK TO CYL 0
4531
4532  024776  005200                  10$:    INC     R0
```

```
4533  025000  020027  000144                  CMP     R0,#100.        ;ALL ITERATIONS DONE?
4534  025004  001247                          BNE     3$              ;BR IF NO
4535
4536  025006  005000                          CLR     R0              ;RESET ITERATION CTR
4537  025010  006337  001372                  ASL     TOCYL
4538  025014  023727  001372  001000          CMP     TOCYL,#1000     ;ALL MAJOR CYL DONE?
4539  025022  001240                          BNE     3$              ;BR IF NO
4540
4541  025024  005037  001372          11$:    CLR     TOCYL           ;RESTORE TO ORIG 22 SECTOR FORMAT.
4542  025030  012737  100000  005460          MOV     #BIT15,TEMP5
4543
4544  025036  004737  032570          12$:    JSR     PC,SUBCLR
4545  025042  104024                          ERROR   24              ;CERR AFTER SCLR
4546
4547  025044  012765  001550  000004          MOV     #HDTAB,RKBA(R5)
4548  025052  012765  177676  000002          MOV     #-66.,RKWC(R5)
4549  025060  013765  001372  000020          MOV     TOCYL,RKDC(R5)
4550
4551  025066  013737  001372  001406          MOV     TOCYL,CALADD    ;SETUP
4552  025074  012737  000000  001514          MOV     #0,HEAD         ;TO FILL
4553  025102  012737  000000  001520          MOV     #0,FORMAT       ;HEADER
4554  025110  004737  033356                  JSR     PC,FHDTAB       ;TABLE
4555
4556
4557  025114  012765  000027  000000          MOV     #<WRHEAD>,RKCS1(R5)     ;WRITE HEADER CMD
4558  025122  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP TIMEOUT
4559  025130  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4560  025134  104200                          ERROR   200             ;NO RDY AFTER WRITE HEADER CMD
4561  025136  004737  032526                  JSR     PC,GSTAT        ;GET FRESH STATUS
4562  025142  032737  100000  005406          BIT     #CERR,HCS1
4563  025150  001405                          BEQ     66$
4564  025152  104201                          ERROR   201             ;CERR AFTER WRITE HEADER CMD
4565  025154  104401  044510                  TYPE    ,MSG26          ;ABORTING DATA TESTS TO DO TIMIMG TESTS
4566  025160  000137  025264                  JMP     TIMING
4567  025164                          66$:
4568
4569
4570  025164  006137  005460                  ROL     TEMP5
4571  025170  006137  001372                  ROL     TOCYL
4572  025174  023727  001372  001000          CMP     TOCYL,#1000     ;ALL MAJOR CYL REFORMATTED?
4573  025202  001315                          BNE     12$             ;BR IF NO
4574
4575  025204  005065  000020                  CLR     RKDC(R5)        ;SETUP TO RETURN TO CYL 0
4576  025210  005037  001176                  CLR     $ESCAPE
4577
4578  025214  012765  000017  000000          MOV     #SEEK,RKCS1(R5) ;SEEK CMD
4579  025222  013737  001434  005450          MOV     T50,TEMP1       ;SETUP TIMEOUT
4580  025230  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4581  025234  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
4582
4583  025236  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP TIMEOUT
4584  025244  004737  032414                  JSR     PC,FATT2        ;FIND ATTN
4585  025250  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
4586
4587  025252  032737  100000  005406          BIT     #CERR,HCS1
4588  025260  001401                          BEQ     67$
```

```
4589  025262  104210                          ERROR   210             ;CERR AFTER SEEK CMD
4590
4591  025264                          67$:
4592
4593
4594                                  .SBTTL  SERVO & SPINDLE TIMING TESTS
4595
4596  025264                          TIMING:
4597
4598
4599
4600
4601                                  ;;*********************************************************************
4602                                  ;*TEST 21       TIME BETWEEN OUTER LIMIT TO HEADS HOME DURING UNLOAD
4603                                  ;*
4604                                  ;*      TIME IS MEASURED FROM ATTN ASSERTING (APPROXIMATES REV & OUTER LIMIT)
4605                                  ;*      TO HEADS HOME ASSERTING. EXPECTED TIME APPROX 500MS
4606                                  ;*
4607                                  ;*      ALL TIMING TESTS ARE BYPASSED IF NEITHER
4608                                  ;*      L OR P CLOCK IS PRESENT & WILL BE INDICATED BY A MESSAGE
4609                                  ;*
4610                                  ;;*********************************************************************
4611  025264  000004                  TST21:  SCOPE
4612  025266  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
4613  025274  012706  001100                  MOV     #STACK,SP
4614
4615  025300  005737  001362                  TST     BYPTIM          ;SEE IF BYPASS TIMING TESTS
4616  025304  001404                          BEQ     TIME1           ;BR IF NO
4617  025306  104401  046011                  TYPE    ,MSG41          ;BYPASS TIMING TESTS
4618  025312  000137  031434                  JMP     $EOP
4619  025316                          TIME1:
4620  025316  005737  005520                  TST     DOTIM
4621  025322  001004                          BNE     1$
4622  025324  104401  043546                  TYPE    ,MSG13          ;TIMING TESTS BYPASSED
4623  025330  000137  031434                  JMP     $EOP
4624
4625  025334  004737  032570          1$:     JSR     PC,SUBCLR
4626  025340  104024                          ERROR   24              ;CERR AFTER SCLR
4627
4628
4629  025342  012765  000017  000000          MOV     #SEEK,RKCS1(R5) ;SEEK CMD
4630  025350  013737  001434  005450          MOV     T50,TEMP1       ;SETUP TIMEOUT
4631  025356  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4632  025362  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
4633
4634  025364  013737  001444  005450          MOV     T50000,TEMP1    ;SETUP TIMEOUT
4635  025372  004737  032414                  JSR     PC,FATT2        ;FIND ATTN
4636  025376  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
4637
4638  025400  032737  100000  005406          BIT     #CERR,HCS1
4639  025406  001401                          BEQ     64$
4640  025410  104210                          ERROR   210             ;CERR AFTER SEEK CMD
4641
4642  025412                          64$:
4643
4644
```

```
4645  025412  004737  032570          JSR     PC,SUBCLR
4646  025416  104024                  ERROR   24                      ;CERR AFTER SCLR
4647
4648  025420  004737  034240          JSR     PC,CALCLK               ;CALIB TIME TO GO THRU 'LOOP'
4649
4650  025424  012737  025612  001176  MOV     #4$,$ESCAPE
4651  025432  012765  000007  000000  MOV     #UNLOAD,RKCS1(R5)               ;UNLOAD CMD
4652  025440  013737  001432  005450  MOV     T10,TEMP1               ;SETUP TIMEOUT
4653  025446  004737  032414          JSR     PC,FATT2                ;FIND ATTN
4654  025452  104073                  ERROR   73                      ;NO ATTN AFTER UNLOAD CMD
4655
4656
4657  025454  012765  100000  000000  MOV     #CCLR,RKCS1(R5)
4658  025462  013765  001222  000010  MOV     $UNIT,RKCS2(R5) ;DRIVE#
4659  025470  012765  000005  000000  MOV     #CLEAR,RKCS1(R5)                ;DRIVE CLEAR CMD
4660  025476  013737  001432  005450  MOV     T10,TEMP1               ;SETUP TIMEOUT
4661  025504  004737  032102          JSR     PC,FRDY                 ;FIND RDY
4662  025510  104151                  ERROR   151                     ;NO RDY AFTER DRIVE CLEAR CMD
4663  025512  004737  032266          JSR     PC,TSTATN               ;TEST FOR ATTN
4664  025516  000401                  BR      65$
4665  025520  104154                  ERROR   154                     ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
4666  025522                  65$:
4667
4668
4669  025522  005037  001472          CLR     LPCNT
4670  025526  012765  000001  000026  MOV     #1,RKMR1(R5)    ;SELECT WORD 1
4671
4672  025534  004737  032526  2$:     JSR     PC,GSTAT
4673  025540  032737  000040  005434  BIT     #D.HDHM,HMR2
4674  025546  001006                  BNE     3$                      ;BR IF GOT HEAD HOME
4675  025550  004737  034672          JSR     PC,LOOP                 ;ELSE GO THRU LOOP
4676  025554  005737  001472          TST     LPCNT                   ;TEST FOR OVERFLOW
4677  025560  001365                  BNE     2$                      ;BR IF NO
4678  025562  104066                  ERROR   66                      ;NO HEAD HOME AFTER UNLOAD CMD
4679
4680  025564  104401  043745  3$:     TYPE    ,MSG18                  ;TIME BEING MEASURED
4681  025570  013737  001472  001160  MOV     LPCNT,$TMP0             ;SETUP FOR MULT
4682  025576  004737  034750          JSR     PC,TYPTIM               ;TYPE TIME IN USEC
4683  025602  104401  001205          TYPE    ,$CRLF
4684  025606  104401  001205          TYPE    ,$CRLF
4685
4686  025612  005037  001176  4$:     CLR     $ESCAPE
4687
4688                          ;;*****************************************************************
4689                          ;*TEST 22       TEST LOW VELOCITY TIMES DURING LOADING
4690                          ;*
4691                          ;*      THIS TEST ISSUES A START SPINDLE COMMAND
4692                          ;*      AFTER 'HEADS HOME' HAS BEEN DETECTED FROM THE PREVIOUS TEST.
4693                          ;*      THE FOLLOWING "LOW VELOCITY" TIMES ARE CHECKED AGAINST
4694                          ;*      LIMITS TO BE DEFINED:
4695                          ;*
4696                          ;*      TIME 1:  TIME BETWEEN HEADS HOME NEGATING & TRACK FOLL OK ASSERTING
4697                          ;*                 EXPECTED TIME APPROX 500 MS
4698                          ;*
4699                          ;*      TIME 2:  TIME BETWEEN OUTER LIMIT & INNER LIMIT
4700                          ;*
```

```
                                ;*          TIME IS MEASURED FROM TRACK FOLL OK (APPROX OUTER LIMIT)
                                ;*          TO REV (APPROX INNER LIMIT)
                                ;*          EXPECTED TIME APPROX 2 SEC
                                ;*
                                ;*     TIME 3:  TIME BETWEEN INNER LIMIT & OUTER LIMIT
                                ;*
                                ;*          TIME IS MEASURED FROM REV ASSERTING (FROM ABOVE)
                                ;*          TO REV NEGATING (APPROX OUTER LIMIT)
                                ;*          EXPECTED TIME APPROX 2 SEC
                                ;*
                                ;;*****************************************************************
025616  000004                  TST22:  SCOPE
025620  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
025626  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
025632  004737  032570                  JSR     PC,SUBCLR
025636  104024                          ERROR   24              ;CERR AFTER SCLR
025640  012765  000011  000000          MOV     #SRTSPL,RKCS1(R5)       ;START SPINDLE CMD
025646  013737  001432  005450          MOV     T10,TEMP1       ;SETUP TIMEOUT
025654  004737  032102                  JSR     PC,FRDY         ;FIND RDY
025660  104121                          ERROR   121             ;RDY NOT SET AFTER START SPIN CMD
025662  004737  034240                  JSR     PC,CALCLK       ;CALIB TIME TO GO THRU 'LOOP'
025666  012737  026252  001176          MOV     #9$,$ESCAPE
025674  013737  001410  001412          MOV     HZ,COUNT
025702  012737  000074  001414          MOV     #60.,SEC
025710  012765  000001  000026          MOV     #1,RKMR1(R5)
025716  004737  035202                  JSR     PC,CLKON        ;TURN CLOCK ON FOR 60 SEC TIMEOUT
025722  004737  032526          1$:     JSR     PC,GSTAT
025726  032737  000040  005434          BIT     #D.HDHM,HMR2
025734  001406                          BEQ     2$              ;BR IF HEAD HOME = 0
025736  005737  001416                  TST     TIMUP
025742  001767                          BEQ     1$
025744  004737  035310                  JSR     PC,CLKOF
025750  104067                          ERROR   67              ;HEAD HOME NOT CLEARED DURING LOAD CMD
025752  004737  035310          2$:     JSR     PC,CLKOF
025756  005037  001472                  CLR     LPCNT           ;SETUP FOR TIME 1
025762  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
025770  004737  032526          3$:     JSR     PC,GSTAT
025774  032737  000020  005434          BIT     #D.TFOK,HMR2
026002  001006                          BNE     4$              ;BR IF GOT TFOK
026004  004737  034672                  JSR     PC,LOOP         ;ELSE GO THRU LOOP
026010  005737  001472                  TST     LPCNT           ;TEST FOR OVERFLOW
026014  001365                          BNE     3$              ;BR IF NO
026016  104070                          ERROR   70              ;TRACK FOLL OK NOT SET DURING LOAD CMD
026020  013737  001472  001462  4$:     MOV     LPCNT,TIM1      ;STORE LOOP COUNT FOR TIME 1
026026  005037  001472                  CLR     LPCNT           ;SETUP FOR TIME 2
026032  012765  000001  000026          MOV     #1,RKMR1(R5)
```

```
4757  026040  004737  032526          5$:   JSR     PC,GSTAT
4758  026044  032737  004000  005434        BIT     #D.REV,HMR2
4759  026052  001006                        BNE     6$              ;BR IF GOT REV
4760  026054  004737  034672                JSR     PC,LOOP
4761  026060  005737  001472                TST     LPCNT           ;TEST FOR OVERFLOW
4762  026064  001365                        BNE     5$              ;BR IF NO
4763  026066  104071                        ERROR   71              ;REV NOT SET DURING LOAD
4764  026070  013737  001472  001464  6$:   MOV     LPCNT,TIM2      ;STORE LOOP COUNT FOR TIME 2
4765
4766
4767  026076  005037  001472                CLR     LPCNT           ;SETUP FOR TIME 3
4768  026102  012765  000001  000026        MOV     #1,RKMR1(R5)
4769
4770  026110  004737  032526          7$:   JSR     PC,GSTAT
4771  026114  032737  004000  005434        BIT     #D.REV,HMR2
4772  026122  001406                        BEQ     8$
4773  026124  004737  034672                JSR     PC,LOOP
4774  026130  005737  001472                TST     LPCNT
4775  026134  001365                        BNE     7$
4776  026136  104072                        ERROR   72              ;REV NOT CLEARED DURING LOAD
4777  026140  013737  001472  001466  8$:   MOV     LPCNT,TIM3      ;STORE LOOP COUNT FOR TIME 3
4778
4779
4780  026146  104401  044076                TYPE    ,MSG20          ;TIME 1 MEASUREMENT
4781  026152  013737  001462  001160        MOV     TIM1,$TMP0      ;SETUP FOR MULT
4782  026160  004737  034750                JSR     PC,TYPTIM       ;TYPE TIME IN USEC
4783
4784  026164  104401  044171                TYPE    ,MSG21          ;TIME 2 MEASUREMENT
4785  026170  013737  001464  001160        MOV     TIM2,$TMP0
4786  026176  004737  034750                JSR     PC,TYPTIM
4787
4788  026202  104401  044263                TYPE    ,MSG22          ;TIME 3 MEASUREMENT
4789  026206  013737  001466  001160        MOV     TIM3,$TMP0
4790  026214  004737  034750                JSR     PC,TYPTIM
4791
4792  026220  104401  001205                TYPE    ,$CRLF
4793  026224  104401  001205                TYPE    ,$CRLF
4794  026230  005037  001176                CLR     $ESCAPE
4795
4796  026234  013737  001442  005450        MOV     T5000,TEMP1
4797  026242  004737  032414                JSR     PC,FATT2        ;FIND ATTN
4798  026246  104074                        ERROR   74              ;NO ATTN AFTER START SPIN CMD
4799  026250  000412                        BR      TST23           ;;GO TO NEXT TEST
4800
4801  026252  005037  001176          9$:   CLR     $ESCAPE
4802  026256  013737  001440  005452        MOV     T100,TEMP2
4803  026264  004737  032320                JSR     PC,FATT1        ;FIND ATTN
4804  026270  104074                        ERROR   74              ;NO ATTN AFTER START SPIN CMD
4805  026272  000137  031434                JMP     $EOP            ;ABORT DRIVE
4806
4807                            ;;*****************************************************************
4808                            ;*TEST 23       MEASURE ROTATIONAL SPEED
4809                            ;*
4810                            ;*      THIS TEST MEASURES INDEX TIMING BY:
4811                            ;*
4812                            ;*              A.  CHANGE FORMAT TO 20 SECTOR & READ HEADER.
```

```
                                        ;*              CONTROLLER RDY STARTS THE TIMER
                                        ;*          B.  CHANGE FORMAT TO 22 SECTOR & READ HEADER.
                                        ;*              CONTROLLER RDY ENDS THE TIMER.
                                        ;*
                                        ;*      INDEX TIMING IS THE TIME BETWEEN THE 2 CONT. RDY TIMES.
                                        ;*      THIS IS BECAUSE A CHANGE OF FORMAT INHIBITS SECTOR PULSES
                                        ;*      UNTIL THE NEXT INDEX APPEARS-THUS KEEPING A GIVEN
                                        ;*      FORMAT COMPLETE THROUGHOUT AN ENTIRE CYLINDER
                                        ;*
                                        ;*      THE TIME IS THE AVERAGE OF 100 READINGS.
                                        ;*
                                        ;;*****************************************************************
026276  000004                    TST23:  SCOPE
026300  012737  000001  001174            MOV     #1,$TIMES       ;;DO 1 ITERATION
026306  012706  001100                    MOV     #STACK,SP       ;RESTORE STK PTR

026312  104401  046050                    TYPE    ,MSG42          ;BYPASSING NEXT 4 TESTS
026316  000137  030520                    JMP     VELTST          ;GO TO VELOCITY TEST

026322  004737  032570                    JSR     PC,SUBCLR
026326  104024                            ERROR   24              ;CERR AFTER SCLR

026330  004737  034240                    JSR     PC,CALCLK       ;CALIB TIME TO GO THRU 'LOOP'

026334  005000                            CLR     R0              ;ITERATION COUNTER
026336  005037  001476                    CLR     SUM             ;LO WORD OF REV TIME SUM
026342  005037  001500                    CLR     SUM+2           ;HI WORD OF REV TIME SUM

026346  012765  010025  000000  1$:       MOV     #<CFMT!RDHEAD>,RKCS1(R5)        ;CHANGE TO 20 SECTOR FMT & READ HEADER
026354  013737  001444  005450            MOV     T50000,TEMP1    ;SETUP TIMEOUT
026362  004737  032102                    JSR     PC,FRDY         ;FIND RDY
026366  104171                            ERROR   171             ;NO RDY AFTER READ HDR CMD

026370  005700                            TST     R0              ;TEST FOR SECTOR 0 AFTER FORMAT CHANGE
026372  001007                            BNE     4$              ;DO ONLY ONCE

026374  004737  032650                    JSR     PC,RDSEC
026400  005737  001426                    TST     SECTOR
026404  001402                            BEQ     4$
026406  104064                            ERROR   64              ;CANT FIND SECTOR 0 FROM INDEX
                                                                ;AFTER FORMAT CHANGE & RDY REC'D
026410  000464                            BR      TST24           ;;GOTO NEXT TEST

026412  005037  001472            4$:     CLR     LPCNT           ;COUNT PASSES THRU LOOP
026416  012765  000025  000000            MOV     #RDHEAD,RKCS1(R5)       ;CHANGE TO 22 SECTOR FMT & READ HEADER
026424  013737  001444  005450            MOV     T50000,TEMP1    ;SETUP TIMEOUT
026432  032765  000200  000000  2$:       BIT     #RDY,RKCS1(R5)
026440  001007                            BNE     3$              ;EXIT IF GOT RDY
026442  004737  034672                    JSR     PC,LOOP         ;ELSE GO THRU LOOP
026446  005337  005450                    DEC     TEMP1
026452  001367                            BNE     2$
026454  104171                            ERROR   171             ;NO RDY AFTER READ HDR CMD
026456  000441                            BR      TST24           ;;GO TO NEXT TST

026460  004737  032650            3$:     JSR     PC,RDSEC
026464  005737  001426                    TST     SECTOR
```

```
                        BEQ     5$
                        ERROR   64              ;CANT FIND SECTOR 0 FROM INDEX
                                                ;AFTER FORMAT CHANGE & RDY REC'D
                        BR      TST24           ;;GOTO NEXT TEST

5$:                     MOV     LPCNT,R2        ;FROM LOOP
                        MOV     LPTIM,R3        ;FROM CALCLK
                        MOV     R2,-(SP)                ;;PUT THE MULTIPLER ON THE STACK
                        MOV     R3,-(SP)                ;;PUT THE MULTIPLICAND ON THE STACK
                        JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
                        MOV     (SP)+,(SP)      ;;DISREGARD THE MSB'S
                        MOV     (SP)+,R3                ;;GET THE LSB'S OF THE PRODUCT

                        ADD     R3,SUM          ;R3 CONTAINS LOW ORDER PRODUCT
                        ADC     SUM+2

                        INC     R0
                        CMP     R0,#100.
                        BNE     1$

                        TYPE    ,MSG24          ;AVG ROTATIONAL TIME

                        JSR     PC,AVGTIM       ;CALC & TYPEOUT AVG TIME
                        TYPE    ,$CRLF
                        TYPE    ,$CRLF

;;*****************************************************************
;*TEST 24        MEASURE MAX SEEK TIME
;*
;*      THIS TEST MEASURES THE MAX SEEK TIME BETWEEN CYLINDERS 0 & 410
;*      THE AVERAGE TIME OF 100 SEEKS IN BOTH DIRECTIONS ARE PRINTED
;*      IF NOT WITHIN LIMITS TO BE SUPPLIED.
;*      MAX SEEK TIME SHOULD BE LESS THAN 70MS.
;*
;;*****************************************************************
TST24:  SCOPE
                        MOV     #1,$TIMES       ;;DO 1 ITERATION
                        MOV     #STACK,SP

                        JSR     PC,CALCLK       ;CALIB TIME TO GO THRU 'LOOP'

                        CLR     R0              ;ITERATION COUNTER
                        CLR     SUM             ;LO WORD OF FOWARD SEEK TIME
                        CLR     SUM+2           ;HI WORD OF FOWARD SEEK TIME
                        CLR     SUM1            ;LO WORD OF REVERSE SEEK TIME
                        CLR     SUM1+2          ;HI WORD OF REVERSE SEEK TIME

1$:                     JSR     PC,SUBCLR
                        ERROR   24              ;CERR AFTER SCLR

                        MOV     #7$,$ESCAPE

                        MOV     #410.,RKDC(R5)  ;SETUP FOR CYL 410.
2$:                     MOV     #SEEK,RKCS1(R5) ;SEEK CMD
                        MOV     T50,TEMP1
```

```
4925  026662  004737  032102                  JSR     PC,FRDY         ;FIND RDY
4926  026666  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
4927
4928  026670  005037  001472                  CLR     LPCNT           ;COUNT PASSES THRU LOOP
4929  026674  013704  001222                  MOV     $UNIT,R4
4930  026700  004737  034716                  JSR     PC,FATT3        ;FIND ATTN AND STEP 'LPCNT'
4931  026704  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
4932
4933  026706  004737  032526                  JSR     PC,GSTAT
4934  026712  032737  100000  005406          BIT     #CERR,HCS1
4935  026720  001401                          BEQ     5$
4936  026722  104210                          ERROR   210             ;CERR AFTER SEEK CMD.
4937
4938  026724  013737  001472  001160  5$:     MOV     LPCNT,$TMP0     ;FROM LOOP
4939  026732  013737  001474  001162          MOV     LPTIM,$TMP1     ;FROM CALCLK
4940  026740  013746  001160                  MOV     $TMP0,-(SP)             ;;PUT THE MULTIPLER ON THE STACK
4941  026744  013746  001162                  MOV     $TMP1,-(SP)             ;;PUT THE MULTIPLICAND ON THE STACK
4942  026750  004737  041714                  JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
4943  026754  012637  001162                  MOV     (SP)+,$TMP1             ;;GET THE LSB'S OF THE PRODUCT
4944  026760  012637  001164                  MOV     (SP)+,$TMP1+2   ;;GET THE MSB'S OF THE PRODUCT
4945
4946  026764  005765  000020                  TST     RKDC(R5)
4947  026770  001414                          BEQ     6$              ;BR IF THIS SEEK WAS REVERSE TO CYL 0
4948
4949  026772  063737  001162  001476          ADD     $TMP1,SUM       ;SUM UP FOWARD SEEK TIMES (LSB)
4950  027000  005537  001500                  ADC     SUM+2
4951  027004  063737  001164  001500          ADD     $TMP2,SUM+2     ;MSB
4952
4953  027012  004737  032570                  JSR     PC,SUBCLR
4954  027016  104024                          ERROR   24              ;CERR AFTER SCLR
4955  027020  000712                          BR      2$              ;SEEK TO CYL 0
4956
4957  027022  063737  001162  001502  6$:     ADD     $TMP1,SUM1      ;SUM UP REVERSE SEEK TIMES (LSB)
4958  027030  005537  001504                  ADC     SUM1+2
4959  027034  063737  001164  001504          ADD     $TMP2,SUM1+2    ;MSB
4960
4961  027042  005200                          INC     R0
4962  027044  020027  000144                  CMP     R0,#100.        ;ALL SEEKS DONE?
4963  027050  001265                          BNE     1$              ;BR & REPEAT IF NO TO CYL 410.
4964
4965  027052  104401  044622                  TYPE    ,MSG28          ;FOWARD SEEK TIME
4966  027056  004737  035016                  JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (FOWARD)
4967
4968  027062  104401  044701                  TYPE    ,MSG29          ;REVERSE SEEK TIME
4969  027066  013737  001502  001476          MOV     SUM1,SUM        ;SETUP FOR
4970  027074  013737  001504  001500          MOV     SUM1+2,SUM+2    ;AVGTIM ROUTINE
4971  027102  004737  035016                  JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (REVERSE)
4972
4973  027106  104401  001205                  TYPE    ,$CRLF
4974  027112  104401  001205                  TYPE    ,$CRLF
4975  027116  005037  001176                  CLR     $ESCAPE
4976  027122  000464                          BR      TST25           ;;GO TO NEXT TEST
4977
4978  027124  005037  001176          7$:     CLR     $ESCAPE
4979
4980  027130  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
```

```
 4981  027136  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
 4982  027144  012765  000013  000000          MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
 4983                                                                        ;RESET CYL DIFF/OFFSET & CYL ADDR REG
 4984                                                                        ;IN RKMR2 & RKMR3 RESP.
 4985  027152  013737  001432  005450          MOV     T10,TEMP1               ;SETUP TIMEOUT
 4986  027160  004737  032102                  JSR     PC,FRDY                 ;FIND RDY
 4987  027164  104124                          ERROR   124                     ;RDY NOT SET AFTER RECAL CMD
 4988
 4989  027166  012765  000001  000026          MOV     #1,RKMR1(R5)            ;SELECT WORD 1
 4990  027174  004737  032526                  JSR     PC,GSTAT
 4991  027200  032737  020000  005434          BIT     #D.RTZ,HMR2
 4992  027206  001001                          BNE     64$
 4993  027210  104244                          ERROR   244                     ;RTZ NOT SET DURING RECAL CMD
 4994  027212  013737  001432  005452  64$:    MOV     T10,TEMP2               ;SETUP TIMEOUT
 4995  027220  004737  032320                  JSR     PC,FATT1                ;FIND ATTN
 4996  027224  104055                          ERROR   55                      ;NO ATTN AFTER RECAL CMD
 4997
 4998  027226  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
 4999  027234  013765  001222  000010          MOV     $UNIT,RKCS2(R5)         ;DRIVE#
 5000  027242  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
 5001  027250  013737  001432  005450          MOV     T10,TEMP1               ;SETUP TIMEOUT
 5002  027256  004737  032102                  JSR     PC,FRDY                 ;FIND RDY
 5003  027262  104151                          ERROR   151                     ;NO RDY AFTER DRIVE CLEAR CMD
 5004  027264  004737  032266                  JSR     PC,TSTATN               ;TEST FOR ATTN
 5005  027270  000401                          BR      65$
 5006  027272  104154                          ERROR   154                     ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
 5007  027274                          65$:
 5008
 5009
 5010
 5011
 5012                                  ;;*****************************************************************
 5013                                  ;*TEST 25       MEASURE MIN SEEK TIME
 5014                                  ;*
 5015                                  ;*      THIS TEST MEASURES THE MIN SEEK TIME BETWEEN CYLINDER 0 & 1
 5016                                  ;*      THE AVERAGE TIME OF 100 SEEKS IN BOTH DIRECTIONS ARE PRINTED
 5017                                  ;*      IF NOT WITHIN LIMITS TO BE SUPPLIED.
 5018                                  ;*      MIN SEEK TIME SHOULD BE LESS THAN 10MS.
 5019                                  ;*
 5020                                  ;*****************************************************************
 5021  027274  000004                  TST25:  SCOPE
 5022  027276  012737  000001  001174          MOV     #1,$TIMES               ;;DO 1 ITERATION
 5023  027304  012706  001100                  MOV     #STACK,SP
 5024
 5025
 5026  027310  004737  034240                  JSR     PC,CALCLK               ;CALIB TIME TO GO THRU 'LOOP'
 5027
 5028  027314  005000                          CLR     R0                      ;ITERATION COUNTER
 5029  027316  005037  001476                  CLR     SUM                     ;LO WORD OF FOWARD SEEK TIME
 5030  027322  005037  001500                  CLR     SUM+2                   ;HI WORD OF FOWARD SEEK TIME
 5031  027326  005037  001502                  CLR     SUM1                    ;LO WORD OF REVERSE SEEK TIME
 5032  027332  005037  001504                  CLR     SUM1+2                  ;HI WORD OF REVERSE SEEK TIME
 5033
 5034  027336  004737  032570          1$:     JSR     PC,SUBCLR
 5035  027342  104024                          ERROR   24                      ;CERR AFTER SCLR
 5036
```

```
5037  027344  012737  027636  001176          MOV     #7$,$ESCAPE
5038
5039  027352  012765  000001  000020          MOV     #1,RKDC(R5)     ;SETUP FOR CYL 1
5040  027360  012765  000017  000000  2$:     MOV     #SEEK,RKCS1(R5) ;SEEK CMD
5041  027366  013737  001434  005450          MOV     TS0,TEMP1
5042  027374  004737  032102                  JSR     PC,FRDY         ;FIND RDY
5043  027400  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
5044
5045  027402  005037  001472                  CLR     LPCNT           ;COUNT PASSES THRU LOOP
5046  027406  013704  001222                  MOV     $UNIT,R4
5047  027412  004737  034716                  JSR     PC,FATT3        ;FIND ATTN AND STEP 'LPCNT'
5048  027416  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
5049
5050  027420  004737  032526                  JSR     PC,GSTAT
5051  027424  032737  100000  005406          BIT     #CERR,HCS1
5052  027432  001401                          BEQ     5$
5053  027434  104210                          ERROR   210             ;CERR AFTER SEEK CMD.
5054
5055  027436  013737  001472  001160  5$:     MOV     LPCNT,$TMP0     ;FROM LOOP
5056  027444  013737  001474  001162          MOV     LPTIM,$TMP1     ;FROM CALCLK
5057  027452  013746  001160                  MOV     $TMP0,-(SP)             ;;PUT THE MULTIPLER ON THE STACK
5058  027456  013746  001162                  MOV     $TMP1,-(SP)             ;;PUT THE MULTIPLICAND ON THE STACK
5059  027462  004737  041714                  JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
5060  027466  012637  001162                  MOV     (SP)+,$TMP1             ;;GET THE LSB'S OF THE PRODUCT
5061  027472  012637  001164                  MOV     (SP)+,$TMP1+2   ;;GET THE MSB'S OF THE PRODUCT
5062
5063  027476  005765  000020                  TST     RKDC(R5)
5064  027502  001414                          BEQ     6$              ;BR IF THIS SEEK WAS REVERSE TO CYL 0
5065
5066  027504  063737  001162  001476          ADD     $TMP1,SUM       ;SUM UP FOWARD SEEK TIMES (LSB)
5067  027512  005537  001500                  ADC     SUM+2
5068  027516  063737  001164  001500          ADD     $TMP2,SUM+2     ;MSB
5069
5070  027524  004737  032570                  JSR     PC,SUBCLR
5071  027530  104024                          ERROR   24              ;CERR AFTER SCLR
5072  027532  000712                          BR      2$              ;SEEK TO CYL 0
5073
5074  027534  063737  001162  001502  6$:     ADD     $TMP1,SUM1      ;SUM UP REVERSE SEEK TIMES (LSB)
5075  027542  005537  001504                  ADC     SUM1+2
5076  027546  063737  001164  001504          ADD     $TMP2,SUM1+2    ;MSB
5077
5078  027554  005200                          INC     R0
5079  027556  020027  000144                  CMP     R0,#100.        ;ALL SEEKS DONE?
5080  027562  001265                          BNE     1$              ;BR & REPEAT IF NO TO CYL 1
5081
5082  027564  104401  044761                  TYPE    ,MSG30          ;FOWARD SEEK TIME
5083  027570  004737  035016                  JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (FOWARD)
5084
5085  027574  104401  045047                  TYPE    ,MSG31          ;REVERSE SEEK TIME
5086  027600  013737  001502  001476          MOV     SUM1,SUM        ;SETUP FOR
5087  027606  013737  001504  001500          MOV     SUM1+2,SUM+2    ;AVGTIM ROUTINE
5088  027614  004737  035016                  JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (REVERSE)
5089
5090  027620  104401  001205                  TYPE    ,$CRLF
5091  027624  104401  001205                  TYPE    ,$CRLF
5092  027630  005037  001176                  CLR     $ESCAPE
```

```
5093  027634  000464                          BR      TST26           ;;GO TO NEXT TEST
5094
5095  027636  005037  001176          7$:     CLR     $ESCAPE
5096
5097  027642  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
5098  027650  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
5099  027656  012765  000013  000000          MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
5100                                                                        ;RESET CYL DIFF/OFFSET & CYL ADDR REG
5101                                                                        ;IN RKMR2 & RKMR3 RESP.
5102  027664  013737  001432  005450          MOV     T10,TEMP1               ;SETUP TIMEOUT
5103  027672  004737  032102                  JSR     PC,FRDY                 ;FIND RDY
5104  027676  104124                          ERROR   124                     ;RDY NOT SET AFTER RECAL CMD
5105
5106  027700  012765  000001  000026          MOV     #1,RKMR1(R5)            ;SELECT WORD 1
5107  027706  004737  032526                  JSR     PC,GSTAT
5108  027712  032737  020000  005434          BIT     #D.RTZ,HMR2
5109  027720  001001                          BNE     64$
5110  027722  104244                          ERROR   244                     ;RTZ NOT SET DURING RECAL CMD
5111  027724  013737  001432  005452  64$:    MOV     T10,TEMP2               ;SETUP TIMEOUT
5112  027732  004737  032320                  JSR     PC,FATT1                ;FIND ATTN
5113  027736  104055                          ERROR   55                      ;NO ATTN AFTER RECAL CMD
5114
5115  027740  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
5116  027746  013765  001222  000010          MOV     $UNIT,RKCS2(R5)         ;DRIVE#
5117  027754  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
5118  027762  013737  001432  005450          MOV     T10,TEMP1               ;SETUP TIMEOUT
5119  027770  004737  032102                  JSR     PC,FRDY                 ;FIND RDY
5120  027774  104151                          ERROR   151                     ;NO RDY AFTER DRIVE CLEAR CMD
5121  027776  004737  032266                  JSR     PC,TSTATN               ;TEST FOR ATTN
5122  030002  000401                          BR      65$
5123  030004  104154                          ERROR   154                     ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
5124  030006                          65$:
5125
5126
5127
5128
5129                                    ;;*****************************************************************
5130                                    ;*TEST 26       MEASURE 137 CYLINDER SEEK TIME
5131                                    ;*
5132                                    ;*      THIS TEST MEASURES THE AVERAGE SEEK TIME BETWEEN CYLINDERS 0 & 137
5133                                    ;*      THE AVERAGE TIME OF 100 SEEKS IN BOTH DIRECTIONS ARE PRINTED
5134                                    ;*      IF NOT WITHIN LIMITS TO BE SUPPLIED.
5135                                    ;*      AVERAGE SEEK TIME SHOULD BE LESS THAN 40MS
5136                                    ;*
5137                                    ;;*****************************************************************
5138  030006  000004                  TST26:  SCOPE
5139  030010  012737  000001  001174          MOV     #1,$TIMES               ;;DO 1 ITERATION
5140  030016  012706  001100                  MOV     #STACK,SP
5141
5142
5143  030022  004737  034240                  JSR     PC,CALCLK               ;CALIB TIME TO GO THRU 'LOOP'
5144
5145  030026  005000                          CLR     R0                      ;ITERATION COUNTER
5146  030030  005037  001476                  CLR     SUM                     ;LO WORD OF FOWARD SEEK TIME
5147  030034  005037  001500                  CLR     SUM+2                   ;HI WORD OF FOWARD SEEK TIME
5148  030040  005037  001502                  CLR     SUM1                    ;LO WORD OF REVERSE SEEK TIME
```

```
5149  030044  005037  001504              CLR     SUM1+2          ;HI WORD OF REVERSE SEEK TIME
5150
5151  030050  004737  032570        1$:   JSR     PC,SUBCLR
5152  030054  104024                      ERROR   24              ;CERR AFTER SCLR
5153
5154  030056  012737  030350  001176      MOV     #7$,$ESCAPE
5155
5156  030064  012765  000211  000020      MOV     #137.,RKDC(R5)  ;SETUP FOR CYL 137.
5157  030072  012765  000017  000000  2$: MOV     #SEEK,RKCS1(R5) ;SEEK CMD
5158  030100  013737  001434  005450      MOV     T50,TEMP1
5159  030106  004737  032102              JSR     PC,FRDY         ;FIND RDY
5160  030112  104131                      ERROR   131             ;NO RDY AFTER SEEK CMD
5161
5162  030114  005037  001472              CLR     LPCNT           ;COUNT PASSES THRU LOOP
5163  030120  013704  001222              MOV     $UNIT,R4
5164  030124  004737  034716              JSR     PC,FATT3        ;FIND ATTN AND STEP 'LPCNT'
5165  030130  104132                      ERROR   132             ;NO ATTN AFTER SEEK CMD
5166
5167  030132  004737  032526              JSR     PC,GSTAT
5168  030136  032737  100000  005406      BIT     #CERR,HCS1
5169  030144  001401                      BEQ     5$
5170  030146  104210                      ERROR   210             ;CERR AFTER SEEK CMD.
5171
5172  030150  013737  001472  001160  5$: MOV     LPCNT,$TMP0     ;FROM LOOP
5173  030156  013737  001474  001162      MOV     LPTIM,$TMP1     ;FROM CALCLK
5174  030164  013746  001160              MOV     $TMP0,-(SP)             ;;PUT THE MULTIPLER ON THE STACK
5175  030170  013746  001162              MOV     $TMP1,-(SP)             ;;PUT THE MULTIPLICAND ON THE STACK
5176  030174  004737  041714              JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
5177  030200  012637  001162              MOV     (SP)+,$TMP1             ;;GET THE LSB'S OF THE PRODUCT
5178  030204  012637  001164              MOV     (SP)+,$TMP1+2   ;;GET THE MSB'S OF THE PRODUCT
5179
5180  030210  005765  000020              TST     RKDC(R5)
5181  030214  001414                      BEQ     6$              ;BR IF THIS SEEK WAS REVERSE TO CYL 0
5182
5183  030216  063737  001162  001476      ADD     $TMP1,SUM       ;SUM UP FOWARD SEEK TIMES (LSB)
5184  030224  005537  001500              ADC     SUM+2
5185  030230  063737  001164  001500      ADD     $TMP2,SUM+2     ;MSB
5186
5187  030236  004737  032570              JSR     PC,SUBCLR
5188  030242  104024                      ERROR   24              ;CERR AFTER SCLR
5189  030244  000712                      BR      2$              ;SEEK TO CYL 0
5190
5191  030246  063737  001162  001502  6$: ADD     $TMP1,SUM1      ;SUM UP REVERSE SEEK TIMES (LSB)
5192  030254  005537  001504              ADC     SUM1+2
5193  030260  063737  001164  001504      ADD     $TMP2,SUM1+2    ;MSB
5194
5195  030266  005200                      INC     R0
5196  030270  020027  000144              CMP     R0,#100.        ;ALL SEEKS DONE?
5197  030274  001265                      BNE     1$              ;BR & REPEAT IF NO TO CYL 137.
5198
5199  030276  104401  045136              TYPE    ,MSG32          ;FOWARD SEEK TIME
5200  030302  004737  035016              JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (FOWARD)
5201
5202  030306  104401  045215              TYPE    ,MSG33          ;REVERSE SEEK TIME
5203  030312  013737  001502  001476      MOV     SUM1,SUM        ;SETUP FOR
5204  030320  013737  001504  001500      MOV     SUM1+2,SUM+2    ;AVGTIM ROUTINE
```

```
5205  030326  004737  035016                  JSR     PC,AVGTIM       ;CALC & TYPE AVG TIME (REVERSE)
5206
5207  030332  104401  001205                  TYPE    ,$CRLF
5208  030336  104401  001205                  TYPE    ,$CRLF
5209  030342  005037  001176                  CLR     $ESCAPE
5210  030346  000464                          BR      TST27           ;;GO TO NEXT TEST
5211
5212  030350  005037  001176          7$:     CLR     $ESCAPE
5213
5214  030354  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
5215  030362  013765  001222  000010          MOV     $UNIT,RKCS2(R5)
5216  030370  012765  000013  000000          MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
5217                                                                  ;RESET CYL DIFF/OFFSET & CYL ADDR REG
5218                                                                  ;IN RKMR2 & RKMR3 RESP.
5219  030376  013737  001432  005450          MOV     T10,TEMP1       ;SETUP TIMEOUT
5220  030404  004737  032102                  JSR     PC,FRDY         ;FIND RDY
5221  030410  104124                          ERROR   124             ;RDY NOT SET AFTER RECAL CMD
5222
5223  030412  012765  000001  000026          MOV     #1,RKMR1(R5)    ;SELECT WORD 1
5224  030420  004737  032526                  JSR     PC,GSTAT
5225  030424  032737  020000  005434          BIT     #D.RTZ,HMR2
5226  030432  001001                          BNE     64$
5227  030434  104244                          ERROR   244             ;RTZ NOT SET DURING RECAL CMD
5228  030436  013737  001432  005452  64$:    MOV     T10,TEMP2       ;SETUP TIMEOUT
5229  030444  004737  032320                  JSR     PC,FATT1        ;FIND ATTN
5230  030450  104055                          ERROR   55              ;NO ATTN AFTER RECAL CMD
5231
5232  030452  012765  100000  000000          MOV     #CCLR,RKCS1(R5)
5233  030460  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;DRIVE#
5234  030466  012765  000005  000000          MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
5235  030474  013737  001432  005450          MOV     T10,TEMP1       ;SETUP TIMEOUT
5236  030502  004737  032102                  JSR     PC,FRDY         ;FIND RDY
5237  030506  104151                          ERROR   151             ;NO RDY AFTER DRIVE CLEAR CMD
5238  030510  004737  032266                  JSR     PC,TSTATN       ;TEST FOR ATTN
5239  030514  000401                          BR      65$
5240  030516  104154                          ERROR   154             ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
5241  030520                          65$:
5242
5243
5244
5245  030520                          VELTST:
5246                                  ;;*****************************************************************
5247                                  ;*TEST 27       MEASURE MAX VELOCITY OF HEADS
5248                                  ;*
5249                                  ;*      THIS TESTS MAX VELOCITY BY DOING SEEKS BETWEEN
5250                                  ;*      CYL 0 & 383 AND MEASURING THE TIME BETWEEN CYLINDERS
5251                                  ;*      128 & 256.  SINCE THE DISTANCE BETWEEN CYL 128 & 256 IS KNOWN,
5252                                  ;*      THE AVERAGE VELOCITY OF 100 SEEKS IS CALCULATED & TYPED
5253                                  ;*      IF NOT WITHIN THE SPECIFIED LIMITS TO BE SUPPLIED.
5254                                  ;*
5255                                  ;;*****************************************************************
5256  030520  000004                  TST27:  SCOPE
5257  030522  012737  000001  001174          MOV     #1,$TIMES       ;;DO 1 ITERATION
5258  030530  012706  001100                  MOV     #STACK,SP       ;RESTORE STK PTR
5259
5260  030534  005000                          CLR     R0              ;ITERATION COUNTER
```

```
5261  030536  005037  001476                  CLR     SUM             ;LO WORD OF FOWARD SEEK TIME
5262  030542  005037  001500                  CLR     SUM+2           ;HI WORD OF FOWARD SEEK TIME
5263  030546  005037  001502                  CLR     SUM1            ;LO WORD OF REVERSE SEEK TIME
5264  030552  005037  001504                  CLR     SUM1+2          ;HI WORD OF REVERSE SEEK TIME
5265
5266  030556  004737  034456                  JSR     PC,VELCAL       ;CLOCK CALIB SIMILAR TO CALCLK
5267
5268  030562  004737  032570          1$:     JSR     PC,SUBCLR
5269  030566  104024                          ERROR   24              ;CERR AFTER SCLR
5270
5271  030570  012737  031264  001176          MOV     #14$,$ESCAPE
5272
5273  030576  012765  000577  000020          MOV     #383.,RKDC(R5)
5274  030604  012765  000017  000000  2$:     MOV     #SEEK,RKCS1(R5) ;SEEK CMD TO CYL 400
5275  030612  013737  001434  005450          MOV     T50,TEMP1
5276  030620  004737  032102                  JSR     PC,FRDY         ;FIND RDY
5277  030624  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
5278
5279  030626  013737  001436  005450          MOV     T500,TEMP1
5280  030634  004737  033004          64$:    JSR     PC,QKCYLD       ;READ CYL DIFF (NO SHIFTING)
5281  030640  032737  004000  001402          BIT     #BIT11,CYLDIF   ;CHECK BIT 7 (NO SHIFTING)
5282  030646  001004                          BNE     65$             ;BR IF SET
5283  030650  005337  005450                  DEC     TEMP1
5284  030654  001367                          BNE     64$
5285  030656  104110                          ERROR   110             ;CANNOT FIND CYL 128
5286
5287  030660  005037  001472          65$:    CLR     LPCNT
5288  030664  004737  033004          66$:    JSR     PC,QKCYLD
5289  030670  032737  004000  001402          BIT     #BIT11,CYLDIF   ;CHECK BIT 7 (NO SHIFTING)
5290  030676  001406                          BEQ     67$
5291
5292  030700  004737  034672                  JSR     PC,LOOP
5293  030704  005737  001472                  TST     LPCNT
5294  030710  001365                          BNE     66$
5295  030712  104111                          ERROR   111             ;CANNOT FIND CYL 256
5296  030714                          67$:
5297  030714  013737  001444  005450          MOV     T50000,TEMP1
5298  030722  004737  032414                  JSR     PC,FATT2        ;FIND ATTN
5299  030726  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
5300
5301  030730  032737  100000  005406          BIT     #CERR,HCS1
5302  030736  001401                          BEQ     7$
5303  030740  104210                          ERROR   210             ;CERR AFTER SEEK CMD
5304
5305  030742  013702  001472          7$:     MOV     LPCNT,R2        ;FROM LOOP
5306  030746  013703  001474                  MOV     LPTIM,R3        ;FROM VELCAL
5307  030752  010246                          MOV     R2,-(SP)                ;;PUT THE MULTIPLER ON THE STACK
5308  030754  010346                          MOV     R3,-(SP)                ;;PUT THE MULTIPLICAND ON THE STACK
5309  030756  004737  041714                  JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
5310  030762  012616                          MOV     (SP)+,(SP)      ;;DISREGARD THE MSB'S
5311  030764  012603                          MOV     (SP)+,R3                ;;GET THE LSB'S OF THE PRODUCT
5312  030766  060337  001476                  ADD     R3,SUM          ;SUM UP FOWARD SEEK TIMES
5313  030772  005537  001500                  ADC     SUM+2
5314
5315  030776  004737  032570                  JSR     PC,SUBCLR
5316  031002  104024                          ERROR   24              ;CERR AFTER SCLR
```

```
5317
5318  031004  012765  000017  000000          MOV     #SEEK,RKCS1(R5) ;SEEK TO CYL 0
5319  031012  013737  001434  005450          MOV     T50,TEMP1
5320  031020  004737  032102                  JSR     PC,FRDY         ;FIND RDY
5321  031024  104131                          ERROR   131             ;NO RDY AFTER SEEK CMD
5322
5323  031026  013737  001436  005450          MOV     T500,TEMP1
5324  031034  004737  033004          68$:    JSR     PC,GKCYLD       ;READ CYL DIFF (NO SHIFTING)
5325  031040  032737  004000  001402          BIT     #BIT11,CYLDIF   ;CHECK BIT 7 (NO SHIFTING)
5326  031046  001004                          BNE     69$             ;BR IF SET
5327  031050  005337  005450                  DEC     TEMP1
5328  031054  001367                          BNE     68$
5329  031056  104111                          ERROR   111             ;CANNOT FIND CYL 256
5330
5331  031060  005037  001472          69$:    CLR     LPCNT
5332  031064  004737  033004          70$:    JSR     PC,GKCYLD
5333  031070  032737  004000  001402          BIT     #BIT11,CYLDIF   ;CHECK BIT 7 (NO SHIFTING)
5334  031076  001406                          BEQ     71$
5335
5336  031100  004737  034672                  JSR     PC,LOOP
5337  031104  005737  001472                  TST     LPCNT
5338  031110  001365                          BNE     70$
5339  031112  104110                          ERROR   110             ;CANNOT FIND CYL 128
5340  031114                          71$:
5341  031114  013737  001444  005450          MOV     T50000,TEMP1
5342  031122  004737  032414                  JSR     PC,FATT2        ;FIND ATTN
5343  031126  104132                          ERROR   132             ;NO ATTN AFTER SEEK CMD
5344
5345  031130  032737  100000  005406          BIT     #CERR,HCS1
5346  031136  001401                          BEQ     12$
5347  031140  104210                          ERROR   210             ;CERR AFTER SEEK CMD
5348
5349  031142  013702  001472          12$:    MOV     LPCNT,R2
5350  031146  013703  001474                  MOV     LPTIM,R3
5351  031152  010246                          MOV     R2,-(SP)                ;;PUT THE MULTIPLER ON THE STACK
5352  031154  010346                          MOV     R3,-(SP)                ;;PUT THE MULTIPLICAND ON THE STACK
5353  031156  004737  041714                  JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
5354  031162  012616                          MOV     (SP)+,(SP)      ;;DISREGARD THE MSB'S
5355  031164  012603                          MOV     (SP)+,R3                ;;GET THE LSB'S OF THE PRODUCT
5356  031166  060337  001502                  ADD     R3,SUM1         ;SUM UP REVERSE SEEK TIMES
5357  031172  005537  001504                  ADC     SUM1+2
5358
5359  031176  005200                          INC     R0
5360  031200  020027  000144                  CMP     R0,#100.        ;DONE 100 SEEKS?
5361  031204  001402                          BEQ     13$             ;BR IF YES
5362  031206  000137  030562                  JMP     1$              ;ELSE DO AGAIN
5363
5364  031212  104401  045275          13$:    TYPE    ,MSG34          ;AVG MAX FWD SPEED
5365  031216  004737  035056                  JSR     PC,AVGSP        ;CALC & TYPE AVG SPEED
5366
5367  031222  104401  045363                  TYPE    ,MSG35          ;AVG MAX REV SPEED
5368  031226  013737  001502  001476          MOV     SUM1,SUM        ;SETUP FOR
5369  031234  013737  001504  001500          MOV     SUM1+2,SUM+2    ;AVGSP ROUTINE
5370  031242  004737  035056                  JSR     PC,AVGSP
5371
5372  031246  104401  001205                  TYPE    ,$CRLF
```

```
5373  031252  104401  001205                    TYPE    $CRLF
5374  031256  005037  001176                    CLR     $ESCAPE
5375  031262  000464                            BR      $EOP
5376
5377  031264  005037  001176          14$:      CLR     $ESCAPE
5378
5379  031270  012765  100000  000000            MOV     #CCLR,RKCS1(R5)
5380  031276  013765  001222  000010            MOV     $UNIT,RKCS2(R5)
5381  031304  012765  000013  000000            MOV     #RECAL,RKCS1(R5)        ;RECAL CMD
5382                                                    ;RESET CYL DIFF/OFFSET & CYL ADDR REG
5383                                                    ;IN RKMR2 & RKMR3 RESP.
5384  031312  013737  001432  005450            MOV     T10,TEMP1               ;SETUP TIMEOUT
5385  031320  004737  032102                    JSR     PC,FRDY                 ;FIND RDY
5386  031324  104124                            ERROR   124                     ;RDY NOT SET AFTER RECAL CMD
5387
5388  031326  012765  000001  000026            MOV     #1,RKMR1(R5)            ;SELECT WORD 1
5389  031334  004737  032526                    JSR     PC,GSTAT
5390  031340  032737  020000  005434            BIT     #D.RTZ,HMR2
5391  031346  001001                            BNE     72$
5392  031350  104244                            ERROR   244                     ;RTZ NOT SET DURING RECAL CMD
5393  031352  013737  001432  005452  72$:      MOV     T10,TEMP2               ;SETUP TIMEOUT
5394  031360  004737  032320                    JSR     PC,FATT1                ;FIND ATTN
5395  031364  104055                            ERROR   55                      ;NO ATTN AFTER RECAL CMD
5396
5397  031366  012765  100000  000000            MOV     #CCLR,RKCS1(R5)
5398  031374  013765  001222  000010            MOV     $UNIT,RKCS2(R5)         ;DRIVE#
5399  031402  012765  000005  000000            MOV     #CLEAR,RKCS1(R5)        ;DRIVE CLEAR CMD
5400  031410  013737  001432  005450            MOV     T10,TEMP1               ;SETUP TIMEOUT
5401  031416  004737  032102                    JSR     PC,FRDY                 ;FIND RDY
5402  031422  104151                            ERROR   151                     ;NO RDY AFTER DRIVE CLEAR CMD
5403  031424  004737  032266                    JSR     PC,TSTATN               ;TEST FOR ATTN
5404  031430  000401                            BR      73$
5405  031432  104154                            ERROR   154                     ;ATTN NOT CLEARED AFTER DRIVE CLEAR CMD
5406  031434                          73$:
5407
5408
5409
5410
```

```
                                .SBTTL  END OF PASS ROUTINE

                                ;;*****************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO ST5

031434                          $EOP:

031434  000004                         SCOPE
031436  012706  001100                 MOV     #STACK,SP
031442  005237  001220                 INC     $DEVCT                  ;INCR COUNT FOR # DRIVES CHECKED
031446  023737  005472  001220         CMP     DRIVS,$DEVCT            ;ARE ALL DRIVES PRESENT TESTED?
031454  001403                         BEQ     $EOP1+2                 ;BR IF YES
031456  000137  012754                 JMP     NUDRV                   ;ELSE TEST NEXT DRIVE PRESENT
031462  000004                 $EOP1:  SCOPE
031464  005037  001102                 CLR     $TSTNM                  ;;ZERO THE TEST NUMBER
031470  005037  001174                 CLR     $TIMES                  ;;ZERO THE NUMBER OF ITERATIONS
031474  005237  001216                 INC     $PASS                   ;;INCREMENT THE PASS NUMBER
031500  042737  100000  001216         BIC     #100000,$PASS           ;;DON'T ALLOW A NEG. NUMBER
031506  005327                         DEC     (PC)+                   ;;LOOP?
031510  000001                 $EOPCT: .WORD   1
031512  003022                         BGT     $DOAGN                  ;;YES
031514  012737                         MOV     (PC)+,@(PC)+            ;;RESTORE COUNTER
031516  000001                 $ENDCT: .WORD   1
031520  031510                         $EOPCT
031522  104401  031567                 TYPE    ,$ENDMG                 ;;TYPE "END PASS #"
031526  013746  001216                 MOV     $PASS,-(SP)             ;;SAVE $PASS FOR TYPEOUT
031532  104405                         TYPDS                           ;;GO TYPE--DECIMAL ASCII WITH SIGN
031534  104401  031564                 TYPE    ,$ENULL                 ;;TYPE A NULL CHARACTER
031540  013700  000042         $GET42: MOV     @#42,R0                 ;;GET MONITOR ADDRESS
031544  001405                         BEQ     $DOAGN                  ;;BRANCH IF NO MONITOR
031546  000005                         RESET                           ;;CLEAR THE WORLD
031550  004710                 $ENDAD: JSR     PC,(R0)                 ;;GO TO MONITOR
031552  000240                         NOP                             ;;SAVE ROOM
031554  000240                         NOP                             ;;FOR
031556  000240                         NOP                             ;;ACT11
031560                         $DOAGN:
031560  000137                         JMP     @(PC)+                  ;;RETURN
031562  011474                 $RTNAD: .WORD   ST5
031564    377     377     000  $ENULL: .BYTE   -1,-1,0                 ;;NULL CHARACTER STRING
031567    015  042412  042116  $ENDMG: .ASCIZ  <15><12>/END PASS #/
031574  050040  051501  020123
031602  000043
```

```
                                .SBTTL  SUBROUTINES

                                ;SUBROUTINE TO CLEAR ALL FLAGS FROM DDUMP THRU DOTIM
                                ;
031604  012700  005462          CLRFLG: MOV     #DDUMP,R0
031610  012701  177757                  MOV     #-17.,R1
031614  005020                  1$:     CLR     (R0)+
031616  005201                          INC     R1
031620  001375                          BNE     1$
031622  000207                          RTS     PC

                                ;
                                ;TYPE PROGRAM ID IF FTITLE=0
                                ;
031624  005737  001364          TITLE:  TST     FTITLE
031630  001004                          BNE     1$
031632  005237  001364                  INC     FTITLE
031636  104401  042212                  TYPE    ,MSG1           ;PROGRAM ID
031642  000207                  1$:     RTS     PC

                                ;
                                ;ROUTINE TO INPUT DRIVE NOS. TYPED IN & SET
                                ;DRIVS, DRIV0-DRIV7 REGISTERS APPROPRIATELY
                                ;

031644  104411                  GDRVS:  RDLIN
031646  012600                          MOV     (SP)+,R0        ;GET STARTING ADDR OF ASCII STRING
031650  012701  177770                  MOV     #-8.,R1         ;SET UP COUNT
031654  112002                  1$:     MOVB    (R0)+,R2        ;GET ASCII CHAR
031656  042702  177400                  BIC     #177400,R2      ;MASK HI BYTE
031662  012703  005474                  MOV     #DRIV0,R3       ;DRIVE FLAG ADDR
031666  012704  000060                  MOV     #60,R4

031672  020402                  2$:     CMP     R4,R2           ;WAS TYPED CHAR 0 THRU 7?
031674  001415                          BEQ     3$              ;BRANCH IF YES
031676  005723                          TST     (R3)+           ;NO, INCREMENT DR FLAG ADDR
031700  005204                          INC     R4
031702  020427  000070                  CMP     R4,#70
031706  001371                          BNE     2$              ;S/B 0-7 OR TERMINATOR
031710  005702                          TST     R2
031712  001022                          BNE     4$
031714  020127  177770                  CMP     R1,#-8.
031720  001426                          BEQ     6$              ;DEFAULT ALL DRIVES
031722  005037  005522          7$:     CLR     SIZFLG          ;BYPASS TEST 1 (SIZING)
031726  000207                          RTS     PC              ;FOUND TERMINATOR, EXIT

031730  005213                  3$:     INC     @R3             ;SET UP FLAG FOR THE DRIVE
031732  005237  005472                  INC     DRIVS           ;INCREMENT TOTAL # DRIVES TO BE TESTED
031736  112002                          MOVB    (R0)+,R2        ;GET NEXT ASCII CHAR.
031740  042702  177400                  BIC     #177400,R2      ;MASK
031744  022702  000054                  CMP     #54,R2          ;IS IT A COMMA?
031750  001407                          BEQ     5$              ;YES, GO TO NEXT WORD.
031752  005702                          TST     R2              ;NO, IS IT A TERMINATOR?
031754  001001                          BNE     4$              ;IF NOT, SOMETHING WRONG.
```

```
5512  031756  000761                          BR      7$              ;FOUND TERMINATOR, EXIT
5513
5514  031760  104401  046221          4$:     TYPE    ,EM1            ;ONLY 0-7 ALLOWED.
5515  031764  000137  010724                  JMP     PRGSRT          ;START ALL OVER
5516
5517  031770  005201                  5$:     INC     R1              ;S/B NO MORE THAN 8 DIFF
5518  031772  001330                          BNE     1$              ;DRIVES TYPED IN.
5519  031774  000771                          BR      4$              ;IF NORE, HAVE ERROR.
5520
5521  031776  005237  005522          6$:     INC     SIZFLG          ;DO TEST 1 (SIZING)
5522  032002  000207                          RTS     PC              ;EXIT.
5523
5524                                  ;
5525                                  ;ROUTINE TO INPUT RKBAS OR DEFAULT.
5526                                  ;
5527
5528  032004  104412                  GBA:    RDOCT
5529  032006  012600                          MOV     (SP)+,R0        ;GET LOW ORDER FROM STACK
5530  032010  005700                          TST     R0
5531  032012  001403                          BEQ     1$              ;BRANCH IF DEFAULT.
5532  032014  010037  001264                  MOV     R0,$BASE
5533  032020  000207                          RTS     PC
5534  032022  012737  177440  001264  1$:     MOV     #177440,$BASE   ;DEFAULT VALUE
5535  032030  000207                          RTS     PC
5536
5537                                  ;
5538                                  ;ROUTINE TO INPUT RKVEC OR DEFAULT
5539                                  ;
5540
5541  032032  104412                  GINT:   RDOCT
5542  032034  012600                          MOV     (SP)+,R0        ;GET LOW ORDER FROM STACK
5543  032036  005700                          TST     R0
5544  032040  001405                          BEQ     1$              ;BRANCH IF DEFAULT
5545  032042  010037  001334                  MOV     R0,RKVEC
5546  032046  004737  032064          2$:     JSR     PC,SETINT
5547  032052  000207                          RTS     PC
5548  032054  012737  000210  001334  1$:     MOV     #210,RKVEC      ;DEFAULT VALUE
5549  032062  000771                          BR      2$
5550
5551                                  ;
5552                                  ;ROUTINE TO SETUP INTERRUPT VECTOR & PRIORITY
5553                                  ;
5554
5555  032064  013700  001334          SETINT: MOV     RKVEC,R0
5556  032070  012720  036046                  MOV     #INTER,(R0)+    ;INTER ADDR TO RKVEC
5557  032074  013710  001336                  MOV     RKPRI,(R0)      ;PRS TO RKVEC+2
5558  032100  000207                          RTS     PC
5559
5560
5561                                  ;
5562                                  ;ROUTINE TO FIND CONTROLLER READY (RDY) DURING A DELAY
5563                                  ;ENTER WITH A COUNT IN TEMP1
5564                                  ;RETURN IF RDY NOT PRESENT (ERROR CONDITION)
5565                                  ;RETURN +2 IF RDY PRESENT (SKIP OVER ERROR)
5566                                  ;STATUS IS OBTAINED BEFORE THE RETURN FOR EITHER CASE
5567                                  ;
```

```
5568  032102  032765  000200  000000  FRDY:   BIT     #RDY,RKCS1(R5)
5569  032110  001006                  BNE     1$
5570  032112  005337  005450          DEC     TEMP1
5571  032116  001371                  BNE     FRDY
5572  032120  004737  032140          JSR     PC,HOLD         ;STORE ALL RK611 REGS IN HOLDING REGS.
5573  032124  000207                  RTS     PC              ;NO RDY, EXIT
5574  032126  062716  000002          1$:     ADD     #2,(SP)         ;SKIP OVER ERROR
5575  032132  004737  032140          JSR     PC,HOLD
5576  032136  000207                  RTS     PC
5577
5578                                  ;
5579                                  ;STORE ALL RK611 REGISTERS IN HOLDING REGS
5580                                  ;
5581
5582  032140  016537  000000  005406  HOLD:   MOV     RKCS1(R5),HCS1
5583  032146  016537  000010  005410          MOV     RKCS2(R5),HCS2
5584  032154  016537  000002  005412          MOV     RKWC(R5),HWC
5585  032162  016537  000004  005414          MOV     RKBA(R5),HBA
5586  032170  016537  000006  005416          MOV     RKDA(R5),HDA
5587  032176  016537  000012  005420          MOV     RKDS(R5),HDS
5588  032204  016537  000014  005422          MOV     RKER(R5),HER
5589  032212  016537  000016  005424          MOV     RKASOF(R5),HASOF
5590  032220  016537  000020  005426          MOV     RKDC(R5),HDC
5591  032226  016537  000026  005432          MOV     RKMR1(R5),HMR1
5592  032234  016537  000034  005434          MOV     RKMR2(R5),HMR2
5593  032242  016537  000036  005436          MOV     RKMR3(R5),HMR3
5594  032250  016537  000030  005440          MOV     RKECPS(R5),HPOS
5595  032256  016537  000032  005442          MOV     RKECPT(R5),HPAT
5596  032264  000207                  RTS     PC
5597
5598                                  ;
5599                                  ;ROUTINE TO CHECK FOR CORRECT ATTN
5600                                  ;RETURN IF ATTN NOT PRESENT (ERROR CONDITION)
5601                                  ;RETURN +2 IF ATTN PRESENT (SKIP OVER ERROR)
5602                                  ;
5603  032266  010446                  ;STATN: MOV     R4,-(SP)        ;SAV R4
5604  032270  013704  001222          MOV     $UNIT,R4
5605  032274  136437  005376  005425  BITB    ATTN(R4),HASOF+1
5606  032302  001404                  BEQ     1$              ;BRANCH IF ATTN NOT PRESENT
5607  032304  012604                  MOV     (SP)+,R4        ;RESTOR R4
5608  032306  062716  000002          ADD     #2,(SP)         ;INCR RET ADDR TO JUMP OVER ERROR.
5609  032312  000207                  RTS     PC
5610  032314  012604                  1$:     MOV     (SP)+,R4        ;RESTOR R4
5611  032316  000207                  RTS     PC
5612
5613                                  ;
5614                                  ;ROUTINE TO FIND ATTN WITHIN TIMES GREATER THAN 1 SEC
5615                                  ;ENTER WITH TIME IN SECONDS IN TEMP2
5616                                  ;RETURN IF NO ATTN (ERROR CONDITION)
5617                                  ;RETURN +2 IF ATTN FOUND
5618                                  ;STATUS IS OBTAINED BEFORE THE RETURN FOR EITHER CASE
5619                                  ;
5620
5621  032320  010446                  FATT1:  MOV     R4,-(SP)        ;SAV R4
5622  032322  012737  177777  005450  3$:     MOV     #-1,TEMP1
5623  032330  013704  001222          MOV     $UNIT,R4
```

```
5624  032334  136465  005376  000017  1$:     BITB    ATTN(R4),RKASOF+1(R5) ;FIND CORRECT ATTN
5625  032342  001014                          BNE     2$
5626  032344  005337  005450                  DEC     TEMP1
5627  032350  001371                          BNE     1$
5628  032352  005337  005452                  DEC     TEMP2
5629  032356  001361                          BNE     3$
5630  032360  005065  000026                  CLR     RKMR1(R5)       ;SELECT WORD 0
5631  032364  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS
5632  032370  012604                          MOV     (SP)+,R4        ;RESTOR R4
5633  032372  000207                          RTS     PC
5634  032374  005065  000026          2$:     CLR     RKMR1(R5)
5635  032400  004737  032526                  JSR     PC,GSTAT        ;GET STATUS AFTER ATTN SEEN
5636  032404  012604                          MOV     (SP)+,R4        ;RESTOR R4
5637  032406  062716  000002                  ADD     #2,(SP)         ;SKIP OVER ERROR
5638  032412  000207                          RTS     PC
5639
5640                                  ;
5641                                  ;ROUTINE TO FIND ATTN WITHIN 1 SEC
5642                                  ;ENTER WITH COUNT IN TEMP1
5643                                  ;RETURN IF NO ATTN (ERROR)
5644                                  ;RETURN +2 IF ATTN FOUND
5645                                  ;STATUS IS OBTAINED BEFORE THE RETURN FOR EITHER CASE
5646                                  ;
5647
5648  032414  010446          FATT2:  MOV     R4,-(SP)        ;SAV R4
5649  032416  013704  001222  2$:     MOV     $UNIT,R4
5650  032422  136465  005376  000017          BITB    ATTN(R4),RKASOF+1(R5)  ;FIND CORRECT ATTN
5651  032430  001011                          BNE     1$
5652  032432  005337  005450                  DEC     TEMP1
5653  032436  001367                          BNE     2$
5654  032440  005065  000026                  CLR     RKMR1(R5)       ;SELECT WORD 0
5655  032444  004737  032526                  JSR     PC,GSTAT        ;GET LATEST STATUS.
5656  032450  012604                          MOV     (SP)+,R4        ;RESTOR R4
5657  032452  000207                          RTS     PC
5658  032454  005065  000026          1$:     CLR     RKMR1(R5)
5659  032460  004737  032526                  JSR     PC,GSTAT
5660  032464  012604                          MOV     (SP)+,R4        ;RESTOR R4
5661  032466  062716  000002                  ADD     #2,(SP)         ;SKIP OVER ERROR
5662  032472  000207                          RTS     PC
5663                                  ;
5664                                  ;ENTER WITH A COUNT IN TEMP1
5665                                  ;THE DELAY IS APPROX 17 US/ITERATION + 12 US TO EXIT
5666                                  ;WHEN COUNT IS 0. BASED ON AN 11/05
5667                                  ;
5668  032474  005737  005450          DLY:    TST     TEMP1           ;5.6 US
5669  032500  001403                          BEQ     1$              ;2.5 US
5670  032502  005337  005450                  DEC     TEMP1           ;6.8 US
5671  032506  000772                          BR      DLY             ;2.5 US
5672  032510  000207                  1$:     RTS     PC              ;3.8 US
5673                                  ;
5674                                  ;THIS ROUTINE TYPES BYPASSED DRIVE#.  ENTER WITH DRIVE# IN R0
5675                                  ;
5676
5677  032512  104401  043634          BYP:    TYPE    ,MSG14          ;BYPASS DRIVE
5678  032516  010046                          MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
5679                                                                  ;;TYPE DR#
```

```
5680  032520  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
5681  032522     001                        .BYTE   1               ;;TYPE 1 DIGIT(S)
5682  032523     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
5683  032524  000207                        RTS     PC
5684
5685                                  ;
5686                                  ;THIS ROUTINE DOES THE SELECT DRIVE COMMAND TO GET STATUS
5687                                  ;IT THEN WAITS FOR CONTROLLER READY
5688                                  ;IF RDY NOT RECEIVED BY THE TIMEOUT, AN ERROR IS FLAGGED
5689                                  ;
5690
5691  032526  013746  005450          GSTAT:  MOV     TEMP1,-(SP)     ;SAVE TEMP1
5692  032532  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;CURRENT DRIVE #
5693  032540  012765  000001  000000          MOV     #SELDRV,RKCS1(R5)  ;GET STATUS WITH SELECT DRIVE CMD
5694  032546  013737  001432  005450          MOV     T10,TEMP1
5695  032554  004737  032102                  JSR     PC,FRDY         ;FIND RDY
5696  032560  104117                          ERROR   117             ;RDY NOT SET BY END OF SELECT DRIVE CMD
5697  032562  012637  005450                  MOV     (SP)+,TEMP1     ;RESTOR TEMP1.
5698  032566  000207                          RTS     PC
5699
5700                                  ;
5701                                  ;THIS ROUTINE DOES A SUBSYSTEM CLEAR & WAITS FOR CONTROLLER READY
5702                                  ;IF RDY IS NOT RECEIVED BY THE END OF THE TIMEOUT, AN ERROR IS FLAGGED.
5703                                  ;THE ROUTINE THEN GETS CURRENT STATUS & CHECKS FOR CONTROLLER ERROR (CERR)
5704                                  ;RETURN IF CERR SET
5705                                  ;RETURN +2 IF CERR CLEAR
5706                                  ;
5707  032570  012765  000040  000010  SUBCLR: MOV     #SCLR,RKCS2(R5) ;SUBSYS CLEAR
5708  032576  013737  001432  005450          MOV     T10,TEMP1
5709  032604  004737  032102                  JSR     PC,FRDY         ;FIND RDY
5710  032610  104120                          ERROR   120             ;RDY NOT SET BY END OF SCLR
5711  032612  013765  001222  000010          MOV     $UNIT,RKCS2(R5) ;CURRENT DRIVE #
5712  032620  005065  000026                  CLR     RKMR1(R5)       ;SELECT WORD 0
5713  032624  004737  032526                  JSR     PC,GSTAT        ;GET STATUS
5714  032630  032737  100000  005406          BIT     #CERR,HCS1      ;CHECK FOR CONT ERROR
5715  032636  001401                          BEQ     1$
5716  032640  000207                          RTS     PC
5717  032642  062716  000002          1$:     ADD     #2,(SP)         ;SKIP OVER ERROR
5718  032646  000207                          RTS     PC
5719
5720                                  ;
5721                                  ;READ THE SECTOR COUNT IN RKMR3, RIGHT JUSTIFY IT & STORE IT IN 'SECTOR'
5722                                  ;
5723  032650  012765  000003  000026  RDSEC:  MOV     #3,RKMR1(R5)    ;WORD 3
5724  032656  004737  032526                  JSR     PC,GSTAT
5725  032662  013737  005436  001426          MOV     HMR3,SECTOR
5726  032670  042737  177017  001426          BIC     #^C<M.SECT>,SECTOR
5727  032676  006237  001426                  ASR     SECTOR          ;RIGHT JUSTIFY
5728  032702  006237  001426                  ASR     SECTOR          ;SECTOR
5729  032706  006237  001426                  ASR     SECTOR          ;INFO
5730  032712  006237  001426                  ASR     SECTOR
5731  032716  000207                          RTS     PC
5732                                  ;
5733                                  ;READ THE CYL DIFF/OFFSET IN RKMR2, RIGHT JUSTIFY IT & STORE IT IN 'CYLDIF'
5734                                  ;
5735  032720  012765  000002  000026  RDCYLD: MOV     #2,RKMR1(R5)    ;WORD 2
```

```
5736  032726  004737  032526                        JSR     PC,GSTAT
5737  032732  013737  005434  001402                MOV     HMR2,CYLDIF
5738  032740  042737  160017  001402                BIC     #↑C<M.CDIF>,CYLDIF
5739  032746  006237  001402                        ASR     CYLDIF          ;RIGHT JUSTIFY
5740  032752  006237  001402                        ASR     CYLDIF          ;CYL DIFF/OFFSET
5741  032756  006237  001402                        ASR     CYLDIF          ;INFO
5742  032762  006237  001402                        ASR     CYLDIF
5743  032766  023727  001402  000777                CMP     CYLDIF,#777     ;CHK TO SEE IF RET IN COMPL. FORM
5744  032774  001002                                BNE     1$              ;BR IF NOT
5745  032776  005037  001402                        CLR     CYLDIF          ;CLR IF YES
5746  033002  000207                        1$:     RTS     PC
5747
5748                                        ;
5749                                        ;QUICK SELECT DRIVE COMMAND TO OBTAIN CYL DIFF
5750                                        ;
5751  033004  013746  005450                QKCYLD: MOV     TEMP1,-(SP)     ;SAVE TEMP1
5752  033010  012765  000002  000026                MOV     #2,RKMR1(R5)    ;SELECT WORD 2
5753  033016  012765  000001  000000                MOV     #SELDRV,RKCS1(R5)       ;SELECT DRIVE CMD
5754  033024  013737  001432  005450                MOV     T10,TEMP1
5755  033032  032765  000200  000000        1$:     BIT     #RDY,RKCS1(R5)  ;TEST FOR CONT RDY
5756  033040  001004                                BNE     2$              ;BR IF THERE
5757  033042  005337  005450                        DEC     TEMP1
5758  033046  001371                                BNE     1$
5759  033050  104117                                ERROR   117             ;NO RDY AFTER SEL DRV CMD
5760
5761  033052  016537  000034  001402        2$:     MOV     RKMR2(R5),CYLDIF
5762  033060  042737  160017  001402                BIC     #↑C<M.CDIF>,CYLDIF      ;GET CYL DIFF ONLY (NO SHIFTING)
5763  033066  012637  005450                        MOV     (SP)+,TEMP1     ;RESTORE TEMP1
5764  033072  000207                                RTS     PC
5765                                        ;
5766                                        ;READ THE CYL ADDR IN RKMR3, RIGHT JUSTIFY IT & STORE IT IN  'CYLADD'
5767                                        ;
5768  033074  012765  000002  000026        RDCYLA: MOV     #2,RKMR1(R5)    ;WORD 2
5769  033102  004737  032526                        JSR     PC,GSTAT
5770  033106  013737  005436  001404                MOV     HMR3,CYLADD
5771  033114  042737  160017  001404                BIC     #↑C<M.CADD>,CYLADD
5772  033122  006237  001404                        ASR     CYLADD          ;RIGHT JUSTIFY
5773  033126  006237  001404                        ASR     CYLADD          ;CYL ADDR
5774  033132  006237  001404                        ASR     CYLADD          ;INFO
5775  033136  006237  001404                        ASR     CYLADD
5776  033142  000207                                RTS     PC
5777                                        ;
5778                                        ;FIND SECTOR 17
5779                                        ;RETURN IF NOT FOUND
5780                                        ;RETURN +4 IF FOUND
5781                                        ;
5782  033144  013737  001442  005450        FSEC17: MOV     T5000,TEMP1     ;SETUP TIMEOUT
5783  033152  004737  032650                1$:     JSR     PC,RDSEC        ;READ SECTOR
5784  033156  023727  001426  000021                CMP     SECTOR,#17.     ;TEST FOR SECTOR 17
5785  033164  001014                                BNE     2$              ;BR IF NOT 17
5786
5787  033166  004737  032650                        JSR     PC,RDSEC
5788  033172  023727  001426  000021                CMP     SECTOR,#17.
5789  033200  001412                                BEQ     3$              ;BR IF READ SAME TWICE
5790  033202  004737  032650                        JSR     PC,RDSEC        ;ELSE TRY 1 MORE TIME
5791  033206  023727  001426  000021                CMP     SECTOR,#17.
```

```
5792  033214  001404                        BEQ     3$              ;BR IF 17
5793
5794  033216  005337  005450          2$:   DEC     TEMP1
5795  033222  001353                        BNE     1$              ;TRY AGAIN
5796  033224  000207                        RTS     PC
5797
5798  033226  062716  000004          3$:   ADD     #4,(SP)         ;SKIP OVER ERROR
5799  033232  000207                        RTS     PC
5800                                        ;
5801                                        ;ROUTINE TO FIND HEADS HOME IN RKMR2 WORD 1 BEFORE SPECIFIED DELAY
5802                                        ;ENTER WITH TIME IN SECONDS IN TEMP2
5803                                        ;RETURN IF NOT FOUND
5804                                        ;RETURN+2 IF FOUND - SKIP OVER ERROR
5805                                        ;
5806  033234  012737  177777  005450  FHDHM: MOV     #-1,TEMP1       ;ALL 1'S
5807  033242  012765  000001  000026        MOV     #1,RKMR1(R5)    ;WORD 1
5808  033250  004737  032526          1$:   JSR     PC,GSTAT
5809  033254  032737  000040  005434        BIT     #D.HDHM,HMR2
5810  033262  001007                        BNE     2$
5811  033264  005337  005450                DEC     TEMP1
5812  033270  001367                        BNE     1$
5813  033272  005337  005452                DEC     TEMP2
5814  033276  001356                        BNE     FHDHM
5815  033300  000207                        RTS     PC
5816  033302  062716  000002          2$:   ADD     #2,(SP)         ;SKIP OVER ERROR
5817  033306  000207                        RTS     PC
5818                                        ;
5819                                        ;ROUTINE TO FIND LOAD HEADS IN RKMR2 WORD 1 BEFORE THE TIMEOUT
5820                                        ;RETURN IF NOT FOUND
5821                                        ;RETURN+2 IF FOUND: SKIP OVER ERROR
5822                                        ;
5823  033310  012737  000372  005450  FLOAD: MOV     #250.,TEMP1
5824  033316  012765  000001  000026        MOV     #1,RKMR1(R5)    ;WORD 1
5825  033324  004737  032526          1$:   JSR     PC,GSTAT
5826  033330  032737  010000  005434        BIT     #D.LOAD,HMR2
5827  033336  001004                        BNE     2$
5828  033340  005337  005450                DEC     TEMP1
5829  033344  001367                        BNE     1$
5830  033346  000207                        RTS     PC
5831  033350  062716  000002          2$:   ADD     #2,(SP)         ;SKIP OVER ERROR
5832  033354  000207                        RTS     PC
5833                                        ;
5834                                        ;FILL HEADER TABLE WITH 66 WORDS OF VALID HEADERS
5835                                        ;ENTER WITH CYL # IN 'CALADD'
5836                                        ;ENTER WITH HEAD # IN 'HEAD'
5837                                        ;ENTER WITH FORMAT IN 'FORMAT'
5838                                        ;
5839  033356  010046                  FHDTAB: MOV     R0,-(SP)        ;SAV R0
5840  033360  010146                        MOV     R1,-(SP)        ;SAV R1
5841  033362  012700  001550                MOV     #HDTAB,R0       ;HEADER WORD TABLE ADDR
5842  033366  005001                        CLR     R1              ;SECTOR COUNTER
5843  033370  013737  001514  001516        MOV     HEAD,HD1
5844  033376  006337  001516                ASL     HD1
5845  033402  006337  001516                ASL     HD1
5846  033406  006337  001516                ASL     HD1
5847  033412  006337  001516                ASL     HD1
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5848  033416  006337  001516                ASL     HD1             ;SETUP HEAD # FOR WORD 2 OF HEADER
5849  033422  013737  001520  001522        MOV     FORMAT,FMT1
5850  033430  000337  001522                SWAB    FMT1
5851  033434  006337  001522                ASL     FMT1            ;SETUP FORMAT FOR WORD 2 OF HEADER
5852
5853  033440  013720  001406          1$:   MOV     CALADD,(R0)+    ;HEADER WORD 1-CYL ADDR
5854  033444  010110                        MOV     R1,(R0)         ;HEADER WORD 2-SECTOR NO
5855  033446  053710  001516                BIS     HD1,(R0)        ;               -HEAD NO
5856  033452  053710  001522                BIS     FMT1,(R0)       ;               -FORMAT
5857  033456  052710  140000                BIS     #<BIT14!BIT15>,(R0)     ;       -GOOD SECTOR FLAGS
5858
5859  033462  013737  001406  005450        MOV     CALADD,TEMP1
5860  033470  011037  005452                MOV     (R0),TEMP2
5861  033474  043737  001406  005452        BIC     CALADD,TEMP2
5862  033502  042037  005450                BIC     (R0)+,TEMP1
5863  033506  053737  005450  005452        BIS     TEMP1,TEMP2
5864  033514  013720  005452                MOV     TEMP2,(R0)+     ;HEADER WORD 3-HEADER CHECK
5865
5866  033520  005201                        INC     R1              ;SECTOR CTR
5867  033522  020127  000026                CMP     R1,#22.         ;ALL 22 SECTORS DONE? (66 WORDS)
5868  033526  001344                        BNE     1$              ;BR IF NO
5869
5870  033530  012601                        MOV     (SP)+,R1        ;RESTOR R1
5871  033532  012600                        MOV     (SP)+,R0        ;RESTOR R0
5872  033534  000207                        RTS     PC
5873
5874                                ;
5875                                ;THIS ROUTINE SORTS THE RHTAB TABLE FROM WHATEVER SECTOR IT BEGINS
5876                                ;WITH AND RE-WRITES THE INFO IN SRTTAB TABLE TO BEGIN WITH SECTOR 0
5877                                ;
5878  033536  010046                SORT:   MOV     R0,-(SP)        ;SAVE R0
5879  033540  010146                        MOV     R1,-(SP)        ;SAVE R1
5880  033542  004737  032650                JSR     PC,RDSEC
5881  033546  062737  000001  001426        ADD     #1,SECTOR
5882  033554  004737  033644                JSR     PC,MULT6        ;MULT SECTOR BY 6
5883
5884  033560  012700  000204                MOV     #132.,R0
5885  033564  163700  001426                SUB     SECTOR,R0       ;R0-SECTOR TO R0 = INDEX
5886  033570  010037  001426                MOV     R0,SECTOR
5887  033574  062737  001754  001426        ADD     #RHTAB,SECTOR   ;SAVE INDEX
5888
5889  033602  062700  001754                ADD     #RHTAB,R0       ;INDEX TO BOT HALF OF RHTAB
5890  033606  012701  002160                MOV     #SRTTAB,R1      ;INDEX TO TOP HALF OF SRTTAB
5891
5892  033612  012021                  1$:   MOV     (R0)+,(R1)+     ;PUT BOTTOM OF RHTAB TO TOP OF SRTTAB
5893  033614  020027  002160                CMP     R0,#RHTAB+132.
5894  033620  001374                        BNE     1$
5895
5896  033622  012700  001754                MOV     #RHTAB,R0       ;PUT TOP OF RHTAB TO BOT OF SRTTAB
5897  033626  012021                  2$:   MOV     (R0)+,(R1)+
5898  033630  020037  001426                CMP     R0,SECTOR
5899  033634  001374                        BNE     2$
5900
5901  033636  012601                        MOV     (SP)+,R1        ;RESTOR R1
5902  033640  012600                        MOV     (SP)+,R0        ;RESTOR R0
5903  033642  000207                        RTS     PC
```

```
                                        ;
                                        ;MULT BY 6. ENTER WITH DESIRED # IN 'SECTOR'
                                        ;
033644  006337  001426        MULT6:  ASL     SECTOR          ;2 X SECTOR
033650  013746  001426                MOV     SECTOR,-(SP)
033654  006337  001426                ASL     SECTOR          ;4 X SECTOR
033660  062637  001426                ADD     (SP)+,SECTOR    ;(4 X S)+(2 X S) = 6 X SECTOR
033664  000207                        RTS     PC
                                        ;
                                        ;THIS ROUTINE IS ENTERED IF THERE IS A READ HEADER MISMATCH.
                                        ;IT COMPARES THE CYLINDER, SECTOR AND HEAD NUMBERS OF WHERE THE
                                        ;HEADS WERE AT THE TIME OF READING AGAINST THE BSE INFO
                                        ;OBTAINED IN A PREVIOUS TEST.
                                        ;RETURN IF NO COMPARE: ERROR CONDITION
                                        ;RETURN+2 IF COMPARE FOUND: SKIP OVER ERROR
                                        ;
033666  010446                  TRUERR: MOV     R4,-(SP)        ;SAVE R4
033670  013746  001160                MOV     $TMP0,-(SP)     ;SAVE
033674  013746  001162                MOV     $TMP1,-(SP)     ;SAVE
033700  013737  005416  001160        MOV     HDA,$TMP0       ;READ TRK SECTOR INFO
033706  013737  005416  001162        MOV     HDA,$TMP1
033714  042737  177740  001160        BIC     #^C<37>,$TMP0   ;TMP0 HAS SECTOR INFO
033722  042737  174377  001162        BIC     #^C<3400>,$TMP1
033730  000337  001162                SWAB    $TMP1           ;TMP1 HAS HEAD INFO
033734  005737  001160                TST     $TMP0           ;SEE IF SECTOR 0
033740  001414                        BEQ     6$
033742  005337  001160                DEC     $TMP0           ;GET ACTUAL WLE SECTOR
033746  013737  001160  001426        MOV     $TMP0,SECTOR    ;STORE SECTOR
033754  013737  001162  001514        MOV     $TMP1,HEAD      ;STORE HEAD
033762  013737  005426  001374        MOV     HDC,CCYL        ;STORE CYLINDER
033770  000440                        BR      9$
033772  005737  001162        6$:     TST     $TMP1           ;SEE IF HEAD 0
033776  001414                        BEQ     7$              ;BR IF YES
034000  005337  001162                DEC     $TMP1           ;GET ACTUAL WLE HEAD
034004  013737  001162  001514        MOV     $TMP1,HEAD
034012  012737  000025  001426        MOV     #21.,SECTOR
034020  013737  005426  001374        MOV     HDC,CCYL
034026  000421                        BR 9$
034030  005737  005426        7$:     TST     HDC             ;SEE IF CYL 0
034034  001414                        BEQ     8$
034036  005337  005426                DEC     HDC             ;GET ACTUAL WLE CYL
034042  013737  005426  001374        MOV     HDC,CCYL
034050  012737  000002  001514        MOV     #2,HEAD
034056  012737  000025  001426        MOV     #21.,SECTOR
034064  000402                        BR      9$
034066  104044                  8$:     ERROR   44              ;RKDC & RKDA INDICATES WCE
034070  000453                        BR      5$              ;OCCURRED AT CYL 411,HD 2 SECTOR 21
```

```
5960  034072  012704  003374          9$:     MOV     #BSE22+8.,R4
5961  034076  012437  001540          1$:     MOV     (R4)+,WORD      ;GET CYL# OFF BSE TABLE
5962  034102  023727  001540  177777          CMP     WORD,#-1        ;SEE IF ALL 1'S
5963  034110  001406                          BEQ     2$              ;EXIT IF YES
5964  034112  023737  001540  001374          CMP     WORD,CCYL       ;COMPARE CYL #
5965  034120  001410                          BEQ     3$              ;BR IF CYL MATCH
5966  034122  005724                          TST     (R4)+           ;ADV TO NEXT CYL WORD
5967  034124  000764                          BR      1$
5968
5969  034126  012637  001162          2$:     MOV     (SP)+,$TMP1     ;RESTORE
5970  034132  012637  001160                  MOV     (SP)+,$TMP0     ;RESTORE
5971  034136  012604                          MOV     (SP)+,R4        ;RESTOR R4
5972  034140  000207                          RTS     PC
5973
5974  034142  011437  001540          3$:     MOV     (R4),WORD       ;GET HEAD & SECTOR FROM BSE TABLE
5975  034146  042737  177400  001540          BIC     #177400,WORD    ;KEEP SECTOR# ONLY
5976  034154  023737  001540  001426          CMP     WORD,SECTOR     ;SECTOR COMPARE?
5977  034162  001402                          BEQ     4$              ;BR IF YES
5978  034164  005724                          TST     (R4)+           ;ELSE GET NEXT CYL # OFF TABLE
5979  034166  000743                          BR      1$
5980
5981  034170  012437  001540          4$:     MOV     (R4)+,WORD      ;GET HEAD & SECTOR FROM BSE TABLE
5982  034174  000337  001540                  SWAB    WORD
5983  034200  042737  177400  001540          BIC     #177400,WORD    ;KEEP HEAD# ONLY
5984  034206  023737  001540  001514          CMP     WORD,HEAD       ;HEAD COMPARE?
5985  034214  001401                          BEQ     5$              ;BR IF YES
5986  034216  000727                          BR      1$
5987
5988  034220  012637  001162          5$:     MOV     (SP)+,$TMP1     ;RESTORE
5989  034224  012637  001160                  MOV     (SP)+,$TMP0     ;RESTORE
5990  034230  012604                          MOV     (SP)+,R4        ;RESTOR R4
5991  034232  062716  000002                  ADD     #2,(SP)         ;SKIP OVER ERR ON RETURN
5992  034236  000207                          RTS     PC
5993                                  ;
5994                                  ;THIS ROUTINE CALIBRATES ANY PDP-11 AGAINST 2 CONSECUTIVE 16MS TICKS FROM AN L OR P CLOC
5995                                  ;
5996                                  ;THE 1ST TICK CLEARS A COUNTER 'LPCNT'. THE PROGRAM THEN GOES THRU A LOOP.
5997                                  ;EACH TIME IT GOES THRU THE LOOP,LPCNT IS INCREMENTED BY 1.
5998                                  ;THE 2ND TICK STOPS INCREMENTING LPCNT AND THE CLOCK INTERRUPT IS TURNED OFF.
5999                                  ;NOW, FOR THIS PARTICULAR PDP-11, THE TIME TO GO THRU THE ABOVE LOOP ONE IS
6000                                  ;16.6MS DIVIDED BY THE CONTENTS OF LPCNT.
6001                                  ;
6002                                  ;AN APPROX VALUE FOR A PDP11-05 MAY BE 0.4MS TO GO THRU THE LOOP ONCE
6003                                  ;
6004                                  ;FROM THIS POINT ON, WHENEVER ACCURACIES GREATER THAN WHAT THE L CLOCK
6005                                  ;CAN PROVIDE ARE NECESSARY, THE EVENT TO BE TIMED IS COMPARED AGAINST
6006                                  ;THE NUMBER OF TIMES THE LOOP IS PASSED THRU AND MULT. BY THE ABOVE
6007                                  ;CALCULATED FIGURE
6008                                  ;
6009
6010  034240  104413                  CALCLK: SAVREG
6011  034242  005000                          CLR     R0              ;ITERATION CTR
6012  034244  005037  001476                  CLR     SUM             ;SUM OF 256 ITERATIONS
6013
6014  034250  012737  000001  001412  5$:     MOV     #1,COUNT        ;GO THRU CLOCK HANDLER
6015  034256  012737  000001  001414          MOV     #1,SEC          ;ONLY ONCE
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```
6016  034264  012737  177777  005450          MOV     #-1,TEMP1       ;ALL 1'S FOR TIMEOUT
6017  034272  004737  035202                  JSR     PC,CLKON
6018
6019
6020  034276  005737  001416          1$:     TST     TIMUP
6021  034302  001007                          BNE     2$              ;BR IF GOT 1'ST TICK
6022  034304  005337  005450                  DEC     TEMP1
6023  034310  001372                          BNE     1$              ;BR IF TIMEOUT NOT DONE
6024  034312  104401  044355                  TYPE    ,MSG23          ;NO CLOCK INTR PRESENT, ABORT TIMING TEST
6025  034316  000137  031434                  JMP     $EOP            ;ABORT DRIVE
6026
6027  034322  012737  000001  001412  2$:     MOV     #1,COUNT        ;GOT 1'ST TICK
6028  034330  012737  000001  001414          MOV     #1,SEC
6029  034336  005037  001472                  CLR     LPCNT           ;LOOP COUNTER
6030  034342  005037  001416                  CLR     TIMUP           ;CLEAR BEFORE 2'ND TICK
6031
6032  034346  005737  001416          3$:     TST     TIMUP
6033  034352  001006                          BNE     4$              ;BR IF GOT 2'ND TICK
6034  034354  004737  034672                  JSR     PC,LOOP
6035  034360  000240                          NOP                     ;THESE NOP'S
6036  034362  000240                          NOP                     ;PROVIDE A
6037  034364  000240                          NOP                     ;DELAY
6038  034366  000767                          BR      3$
6039
6040  034370  004737  035310          4$:     JSR     PC,CLKOF        ;GOT 2'ND TICK, TURN OFF CLOCK
6041  034374  063737  001472  001476          ADD     LPCNT,SUM
6042
6043  034402  005200                          INC     R0
6044  034404  020027  000400                  CMP     R0,#256.        ;ALL ITERATIONS DONE?
6045  034410  001317                          BNE     5$              ;BR IF NO
6046
6047  034412  000337  001476                  SWAB    SUM             ;DIVIDE BY 256
6048  034416  105037  001477                  CLRB    SUM+1           ;TO GET AVERAGE
6049
6050  034422  005000                          CLR     R0              ;CLEAR FOR DIV
6051  034424  005001                          CLR     R1
6052  034426  005002                          CLR     R2
6053  034430  005004                          CLR     R4
6054  034432  012703  040432                  MOV     #16666.,R3      ;LSB DIVIDEND (16666 US)
6055  034436  013705  001476                  MOV     SUM,R5          ;DIVISOR (AVERAGE OF 256)
6056  034442  004737  036170                  JSR     PC,M.DPID       ;DO DIVIDE
6057  034446  010337  001474                  MOV     R3,LPTIM        ;STORE QUOTIENT
6058                                                                  ;THIS EQUALS THE TIME IN USEC
6059                                                                  ;TO GO THRU THE LOOP ONCE
6060  034452  104414                  RESREG
6061  034454  000207                  RTS     PC
6062
6063                          ;
6064                          ;THIS ROUTINE IS EXACTLY THE SAME AS THE ABOVE EXCEPT THAT
6065                          ;A JSR PC QKCYLD HAS BEEN INSERTED TO TAKE UP SOME TIME
6066                          ;TO MATCH THE TIME TAKEN BY THE ROUTINE THAT USES THIS ROUTINE
6067                          ;
6068  034456  104413          VELCAL: SAVREG
6069  034460  005000                  CLR     R0              ;ITERATION CTR
6070  034462  005037  001476          CLR     SUM             ;SUM OF 256 ITERATIONS
6071
```

```
6072  034466  012737  000001  001412  5$:     MOV     #1,COUNT        ;SEE ABOVE CALCLK FOR COMMENTS
6073  034474  012737  000001  001414          MOV     #1,SEC
6074  034502  012737  177777  005450          MOV     #-1,TEMP1
6075  034510  004737  035202                  JSR     PC,CLKON
6076
6077  034514  005737  001416          1$:     TST     TIMUP
6078  034520  001007                          BNE     2$
6079  034522  005337  005450                  DEC     TEMP1
6080  034526  001372                          BNE     1$
6081  034530  104401  044355                  TYPE    ,MSG23          ;NO CLOCK
6082  034534  000137  031434                  JMP     $EOP
6083
6084  034540  012737  000001  001412  2$:     MOV     #1,COUNT
6085  034546  012737  000001  001414          MOV     #1,SEC
6086  034554  005037  001472                  CLR     LPCNT
6087  034560  005037  001416                  CLR     TIMUP
6088
6089  034564  005737  001416          3$:     TST     TIMUP
6090  034570  001005                          BNE     4$
6091  034572  004737  033004                  JSR     PC,QKCYLD       ;THIS IS ONLY DIFFERENCE BETWEEN
6092                                                                  ;PRECEEDING SUBROUTINE
6093  034576  004737  034672                  JSR     PC,LOOP
6094  034602  000770                          BR      3$
6095
6096  034604  004737  035310          4$:     JSR     PC,CLKOF
6097  034610  063737  001472  001476          ADD     LPCNT,SUM
6098
6099  034616  005200                          INC     R0
6100  034620  020027  000400                  CMP     R0,#256.
6101  034624  001320                          BNE     5$
6102
6103  034626  000337  001476                  SWAB    SUM
6104  034632  105037  001477                  CLRB    SUM+1
6105
6106  034636  005000                          CLR     R0
6107  034640  005001                          CLR     R1
6108  034642  005002                          CLR     R2
6109  034644  005004                          CLR     R4
6110  034646  012703  040432                  MOV     #16666.,R3
6111  034652  013705  001476                  MOV     SUM,R5
6112  034656  004737  036170                  JSR     PC,M.DPID
6113  034662  010337  001474                  MOV     R3,LPTIM
6114  034666  104414                          RESREG
6115  034670  000207                          RTS     PC
6116
6117
6118                                  ;
6119                                  ;WITH 50 IN R0, IT TAKES APPROX 400 US FOR AN 11/05 TO GO THRU THIS
6120                                  ;LOOP AND INCREMENT 'LPCNT' ONCE.
6121                                  ;THIS 400 US IS APPROX 2.5% OF 16MS GIVING A RESOLUTION OF 0.4MS
6122                                  ;PER COUNT IN 'LPCNT'.
6123                                  ;WHEN USED BY THE 'CALCLK' ROUTINE, LPCLK SHOULD BE APPROX 40(10)=50(8)
6124                                  ;WITH AN 11/05 TO 200(10)=264(8) FOR AN 11/70
6125                                  ;
6126  034672  010046                  LOOP:   MOV     R0,-(SP)        ;SAVE R0
6127  034674  012700  000062                  MOV     #50.,R0
```

```
6128  034700  005300                1$:     DEC     R0
6129  034702  001401                        BEQ     2$
6130  034704  000775                        BR      1$
6131  034706  005237  001472        2$:     INC     LPCNT
6132  034712  012600                        MOV     (SP)+,R0        ;RESTORE R0
6133  034714  000207                        RTS     PC
6134                                ;
6135                                ;THIS ROUTINE FINDS ATTN FROM A SEEK AND RETURNS
6136                                ;
6137  034716  136465  005376  000017  FATT3:  BITB    ATTN(R4),RKASOF+1(R5)   ;TEST FOR ATTN
6138  034724  001006                        BNE     1$              ;EXIT IF THERE
6139  034726  004737  034672                JSR     PC,LOOP         ;ELSE GO THRU LOOP
6140  034732  005737  001472                TST     LPCNT           ;TEST FOR OVERFLOW
6141  034736  001367                        BNE     FATT3           ;BR IF NO AND TRY AGAIN
6142  034740  000207                        RTS     PC
6143  034742  062716  000002        1$:     ADD     #2,(SP)         ;JUMP OVER ERROR
6144  034746  000207                        RTS     PC
6145                                ;
6146                                ;ROUTINE TO MULT & TYPE A 2 WORD PRODUCT
6147                                ;ENTER WITH LPCNT IN $TMP0
6148                                ;USED FOR LOW VEL TIMES IN UNLD & LOADING
6149                                ;
6150  034750                        TYPTIM:
6151  034750  013746  001474                MOV     LPTIM,-(SP)             ;;PUT THE MULTIPLER ON THE STACK
6152  034754  013746  001160                MOV     $TMP0,-(SP)             ;;PUT THE MULTIPLICAND ON THE STACK
6153  034760  004737  041714                JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
6154  034764  012637  001160                MOV     (SP)+,$TMP0             ;;GET THE LSB'S OF THE PRODUCT
6155  034770  012637  001162                MOV     (SP)+,$TMP0+2   ;;GET THE MSB'S OF THE PRODUCT
6156  034774  012746  001160                MOV     #$TMP0,-(SP)    ;PUSH LSB ONTO STACK
6157                                                                ;MSB IN $TMP1 FROM MULT MACRO
6158  035000  004737  041424                JSR     PC,$DB2D        ;CONVERT TO ASCII STRING
6159  035004  004737  041654                JSR     PC,$SUPRS       ;TYPE TIMES
6160  035010  104401  044504                TYPE    ,MSG25          ;MICRO SEC
6161  035014  000207                        RTS     PC
6162
6163                                ;
6164                                ;ROUTINE USED BY TIMING TO OBTAIN THE AVERAGE OF 100 TIMES IN MICRO SECONDS
6165                                ;
6166  035016  104413                AVGTIM: SAVREG
6167  035020  005000                        CLR     R0              ;CLEAR FOR DIV
6168  035022  005001                        CLR     R1
6169  035024  005004                        CLR     R4
6170  035026  013703  001476                MOV     SUM,R3  ;LSB DIVIDEND
6171  035032  013702  001500                MOV     SUM+2,R2        ;MSB DIVIDEND
6172  035036  012705  000144                MOV     #100.,R5        ;DIVISOR
6173  035042  004737  035150                JSR     PC,DIVTYP
6174  035046  104401  044504                TYPE    ,MSG25          ;USEC
6175  035052  104414                        RESREG
6176  035054  000207                        RTS     PC
6177
6178                                ;
6179                                ;ROUTINE TO CALC & TYPE AVERAGE SPEED
6180                                ;
6181  035056  104413                AVGSP:  SAVREG
6182  035060  005000                        CLR     R0              ;CLEAR FOR DIV
6183  035062  005001                        CLR     R1
```

```
 6184  035064  013703  001476              MOV     SUM,R3          ;LSB DIVIDEND
 6185  035070  013702  001500              MOV     SUM+2,R2        ;MSB DIVIDEND
 6186  035074  012705  103240              MOV     #103240,R5      ;LSB DIVISOR
 6187  035100  012704  000001              MOV     #1,R4           ;MSB DIVISOR
 6188                                                              ;TO DIVIDE BY 100000(10)
 6189                                                              ;100000(10)=303240(8)
 6190  035104  004737  036170              JSR     PC,M.DPID       ;GO DIVIDE
 6191  035110  010337  001162              MOV     R3,$TMP1        ;SAVE QUOTIENT
 6192
 6193  035114  005000                      CLR     R0              ;CLEAR FOR DIV
 6194  035116  005001                      CLR     R1
 6195  035120  005002                      CLR     R2
 6196  035122  005004                      CLR     R4
 6197  035124  012703  001231              MOV     #665.,R3        ;LSB DIVIDEND
 6198  035130  013705  001162              MOV     $TMP1,R5        ;DIVISOR
 6199  035134  004737  035150              JSR     PC,DIVTYP
 6200  035140  104401  045452              TYPE    ,MSG36          ;INCHES/SEC
 6201  035144  104414                      RESREG
 6202  035146  000207                      RTS     PC
 6203                                  ;
 6204                                  ;ROUTINE TO DIVIDE  & TYPE WITH SUPPRESSED 0'S
 6205                                  ;
 6206  035150  004737  036170  DIVTYP:    JSR     PC,M.DPID       ;GO DIVIDE
 6207  035154  010337  001160              MOV     R3,$TMP0        ;STORE LSB QUOTIENT
 6208  035160  010237  001162              MOV     R2,$TMP1        ;STORE MSB QUOTIENT
 6209  035164  012746  001160              MOV     #$TMP0,-(SP)    ;PUSH LSB ON STACK
 6210  035170  004737  041424              JSR     PC,$DB2D        ;CONVERT TO ASCII
 6211  035174  004737  041654              JSR     PC,$SUPRS       ;TYPE IT
 6212  035200  000207                      RTS     PC
 6213
 6214                                  ;
 6215                                  ;ROUTINE TO TURN L OR P CLOCK INTERRUPT ON
 6216                                  ;
 6216  035202  012746  000000  CLKON:    MOV     #PRO,-(SP)      ;PSW LOADED TO BE
 6217  035206  012746  035214              MOV     #2$,-(SP)       ;LSI-11 COMPATABLE
 6218  035212  000002                      RTI                     ;ENABLE CLOCK INTERRUPTS
 6219  035214  005037  001416      2$:     CLR     TIMUP
 6220  035220  005737  005516              TST     PCLKF
 6221  035224  001004                      BNE     1$              ;BRANCH IF P-CLOCK PRESENT
 6222  035226  012777  000100  144112      MOV     #100,@LKS       ;L-CLOCK, ENABLE INT
 6223  035234  000207                      RTS     PC
 6224  035236  012777  177777  144076  1$: MOV     #-1,@PKSB       ;P-CLOCK, ALL 1'S
 6225  035244  012777  000135  144066      MOV     #135,@PKS       ;ENABLE INT, CT UP, REP INT
 6226  035252  000207                      RTS     PC              ;LINE FREQ & RUN
 6227                                  ;
 6228                                  ;KW11-L & KW11-P INTERRUPT HANDLER
 6229                                  ;
 6230  035254  005037  001416  CLOCK:    CLR     TIMUP
 6231  035260  005337  001412              DEC     COUNT
 6232  035264  001010                      BNE     1$
 6233  035266  013737  001410  001412      MOV     HZ,COUNT
 6234  035274  005337  001414              DEC     SEC
 6235  035300  001002                      BNE     1$
 6236  035302  005237  001416              INC     TIMUP           ;SORRY, TIME IS UP
 6237  035306  000002              1$:     RTI
 6238                                  ;
 6239                                  ;ROUTINE TO TURN L OR P CLOCK INTERRUPT OFF
```

```
                                ;
035310  012746  000340          CLKOF:  MOV     #PR7,-(SP)      ;PSW LOADED TO BE
035314  012746  035322                  MOV     #2$,-(SP)       ;LSI-11 COMPATABLE
035320  000002                          RTI                     ;LOCK OUT ALL INTERRUPTS
035322  005737  005516          2$:     TST     PCLKF
035326  001003                          BNE     1$              ;BRACH IF P-CLOCK PRESENT
035330  005077  144012                  CLR     @LKS            ;L-CLOCK, CLEAR INTERRUPT
035334  000207                          RTS     PC
035336  005077  143776          1$:     CLR     @PKS            ;P-CLOCK, CLEAR INTERRUPT
035342  000207                          RTS     PC
                                ;
                                ;THIS ROUTINE CHECKS RKMR2 (MSGA)-WORDS 0 & 1
                                ;ENTER WITH SHOULD BE VALUE IN SBMR2.
                                ;RETURN IF NO COMPARE, RETURN +2 IF COMPARE
                                ;
035344  013746  005450          CKMR2:  MOV     TEMP1,-(SP)     ;SAV TEMP1
035350  053737  001222  005444          BIS     $UNIT,SBMR2     ;INSERT DRIVE #
035356  013737  005444  005450          MOV     SBMR2,TEMP1
035364  004737  035524                  JSR     PC,SBPAR        ;GET PARITY FOR SBMR2
035370  013737  005450  005444          MOV     TEMP1,SBMR2     ;NOW HAS PARITY
035376  023737  005444  005434          CMP     SBMR2,HMR2      ;SHOULD BE SAME
035404  001005                          BNE     1$
035406  012637  005450                  MOV     (SP)+,TEMP1     ;RESTOR TEMP1
035412  062716  000002                  ADD     #2,(SP)         ;COMPARE OK, SKIP OVER ERROR.
035416  000207                          RTS     PC
035420  012637  005450          1$:     MOV     (SP)+,TEMP1     ;RESTOR TEMP1
035424  000207                          RTS     PC
                                ;
                                ;THIS ROUTINE CHECKS RKMR3 (MSGB)-WORDS 0 & 1
                                ;ENTER WITH SHOULD BE VALUE IN SBMR3
                                ;RETURN IF NO COMPARE, RETURN +2 IF COMPARE
                                ;
035426  013746  005450          CKMR3:  MOV     TEMP1,-(SP)     ;SAV TEMP1
035432  013737  005432  005450          MOV     HMR1,TEMP1
035440  042737  177774  005450          BIC     #^C<M.ID>,TEMP1
035446  053737  005450  005446          BIS     TEMP1,SBMR3     ;INSERT WORD #
035454  013737  005446  005450          MOV     SBMR3,TEMP1
035462  004737  035524                  JSR     PC,SBPAR        ;GET PARITY FOR SBMR3
035466  013737  005450  005446          MOV     TEMP1,SBMR3     ;NOW HAS PARITY
035474  023737  005446  005436          CMP     SBMR3,HMR3      ;SHOULD BE SAME
035502  001005                          BNE     1$
035504  012637  005450                  MOV     (SP)+,TEMP1     ;RESTOR TEMP1
035510  062716  000002                  ADD     #2,(SP)         ;COMPARE OK, SKIP OVER ERROR.
035514  000207                          RTS     PC
035516  012637  005450          1$:     MOV     (SP)+,TEMP1     ;RESTOR TEMP1
035522  000207                          RTS     PC
                                ;
                                ;THIS ROUTINE GENERATES PARITY FOR SBMR2 AND SBMR3
                                ;ENTER WITH SBMR2 / SBMR3 IN TEMP1
                                ; TEMP1 IS ROTATED LEFT 17 TIMES. EACH TIME THE CARRY BIT IS SET,
                                ;R1 IS INCREMENTED. AT THE END OF 17 ROTATES ( TEMP1 BACK TO ORIG),
                                ;R1 BIT 0 IS EXAMINED. IF IT IS SET, INDICATING AN ODD # OF 1'S,
                                ; THE PARITY BIT IS NOT SET IN B .
```

```
                                        ;IF IT IS NOT SET, INDICATING AN EVEN # OF 1'S ,THE PARITY BIT IS
                                        ;SET IN TEMP1
                                        ;
035524  010046                  $BPAR:  MOV     R0,-(SP)        ;SAVE R0
035526  010146                          MOV     R1,-(SP)        ;SAVE R1
035530  012700  000021                  MOV     #17.,R0         ;SHIFT COUNTER
035534  005001                          CLR     R1              ;COUNT # OF 1'S IN TEMP1
035536  000241                          CLC                     ;CLEAR CARRY
                                
035540  006137  005450          1$:     ROL     TEMP1
035544  103001                          BCC     2$              ;BR IF CARRY CLEAR
035546  005201                          INC     R1              ;COUNT # OF 1'S
035550  005300                  2$:     DEC     R0              ;SHIFT COUNTER
035552  001372                          BNE     1$
                                
035554  032701  000001                  BIT     #BIT0,R1
035560  001003                          BNE     3$              ;BR IF ODD # IN R0
035562  052737  100000  005450          BIS     #M.PAR,TEMP1    ;SET PARITY BIT
035570  012601                  3$:     MOV     (SP)+,R1        ;RESTORE R1
035572  012600                          MOV     (SP)+,R0        ;RESTORE R0
035574  000207                          RTS     PC
                                
                                        ;
                                        ;ROUTINE TO ENABLE LOOPING ON INTERMITTANT ERRORS
                                        ;WHEN $LPERR SET BY OTHER THAN SCOPE ROUTINE
                                        ; IE: MY LOOP MACRO
                                        ;
035576  032777  001000  143334  $SCOP1$: BIT     #SW9,@SWR       ;LOOP ON ERROR?
035604  001406                          BEQ     1$              ;BR IF NO
035606  105737  001103                  TSTB    $ERFLG          ;HAD ERROR?
035612  001403                          BEQ     1$              ;BR IF NO
035614  013716  001110                  MOV     $LPERR,(SP)
035620  000002                          RTI
                                
035622  011637  001110          1$:     MOV     (SP),$LPERR     ;SET LOOP ADDR FOR TIGHT SCOPE LOOP
035626  000002                          RTI
                                
                                
                                
                                        .SBTTL  UNEXPECTED TIMEOUT HANDLER
                                
                                        ;
                                        ;THIS ROUTINE IS ENTERED IF THERE IS
                                        ;       A.  NON EXISTANT MEMORY (NO SSYN)
                                        ;       B.  BOUNDRY ERROR
                                        ;       C.  STACK OVERFLOW
                                        ;
035630  011600                  BADTMO: MOV     (SP),R0         ;SAVE PC WHERE TIMEOUT OCCURRED.
035632  005740                          TST     -(R0)           ;GET PC BEFORE UPDATE
035634  032777  020000  143276          BIT     #SW13,@SWR      ;INHIBIT ERR TYPOUT?
035642  001005                          BNE     1$              ;YES, DON'T TYPE
035644  104401  046365                  TYPE    ,EM3            ;ABORT TESTS,UNEXP T.O. @ PC=
035650  010046                          MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
                                                                ;;TYPE PC
035652  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
```

```
6352  035654  000006                          .BYTE   6               ;;TYPE 6 DIGIT(S)
6353  035655  000000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
6354  035656  032777  001000  143254  1$:     BIT     #SW9,@SWR       ;LOOP ON ERROR?
6355  035664  001403                          BEQ     2$              ;NO, BRANCH
6356  035666  022626                          CMP     (SP)+,(SP)+     ;YES, RESTORE STACK
6357  035670  000177  143212                  JMP     @$LPADR         ;GO TO STARTING ADDR OF TEST
6358                                                                  ;THAT GAVE BAD TIMEOUT
6359  035674  032777  040000  143236  2$:     BIT     #SW14,@SWR      ;LOOP ON TEST?
6360  035702  001401                          BEQ     3$              ;NO BRANCH
6361  035704  000002                          RTI                     ;YES
6362
6363  035706  000000                  3$:     HALT                    ;UNEXPECTED TIME OUT OCCURRED
6364                                                                  ;AS INDICATED. YOU CAN LOOP ON
6365                                                                  ;ERROR, LOOP ON TEST OR INHIBIT
6366                                                                  ;ERROR TYPEOUT BY SETTING THOSE
6367                                                                  ;SWITCHES.
6368                                                                  ;
6369  035710  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
6370  035712  000137  031462                  JMP     $EOP1           ;ABORT TESTS
6371
6372                          .SBTTL  UNEXPECTED INTERRUPT HANDLER
6373
6374                          ;
6375                          ;THIS ROUTINE CHECKS SW13 (INH ERR TYPOUT), SW9 (LOOP ON ERR)
6376                          ;& SW14 (LOOP ON TEST).
6377                          ;
6378
6379  035716  011600          BADINT: MOV     (SP),R0         ;SAVE PC WHERE INT OCCURRED
6380  035720  005740                  TST     -(R0)           ;GET PC BEFORE UPDATE
6381  035722  032777  020000  143210  BIT     #SW13,@SWR      ;INHIBIT ERR TYPEOUT?
6382  035730  001005                  BNE     1$              ;YES, DONT TYPE
6383  035732  104401  046440          TYPE    ,EM4            ;ABORT TESTS, UNEXP INT @ PC=
6384  035736  010046                  MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
6385                                                          ;;TYPE PC
6386  035740  104403                  TYPOS                   ;;GO TYPE--OCTAL ASCII
6387  035742     006                  .BYTE   6               ;;TYPE 6 DIGIT(S)
6388  035743     000                  .BYTE   0               ;;SUPPRESS LEADING ZEROS
6389
6390  035744  032777  001000  143166  1$:     BIT     #SW9,@SWR       ;LOOP ON ERROR?
6391  035752  001403                          BEQ     2$              ;NO, BRANCH
6392  035754  022626                          CMP     (SP)+,(SP)+     ;YES, RESTORE STACK
6393  035756  000177  143124                  JMP     @$LPADR         ;GO TO THE STARTING ADDR OF
6394                                                                  ;TEST THAT GAVE UNEXP. INT.
6395  035762  032777  040000  143150  2$:     BIT     #SW14,@SWR      ;LOOP ON TEST?
6396  035770  001401                          BEQ     3$              ;NO, BRANCH
6397  035772  000002                          RTI                     ;YES.
6398
6399  035774  000000                  3$:     HALT                    ;UNEXPECTED INTERRUPT OCCURRED AS
6400                                                                  ;INDICATED. YOU CAN LOOP ON ERROR,
6401                                                                  ;LOOP ON TEST OR INHIBIT
6402                                                                  ;ERROR TYPEOUT BY SETTING THOSE
6403                                                                  ;SWITCHES
6404                                                                  ;
6405  035776  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
6406  036000  000137  031462                  JMP     $EOP1           ;ABORT TESTS
6407
```

```
                                        .SBTTL  MEMORY CHECK ENABLE TRAP

036004  012737  036020  001176  MEMERR: MOV     #1$,$ESCAPE
036012  011637  001354                  MOV     (SP),TRAPPC     ;STORE PC
036016  104041                          ERROR   41              ;UNEXP MEM PARITY TRAP
036020  005037  001176          1$:     CLR     $ESCAPE
036024  032777  001000  143106        BIT     #SW9,@SWR       ;CHECK IF LOOP ON ERROR
036032  001001                        BNE     2$              ;YES, FORCE STACK AND TRY AGAIN
036034  000002                        RTI                     ;ELSE RETURN

036036  012706  001100          2$:     MOV     #STACK,SP       ;INIT STACK
036042  000177  143042                  JMP     @$LPERR         ;LOOP ON ERROR


                                        .SBTTL  RK06 INTERRUPT HANDLER

036046  000240          INTER:  NOP
036050  000240                  NOP
036052  000240                  NOP
036054  011600                  MOV     (SP),R0         ;SAVE PC WHERE INT OCCURRED.
036056  005740                  TST     -(R0)           ;GET PC BEFORE UPDATE.
036060  104401  043307          TYPE    ,MSG6           ;INT AT PC=
036064  010046                  MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
                                                        ;;TYPE PC
036066  104403                  TYPOS                   ;;GO TYPE--OCTAL ASCII
036070     006                  .BYTE   6               ;;TYPE 6 DIGIT(S)
036071     000                  .BYTE   0               ;;SUPPRESS LEADING ZEROS
036072  000000                  HALT
036074  000240                  NOP
036076  000240                  NOP
036100  000002                  RTI


                                        .SBTTL  POWER DOWN AND UP ROUTINES

                                        ;POWER DOWN ROUTINE

036102  012737  036114  000024  $PWRDN: MOV     #$PWRUP,PWRVEC  ;SET UP VECTOR
036110  000000                  HALT
036112  000776                  BR      .-2             ;HANG UP.


                                        ;POWER UP ROUTINE

036114  005037  036166          $PWRUP: CLR     $PWRCT          ;WAIT LOOP FOR TTY
036120  005237  036166          1$:     INC     $PWRCT          ;WAIT FOR THE INCR
036124  001375                  BNE     1$              ;OF WORD
036126  012737  036102  000024        MOV     #$PWRDN,PWRVEC  ;SET POWER DOWN VECTOR
036134  012737  000340  000026        MOV     #PR7,PWRVEC+2   ;PRIORITY 7
036142  012737  000340  000036        MOV     #PR7,TRAPVEC+2  ;LOCKOUT ALL INTERRUPTS FOR TRAPS
036150  012706  001100                MOV     #STACK,SP       ;INITIALIZE STACK
036154  104401  043477                TYPE    ,MSG11          ;REPORT POWER FAIL
036160  000005                        RESET
036162  000137  013106                JMP     PFSRT

036166  000000          $PWRCT: 0                       ;WAIT COUNT FOR TTY

                        ;
```

```
                                        ;DIVISION UTILITY ROUTINE
                                        ;
                                        ;R0-R1-R2-R3=DIVIDEND
                                        ;R4-R5=DIVISOR
                                        ;R0-R1=REMAINDER AFTER DIVISION
                                        ;R2-R3=QUOTIENT AFTER DIVISION
                                        ;ENTER WITH JSR PC,M.DPID
                                        ;
036170  012746  000040        M.DPID: MOV     #40,-(SP)       ;COUNTER FOR DIVISION CYCLES
036174  010446                MOV     R4,-(SP)        ;HI ORDER
036176  010546                MOV     R5,-(SP)        ;LO ORDER TO THE STACK
036200  005466  000002        NEG     2(SP)           ;FORM NEGATIVE
036204  005416                NEG     @SP             ;VERSION OF DIVISOR
036206  005666  000002        SBC     2(SP)
036212  061601                ADD     @SP,R1
036214  005500                ADC     R0              ;PERFORM INIT SUBT.
036216  066600  000002        ADD     2(SP),R0
036222  103445                BCS     M.DP50          ;IF CARRY THEN OVERFLOW HAS OCCURRED
036224  005046                CLR     -(SP)           ;THIS IS A LONGER LASTING CARRY BIT
036226  006103        M.DP40: ROL     R3
036230  006102                ROL     R2
036232  006101                ROL     R1
036234  006100                ROL     R0
036236  005716                TST     @SP             ;TEST CARRY INDICATOR
036240  001410                BEQ     M.DP41          ;IF TO CARRY THEN ADD, ELSE SUBT.
036242  005016                CLR     @SP             ;CLEAR UP FOR NEXT TIME
036244  066601  000002        ADD     2(SP),R1
036250  005500                ADC     R0              ;ADD -(DIVISOR)
036252  005516                ADC     @SP             ;SET CARRY
036254  066600  000004        ADD     4(SP),R0
036260  000404                BR      M.DP42

036262  060501        M.DP41: ADD     R5,R1
036264  005500                ADC     R0              ;ADD +(DIVISOR)
036266  005516                ADC     @SP             ;SET CARRY
036270  060400                ADD     R4,R0
036272  005516        M.DP42: ADC     @SP             ;SET CARRY
036274  005716                TST     @SP             ;TEST THE UPDATE INDICATOR
036276  001401                BEQ     .+4             ;IF 0,FORGET IT
036300  005203                INC     R3              ;NO CARRY POSSIBLE HERE
036302  005366  000006        DEC     6(SP)           ;DECREMENT CTR
036306  003347                BGT     M.DP40          ;BR IF MORE TO DO
036310  006003                ROR     R3
036312  103404                BCS     M.DP44
036314  060501                ADD     R5,R1
036316  005500                ADC     R0
036320  060400                ADD     R4,R0
036322  000241                CLC

036324  006103        M.DP44: ROL     R3
036326  062706  000010        ADD     #10,SP          ;ADJUST STACK BY 4 WORDS
036332  000242                CLV
036334  000207                RTS     PC

036336  062706  000006        M.DP50: ADD     #6,SP
036342  000262                SEV
```

```
 6520  036344  000207                          RTS     PC
 6521
```

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

036346                          $SCOPE:
036346  104407                          CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
036350  032777  040000  142562  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
036356  001114                          BNE     $OVER           ;;YES IF SW14=1
                                ;#####START OF CODE FOR THE XOR TESTER#####
036360  000416                  $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                                ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
036362  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
036366  012737  036406  000004          MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
036374  005737  177060                  TST     @#177060        ;;TIME OUT ON XOR?
036400  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
036404  000463                          BR      $SVLAD          ;;GO TO THE NEXT TEST
036406  022626                  5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
036410  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
036414  000423                          BR      7$              ;;LOOP ON THE PRESENT TEST
036416                          6$:;#####END OF CODE FOR THE XOR TESTER#####
036416  032777  000400  142514          BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
036424  001404                          BEQ     2$              ;;BR IF NO
036426  127737  142506  001102          CMPB    @SWR,$TSTNM     ;;ON THE RIGHT TEST?    SWR<7:0>
036434  001465                          BEQ     $OVER           ;;BR IF YES
036436  105737  001103          2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
036442  001421                          BEQ     3$              ;;BR IF NO
036444  123737  001115  001103          CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
036452  101015                          BHI     3$              ;;BR IF NO
036454  032777  001000  142456          BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
036462  001404                          BEQ     4$              ;;BR IF NO
036464  013737  001110  001106  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
036472  000446                          BR      $OVER
036474  105037  001103          4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
036500  005037  001174                  CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
036504  000415                          BR      1$              ;;ESCAPE TO THE NEXT TEST
036506  032777  004000  142424  3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
036514  001011                          BNE     1$              ;;BR IF YES
036516  005737  001216                  TST     $PASS           ;;IF FIRST PASS OF PROGRAM
036522  001406                          BEQ     1$              ;;      INHIBIT ITERATIONS
036524  005237  001104                  INC     $ICNT           ;;INCREMENT ITERATION COUNT
036530  023737  001174  001104          CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
036536  002024                          BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
036540  012737  000001  001104  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
036546  013737  036624  001174          MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
036554  105237  001102          $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
036560  113737  001102  001214          MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
```

```
                                ;;*****************************************************************
                                ;*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

036626                          $ERROR:
036626  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
036630  105237  001103          7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
036634  001775                          BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
036636  013777  001102  142276          MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
036644  032777  002000  142266          BIT     #BIT10,@SWR     ;;BELL ON ERROR?
036652  001402                          BEQ     1$              ;;NO - SKIP
036654  104401  001200                  TYPE    ,$BELL          ;;RING BELL
036660  005237  001112          1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
036664  011637  001116                  MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
036670  162737  000002  001116          SUB     #2,$ERRPC
036676  117737  142214  001114          MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
036704  032777  020000  142226          BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
036712  001004                          BNE     20$             ;;SKIP TYPEOUTS
036714  004737  054364                  JSR     PC,TYPERR       ;;GO TO USER ERROR ROUTINE
036720  104401  001205                  TYPE    ,$CRLF
036724                          20$:
036724  122737  000001  001230          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
036732  001007                          BNE     2$              ;;NO,SKIP APT ERROR REPORT
036734  113737  001114  036746          MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
036742  004737  037552                  JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
036746     000                  21$:    .BYTE   0
036747     000                          .BYTE   0
036750  000777                  22$:    BR      22$             ;;APT ERROR LOOP
036752  005777  142162          2$:     TST     @SWR            ;;HALT ON ERROR
036756  100002                          BPL     3$              ;;SKIP IF CONTINUE
036760  000000                          HALT                    ;;HALT ON ERROR!
036762  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
036764  032777  001000  142146  3$:     BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
036772  001402                          BEQ     4$              ;;BR IF NO
036774  013716  001110                  MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
037000  005737  001176          4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
037004  001402                          BEQ     5$              ;;BR IF NONE
037006  013716  001176                  MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
```

```
                                5$:
037012
037012  022737  031550  000042          CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
037020  001001                          BNE     6$              ;;BRANCH IF NO
037022  000000                          HALT                    ;;YES
037024                          6$:
037024  000002                          RTI                     ;;RETURN
                                .SBTTL  TYPE ROUTINE

                                ;;**************************************************************
                                ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                ;*NOTE1:         $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                ;*NOTE2:         $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                ;*NOTE3:         $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                ;*
                                ;*CALL:
                                ;*1) USING A TRAP INSTRUCTION
                                ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                ;*OR
                                ;*      TYPE
                                ;*      MESADR
                                ;*

037026  105737  001157          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
037032  100002                          BPL     1$              ;;BR IF YES
037034  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
037036  000430                          BR      3$              ;;LEAVE
037040  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
037042  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
037046  122737  000001  001230          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
037054  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
037056  132737  000100  001231          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
037064  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
037066  010037  037076                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
037072  004737  037542                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
037076  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
037100  132737  000040  001231  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
037106  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
037110  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
037112  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
037114  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
037116  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
037120  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
037124  000002                          RTI                     ;;RETURN
037126  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
037132  001430                          BEQ     8$
037134  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
037140  001006                          BNE     5$
037142  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
037144  104401                          TYPE                    ;;TYPE A CR AND LF
037146  001205                          $CRLF
037150  105037  037304                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
037154  000755                          BR      2$              ;;GET NEXT CHARACTER
037156  004737  037240          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
037162  123726  001156          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
037166  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
```

```
6690  037170  013746  001154                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
6691                                                                    ;;AND THE NULL CHAR.
6692  037174  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
6693  037200  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
6694  037202  004737  037240                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
6695  037206  105337  037304                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
6696  037212  000770                          BR      7$              ;;LOOP
6697
6698                                  ;HORIZONTAL TAB PROCESSOR
6699
6700  037214  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
6701  037220  004737  037240          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
6702  037224  132737  000007  037304          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
6703  037232  001372                          BNE     9$              ;;TAB STOP
6704  037234  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
6705  037236  000724                          BR      2$              ;;GET NEXT CHARACTER
6706  037240  105777  141704          $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
6707  037244  100375                          BPL     $TYPEC
6708  037246  116677  000002  141676          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
6709  037254  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
6710  037262  001003                          BNE     1$              ;;BRANCH IF NO
6711  037264  105037  037304                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
6712  037270  000406                          BR      $TYPEX          ;;EXIT
6713  037272  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
6714  037300  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
6715  037302  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
6716  037304  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
6717  037306  000207          $TYPEX: RTS     PC
6718
6719                                  .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
6720
6721                                  ;;**************************************************************
6722                                  ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
6723                                  ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
6724                                  ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
6725                                  ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
6726                                  ;*REPLACED WITH SPACES.
6727                                  ;*CALL:
6728                                  ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
6729                                  ;*      TYPDS                   ;;GO TO THE ROUTINE
6730
6731  037310                          $TYPDS:
6732  037310  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
6733  037312  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
6734  037314  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
6735  037316  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
6736  037320  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
6737  037322  012746  020200                  MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
6738  037326  016605  000020                  MOV     20(SP),R5       ;;GET THE INPUT NUMBER
6739  037332  100004                          BPL     1$              ;;BR IF INPUT IS POS.
6740  037334  005405                          NEG     R5              ;;MAKE THE BINARY NUMBER POS.
6741  037336  112766  000055  000001          MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
6742  037344  005000          1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
6743  037346  012703  037524                  MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
6744  037352  112723  000040                  MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
6745  037356  005002          2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
```

```
6746  037360  016001  037514          MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
6747  037364  160105          3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
6748  037366  002402                  BLT     4$              ;;BR IF DONE
6749  037370  005202                  INC     R2              ;;INCREASE THE BCD DIGIT BY 1
6750  037372  000774                  BR      3$
6751  037374  060105          4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
6752  037376  005702                  TST     R2              ;;CHECK IF BCD DIGIT=0
6753  037400  001002                  BNE     5$              ;;FALL THROUGH IF 0
6754  037402  105716                  TSTB    (SP)            ;;STILL DOING LEADING 0'S?
6755  037404  100407                  BMI     7$              ;;BR IF YES
6756  037406  106316          5$:     ASLB    (SP)            ;;MSD?
6757  037410  103003                  BCC     6$              ;;BR IF NO
6758  037412  116663  000001  177777  MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
6759  037420  052702  000060    6$:   BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
6760  037424  052702  000040    7$:   BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
6761  037430  110223                  MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
6762  037432  005720                  TST     (R0)+           ;;JUST INCREMENTING
6763  037434  020027  000010          CMP     R0,#10          ;;CHECK THE TABLE INDEX
6764  037440  002746                  BLT     2$              ;;GO DO THE NEXT DIGIT
6765  037442  003002                  BGT     8$              ;;GO TO EXIT
6766  037444  010502                  MOV     R5,R2           ;;GET THE LSD
6767  037446  000764                  BR      6$              ;;GO CHANGE TO ASCII
6768  037450  105726          8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
6769  037452  100003                  BPL     9$              ;;BR IF NO
6770  037454  116663  177777  177776  MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
6771  037462  105013          9$:     CLRB    (R3)            ;;SET THE TERMINATOR
6772  037464  012605                  MOV     (SP)+,R5        ;;POP STACK INTO R5
6773  037466  012603                  MOV     (SP)+,R3        ;;POP STACK INTO R3
6774  037470  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
6775  037472  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
6776  037474  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
6777  037476  104401  037524          TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
6778  037502  016666  000002  000004  MOV     2(SP),4(SP)     ;;ADJUST THE STACK
6779  037510  012616                  MOV     (SP)+,(SP)
6780  037512  000002                  RTI                     ;;RETURN TO USER
6781  037514  023420          $DTBL:  10000.
6782  037516  001750                  1000.
6783  037520  000144                  100.
6784  037522  000012                  10.
6785  037524  000004          $DBLK:  .BLKW   4
6786                          .SBTTL  APT COMMUNICATIONS ROUTINE
6787
6788                          ;;**********************************************************************
6789  037534  112737  000001  040000  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
6790  037542  112737  000001  037776  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
6791  037550  000403                  BR      $ATYC
6792  037552  112737  000001  040000  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
6793  037560                  $ATYC:
6794  037560  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
6795  037562  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
6796  037564  105737  037776          TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
6797  037570  001450                  BEQ     5$              ;;IF NOT:  BR
6798  037572  122737  000001  001230  CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
6799  037600  001031                  BNE     3$              ;;IF NOT:  BR
6800  037602  132737  000100  001231  BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
6801  037610  001425                  BEQ     3$              ;;IF NOT:  BR
```

```
6802  037612  017600  000004          MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
6803  037616  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
6804  037624  005737  001210    1$:   TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
6805  037630  001375                  BNE     1$              ;;IF NOT:  WAIT
6806  037632  010037  001224          MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
6807  037636  105720            2$:   TSTB    (R0)+           ;;FIND END OF MESSAGE
6808  037640  001376                  BNE     2$
6809  037642  163700  001224          SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
6810  037646  006200                  ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
6811  037650  010037  001226          MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
6812  037654  012737  000004  001210  MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
6813  037662  000413                  BR      5$
6814  037664  017637  000004  037710  3$:   MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
6815  037672  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
6816  037700  013746  177776          MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
6817  037704  004737  037026          JSR     PC,$TYPE        ;;CALL TYPE MACRO
6818  037710  000000            4$:   .WORD   0
6819  037712                    5$:
6820  037712  105737  040000    10$:  TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
6821  037716  001416                  BEQ     12$             ;;IF NOT:  BR
6822  037720  005737  001230          TST     $ENV            ;;RUNNING UNDER APT?
6823  037724  001413                  BEQ     12$             ;;IF NOT:  BR
6824  037726  005737  001210    11$:  TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
6825  037732  001375                  BNE     11$             ;;IF NOT:  WAIT
6826  037734  017637  000004  001212  MOV     @4(SP),$FATAL   ;;GET ERROR #
6827  037742  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
6828  037750  005237  001210          INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
6829  037754  105037  040000    12$:  CLRB    $FFLG           ;;CLEAR FATAL FLAG
6830  037760  105037  037777          CLRB    $LFLG           ;;CLEAR LOG FLAG
6831  037764  105037  037776          CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
6832  037770  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
6833  037772  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
6834  037774  000207                  RTS     PC              ;;RETURN
6835  037776     000  $MFLG:  .BYTE   0               ;;MESSG. FLAG
6836  037777     000  $LFLG:  .BYTE   0               ;;LOG FLAG
6837  040000     000  $FFLG:  .BYTE   0               ;;FATAL FLAG
6838        040002          .EVEN
6839        000200  APTSIZE=200
6840        000001  APTENV=001
6841        000100  APTSPOOL=100
6842        000040  APTCSUP=040
6843                .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
6844
6845                ;;**************************************************************
6846                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
6847                ;*OCTAL (ASCII) NUMBER AND TYPE IT.
6848                ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
6849                ;*CALL:
6850                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
6851                ;*      TYPOS                   ;;CALL FOR TYPEOUT
6852                ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
6853                ;*      .BYTE   M               ;;M=1 OR 0
6854                ;*                                      ;;1=TYPE LEADING ZEROS
6855                ;*                                      ;;0=SUPPRESS LEADING ZEROS
6856                ;*
6857                ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
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```
                                        ;*$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

040002  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
040006  116637  000001  040225          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
040014  112637  040227                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
040020  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
040024  000406                          BR      $TYPON
040026  112737  000001  040225  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
040034  112737  000006  040227          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
040042  112737  000005  040224  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
040050  010346                          MOV     R3,-(SP)        ;;SAVE R3
040052  010446                          MOV     R4,-(SP)        ;;SAVE R4
040054  010546                          MOV     R5,-(SP)        ;;SAVE R5
040056  113704  040227                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
040062  005404                          NEG     R4
040064  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
040070  110437  040226                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
040074  113704  040225                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
040100  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
040104  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
040106  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
040110  000404                          BR      3$              ;;GO DO MSB
040112  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
040114  006105                          ROL     R5
040116  006105                          ROL     R5
040120  010503                          MOV     R5,R3
040122  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
040124  105337  040226                  DECB    $OMODE          ;;TYPE THIS DIGIT?
040130  100016                          BPL     7$              ;;BR IF NO
040132  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
040136  001002                          BNE     4$              ;;TEST FOR 0
040140  005704                          TST     R4              ;;SUPPRESS THIS 0?
040142  001403                          BEQ     5$              ;;BR IF YES
040144  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
040146  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
040152  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
040156  110337  040222                  MOVB    R3,8$           ;;SAVE FOR TYPING
040162  104401  040222                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
040166  105337  040224          7$:     DECB    $OCNT           ;;COUNT BY 1
040172  003347                          BGT     2$              ;;BR IF MORE TO DO
040174  002402                          BLT     6$              ;;BR IF DONE
040176  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
040200  000744                          BR      2$              ;;GO DO THE LAST DIGIT
040202  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
040204  012604                          MOV     (SP)+,R4        ;;RESTORE R4
040206  012603                          MOV     (SP)+,R3        ;;RESTORE R3
040210  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
040216  012616                          MOV     (SP)+,(SP)
```

```
 6914  040220  000002                        RTI                     ;;RETURN
 6915  040222     000          8$:          .BYTE   0               ;;STORAGE FOR ASCII DIGIT
 6916  040223     000                       .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
 6917  040224     000          $OCNT:       .BYTE   0               ;;OCTAL DIGIT COUNTER
 6918  040225     000          $OFILL:      .BYTE   0               ;;ZERO FILL SWITCH
 6919  040226  000000          $OMODE:      .WORD   0               ;;NUMBER OF DIGITS TO TYPE
 6920                                       .SBTTL  TTY INPUT ROUTINE
 6921
 6922                                       ;;**************************************************************
 6923                                       .ENABL  LSB
 6924
 6925                                       ;;**************************************************************
 6926                                       ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
 6927                                       ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
 6928                                       ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
 6929                                       ;*WHEN OPERATING IN TTY FLAG MODE.
 6930  040230  022737  000176  001140  $CKSWR:  CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
 6931  040236  001074                        BNE     15$             ;;BRANCH IF NO
 6932  040240  105777  140700                TSTB    @$TKS           ;;CHAR THERE?
 6933  040244  100071                        BPL     15$             ;;IF NO, DON'T WAIT AROUND
 6934  040246  117746  140674                MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
 6935  040252  042716  177600                BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
 6936  040256  022726  000007                CMP     #7,(SP)+        ;;IS IT A CONTROL G?
 6937  040262  001062                        BNE     15$             ;;NO, RETURN TO USER
 6938  040264  123727  001134  000001        CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
 6939  040272  001456                        BEQ     15$             ;;BRANCH IF YES
 6940
 6941  040274  104401  041115                TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
 6942  040300  104401  041122  $GTSWR:       TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
 6943  040304  013746  000176                MOV     $WREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
 6944  040310  104402                        TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
 6945  040312  104401  041133                TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
 6946  040316  005046          19$:         CLR     -(SP)           ;;CLEAR COUNTER
 6947  040320  005046                        CLR     -(SP)           ;;THE NEW SWR
 6948  040322  105777  140616          7$:   TSTB    @$TKS           ;;CHAR THERE?
 6949  040326  100375                        BPL     7$              ;;IF NOT TRY AGAIN
 6950
 6951  040330  117746  140612                MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
 6952  040334  042716  177600                BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
 6953
 6954
 6955
 6956  040340  021627  000025          9$:   CMP     (SP),#25        ;;IS IT A CONTROL-U?
 6957  040344  001005                        BNE     10$             ;;BRANCH IF NOT
 6958  040346  104401  041110                TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
 6959  040352  062706  000006          20$:  ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
 6960  040356  000757                        BR      19$             ;;LET'S TRY IT AGAIN
 6961
 6962
 6963  040360  021627  000015          10$:  CMP     (SP),#15        ;;IS IT A <CR>?
 6964  040364  001022                        BNE     16$             ;;BRANCH IF NO
 6965  040366  005766  000004                TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
 6966  040372  001403                        BEQ     11$             ;;BRANCH IF YES
 6967  040374  016677  000002  140536        MOV     2(SP),@SWR      ;;SAVE NEW SWR
 6968  040402  062706  000006          11$:  ADD     #6,SP           ;;CLEAR UP STACK
 6969  040406  104401  001205          14$:  TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
```

```
6970  040412  123727  001135  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
6971  040420  001003                          BNE     15$             ;;BRANCH IF NOT
6972  040422  012777  000100  140514          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
6973  040430  000002                  15$:     RTI                     ;;RETURN
6974  040432  004737  037240          16$:     JSR     PC,$TYPEC       ;;ECHO CHAR
6975  040436  021627  000060                   CMP     (SP),#60        ;;CHAR < 0?
6976  040442  002420                          BLT     18$             ;;BRANCH IF YES
6977  040444  021627  000067                   CMP     (SP),#67        ;;CHAR > 7?
6978  040450  003015                          BGT     18$             ;;BRANCH IF YES
6979  040452  042726  000060                   BIC     #60,(SP)+       ;;STRIP-OFF ASCII
6980  040456  005766  000002                   TST     2(SP)           ;;IS THIS THE FIRST CHAR
6981  040462  001403                          BEQ     17$             ;;BRANCH IF YES
6982  040464  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
6983  040466  006316                          ASL     (SP)            ;;   CHAR OVER TO MAKE
6984  040470  006316                          ASL     (SP)            ;;   ROOM FOR NEW ONE.
6985  040472  005266  000002          17$:     INC     2(SP)           ;;KEEP COUNT OF CHAR
6986  040476  056616  177776                   BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
6987  040502  000707                          BR      7$              ;;GET THE NEXT ONE
6988  040504  104401  001204          18$:     TYPE    ,$QUES          ;;TYPE ?<CR><LF>
6989  040510  000720                          BR      20$             ;;SIMULATE CONTROL-U
6990                                  .DSABL  LSB
6991
6992
6993                                  ;;*****************************************************************
6994                                  ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
6995                                  ;*CALL:
6996                                  ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
6997                                  ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
6998                                  ;*                              ;;WITH PARITY BIT STRIPPED OFF
6999                                  ;
7000
7001  040512  011646          $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
7002  040514  016666  000004  000002          MOV     4(SP),2(SP)     ;;SAVE THE PS
7003  040522  105777  140416          1$:     TSTB    @$TKS           ;;WAIT FOR
7004  040526  100375                          BPL     1$              ;;A CHARACTER
7005  040530  117766  140412  000004          MOVB    @$TKB,4(SP)     ;;READ THE TTY
7006  040536  042766  177600  000004          BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
7007  040544  026627  000004  000023          CMP     4(SP),#23       ;;IS IT A CONTROL-S?
7008  040552  001013                          BNE     3$              ;;BRANCH IF NO
7009  040554  105777  140364          2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
7010  040560  100375                          BPL     2$              ;;LOOP UNTIL ITS THERE
7011  040562  117746  140360                  MOVB    @$TKB,-(SP)     ;;GET CHARACTER
7012  040566  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
7013  040572  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
7014  040576  001366                          BNE     2$              ;;IF NOT DISCARD IT
7015  040600  000750                          BR      1$              ;;YES, RESUME
7016  040602  026627  000004  000140  3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
7017  040610  002407                          BLT     4$              ;;BRANCH IF YES
7018  040612  026627  000004  000175          CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
7019  040620  003003                          BGT     4$              ;;BRANCH IF YES
7020  040622  042766  000040  000004          BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
7021  040630  000002                  4$:     RTI                     ;;GO BACK TO USER
7022                                  ;;*****************************************************************
7023                                  ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
7024                                  ;*CALL:
7025                                  ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
```

```
                                        ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                                        ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
                                        $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
                                                CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
                                        1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
                                        2$:     CMP     #$TTYIN+22,R3   ;;BUFFER FULL?
                                                BLOS    4$              ;;BR IF YES
                                                RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
                                                MOVB    (SP)+,(R3)      ;;GET CHARACTER
                                        10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
                                                BNE     5$              ;;BR IF NO
                                                TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
                                                BNE     6$              ;;BR IF NO
                                                MOVB    #'\,9$          ;;TYPE A BACK SLASH
                                                TYPE    ,9$
                                                MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
                                        6$:     DEC     R3              ;;BACKUP BY ONE
                                                CMP     R3,#$TTYIN      ;;STACK EMPTY?
                                                BLO     4$              ;;BR IF YES
                                                MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
                                                TYPE    ,9$             ;;GO TYPE
                                                BR      2$              ;;GO READ ANOTHER CHAR.
                                        5$:     TST     (SP)            ;;RUBOUT KEY SET?
                                                BEQ     7$              ;;BR IF NO
                                                MOVB    #'\,9$          ;;TYPE A BACK SLASH
                                                TYPE    ,9$
                                                CLR     (SP)            ;;CLEAR THE RUBOUT KEY
                                        7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
                                                BNE     8$              ;;BR IF NO
                                                TYPE    ,$CNTLU         ;;TYPE A CONTROL "U"
                                                BR      1$              ;;GO START OVER
                                        8$:     CMPB    #22,(R3)        ;;IS CHARACTER A "↑R"?
                                                BNE     3$              ;;BRANCH IF NO
                                                CLRB    (R3)            ;;CLEAR THE CHARACTER
                                                TYPE    ,$CRLF          ;;TYPE A "CR" & "LF"
                                                TYPE    ,$TTYIN         ;;TYPE THE INPUT STRING
                                                BR      2$              ;;GO PICKUP ANOTHER CHACTER
                                        4$:     TYPE    ,$QUES          ;;TYPE A '?'
                                                BR      1$              ;;CLEAR THE BUFFER AND LOOP
                                        3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
                                                TYPE    ,9$
                                                CMPB    #15,(R3)+       ;;CHECK FOR RETURN
                                                BNE     2$              ;;LOOP IF NOT RETURN
                                                CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
                                                TYPE    ,$LF            ;;TYPE A LINE FEED
                                                TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
                                                MOV     (SP)+,R3        ;;RESTORE R3
                                                MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
                                                MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
                                                MOV     #$TTYIN,4(SP)
                                                RTI                     ;;RETURN
                                        9$:     .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
                                                .BYTE   0               ;;TERMINATOR
                                        $TTYIN: .BLKB   22              ;;RESERVE 22 BYTES FOR TTY INPUT
                                        $CNTLU: .ASCIZ  /↑U/<15><12>    ;;CONTROL "U"
```

```
7082  041115  136     006507  000012  $CNTLG: .ASCIZ  /↑G/<15><12>     ;;CONTROL "G"
7083  041122  005015  053523  020122  $MSWR:  .ASCIZ  <15><12>/SWR = /
7084  041130  020075  000
7085  041133  040     047040  053505  $MNEW:  .ASCIZ  /  NEW = /
7086  041140  036440  000040
7087                                  .SBTTL  READ AN OCTAL NUMBER FROM THE TTY
7088
7089                                  ;;*****************************************************************
7090                                  ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
7091                                  ;*CHANGE IT TO BINARY.
7092                                  ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
7093                                  ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
7094                                  ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
7095                                  ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
7096                                  ;*CALL:
7097                                  ;*      RDOCT                   ;;READ AN OCTAL NUMBER
7098                                  ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
7099                                  ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT
7100
7101  041144  011646          $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
7102  041146  016666  000004  000002          MOV     4(SP),2(SP)     ;;INPUT NUMBER
7103  041154  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
7104  041156  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
7105  041160  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
7106  041162  104411          1$:     RDLIN                   ;;READ AN ASCIZ LINE
7107  041164  012600                  MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
7108  041166  010037  041272          MOV     R0,5$           ;;AND SAVE IT
7109  041172  005001                  CLR     R1              ;;CLEAR DATA WORD
7110  041174  005002                  CLR     R2
7111  041176  112046          2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
7112  041200  001420                  BEQ     3$              ;;IF ZERO GET OUT
7113  041202  122716  000060          CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
7114  041206  003026                  BGT     4$              ;;IS AN OCTAL DIGIT
7115  041210  122716  000067          CMPB    #'7,(SP)
7116  041214  002423                  BLT     4$
7117  041216  006301                  ASL     R1              ;;*2
7118  041220  006102                  ROL     R2
7119  041222  006301                  ASL     R1              ;;*4
7120  041224  006102                  ROL     R2
7121  041226  006301                  ASL     R1              ;;*8
7122  041230  006102                  ROL     R2
7123  041232  042716  177770          BIC     #↑C7,(SP)       ;;STRIP THE ASCII JUNK
7124  041236  062601                  ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
7125  041240  000756                  BR      2$              ;;LOOP
7126  041242  005726          3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
7127  041244  010166  000012          MOV     R1,12(SP)       ;;SAVE THE RESULT
7128  041250  010237  041302          MOV     R2,$HIOCT
7129  041254  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
7130  041256  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
7131  041260  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
7132  041262  000002                  RTI                     ;;RETURN
7133  041264  005726          4$:     TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
7134  041266  105010                  CLRB    (R0)            ;;SET A TERMINATOR
7135  041270  104401                  TYPE                    ;;TYPE UP THRU THE BAD CHAR.
7136  041272  000000          5$:     .WORD   0
7137  041274  104401  001204          TYPE    ,$QUES          ;;"?" "CR" & "LF"
```

```
                                        BR      1$              ;;TRY AGAIN
                                $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
                                .SBTTL  DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT ROUTINE

                                ;;******************************************************************
                                ;*THIS ROUTINE WILL CONVERT A 32-BIT UNSIGNED BINARY NUMBER TO AN
                                ;*UNSIGNED OCTAL ASCIZ NUMBER.
                                ;*CALL
                                ;*      MOV     #PNTR,-(SP)     ;;POINTER TO LOW WORD OF BINARY NUMBER
                                ;*      JSR     PC,@#$DB2O      ;;CALL THE ROUTINE
                                ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK

                                $DB2O:  SAVREG                  ;;SAVE ALL REGISTERS
                                        MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
                                        MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
                                        MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
                                        MOV     #^C7,R3         ;;MASK
                                        MOV     (R1)+,R0        ;;LOWER WORD
                                        MOV     (R1)+,R1        ;;HIGH WORD
                                        CLR     R2              ;;TERMINATOR
                                1$:     MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
                                        MOV     R0,R2           ;;GET THIS DIGIT
                                        DEC     R4              ;;COUNT THIS CHARACTER
                                        BGT     3$              ;;BR IF NOT THE LAST DIGIT
                                        BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
                                        INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
                                        MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
                                        RESREG                  ;;RESTORE ALL REGISTERS
                                        RTS     PC              ;;RETURN TO USER
                                2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
                                3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
                                        ROR     R0              ;;      THE NEXT OCTAL DIGIT
                                        ROR     R1
                                        ROR     R0
                                        ROR     R1
                                        ROR     R0
                                        BIC     R3,R2           ;;MASK OUT ALL JUNK
                                        ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
                                        BR      1$              ;;GO PUT IT IN THE DATA TABLE
                                $OCTVL: .BLKB   14.             ;;RESERVE DATA TABLE
                                .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

                                $DB2D:  SAVREG                  ;;SAVE REGISTERS
                                        MOV     2(SP),R2        ;;PICKUP THE DATA POINTER
```

```
7194  041432  012700  041604              MOV     #$DECVL,R0      ;;GET ADDRESS OF "$DECVL" STRING
7195  041436  010066  000002              MOV     R0,2(SP)        ;;PUT ADDRESS OF ASCIZ STRING ON STACK
7196  041442  012201                      MOV     (R2)+,R1        ;;PICKUP THE BINARY NUMBER
7197  041444  012202                      MOV     (R2)+,R2
7198  041446  012737  000012  041522      MOV     #10.,4$         ;;SET UP TO DO 10 CONVERSIONS
7199  041454  012704  041534              MOV     #$TNPWR,R4      ;;ADDRESS OF TEN POWER
7200  041460  012705  041536              MOV     #$TNPWR+2,R5
7201  041464  005003              1$:     CLR     R3              ;;CLEAR PARTIAL
7202  041466  161401              2$:     SUB     (R4),R1         ;;SUBTRACT TEN POWER
7203  041470  005602                      SBC     R2
7204  041472  161502                      SUB     (R5),R2
7205  041474  002402                      BLT     3$              ;;BR IF TEN POWER TO LARGE
7206  041476  005203                      INC     R3              ;;ADD 1 TO PARTIAL
7207  041500  000772                      BR      2$              ;;LOOP
7208  041502  062401              3$:     ADD     (R4)+,R1        ;;RESTORE SUBTRACTED VALUE
7209  041504  005502                      ADC     R2
7210  041506  062402                      ADD     (R4)+,R2
7211  041510  022525                      CMP     (R5)+,(R5)+     ;;MOVE TO NEXT TEN POWER
7212  041512  052703  000060              BIS     #'0,R3          ;;CHANGE PARTIAL TO ASCII
7213  041516  110320                      MOVB    R3,(R0)+        ;;SAVE IT
7214  041520  005327                      DEC     (PC)+           ;;DONE?
7215  041522  000000              4$:     .WORD   0
7216  041524  001357                      BNE     1$              ;;BR IF NO
7217  041526  105020                      CLRB    (R0)+           ;;TERMINATOR
7218  041530  104414                      RESREG                  ;;RESTORE REGISTERS
7219  041532  000207                      RTS     PC              ;;RETURN
7220  041534  145000              $TNPWR: 145000                  ;;1.0E09
7221  041536  035632                      35632
7222  041540  160400                      160400                  ;;1.0E08
7223  041542  002765                      2765
7224  041544  113200                      113200                  ;;1.0E07
7225  041546  000230                      230
7226  041550  041100                      041100                  ;;1.0E06
7227  041552  000017                      17
7228  041554  103240                      103240                  ;;1.0E05
7229  041556  000001                      1
7230  041560  023420                      23420                   ;;1.0E04
7231  041562  000000                      0
7232  041564  001750                      1750                    ;;1.0E03
7233  041566  000000                      0
7234  041570  000144                      144                     ;;1.0E02
7235  041572  000000                      0
7236  041574  000012                      12                      ;;1.0E01
7237  041576  000000                      0
7238  041600  000001                      1                       ;;1.0E00
7239  041602  000000                      0
7240  041604  000014              $DECVL: .BLKB   12.             ;;RESERVE STORAGE FOR ASCIZ STRING
7241                              .SBTTL  SINGLE LENGTH BINARY TO DECIMAL ASCIZ ROUTINE
7242
7243                              ;;**************************************************************
7244                              ;*THIS ROUTINE WILL CONVERT A 16-BIT UNSIGNED BINARY NUMBER TO AN
7245                              ;*UNSIGNED DECIMAL ASCIZ NUMBER.
7246                              ;*CALL
7247                              ;*      MOV     NUMBER,-(SP)    ;;PUT BINARY NUMBER ON THE STACK
7248                              ;*      JSR     PC,@#$$B2D      ;;CALL
7249                              ;*      RETURN                  ;;ADDRESS OF THE 1ST ASCIZ CHAR.IS ON THE STACK
```

```
7250
7251
7252  041620  016637  000002  041650  $SB2D:  MOV     2(SP),1$        ;;SAVE BINARY NUMBER
7253  041626  012746  041650          MOV     #1$,-(SP)       ;;SET POINTER
7254  041632  004737  041424          JSR     PC,@#$DB2D      ;;CALL DOUBLE LENGTH CONVERT
7255  041636  062716  000005          ADD     #5,(SP)         ;;ONLY ALLOW FIVE CHARACTERS
7256  041642  012666  000002          MOV     (SP)+,2(SP)     ;;PICKUP POINTER
7257  041646  000207                  RTS     PC              ;;RETURN
7258  041650  000000  000000  1$:     .WORD   0,0
7259                           .SBTTL  TYPE NUMERICAL ASCIZ STRING SUPPRESS LEADING ZEROS
7260
7261                           ;;**********************************************************************
7262                           ;*THIS ROUTINE IS USED TO TYPE AN ASCIZ NUMBER SUPPRESSING THE
7263                           ;*LEADING NUMBERS.
7264                           ;*CALL
7265                           ;*      MOV     #NUMADR,-(SP)   ;;FIRST ADDRESS OF ASCIZ STRING
7266                           ;*      JSR     PC,@#$SUPRS
7267
7268
7269  041654  010046          $SUPRS: MOV     R0,-(SP)        ;;SAVE R0
7270  041656  016600  000004          MOV     4(SP),R0        ;;PICKUP THE POINTER
7271  041662  105710          1$:     TSTB    (R0)            ;;TERMINATEOR?
7272  041664  001403                  BEQ     2$              ;;BR IF YES
7273  041666  122720  000060          CMPB    #'0,(R0)+       ;;IS THIS AN ASCII "0" ?
7274  041672  001773                  BEQ     1$              ;;BR IF YES
7275  041674  005300          2$:     DEC     R0              ;;BACKUP BY "1"
7276  041676  010037  041704          MOV     R0,3$           ;;SAVE FOR TYPING
7277  041702  104401                  TYPE                    ;;GO TYPE
7278  041704  000000          3$:     .WORD   0               ;;ASCIZ POINTER GOES HERE
7279  041706  012600                  MOV     (SP)+,R0        ;;RESTORE R0
7280  041710  012616                  MOV     (SP)+,(SP)      ;;RESTORE THE STACK
7281  041712  000207                  RTS     PC              ;;RETURN
7282                           .SBTTL  INTEGER MULTIPLY ROUTINE
7283
7284                           ;;**********************************************************************
7285                           ;*CALL
7286                           ;*      MOV     MULTIPLER,-(SP)
7287                           ;*      MOV     MULTIPLICAND,-(SP)
7288                           ;*      JSR     PC,@#$MULT
7289                           ;*      RETURN  ;;PRODUCT IS ON THE STACK
7290                           ;*
7291                           ;*      STACK   PRODUCT
7292                           ;*      -----   -------
7293                           ;*      TOP     LSB'S
7294                           ;*      +2      MSB'S
7295
7296  041714                  $MULT:
7297  041714  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
7298  041716  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
7299  041720  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
7300  041722  005046                  CLR     -(SP)           ;;CLEAR THE SIGN KEY
7301  041724  016601  000012          MOV     12(SP),R1       ;;GET THE MULTIPLICAND
7302  041730  100002                  BPL     1$              ;;BR IF PLUS
7303  041732  005216                  INC     (SP)            ;;SET THE SIGN KEY
7304  041734  005401                  NEG     R1              ;;MAKE THE MULTIPLICAND POSTIVE
7305  041736  016602  000014  1$:     MOV     14(SP),R2       ;;GET THE MULTIPLIER
```

```
7306  041742  100002                        BPL     2$              ;;BR IF PLUS
7307  041744  005316                        DEC     (SP)            ;;UPDATE THE SIGN KEY
7308  041746  005402                        NEG     R2              ;;MAKE THE MULTIPLIER POSTIVE
7309  041750  012746  000021          2$:    MOV     #17.,-(SP)      ;;SET THE LOOP COUNT
7310  041754  005000                        CLR     R0              ;;SETUP FOR THE MULTIPLY LOOP
7311  041756  103001                3$:     BCC     4$              ;;DON'T ADD IF MULTIPLICAND = 0
7312  041760  060200                        ADD     R2,R0
7313  041762  006000                4$:     ROR     R0              ;;POSITION THE PARITIAL PRODUCT AND
7314  041764  006001                        ROR     R1              ;;THE MULTIPLICAND
7315  041766  005316                        DEC     (SP)            ;;HAS ALL BITS OF THE MULTIPLICAND BEEN DONE?
7316  041770  001372                        BNE     3$              ;;BR IF NO
7317  041772  022616                        CMP     (SP)+,(SP)      ;;SHOULD PRODUCT BE NEGATIVE?
7318  041774  001403                        BEQ     5$              ;;GO TO EXIT IF NO
7319  041776  005400                        NEG     R0              ;;YES--SO MAKE IT SO
7320  042000  005401                        NEG     R1
7321  042002  005600                        SBC     R0
7322  042004  005726                5$:     TST     (SP)+           ;;CLEAR SIGN INFO. OFF OF STACK
7323  042006  010066  000012              MOV     R0,12(SP)       ;;PUT THE PRODUCT ON THE STACK (MSB'S)
7324  042012  010166  000010              MOV     R1,10(SP)       ;;LSB'S
7325  042016  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
7326  042020  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
7327  042022  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
7328  042024  000207                        RTS     PC
7329                          .SBTTL  SAVE AND RESTORE R0-R5 ROUTINES
7330
7331                          ;;*****************************************************************
7332                          ;*SAVE R0-R5
7333                          ;*CALL:
7334                          ;*      SAVREG
7335                          ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
7336                          ;*
7337                          ;*TOP---(+16)
7338                          ;* +2---(+18)
7339                          ;* +4---R5
7340                          ;* +6---R4
7341                          ;* +8---R3
7342                          ;*+10---R2
7343                          ;*+12---R1
7344                          ;*+14---R0
7345
7346  042026                  $SAVREG:
7347  042026  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
7348  042030  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
7349  042032  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
7350  042034  010346                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
7351  042036  010446                  MOV     R4,-(SP)        ;;PUSH R4 ON STACK
7352  042040  010546                  MOV     R5,-(SP)        ;;PUSH R5 ON STACK
7353  042042  016646  000022          MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
7354  042046  016646  000022          MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
7355  042052  016646  000022          MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
7356  042056  016646  000022          MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
7357  042062  000002                  RTI
7358
7359                          ;*RESTORE R0-R5
7360                          ;*CALL:
7361                          ;*      RESREG
```

```
042064
042064  012666  000022          $RESREG:
042064  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
042070  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
042074  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
042100  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
042104  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
042106  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
042110  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
042112  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
042114  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
042116  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
042120  000002                          RTI
                                .SBTTL  TRAP DECODER

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

042122  010046          $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
042124  016600  000002          MOV     2(SP),R0        ;;GET TRAP ADDRESS
042130  005740                  TST     -(R0)           ;;BACKUP BY 2
042132  111000                  MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
042134  006300                  ASL     R0              ;;POSITION FOR INDEXING
042136  016000  042156          MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
042142  000200                  RTS     R0              ;;GO TO ROUTINE


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

042144  011646          $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
042146  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
042154  000002                  RTI                     ;;RESTORE THE PSW

                                .SBTTL  TRAP TABLE

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

                                ;       ROUTINE
                                ;       -------
042156  042144          $TRPAD: .WORD   $TRAP2
042160  037026                  $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
042162  040026                  $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
042164  040002                  $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
042166  040042                  $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
042170  037310                  $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)

042172  040300                  $GTSWR  ;;CALL=GTSWR    TRAP+6(104406)  GET SOFT-SWR SETTING

042174  040230                  $CKSWR  ;;CALL=CKSWR    TRAP+7(104407)  TEST FOR CHANGE IN SOFT-SWR
042176  040512                  $RDCHR  ;;CALL=RDCHR    TRAP+10(104410) TTY TYPEIN CHARACTER ROUTINE
042200  040632                  $RDLIN  ;;CALL=RDLIN    TRAP+11(104411) TTY TYPEIN STRING ROUTINE
042202  041144                  $RDOCT  ;;CALL=RDOCT    TRAP+12(104412) READ AN OCTAL NUMBER FROM TTY
042204  042026                  $SAVREG ;;CALL=SAVREG   TRAP+13(104413) SAVE R0-R5 ROUTINE
```

```
  7418  042206  042064                    $RESREG ;;CALL=RESREG   TRAP+14(104414) RESTORE R0-R5 ROUTINE
  7419  042210  035576                    SCOPI$  ;;CALL=SCOPI    TRAP+15(104415) INTERNAL LOOP ON ERROR
  7420
```

```
                                        .SBTTL  SERVICE MESSAGES

042212 005015 047125 041111  MSG1:    .ASCII  <CR><LF>/UNIBUS RK06 DRIVE DIAGNOSTIC/
042220 051525 051040 030113
042226 020066 051104 053111
042234 020105 044504 043501
042242 047516 052123 041511
042250 005015 050011 051101          .ASCII  <CR><LF>/       PART 2  012/<CR><LF>
042256 020124 004462 030460
042264 006462     012
042267     015 004412 025052          .ASCII  <CR><LF>/       ***** CAUTION *****/<CR><LF>
042274 025052 020052 040503
042302 052125 047511 020116
042310 025052 025052 006452
042316     012
042317     015 052012 044510          .ASCII  <CR><LF>/THIS PROGRAM SHOULD  BE HALTED ONLY AT THE END/
042324 020123 051120 043517
042332 040522 020115 044123
042340 052517 042114 020040
042346 042502 044040 046101
042354 042524 020104 047117
042362 054514 040440 020124
042370 044124 020105 047105
042376     104
042377     015 047412 020106          .ASCII  <CR><LF>/OF A PASS, OTHERWISE HEADERS WRITTEN ON THE/
042404 020101 040520 051523
042412 020054 052117 042510
042420 053522 051511 020105
042426 042510 042101 051105
042434 020123 051127 052111
042442 042524 020116 047117
042450 052040 042510
042454 005015 044504 045523          .ASCII  <CR><LF>/DISK CARTRIDGE MAY BE LEFT IN AN UNFORMATTED STATE/<CR><LF>
042462 041440 051101 051124
042470 042111 042507 046440
042476 054501 041040 020105
042504 042514 052106 044440
042512 020116 047101 052440
042520 043116 051117 040515
042526 052124 042105 051440
042534 040524 042524 005015
042542 005015 046101 047523          .ASCII  <CR><LF>/ALSO, DRIVES TO BE TESTED SHOULD HAVE:/<CR><LF>
042550 020054 051104 053111
042556 051505 052040 020117
042564 042502 052040 051505
042572 042524 020104 044123
042600 052517 042114 044040
042606 053101 035105 005015
042614 005015 027101 044040          .ASCII  <CR><LF>/A. HEADS MANUALLY LOADED/
042622 040505 051504 046440
042630 047101 040525 046114
042636 020131 047514 042101
042644 042105
042646 005015 027102 041440          .ASCII  <CR><LF>/B. CORRECT PORT SELECTED/
```

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 7477  042654  051117  042522  052103
 7478  042662  050040  051117  020124
 7479  042670  042523  042514  052103
 7480  042676  042105
 7481  042700  005015  027103  053440          .ASCII  <CR><LF>/C. WRITE LOCK DISABLED/
 7482  042706  044522  042524  046040
 7483  042714  041517  020113  044504
 7484  042722  040523  046102  042105
 7485  042730  005015  027104  042040          .ASCII  <CR><LF>/D. DRIVE READY INDICATOR ON/<CR><LF>
 7486  042736  044522  042526  051040
 7487  042744  040505  054504  044440
 7488  042752  042116  041511  052101
 7489  042760  051117  047440  006516
 7490  042766     012
 7491  042767     015  042012  044522          .ASCII  <CR><LF>/DRIVES NOT TO BE TESTED MUST HAVE/
 7492  042774  042526  020123  047516
 7493  043002  020124  047524  041040
 7494  043010  020105  042524  052123
 7495  043016  042105  046440  051525
 7496  043024  020124  040510  042526
 7497  043032  005015  047502  044124          .ASCIZ  <CR><LF>/BOTH PORTS DESELECTED/
 7498  043040  050040  051117  051524
 7499  043046  042040  051505  046105
 7500  043054  041505  042524  000104
 7501
 7502
 7503  043062  005015  042502  051440  MSG2:   .ASCIZ  <CR><LF>/BE SURE TO PUT SCRATCH PACK IN DRIVE 0/
 7504  043070  051125  020105  047524
 7505  043076  050040  052125  051440
 7506  043104  051103  052101  044103
 7507  043112  050040  041501  020113
 7508  043120  047111  042040  044522
 7509  043126  042526  030040     000
 7510  043133     015  042012  044522  MSG3:   .ASCIZ  <CR><LF>/DRIVE(S) TO BE TESTED: /
 7511  043140  042526  051450  020051
 7512  043146  047524  041040  020105
 7513  043154  042524  052123  042105
 7514  043162  020072     000
 7515  043165     015  052012  050131  MSG4:   .ASCIZ  <CR><LF>/TYPE BUSS ADDRESS IF NOT 177440 /
 7516  043172  020105  052502  051523
 7517  043200  040440  042104  042522
 7518  043206  051523  044440  020106
 7519  043214  047516  020124  033461
 7520  043222  032067  030064  000040
 7521  043230  005015  054524  042520  MSG5:   .ASCIZ  <CR><LF>/TYPE CONTROLLER INTERRUPT VECTOR IF NOT 210 /
 7522  043236  041440  047117  051124
 7523  043244  046117  042514  020122
 7524  043252  047111  042524  051122
 7525  043260  050125  020124  042526
 7526  043266  052103  051117  044440
 7527  043274  020106  047516  020124
 7528  043302  030462  020060     000
 7529  043307     015  044412  052116  MSG6:   .ASCIZ  <CR><LF>/INTERRUPT OCCURRED AT PC=/
 7530  043314  051105  052522  052120
 7531  043322  047440  041503  051125
 7532  043330  042522  020104  052101
```

```
 7533  043336  050040  036503     000
 7534  043343     015  042012  044522  MSG7:   .ASCIZ  <CR><LF>/DRIVE 0 WILL NOT BE TESTED/
 7535  043350  042526  030040  053440
 7536  043356  046111  020114  047516
 7537  043364  020124  042502  052040
 7538  043372  051505  042524  000104
 7539  043400  005015  042522  042101  MSG8:   .ASCIZ  <CR><LF>/READ DATA WITH OFFSET TEST/<CR><LF>
 7540  043406  042040  052101  020101
 7541  043414  044527  044124  047440
 7542  043422  043106  042523  020124
 7543  043430  042524  052123  005015
 7544  043436     000
 7545  043437     015  044012  040505  MSG9:   .ASCIZ  <CR><LF>/HEAD NO./
 7546  043444  020104  047516  000056
 7547  043452  005015  053412  046111  MSG10:  .ASCIZ  <CR><LF><LF>/WILL TEST DRIVES:/
 7548  043460  020114  042524  052123
 7549  043466  042040  044522  042526
 7550  043474  035123     000
 7551  043477     015  005012  047520  MSG11:  .ASCIZ  <CR><LF><LF>/POWER UP RESTART TO TEST 1/<CR><LF>
 7552  043504  042527  020122  050125
 7553  043512  051040  051505  040524
 7554  043520  052122  052040  020117
 7555  043526  042524  052123  030440
 7556  043534  005015     000
 7557  043537     116  047117  006505  MSG12:  .ASCIZ  /NONE/<CR><LF>
 7558  043544  000012
 7559  043546  005015  047516  046040  MSG13:  .ASCII  <CR><LF>/NO L OR P CLOCKS PRESENT/
 7560  043554  047440  020122  020120
 7561  043562  046103  041517  051513
 7562  043570  050040  042522  042523
 7563  043576  052116
 7564  043600  005015  046101  020114          .ASCIZ  <CR><LF>/ALL TIMING TESTS BYPASSED/
 7565  043606  044524  044515  043516
 7566  043614  052040  051505  051524
 7567  043622  041040  050131  051501
 7568  043630  042523  000104
 7569  043634  005015  054502  040520  MSG14:  .ASCIZ  <CR><LF>/BYPASSING DRIVE /
 7570  043642  051523  047111  020107
 7571  043650  051104  053111  020105
 7572  043656     000
 7573  043657     015  005012  051104  MSG15:  .ASCIZ  <CR><LF><LF>/DRIVE /
 7574  043664  053111  020105     000
 7575  043671     015  042012  044522  MSG16:  .ASCIZ  <CR><LF>/DRIVE SERIAL NO. /
 7576  043676  042526  051440  051105
 7577  043704  040511  020114  047516
 7578  043712  020056     000
 7579  043715     015  041412  051101  MSG17:  .ASCIZ  <CR><LF>/CARTRIDGE SERIAL NO. /
 7580  043722  051124  042111  042507
 7581  043730  051440  051105  040511
 7582  043736  020114  047516  020056
 7583  043744     000
 7584  043745     015  052012  046511  MSG18:  .ASCIZ  <CR><LF>/TIME BETWEEN OUTER LIMIT & HEADS HOME DURING UNLOADING: /
 7585  043752  020105  042502  053524
 7586  043760  042505  020116  052517
 7587  043766  042524  020122  044514
 7588  043774  044515  020124  020046
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 7589  044002  042510  042101  020123
 7590  044010  047510  042515  042040
 7591  044016  051125  047111  020107
 7592  044024  047125  047514  042101
 7593  044032  047111  035107  000040
 7594  044040  005015  054502  040520  MSG19:  .ASCIZ  <CR><LF>/BYPASSING ALL WRITE TESTS/<CR><LF>
 7595  044046  051523  047111  020107
 7596  044054  046101  020114  051127
 7597  044062  052111  020105  042524
 7598  044070  052123  006523  000012
 7599  044076  005015  044524  042515  MSG20:  .ASCIZ  <CR><LF>/TIME BETWEEN HEADS HOME & TRACK FOLL OK DURING LOADING: /
 7600  044104  041040  052105  042527
 7601  044112  047105  044040  040505
 7602  044120  051504  044040  046517
 7603  044126  020105  020046  051124
 7604  044134  041501  020113  047506
 7605  044142  046114  047440  020113
 7606  044150  052504  044522  043516
 7607  044156  046040  040517  044504
 7608  044164  043516  020072      000
 7609  044171     015  052012  046511  MSG21:  .ASCIZ  <CR><LF>/TIME BETWEEN OUTER LIMIT & INNER LIMIT DURING LOADING: /
 7610  044176  020105  042502  053524
 7611  044204  042505  020116  052517
 7612  044212  042524  020122  044514
 7613  044220  044515  020124  020046
 7614  044226  047111  042516  020122
 7615  044234  044514  044515  020124
 7616  044242  052504  044522  043516
 7617  044250  046040  040517  044504
 7618  044256  043516  020072      000
 7619  044263     015  052012  046511  MSG22:  .ASCIZ  <CR><LF>/TIME BETWEEN INNER LIMIT & OUTER LIMIT DURING LOADING: /
 7620  044270  020105  042502  053524
 7621  044276  042505  020116  047111
 7622  044304  042516  020122  044514
 7623  044312  044515  020124  020046
 7624  044320  052517  042524  020122
 7625  044326  044514  044515  020124
 7626  044334  052504  044522  043516
 7627  044342  046040  040517  044504
 7628  044350  043516  020072      000
 7629  044355     015  047012  020117  MSG23:  .ASCIZ  <CR><LF>/NO CLOCK INTERRUPTS PRESENT, ABORTING TIMING TESTS/
 7630  044362  046103  041517  020113
 7631  044370  047111  042524  051122
 7632  044376  050125  051524  050040
 7633  044404  042522  042523  052116
 7634  044412  020054  041101  051117
 7635  044420  044524  043516  052040
 7636  044426  046511  047111  020107
 7637  044434  042524  052123  000123
 7638  044442  005015  053101  051105  MSG24:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 1 REVOLUTION: /
 7639  044450  043501  020105  044524
 7640  044456  042515  043040  051117
 7641  044464  030440  051040  053105
 7642  044472  046117  052125  047511
 7643  044500  035116  000040
 7644  044504  052440  000123          MSG25:  .ASCIZ  / US/
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7645  044510  005015  040412  047502  MSG26:  .ASCIZ  <CR><LF><LF>/ABORTING DATA TESTS & GOING TO TIMING TESTS/<CR><LF><LF>
7646  044516  052122  047111  020107
7647  044524  040504  040524  052040
7648  044532  051505  051524  023040
7649  044540  043440  044517  043516
7650  044546  052040  020117  044524
7651  044554  044515  043516  052040
7652  044562  051505  051524  005015
7653  044570  000012
7654  044572  005015  040412  046114  MSG27:  .ASCIZ  <CR><LF><LF>/ALL DRIVES TESTED/<CR><LF><LF>
7655  044600  042040  044522  042526
7656  044606  020123  042524  052123
7657  044614  042105  005015  000012
7658  044622  005015  053101  051105  MSG28:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 410 CYLINDER FOWARD SEEK:  /
7659  044630  043501  020105  044524
7660  044636  042515  043040  051117
7661  044644  032040  030061  041440
7662  044652  046131  047111  042504
7663  044660  020122  047506  040527
7664  044666  042122  051440  042505
7665  044674  035113  020040      000
7666  044701      015 040412  042526  MSG29:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 410 CYLINDER REVERSE SEEK:  /
7667  044706  040522  042507  052040
7668  044714  046511  020105  047506
7669  044722  020122  030464  020060
7670  044730  054503  044514  042116
7671  044736  051105  051040  053105
7672  044744  051105  042523  051440
7673  044752  042505  035113  020040
7674  044760      000
7675  044761      015 040412  042526  MSG30:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 1 CYLINDER (0 TO 1) FOWARD SEEK:  /
7676  044766  040522  042507  052040
7677  044774  046511  020105  047506
7678  045002  020122  020061  054503
7679  045010  044514  042116  051105
7680  045016  024040  020060  047524
7681  045024  030440  020051  047506
7682  045032  040527  042122  051440
7683  045040  042505  035113  020040
7684  045046      000
7685  045047      015 040412  042526  MSG31:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 1 CYLINDER (0 TO 1) REVERSE SEEK:  /
7686  045054  040522  042507  052040
7687  045062  046511  020105  047506
7688  045070  020122  020061  054503
7689  045076  044514  042116  051105
7690  045104  024040  020060  047524
7691  045112  030440  020051  042522
7692  045120  042526  051522  020105
7693  045126  042523  045505  020072
7694  045134  000040
7695  045136  005015  053101  051105  MSG32:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 137 CYLINDER FOWARD SEEK:  /
7696  045144  043501  020105  044524
7697  045152  042515  043040  051117
7698  045160  030440  033463  041440
7699  045166  046131  047111  042504
7700  045174  020122  047506  040527
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7701  045202  042122  051440  042505
7702  045210  035113  020040     000
7703  045215     015  040412  042526  MSG33:  .ASCIZ  <CR><LF>/AVERAGE TIME FOR 137 CYLINDER REVERSE SEEK:  /
7704  045222  040522  042507  052040
7705  045230  046511  020105  047506
7706  045236  020122  031461  020067
7707  045244  054503  044514  042116
7708  045252  051105  051040  053105
7709  045260  051105  042523  051440
7710  045266  042505  035113  020040
7711  045274     000
7712  045275     015  040412  042526  MSG34:  .ASCIZ  <CR><LF>/AVERAGE FOWARD SPEED BETWEEN CYLINDERS 128 & 256:  /
7713  045302  040522  042507  043040
7714  045310  053517  051101  020104
7715  045316  050123  042505  020104
7716  045324  042502  053524  042505
7717  045332  020116  054503  044514
7718  045340  042116  051105  020123
7719  045346  031061  020070  020046
7720  045354  032462  035066  020040
7721  045362     000
7722  045363     015  040412  042526  MSG35:  .ASCIZ  <CR><LF>/AVERAGE REVERSE SPEED BETWEEN CYLINDERS 128 & 256:  /
7723  045370  040522  042507  051040
7724  045376  053105  051105  042523
7725  045404  051440  042520  042105
7726  045412  041040  052105  042527
7727  045420  047105  041440  046131
7728  045426  047111  042504  051522
7729  045434  030440  034062  023040
7730  045442  031040  033065  020072
7731  045450  000040
7732  045452  020040  047111  044103  MSG36:  .ASCIZ  /  INCHES PER SECOND/
7733  045460  051505  050040  051105
7734  045466  051440  041505  047117
7735  045474  000104
7736  045476  005015  047516  053440  MSG37:  .ASCIZ  <CR><LF>/NO WRITE CHECK ERROR AT MAX POSITIVE OFFSET/
7737  045504  044522  042524  041440
7738  045512  042510  045503  042440
7739  045520  051122  051117  040440
7740  045526  020124  040515  020130
7741  045534  047520  044523  044524
7742  045542  042526  047440  043106
7743  045550  042523  000124
7744  045554  005015  047516  053440  MSG38:  .ASCIZ  <CR><LF>/NO WRITE CHECK ERROR AT MAX NEGATIVE OFFSET/<CR><LF>
7745  045562  044522  042524  041440
7746  045570  042510  045503  042440
7747  045576  051122  051117  040440
7748  045604  020124  040515  020130
7749  045612  042516  040507  044524
7750  045620  042526  047440  043106
7751  045626  042523  006524  000012
7752  045634  005015  051127  052111  MSG39:  .ASCIZ  <CR><LF>/WRITE CHECK FAILURE AT OFFSET =/
7753  045642  020105  044103  041505
7754  045650  020113  040506  046111
7755  045656  051125  020105  052101
7756  045664  047440  043106  042523
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7757  045672  020124  000075
7758  045676  005015  047503  046125  MSG40:  .ASCII  <CR><LF>/COULD NOT READ BAD SECTOR INFO ON CYL 410/
7759  045704  020104  047516  020124
7760  045712  042522  042101  041040
7761  045720  042101  051440  041505
7762  045726  047524  020122  047111
7763  045734  047506  047440  020116
7764  045742  054503  020114  030464
7765  045750     060
7766  045751     015  047412  020122          .ASCIZ  <CR><LF>/OR ALIGNMENT CARTRIDGE USED/<CR><LF>
7767  045756  046101  043511  046516
7768  045764  047105  020124  040503
7769  045772  052122  044522  043504
7770  046000  020105  051525  042105
7771  046006  005015     000
7772  046011     015  041012  050131  MSG41:  .ASCIZ  <CR><LF>/BYPASSING ALL TIMING TESTS/<CR><LF>
7773  046016  051501  044523  043516
7774  046024  040440  046114  052040
7775  046032  046511  047111  020107
7776  046040  042524  052123  006523
7777  046046  000012
7778  046050  005015  047522  040524  MSG42:  .ASCII  <CR><LF>/ROTATIONAL, MAX-MIN, AND 137 CYL SEEK TIMES/
7779  046056  044524  047117  046101
7780  046064  020054  040515  026530
7781  046072  044515  026116  040440
7782  046100  042116  030440  033463
7783  046106  041440  046131  051440
7784  046114  042505  020113  044524
7785  046122  042515     123
7786  046125     015  040412  042522          .ASCIZ  <CR><LF>/ARE TEMPORARILY BYPASSED UNTIL ACCURACIES CAN BE IMPROVED/
7787  046132  052040  046505  047520
7788  046140  040522  044522  054514
7789  046146  041040  050131  051501
7790  046154  042523  020104  047125
7791  046162  044524  020114  041501
7792  046170  052503  040522  044503
7793  046176  051505  041440  047101
7794  046204  041040  020105  046511
7795  046212  051120  053117  042105
7796  046220     000
7797
7798
7799                                  .SBTTL  ERROR MESSAGES
7800
7801  046221     015  042412  051122  EM1:    .ASCIZ  <CR><LF>/ERROR, ONLY 0 THRU 7 ALLOWED, TRY AGAIN/<CR><LF>
7802  046226  051117  020054  047117
7803  046234  054514  030040  052040
7804  046242  051110  020125  020067
7805  046250  046101  047514  042527
7806  046256  026104  052040  054522
7807  046264  040440  040507  047111
7808  046272  005015     000
7809  046275     104  044522  042526  EM2:    .ASCIZ  /DRIVE # IN RKCS2 CANNOT BE READ BACK CORRECTLY IN RKMR2/
7810  046302  021440  044440  020116
7811  046310  045522  051503  020062
7812  046316  040503  047116  052117
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 7813  046324  041040  020105  042522
 7814  046332  042101  041040  041501
 7815  046340  020113  047503  051122
 7816  046346  041505  046124  020131
 7817  046354  047111  051040  046513
 7818  046362  031122     000
 7819  046365     015  040412  047502  EM3:    .ASCIZ  <CR><LF>/ABORT TESTS...UNEXPECTED TIME OUT AT PC=/
 7820  046372  052122  052040  051505
 7821  046400  051524  027056  052456
 7822  046406  042516  050130  041505
 7823  046414  042524  020104  044524
 7824  046422  042515  047440  052125
 7825  046430  040440  020124  041520
 7826  046436  000075
 7827  046440  005015  041101  051117  EM4:    .ASCIZ  <CR><LF>/ABORT TESTS...UNEXPECTED INTERRUPT AT PC=/
 7828  046446  020124  042524  052123
 7829  046454  027123  027056  047125
 7830  046462  054105  042520  052103
 7831  046470  042105  044440  052116
 7832  046476  051105  052522  052120
 7833  046504  040440  020124  041520
 7834  046512  000075
 7835  046514  042115  020123  042523  EM5:    .ASCIZ  /MDS SET IN RKCS2/
 7836  046522  020124  047111  051040
 7837  046530  041513  031123     000
 7838  046535     125  042506  051440  EM6:    .ASCIZ  /UFE SET IN RKCS2/
 7839  046542  052105  044440  020116
 7840  046550  045522  051503  000062
 7841  046556  051104  020101  047111  EM7:    .ASCIZ  /DRA IN RKDS & NED IN RKCS2 RESET; WRONG PORT SELECTED?/
 7842  046564  051040  042113  020123
 7843  046572  020046  042516  020104
 7844  046600  047111  051040  041513
 7845  046606  031123  051040  051505
 7846  046614  052105  020073  051127
 7847  046622  047117  020107  047520
 7848  046630  052122  051440  046105
 7849  046636  041505  042524  037504
 7850  046644     000
 7851  046645     104  044522  042526  EM8:    .ASCIZ  /DRIVE PRESENT BUT NOT SPECIFIED BY OPERATOR/
 7852  046652  050040  042522  042523
 7853  046660  052116  041040  052125
 7854  046666  047040  052117  051440
 7855  046674  042520  044503  044506
 7856  046702  042105  041040  020131
 7857  046710  050117  051105  052101
 7858  046716  051117     000
 7859  046721     104  044522  042526  EM9:    .ASCIZ  /DRIVE NOT PRESENT BUT SPECIFIED BY OPERATOR/
 7860  046726  047040  052117  050040
 7861  046734  042522  042523  052116
 7862  046742  041040  052125  051440
 7863  046750  042520  044503  044506
 7864  046756  042105  041040  020131
 7865  046764  050117  051105  052101
 7866  046772  051117     000
 7867  046775     101  047502  052122  EM10:   .ASCIZ  /ABORT TESTS...CANNOT REFERENCE CONTROLLER REGISTER/
 7868  047002  052040  051505  051524
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7869  047010  027056  041456  047101
7870  047016  047516  020124  042522
7871  047024  042506  042522  041516
7872  047032  020105  047503  052116
7873  047040  047522  046114  051105
7874  047046  051040  043505  051511
7875  047054  042524  000122
7876  047060  051104  020101  047111  EM11:   .ASCIZ  /DRA IN RKDS & NED IN RKCS2 BOTH SET/
7877  047066  051040  042113  020123
7878  047074  020046  042516  020104
7879  047102  047111  051040  041513
7880  047110  031123  041040  052117
7881  047116  020110  042523  000124
7882  047124  047503  052116  047522  EM12:   .ASCIZ  /CONTROLLER NOT READY IN RKCS1/
7883  047132  046114  051105  047040
7884  047140  052117  051040  040505
7885  047146  054504  044440  020116
7886  047154  045522  051503  000061
7887  047162  047516  040440  052124  EM13:   .ASCIZ  /NO ATTN IN RKASOF/
7888  047170  020116  047111  051040
7889  047176  040513  047523  000106
7890  047204  047125  054105  042520  EM14:   .ASCIZ  /UNEXPECTED MEMORY PARITY TRAP/
7891  047212  052103  042105  046440
7892  047220  046505  051117  020131
7893  047226  040520  044522  054524
7894  047234  052040  040522  000120
7895  047242  045522  041504  023040  EM15:   .ASCII  /RKDC & RKDA INDICATE THAT WCE OCCURRED AT/
7896  047250  051040  042113  020101
7897  047256  047111  044504  040503
7898  047264  042524  052040  040510
7899  047272  020124  041527  020105
7900  047300  041517  052503  051122
7901  047306  042105  040440     124
7902  047313     015  041412  046131          .ASCIZ  <CR><LF>/CYL 411, TRACK 2, SECTOR 21/
7903  047320  032040  030461  020054
7904  047326  051124  041501  020113
7905  047334  026062  051440  041505
7906  047342  047524  020122  030462
7907  047350     000
7908  047351     103  047101  047516  EM16:   .ASCIZ  /CANNOT READ BAD SECTOR INFORMATION/
7909  047356  020124  042522  042101
7910  047364  041040  042101  051440
7911  047372  041505  047524  020122
7912  047400  047111  047506  046522
7913  047406  052101  047511  000116
7914  047414  042515  051523  043501  EM17:   .ASCIZ  /MESSAGE A0 ERROR/
7915  047422  020105  030101  042440
7916  047430  051122  051117     000
7917  047435     115  051505  040523  EM18:   .ASCIZ  /MESSAGE B0 ERROR/
7918  047442  042507  041040  020060
7919  047450  051105  047522  000122
7920  047456  042515  051523  043501  EM19:   .ASCIZ  /MESSAGE A1 ERROR/
7921  047464  020105  030501  042440
7922  047472  051122  051117     000
7923  047477     115  051505  040523  EM20:   .ASCIZ  /MESSAGE B1 ERROR/
7924  047504  042507  041040  020061
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7925  047512  051105  047522  000122
7926  047520  042503  051122  051440  EM21:   .ASCIZ  /CERR SET IN RKCS1/
7927  047526  052105  044440  020116
7928  047534  045522  051503  000061
7929  047542  047526  020114  040526  EM24:   .ASCIZ  /VOL VALID NOT SET IN RKMR2/
7930  047550  044514  020104  047516
7931  047556  020124  042523  020124
7932  047564  047111  051040  046513
7933  047572  031122     000
7934  047575     103  046131  040440  EM36:   .ASCIZ  /CYL ADDR IN RKMR3 NOT SAME AS RKDC/
7935  047602  042104  020122  047111
7936  047610  051040  046513  031522
7937  047616  047040  052117  051440
7938  047624  046501  020105  051501
7939  047632  051040  042113  000103
7940  047640  054503  020114  044504  EM39:   .ASCIZ  /CYL DIFF & OFFSET IN RKMR2 NOT CLEARED/
7941  047646  043106  023040  047440
7942  047654  043106  042523  020124
7943  047662  047111  051040  046513
7944  047670  031122  047040  052117
7945  047676  041440  042514  051101
7946  047704  042105     000
7947  047707     103  046131  040440  EM40:   .ASCIZ  /CYL ADDR IN RKMR3 NOT CLEARED/
7948  047714  042104  020122  047111
7949  047722  051040  046513  031522
7950  047730  047040  052117  041440
7951  047736  042514  051101  042105
7952  047744     000
7953  047745     103  046131  040440  EM41:   .ASCIZ  /CYL ADDR IN RKMR3 DID NOT REMAIN CLEARED/
7954  047752  042104  020122  047111
7955  047760  051040  046513  031522
7956  047766  042040  042111  047040
7957  047774  052117  051040  046505
7958  050002  044501  020116  046103
7959  050010  040505  042522  000104
7960  050016  052101  047124  047040  EM55:   .ASCIZ  /ATTN NOT CLEARED IN RKASOF/
7961  050024  052117  041440  042514
7962  050032  051101  042105  044440
7963  050040  020116  045522  051501
7964  050046  043117     000
7965  050051     110  040505  051504  EM60:   .ASCIZ  /HEADS HOME NOT FOUND IN RKMR2/
7966  050056  044040  046517  020105
7967  050064  047516  020124  047506
7968  050072  047125  020104  047111
7969  050100  051040  046513  031122
7970  050106     000
7971  050107     104  042524  051440  EM62:   .ASCIZ  /DTE SET IN RKER/
7972  050114  052105  044440  020116
7973  050122  045522  051105     000
7974  050127     104  052114  051440  EM63:   .ASCIZ  /DLT SET IN RKCS2/
7975  050134  052105  044440  020116
7976  050142  045522  051503  000062
7977  050150  042522  042101  044040  EM65:   .ASCIZ  /READ HEADER ERROR/
7978  050156  040505  042504  020122
7979  050164  051105  047522  000122
7980  050172  054503  020114  042101  EM66:   .ASCIZ  /CYL ADDR IN RKMR3 INCORRECT/
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 7981  050200  051104  044440  020116
 7982  050206  045522  051115  020063
 7983  050214  047111  047503  051122
 7984  050222  041505  000124
 7985  050226  046101  043511  046516  EM69:   .ASCIZ  /ALIGNMENT CARTRIDGE USED
 7986  050234  047105  020124  040503
 7987  050242  052122  044522  043504
 7988  050250  020105  051525  042105
 7989  050256     000
 7990  050257     122  055124  047040  EM74:   .ASCIZ  /RTZ NOT SET IN RKMR2/
 7991  050264  052117  051440  052105
 7992  050272  044440  020116  045522
 7993  050300  051115  000062
 7994  050304  051127  052111  020105  EM80:   .ASCIZ  /WRITE CHECK ERROR SET IN RKCS2/
 7995  050312  044103  041505  020113
 7996  050320  051105  047522  020122
 7997  050326  042523  020124  047111
 7998  050334  051040  041513  031123
 7999  050342     000
 8000  050343     127  044522  042524  EM81:   .ASCIZ  /WRITE CHECK COMMAND NOT FUNCTIONING/
 8001  050350  041440  042510  045503
 8002  050356  041440  046517  040515
 8003  050364  042116  047040  052117
 8004  050372  043040  047125  052103
 8005  050400  047511  044516  043516
 8006  050406     000
 8007  050407     122  040505  020104  EM82:   .ASCIZ  /READ DATA DID NOT COMPARE WITH WRITE DATA/
 8008  050414  040504  040524  042040
 8009  050422  042111  047040  052117
 8010  050430  041440  046517  040520
 8011  050436  042522  053440  052111
 8012  050444  020110  051127  052111
 8013  050452  020105  040504  040524
 8014  050460     000
 8015  050461     104  052101  020101  EM83:   .ASCIZ  /DATA CHECK ERROR SET IN RKER/
 8016  050466  044103  041505  020113
 8017  050474  051105  047522  020122
 8018  050502  042523  020124  047111
 8019  050510  051040  042513  000122
 8020  050516  043117  051506  052105  EM85:   .ASCIZ  /OFFSET STATUS BIT IN RKMR2 CLEARED/
 8021  050524  051440  040524  052524
 8022  050532  020123  044502  020124
 8023  050540  047111  051040  046513
 8024  050546  031122  041440  042514
 8025  050554  051101  042505     000
 8026  050561     117  041106  042523  EM86:   .ASCIZ  /OFFSET REG IN RKMR2 NOT = RKASOF/
 8027  050566  020124  042522  020107
 8028  050574  047111  051040  046513
 8029  050602  031122  047040  052117
 8030  050610  036440  051040  040513
 8031  050616  047523  000106
 8032  050622  044504  020104  047516  EM88:   .ASCIZ  /DID NOT FIND SECTOR 0 FROM INDEX/
 8033  050630  020124  044506  042116
 8034  050636  051440  041505  047524
 8035  050644  020122  020060  051106
 8036  050652  046517  044440  042116
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8037  050660  054105  000
8038  050663  110  040505  051504  EM89:   .ASCIZ  /HEADS HOME NOT CLEARED IN RKMR2/
8039  050670  044040  046517  020105
8040  050676  047516  020124  046103
8041  050704  040505  042522  020104
8042  050712  047111  051040  046513
8043  050720  031122  000
8044  050723  124  040522  045503  EM90:   .ASCIZ  /TRACK FOLL OK NOT SET IN RKMR2/
8045  050730  043040  046117  020114
8046  050736  045517  047040  052117
8047  050744  051440  052105  044440
8048  050752  020116  045522  051115
8049  050760  000062
8050  050762  042522  020126  047516  EM91:   .ASCIZ  /REV NOT SET IN RKMR2/
8051  050770  020124  042523  020124
8052  050776  047111  051040  046513
8053  051004  031122  000
8054  051007  122  053105  047040  EM92:   .ASCIZ  /REV NOT CLEARED IN RKMR2/
8055  051014  052117  041440  042514
8056  051022  051101  042105  044440
8057  051030  020116  045522  051115
8058  051036  000062
8059  051040  042522  042101  047111  EM93:   .ASCIZ  /READING WRONG CYLINDER # IN HEADER...MISPOSITION/
8060  051046  020107  051127  047117
8061  051054  020107  054503  044514
8062  051062  042116  051105  021440
8063  051070  044440  020116  042510
8064  051076  042101  051105  027056
8065  051104  046456  051511  047520
8066  051112  044523  044524  047117
8067  051120  000
8068  051121  117  043106  042523  EM94:   .ASCIZ  /OFFSET STATUS BIT IN RKMR2 NOT CLEARED/
8069  051126  020124  052123  052101
8070  051134  051525  041040  052111
8071  051142  044440  020116  045522
8072  051150  051115  020062  047516
8073  051156  020124  046103  040505
8074  051164  042522  000104
8075  051170  047506  046522  052101  EM95:   .ASCIZ  /FORMAT BIT NOT SET IN RKMR2/
8076  051176  041040  052111  047040
8077  051204  052117  051440  052105
8078  051212  044440  020116  045522
8079  051220  051115  000062
8080  051224  040503  047116  052117  EM96:   .ASCIZ  /CANNOT FIND SECTOR 17/
8081  051232  043040  047111  020104
8082  051240  042523  052103  051117
8083  051246  030440  000067
8084  051252  042510  042101  051440  EM97:   .ASCIZ  /HEAD SWITCHING LONGER THAN 16 MS/
8085  051260  044527  041524  044510
8086  051266  043516  046040  047117
8087  051274  042507  020122  044124
8088  051302  047101  030440  020066
8089  051310  051515  000
8090  051313  103  047101  047516  EM98:   .ASCIZ  /CANNOT FIND CYLINDER 128/
8091  051320  020124  044506  042116
8092  051326  041440  046131  047111
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8093  051334  042504  020122  031061
8094  051342  000070
8095  051344  040503  047116  052117  EM99:   .ASCIZ  /CANNOT FIND CYLINDER 256/
8096  051352  043040  047111  020104
8097  051360  054503  044514  042116
8098  051366  051105  031040  033065
8099  051374     000
8100  051375     104  044522  042526  EM100:  .ASCIZ  /DRIVE OFF TRACK SET IN RKMR3/
8101  051402  047440  043106  052040
8102  051410  040522  045503  051440
8103  051416  052105  044440  020116
8104  051424  045522  051115  000063
8105  051432  044504  020104  047516  EM101:  .ASCIZ  /DID NOT GO TO CYLINDER 10/
8106  051440  020124  047507  052040
8107  051446  020117  054503  044514
8108  051454  042116  051105  030440
8109  051462  000060
8110
8111                                  .SBTTL  DATA HEADERS
8112
8113  051464  042524  052123  047040  DH1:    .ASCIZ  /TEST NO.  PC/
8114  051472  027117  020040  041520
8115  051500     000
8116  051501     122  046513  031122  DH2:    .ASCIZ  /RKMR2  RKMR3   RKER    RKDS    RKCS1   RKCS2/
8117  051506  051011  046513  031522
8118  051514  051011  042513  004522
8119  051522  045522  051504  051011
8120  051530  041513  030523  051011
8121  051536  041513  031123     000
8122  051543     122  040513  047523  DH3:    .ASCIZ  /RKASOF/
8123  051550  000106
8124  051552  044123  052517  042114  DH4:    .ASCIZ  /SHOULD BE/
8125  051560  041040  000105
8126  051564  045522  051115  004462  DH5:    .ASCIZ  /RKMR2  RKMR3   RKER    RKDS    RKDC    RKCS1   RKCS2/
8127  051572  045522  051115  004463
8128  051600  045522  051105  051011
8129  051606  042113  004523  045522
8130  051614  041504  051011  041513
8131  051622  030523  051011  041513
8132  051630  031123     000
8133  051633     122  046513  031122  DH6:    .ASCIZ  /RKMR2   RKMR3   RKDC   FROM CYL  TO CYL  CYL DIFF/
8134  051640  020040  051040  046513
8135  051646  031522  020040  051040
8136  051654  042113  020103  020040
8137  051662  051106  046517  041440
8138  051670  046131  020040  047524
8139  051676  041440  046131  020040
8140  051704  054503  020114  044504
8141  051712  043106     000
8142  051715     122  046513  031122  DH7:    .ASCIZ  /RKMR2  RKMR3   RKER    RKDS    RKDA    RKCS1   RKCS2/
8143  051722  051011  046513  031522
8144  051730  051011  042513  004522
8145  051736  045522  051504  051011
8146  051744  042113  004501  045522
8147  051752  051503  004461  045522
8148  051760  051503  000062
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8149  051764  042524  052123  047040  DH8:    .ASCIZ  /TEST NO.      TRAP PC/
8150  051772  027117  052011  040522
8151  052000  020120  041520     000
8152  052005     101  052106  051105  DH9:    .ASCIZ  /AFTER START SPINDLE COMMAND REC'D BY DRIVE/
8153  052012  051440  040524  052122
8154  052020  051440  044520  042116
8155  052026  042514  041440  046517
8156  052034  040515  042116  051040
8157  052042  041505  042047  041040
8158  052050  020131  051104  053111
8159  052056  000105
8160  052060  052101  042440  042116  DH10:   .ASCIZ  /AT END OF HEAD LOADING/
8161  052066  047440  020106  042510
8162  052074  042101  046040  040517
8163  052102  044504  043516     000
8164  052107     122  046513  031122  DH11:   .ASCIZ  /RKMR2  RKMR3   RKCS1   RKCS2   EXPECTED        WAS/
8165  052114  051011  046513  031522
8166  052122  051011  041513  030523
8167  052130  051011  041513  031123
8168  052136  042411  050130  041505
8169  052144  042524  004504  040527
8170  052152  000123
8171  052154  045522  051115  004462  DH12:   .ASCIZ  /RKMR2  RKMR3   RKCS1   RKCS2   RKDC    RKDA/
8172  052162  045522  051115  004463
8173  052170  045522  051503  004461
8174  052176  045522  051503  004462
8175  052204  045522  041504  051011
8176  052212  042113  000101
8177  052216  043101  042524  020122  DH17:   .ASCIZ  /AFTER RECAL COMMAND/
8178  052224  042522  040503  020114
8179  052232  047503  046515  047101
8180  052240  000104
8181  052242  043101  042524  020122  DH18:   .ASCIZ  /AFTER UNLOAD COMMAND/
8182  052250  047125  047514  042101
8183  052256  041440  046517  040515
8184  052264  042116     000
8185  052267     101  052106  051105  DH19:   .ASCIZ  /AFTER PACK COMMAND/
8186  052274  050040  041501  020113
8187  052302  047503  046515  047101
8188  052310  000104
8189  052312  043101  042524  020122  DH20:   .ASCIZ  /AFTER SELECT DRIVE COMMAND/
8190  052320  042523  042514  052103
8191  052326  042040  044522  042526
8192  052334  041440  046517  040515
8193  052342  042116     000
8194  052345     101  052106  051105  DH21:   .ASCIZ  /AFTER SUBSYSTEM CLEAR/
8195  052352  051440  041125  054523
8196  052360  052123  046505  041440
8197  052366  042514  051101     000
8198  052373     101  052106  051105  DH22:   .ASCIZ  /AFTER DRIVE CLEAR COMMAND/
8199  052400  042040  044522  042526
8200  052406  041440  042514  051101
8201  052414  041440  046517  040515
8202  052422  042116     000
8203  052425     101  052106  051105  DH24:   .ASCIZ  /AFTER OFFSET COMMAND/
8204  052432  047440  043106  042523
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 8205  052440  020124  047503  046515
 8206  052446  047101  000104
 8207  052452  043101  042524  020122  DH25:   .ASCIZ  /AFTER SEEK COMMAND/
 8208  052460  042523  045505  041440
 8209  052466  046517  040515  042116
 8210  052474     000
 8211  052475     101  052106  051105  DH26:   .ASCIZ  /AFTER READ DATA COMMAND/
 8212  052502  051040  040505  020104
 8213  052510  040504  040524  041440
 8214  052516  046517  040515  042116
 8215  052524     000
 8216  052525     101  052106  051105  DH27:   .ASCIZ  /AFTER WRITE DATA COMMAND/
 8217  052532  053440  044522  042524
 8218  052540  042040  052101  020101
 8219  052546  047503  046515  047101
 8220  052554  000104
 8221  052556  043101  042524  020122  DH30:   .ASCIZ  /AFTER READ HEADER COMMAND/
 8222  052564  042522  042101  044040
 8223  052572  040505  042504  020122
 8224  052600  047503  046515  047101
 8225  052606  000104
 8226  052610  043101  042524  020122  DH32:   .ASCIZ  /AFTER WRITE CHECK COMMAND/
 8227  052616  051127  052111  020105
 8228  052624  044103  041505  020113
 8229  052632  047503  046515  047101
 8230  052640  000104
 8231  052642  052504  044522  043516  DH33:   .ASCIZ  /DURING SEEK COMMAND/
 8232  052650  051440  042505  020113
 8233  052656  047503  046515  047101
 8234  052664  000104
 8235  052666  045522  051115  020062  DH36:   .ASCIZ  /RKMR2   RKMR3   RKCS1   RKCS2  FROM SECT  TO SECT/
 8236  052674  020040  045522  051115
 8237  052702  020063  020040  045522
 8238  052710  051503  020061  020040
 8239  052716  045522  051503  020062
 8240  052724  043040  047522  020115
 8241  052732  042523  052103  020040
 8242  052740  047524  051440  041505
 8243  052746  000124
 8244  052750  043101  042524  020122  DH39:   .ASCIZ  /AFTER WRITE HEADER COMMAND/
 8245  052756  051127  052111  020105
 8246  052764  042510  042101  051105
 8247  052772  041440  046517  040515
 8248  053000  042116     000
 8249  053003     122  046513  031122  DH40:   .ASCIZ  /RKMR2  RKMR3   RKDA    WORD#   HEADER WAS  SHOULD BE/
 8250  053010  051011  046513  031522
 8251  053016  051011  042113  004501
 8252  053024  047527  042122  004443
 8253  053032  042510  042101  051105
 8254  053040  053440  051501  020040
 8255  053046  044123  052517  042114
 8256  053054  041040  000105
 8257  053060  052504  044522  043516  DH41:   .ASCIZ  /DURING RECAL COMMAND/
 8258  053066  051040  041505  046101
 8259  053074  041440  046517  040515
 8260  053102  042116     000
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8261  053105     117  020116  042523  DH42:   .ASCIZ  /ON SECTORS 0,2,4,6 OR 8  CYL 410 TRACK 2/
8262  053112  052103  051117  020123
8263  053120  026060  026062  026064
8264  053126  020066  051117  034040
8265  053134  020040  054503  020114
8266  053142  030464  020060  051124
8267  053150  041501  020113  000062
8268  053156  047117  051440  041505  DH43:   .ASCIZ  /ON SECTORS 1,3,5,7 OR 9  CYL 410 TRACK2/
8269  053164  047524  051522  030440
8270  053172  031454  032454  033454
8271  053200  047440  020122  020071
8272  053206  041440  046131  032040
8273  053214  030061  052040  040522
8274  053222  045503  000062
8275  053226  047506  046522  052101  DH44:   .ASCIZ  /FORMAT & ALL READ-WRITE TESTS WILL BE BYPASSED/
8276  053234  023040  040440  046114
8277  053242  051040  040505  026504
8278  053250  051127  052111  020105
8279  053256  042524  052123  020123
8280  053264  044527  046114  041040
8281  053272  020105  054502  040520
8282  053300  051523  042105     000
8283  053305     101  052106  051105  DH47:   .ASCIZ  /AFTER READ HEADER COMMAND WITH MOVEMENT/
8284  053312  051040  040505  020104
8285  053320  042510  042101  051105
8286  053326  041440  046517  040515
8287  053334  042116  053440  052111
8288  053342  020110  047515  042526
8289  053350  042515  052116     000
8290  053355     101  052106  051105  DH51:   .ASCIZ  /AFTER SEEK TO SELF COMMAND/
8291  053362  051440  042505  020113
8292  053370  047524  051440  046105
8293  053376  020106  047503  046515
8294  053404  047101  000104
8295  053410  044527  044124  044440  DH52:   .ASCIZ  /WITH INTENTIONAL MISCOMPARE/
8296  053416  052116  047105  044524
8297  053424  047117  046101  046440
8298  053432  051511  047503  050115
8299  053440  051101  000105
8300  053444  052504  044522  043516  DH53:   .ASCIZ  /DURING OFFSET COMMAND/
8301  053452  047440  043106  042523
8302  053460  020124  047503  046515
8303  053466  047101  000104
8304  053472  043101  042524  020122  DH54:   .ASCIZ  /AFTER FORMAT CHANGE AND CONTR READY REC'D/
8305  053500  047506  046522  052101
8306  053506  041440  040510  043516
8307  053514  020105  047101  020104
8308  053522  047503  052116  020122
8309  053530  042522  042101  020131
8310  053536  042522  023503  000104
8311  053544  045522  051115  004462  DH56:   .ASCIZ  /RKMR2  RKMR3   RKDC    CYL #   HEADER WORD 0/
8312  053552  045522  051115  004463
8313  053560  045522  041504  041411
8314  053566  046131  021440  044011
8315  053574  040505  042504  020122
8316  053602  047527  042122  030040
```

```
8317  053610     000
8318  053611     101  052106  051105  DH57:   .ASCIZ  /AFTER WRITE COMMAND WITH OFFSET/
8319  053616  053440  044522  042524
8320  053624  041440  046517  040515
8321  053632  042116  053440  052111
8322  053640  020110  043117  051506
8323  053646  052105     000
8324  053651     104  052101  020101  DH58:   .ASCIZ  /DATA WAS       SHOULD BE/
8325  053656  040527  020123  051411
8326  053664  047510  046125  020104
8327  053672  042502     000
8328
8329                             .SBTTL  ERROR OUTPUT DATA
8330
8331          053676                     .EVEN
8332  053676  001214  001116  005434  DT1:    $TESTN,$ERRPC,HMR2,HMR3,HER,HDS,HCS1,HCS2,SBMR2,SBMR3
8333  053704  005436  005422  005420
8334  053712  005406  005410  005444
8335  053720  005446
8336  053722  001214  001116  005434  DT2:    $TESTN,$ERRPC,HMR2,HMR3,HER,HDS,HCS1,HCS2,HASOF
8337  053730  005436  005422  005420
8338  053736  005406  005410  005424
8339  053744  001214  001354          DT3:    $TESTN,TRAPPC
8340  053750  001214  001116  005434  DT4:    $TESTN,$ERRPC,HMR2,HMR3,HDC,FRCYL,TOCYL,CALDIF
8341  053756  005436  005426  001370
8342  053764  001372  001400
8343  053770  001214  001116  005434  DT5:    $TESTN,$ERRPC,HMR2,HMR3,HER,HDS,HDA,HCS1,HCS2,SBMR2,SBMR3
8344  053776  005436  005422  005420
8345  054004  005416  005406  005410
8346  054012  005444  005446
8347  054016  001214  001116  005434  DT6:    $TESTN,$ERRPC,HMR2,HMR3,HCS1,HCS2,WD2,WD1
8348  054024  005436  005406  005410
8349  054032  001510  001506
8350  054036  001214  001116  005434  DT7:    $TESTN,$ERRPC,HMR2,HMR3,HDA,WDCNT,HDWD,TEMP1
8351  054044  005436  005416  001524
8352  054052  001542  005450
8353  054056  001214  001116  005434  DT8:    $TESTN,$ERRPC,HMR2,HMR3,HDC,TOCYL,FRCYL,CALDIF
8354  054064  005436  005426  001372
8355  054072  001370  001400
8356  054076  001214  001116  005434  DT9:    $TESTN,$ERRPC,HMR2,HMR3,HDC,TOCYL,RHTAB
8357  054104  005436  005426  001372
8358  054112  001754
8359  054114  001214  001116  005434  DT10:   $TESTN,$ERRPC,HMR2,HMR3,HCS1,HCS2,HDC,HDA
8360  054122  005436  005406  005410
8361  054130  005426  005416
8362
8363                             .SBTTL  ERROR DATA FORMATS
8364
8365  054134  000002                     DF1:    2
8366  054136     002     000                     .BYTE 2,0
8367  054140  051501                             DH2
8368  054142     006     000                     .BYTE 6,0
8369
8370  054144  000001                     DF2:    1
8371  054146     002     000                     .BYTE   2,0
8372
```

```
8373  054150  000003                  DF3:    3
8374  054152     000      000                 .BYTE   0,0
8375  054154  051464                          DH1
8376  054156     002      000                 .BYTE   2,0
8377  054160  052107                          DH11
8378  054162     006      000                 .BYTE   6,0
8379
8380  054164  000002                  DF4:    2
8381  054166     002      000                 .BYTE   2,0
8382  054170  052154                          DH12
8383  054172     006      000                 .BYTE   6,0
8384
8385  054174  000003                  DF6:    3
8386  054176     000      000                 .BYTE 0,0
8387  054200  051464                          DH1
8388  054202     002      000                 .BYTE 2,0
8389  054204  051633                          DH6
8390  054206     006      000                 .BYTE 6,0
8391
8392  054210  000004                  DF8:    4
8393  054212     000      000                 .BYTE 0,0
8394  054214  051464                          DH1
8395  054216     002      000                 .BYTE 2,0
8396  054220  051501                          DH2
8397  054222     006      000                 .BYTE 6,0
8398  054224  051552                          DH4
8399  054226     001      000                 .BYTE 1,0
8400
8401  054230  000004                  DF9:    4
8402  054232     000      000                 .BYTE 0,0
8403  054234  051464                          DH1
8404  054236     002      000                 .BYTE 2,0
8405  054240  051501                          DH2
8406  054242     006      000                 .BYTE 6,0
8407  054244  051552                          DH4
8408  054246     002      000                 .BYTE 2,0
8409
8410  054250  000003                  DF10:   3
8411  054252     000      000                 .BYTE 0,0
8412  054254  051464                          DH1
8413  054256     002      000                 .BYTE 2,0
8414  054260  051501                          DH2
8415  054262     006      000                 .BYTE 6,0
8416
8417  054264  000004                  DF11:   4
8418  054266     000      000                 .BYTE 0,0
8419  054270  051464                          DH1
8420  054272     002      000                 .BYTE 2,0
8421  054274  051501                          DH2
8422  054276     006      000                 .BYTE 6,0
8423  054300  051543                          DH3
8424  054302     001      000                 .BYTE 1,0
8425
8426  054304  000002                  DF14:   2
8427  054306     002      000                 .BYTE   2,0
8428  054310  053003                          DH40
```

```
                                        .BYTE   6,0
                                DF15:   3
                                        .BYTE   0,0
                                        DH1
                                        .BYTE   2,0
                                        DH7
                                        .BYTE   7,0
                                DF17:   4
                                        .BYTE   0,0
                                        DH44
                                        .BYTE   0,0
                                        DH1
                                        .BYTE   2,0
                                        DH2
                                        .BYTE   6,0
                                DF20:   3
                                        .BYTE   0,0
                                        DH1
                                        .BYTE   2,0
                                        DH56
                                        .BYTE   5,0
                                .EVEN
                                ;*****************************************************************
                                .SBTTL  TYPE ERROR ROUTINE
                                ;*ENTRY JSR PC,TYP ERR
                                ;*RETURN RTS PC
                                ;*
                                ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
                                ;*ERROR IS TO BE REPORTED. IT THEN USES THE "ERROR TABLE" ($ERRTB)
                                ;*ENTRY TO DEFINE WHAT INFORMATION IS TO BE REPORTED CONCERNING
                                ;*THE ERROR.
                                ;*****************************************************************
                                TYPERR: SAVREG
                                        MOVB    $ITEMB,R0       ;ENTER ERROR NUMBER
                                        BIC     #177400,R0      ;CLEAR SIGN EXTENSION
                                        DEC     R0              ;FORM INDEX FOR ERROR TABLE
                                        ASL     R0
                                        ASL     R0
                                        ASL     R0
                                1$:     ADD     #$ERRTB,R0      ;FORM ADDRESS OF ERROR ENTRY
                                        MOV     (R0)+,2$        ;GET EM POINTER
                                        BEQ     3$              ;BRANCH IF THERE ISN'T ONE
                                        TYPE    ,$CRLF          ;TYPE CARRIAGE RETURN LINE FEED
                                        TYPE                    ;TYPE ERROR MESSAGE (EM)
                                2$:     .WORD   0               ;EM POINTER GOES HERE
                                3$:     MOV     (R0)+,4$        ;GET DH POINTER
                                        BEQ     5$              ;BRANCH IF THERE ISN'T ONE
                                        TYPE    ,$CRLF          ;TYPE CR-LF
                                        TYPE                    ;TYPE DATA HEADER
                                4$:     .WORD   0               ;DH POINTER GOES HERE
                                5$:     MOV     (R0)+,R1        ;GET DT POINTER
                                        BEQ     20$             ;BRANCH IF THERE ARE NONE
                                        CLR     R4              ;SET INDENT SWITCH
```

```
8485  054454  012000                    MOV     (R0)+,R0        ;GET DF POINTER
8486  054456  012002                    MOV     (R0)+,R2        ;STORE NUMBER OF DH'S
8487  054460  001446                    BEQ     17$             ;DH NUM IS 0-BRANCH
8488  054462  005104                    COM     R4              ;NO INDENT
8489  054464  104401  001205            TYPE    ,$CRLF
8490  054470  112003            10$:    MOVB    @(R0)+,R3       ;GET & STORE NUMBER OF DATA WORDS
8491  054472  105720                    TSTB    (R0)+           ;BUMP PAST FORMAT WORD
8492  054474  005703                    TST     R3              ;TEST IF ANY DATA FOR THIS HEADER
8493  054476  001407                    BEQ     14$             ;NO - SKIP DATA PRINT
8494  054500  013146            11$:    MOV     @(R1)+,-(SP)    ;PUT FIRST DATA WORD ON STACK
8495  054502  104402                    TYPOC                   ;TYPE IT
8496  054504  005303                    DEC     R3              ;MORE DATA WORDS
8497  054506  001403                    BEQ     14$             ;NO-BRANCH
8498  054510  104401  054640            TYPE    ,SPACE2         ;TYPE SEPARATORS
8499  054514  000771                    BR      11$             ;LOOP
8500  054516  005302            14$:    DEC     R2              ;MORE DH'S?
8501  054520  003431                    BLE     20$             ;NO-BRANCH
8502  054522  104401  001205            TYPE    ,$CRLF
8503  054526  005760  000002            TST     2(R0)           ;ONLY A DH IN THIS REQUEST?
8504  054532  001404                    BEQ     15$             ;YES-BRANCH BYPASS INDENT
8505  054534  005104                    COM     R4              ;INDENT?
8506  054536  001002                    BNE     15$             ;NO-BRANCH
8507  054540  104401  054640            TYPE    ,SPACE2         ;YES-TYPE SPACES
8508  054544  012037  054552    15$:    MOV     @(R0)+,16$      ;GET NEXT DH POINTER
8509  054550  104401                    TYPE                    ;TYPE DH
8510  054552  000000            16$:    .WORD   0               ;DH POINTER GOES HERE
8511  054554  105710                    TSTB    (R0)            ;TYPE A DT?
8512  054556  001003                    BNE     21$             ;YES-BRANCH
8513  054560  062700  000002            ADD     #2,R0           ;INCREMENT DF POINTER
8514  054564  000754                    BR      14$             ;SEE IF END OF DF BLOCK
8515  054566  104401  001205    21$:    TYPE    ,$CRLF
8516  054572  005704                    TST     R4              ;INDENT?
8517  054574  001335                    BNE     10$             ;NO-BRANCH
8518  054576  104401  054640    17$:    TYPE    ,SPACE2         ;YES-TYPE SPACES
8519  054602  000732                    BR      10$             ;LOOP
8520  054604  104414            20$:    RESREG
8521
8522  054606  032777  010000  124324    BIT     #SW12,@SWR      ;SEE IF ABORT DRV AFTER 20 ERRORS
8523  054614  001410                    BEQ     25$             ;BR IF NO
8524  054616  023727  001103  000024    CMP     $ERFLG,#20.     ;ELSE SEE IF HAVE 20 ERRORS
8525  054624  001004                    BNE     25$             ;BR IF NO
8526  054626  012706  001100            MOV     #STACK,SP       ;ELSE RESTORE STACK PTR
8527  054632  000137  031434            JMP     $EOP            ;AND GO TO NEXT DRV
8528
8529  054636  000207            25$:    RTS     PC
8530  054640  020040      000   SPACE2: .ASCIZ/  /              ;2 SPACES
8531                                    ;  ODT-11 -- V005A
8532
8533                                    ; DEC-11-UODPA-A-LA
8534
8535                                    ; COPYRIGHT 1969,1970,1972
8536                                    ; DIGITAL EQUIPMENT CORPORATION
8537                                    ; MAYNARD, MASSACHUSETTS 01754
8538                                            .ENABL  ABS,AMA
8539          054644                            .EVEN
8540          054724                            .=.+60
```

```
                    000000          R0      =       %0      ; REGISTER
                    000001          R1      =       %1      ;  NAMING
                    000002          R2      =       %2      ;   CONVENTIONS
                    000003          R3      =       %3
                    000004          R4      =       %4
                    000005          R5      =       %5
                    000006          SP      =       %6
                    000007          PC      =       %7
                    177776          ST      =       177776          ;STATUS REGISTER
                                    ;
                    000014          O.TVEC  =       14              ;TRT VECTOR LOCATION
                    000340          O.STM   =       340             ;PRIORITY MASK - STATUS REGISTER
                    000020          O.TBT   =       20              ;T-BIT MASK - STATUS REGISTER
                    000003          TRT     =       000003          ;TRT INSTRUCTION
                    000006          RTT     =       000006          ;RTT INSTRUCTION
                                    ;
                                    ; R5 IS USUALLY CONSIDERED SAFE, THE CURRENT ADDRESS WORD
                                    ; RESIDES IN IT.  AFTER A BREAKPOINT, IT IS SET TO ZERO, AND SEARCH
                                    ; OPERATIONS LEAVE IT RANDOMLY FILLED.  OTHERWISE, IT SHOULD NOT
                                    ; BE USED EXCEPT FOR JSR'S AND THE CURRENT ADDRESS POINTER (CAD).
                                    ;
                    177562          O.RDB   =       177562  ;R DATA BUFFER
                    177560          O.RCSR  =       177560  ;R C/SR
                    177566          O.TDB   =       177566  ;T DATA BUFFER
                    177564          O.TCSR  =       177564  ;T C/SR
                                    ;
                                    ;
                                    ; INITIALIZE ODT
                                    ;  USE O.ODT FOR A NORMAL ENTRY
                                    ;  USE O.ODT+2 TO RESTART ODT - WIPING OUT ALL BREAKPOINTS
                                    ;  USE O.ODT+4 TO RE-ENTER (I.E. - FAKE A BREAKPOINT)
                                    ;
  054724  000413                    O.ODT:  BR      O.STRT          ;NORMAL ENTRY
  054726  000417                            BR      O.RST           ;RESTART
  054730  013737  177776  054704    O.ENTR: MOV     ST,O.UST        ;RE-ENTER  --  SAVE STATUS
  054736  013737  000016  177776            MOV     O.TVEC+2,ST     ;SET UP LOCAL STATUS
Z 054744  010737  054702                    MOV     PC,O.UPC        ;FAKE THE PC
  054750  000137  056102                    JMP     O.BK1
                                    ;
  054754  012706  054664            O.STRT: MOV     #O.URO,SP       ;SET UP STACK
  054760  010637  054700                    MOV     SP,O.USP        ;FAKE THE SAVED STACK
  054764  000414                            BR      O.RST1          ;CLEAR BREAKPOINT TABLES
  054766  004037  056310            O.RST:  JSR     0,O.SVR         ;SAVE REGISTERS
  054772  013777  054722  177716            MOV     O.UIN,@O.ADR1   ;REMOVE THE BREAKPOINT
  055000  113704  054706                    MOVB    O.PRI,R4        ;GET ODT PRIORITY
  055004  106004                            RORB    R4              ;SHIFT
  055006  106004                            RORB    R4              ;  INTO
  055010  106004                            RORB    R4              ;   POSITION
  055012  110437  177776                    MOVB    R4,ST           ;STORE IN STATUS
Z 055016  000127                    O.RST1: JMP     (PC)+
  055020  000403                            BR      O.45
  055022  012737  000002  056012            MOV     #RTI,O.RTIT     ;SET TO RTI IF 11/20 OR /05
  055030  105037  056731            O.45:   CLRB    O.P             ;DISALLOW PROCEED
  055034  012737  000340  000016            MOV     #O.STM,O.TVEC+2 ;STATUS WORD TO TRT VECTOR + 2
  055042  012737  056072  000014            MOV     #O.BRK,O.TVEC   ;PC TO TRT VECTOR
  055050  000447                            BR      O.RALL          ;CLEAR BREAKPOINT TABLES
```

```
8597
8598                                    ;
8599                                    ; SPECIAL NAME HANDLER
8600                                    ;  DEPENDS UPON THE EXPLICIT ORDER OF THE TWO TABLES 0.TL AND 0.URO
8601                                    ;
8602  055052  004537  056532  0.REGT: JSR     5,0.GET         ;SPECIAL NAME, GET ONE MORE CHARACTER
8603  055056  012704  056755          MOV     #0.TL,R4        ;TABLE START ADDRESS
8604  055062  120024          0.RSP:  CMPB    R0,(R4)+        ;IS THIS THE CORRECT CHARACTER?
8605  055064  001413          BEQ     0.SP            ;JUMP IF YES
8606  055066  022704  056763          CMP     #0.TL+0.LG,R4   ;IS THE SEARCH DONE?
8607  055072  101373          BHI     0.RSP           ;BRANCH IF NOT
8608  055074  042700  177770          BIC     #177770,R0      ;MASK OFF OCTAL
8609  055100  010004          MOV     R0,R4
8610  055102  006304          0.SP1:  ASL     R4
8611  055104  062704  054664          ADD     #0.URO,R4       ;GENERATE ADDRESS
8612  055110  005202          INC     R2              ;SET FOUND FLAG
8613  055112  000444          BR      0.SCAN          ;GO FIND NEXT CHARACTER
8614  055114  162704  056746  0.SP:   SUB     #0.TL-7,R4      ;CORRECT CONSTANT
8615  055120  000770          BR      0.SP1
8616                                    ;
8617                                    ; ↑ HANDLER - OPEN INDEXED ON THE PC
8618                                    ;
8619  055122  004737  056656  0.ORPC: JSR     PC,0.TCLS
8620  055126  010502          MOV     R5,R2           ;CURRENT ADDRESS IN R2
8621  055130  061202          ADD     @R2,R2          ;COMPUTE
8622  055132  006202          ASR     R2              ;MOVE ONE BIT TO CARRY
8623  055134  103421          BCS     0.ERR           ;ERROR IF ODD NUMBER
8624  055136  006302          ASL     R2              ;RESTORE WORD
8625  055140  005722          TST     (R2)+           ; AND INCREMENT BY TWO
8626  055142  010205          MOV     R2,R5           ;UPDATE CAD
8627  055144  000137  055416  JMP     0.OP2           ;GO FINISH UP
8628                                    ;
8629                                    ; B HANDLER - SET AND REMOVE BREAKPOINTS
8630                                    ;
8631  055150  005702          0.BKPT: TST     R2              ;IF NO NUMBER TYPED
8632  055152  001406          BEQ     0.RALL          ;  REMOVE BREAKPOINT
8633  055154  006204          ASR     R4              ;CHECK IF ODD
8634  055156  103410          BCS     0.ERR           ;JUMP IF ODD
8635  055160  006304          ASL     R4              ;RESTORE ONE BIT
8636  055162  010437  054716          MOV     R4,0.ADR1       ;SET A BREAKPOINT
8637  055166  000412          BR      0.DCD
8638  055170  012737  056772  054716  0.RALL: MOV     #0.TRTC,0.ADR1  ;CLEAR BREAKPOINT
8639  055176  000406          BR      0.DCD
8640                                    ;
8641                                    ; COMMAND DECODER - ODT11
8642                                    ;
8643                                    ;   REGISTERS R0-R4 MAY BE USED,
8644                                    ;    REGISTER R5 WILL BE CONSIDERED SAFE
8645                                    ;
8646  055200  052705  000001  0.ERR:  BIS     #1,R5           ;CLOSE EVERYTHING
8647  055204  012700  000077          MOV     #'?,R0          ;  ? TO BE TYPED
8648  055210  004537  056610          JSR     5,0.FTYP        ; OUTPUT ?
8649  055214  004537  056710  0.DCD:  JSR     5,0.CRLS        ;TYPE  <CR><LF>#
8650  055220  005004          0.DCD1: CLR     R4              ; R4 CONTAINS THE CONVERTED OCTAL
8651  055222  005002          CLR     R2              ; R2 IS THE NUMBER FOUND FLAG
8652  055224  004537  056532  0.SCAN: JSR     5,0.GET         ;GET A CHAR, RETURN IN R0
8653  055230  022700  000060          CMP     #'0,R0          ;COMPARE WITH ASCII 0
```

```
8653  055234  101013                  BHI     0.CLGL          ;CHECK LEGALITY IF NON-NUMERIC
8654  055236  022700  000067          CMP     #'7,R0          ;COMPARE WITH ASCII 7
8655  055242  103410                  BLO     0.CLGL          ;CHECK LEGALITY IF NOT OCTAL
8656  055244  042700  177770          BIC     #177770,R0      ;CONVERT TO BCD
8657  055250  006304                  ASL     R4              ; MAKE ROOM
8658  055252  006304                  ASL     R4              ;  IN
8659  055254  006304                  ASL     R4              ;    R4
8660  055256  060004                  ADD     R0,R4           ;PACK THREE BITS IN R4
8661  055260  005202                  INC     R2              ;R2 HAS NUMERIC FLAG
8662  055262  000760                  BR      0.SCAN          ;   AND TRY AGAIN
8663  055264  005001          0.CLGL: CLR     R1              ;CLEAR INDEX
8664  055266  120061  056741  0.LGL1: CMPB    R0,0.LGCH(R1)   ;DO THE CODES MATCH?
8665  055272  001405                  BEQ     0.LGL2          ;JUMP IF YES
8666  055274  005201                  INC     R1              ; SET INDEX FOR NEXT SEARCH
8667  055276  020127  000014          CMP     R1,#0.CLGT      ;IS THE SEARCH DONE?
8668  055302  103336                  BHIS    0.ERR           ;   OOPS!
8669  055304  000770                  BR      0.LGL1          ;RE-LOOP
8670  055306  006301          0.LGL2: ASL     R1              ;MULTIPLY BY TWO
8671  055310  000171  055314          JMP     @0.LGDR(R1)     ;GO TO PROPER ROUTINE
8672
8673  055314  055344  0.LGDR: 0.WRD    ;  /    OPEN WORD
8674  055316  055376          0.CRET  ;  CARRIAGE RETURN    CLOSE
8675  055320  055052          0.REGT  ;  $  REGISTER OPS
8676  055322  055706          0.GO    ;  G  GO TO ADDRESS K
8677  055324  055410          0.OP1   ;  <LF>  MODIFY, CLOSE, OPEN NEXT
8678  055326  055122          0.ORPC  ;  ←  OPEN RELATED, INDEX - PC
8679  055330  055442          0.BACK  ;  ↑  OPEN PREVIOUS
```

```
                        0.OFST  ;  O  OFFSET
                        0.WSCH  ;  W  SEARCH WORD
                        0.EFF   ;  E  SEARCH EFFECTIVE ADDRESS
                        0.BKPT  ;  B  BREAKPOINTS
                        0.PROC  ;  P  PROCEED
000030          0.LGL   =       .-0.LGDR        ;LGL MUST EQUAL 2X CHLGT ALWAYS
                ;
                ; PROCESS / - OPEN WORD
                ;
055344  005702  0.WRD:  TST     R2              ;GET VALUE IF R2 IS NON-ZERO
055346  001410          BEQ     0.WRDA          ;SKIP OTHERWISE
055350  010405          MOV     R4,R5           ;    PUT VALUE IN CAD
055352  006205  0.WRD1: ASR     R5              ;MOVE ONE BIT TO CARRY
055354  103711  0.ERR2: BCS     0.ERR           ;JUMP IF ODD ADDRESS
055356  006305          ASL     R5              ;RESTORE THE CARRY BIT
055360  011500          MOV     @R5,R0          ;GET CONTENTS OF WORD
055362  004537  056446  JSR     5,0.CADV        ;GO GET AND TYPE OUT @CAD
055366  000714          BR      0.DCD1          ;GO BACK TO DECODER
055370  042705  000001  0.WRDA: BIC     #1,R5           ;CLEAR CLOSED BIT
055374  000766          BR      0.WRD1          ;GO BACK TO MAIN-LINE
                ;
                ; PROCESS CARRIAGE RETURN
                ;
055376  004737  056656  0.CRET: JSR     PC,0.TCLS       ;CLOSE LOCATION
055402  052705  000001          BIS     #1,R5           ;CLOSE EVERYTHING
055406  000702          BR      0.DCD           ;RETURN TO DECODER
                ;
                ; PROCESS <LF>, OPEN NEXT WORD
                ;
055410  004737  056656  0.OP1:  JSR     PC,0.TCLS       ;CLOSE PRESENT CELL
055414  005725          TST     (R5)+           ;GENERATE NEW ADDRESS
055416  004537  056702  0.OP2:  JSR     5,0.CRLF        ;<CR><LF>
055422  010500          MOV     R5,R0           ;NUMBER TO TYPE
055424  004537  056446  JSR     5,0.CADV        ;  TYPE OUT ADDRESS
055430  012700  000057  MOV     #'/,R0          ;TYPE A /
055434  004537  056610  JSR     5,0.FTYP
055440  000744          BR      0.WRD1          ;GO PROCESS IT
                ;
                ; PROCESS ↑, OPEN PREVIOUS WORD
                ;
055442  004737  056656  0.BACK: JSR     PC,0.TCLS
055446  005745          TST     -(R5)           ;GENERATE NEW ADDRESS
055450  000762          BR      0.OP2           ;GO DO THE REST
                ;
                ; PROCESS 0, COMPUTE OFFSET
                ;
055452  006205  0.OFST: ASR     R5              ;GET LOW ORDER BIT
055454  103737          BCS     0.ERR2          ;ERROR IF CLOSED
055456  006305          ASL     R5              ;RESTORE WORD
055460  012700  000040  MOV     #' ,R0          ;TYPE ONE BLANK
055464  004537  056610  JSR     5,0.FTYP        ;  AS A SEPARATOR
055470  160504          SUB     R5,R4           ;COMPUTE
055472  005304          DEC     R4
055474  005304          DEC     R4              ;    16 BIT OFFSET
055476  010400          MOV     R4,R0           ;TYPE A
055500  010402          MOV     R4,R2           ;SAVE R4
```

```
 8736  055502  004537  056446            JSR     5,0.CADV        ;NUMBER IN R0 - WORD MODE
 8737  055506  010200                    MOV     R2,R0
 8738  055510  006200                    ASR     R0              ;DIVIDE BY TWO
 8739  055512  103402                    BCS     0.OF1           ;BRANCH IF ODD
 8740  055514  004537  056446            JSR     5,0.CADV        ;NUMBER IN R0 - BYTE MODE
 8741  055520  000137  055220  0.OF1:    JMP     0.DCD1          ;ALL DONE
 8742                                    ;
 8743                                    ; SEARCHES - $MSK   HAS THE MASK
 8744                                    ;            $MSK+2 HAS THE FWA
 8745                                    ;            $MSK+4 HAS THE LWA
```

```
8746
8747  055524  005201                  Ò.EFF:  INC     R1              ;SET EFFECTIVE SEARCH
8748  055526  000401                          BR      O.WDS
8749  055530  005001                  O.WSCH: CLR     R1              ;SET WORD SEARCH
8750  055532  005702                  O.WDS:  TST     R2              ;CHECK FOR OBJECT FOUND
8751  055534  001621                  O.ERR1: BEQ     O.ERR           ;ERROR IF NO OBJECT
8752  055536  013702  054712                  MOV     O.MSK+2,R2      ;SET ORIGIN
8753  055542  013705  054710                  MOV     O.MSK,R5        ;SET MASK
8754  055546  005105                          COM     R5              ;AND COMPLEMENT IT
8755  055550  020237  054714          O.WDS2: CMP     R2,O.MSK+4      ; IS THE SEARCH ALL DONE?
8756  055554  101217                          BHI     O.DCD           ;  YES
8757  055556  011200                          MOV     @R2,R0          ; GET OBJECT
8758  055560  005701                          TST     R1              ;NO
8759  055562  001027                          BNE     O.EFF1          ;BRANCH IF EFFECTIVE SEARCH
8760  055564  010046                          MOV     R0,-(SP)
8761  055566  010403                          MOV     R4,R3           ;EXCLUSIVE OR
8762  055570  040400                          BIC     R4,R0           ; IS DONE
8763  055572  042603                          BIC     (SP)+,R3        ;       IN A VERY
8764  055574  050003                          BIS     R0,R3           ;    FANCY MANNER HERE
8765  055576  040503                          BIC     R5,R3           ;AND RESULT WITH MASK
8766  055600  001016                  O.WDS3: BNE     O.WDS4          ;RE-LOOP IF NO MATCH
8767  055602  010446                          MOV     R4,-(SP)        ;REGISTERS R2,R4, AND R5 ARE SAFE
8768  055604  004537  056702                  JSR     5,Ò.CRLF        ;TYPE <CR,LF>
8769  055610  010200                          MOV     R2,R0           ;GET READY TO TYPE
8770  055612  004537  056446                  JSR     5,Ò.CADV        ;  TYPE ADDRESS
8771  055616  012700  000057                  MOV     #'/,R0          ;SLASH TO R0
8772  055622  004537  056610                  JSR     5,O.FTYP        ;TYPE IT
8773  055626  011200                          MOV     @R2,R0          ;GET CONTENTS
8774  055630  004537  056446                  JSR     5,Ò.CADV        ;TYPE CONTENTS
8775  055634  012604                          MOV     (SP)+,R4        ; RESTORE R4
8776  055636  005722                  O.WDS4: TST     (R2)+           ;INCREMENT TO NEXT CELL AND
8777  055640  000743                          BR      O.WDS2          ;    RETURN
8778  055642  020004                  O.EFF1: CMP     R0,R4           ; IS (X)=K?
8779  055644  001755                          BEQ     O.WDS3          ;TYPE IF EQUAL
8780  055646  010003                          MOV     R0,R3           ;(X) TO R3
8781  055650  060203                          ADD     R2,R3           ;(X)+X
8782  055652  005203                          INC     R3
8783  055654  005203                          INC     R3              ;(X)+X+2
8784  055656  020304                          CMP     R3,R4           ;IS (X)+X+2=K?
8785  055660  001747                          BEQ     O.WDS3          ;BRANCH IF EQUAL
8786  055662  042700  177400                  BIC     #177400,R0      ;WIPE OUT EXTRANEOUS BITS
8787  055666  110000                          MOVB    R0,R0           ;EXTEND SIGN
8788  055670  000257                          CCC
8789  055672  006300                          ASL     R0              ;MULTIPLY BY TWO
8790  055674  005200                          INC     R0              ;ADD TWO
8791  055676  005200                          INC     R0
8792  055700  060200                          ADD     R2,R0           ;ADD PC
8793  055702  020004                          CMP     R0,R4           ;IS THE RESULT A PROPER REL. BRANCH?
8794  055704  000735                          BR      O.WDS3
8795                                  ;
8796                                  ; PROCESS G - GO
8797                                  ;
8798  055706  105037  056731          Ò.GO:   CLRB    O.P             ;DISALLOW PROCEED
8799  055712  006204                          ASR     R4              ;CHECK LOW ORDER BIT
8800  055714  103617                          BCS     O.ERR2          ;ERROR IF ODD NUMBER
8801  055716  006304                          ASL     R4              ;RESTORE WORD
```

```
8802  055720  010437  054702                 MOV     R4,0.UPC        ;SET UP NEW PC
8803  055724  112737  000340  177776         MOVB    #0.STM,ST       ;SET HIGH PRIORITY
8804  055732  004537  056400                 JSR     5,0.RSTT        ;RESTORE TELETYPE
8805  055736  105037  056730         0.TBIT: CLRB    0.T             ;CLEAR BOTH
8806  055742  042737  000020  054704         BIC     #0.TBT,0.UST    ;  T-BIT FLAGS
8807  055750  017737  176742  054722         MOV     @0.ADR1,0.UIN   ;SAVE INSTRUCTION
8808  055756  013777  056772  176732         MOV     0.TRTC,@0.ADR1  ;REPLACE WITH TRAP
8809  055764  012600                 0.GO2:  MOV     (SP)+,R0        ;RESTORE
8810  055766  012601                         MOV     (SP)+,R1        ;  R0
8811  055770  012602                         MOV     (SP)+,R2        ;    THRU
8812  055772  012603                         MOV     (SP)+,R3
8813  055774  012604                         MOV     (SP)+,R4        ;
8814  055776  012605                         MOV     (SP)+,R5        ;    R5
8815  056000  012606                         MOV     (SP)+,SP        ;  AND SP
8816  056002  013746  054704                 MOV     0.UST,-(SP)     ;    AND STATUS
8817  056006  013746  054702                 MOV     0.UPC,-(SP)     ;    AND PC
8818  056012  000006                 0.RTIT: RTT                     ;CHANGED TO RTI FOR 11/20 AND /05
8819                                         ;
8820                                         ; PROCESS P - PROCEED
8821                                         ;   ONLY ALLOWED AFTER A BREAKPOINT
8822                                         ;
8823  056014  105737  056731         0.PROC: TSTB    0.P             ;CHECK LEGALITY OF PROCEED
8824  056020  001645                         BEQ     0.ERR1          ;NOT LEGAL
8825  056022  105037  056731                 CLRB    0.P             ;CLEAR PROCEED FLAG
8826  056026  005702                         TST     R2              ;WAS COUNT SPECIFIED?
8827  056030  001402                         BEQ     0.PR1           ;NO
8828  056032  010437  054720                 MOV     R4,0.CT         ;YES, PUT AWAY COUNT
8829  056036  112737  000340  177776 0.PR1:  MOVB    #0.STM,ST       ;FORCE HIGH PRIORITY
8830  056044  004537  056400                 JSR     5,0.RSTT        ;RESTORE TTY
8831  056050  112737  000340  177776 0.C1:   MOVB    #0.STM,ST       ;SET HIGH PRIORITY
8832  056056  105237  056730                 INCB    0.T             ;SET T-BIT FLAG
8833  056062  052737  000020  054704         BIS     #0.TBT,0.UST    ;SET T-BIT
8834  056070  000735                         BR      0.GO2
8835                                         ;
8836                                         ; BREAKPOINT HANDLER
8837                                         ;  A TRT BREAKPOINT CAUSES 0.BRK TO BE ENTERED, WHICH SAVES
8838                                         ;  VARIOUS ODDS AND ENDS, FINDS OUT IF THE BREAKPOINT WAS LEGAL,
8839                                         ;  AND GIVES CONTROL TO THE COMMAND DECODER
8840                                         ;
8841  056072  012637  054702         0.BRK:  MOV     (SP)+,0.UPC     ;PRIORITY IS 7 UPON ENTRY
8842  056076  012637  054704                 MOV     (SP)+,0.UST     ;SAVE STATUS AND PC
8843  056102  004037  056310         0.BK1:  JSR     0,0.SVR         ;SAVE VARIOUS REGISTERS
8844  056106  105737  056730                 TSTB    0.T             ;CHECK FOR T-BIT SET
8845  056112  001311                         BNE     0.TBIT          ;JUMP IF SET
8846  056114  013777  054722  176574         MOV     0.UIN,@0.ADR1   ;REMOVE BREAKPOINTS
8847  056122  105737  054706                 TSTB    0.PRI           ;CHECK IF PRIORITY
8848  056126  100003                         BPL     0.BK2           ;  IS AS SAME AS USER PGM
8849  056130  113705  054704                 MOVB    0.UST,R5        ;PICK UP USER UST IF SO
8850  056134  000407                         BR      0.BK3           ;AND DON'T COMPUTE THE PRIORITY
8851  056136  113705  054706         0.BK2:  MOVB    0.PRI,R5        ;OTHERWISE PICK UP ACTUAL PRIORITY
8852  056142  000257                         CCC                     ;CLEAR CARRY
8853  056144  106005                         RORB    R5              ;SHIFT LOW ORDER BITS
8854  056146  106005                         RORB    R5              ;  INTO
8855  056150  106005                         RORB    R5              ;    HIGH ORDER
8856  056152  106005                         RORB    R5              ;      POSITION
8857  056154  110537  177776         0.BK3:  MOVB    R5,ST           ;PUT THE STATUS AWAY WHERE IT BELONGS
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8858  056160  013705  054702                  MOV     0.UPC,R5        ;GET PC, IT POINTS TO THE TRT
8859  056164  005745                          TST     -(R5)           ;SUBTRACT TWO
8860  056166  010537  054702                  MOV     R5,0.UPC        ;FROM THE USER'S PC
8861  056172  020537  054716                  CMP     R5,0.ADR1       ;COMPARE WITH LIST
8862  056176  001417                          BEQ     0.B2            ;JUMP IF FOUND
8863  056200  004537  056346                  JSR     5,0.SVTT        ;SAVE TELETYPE STATUS
8864  056204  004537  056702                  JSR     5,0.CRLF
8865  056210  012704  056734                  MOV     #0.BD,R4        ;ERROR, NOTHING FOUND
8866  056214  012703  056736                  MOV     #0.BD+1,R3
8867  056220  004537  056574                  JSR     5,0.TYPE        ;OUTPUT "BE" FOR BAD ENTRY
8868  056224  010500                          MOV     R5,R0
8869  056226  042737  000020  054704          BIC     #0.TBT,0.UST    ;CLEAR OUT ANY POSSIBLE FAKE T-BIT
8870  056234  000420                          BR      0.B3            ; AND CONTINUE
8871  056236  005337  054720          0.B2:   DEC     0.CT
8872  056242  003302                          BGT     0.C1            ;JUMP IF REPEAT
8873  056244  012737  000001  054720          MOV     #1,0.CT         ;RESET COUNT TO 1
8874  056252  105237  056731                  INCB    0.P             ;ALLOW PROCEED
8875  056256  004537  056346                  JSR     5,0.SVTT        ;SAVE TELETYPE STATUS, R4 IS SAFE
8876  056262  012700  000102                  MOV     #'B,R0
8877  056266  004537  056610                  JSR     5,0.FTYP        ;TYPE "B"
8878  056272  013700  054716                  MOV     0.ADR1,R0       ;GET ADDRESS OF BREAK
8879  056276  004537  056446          0.B3:   JSR     5,0.CADV        ;TYPE ADDRESS
8880  056302  005005                          CLR     R5              ;CLEAR CAD
8881  056304  000137  055214                  JMP     0.DCD           ;GO TO DECODER
8882                                  ;
8883                                  ; SAVE REGISTERS R0-R6 IN INTERNAL STACK
8884                                  ;
8885  056310  012637  056726          0.SVR:  MOV     (SP)+,0.XXX     ;PICK REGISTER FROM STACK AND SAVE
8886  056314  010637  054700                  MOV     SP,0.USP        ;SAVE USER STACK ADDRESS
8887  056320  012706  054700                  MOV     #0.USP,SP       ;SET TO INTERNAL STACK
8888  056324  010546                          MOV     R5,-(SP)        ;SAVE
8889  056326  010446                          MOV     R4,-(SP)        ; REGISTERS
8890  056330  010346                          MOV     R3,-(SP)        ;1
8891  056332  010246                          MOV     R2,-(SP)        ; THRU
8892  056334  010146                          MOV     R1,-(SP)        ;     5
8893  056336  013746  056726                  MOV     0.XXX,-(SP)     ;PUT SAVED REGISTER ON STACK
8894  056342  005746                          TST     -(SP)
8895  056344  000200                          RTS     R0
8896                                  ;
8897                                  ; SAVE TELETYPE STATUS
8898                                  ;
8899  056346  113737  177560  056732  0.SVTT: MOVB    0.RCSR,0.CSR1   ;SAVE R C/SR
8900  056354  113737  177564  056733          MOVB    0.TCSR,0.CSR2   ;SAVE T C/SR
8901  056362  105037  177560                  CLRB    0.RCSR          ;CLEAR ENABLE AND MAINTENANCE
8902  056366  105037  177564                  CLRB    0.TCSR          ;  BITS IN BOTH C/SR
8903  056372  004537  056702                  JSR     5,0.CRLF        ;TYPE <CR,LF>
8904  056376  000205                          RTS     R5
8905                                  ;
8906                                  ; RESTORE TELETYPE STATUS
8907                                  ;
8908  056400  004537  056702          0.RSTT: JSR     5,0.CRLF                ;<CR,LF> BEFORE RESTORING
8909  056404  105737  177564                  TSTB    0.TCSR          ;WAIT READY ON PRINTER
8910  056410  100375                          BPL     .-4
8911  056412  032737  004000  177560          BIT     #4000,0.RCSR    ;CHECK BUSY FLAG ON READER
8912  056420  001403                          BEQ     0.RSE1          ;SKIP READY LOOP IF NOT BUSY
8913  056422  105737  177560                  TSTB    0.RCSR          ;WAIT READY
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8914  056426  100375                  0.RSE1: BPL     .-4             ;    ON READER
8915  056430  113737  056732  177560          MOVB    0.CSR1,0.RCSR   ;RESTORE
8916  056436  113737  056733  177564          MOVB    0.CSR2,0.TCSR   ;  THE STATUS REGISTERS
8917  056444  000205                          RTS     R5
8918
8919                                  ;
8920                                  ; TYPE OUT CONTENTS OF WORD OR BYTE WITH ONE TRAILING SPACE
8921                                  ; WORD IS IN R0
8922                                  ;
8923  056446  010246                  0.CADV: MOV     R2,-(SP)        ;SAVE R2
8924  056450  012704  056771                  MOV     #0.BUF+6,R4     ;BUFFER START ADDRESS
8925  056454  012746  000060                  MOV     #'0,-(SP)               ;CONSTANT ASCII 0
8926  056460  010002                  0.SPC:  MOV     R0,R2           ; GET
8927  056462  042702  177770                  BIC     #177770,R2      ;    OCTAL CHARACTER
8928  056466  061602                          ADD     (SP),R2         ;CONVERT TO ASCII
8929  056470  110244                          MOVB    R2,-(R4)        ;STORE IN BUFFER
8930  056472  006200                          ASR     R0              ;SHIFT THIS MESS
8931  056474  006200                          ASR     R0              ; RIGHT
8932  056476  006200                          ASR     R0              ;    THREE WHOLE PLACES
8933  056500  020427  056764                  CMP     R4,#0.BUF+1     ;DONE?
8934  056504  101365                          BHI     0.SPC           ;    NO
8935  056506  042700  177776                  BIC     #177776,R0      ;GET LAST BIT
8936  056512  062600                          ADD     (SP)+,R0                ;CONVERT TO ASCII
8937  056514  110044                          MOVB    R0,-(R4)        ;AND PUT IT AWAY
8938  056516  012703  056771                  MOV     #0.BUF+6,R3     ;LWA
8939  056522  004537  056574                  JSR     5,0.TYPE        ;TYPE WHOLE STRING OF CHARACTERS
8940  056526  012602                          MOV     (SP)+,R2        ;RESTORE R2
8941  056530  000205                          RTS     R5
8942                                  ;
8943                                  ; GENERAL CHARACTER INPUT ROUTINE
8944                                  ; CHARACTER INPUT GOES TO R0
8945                                  ;
8946  056532  105737  177560          0.GET:  TSTB    0.RCSR          ;WAIT FOR
8947  056536  100375                          BPL     .-4             ;    INPUT FROM KEYBOARD
8948  056540  113700  177562                  MOVB    0.RDB,R0        ;GET A CHARACTER
8949  056544  004537  056610                  JSR     5,0.FTYP        ;ECHO CHARACTER
8950  056550  042700  177600                  BIC     #177600,R0      ;STRIP OFF PARITY FROM CHARACTER
8951  056554  001766                          BEQ     0.GET           ;IGNORE NULLS
8952  056556  122700  000040                  CMPB    #40,R0          ;CHECK FOR SPACES
8953  056562  001763                          BEQ     0.GET           ;IGNORE NULLS
8954  056564  122700  000073                  CMPB    #';,R0          ;CHECK FOR SEMI-COLON
8955  056570  001760                          BEQ     0.GET           ;IGNORE THEM IF FOUND
8956  056572  000205                          RTS     R5
8957                                  ;
8958                                  ; GENERAL CHARACTER OUTPUT ROUTINE
8959                                  ;  ADDRESS OF FIRST BYTE IN R4,
8960                                  ;  ADDRESS OF LAST BYTE IN R3, (R3)>(R4)
8961                                  ;
8962  056574  020304                  0.TYPE: CMP     R3,R4           ;CHECK FOR COMPLETION
8963  056576  103426                          BLO     0.TYP1          ;  EXIT WHEN DONE
8964  056600  112400                          MOVB    (R4)+,R0        ;GET A CHARACTER
8965  056602  004537  056610                  JSR     5,0.FTYP        ;TYPE ONE CHARACTER
8966  056606  000772                          BR      0.TYPE          ;LOOP UNTIL DONE
8967                                  ;
8968                                  ; TYPE ONLY ONE CHARACTER (CONTAINED IN R0)
8969  056610  105737  177564          0.FTYP: TSTB    0.TCSR          ;CHECK STATUS
```

```
                        BPL     .-4             ;WAIT UNTIL READY
                        MOVB    R0,O.TDB        ;TYPE ONE CHARACTER
                        CMPB    R0,@#45         ;IS CHAR TO BE FILLED?
                        BNE     O.TYP1          ;NO
                        MOVB    @#44,-(SP)      ;YES, INIT THE COUNT
O.TYP2:                 TSTB    O.TCSR
                        BPL     O.TYP2
                        CLRB    O.TDB           ;GENERATE NULL FILLER
                        DECB    @SP
                        BGT     O.TYP2
                        TST     (SP)+           ;POP STACK
O.TYP1:                 RTS     R5
;
; CLOSE WORD OR BYTE AND EXIT,
; UPON ENTERING, R2 HAS NUMERIC FLAG, R4 HAS CONTENTS
;
O.TCLS:                 ASR     R5              ;GET LOW ORDER BIT
                        BCS     O.TC            ;JUMP IF ALREADY CLOSED
                        ASL     R5
                        TST     R2              ;IF NO NUMBER WAS TYPED THERE IS
                        BEQ     O.CLS1          ;NO CHANGE TO THE OPEN CELL
                        MOV     R4,@R5          ;STORE WORD
O.CLS1:                 RTS     PC
O.TC:                   TST     -(SP)           ;POP EXTRA CELL FROM STACK
                        JMP     O.ERR           ;AND SCREAM BLOODY MURDER
;
; O.CRLF - TYPE <CR,LF>
; O.CRLS - TYPE <CR,LF>*
;
O.CRLF:                 MOV     #O.CR+1,R3      ;LWA <CR,LF>
                        BR      O.CRS
O.CRLS:                 MOV     #O.CR+2,R3      ;LWA <CR,LF>*
O.CRS:                  MOV     #O.CR,R4        ;FWA
                        JSR     5,O.TYPE        ;TYPE SOMETHING
                        RTS     R5
;
O.XXX:                  .WORD   0               ;TEMPORARY STORAGE
O.T:                    .BYTE   0               ;  T-BIT FLAG
O.P:                    .BYTE   0               ;PROCEED FLAG = 0 IF PROCEED NOT ALLOWED
                                                ;             = 1 IF PROCEED ALLOWED
O.CSR1:                 .BYTE   0               ;SAVE CELL - R C/SR
O.CSR2:                 .BYTE   0               ;SAVE CELL - T C/SR
;
                        .EVEN
O.BD:                   .WORD   "BE
;
O.CR:                   .BYTE   015     ;       <CR>
                        .BYTE   012     ;       <LF>
                        .BYTE   '*      ;       *
;
O.LGCH:                 .BYTE   '/      ;       /
                        .BYTE   015     ;       CARRIAGE RETURN
                        .BYTE   '$      ;       $
                        .BYTE   'G      ;       G
                        .BYTE   012     ;       <LF>
                        .BYTE   '^      ;       ^
```

```
 9026  056747  136                    .BYTE   '↑      ; ↑
 9027  056750  117                    .BYTE   'O      ; O
 9028  056751  127                    .BYTE   'W      ; W
 9029  056752  105                    .BYTE   'E      ; E
 9030  056753  102                    .BYTE   'B      ; B
 9031  056754  120                    .BYTE   'P      ; P
 9032          000014    O.CLGT  =       .-O.LGCH                ;TABLE LENGTH
 9033                    ;
 9034  056755  123    O.TL:   .BYTE   'S      ;DO        1
 9035  056756  120            .BYTE   'P      ;NOT       2
 9036  056757  115            .BYTE   'M      ;CHANGE    3
 9037  056760  000            .BYTE   0       ;THE       4
 9038  056761  000            .BYTE   0       ;ORDER     5
 9039  056762  102            .BYTE   'B      ;HERE      6
 9040          000006    O.LG    =       .-O.TL
 9041                    ;
 9042  056763            O.BUF:                          ;6 CHAR. BUFFER WITH
 9043          056771    .       =       ;+6
 9044  056771  040               .BYTE                   ;TRAILING BLANK
 9045                            .EVEN
 9046                    ;
 9047  056772  000003    O.TRTC: TRT                     ;TRACE TRAP PROTOTYPE
 9048                    ;
 9049                    ;THE ORDER OF THE FOLLOWING ENTRIES IS CRITICAL
 9050                    ;
 9051          054664    .       =       O.ODT-40
 9052  054664  000000    O.UR0:  0       ;USER R0
 9053  054666  000000            0       ;      R1
 9054  054670  000000            0       ;      R2
 9055  054672  000000            0       ;      R3
 9056  054674  000000            0       ;      R4
 9057  054676  000000            0       ;      R5
 9058  054700  000000    O.USP:  0       ;USER SP
 9059  054702  000000    O.UPC:  0       ;USER PC
 9060  054704  000000    O.UST:  0       ;USER ST
 9061  054706  000007    O.PRI:  7       ;ODT PRIORITY
 9062  054710  000000    O.MSK:  0       ;MASK
 9063  054712  000000            0       ;LOW LIMIT
 9064  054714  000000            0       ;HIGH LIMIT
 9065                    ;
 9066                    ; BREAK POINT LISTS, ADR1 = ADDRESS OF BREAKPOINT,CT = COUNT,
 9067                    ;   UIN = CONTENTS
 9068                    ;
 9069  054716  000000    O.ADR1: 0
 9070  054720  000000    O.CT:   0
 9071  054722  000000    O.UIN:  0
 9072          000001            .END
```

```
ABASE = 177440          466     507     531#
ACDW1 = 000000          466     509
ACDW2 = 000000          466     510
ACLO  = 000010          257#
ACPUOP= 000000          466     481
ACTII   005466         1173#   2363#
ADDW0 = 000000          466     511
ADDW1 = 000000          466     512
ADDW10= 000000          466     521
ADDW11= 000000          466     522
ADDW12= 000000          466     523
ADDW13= 000000          466     524
ADDW14= 000000          466     525
ADDW15= 000000          466     526
ADDW2 = 000000          466     513
ADDW3 = 000000          466     514
ADDW4 = 000000          466     515
ADDW5 = 000000          466     516
ADDW6 = 000000          466     517
ADDW7 = 000000          466     518
ADDW8 = 000000          466     519
ADDW9 = 000000          466     520
ADEVCT= 000000          466     472
ADEVM = 000000          466     508
AENV  = 000000          466     477
AENVM = 000000          466     478
AFATAL= 000000          466     469
AMADR1= 000000          466     494
AMADR2= 000000          466     498
AMADR3= 000000          466     501
AMADR4= 000000          466     504
AMAMS1= 000000          466     488
AMAMS2= 000000          466     496
AMAMS3= 000000          466     499
AMAMS4= 000000          466     502
AMSGAD= 000000          466     474
AMSGLG= 000000          466     475
AMSGTY= 000000          466     468
AMTYP1= 000000          466     489
AMTYP2= 000000          466     497
AMTYP3= 000000          466     500
AMTYP4= 000000          466     503
APASS = 000000          466     471
APRIOR= 000000          466
APTCSU= 000040         6670    6842#
APTENV= 000001         6617    6663    6798    6840#
APTSIZ= 000200         2296    6839#
APTSPO= 000100         6665    6800    6841#
ASWREG= 000000          466     479
ATESTN= 000000          466     470
ATTN    005376          640#    5605    5624    5650    6137
AUNIT = 000000          466     473
AUSWR = 000000          466     480
AVECT1= 000000          466     505
AVECT2= 000000          466     506
AVGSP   035056         5365    5370    6181#
```

```
AVGTIM  035016          4891    4966    4971    5083    5088    5200    5205    6166#
BADINT  035716          6379#
BADTMO  035630          2441    6344#
BAI     = 000020         220#    3008    3121    3250    3297    3694    3732    3865    4045    4101    4212    4251    4367
                        4479    4510
BA16    = 000400         206#
BA17    = 001000         207#
BIT0    = 000001         149#     203     235     254    6311
BIT00   = 000001         139#     149
BIT01   = 000002         138#     148
BIT02   = 000004         137#     147
BIT03   = 000010         136#     146
BIT04   = 000020         135#     145
BIT05   = 000040         134#     144
BIT06   = 000100         133#     143
BIT07   = 000200         132#     142
BIT08   = 000400         131#     141    6552
BIT09   = 001000         130#     140    6560    6628
BIT1    = 000002         148#     236
BIT10   = 002000         129#     208     226     245     277     291     305     318     332    6605
BIT11   = 004000         128#     209     227     246     263     278     292     306     319     333    5281    5289    5325
                        5333    6567
BIT12   = 010000         127#     210     228     247     279     293     307     320     334
BIT13   = 020000         126#     211     229     248     264     280     294     308     321     335    6612
BIT14   = 040000         125#     212     230     249     265     281     295     309     322     336     349    5857    6538
BIT15   = 100000         124#     213     214     231     250     266     282     352    4411    4542    5857
BIT2    = 000004         147#     237     256
BIT3    = 000010         146#     219     238     257
BIT4    = 000020         145#     220     239     258     271     299     326
BIT5    = 000040         144#     221     240     259     272     286     300     313     327
BIT6    = 000100         143#     204     222     241     260     273     287     301     314     328
BIT7    = 000200         142#     205     223     242     261     274     288     302     315     329    3465    3521    3560
                        3648    3890
BIT8    = 000400         141#     206     224     243     262     275     289     303     316     330
BIT9    = 001000         140#     207     225     244     276     290     304     317     331
BPTVEC= 000014           156#
BSE     = 000200         242#
BSERR   001544           622#    2797*   2812*   2821*   2822    2839*   2884
BSE20   002364           629#    2847
BSE22   003364           630#    2799    2836    2854    5960
BYP     032512          2510    2532    2536    2551    2603    2611    2629    2633    2637    2641    5677#
BYPTIM  001362           548#    2224*   2229*   2234*   2239*   2244*   2249*   4615
BYPWRT  001360           547#    2223*   2228*   2233*   2238*   2243*   2248*   2878
BYTIM   010624           368     2232#
BYTIMA  010666           374     2242#
BYWRT   010604           366     2227#
BYWRTA  010644           372     2237#
CALADD  001406           560#    2981*   3225*   3360*   4551*   5853    5859    5861
CALCLK  034240          4648    4724    4835    4909    5026    5143    6010#
CALDIF  001400           557#    4472*   8340    8353
CCLR    = 100000         214#    2941    2950    3024    3033    3073    3082    3147    3156    3188    3197    3276    3285
                        3330    3339    3420    3437    3446    3481    3492    3500    3509    3712    3721    3756    3765
                        3815    3832    3841    3853    3923    3941    3994    4011    4020    4032    4061    4070    4081
                        4125    4134    4153    4171    4228    4237    4275    4284    4301    4319    4657    4980    4998
                        5097    5115    5214    5232    5379    5397
CCYL    001374           555#    5938*   5946*   5952*   5964
```

```
CDT    = 002000   208#
CERR   = 100000   213# 2490  2589  2809  2910  2933  2992  3016  3065  3132  3236  3259  3305
                  3371  3546  3590  3641  3704  3741  4053  4110  4220  4260  4435  4458  4492
                  4523  4562  4587  4638  4934  5051  5168  5301  5345  5714
CFMT   = 010000   210# 3231  3254  3266  3299  3320  4841
CKMR2    035344  2944  2954  3027  3037  3076  3086  3150  3160  3191  3201  3279  3289  3333
                  3343  3413  3424  3440  3450  3503  3513  3715  3725  3759  3769  3808  3819
                  3835  3845  3987  3998  4014  4024  4064  4074  4128  4138  4231  4241  4278
                  4288  6255#
CKMR3    035426  2947  2957  3030  3040  3079  3089  3153  3163  3194  3204  3282  3292  3336
                  3346  3417  3428  3443  3453  3506  3516  3718  3728  3762  3772  3812  3823
                  3838  3848  3991  4002  4017  4027  4067  4077  4131  4141  4234  4244  4281
                  4291  6274#
CKSWR  = 104407   6537  6601  6627  7413#
CLEAR  = 000005   191# 3483  3855  3943  4034  4173  4321  4659  5000  5117  5234  5399
CLKOF    035310  4381  4737  4740  6040  6096  6241#
CLKON    035202  4731  6017  6075  6216#
CLOCK    035254  2393  6230#
CLRFLG   031604  2313  5461#
COΣ    = 001000   244#
COUNT    001412  564#  4728*  6014*  6027*  6072*  6084*  6231*  6233#
CR     = 000015   64#  6709  6719  7425  7430  7433  7438  7447  7455  7464  7471  7476  7481
                  7485  7491  7497  7503  7510  7515  7521  7529  7534  7539  7545  7547  7551
                  7557  7559  7564  7569  7573  7575  7579  7584  7594  7599  7609  7619  7629
                  7638  7645  7654  7658  7666  7675  7685  7695  7703  7712  7722  7736  7744
                  7752  7758  7766  7772  7778  7786  7801  7819  7827  7902
CRLF   = 000200   65#  6680  6719
CTO    = 004000   209#
CYL      001446  581#  4204
CYLADD   001404  559#  3458  3620  4087  4497  4528  5770*  5771*  5772*  5773*  5774*  5775*
CYLDIF   001402  558#  3469  3475  3525  3531  3564  3570  3625  4083  5281  5289  5325  5333
                 5737*  5738*  5739*  5740*  5741*  5742*  5743  5745*  5761*  5762*
DATAD    001526  613#  3006  3007  3106  3174  4044  4100  4116
DATAD1   001530  614#  4366
DATAI    001532  615#  2924  3110  3111  3122  3138  3249  3296  3311  3693  3731  3747  3864
                 4478  4509
DCK    = 100000   250#  3058
DCLO   = 000020   258#
DDISP  = 177570   71#  441  2284
DDPCH    005464  1172#  2359*  2498  2683
DDT    = 000400   262#
DDUMP    005462  1171#  2326*  5461
DF1      054134  1213  1219  1225  1231  1236  1242  1248  1254  1565  8365#
DF10     054250  1259  1264  1269  1274  1279  1289  1299  1304  1314  1330  1385  1410  1415
                 1440  1475  1485  1490  1495  1500  1505  1515  1540  1545  1550  1555  1560
                 1575  1580  1605  1610  1615  1620  1625  1635  1660  1665  1690  1740  1841
                 1861  1866  1916  1986  2021  2057  8410#
DF11     054264  1350  1355  1390  1400  1510  1595  1600  1630  1755  8417#
DF14     054304  1886  8426#
DF15     054314  1570  1851  1856  1876  1881  1991  1996  2001  8432#
DF17     054330  2011  2016  8439#
DF2      054144  1380  8370#
DF20     054350  1420  8447#
DF3      054150  1284  1294  8373#
DF4      054164  1395  8380#
DF6      054174  1585  1590  1911  2052  8385#
```

```
DF8     054210  1360  1365  1370  1425  1430  1435  1445  1450  1455  1520  1530  1670  1680
                1891  1901  1961  1966  2117  2172  2177  2192  2197  8392#
DF9     054230  1309  1319  1324  1335  1340  1345  1375  1460  1465  1525  1535  1675  1685
                1896  1906  2122  2142  2147  2152  2157  2182  2187  8401#
DH1     051464  1211  1217  1223  1229  1234  1240  1246  1252  1288  1393  1563  1884  8113#
                8375  8387  8394  8403  8412  8419  8434  8443  8449
DH10    052060  1513  1518  1523  1528  1533  1859  1864  8160#
DH11    052107  8164#  8377
DH12    052154  8171#  8382
DH17    052216  1408  1413  1438  1633  1959  1964  2180  2185  8177#
DH18    052242  1483  1508  8181#
DH19    052267  1328  1603  8185#
DH2     051501  8116#  8367  8396  8405  8414  8421  8445
DH20    052312  1608  8189#
DH21    052345  1312  1613  8194#
DH22    052373  1388  1598  1738  1753  2140  2145  2170  2175  8198#
DH24    052425  1348  1353  1368  1373  1383  1593  2115  2120  8203#
DH25    052452  1418  1573  1578  1658  1663  1668  1673  1678  1683  1688  1909  1914  2050
                8207#
DH26    052475  1267  1272  1292  1297  1322  1333  1433  1443  1984  1989  1994  1999  8211#
DH27    052525  1257  1262  1307  1317  1423  1428  1543  1568  1583  1588  8216#
DH3     051543  8122#  8423
DH30    052556  1623  1839  1849  1854  8221#
DH32    052610  1277  1282  1302  1338  1343  1448  1453  1548  8226#
DH33    052642  1889  1894  1899  1904  8231#
DH36    052666  8235#
DH39    052750  1874  1879  2150  2155  2190  2195  8244#
DH4     051552  8124#  8398  8407
DH40    053003  8249#  8428
DH41    053060  2055  8257#
DH42    053105  2009  8261#
DH43    053156  2014  8268#
DH44    053226  2019  8275#  8441
DH47    053305  1538  8283#
DH5     051564  8126#
DH51    053355  1398  1628  8290#
DH52    053410  1287  8295#
DH53    053444  1358  1363  1458  1463  8300#
DH54    053472  1473  8304#
DH56    053544  8311#  8451
DH57    053611  1553  1558  8318#
DH58    053651  8324#
DH6     051633  8133#  8389
DH7     051715  8142#  8436
DH8     051764  1378  8149#
DH9     052005  1488  1493  1498  1503  1618  8152#
DI    = 040000   212#
DISPLA  001142   441#  2284*  2292*  6582*  6604*
DISPRE  000174   361#  2292
DIVTYP  035150  6173  6199  6206#
DLT   = 100000   231#  2816  3601
DLY     032474  4373  5668#  5671
DMD   = 000040   272#
DOTIM   005520  1191#  2392*  2401*  4354  4620
DOWRT   013752  2879  2882#
DPAT1   001534   616#  4211  4250  4266
```

```
DPAT2   001536          617#
DRA   = 000001          254#  2526  2619
DRDY  = 000200          261#
DRIVS   005472         1175#  2474* 2500* 2517  2607* 2672  5424  5505*
DRIVO   005474         1180#  2374  2476  2575  5488
DRIV1   005476         1181#
DRIV2   005500         1182#
DRIV3   005502         1183#
DRIV4   005504         1184#
DRIV5   005506         1185#
DRIV6   005510         1186#
DRIV7   005512         1187#
DROT  = 000040          259#
DRPAR = 000010          238#
DRVMSK= 000007          218#  2493  2592
DRVPTR  001366          551#  2374* 2677  2687*
DSC   = 040000          265#
DSWR  = 177570           70#   440  2283
DTE   = 010000          247#  2813
DTYE  = 000040          240#
DT1     053676         1212   1218  1224  1230  1235  1241  1247  1253  1258  1263  1268  1273  1278
                       1298   1303  1308  1313  1318  1323  1329  1334  1339  1344  1359  1364  1369
                       1374   1384  1409  1414  1424  1429  1434  1439  1444  1449  1454  1459  1464
                       1474   1484  1489  1494  1499  1504  1514  1519  1524  1529  1534  1539  1544
                       1549   1554  1559  1564  1574  1579  1604  1609  1614  1619  1624  1634  1659
                       1664   1669  1674  1679  1684  1689  1739  1840  1860  1865  1890  1895  1900
                       1905   1915  1960  1965  1985  2010  2015  2020  2056  2116  2121  2141  2146
                       2151   2156  2171  2176  2181  2186  2191  2196  8332#
DT10    054114         1394   8359#
DT2     053722         1349   1354  1389  1399  1509  1594  1599  1629  1754  8336#
DT3     053744         1379   8339#
DT4     053750         1584   1589  1910  8340#
DT5     053770         1569   1850  1855  1875  1880  1990  1995  2000  8343#
DT6     054016         1283   1293  8347#
DT7     054036         1885   8350#
DT8     054056         2051   8353#
DT9     054076         1419   8356#
D.ACLO= 000100          314#
D.BRHM= 000100          301#  2953  3036  3085  3159  3200  3288  3342  3423  3449  3512  3724  3768
                       3818   3844  3997  4023  4073  4137  4240  4287
D.CART= 000400          303#  2953  3036  3085  3159  3200  3288  3342  3423  3449  3512  3724  3768
                       3818   3844  3997  4023  4073  4137  4240  4287
D.DDT = 000400          289#
D.DOOR= 000200          302#  2953  3036  3085  3159  3200  3288  3342  3423  3449  3512  3724  3768
                       3818   3844  3997  4023  4073  4137  4240  4287
D.DRA = 000040          286#  2943  3026  3075  3149  3190  3278  3332  3412  3439  3502  3714  3758
                       3807   3834  3986  4013  4063  4127  4230  4277
D.DRDY= 000200          288#  2943  3026  3075  3149  3190  3278  3332  3439  3502  3714  3758  3834
                       4013   4063  4127  4230  4277
D.DROT= 020000          321#  4488  4519
D.DSC = 040000          295#  3439  3834  4013
D.FLT = 000200          315#
D.FORM= 001000          290#  3270  3324
D.FWD = 002000          305#
D.HDFL= 000200          329#
D.HDHM= 000040          300#  4673  4733  5809
```

```
D.IDRE= 000040          313#
D.ILF = 000400          316#
D.LIMD= 020000          335#
D.LOAD= 010000          307#  5826
D.MHD = 000400          330#
D.NMOV= 010000          334#
D.OFF = 002000          291#  3412  3439  3494  3502  3553  3615  3807  3834  3986  4013
D.PAR = 001000          317#
D.PIP = 020000          294#  3412  3807  3986
D.PLO = 004000          333#
D.REV = 004000          306#  4758  4771
D.RTZ = 020000          308#  3934  4164  4312  4991  5108  5225  5390
D.SECT= 000020          326#
D.SKI = 002000          318#
D.SPIN= 010000          293#  2943  3026  3075  3149  3190  3278  3332  3412  3439  3502  3714  3758
                       3807  3834  3986  4013  4063  4127  4230  4277
D.SPLS= 010000          320#
D.SPOK= 001000          304#  2953  3036  3085  3159  3200  3288  3342  3423  3449  3512  3724  3768
                       3818  3844  3997  4023  4073  4137  4240  4287
D.SUNS= 040000          336#
D.TFOK= 000020          299#  2953  3036  3085  3159  3200  3288  3342  3423  3449  3512  3724  3768
                       3818  3844  3997  4023  4073  4137  4240  4287  4745
D.TIB = 002000          332#
D.UNLD= 040000          309#
D.UNS = 040000          322#
D.VV  = 000100          287#  2753  2767  2943  3026  3075  3149  3190  3278  3332  3412  3439  3502
                       3714  3758  3807  3834  3986  4013  4063  4127  4230  4277
D.WCUR= 000040          327#
D.WGAT= 000100          328#
D.WLE = 004000          319#
D.WRL = 004000          292#
D.XERR= 001000          331#
ECCW  = 020000          280#
ECH   = 000100          241#
EMTVEC= 000030          159#  2267*  2268*
EM1     046221         5514  7801#
EM10    046775         1245  7867#
EM100   051375         1582  8100#
EM101   051432         1622  8105#
EM11    047060         1251  7876#
EM12    047124         1256  1266  1276  1347  1602  1607  1612  1617  1632  1657  1737  1838  1873
                       1983  7882#
EM13    047162         1352  1437  1507  1512  1662  7887#
EM14    047204         1377  7890#
EM15    047242         1392  7895#
EM16    047351         2008  2013  7908#
EM17    047414         1357  1422  1432  1447  1517  1667  1888  1958  2114  2169  2189  7914#
EM18    047435         1306  1321  1337  1457  1522  1672  1893  2119  2139  2149  2179  7917#
EM19    047456         1362  1367  1427  1442  1452  1527  1677  1898  1963  2174  2194  7920#
EM2     046275         1210  7809#
EM20    047477         1316  1332  1342  1372  1462  1532  1682  1903  2144  2154  2184  7923#
EM21    047520         1261  1271  1301  1311  1853  1878  1913  1988  7926#
EM24    047542         1327  7929#
EM3     046365         6348  7819#
EM36    047575         1587  1908  2049  7934#
EM39    047640         1407  1552  1687  1858  7940#
```

```
EM4     046440            6383    7827#
EM40    047707            1412    1557    1863    7947#
EM41    047745            1382    7953#
EM5     046514            1216    7835#
EM55    050016            1752    7960#
EM6     046535            1222    7838#
EM60    050051            1482    7965#
EM62    050107            1993    7971#
EM63    050127            1848    1998    7974#
EM65    050150            1883    7977#
EM66    050172            7980#
EM69    050226            2018    7985#
EM7     046556            1228    7841#
EM74    050257            2054    7990#
EM8     046645            1233    7851#
EM80    050304            1281    7994#
EM81    050343            1286    8000#
EM82    050407            1291    8007#
EM83    050461            1296    8015#
EM85    050516            1387    1397    8020#
EM86    050561            1592    1597    1627    8026#
EM88    050622            1472    8032#
EM89    050663            1487    8038#
EM9     046721            1239    7859#
EM90    050723            1492    8044#
EM91    050762            1497    8050#
EM92    051007            1502    8054#
EM93    051040            1417    8059#
EM94    051121            1537    8068#
EM95    051170            1542    1547    8075#
EM96    051224            1562    8080#
EM97    051252            1567    8084#
EM98    051313            1572    8090#
EM99    051344            1577    8095#
ERRVEC= 000004             152#   2281    2282*   2293*   2300*   2301*   2310*   2311*   2377*   2381*   2388*   2423*   2441*
                          6543    6544*   6546*   6549*
ESEC    001424             570#
FATT1   032320            3938    4168    4316    4803    4995    5112    5229    5394    5621#
FATT2   032414            3433    3543    3638    3828    4007    4455    4584    4635    4653    4797    5298    5342    5648#
FATT3   034716            4930    5047    5164    6137#   6141
FHDHM   033234            5806#   5814
FHDTAB  033356            2984    3228    3363    4554    5839#
FLOAD   033310            5823#
FMTE  = 000020             239#
FMT1    001522             610#   5849*   5850*   5851*   5856
FORMAT  001520             609#   2983*   3227*   3362*   4553*   5849
FRCYL   001370             553#   4467*   8340    8353
FRDY    032102            2469    2483    2488    2582    2587    2764    2806    2907    2930    2989    3013    3055    3128
                          3179    3233    3256    3268    3301    3322    3368    3407    3485    3539    3588    3634    3701
                          3737    3802    3857    3869    3929    3945    3981    4036    4050    4106    4159    4175    4217
                          4256    4307    4323    4377    4432    4451    4484    4515    4559    4580    4631    4661    4721
                          4843    4925    4986    5002    5042    5103    5119    5159    5220    5236    5276    5320    5385
                          5401    5568#   5571    5695    5709
FSEC17  033144            4362    5782#
FTITLE  001364             549#   5472    5474*
GBA     032004            2345    5528#
```

```
GDRVS   031644          2343    5483#
GINT    032032          2347    5541#
GNS   = ****** U         360    7405    7406    7407    7408    7409    7411    7413    7414    7415    7416    7417    7418
                        7419
GO    = 000001          203#
GSTAT   032526          2717    2808    2909    2932    2942    2952    2991    3015    3025    3035    3057    3074    3084
                        3131    3148    3158    3181    3189    3199    3235    3258    3277    3287    3304    3331    3341
                        3370    3411    3422    3438    3448    3493    3501    3511    3603    3703    3713    3723    3740
                        3757    3767    3806    3817    3833    3843    3871    3933    3985    3996    4012    4022    4052
                        4062    4072    4109    4126    4136    4163    4219    4229    4239    4259    4276    4286    4311
                        4434    4487    4518    4561    4672    4732    4744    4757    4770    4933    4990    5050    5107
                        5167    5224    5389    5631    5635    5655    5659    5691#   5713    5724    5736    5769    5808
                        5825
GTSWR = 104406          7411#
HASOF   005424          1146#   5589*   5605    8336
HBA     005414          1142#   5585*
HCS1    005406          1139#   2490    2589    2809    2910    2933    2992    3016    3065    3132    3236    3259    3305
                        3371    3546    3590    3641    3704    3741    4053    4110    4220    4260    4435    4458    4492
                        4523    4562    4587    4638    4934    5051    5168    5301    5345    5582*   5714    8332    8336
                        8343    8347    8359
HCS2    005410          1140#   2522    2524    2528    2540    2615    2617    2621    2624    2816    3135    3182    3308
                        3744    3872    4113    4263    5583*   8332    8336    8343    8347    8359
HDA     005416          1143#   5586*   5926    5927    8343    8350    8359
HDB     005430          1148#
HDC     005426          1147#   5590*   5938    5946    5949    5951*   5952    8340    8353    8356    8359
HDS     005420          1144#   2526    2619    5587*   8332    8336    8343
HDTAB   001550           625#   2893    2899    2902    2977    3220    3355    4416    4423    4426    4547    5841
HDWD    001542           620#   8350
HD1     001516           608#   5843*   5844*   5845*   5846*   5847*   5848*   5855
HEAD    001514           607#   2982*   3226*   3361*   4552*   5843    5937*   5944*   5953*   5984
HER     005422          1145#   2813    3058    5588*   8332    8336    8343
HMR1    005432          1149#   5591*   6275
HMR2    005434          1150#   2492    2591    2718    2753    2767    3270    3324    3494    3553    3615    3934    4164
                        4312    4673    4733    4745    4758    4771    4991    5108    5225    5390    5592*   5737    5809
                        5826    6260    8332    8336    8340    8343    8347    8350    8353    8356    8359
HMR3    005436          1151#   4488    4519    5593*   5725    5770    6281    8332    8336    8340    8343    8347    8350
                        8353    8356    8359
HOLD    032140          5572    5575    5582#
HPAT    005442          1153#   5595*
HPOS    005440          1152#   5594*
HT    = 000011            62#   6678    6719
HVRC  = 000400           243#
HWC     005412          1141#   5584*
HZ      001410           562#   4728    6233
IDAE  = 002000           245#
IE    = 000100           204#
ILF   = 000001           235#
INTER   036046          5556    6424#
INVCYL  005364           633#
IOTVEC= 000020           157#   2265*   2266*
IR    = 000100           222#
LCLKF   005514          1189#   2379*
LCVEC   001350           539#   2380
LF    = 000012            63#   6713    6719    7425    7430    7433    7438    7447    7455    7464    7471    7476    7481
                        7485    7491    7497    7503    7510    7515    7521    7529    7534    7539    7545    7547    7551
                        7557    7559    7564    7569    7573    7575    7579    7584    7594    7599    7609    7619    7629
```

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                    7638    7645    7654    7658    7666    7675    7685    7695    7703    7712    7722    7736    7744
                    7752    7758    7766    7772    7778    7786    7801    7819    7827    7902
LIMERR  001546       623#
LKS     001346       537#    2378    6222*   6246*
LOOP    034672      4675    4747    4760    4773    4861    5292    5336    6034    6093    6126#   6139
LPCNT   001472       593#    4669*   4676    4681    4741*   4748    4751    4754*   4761    4764    4767*   4774    4777
                    4856*   4874    4928*   4938    5045*   5055    5162*   5172    5287*   5293    5305    5331*   5337
                    5349    6029*   6041    6086*   6097    6131*   6140
LPTIM   001474       594#    4875    4939    5056    5173    5306    5350    6057*   6113*   6151
MCLK  = 000400       275#
MOS   = 001000       225#    2522    2615
MEMBAS= 172100       543#    2303*
MEMERR  036004      2305    6410#
MEMPAR  011214      2300#
MEMVEC= 000114       542#    2305*   2306*
MERD  = 001000       276#
MESMSK= 000017       270#
MEWD  = 002000       277#
MIND  = 000200       274#
MSG1    042212      5475    7425#
MSG10   043452      2473    7547#
MSG11   043477      6457    7551#
MSG12   043537      2519    7557#
MSG13   043546      2402    4622    7559#
MSG14   043634      5677    7569#
MSG15   043657      2542    2688    7573#
MSG16   043671      2715    7575#
MSG17   043715      2853    7579#
MSG18   043745      4680    7584#
MSG19   044040      2880    7594#
MSG2    043062      2327    7503#
MSG20   044076      4780    7599#
MSG21   044171      4784    7609#
MSG22   044263      4788    7619#
MSG23   044355      6024    6081    7629#
MSG24   044442      4889    7638#
MSG25   044504      6160    6174    7644#
MSG26   044510      2887    2913    2936    2995    3019    3062    3068    3239    3262    3374    3593    3605    3707
                    4056    4223    4438    4565    7645#
MSG27   044572      2674    7654#
MSG28   044622      4965    7658#
MSG29   044701      4968    7666#
MSG3    043133      2342    7510#
MSG30   044761      5082    7675#
MSG31   045047      5085    7685#
MSG32   045136      5199    7695#
MSG33   045215      5202    7703#
MSG34   045275      5364    7712#
MSG35   045363      5367    7722#
MSG36   045452      6200    7732#
MSG37   045476      3905    7736#
MSG38   045554      3918    7744#
MSG39   045634      3881    7752#
MSG4    043165      2344    7515#
MSG40   045676      2886    7758#
MSG41   046011      4617    7772#
```

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MSG42   046050          4829    7778#
MSG5    043230          2346    7521#
MSG6    043307          6429    7529#
MSG7    043343          2361    7534#
MSG8    043400          3777    7539#
MSG9    043437          3781    7545#
MSP     = 000100         273#
MUL T6  033644          5882    5908#
M.ALGN= 040000          349#
M.CADD= 017760          348#    5771
M.CDIF= 017760          341#    5738    5762
M.DPID  036170          6056    6112    6190    6206    6472#
M.DP40  036226          6483#   6505
M.DP41  036262          6488    6496#
M.DP42  036272          6494    6500#
M.DP44  036324          6507    6513#
M.DPSO  036336          6481    6518#
M.DRV = 000007          340#
M.HEAD= 007000          351#
M.ID    = 000003        347#    6276
M.OFST= 017760          342#
M.PAR = 100000          352#    6313
M.SECT= 000760          350#    5726
M.SER = 077770          343#
NED     = 010000        228#    2528    2540    2621    2624
NEM     = 004000        227#
NUDRV   012754          2554    2655#   5426
NXF     = 000004        237#
OFFERR  001512          604#    3789*   3877*   3879    3895    3903    3912    3916
OFFSET= 000015          195#    3405    3800    3979
OFST    = 000004        256#
OPI     = 020000        248#
OR      = 000200        223#
O.ADR1  054716          8584*   8635*   8637*   8807    8808*   8846*   8861    8878    9069#
O.BACK  055442          8679    8720#
O.BD    056734          8865    8866    9014#
O.BKPT  055150          8630#   8683
O.BK1   056102          8578    8843#
O.BK2   056136          8848    8851#
O.BK3   056154          8850    8857#
O.BRK   056072          8595    8841#
O.BUF   056763          8923    8932    8937    9042#
O.B2    056236          8862    8871#
O.B3    056276          8870    8879#
O.CADV  056446          8696    8713    8736    8740    8770    8774    8879    8922#
O.CLGL  055264          8653    8655    8663#
O.CLGT= 000014          8667    9032#
O.CLS1  056672          8990    8992#
O.CR    056736          8999    9001    9002    9016#
O.CRET  055376          8674    8703#
O.CRLF  056702          8711    8768    8864    8903    8908    8999#
O.CRLS  056710          8648    9001#
O.CRS   056714          9000    9002#
O.CSR1  056732          8899*   8915    9010#
O.CSR2  056733          8900*   8916    9011#
O.CT    054720          8828*   8871*   8873*   9070#
```

```
0.C1    056050          8831#   8872
0.DCD   055214          8636    8638    8648#   8705    8756    8881
0.DCD1  055220          8643*   8697    8741
0.EFF   055524          8682    8747#
0.EFF1  055642          8759    8778#
0.ENTR  054730          8575#
0.ERR   055200          8622    8633    8645#   8668    8693    8751    8994
0.ERR1  055534          8751#   8824
0.ERR2  055354          8693#   8727    8800
0.FTYP  056610          8647    8715    8730    8772    8877    8948    8964    8969#
0.GET   056532          8601    8651    8945#   8950    8952    8954
0.GO    055706          8676    8798#
0.GO2   055764          8809#   8834
0.LG  = 000006          8605    9040#
0.LGCH  056741          8664    9020#   9032
0.LGDR  055314          8671    8673#   8685
0.LGL = 000030          8685#
0.LGL1  055266          8664#   8669
0.LGL2  055306          8665    8670#
0.MSK   054710          8752    8753    8755    9062#
0.OOT   054724           377    8573#   9051
0.OFST  055452          8680    8726#
0.OF1   055520          8739    8741#
0.OP1   055410          8677    8709#
0.OP2   055416          8626    8711#   8722
0.ORPC  055122          8618#   8678
0.P     056731          8593*   8798*   8823    8825*   8874*   9008#
0.PRI   054706          8585    8847    8851    9061#
0.PROC  056014          8684    8823#
0.PR1   056036          8827    8829#
0.RALL  055170          8596    8631    8637#
0.RCSR= 177560          8563#   8899    8901*   8911    8913    8915*   8945
0.RDB = 177562          8562#   8947
0.REGT  055052          8601#   8675
0.RSE1  056430          8912    8915#
0.RSP   055062          8603#   8606
0.RST   054766          8574    8583#
0.RSTT  056400          8804    8830    8908#
0.RST1  055016          8582    8590#
0.RTIT  056012          8592*   8818#
0.SCAN  055224          8612    8651#   8662
0.SP    055114          8604    8613#
0.SPC   056460          8925#   8933
0.SP1   055102          8609#   8614
0.STM = 000340          8552#   8594    8803    8829    8831
0.STRT  054754          8573    8580#
0.SVR   056310          8583    8843    8885#
0.SVTT  056346          8863    8875    8899#
0.T     056730          8805*   8832*   8844    9007#
0.TBIT  055736          8805#   8845
0.TBT = 000020          8553#   8806    8833    8869
0.TC    056674          8987    8993#
0.TCLS  056656          8618    8703    8709    8720    8986#
0.TCSR= 177564          8565#   8900    8902*   8909    8916*   8969    8975
0.TDB = 177566          8564#   8971*   8977*
0.TL    056755          8602    8605    8613    9034#   9040
```

```
0.TRTC  056772          8637    8808    9047#
0.TVEC= 000014          8551#   8576    8594*   8595*
0.TYPE  056574          8867    8938    8961#   8965    9003
0.TYP1  056654          8962    8973    8981#
0.TYP2  056634          8975#   8976    8979
0.UIN   054722          8584    8807*   8846    9071#
0.UPC   054702          8577*   8802*   8817    8841*   8858    8860*   9059#
0.URD   054664          8580    8610    9052#
0.USP   054700          8581*   8886*   8887    9058#
0.UST   054704          8575*   8806*   8816    8833*   8842*   8849    8869*   9060#
0.WDS   055532          8748    8750#
0.WDS2  055550          8755#   8777
0.WDS3  055600          8766#   8779    8785    8794
0.WDS4  055636          8766    8776#
0.WRD   055344          8673    8689#
0.WRDA  055370          8690    8698#
0.WRD1  055352          8692#   8699    8716
0.WSCH  055530          8681    8749#
0.XXX   056726          8885*   8893    9006#
0.45    055030          8591    8593#
PACK    = 000003          190#  2762
PARAM   001356            546#  2222*   2227*   2232*   2237*   2242*   2247*   2339
PARTSRT 010564            370   2222#
PAT     = 000020          271#
PC      =%000007           83#  2313*   2323*   2343*   2345*   2347*   2360*   2367*   2469*   2483*   2488*   2510*   2532*
                         2536*  2551*   2582*   2587*   2603*   2611*   2629*   2633*   2637*   2641*   2712*   2717*   2736*
                         2750*  2759*   2764*   2793*   2806*   2808*   2855*   2856*   2890*   2907*   2909*   2921*   2930*
                         2932*  2942*   2944*   2947*   2952*   2954*   2957*   2974*   2984*   2989*   2991*   3003*   3013*
                         3015*  3025*   3027*   3030*   3035*   3037*   3040*   3046*   3055*   3057*   3074*   3076*   3079*
                         3084*  3086*   3089*   3100*   3118*   3128*   3131*   3139*   3148*   3150*   3153*   3158*   3160*
                         3163*  3171*   3179*   3181*   3189*   3191*   3194*   3199*   3201*   3204*   3218*   3228*   3233*
                         3235*  3246*   3256*   3258*   3268*   3277*   3279*   3282*   3287*   3289*   3292*   3301*   3304*
                         3312*  3322*   3331*   3333*   3336*   3341*   3343*   3346*   3352*   3363*   3368*   3370*   3399*
                         3407*  3411*   3413*   3417*   3422*   3424*   3428*   3433*   3438*   3440*   3443*   3448*   3450*
                         3453*  3457*   3468*   3474*   3485*   3487*   3493*   3501*   3503*   3506*   3511*   3513*   3516*
                         3524*  3530*   3539*   3543*   3563*   3569*   3576*   3588*   3603*   3619*   3624*   3629*   3634*
                         3638*  3690*   3701*   3703*   3713*   3715*   3718*   3723*   3725*   3728*   3737*   3740*   3748*
                         3757*  3759*   3762*   3767*   3769*   3772*   3791*   3802*   3806*   3808*   3812*   3817*   3819*
                         3823*  3828*   3833*   3835*   3838*   3843*   3845*   3848*   3857*   3859*   3869*   3871*   3876*
                         3929*  3933*   3938*   3945*   3947*   3973*   3981*   3985*   3987*   3991*   3996*   3998*   4002*
                         4007*  4012*   4014*   4017*   4022*   4024*   4027*   4036*   4038*   4050*   4052*   4062*   4064*
                         4067*  4072*   4074*   4077*   4082*   4086*   4096*   4106*   4109*   4117*   4126*   4128*   4131*
                         4136*  4138*   4141*   4159*   4163*   4168*   4175*   4177*   4206*   4217*   4219*   4229*   4231*
                         4234*  4239*   4241*   4244*   4256*   4259*   4267*   4276*   4278*   4281*   4286*   4288*   4291*
                         4307*  4311*   4316*   4323*   4325*   4359*   4362*   4373*   4377*   4381*   4413*   4432*   4434*
                         4451*  4455*   4474*   4484*   4487*   4496*   4505*   4515*   4518*   4527*   4544*   4554*   4559*
                         4561*  4580*   4584*   4625*   4631*   4635*   4645*   4648*   4653*   4661*   4663*   4672*   4675*
                         4682*  4716*   4721*   4724*   4731*   4732*   4737*   4740*   4744*   4747*   4757*   4760*   4770*
                         4773*  4782*   4786*   4790*   4797*   4803*   4832*   4835*   4843*   4849*   4861*   4867*   4878*
                         4891*  4909*   4917*   4925*   4930*   4933*   4942*   4953*   4966*   4971*   4986*   4990*   4995*
                         5002*  5004*   5026*   5034*   5042*   5047*   5050*   5059*   5070*   5083*   5088*   5103*   5107*
                         5112*  5119*   5121*   5143*   5151*   5159*   5164*   5167*   5176*   5187*   5200*   5205*   5220*
                         5224*  5229*   5236*   5238*   5266*   5268*   5276*   5280*   5288*   5292*   5298*   5309*   5315*
                         5320*  5324*   5332*   5336*   5342*   5353*   5365*   5370*   5385*   5389*   5394*   5401*   5403*
                         5432*  5435*   5445*   5450    5466*   5476*   5502*   5522*   5533*   5535*   5546*   5547*   5558*
                         5572*  5573*   5575*   5576*   5596*   5609*   5611*   5631*   5633*   5635*   5638*   5655*   5657*
```

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                    5659*  5662*  5672*  5683*  5695*  5698*  5709*  5713*  5716*  5718*  5724*  5731*  5736*
                    5746*  5764*  5769*  5776*  5783*  5787*  5790*  5796*  5799*  5808*  5815*  5817*  5825*
                    5830*  5832*  5872*  5880*  5882*  5903*  5912*  5972*  5992*  6017*  6034*  6040*  6056*
                    6061*  6075*  6091*  6093*  6096*  6112*  6115*  6133*  6139*  6142*  6144*  6153*  6158*
                    6159*  6161*  6173*  6176*  6190*  6199*  6202*  6206*  6210*  6211*  6212*  6223*  6226*
                    6247*  6249*  6258*  6264*  6266*  6279*  6285*  6287*  6316*  6516*  6520*  6614*  6620*
                    6668*  6687*  6694*  6701*  6715*  6717*  6817*  6834*  6974*  7167*  7214*  7219*  7254*
                    7257*  7281*  7328*  8529*  8548*  8577   8590   8618*  8703*  8709*  8720*  8992*
PCA    = 004000      278#
PCD    = 010000      279#
PCLKF    005516     1190#  2383*  2390*  6220   6244
PCVEC    001352      540#  2384   2391
PCYL     001376      556#
PFSRT    013106     2698#  6459
PGE    = 002000      226#
PIP    = 020000      264#
PIRQ   = 177772       69#
PIRQVE= 000240      163#
PKRB     001344      536#
PKS      001340      534#  2382   2389   6225*  6248*
PKSB     001342      535#  6224*
PPTP     005470     1174#  2330*
PRGSRT   010724     2225   2230   2235   2240   2245   2250#  5515
PRO    = 000000       86#  6216
PR1    = 000040       87#
PR2    = 000100       88#
PR3    = 000140       89#
PR4    = 000200       90#
PR5    = 000240       91#  533
PR6    = 000300       92#
PR7    = 000340       93#  2252   2301   2306   2371   2394   6241   6454   6455
PS     = 177776       66#   67
PSEC     001422      569#
PSW    = 177776       67#
PWRVEC= 000024      158#  2271*  2272*  6444*  6453*  6454*
QKCYLD   033004     5280   5288   5324   5332   5751#  6091
RDCHR  = 104410     7034   7414#
RDCYLA   033074     3457   3619   4086   4496   4527   5768#
RDCYLD   032720     3468   3474   3524   3530   3563   3569   3624   4082   5735#
RDDATA= 000021      197#  2804   3053
RDGATE= 100000      282#
RDHEAD= 000025      199#  3586   4841   4857
RDLIN  = 104411     5483   7106   7415#
RDOCT  = 104412     5528   5541   7416#
RDSEC    032650     4849   4867   5723#  5783   5787   5790   5880
RDTAB    004364      631#  3049   3094   3103
RDY    = 000200      205#  4375   4859   5568   5755
RECAL  = 000013      194#  3925   4155   4303   4982   5099   5216   5381
RESREG= 104414     6060   6114   6175   6201   7166   7218   7418#  8520
RESVEC= 000010      153#
RHTAB    001754      626#  3585   3609   5887   5889   5893   5896   8356
RKASOF= 000016      176#  2432   3402*  3463*  3519*  3558*  3794*  3976*  5589   5624   5650   6137
RKBA   = 000004      171#  2428   2799*  2847*  2902*  2924*  2977*  3006*  3049*  3110*  3122*  3174*  3220*
                    3249*  3296*  3355*  3693*  3731*  3864*  4044*  4100*  4211*  4250*  4366*  4426*  4478*
                    4509*  4547*  5585
RKCS1  = 000000      169#  2425   2486*  2585*  2762*  2804*  2905*  2928*  2941*  2950*  2987*  3011*  3024*
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                    3033*  3053*  3073*  3082*  3126*  3147*  3156*  3177*  3188*  3197*  3231*  3254*  3266*
                    3276*  3285*  3299*  3320*  3330*  3339*  3366*  3405*  3420*  3437*  3446*  3481*  3483*
                    3492*  3500*  3509*  3537*  3586*  3632*  3699*  3712*  3721*  3735*  3756*  3765*  3800*
                    3815*  3832*  3841*  3853*  3855*  3867*  3923*  3925*  3941*  3943*  3979*  3994*  4011*
                    4020*  4032*  4034*  4048*  4061*  4070*  4081*  4104*  4125*  4134*  4153*  4155*  4171*
                    4173*  4215*  4228*  4237*  4254*  4275*  4284*  4301*  4303*  4319*  4321*  4370*  4375
                    4430*  4449*  4482*  4513*  4557*  4578*  4629*  4651*  4657*  4659*  4719*  4841*  4857*
                    4859   4923*  4980*  4982*  4998*  5000*  5040*  5097*  5099*  5115*  5117*  5157*  5214*
                    5216*  5232*  5234*  5274*  5318*  5379*  5381*  5397*  5399*  5568   5582   5693*  5753*
                    5755
RKCS2  = 000010       173#  2426   2467*  2481*  2485*  2580*  2584*  3008*  3121*  3250*  3297*  3482*  3601
                    3694*  3732*  3854*  3865*  3924*  3942*  4033*  4045*  4101*  4154*  4172*  4212*  4251*
                    4302*  4320*  4367*  4479*  4510*  4658*  4981*  4999*  5098*  5116*  5215*  5233*  5380*
                    5398*  5583   5692*  5707*  5711*
RKDA   = 000006       172#  2429   2800*  2824*  2848*  3796*  4210*  4249*  4369*  5586
RKDB   = 000024       178#  2434   3137   3310   3596   3597   3598   3746   3875   4115   4265
RKDC   = 000020       177#  2433   2801*  3580*  4209*  4248*  4428*  4447*  4477*  4549*  4575*  4922*  4946
                    5039*  5063   5156*  5180   5273*  5590
RKDS   = 000012       174#  2430   5587
RKECPS= 000030        182#  2438   5594
RKECPT= 000032        183#  2439   5595
RKER   = 000014       175#  2431   5588
RKMR1  = 000026       179#  2435   2716*  2951*  3034*  3083*  3157*  3198*  3286*  3340*  3410*  3421*  3447*
                    3510*  3722*  3766*  3805*  3816*  3842*  3932*  3984*  3995*  4021*  4071*  4135*  4162*
                    4238*  4285*  4310*  4670*  4730*  4742*  4755*  4768*  4989*  5106*  5223*  5388*  5591
                    5630*  5634*  5654*  5658*  5712*  5723*  5735*  5752*  5768*  5807*  5824*
RKMR2  = 000034       180#  2436   5592   5761
RKMR3  = 000036       181#  2437   5593
RKPRI    001336       533#  5557
RKVEC    001334       532#  2366*  5545*  5548*  5555
RKWC   = 000002       170#  2427   2803*  2903*  2925*  2978*  3009*  3050*  3123*  3175*  3221*  3251*  3295*
                    3356*  3695*  3733*  3866*  4046*  4102*  4213*  4252*  4368*  4427*  4480*  4511*  4548*
                    5584
RLS    = 000010       219#
RTT    = 000006      8555#
R0     =%000000       74#  2380*  2384*  2391*  2393*  2394*  2475*  2485   2494   2496   2503   2514*  2515
                    2543   2574*  2584   2593   2598*  2599   2689*  2690   2728*  2729*  2730*  2731   2835*
                    2836   2893*  2895*  2896*  2897*  2899   3007*  3096   3098   3106   3111*  3585*  3596*
                    3597*  3598*  3780*  3794   3882   3890   3893   3897*  3900*  3910   3971*  3976   4146
                    4148*  4204*  4209   4248   4295   4416*  4418*  4419*  4420*  4421*  4423   4465*  4532*
                    4533   4536*  4837*  4846   4885*  4886   4911*  4961*  4962   5028*  5078*  5079   5145*
                    5195*  5196   5260*  5359*  5360   5442*  5445   5461*  5463*  5484*  5486   5506   5529*
                    5530   5532   5542*  5543   5545   5555*  5556*  5557*  5678   5839   5841*  5853*  5854*
                    5855*  5856*  5857*  5860   5862   5864*  5871*  5878   5884*  5885*  5886   5889*  5892
                    5893   5896*  5897   5898   5902*  6011*  6043*  6044   6050*  6069*  6099*  6100   6106*
                    6126   6127*  6128*  6132*  6167*  6182*  6193*  6299   6301*  6308*  6315*  6344*  6345
                    6349   6379*  6380   6384   6427*  6428   6430   6479*  6480*  6486*  6491*  6493*  6497*
                    6499*  6509*  6510*  6661   6662*  6667   6672   6675*  6732   6742*  6746   6762   6763
                    6776*  6794   6802*  6806   6807   6809*  6810*  6811   6833*  7103   7107*  7108   7111
                    7131*  7134*  7156*  7160   7170*  7172*  7174*  7194*  7195   7213*  7217*  7269   7270*
                    7271   7273   7275*  7276   7279*  7297   7310*  7312*  7313*  7319*  7321*  7323   7327*
                    7347   7372*  7382   7383*  7384   7385*  7386*  7387*  7388*  8465*  8466*  8467*  8468*
                    8469*  8470*  8471*  8472   8477   8482   8485*  8486   8490   8491   8503   8508   8511
                    8513*  8541#  8603   8607*  8608   8646*  8652   8654   8656*  8660   8664   8695*  8712*
                    8714*  8729*  8734*  8737*  8738*  8757*  8760   8762*  8764   8769*  8771*  8773*  8778
                    8780   8786*  8787*  8789*  8790*  8791*  8792*  8793   8809*  8868*  8876*  8878*  8895*
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                    8925    8929*   8930*   8931*   8934*   8935*   8936    8947*   8949*   8951    8953    8963*   8971
                    8972
R1      =%000001      75#   2476*   2501*   2513    2575*   2595    2597    2605    2608*   2626    2677*   2681    2687
                    2718*   2722*   2723*   2724*   2725*   2726*   2727*   2728    3094*   3095    3098    3103    3475
                    3531    3570    3657*   3660*   3778*   3782    3795*   3796    3797*   3953*   3954    5462*   5464*
                    5485*   5499    5517*   5840    5842*   5854    5866*   5867    5870*   5679    5890*   5892*   5897*
                    5901*   6051*   6107*   6168*   6183*   6194*   6300    6302*   6307*   6311    6314*   6478*   6485*
                    6490*   6496*   6508*   6733    6746*   6747    6751    6775*   6795    6832*   7104    7109*   7117*
                    7119*   7121*   7124*   7127    7130*   7152*   7156    7157*   7169*   7171*   7173*   7196*   7202*
                    7208*   7298    7301*   7304*   7314*   7320*   7324    7326*   7348    7371*   8482*   8494    8542#
                    8663*   8664    8666*   8667    8670*   8671    8747*   8749*   8758    8810*   8892
R2      =%000002      76#   3397*   3402    3463    3465    3469    3519    3521    3525    3558    3560    3564    3648
                    3651*   3652    3656*   3661*   3662    4874*   4876    5305*   5307    5349*   5351    5486*   5487*
                    5491    5497    5506*   5507*   5508    5510    6052*   6108*   6171*   6185*   6195*   6208    6484*
                    6734    6745*   6749*   6752    6759*   6760*   6761    6766*   6774*   7105    7110*   7118*   7120*
                    7122*   7128    7129*   7158*   7159    7160*   7175*   7176*   7193*   7196    7197*   7203*   7204*
                    7209*   7210*   7299    7305*   7308*   7312    7325*   7349    7370*   8486*   8500*   8543#   8611*
                    8619*   8620*   8621*   8623*   8624    8625    8630    8650*   8661*   8689    8735*   8737    8750
                    8752*   8755    8757    8769    8773    8776    8781    8792    8811*   8826    8891    8922    8925*
                    8926*   8927*   8928    8939*   8989
R3      =%000003      77#   2721*   2732*   4875*   4877    4879    4880*   4882    5306*   5308    5310    5311*   5312
                    5350*   5352    5354    5355*   5356    5488*   5493    5504*   6054*   6057    6110*   6113    6170*
                    6184*   6191    6197*   6207    6483*   6503*   6506*   6513*   6735    6743*   6744*   6758*   6761*
                    6770*   6771*   6773*   6876    6885*   6891*   6892*   6895*   6900*   6901*   6902    6911*   7029
                    7031*   7032    7035*   7036    7043*   7044    7046    7054    7058    7060*   7066    7068    7070*
                    7073*   7155*   7168*   7175    7201*   7206*   7212*   7213    7350    7369*   8490*   8492    8496*
                    8544#   8761*   8763*   8764*   8765*   8780*   8781*   8782*   8783*   8784    8812*   8866*   8890
                    8937*   8961    8999*   9001*
R4      =%000004      78#   2719*   2720    2731*   2734*   4929*   5046*   5163*   5489*   5491    5494*   5495    5603
                    5604*   5605    5607*   5610*   5621    5623*   5624    5632*   5636*   5648    5649*   5650    5656*
                    5660*   5922    5960*   5961    5966    5971*   5974    5978    5981    5990*   6053*   6109*   6137
                    6169*   6187*   6196*   6473    6499    6510    6877    6879*   6880*   6881*   6882    6883*   6897
                    6899*   6907*   6910*   7154*   7161*   7199*   7202    7208    7210    7351    7368*   8484*   8488*
                    8505*   8516    8545#   8585*   8586*   8587*   8588*   8589    8602*   8603    8605    8608*   8609*
                    8610*   8613*   8632*   8634*   8635    8649*   8657*   8658*   8659*   8660*   8691    8731*   8732*
                    8733*   8734    8735    8761    8762    8767    8775*   8778    8784    8793    8799*   8801*   8802
                    8813*   8828    8865*   8889    8923*   8928*   8932    8936*   8961    8963    8991    9002*
R5      =%000005      79#   2424*   2425    2426    2427    2428    2429    2430    2431    2432    2433    2434    2435
                    2436    2437    2438    2439    2467*   2481*   2485*   2486*   2580*   2584*   2585*   2716*   2762*
                    2799*   2800*   2801*   2803*   2804*   2824*   2847*   2848*   2902*   2903*   2905*   2924*   2925*
                    2928*   2941*   2950*   2951*   2977*   2978*   2987*   3006*   3008*   3009*   3011*   3024*   3033*
                    3034*   3049*   3050*   3053*   3073*   3082*   3083*   3110*   3121*   3122*   3123*   3126*   3137
                    3147*   3156*   3157*   3174*   3175*   3177*   3188*   3197*   3198*   3220*   3221*   3231*   3249*
                    3250*   3251*   3254*   3266*   3276*   3285*   3286*   3295*   3296*   3297*   3299*   3310    3320*
                    3330*   3339*   3340*   3355*   3356*   3366*   3402*   3405*   3410*   3420*   3421*   3437*   3446*
                    3447*   3463*   3481*   3482*   3483*   3492*   3500*   3509*   3510*   3519*   3537*   3558*   3580*
                    3586*   3596    3597    3598    3601    3632*   3693*   3694*   3695*   3699*   3712*   3721*   3722*
                    3731*   3732*   3733*   3735*   3746    3756*   3765*   3766*   3794*   3796*   3800*   3805*   3815*
                    3816*   3832*   3841*   3842*   3853*   3854*   3855*   3864*   3865*   3866*   3867*   3875    3923*
                    3924*   3925*   3932*   3941*   3942*   3943*   3976*   3979*   3984*   3994*   3995*   4011*   4020*
                    4021*   4032*   4033*   4034*   4044*   4045*   4046*   4048*   4061*   4070*   4071*   4081*   4100*
                    4101*   4102*   4104*   4115    4125*   4134*   4135*   4153*   4154*   4155*   4162*   4171*   4172*
                    4173*   4209*   4210*   4211*   4212*   4213*   4215*   4228*   4237*   4238*   4248*   4249*   4250*
                    4251*   4252*   4254*   4265    4275*   4284*   4285*   4301*   4302*   4303*   4310*   4319*   4320*
                    4321*   4366*   4367*   4368*   4369*   4370*   4375    4426*   4427*   4428*   4430*   4447*   4449*
                    4477*   4478*   4479*   4480*   4482*   4509*   4510*   4511*   4513*   4547*   4548*   4549*   4557*
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                    4575*  4578*  4629*  4651*  4657*  4658*  4659*  4670*  4719*  4730*  4742*  4755*  4768*
                    4841*  4857*  4859   4922*  4923*  4946   4980*  4981*  4982*  4989*  4998*  4999*  5000*
                    5039*  5040*  5063   5097*  5098*  5099*  5106*  5115*  5116*  5117*  5156*  5157*  5180
                    5214*  5215*  5216*  5223*  5232*  5233*  5234*  5273*  5274*  5318*  5379*  5380*  5381*
                    5388*  5397*  5398*  5399*  5568   5582   5583   5584   5585   5586   5587   5588   5589
                    5590   5591   5592   5593   5594   5595   5624   5630*  5634*  5650   5654*  5658*  5692*
                    5693*  5707*  5711*  5712*  5723*  5735*  5752*  5753*  5755   5761   5768*  5807*  5824*
                    6055*  6111*  6137   6172*  6186*  6198*  6474   6496   6508   6736   6738*  6740*  6747*
                    6751*  6766   6772*  6878   6884*  6886*  6888*  6889*  6890*  6891   6909*  7153*  7159*
                    7164*  7165   7200*  7204   7211   7352   7367*  8546#  8619   8625*  8645*  8691*  8692*
                    8694*  8695   8698*  8704*  8710   8712   8721   8726*  8728*  8731   8753*  8754*  8765
                    8814*  8849*  8851*  8853*  8854*  8855*  8856*  8857   8858*  8859   8860   8861   8868
                    8880*  8888   8904*  8917*  8940*  8955*  8981*  8986*  8988*  8991*  9004*
R6      =%000006      80#    82   2259*  2260*  2261
R7      =%000007      81#    83
SAVREG= 104413      6010   6068   6166   6181   7151   7192   7417#  8464
SBMR2   005444      1158#  2943*  2953*  3026*  3036*  3075*  3085*  3149*  3159*  3190*  3200*  3278*  3288*
                    3332*  3342*  3412*  3423*  3439*  3449*  3502*  3512*  3714*  3724*  3758*  3768*  3807*
                    3818*  3834*  3844*  3986*  3997*  4013*  4023*  4063*  4073*  4127*  4137*  4230*  4240*
                    4277*  4287*  6256*  6257   6259*  6260   8332   8343
SBMR3   005446      1159#  2946*  2956*  3029*  3039*  3078*  3088*  3152*  3162*  3193*  3203*  3281*  3291*
                    3335*  3345*  3416*  3427*  3442*  3452*  3505*  3515*  3717*  3727*  3761*  3771*  3811*
                    3822*  3837*  3847*  3990*  4001*  4016*  4026*  4066*  4076*  4130*  4140*  4233*  4243*
                    4280*  4290*  6277*  6278   6280*  6281   8332   8343
SBPAR   035524      6258   6279   6299#
SCLR    = 000040     221#  2467   2481   2580   5707
SCOP1   = 104415    2478   2577   2756   2918   3000   3043   3115   3168   3243   3349   4093   4469   4502
                    7419#
SCOP1$  035576      6323#  7419
SDC     = ****** U  7424
SEC     001414       566#  4729*  6015*  6028*  6073*  6085*  6234*
SECNT   001420       568#
SECTOR  001426       571#  4850   4868   5725*  5726*  5727*  5728*  5729*  5730*  5784   5788   5791   5881*
                    5885   5886*  5887*  5898   5908*  5909   5910*  5911*  5936*  5945*  5954*  5976
SEEK    = 000017     196#  3537   3632   4449   4578   4629   4923   5040   5157   5274   5318
SELDRV= 000001       189#  2486   2585   3266   3320   5693   5753
SETINT  032064      2367   5546   5555#
SIZFLG  005522      1192#  2368*  2471   5501*  5521*
SKI     = 000002     236#
SORT    033536      5878#
SP      =%000006     82#   2251*  2252*  2253*  2263*  2281*  2289*  2293   2309   2370*  2371*  2372*  2387
                    2397   2400   2419*  2444   2465*  2479*  2503*  2543*  2573*  2578*  2668*  2690*  2708*
                    2720*  2748*  2757*  2791*  2854*  2876*  2919*  2973*  3001*  3044*  3116*  3169*  3217*
                    3244*  3350*  3395*  3688*  3782*  3882*  3969*  4094*  4202*  4352*  4409*  4470*  4503*
                    4613*  4714*  4827*  4876*  4877*  4879*  4880   4906*  4940*  4941*  4943   4944   5023*
                    5057*  5058*  5060   5061   5140*  5174*  5175*  5177   5178   5258*  5307*  5308*  5310*
                    5311   5351*  5352*  5354*  5355   5422*  5439*  5484   5529   5542   5574*  5603*  5607
                    5608*  5610   5621*  5632   5636   5637*  5648*  5656   5660   5661*  5678*  5691*  5697
                    5717*  5751*  5763   5798*  5816*  5831*  5839*  5840*  5870   5871   5878*  5879*  5901
                    5902   5909*  5911   5922*  5923*  5924*  5969   5970   5971   5988   5989   5990   5991*
                    6126*  6132   6143*  6151*  6152*  6154   6155   6156*  6209*  6216*  6217*  6241*  6242*
                    6255*  6262   6263*  6265   6274*  6283   6284*  6286   6299*  6300*  6314   6315   6327*
                    6330   6344   6349*  6356   6369   6379   6384*  6392   6405   6411   6418*  6427   6430*
                    6456*  6472*  6473*  6474*  6475*  6476*  6477*  6478   6480   6482*  6487   6489*  6490
                    6492*  6493   6498*  6500*  6501   6504*  6514*  6518*  6543*  6546   6548   6549   6578
                    6579   6583*  6609   6630*  6633*  6661*  6662   6672*  6674   6675   6676*  6678   6680
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                    6682   6688   6690*  6692*  6700*  6704   6708   6709   6713   6732*  6733*  6734*  6735*
                    6736*  6737*  6738   6741*  6754   6756*  6758   6768   6770   6772   6773   6774   6775
                    6776   6778*  6779*  6794*  6795*  6802   6803*  6814   6815*  6816*  6826   6827*  6832
                    6833   6868*  6869   6870   6871*  6876*  6877*  6878*  6884   6909   6910   6911   6912*
                    6913*  6934*  6935*  6936   6943*  6946*  6947*  6951*  6952*  6956   6959*  6963   6965
                    6967   6968*  6975   6977   6979*  6980   6982*  6983*  6984*  6985*  6986*  7001*  7002*
                    7005*  7006*  7007   7011*  7012*  7013   7016   7018   7020*  7029*  7030*  7035   7038
                    7042*  7049   7053*  7072   7073   7074*  7075*  7076*  7101*  7102*  7103*  7104*  7105*
                    7107   7111*  7113   7115   7123*  7124   7126   7127*  7129   7130   7131   7133   7152
                    7165*  7193   7195*  7252   7253*  7255*  7256*  7269*  7270   7279   7280*  7297*  7298*
                    7299*  7300*  7301   7303*  7305   7307*  7309*  7315*  7317   7322   7323*  7324*  7325
                    7326   7327   7347*  7348*  7349*  7350*  7351*  7352*  7353*  7354*  7355*  7356*  7363*
                    7364*  7365*  7366*  7367   7368   7369   7370   7371   7372   7382*  7383   7393*  7394*
                    8494*  8526*  8547#  8580*  8581   8760*  8763   8767*  8775   8809   8810   8811   8812
                    8813   8814   8815*  8816*  8817*  8841   8842   8885   8886   8887*  8888*  8889*  8890*
                    8891*  8892*  8893*  8894   8922*  8924*  8927   8935   8939   8974*  8978*  8980   8993
SPACE2  054640      8498   8507   8518   8530#
SPAR   = 020000      211#
$RTSPL= 000011       193#  4719
$RTTAB  002160       627#  5890
ST     = 177776     8549#  8575   8576*  8589*  8803*  8829*  8831*  8857*
STACK  = 001100       57#  2251   2263   2370   2419   2465   2479   2573   2578   2668   2708   2748   2757
                    2791   2876   2919   2973   3001   3044   3116   3169   3217   3244   3350   3395   3688
                    3969   4094   4202   4352   4409   4470   4503   4613   4714   4827   4906   5023   5140
                    5258   5422   6418   6456   8526
START   010710       364  2247#
START1  011304      2321#
STKLMT= 177774        68#
ST2     011352      2328   2339#
ST3     011416      2329   2357#
ST4     011450      2341   2362   2365#
ST5     011474      2348   2370#  5451
SUBCLR  032570      2712   2750   2759   2793   2890   2921   2974   3003   3046   3118   3171   3218   3246
                    3352   3399   3576   3629   3690   3791   3973   4096   4206   4359   4413   4474   4505
                    4544   4625   4645   4716   4832   4917   4953   5034   5070   5151   5187   5268   5315
                    5707#
SUM     001476       596#  4838*  4839*  4882*  4883*  4912*  4913*  4949*  4950*  4951*  4969*  4970*  5029*
                    5030*  5066*  5067*  5068*  5086*  5087*  5146*  5147*  5183*  5184*  5185*  5203*  5204*
                    5261*  5262*  5312*  5313*  5368*  5369*  6012*  6041*  6047*  6048*  6055   6070*  6097*
                    6103*  6104*  6111   6170   6171   6184   6185
SUM1    001502       598#  4914*  4915*  4957*  4958*  4959*  4969   4970   5031*  5032*  5074*  5075*  5076*
                    5086   5087   5148*  5149*  5191*  5192*  5193*  5203   5204   5263*  5264*  5356*  5357*
                    5368   5369
SVAL   = 100000      266#
SWR     001140       440#  2261   2283*  2285   2291*  2298*  6323   6346   6354   6359   6381   6390   6395
                    6414   6538   6552   6554   6560   6567   6605   6612   6624   6628   6930   6967*  8522
SWREG   000176       362#  2291   6930   6943
SW0    = 000001      121#
SW00   = 000001      111#   121
SW01   = 000002      110#   120
SW02   = 000004      109#   119
SW03   = 000010      108#   118
SW04   = 000020      107#   117
SW05   = 000040      106#   116
SW06   = 000100      105#   115
SW07   = 000200      104#   114
```

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SW08  = 000400            103#   113
SW09  = 001000            102#   112
SW1   = 000002            120#
SW10  = 002000            101#
SW11  = 004000            100#
SW12  = 010000             99#  8522
SW13  = 020000             98#  6346  6381
SW14  = 040000             97#  6359  6395
SW15  = 100000             96#
SW2   = 000004            119#
SW3   = 000010            118#
SW4   = 000020            117#
SW5   = 000040            116#
SW6   = 000100            115#
SW7   = 000200            114#
SW8   = 000400            113#
SW9   = 001000            112#  6323  6354  6390  6414
TBITVE= 000014            154#
TEMP1   005450           1161#  2468* 2482* 2487* 2492* 2493* 2494  2581* 2586* 2591* 2592* 2593  2763*
                         2805*  2906* 2929* 2988* 3012* 3054* 3127* 3178* 3232* 3255* 3267* 3300* 3321*
                         3367*  3406* 3432* 3484* 3538* 3542* 3587* 3633* 3637* 3700* 3736* 3801* 3827*
                         3856*  3868* 3928* 3944* 3980* 4006* 4035* 4049* 4105* 4158* 4174* 4216* 4255*
                         4306*  4322* 4372* 4431* 4450* 4454* 4483* 4514* 4558* 4579* 4583* 4630* 4634*
                         4652*  4660* 4720* 4796* 4842* 4858* 4862* 4924* 4985* 5001* 5041* 5102* 5118*
                         5158*  5219* 5235* 5275* 5279* 5283* 5297* 5319* 5323* 5327* 5341* 5384* 5400*
                         5570*  5622* 5626* 5652* 5668  5670* 5691  5694* 5697* 5708* 5751  5754* 5757*
                         5763*  5782* 5794* 5806* 5811* 5823* 5828* 5859* 5862* 5863  6016* 6022* 6074*
                         6079*  6255  6257* 6259  6262* 6265* 6274  6275* 6276* 6277  6278* 6280  6283*
                         6286*  6305* 6313* 8350
TEMP2   005452           1162#  2795* 2825* 2826  2846* 3937* 4167* 4315* 4802* 4994* 5111* 5228* 5393*
                         5628*  5813* 5860* 5861* 5863* 5864
TEMP3   005454           1163#  2796* 2828  2842* 2843
TEMP4   005456           1164#  2836*
TEMP5   005460           1165#  4358* 4369  4383  4385* 4411* 4443* 4542* 4570*
TIME1   025316           4616   4619#
TIMING  025264           2881   2888  2914  2937  2996  3020  3063  3069  3240  3263  3375  3594  3606
                         3708   4057  4224  4439  4566  4596#
TIMUP   001416            567#  4735  6020  6030* 6032  6077  6087* 6089  6219* 6230* 6236*
TIM1    001462            588#  4751* 4781
TIM2    001464            589#  4764* 4785
TIM3    001466            590#  4777* 4789
TIM4    001470            591#
TITLE   031624           2323   2360  5472#
TKVEC = 000060            161#
TOCYL   001372            554#  2979* 2981  3222* 3225  3357* 3360  3579* 3609  4410* 4418  4421  4428
                         4444*  4445  4466* 4472  4477  4497  4537* 4538  4541* 4549  4551  4571* 4572
                         8340   8353  8356
TPVEC = 000064            162#
TRAPPC  001354            544#  6411* 8339
TRAPVE= 000034            160#  2269* 2270* 6455*
TRT   = 000003           8554#  9047
TRTVEC= 000014            155#
TRUERR  033666           3100   3139  3312  3748  3876  4117  4267  5922#
TSTATN  032266           3487   3859  3947  4038  4177  4325  4663  5004  5121  5238  5403  5603#
TST1    011656           2395   2417#
TST10   013720           2831   2833  2852  2874#
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TST11    014320          2971#
TST12    015650          3215#
TST13    016672          3393#
TST14    020224          3663    3686#
TST15    021712          3913    3955    3967#
TST16    023154          4200#
TST17    024024          4350#
TST2     012020          2442    2463#
TST20    024212          4356    4364    4384    4407#
TST21    025264          4611#
TST22    025616          4712#
TST23    026276          4799    4825#
TST24    026562          4854    4865    4872    4904#
TST25    027274          4976    5021#
TST26    030006          5093    5138#
TST27    030520          5210    5256#
TST3     012430          2472    2571#
TST4     012754          2601    2[illegible]#
TST5     013106          2706#
TST6     013244          2711    2[illegible]#
TST7     013346          2754    27[illegible]    2789#
TYPOS =  104405          5440    7409#
TYPE  =  104401          2327    2342    2344    2346    2361    2402    2473    2502    2519    2542    2674    2688    2696
                         2715    2737    2738    2853    2857    2858    2880    2886    2887    2913    2936    2995    3019
                         3062    3068    3[illegible]    3262    3374    3593    3605    3707    3777    3781    3787    3881    3887
                         3888    3905    3918    4056    4223    4438    4565    4617    4622    4680    4683    4684    4780
                         4784    4788    4792    4793    4829    4889    4892    4893    4965    4968    4973    4974    5082
                         5085    5090    5091    5199    5202    5207    5208    5364    5367    5372    5373    5438    5441
                         5475    5514    5677    6024    6081    6160    6174    6200    6348    6383    6429    6457    6607
                         6615    6683    6777    6903    6941    6942    6945    6958    6969    6988    7041    7047    7052
                         7056    7061    7062    7064    7067    7071    7135    7137    7277    7405#   8474    8475    8479
                         8480    8489    8498    8502    8507    8509    8515    8518
TYPERR   054364          6614    8464#
TYPOC =  104402          6944    7406#   8495
TYPON =  104404          7408#
TYPOS =  104403          2505    2545    2692    3784    3884    5680    6351    6386    6432    7407#
TYPTIM   034750          4682    4782    4786    4790    6150#
T1       001430           573#
T10      001432           574#    2468    2482    2487    2581    2586    3267    3321    3484    3856    3928    3937    3944
                         4035    4158    4167    4174    4306    4315    4322    4652    4660    4720    4985    4994    5001
                         5102    5111    5118    5219    5228    5235    5384    5393    5400    5694    5708    5754
T100     001440           577#    3406    3801    3990    4802
T50      001434           575#    3538    3633    4450    4579    4630    4924    5041    5158    5275    5319
T500     001436           576#    5279    5323
T5000    001442           578#    3432    3827    4006    4796    5782
T50000   001444           579#    2805    2906    2929    2988    3012    3054    3127    3232    3255    3300    3367    3542
                         3587    3637    3700    3736    4049    4105    4216    4255    4431    4454    4483    4514    4558
                         4583    4634    4842    4858    5297    5341
UFE   =  000400           224#    2524    2617
UNLOAD=  000007           192#    4651
UNS   =  040000           249#
UPE   =  020000           229#
VELCAL   034456          5266    6068#
VELTST   030520          4830    5245#
VV    =  000100           260#
WCE   =  040000           230#    3135    3182    3308    3744    3872    4113    4263
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WDCNT   001524            611#  8350
WD1     001506            601#  3095*  3137*  3310*  3746*  3875*  4115*  4265*  8347
WD2     001510            602#  3096*  3138*  3311*  3747*  4116*  4266*  8347
WLE   = 004000            246#
WORD    001540            619#  5961*  5962   5964   5974*  5975*  5976   5981*  5982*  5983*  5984
WRDATA= 000023            198#  2928   3011   3254   3699   4048   4215   4370   4482   4513
WRHEAD= 000027            200#  2905   2987   3231   3366   4430   4557
WRL   = 004000            263#
WRTCHK= 000031            201#  3126   3177   3299   3735   3867   4104   4254
WRTGAT= 040000            281#
$APTHD  001000            399    405#
$ASTAT= ****** U         6820   6835
$ATYC   037560           6791   6793#
$ATY1   037534           6789#
$ATY3   037542           6668   6790#
$ATY4   037552           6620   6792#
$AUTOB  001134            437#  6938   7087
$BASE   001264            507#  2365*  2424   5532*  5534*
$BDADR  001122            432#
$BDDAT  001126            434#
$BELL   001200            458#  6607   6640
$CDW1   001270            509#
$CDW2   001272            510#
$CHARC  037304           6685*  6695*  6702   6711*  6716#
$CKSWR  040230           6930#  7413
$CMTAG  001100            420#  2258   2259   2267   2273   2274   2275
$CM3  = 000000            450#
$CM4  = 000006            450#   451#   452#   453#   454#   455#   456#
$CNTLG  041115           6941   7082#
$CNTLU  041110           6958   7056   7081#
$CPUOP  001236            481#
$CRLF   001205            460#  2502   2696   2737   2738   2857   2858   3787   3887   3888   4683   4684   4792
                         4793   4892   4893   4973   4974   5090   5091   5207   5208   5372   5373   6615   6640
                         6684   6719   6969   7061   7081   7140   8474   8479   8489   8502   8515
$DBLK   037524           6743   6777   6785#
$DB2D   041424           6158   6210   7192#  7254
$DB2O   041304           2855   7151#
$DDW0   001274            511#
$DDW1   001276            512#
$DDW10  001320            521#
$DDW11  001322            522#
$DDW12  001324            523#
$DDW13  001326            524#
$DDW14  001330            525#
$DDW15  001332            526#
$DDW2   001300            513#
$DDW3   001302            514#
$DDW4   001304            515#
$DDW5   001306            516#
$DDW6   001310            517#
$DDW7   001312            518#
$DDW8   001314            519#
$DDW9   001316            520#
$DECVL  041604           7194   7240#
$DEVCT  001220            472#  2314*  2375*  2678   5423*  5424
$DEVM   001266            508#
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$DOAGN  031560          5434    5443    5449#
$DTBL   037514          6746    6781#
$ENDAD  031550           385    5445#   6635
$ENDCT  031516          2273    5436#
$ENDMG  031567          5438    5453#
$ENULL  031564          5441    5452#
$ENV    001230           477#   6617    6663    6798    6822
$ENVM   001231           478#   2296    6665    6670    6800
$EOP    031434          4618    4623    4805    5375    5419#   6025    6082    8527
$EOPCT  031510          2273*   5433#   5437
$EOP1   031462          2446    2520    2675    5425    5427#   6370    6406
$ERFLG  001103           423#   6325    6527    6556    6558    6564*   6586    6602*   6640    8524
$ERMAX  001115           429#   2276*   6558    6581*   6586
$ERROR  036626          2267    6600#
$ERRPC  001116           430#   6609*   6610*   6611    6640    8332    8336    8340    8343    8347    8350    8353    8356
                        8359
$ERRTB  005524          1207#   8471
$ERTTL  001112           427#   6608*   6640
$ESCAP  001176           457#   2275*   3404*   3431*   3799*   3826*   3978*   4005*   4464*   4576*   4650*   4686*   4726*
                        4794*   4801*   4920*   4975*   4978*   5037*   5092*   5095*   5154*   5209*   5212*   5271*   5374*
                        5377*   6410*   6413*   6580*   6631    6633    6640
$ETABL  001230           476#
$ETEND  001334           411     529#
$FATAL  001212           469#   6826*
$FFLG   040000          6789*   6792*   6820    6829*   6837#
$FILLC  001156           448#   6688    6719
$FILLS  001155           447#   6719
$GDADR  001120           431#
$GDDAT  001124           433#
$GET42  031540          5442#
$GTSWR  040300          6942#   7411
$HD   = 000000            28
$HIBTS  001000           406#
$HIOCT  041302          7128*   7139#
$ICNT   001104           424#   6571*   6572    6574*   6585
$INTAG  001135           438#   6970    7087
$ITEMB  001114           428#   6611*   6619    6640    8465
$LF     001206           461#   6640    6719    7071    7081    7140
$LFLG   037777          6830*   6836#
$LPADR  001106           425#   2277*   6357    6393    6562*   6578*   6583    6585
$LPERR  001110           426#   2278*   6327    6330*   6419    6562    6579*   6585    6630
$MADR1  001242           494#
$MADR2  001246           498#
$MADR3  001252           501#
$MADR4  001256           504#
$MAIL   001210           407     411     467#    2295    6577    6617    6663
$MAMS1  001240           488#
$MAMS2  001244           496#
$MAMS3  001250           499#
$MAMS4  001254           502#
$MBADR  001002           407#
$MFLG   037776          6790*   6796    6831*   6835#
$MNEW   041133          6945    7085#
$MSGAD  001224           474#   6806*   6809
$MSGLG  001226           475#   6811*
$MSGTY  001210           468#   6804    6812*   6824    6828*
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$MTYP1  001241           489#
$MTYP2  001245           497#
$MTYP3  001251           500#
$MTYP4  001255           503#
$MUL  = 000037          4879#   4881    4943#   5060#   5177#   5310#   5312    5354#   5356    6154#
$MULT   041714          4878    4942    5059    5176    5309    5353    6153    7296#
$MXCNT  036624          6575    6585#
$NULL   001154           446#   6690    6719
$NWTST= 000001          2407#   2409    2449#   2451    2556#   2558    2657#   2659    2699#   2701    2740#   2742    2773#
                        2775    2864#   2866    2961#   2963    3208#   3210    3380#   3382    3666#   3668    3957#   3959
                        4184#   4186    4332#   4334    4388#   4390    4601#   4603    4688#   4690    4807#   4809    4895#
                        4897    5012#   5014    5129#   5131    5246#   5248
$OCNT   040224          6875*   6904*   6917#
$OCTVL  041406          2719    7153    7178#
$OMODE  040226          6870*   6874*   6879    6882*   6893*   6919#
$OVER   036610          6539    6555    6563    6573    6582#
$PASS   001216           471#   2295*   2710    2851    5430*   5431*   5439    5452    6569    6586
$PASTM  001006           409#
$PWRCT  036166          6450*   6451*   6461#
$PWRON  036102          2271    6444#   6453
$PWRUP  036114          6444    6450#
$QUES   001204           459#   6640    6719    6988    7064    7081    7137    7140
$RDCHR  040512          7001#   7414
$RDDEC= ****** U        7417
$RDLIN  040632          7029#   7415
$RDOCT  041144          7101#   7416
$RDSZ = 000022          7022#
$RESRE  042064          7362#   7418
$RTNAD  031562          5451#
$R2A  = ****** U        7419
$SAVRE  042026          7346#   7417
$SB2D   041620          7252#
$SCOPE  036346          2265    6536#
$SETUP= 000137          2219#   2264    2265    2267    2269    2271    2273    2274    2275    2277    5428    6537    6601
                        6627    6635    6925    7087
$STUP = 177777          2219#
$SUPRS  041654          2736    2856    6159    6211    7269#
$SVLAD  036554          6547    6576#
$SVPC = 000244           383#    388
$SWR  = 167400            13#     28      33      34      35      36      37      38      39      40     456     457     458
                        2274    2275    2277    2278    2418    2464    2572    2667    2707    2747    2790    2875    2972
                        3216    3394    3687    3968    4201    4351    4408    4612    4713    4826    4905    5022    5139
                        5257    5416    5429    5444    5450    5452    6528    6529    6530    6531    6532    6538    6550
                        6552    6553    6556    6557    6558    6565    6566    6567    6579    6582    6585    6592    6593
                        6594    6595    6596    6605    6612    6624    6628    6640
$SWREG  001232           479#   2298
$SWRMK= 000000            40      41    6532    6533    6554
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$TIMES  001174           456#   2274*   2418*   2464*   2572*   2667*   2707*   2747*   2790*   2875*   2972*   3216*   3394*
                        3687*   3968*   4201*   4351*   4408*   4612*   4713*   4826*   4905*   5022*   5139*   5257*   5429*
                        6565*   6572    6575*   6585
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                       5944   5969*  5988*  6191*  6198   6208*
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$TMP3   001166          453#
$TMP4   001170          454#
$TMP5   001172          455#
$TN   = 000030           14#    28   2395   2407   2418#  2442   2449   2464#  2472   2556   2572#  2601   2657
                       2667#  2669   2670   2699   2707#  2711   2740   2747#  2754   2768   2773   2790#  2831
                       2833   2852   2864   2875#  2961   2972#  3208   3216#  3380   3394#  3663   3666   3687#
                       3913   3955   3957   3968#  4184   4201#  4332   4351#  4356   4364   4384   4388   4408#
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$TPFLG  001157          449#  6657   6719
$TPS    001150          444#  6706   6719
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$TYPEX  037306         6712   6714   6717#
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CKWD3    699#  4080
COMMEN     1#   164#
DRCLR    714#  3480  3852  3940  4031  4170  4318  4656  4997  5114  5231  5396
ENDCOM     1#   164#
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GETPRI     1#   164#
GETSWR     1#   164#
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LOOP     651#  2477  2576  2756  2918  3000  3043  3114  3168  3243  3349  4093  4469  4501
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MULT       1#   164#  4876  4940  5057  5174  5307  5351  6150
NEWTST     1#   164#  2407  2449  2556  2657  2699  2740  2773  2864  2961  3208  3380  3666  3957
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OFFDIR  1085#  3462  3519  3557
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OWNTAG   413#   531
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PUSH       1#   164#  6731  6793  6795  6816  7103  7296  7347
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SETPRI     1#   164#
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SKTIM      999#  4908   5025   5142
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SWRSU        1#   164#  2279#
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ASLB    6756
ASR     5727  5728  5729  5730  5739  5740  5741  5742  5772  5773  5774  5775  6810  7168  8621
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BCC     6306  6757  7311
BCS     6481  6507  8622  8633  8693  8727  8739  8800  8987
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BHI     6559  8606  8653  8756  8933
BHIS    8668
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         455     468     469     470     471     472     473     474     475     479     480     481     494     498     501
         504     505     506     507     508     509     510     511     512     513     514     515     516     517     518
         519     520     521     522     523     524     525     526    5433    5436    5451    6669    6716    6818    6919
        7136    7139    7215    7258    7278    7404    8476    8481    8510    9006    9014


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

*,DZR6IB/CRF/SOL=SYSMAC.C1,DZR6IB.P11
RUN-TIME: 59 89 16 SECONDS
RUN-TIME RATIO: 604/165=3.6
CORE USED:  41K  (81 PAGES)
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Spooler runtime 33 Seconds, 137 KCS, 923 disk reads, 4 disk writes, 225 pages