RK11/RK05

PERFORMANCE EXERCISER

MD-11-DZRKH-F

EP-DZRKH-F-DL-B

FICHE 1 OF 1

DEC 1976

digital

MADE IN USA

IDENTIFICATION

SEQ 0001

PRODUCT CODE: MAINDEC-11-DZRKH-F

PRODUCT NAME: RK11 RK05 PERFORMANCE EXERCISER

DATE: DECEMBER, 1976

MAINTAINER: DIAGNOSTIC GROUP

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REVISIONS: TOM SAWYER, GEORGE GALLANT, CHUCK HESS

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1.0 ABSTRACT

THE RK11/RK05 PERFORMANCE EXERCISER IS A HIGH LEVEL EXERCISER PROGRAM AIMED AT SIMULATING A RK11/RK05 SYSTEM ENVIRONMENT AND CHECKING FOR ERRORS THAT ARISE IN SUCH AN ENVIRONMENT (INTERACTION, POLLING, ETC). IT ALSO PROVIDES A MEANS OF EVALUATING A SYSTEM THROUGH ITS ERROR LOGGING AND DATA-TRANSFER LOGGING FACILITIES.

AT THE BEGINNING OF THE PROGRAM THERE IS A SERIES OF TESTS SPECIFICALLY AIMED AT DETECTING AND ANALYZING FAILURES ASSOCIATED WITH BOUNDARY CONDITION TRANSFERS.

THE LATTER PART (AND THE MORE SIGNIFICANT ONE) CONSISTS OF THE EXERCISER.

2.0 REQUIREMENTS

2.1 EQUIPMENT

A. PDP11 WITH CONSOLE TELTYPE
B. 8K OF MEMORY - 12K FOR CHAIN MODE
C. RK11 OR RKV11 CONTROLLER
D. 1-8 RK05 OR RK05F DRIVES (DRIVE TYPES MAY BE MIXED.

2.2 PRELIMINARY PROGRAMS

SINCE THIS IS A HIGH-LEVEL EXERCISER PROGRAM, THE CONTROLLER AND THE DRIVE SHOULD BE FREE OF BASIC FAULTS. IT IS POSSIABLE TO HANG THE PROGRAM IF THE HEAD POSITIONING LOGIC IS FAULTY ON DUAL DENSITY DRIVES. THUS THE FOLLOWING PROGRAMS SHOULD BE RUN BEFORE ATTEMPTING TO USE THIS PROGRAM.

A. RK11 BASIC LOGIC TESTS (I AND II)
B. RK11/RK05 DYNAMIC TESTS
C. RK05 UTILITY PACKAGE (IF NEEDED)

2.3 EXECUTION TIME

THIS VARIES FROM 30 TO 90 MINUTES FOR A PASS. IT SHOULD BE NOTED THAT THIS IS AN EXERCISER LEVEL PROGRAM AND SHOULD BE PREFERRABLY RUN FOR A LONG PERIOD OF TIME.

3.0 STARTING ADDRESS

200 - ALL SWITCHES DOWN. SEE SEC. 6.0 FOR SWITCHES.

210 - RESTART ADDRESS. THE RESTART ADDRESS PROVIDES THE USER WITH AN ABILITY TO GO STRAIGHT TO EXERCISER PART OF THE PROGRAM (SKIPPING TESTS 1-7). THERE IS A SWITCH OPTION (SW 4) WHICH ALLOWS THE USER TO INHIBIT THE REWRITE OF RANDOM PATTERNS ON ALL DRIVES, ON RESTART. SEE SEC- 6.9.

4.0 PROGRAM CONTROL MODES AND OPERATOR ACTION

PAPER TAPE LOADING
RKDP DUMP MODE
RKDP CHAIN MODE
ACT11

4.1 PAPER TAPE LOADING

4.1.1 LOAD PROGRAM INTO MEMORY USING STANDARD PROCEDURE FOR ABSOLUTE TAPES.

4.1.2 MAKE SURE THAT THE DRIVES TO BE CHECKED ARE LOADED WITH DISKS AND ARE IN 'RUN'. 'WRT ENABLE' THEM. CHECK THAT 'WRT PROT' LIGHT ON THESE DRIVES IS OFF. PUT DRIVES THAT ARE NOT TO BE TESTED ON 'LOAD'.

4.1.3 LOAD ADDRESS 200

4.1.4 SET SWITCHES IF DESIRED (SEE SEC 6.0) AND PRESS START

4.1.5 THE PROGRAM IDENTIFIES ITSELF

MAINDEC-11-DZRKH-F

RK11/RKOS PERFORMANCE EXERCISER

THEN IT PROCEEDS TO TEST THE DRIVES.

4.2 RKDP DUMP MODE

4.2.1 THE PROGRAM IS LOADED BY THE RKDP MONITOR.

4.2.2 SET SA=200. SELECT ANY SWITCHES YOU WANT AND PRESS START.

4.2.3 THE PROGRAM IDENTIFIES ITSELF AND PRINTS OUT:

'TO TEST DRIVE 'N' HALT PROGRAM, REMOVE RKDP PACK AND REPLACE IT WITH A WORK PACK, CLEAR LOCATION 40, AND RESTART PROGRAM'

IN RESPONSE TO THIS MESSAGE, PERFORM THE ACTIONS REQUESTED IF THE DRIVE ON WHICH THE RKDP PACK IS MOUNTED IS TO BE TESTED.

4.3 RKDP CHAIN MODE

THE PROGRAM IS CHAIN LOADED FROM RKDP PACK ON DRIVE 'N'. AFTER IDENTIFYING ITSELF, THE FOLLOWING MESSAGE APPEARS:

'DRIVE 'N' NOT TESTED'

DRIVE 'N' WILL NOT BE TESTED SINCE THE RKDP PACK IS ON THAT DRIVE.

4.4 ACT11 MODE

THE PROGRAM IS LOADED BY THE ACT11 MONITOR. AFTER IDENTIFYING ITSELF, ASCERTAINS THE NUMBER OF DRIVES PRESENT AND PROCEEDS TO TEST EACH OF THEM AS BEFORE.

5.0 DRIVE SELECTION

PUT ALL THE DRIVES THAT ARE TO BE EXERCISED AND TESTED ON 'RUN', WRITE ENABLE THEM. MAKE SURE THAT THE 'WRT PROT' IS OFF. THE PROGRAM RECOGNIZES THAT THESE DRIVES ARE ON LINE AND PROCEEDS TO TEST THEM. RK05F DRIVES WILL HAVE THE LETTER F TYPED AFTER THE DRIVE NUMBER.

IF A FATAL ERROR OCCURS ON A DRIVE WHILE THE PROGRAM IS RUNNING THE DRIVE IS AUTOMATICALLY DESELECTED ('DSELCT') AND DROPPED FROM THE DRIVE SELECTION LIST.

6.0 SWITCH OPTIONS

IF THE PROGRAM IS BEING RUN ON A SWITCHLESS PROCESSOR (I.E. AN 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' whenever the program enters the scope routine or begins a new test. 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.

SW<15>=1	HALT ON ERROR
SW<13>=1	INHIBIT ERROR PRINTOUTS
SW<12>=1	TYPE OUT THE ERROR HISTORY
SW<11>=1	DUMP OUT ALL RK11 REGISTERS
SW<10>=1	RING BELL ON ERROR
SW<09>=1	LOOP ON SPECIFIC ERROR
SW<08>=1	DUMP OUT TRANSFER DATA AND ERROR STATISTICS
SW<06>=1	SELECT BUS ADDRESS LIMITS FOR DATA TRANSFERS
SW<05>=1	HALT BEFORE DOING THE NEXT SET OF COMMANDS
SW<04>=1	DO NOT REWRITE THE DISKS ON 210 RETSART
SW<03>=1	TYPE OUT ELAPSED TIME AT ERROR
SW<02>=1	DROP DRIVE AFTER MAXIMUM ERRORS

SW<01>=1 TYPE SERIAL NUMBER OF ERRORING DRIVE
SW<00>=1 TYPE ONLY ELAPSED TIME IF SW<08> AND SW<03> = 1

6.1 SW<15>

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

6.2 SW<13>

THIS SWITCH INHIBITS ALL ERROR MESSAGES. NORMALLY JSED WHEN LOOPING ON ERROR (SW 9).

6.3 SW<12>

IF THIS SWITCH IS SET WHEN AN ERROR OCCURS, INFORMATION ABOUT THE HISTORY OF THAT ERROR IS TYPED OUT.

THE FUNCTION THAT WAS BEING PERFORMED ON THE RK11 IS TYPED OUT. THE FUNCTION COULD BE EITHER A READ, WRITE, WRITE CHECK, READ CHECK. BESIDES THESE NORMAL FUNCTIONS, IT COULD BE A CONTROL RESET, DRIVE RESET OR POSITIONING OF THE HEADS (SEEKING). FOR THE FOUR FUNCTIONS THE INITIAL DISK ADDRESS, BUS ADDRESS AND WORD COUNT (2'S COMPLEMENT) ARE ALSO GIVEN. FOR DRIVE RESET AND POSITIONING THE DRIVE NUMBER OR WHICH THE OPERATION WAS BEING PERFORMED IS GIVEN.

SIMILAR INFORMATION IS TYPED OUT ABOUT THE FUNCTION THAT WAS DONE JUST BEFORE THE ONE GIVING THE ERROR.

6.4 SW<11>

IF THIS SWITCH IS SET WHEN AN ERROR OCCURS, THE CONTENTS OF ALL RK11 REGISTERS ARE TYPED OUT.

6.5 SW<09>

THIS SWITCH PROVIDES THE TIGHTEST POSSIBLE SCOPE LOOP. LOOPING IS DONE WHEN AN ERROR OCCURS. NOTE THAT THERE ARE TWO CLASSES OF ERRORS AND HENCE TWO CLASSES OF ERROR LOOPS, REFER TO SEC 8.0 FOR THE DIFFERNECE IN THE ERROR LOOPS PROVIDED BY SW 9.

6.6 SW<08>

WHEN THIS SWITCH IS SET, THE ERROR AND TRANSFER DATA STATISTICS WHICH HAVE BEEN COLLECTED UNTIL THAT TIME, ARE TYPED OUT.

THE TRANSFER DATA STATISTICS GIVE THE NUMBER OF WORDS WRITTEN AND READ ON EACH DRIVE THAT IS PRESENT. IT SHOULD BE NOTED THAT READ CHECK AND WRITE CHECK ARE CONSIDERED TO BE ESSENTIALLY READ OPERATIONS.

THE ERROR STATISTICS GIVE THE NUMBER OF ERRORS THAT HAVE OCCURRED

(IF ANY) IN THE FOLLOWING CATEGORIES, ON THE DRIVES THAT ARE PRESENT:

CHECK SUM ERROR
WRITE CHECK ERROR
DATA COMPARISON ERROR
HARD ERROR
SEEK ERROR
SEEK INCOMPLETE

ABORTS - WHEN AN ERROR OCCURS THE FUNCTION IS RETRIED TWICE. IF STILL THE ERROR PERSISTS THE FUNCTION IS ABORTED AND THE ABORT COUNT IS INCREMENTED FOR THAT DRIVE.

6.7 SW<06>

THIS SWITCH ENABLES THE USER TO SELECT THE LIMITS OF THE MEMORY BUS ADDRESSES BETWEEN WHICH THE DATA TRANSFERS WILL BE DONE. NORMALLY THE TRANSFERS ARE DONE BETWEEN THE LOWER LIMIT (BASEBA) AND THE HIGHER LIMIT (MAXBA). THESE TWO LIMITS ARE NORMALLY SELECTED BY THE PROGRAM AND USE THE MAXIMUM AVAILABLE MEMORY. IF THE USER WANTS TO DO DATA TRANSFERS BETWEEN SELECTED MEMORY ADDRESSES (EX: BETWEEN 12K AND 16K) THEN THIS SWITCH SHOULD BE SET AT THE STARTING OF THE PROGRAM. THE FOLLOWING MESSAGE APPEARS:

TYPE OCTAL BUS ADDRESS FOR DATA XFER, BETWEEN XXXXXX AND YYYYYY

LO LIMIT?
HI LIMIT?

IN RESPONSE THE USER SHOULD TYPE IN ANY TWO BUS ADDRESSES (OCTAL) BETWEEN XXXXXX AND YYYYYY. IF THE USER TYPES IN ANYTHING OUT OF THE X AND Y RANGE THE QUESTION IS ASKED AGAIN.

THIS SWITCH COULD BE QUITE USEFUL IN DETERMINING WHETHER THE PROBLEM IS WITHIN THE RK11 OR OUTSIDE (IN MEMORY). NORMALLY, IF THE PROBLEM IS WITHIN THE RK11, ERRORS WILL KEEP ON OCCURING REGARDLESS OF WHERE IN THE MEMORY DATA TRANSFERS ARE TAKING PLACE. ON THE OTHER HAND IF THE PROBLEM IS MEMORY RELATED, THE ERRORS WILL TEND TO DISAPPEAR FOR DATA TRANSFERS TO CERTAIN MEMORY BLOCKS AND WOULD REAPPEAR FOR OTHER ONES.

6.8 SW<05>

THIS SWITCH PROVIDES THE USER A CAPABILITY TO HALT THE PROGRAM AT A KNOWN POINT. THE HALT IS DONE AFTER THE CURRENT SET OF EIGHT COMMANDS IN THE QUEUE HAVE BEEN EXECUTED. THE "HALT" IS LOCATED AT THE BEGINNING OF THE'GEN8RQ' ROUTINE, JUST BEFORE A SET OF 8 NEW COMMANDS IS GENERATED. AFTER THE PROGRAM HALTS, THE EXECUTION CAN BE RESUMED BY PRESSING CONTINUE, OR THE PROGRAM CAN BE STARTED BACK AT 200 OR RESTARTED AT 210.

6.9 SW<04>

THIS SWITCH PROVIDES THE USER WITH AN ABILITY TO SKIP THE TIME CONSUMING REWRITE OF ALL THE DISKS WHEN THE PROGRAM IS RESTARTED AT 210. THIS SWITCH CAN BE USED ONLY WHEN RESTARTING THE PROGRAM AT 210 WITH SW 4 SET. ON RESTARTING THE PROGRAM AT 210, THE INITIAL BOUNDARY CONDITION TESTS (TST1-TST7) ARE SKIPPED. IF SWITCH 4 IS SET, THE REWRITE OF ALL THE DISKS (WHICH WOULD HAVE BEEN NORMALLY DONE) IS ALSO SKIPPED. THE USER IS CAUTIONED TO USE THIS SWITCH CAREFULLY. THE DISKS SHOULD HAVE BEEN WRITTEN WITH RANDOM PATTERNS AT LEAST ONCE BEFORE RESTARTING THE PROGRAM AT 210. IT SHOULD BE NOTED THAT TESTS 1-7 WRITE ON CYLINDERS 0.1. ON RESTART, THE STATISTICS COLLECTED SO FAR ARE SAVED.

6.10 SW<03>

THIS SWITCH ALLOWS THE TYPEOUT OF THE ELAPSED TIME AT WHICH ERROR OCCURRED. THE TIMING STARTS AT THE BEGINNING OF THE EXERCISER PROGRAM. THIS SWITCH SHOULD NOT BE SET IF KW11L LINE CLOCK IS NOT AVAILABLE ON THE SYSTEM.

6.11 SW<02>

THIS SWITCH CAUSES DRIVES WHICH EXCEED A MAXIMUM NUMBER OF ERRORS TO BE DEASSIGNED BY THE PROGRAM. THE PROGRAM CONTINUES TESTING OTHER DRIVES WHICH HAVE NOT ACCUMULATED THE REQUIRED NUMBER OF ERRORS.

6.12 SW<01>

IF THIS SWITCH IS SET, THE PROGRAM ALLOWS A SERIAL NUMBER TO BE SPECIFIED FOR EACH DRIVE TESTED. THE SERIAL NUMBER IS TYPED WITH EACH ERROR MESSAGE FOR THAT PARTICULAR DRIVE.

6.13 SW<00>

IF SW<08> AND SW<03> ARE SET, SETTING THIS SWITCH TYPES OUT THE ELAPSED TIME FROM THE START OF THE PROGRAM.

7.0 EXERCISER PROGRAM

THE EXERCISER PROGRAM ATTEMPTS TO SIMULATE A DISK OPERATING SYSTEM ENVIRONMENT BY DOING RANDOM EVENTS (FUNCTIONS) USING RANDOMLY SELECTED PARAMETERS (DISK ADDRESS, BUS ADDRESS, WORD COUNT ETC.. AN ATTEMPT IS MADE TO DETECT INTER-ACTION PROBLEMS, OVERLAPPING SEEK PROBLEMS, ETC. FOR EXAMPLE, OVER 500 MILLION BITS ARE TRANSFERRED PER HOUR ON A TYPICAL RK11/RK05 SYSTEM (BASED ON 2 DRIVES, PDP11/50, 28K SYSTEM).

EIGHT JOBS OR COMMANDS ARE GENERATED AT A TIME (GENBRQ) AND PUT IN A QUEUE TO BE PROCESSED. THE ALGORITHM WORKS AS FOLLOWS. COMMANDS IN THE QUEUE ARE PREPOSITIONED (HEADS) BY PREFORMING OVERLAPPING SEEKS. WHILE SOME OF THE DRIVES ARE BEING POSITIONED, THE LAST AVAILABLE (AND EXECUTABLE COMMAND IS PERFORMED. THUS WHILE SOME DRIVES ARE BUSY POSITIONING THEIR HEADS, SOME DRIVE IS PERFORMING A FUNCTION (DATA TRANSFER,ETC). AS SOON AS THE CONTROLLER IS FREE, A CHECK IS MADE TO SEE IF THERE IS ANY DRIVE WHICH HAS ALREADY POSITIONED ITS HEAD. IF ONE IS FOUND THE COMMAND IS EXECUTED ON THAT DRIVE AND THE CONTROLLER AGAIN BECOMES BUSY. IF NO POSITIONED COMMAND IS FOUND, A CHECK IS MADE TO SEE IF THERE IS A COMMAND THAT IS TO BE POSITIONED. IF YES, IT IS POSITIONED AND THE LAST AVAILABLE COMMAND IS EXECUTED. IF IT IS FOUND THAT NO DRIVE NEEDS TO BE POSITIONED (THIS COULD HAPPEN IF THERE IS ONLY ONE COMMAND LEFT IN THE QUEUE OR THE REMAINING COMMANDS IN THE QUEUE ARE TO BE PERFORMED ON THE SAME DRIVE), THEN THE COMMANDS IS/ ARE EXECUTED.

THE ABOVE ALGORITHM HELPS SIMULATE A REAL ENVIRONMENT, AT THE SAME TIME MAXIMISING THE RATE OF DATA TRANSFERS. THE EXERCISER PROGRAM GIVES AN ELABORATE ERROR DETECTION CAPABILITY. THE STATE OF THE PROGRAM IS CONTINUOSLY TRACKED BY SOFTWARE KEYS, FLAGS, ETC. THESE FLAGS AND KEYS HAVE BEEN EXPLAINED IN DETAIL AT THE BEGINING OF THE LISTINGS, WHERE THEY ARE DEFINED. ON DUAL DENSITY DRIVES, ONLY ONE LOGICAL DRIVE IS SELECTED DURING EACH QUEUE BUILD. THIS INSURES THAT OVERLAPPED SEEKS WILL NOT INTEFER WTTH THE HEAD POSITIONING LOGIC.

THE PARAMETERS USED FOR DOING THE COMMANDS ARE SELECTED RANDOMLY USING A RANDOM GENERATOR . THE FUNCTION TO BE PERFORMED IS SELECTED RANDOMLY FROM ONE OF THE FOUR: WRITE, READ, WRITE CHECK, OR READ CHECK. THE DRIVE NUMBER IS SELECTED FROM THE AVAILABLE DRIVES. THE DISK ADDRESS IS SELECTED OVER THE ENTIRE RANGE AND THE WORD COUNT AND BUS ADDRESS ARE SELECTED RANDOMLY IN SUCH A WAY THAT A NON-EXISTENT MEMORY ERROR OR OVERRUN CONDITION DOES NOT OCCUR.

RANDOM DATA BLOCKS ARE WRITTEN ON THE DISK. THE FIRST WORD OF EACH SECTOR BLOCK IS A NUMBER (2'S COMPLEMENT) INDICATING THE TOTAL NUMBER OF WORDS WRITTEN IN THAT SECTOR. THE REST OF THE WORDS IN THE BLOCK ARE GENERATED USING THE DISK ADDRESS (OF THAT SECTOR) AS THE RANDOM SEED NUMBER.

8.0 LOOPING CAPABILITIES:

SWITCH 9 GIVES LOOPING CAPABILITIES, ON ERROR. THERE ARE TWO CLASSES OF ERRORS:

A. ERRORS OCCURING IN THE NON-EXERCISER PART OF THE PROGRAM (ERROR NUMBERS UNDER 100 IN THE ERROR ITEMS TABLE)

B. ERRORS OCCURING IN THE EXERCISER PART OF THE PROGRAM (ERROR NUMBERS STARTING FROM 100 AND UP IN THE ERROR ITEMS TABLE)

C. NON-EXERCISER SCOPE LOOPS: IN THIS CASE, THE PROGRAM LOOPS ON A SPECIFIC ERROR GIVING A NARROW SCOPE LOOP. THIS SCOPE LOOP IS SIMILIAR TO THE ONE PROVIDED IN THE PK11 BASIC LOGIC TEST AND DYNAMIC TEST, WHICH THE USER MIGHT BE FAMILIAR WITH.

D. EXERCISER SCOPE LOOPS: WHEN AN ERROR OCCURS (AFTER TYPING OUT THE ERROR MESSAGE) CONTROL IS TRANSFERRED TO THE BEGINNING OF THE COMMAND-QUEUE. THE COMMANDS FROM THE FIRST COMMAND ONWARDS, ARE EXECUTED AGAIN TILL THE POINT OF EPROR. THIS LOOPING PROVIDES THE USER WITH A CAPABILITY TO RECREATE A SET OF EVENTS THAT LED TO THE ERROR.

9.0 TRANSFER DATA LOGGING

IN THIS PROGRAM, WHENEVER A DATA TRANSFER TAKES PLACE IT IS LOGGED WHETHER IT IS READ, READ CHECK, WRITE OR WRITE CHECK. SEPERATE COUNTS ARE KEPT FOR DATA TRANSFERS TAKING PLACE ON EACH DRIVE IN THE SYSTEM. AT ANY GIVEN TIME THE USER CAN GET THESE TRANSFER STATISTICS BY SETTING SWITCH 8 TO 1 (SEE SEC.6.6). THIS IS HELPFUL FOR EVALUATING A SYSTEM.

10.0 ERROR LOGGING

THRCUGHOUT THE EXERCISER PROGRAM, WHEN AN ERROR OCCURS IT IS LOGGED. THE FOLLOWING CLASSES OF ERRORS ARE LOGGED FOR EACH DRIVE IN THE SYSTEM:

CHECK SUM ERROR
WRITE CHECK ERROR
DATA COMPARISON ERROR
HARD ERRORS
SEEK ERROR
SEEK INCOMPLETE ERROR
ABORTS

THE ERROR STATISTICS CAN BE OBTAINED BY PUTTING SWITCH 8 TO 1. THE ERROR STATISTICS CAN BE USED IN CONJUNCTION WITH DATA TRANSFER STATISTICS TO GIVE AN IDEA OF THE SYSTEM PERFORMANCE (NUMBER OF WORDS TRANSFERRED PER ERROR, CSE FREQUENCY, RECOVERABLE VERSUS NON-RECOVERABLE ERRORS ETC.).

11.0 ERROR REPORTING AND RECOVERY

WHENEVER AN ERROR OCCURS IT IS REPORTED ALONG WITH RELEVANT INFORMATION. THE RK11 REGISTERS REPORTED IN THE ERROR MESSAGES REPRESENT THE CONTENTS AT THE TIME OF ERROR. EACH ERROR MESSAGE CONTAINS A 'PC' NUMBER, THIS IS THE PC LOCATION IN THE PROGRAM WHERE THE ERROR CALL IS LOCATED. THE USER IS ADVISED TO REFERENCE THIS LOCATION IN THE LISTINGS, IN CASE MORE INFORMATION ABOUT THE ERROR IS DESIRED.

SOME (SYSTEM) ERRORS REFER TO SOFTWARE FLAGS AND KEYS WHICH ARE USED TO MONITOR THE ONGOING ACTIVITIES ON THE SYSTEM. THESE FLAGS ARE EXPLAINED AT THE BEGINING OF THE LISTINGS AND SOULD BE REFERRED TO, IF THE NEED ARISES.

IF A FATAL ERROR CONDITION IS DETECTED (LIKE DRIVE UNSAFE, WRITE PROTECT SET, DRIVE READY CLEAR, ETC.) THE DRIVE IS REMOVED FROM THE DRIVE SELECTION TABLE AND DROPPED FROM FURTHER TESTING. A MESSAGE IS GIVEN INDICATING DROPPING OF THAT DRIVE. FOR FURTHER INFORMATION, REFER TO THE 'CHKDRV' AND 'DSELCT' ROUTINES IN THE LISTINGS.

RECOVERABLE ERRORS ARE RETRIED THREE TIMES. IF THE ERROR CONDITION FAILS TO CORRECT OR A IF A DIFFERENT ERROR OCCURS THE FUNCTION IS ABORTED. MESSAGES ARE PRINTED ONLY ONCE FOR EACH ERROR. AFTER EIGHT ABORTS ARE RECORDED ON A DRIVE THE DRIVE IS DROPPED. DUAL DENSITY DRIVES ARE ALWAYS DROPPED IN PAIRS.

12.0 SUBROUTINES AND HANDLERS

THERE ARE TWO WAYS IN WHICH MOST OF THE SUBROUTINES USED IN THIS PROGRAM ARE CALLED:

1. THROUGH THE NORMAL JSR CALL

```
JSR     REG,SUBROUTINE
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2. THROGH THE 'TRAP' INSTRUCTION. THE TRAP INSTRUCTION WITH ITS LOWER BYTE ENCODED SERVES AS A CALL FOR SOME ROUTINES. WHEN THE 'TRAP' IS EXECUTED A TRAP OCCURS TO THE TRAP VECTOR AND THE TRAP DECODER IS ENTERED. THE TRAP DECODER ($TRAP) WILL PICK UP THE LOWER BYTE OF THE 'TRAP' INSTRUCTION AND USE IT TO INDEX THROUGH THE TRAP TABLE ($TRAPAD) FOR THE STARTING ADDRESS OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL GO TO THE DESIRED ROUTINE.

3. $SCOPE - THE SCOPE HANDLER

THE SCOPE HANDLER IS ENTERED THROUGH THE EXECUTION OF THE 'IOT' INSTRUCTION. IT KEEPS TRACK OF VARIOUS POINTERS, FLAGS AND DECIDES IF LOOPING IS TO BE DONE ON ERROR (SW 9). IT SHOULD BE NOTED THAT THIS HANDLER IS USED MOSTLY IN THE NON-EXERCISER PART OF THE PROGRAM.

4. $ERROR - ERROR HANDLER ROUTINE

THE ERROR HANDLER IS ENTERED THROUGH THE EXECUTION OF THE 'EMT' INSTRUCTION. THE LOWER BYTE OF THE EMT INSTRUCTION IS ENCODED TO GIVE AN IDENTIFIER TO THE ERROR CALL. THUS 'ERROR 1' IS 104001, ETC. THE ERROR ROUTINE DECIDES IF ANY ACTION IS TO BE TAKEN DEPENDING ON THE SWITCH SETTING (LIKE, HALT ON ERROR, INHIBIT ERROR TYPEOUT, ETC.).

MOST OF THE SUBROUTINES RESIDE IN THE LATTER PART OF THE PROGRAM. THE USER CAN REFER TO THEM TROUGH THE CROSS REFERENCE TABLE AT THE END OF THE LISTINGS OR TABLE OF CONTENTS AT THE BEGINING.

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                        .TITLE  MAINDEC-11-DZRKH-F
                        ;*COPYRIGHT (C) 1973,1976
                        ;*DIGITAL EQUIPMENT CORP.
                        ;*MAYNARD, MASS. 01754
                        ;*
                        ;*PROGRAM BY JIM KAPADIA
                        ;*
                        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        ;*PACKAGE (MAINDEC-11-DZQAC-C2), SEPT 14, 1976.
                        ;*
                        ;*REVISED BY GEORGE GALLANT,TOM SAWYER   -  MARCH 1976
                        ;*REVISED BY CHUCK HESS - AUGUST 1976
                        .SBTTL  OPERATIONAL SWITCH SETTINGS
                        ;*
                        ;*       SWITCH                  USE
                        ;*       ------          --------------------
                        ;*         15            HALT ON ERROR
                        ;*         14            LOOP ON TEST
                        ;*         13            TYPE OUT ERROR HISTORY
                        ;*         12            BELL ON ERROR
                        ;*         11            LOOP ON ERROR
                        ;*         10            TYPE OUT ERROR AND TRANSFER DATA STATISTICS
                        ;*          9            SELECT BUS ADDRESS LIMITS FOR DISK DATA TRANSFERS
                        ;*          8            HALT BEFORE DOING NEXT SET OF COMMANDS(GENBRQ)
                        ;*          7            DO NOT REWRITE THE DISKS ON RESTART AT 21C
                        ;*          6            TYPE OUT ELAPSED TIME AT ERROR
                        ;*          5            DROP DRIVE AFTER MAXM ERORS ON THIS DRIVE
                        ;*          4            TYPE SERIAL NUMBER OF ERRORING DRIVE
                        ;*          3            IF SW8=1, ONLY TYPE ELAPSED TIME
                        ;*          2            DUMP OUT ALL RK11 REGISTERS ON ERROR

                        ;*       YOU ARE ADVISED TO READ THE DOCUMENT FOR THIS PROGRAM.
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                        .SBTTL  BASIC DEFINITIONS

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

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

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

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

                        ;*"SWITCH REGISTER" SWITCH DEFINITIONS
100000                  SW15=   100000
040000                  SW14=   40000
020000                  SW13=   20000
010000                  SW12=   10000
004000                  SW11=   4000
002000                  SW10=   2000
001000                  SW09=   1000
000400                  SW08=   400
000200                  SW07=   200
000100                  SW06=   100
000040                  SW05=   40
000020                  SW04=   20
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                        SW03=   10
                        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)
                        BIT15=  100000
                        BIT14=  40000
                        BIT13=  20000
                        BIT12=  10000
                        BIT11=  4000
                        BIT10=  2000
                        BIT09=  1000
                        BIT08=  400
                        BIT07=  200
                        BIT06=  100
                        BIT05=  40
                        BIT04=  20
                        BIT03=  10
                        BIT02=  4
                        BIT01=  2
                        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
```

```
                        KWLVEC=100              ;KW11L CLOCK VECTOR

                        .EQUIV  BIT15,ERR
                        .EQUIV  BIT14,HE
                        .EQUIV  BIT13,SCP


                        .EQUIV  BIT12,DPL
                        .EQUIV  BIT10,DRU
                        .EQUIV  BIT09,SIN
                        .EQUIV  BIT07,DRY
                        .EQUIV  BIT06,RWS
                        .EQUIV  BIT05,WPS


                        .EQUIV  BIT12,SKE
                        .EQUIV  BIT01,CSE
                        .EQUIV  BIT00,WCE

                        .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  003376          JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM

000210                          .=210                   ;RESTART ADDRESS, IF RESTART IS
000210  105237  001253          INCB    FRSTRT          ;DONE AT 210, THE BOUNDARY CONDITION
000214  000137  003376          JMP     @#START         ;TESTS (TST1-7) ARE SKIPPED. IF SW 4
                                                        ;IS SET THEN THE DISKS ARE NOT REWRITTEN
                                                        ;(WRDSK) WITH RANDOM PATTERNS. NORAMALLY
                                                        ;ALL THE DISKS PRESENT ARE COMPLETELY
                                                        ;WRITTEN WITH RANDOM PATTERNS, AT THE
                                                        ;BEGINING OF THE
                                                        ;EXERCISER PART OF THE PROGRAM.

                        .SBTTL  ACT11 HOOKS

                        ;;**************************************************************
                        ;HOOKS REQUIRED BY ACT11
000220                          $SVPC=.                 ;SAVE PC
000046                          .=46
000046  022656                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
000052                          .=52
000052  000000                  .WORD   0               ;;2)SET LOC.52 TO ZERO
000220                          .=$SVPC                 ;; RESTORE PC

                        ;KT11 REGISTER DEFINITIONS
                        .SBTTL  MEMORY MANAGEMENT DEFINITIONS
```

```
                        ;*KT11 VECTOR ADDRESS

000250                  MMVEC=  250

                        ;*KT11 STATUS REGISTER ADDRESSES

177572                  SR0=    177572
177574                  SR1=    177574
177576                  SR2=    177576
172516                  SR3=    172516

                        ;*KERNEL "I" PAGE DESCRIPTOR REGISTERS

172300                  KIPDR0= 172300
172302                  KIPDR1= 172302
172304                  KIPDR2= 172304
172306                  KIPDR3= 172306
172310                  KIPDR4= 172310
172312                  KIPDR5= 172312
172314                  KIPDR6= 172314
172316                  KIPDR7= 172316

                        ;*KERNEL "D" PAGE DESCRIPTOR REGISTERS

172320                  KDPDR0= 172320
172322                  KDPDR1= 172322
172324                  KDPDR2= 172324
172326                  KDPDR3= 172326
172330                  KDPDR4= 172330
172332                  KDPDR5= 172332
172334                  KDPDR6= 172334
172336                  KDPDR7= 172336

                        ;*KERNEL "I" PAGE ADDRESS REGISTERS

172340                  KIPAR0= 172340
172342                  KIPAR1= 172342
172344                  KIPAR2= 172344
172346                  KIPAR3= 172346
172350                  KIPAR4= 172350
172352                  KIPAR5= 172352
172354                  KIPAR6= 172354
172356                  KIPAR7= 172356

                        ;*KERNEL "D" PAGE ADDRESS REGISTERS

172360                  KDPAR0= 172360
172362                  KDPAR1= 172362
172364                  KDPAR2= 172364
172366                  KDPAR3= 172366
172370                  KDPAR4= 172370
172372                  KDPAR5= 172372
172374                  KDPAR6= 172374
172376                  KDPAR7= 172376
```

```
                                .SBTTL  COMMON TAGS

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

001100                                  .=1100
001100                  $CMTAG:                         ;;START OF COMMON TAGS
001100  000000          $PASS:  .WORD   0               ;;CONTAINS PASS COUNT
001102     000          $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
001103     000          $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
001104  000000          $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000          $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
001110  000000          $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000          $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
001114     000          $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
001115     001          $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
001116  000000          $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120  000000          $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
001122  000000          $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
001124  000000          $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
001126  000000          $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
001130  000000                  .WORD   0               ;;RESERVED--NOT TO BE USED
001132  000000                  .WORD   0
001134     000          $AUTOB: .BYTE   0               ;;AUTOMATIC MODE INDICATOR
001135     000          $INTAG: .BYTE   0               ;;INTERRUPT MODE INDICATOR
001136  000000                  .WORD   0
001140  177570          SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
001142  177570          DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
001144  177560          $TKS:   177560                  ;;TTY KBD STATUS
001146  177562          $TKB:   177562                  ;;TTY KBD BUFFER
001150  177564          $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
001152  177566          $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
001154     000          $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001155     002          $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001156     012          $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001157     000          $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001160  000000          $REGAD: .WORD   0               ;;CONTAINS THE ADDRESS FROM
                                                        ;;WHICH  ($REGO) WAS OBTAINED
001162  000000          $REGO:  .WORD   0               ;;CONTAINS (($REGAD)+0)
001164  000000          $REG1:  .WORD   0               ;;CONTAINS (($REGAD)+2)
001166  000000          $REG2:  .WORD   0               ;;CONTAINS (($REGAD)+4)
001170  000000          $REG3:  .WORD   0               ;;CONTAINS (($REGAD)+6)
001172  000000          $REG4:  .WORD   0               ;;CONTAINS (($REGAD)+10)
001174  000000          $REG5:  .WORD   0               ;;CONTAINS (($REGAD)+12)
001176  000000          $REG6:  .WORD   0               ;;CONTAINS (($REGAD)+14)
001200  000000          $REG7:  .WORD   0               ;;CONTAINS (($REGAD)+16)
001202  000000          $REG10: .WORD   0               ;;CONTAINS (($REGAD)+20)
001204  000000          $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
001206  177607  000377  $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
001212     077          $QUES:  .ASCII  /?/             ;;QUESTION MARK
001213     015          $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001214  000012          $LF:    .ASCIZ  <12>            ;;LINE FEED
                                ;;**********************************************************************
001216  177400          RKDS:   .WORD   177400
001220  177402          RKER:   .WORD   177402
```

```
                                RKCS:   .WORD   177404
                                RKWC:   .WORD   177406
                                RKBA:   .WORD   177410
                                RKDA:   .WORD   177412
                                RKDB:   .WORD   177416
                                KWLS:   .WORD   177546  ;STATUS REGISTER FOR KW11L

                                PCNTR:  .WORD   250.

                                RKVEC:  .WORD   220     ;NORMAL RK11 INTERRUPT VECTOR ADDRESS
                                RKSTAT: .WORD   222     ;PSW TO BE USED ON INTERRUPT

                                PPRLVL: .WORD   240     ;PROGRAM PRIORITY LEVEL=5. PRIORITY LEVEL
                                                        ;AT WHICH THE PROGRAM OPERATES CAN BE CHANGED
                                                        ;BY ALTERING THIS LOCATION.
                                KWPLVL: .WORD   340     ;PRIORITY LEVEL OF THE KW11L CLOCK SERVICE
                                                        ;ROUTINE.

                                SRDRV:  .WORD   177777  ;'SRDRV' CONTAINS THE DRIVE NO WHOOSE SERIAL
                                                        ;NO IS TO BE TYPED OUT WHEN AN ERROR OCCURS,
                                                        ;IF SW 1 IS SET. WHEN (SRDRV)=-1 SERIAL NO
                                                        ;IS NOT TYPPED OUT, BECAUSE THE ERROR WAS NOT
                                                        ;POSITIVELY ATTRIBUTABLE TO A SPECIFIC DRIVE.

                                FTITLE: .BYTE   0
                                FRSTRT: .BYTE   0       ;FLAG FOR RESTART AT 210
```

```
MAINDEC-11-DZRKH-F     MACY11 27.1006)  04-OCT-76  13:29  PAGE 8
DZRKHF.P11    22-SEP-76 08:57           COMMON TAGS                                                    SEQ 0021

                                        ;THIS TABLE CONTAINS (IN ASCENDING ORDER) THE DRIVE NUMBERS THAT ARE
                                        ;PRESENT. THUS IF 3 DRIVES 0,1,2 ARE PRESENT; PDR WILL CONTAIN PDR' WILL
                                        ;CONTAIN 1 AND PDR2 WILL CONTAIN 2.  THE UPPER BIT OF EACH 'PDR' BYTE IS SET IF THE
                                        ;CORRESPONDING DRIVE IS AN 'F' DRIVE.

001254  000010                          PDR:    .BLKB   10

001264  000000                          DR.PRS: .WORD   0       ;CONTAINS TOTAL NUMBER OF DRIVES PRESENT

                                        ;THE FOLLOWING LOCATIONS CONTAIN SERIAL NUMBERS CORRESPONDING TO EACH
                                        ;DRIVE. THE SERIAL NUMBERS ARE KEYED IN BY THE USER, WHEN THE PROGRAM
                                        ;IS STARTED WITH SWITCH 1 SET TO 1. THIS FEATURE IS NORMALLY USED IN
                                        ;PRODUCTION ENVIRONMENT.

001266  000010                          SRNO:   .BLKW   10      ;SERIAL NO'S FOR DRIVES 0-7


                                        ;THE FOLLOWING 8 KEYS ARE FOR THE 8 COMMANDS IN THE QUEUE, TO BE
                                        ;EXECUTED ON DIFFERENT DRIVES. EACH KEY IS ASSOCIATED WITH AN EXECUTABLE
                                        ;COMMAND ON THE RK11. VARIOUS BITS OF THE KEY DESCRIBE A COMMAND
                                        ;AS INDICATED BELOW

                                        ;<0-2>  DRIVE NUMBER ON WHICH THE COMMAND IS TO BE EXECUTED
                                        ;<4>    INDICATES THAT THE HEADS ARE BEING/OR HAVE BEEN
                                        ;       POSITIONED ON THE DRIVE
                                        ;<5>    INDICATES A 'WRT CHK' SHOULD BE DONE FOLLOWING THE 'WRITE'
                                        ;<6>    INDICATES A WRITE CHECK FUNCTION HAS BEEN INITIATED
                                        ;<7>    INDICATES THAT A FUNCTION IS IN PROGRESS (IT IS NOT SET
                                        ;       WHEN POSITIONING IS BEING DONE ON A DRIVE)
                                        ;<8-10> INDICATES THE POSITION OF THIS KEY IN THE 8-KEY TABLE
                                        ;       (POSITIONS BEING 0,1,2,3,4,5,6,7)
                                        ;<11>   INDICATES THAT FUNCTION CORRESPONDING TO THIS KEY HAS
                                        ;       BEEN ABORTED
                                        ;<12>   INDICATES HIGH PRIORITY FOR THE COMMAND (NORMALLY
                                        ;       SET AFTER AN ERROR OCCURED ON THE COMMAND)
                                        ;<14>   INDICATES THAT THE COMMAND CORRESPONDING TO THIS KEY HAS BEEN
                                        ;       ABORTED BECAUSE THE DRIVE WAS DESELECTED (DSELECT)
                                        ;<15>   INDICATES THAT THE COMMAND HAS BEEN COMPLETED
                                        ;       (ALSO SET WHEN COMMAND IS ABORTED AFTER RETRIES)


001306  000010                          KEY:    .BLKW   10      ;KEY FOR THE  COMMANDS IN QUEUE


                                        ;THE PARAMETERS TO BE USED FOR EACH COMMAND IN THE QUEUE
                                        ;ARE STORED IN A TABLE STARTING AT 'CMND'. BITS <8-10>
                                        ;OF THE COMMAND KEYS (KEY, KEY2, ---KEY8) ARE USED TO POINT
                                        ;TO THE RIGHT SET OF PARAMETERS.


                                        ;       WORD 1 CONTAINS RKDA TO BE USED
                                        ;       WORD 2 CONTAINS RKCS (FUNCTION BITS ONLY)
                                        ;       WORD 3 CONTAINS RKWC (WORD COUNT 2'S COMP)
                                        ;       WODR 4 CONTAINS RKBA
```

```
001326  000040          CMND:   .BLKW   40      ;STORAGE TABLE

                        ;THESE ARE BUSY FLAGS FOR THE DRIVES. IF A DRIVE IS BUSY PERFORMING
                        ;ANY FUNCTION (INCLUDING POSITIONING) THEN BIT 7 OF THE FLAG FOR THAT
                        ;DRIVE IS SET. BITS 0-3 CONTAIN THE OFFSET TO KEY # WHICH MADE THE DRIVE
                        ;BUSY. EX: DRIVE #3 WAS MADE TO DO A WRITE BY COMMAND
                        ;KEY5, HENCE 'BUSY3' WILL CONTAIN 210. NOTE THAT 10 IS THE
                        ;OFFSET FOR KEY5 (TAKING KEY AS BASE).  KEY #= OFFSET(0-3)/2 + 1

001426  000010          BUSY:   .BLKB   10      ;BUSY FLAGS FOR DRIVES 0-7


                        ;THESE FLAGS WHEN SET INDICATE THAT A DRIVE IS BEING
                        ;POSITIONED OR HAS ALREADY BEEN POSITIONED.

001436  000010          POS:    .BLKB   10      ;DRIVE 0 POSITIONED


                        ;RETRY COUNTS FOR A PARTICULAR FUNCTION ON A DRIVE THE FUNCTION IS ABORTED
                        ;ON A DRIVE WHEN THE RETRY COUNT REACHES 3.

001446  000010          RETRY:  .BLKB   10      ;DRIVES 0-7 RERTY COUNTS

001456  000000          WCFLG:  .WORD   0       ;IF BIT 15 IS SET WRITE CHK IS TO BE DONE
                                                ;FOLLOWING THE WRITE. BITS 0-3 CONTAIN THE
                                                ;OFFSET TO KEY# (FROM BASE=KEY)

001460  000000          QSCNT:  .WORD   0       ;THIS IS A COUNT FOR KEEPING TRACK OF THE TIME
                                                ;TAKEN BY ALL THE 8 COMMANDS IN THE QUEUE.
                                                ;IF THIS COUNTS DOWN TO 0 AN ERROR IS REPORTED

001462  000000          PRSFNC: .WORD   0       ;COTAINS INFO ABOUT THE PRESENT COMMAND
                                                ;BEING PERFORMED ON THE RK11
001464  000000          PSTFNC: .WORD   0       ;CONTAINS INFO ABOUT THE COMMAND PERFORMED
                                                ;BEFORE THE 'PRSCMND'


001466  000000          CICNT:  .WORD   0       ;THIS IS A COUNT-TIMER USED FOR KEEPING TRACK
001470  000000          CICNT1: .WORD   0       ;OF THE TIME TAKEN BY ANY FUNCTION TO BE
                                                ;COMPLETED. IF THE COUNT GOES TO 0 AN ERROR IS REPORTED.

001472  000000          TIMER:  .WORD   0
001474  000000          ERCODE: .WORD   0
001476  000000          DRVPTR: .WORD   0
001500  000000          DRVCNT: .WORD   0


001502  000000          QDRV:   .WORD   0       ;TEMPORARY REGISTERS USED BY 'GEN8RQ'
001504  000000          QCYL:   .WORD   0       ;ROUTINE TO STORE VARIOUS PARAMETERS
001506  000000          QSUR:   .WORD   0       ;OF A COMMAND AS THEY ARE GENERATED.
001510  000000          QSEC:   .WORD   0
001512  000000          QFNC:   .WORD   0
001514  000000          QBUSAD: .WORD   0
001516  000000          QWRCNT: .WORD   0
```

```
                                ;THIS TABLE CONTAINS VARIOUS MAPPING FACTORS TO BE USED
                                ;FOR GENERATING RANDOM PARAMETERS FROM RANDOM NUMBERS

001520  000000                  DRMAP:  .WORD   0       ;MAPPING FACTOR FOR GENERATING RANDOM DRIVE NUMBER
001522  000000                  CYLMAP: .WORD   0       ;MAPPING FACTOR FOR CYLINDER
001524  000000                  SECMAP: .WORD   0       ;MAPPING FACTOR FOR SECTOR
001526  000000                  FNMAP:  .WORD   0       ;MAPPING FACTOR FOR FUNCTION
001530  000000                  BAMAP:  .WORD   0       ;MAPPING FACTOR FOR BUS ADDRESS
001532  000000                  WCMAP:  .WORD   0       ;MAPPING FACTOR FOR WORD COUNT


                                ;THESE TWO FLAGS CORRESPOND TO THE 2 INTERRUPT HANDLERS (RK11) USED
                                ;IN THIS PROGRAM. WHEN THE INTERRUPT HANDLER IS ENTERED THE FLAG IS
                                ;CLEARED OR SET.

001534  000                     INTFLG: .BYTE   0       ;FOR 'INTHND ', CLEARED ON ENTERING HANDLER
001535  000                     INTIFL: .BYTE   0       ;FOR 'INTISK', SET ON ENTERING HANDLER

001536  000000                  SAVKEY: .WORD   0
001540  000000                  ECOUNT: .WORD   0

                                ;THIS TABLE CONTAINS COUNTS FOR THE NUMBER OF OF ERRORS OCCURING ON A
                                ;DRIVE (NOTE: ONLY THOSE ERRORS WHICH ARE POSITIVELY ATTRIBUTABLE TO A
                                ;SPECIFIC DRIVE). THE COUNT  KEPT ONLY IF SWITCH 2 IS SET, WHEN THE COUNT
                                ;REACHES THE MAXIMUM ALLOWABLE (USUALLY 3) THE DRIVE IS DROPPED FROM
                                ;TESTING AND IS TAKEN OUT OF THE DRIVE SELECTION TABLE.

001542  000010                  ERDRV:  .BLKB   10      ;COUNT FOR DRIVES 0-7

001552  000000                  KWHR:   .WORD   0       ;COUNTS HOURS (2'S COMPLEMENT)
001554  000000                  KWMIN:  .WORD   0       ;COUNTS MINUTES (2'S COMPLEMENT)
001556  000000                  KWSEC:  .WORD   0       ;COUNTS SECONDS (2'S COMPLEMENT)
001560  000000                  KWCOUNT: .WORD  0       ;COUNTS CPS FROM KW11L (2'S COMPLMNT)

                                ;THIS TABLE CONTAINS COUNTS FOR HARD ERRORS ON A PARTICULAR DRIVE.
                                ;EX HECN2 WILL CONTAIN THE TOTAL NUMBER OF HARD ERRORS THAT OCCURED ON
                                ;DRIVE 2

001562  000010                  HECN:   .BLKW   10      ;DRIVE 0-7 HARD ERROR COUNTS

                                ;THIS TABLE CONTAINS COUNTS FOR SEEK ERRORS
                                ;ON A PARTICULAR DRIVE.

001602  000010                  SKECN:  .BLKW   10      ;DRIVE 0-7 SEEK ERROR COUNTS


                                ;THIS TABLE CONTAINS COUNTS FOR SIN ERRORS ON A
                                ;PARTICULAR DRIVE

001622  000010                  SINCN:  .BLKB   10      ;DRIVE 0-7 SIN COUNTS

                                ;THIS TABLE CONTAINS COUNTS FOR WRITE CHECK ERRORS
                                ;THAT OCCURED ON A PARTICULAR DRIVE
```

```
000510  001632  000010                WCECN:  .BLKW   10      ;WCE COUNT FOR DRIVES 0-7
000511
000512
000513
000514                                ;THIS TABLE CONTAINS COUNTS FOR CHECK SUM ERROR THAT
000515                                ;OCCURED ON A PARTICULAR DRIVE
000516  001652  000010                CSECN:  .BLKW   10      ;CSE COUNT FOR DRIVES 0-7
000517
000518
000519                                ;THIS TABLE CONTAINS COUNT OF NUMBER OF FUNCTIONS
000520                                ;THAT WERE ABORTED ON A PARTICULAR DRIVE. A
000521                                ;FUNCTION IS ABORTED ONLY AFTER DOING RETRIES
000522  001672  000010                ABORT:  .BLKW   10      ;ABORT COUNT FOR DRIVES 0-7
000523
000524                                ;COUNTS FOR NUMBER OF DATA ERRORS THAT OCCURED ON INDIVIDUAL DRIVES.
000525
000526  001712  000010                DATER:  .BLKW   10      ;DRIVES 0-7
```

```
000000                  NWRTL:  .WORD   0       ;LO WORD: OF THE 2 WORD COUNT-GIVING TOTAL
000000                  NWRTH:  .WORD   0       ;HI WORD:# OF WORDS WRITTEN ON DRIVE 0
000016                          .BLKW   14.     ;FOR REST OF DRIVES 1-7

000000                  NRDL:   .WORD   0       ;LO WORD: 2 WORD COUNT GIVING TOTAL
000000                  NRDH:   .WORD   0       ;HI WORD: # OF WORDS READ ON DRIVE 0
000016                          .BLKW   14.     ;FOR DRIVES 1-7

001326                  PCMND:  .WORD   CMND    ;POINTERS TO PARAMETERS FOR COMMANDS IN QUEUE
001336                          .WORD   CMND+10 ;POINTER TO SECOND COMMAND
001346                          .WORD   CMND+20 ;POINTER TO THIRD COMMAND
001356                          .WORD   CMND+30 ;POINTER TO FOURTH COMMAND
001366                          .WORD   CMND+40 ;POINTER TO FIFTH COMMAND
001376                          .WORD   CMND+50 ;POINTER TO SIXTH COMMAND
001406                          .WORD   CMND+60 ;POINTER TO SEVENTH COMMAND
001416                          .WORD   CMND+70 ;POINTER TO EIGHTH COMMAND

000000                  BASEBA: .WORD   0       ;CONTAINS THE LOWEST BUS ADDRESS STARTING WHICH DATA TRANSFERS
                                                ;CAN BE DONE
000000                  MAXBA:  .WORD   0       ;CONTAINS THE HIGHEST BUS ADDRESS TO WHICH DATA TRANSFERS
                                                ;CAN BE DONE.
000000                  REPCNT:.WORD    0       ;CONTAINS THE REPETITION COUNT- THE NUMBER
                                                ;OF TIMES Q REQUESTS WILL BE GENERATED. WHEN THIS
                                                ;COUNT GOES TO 0. IT MEANS AN END OF PASS. HOWEVER
                                                ;NOTE THAT THERE IS NO TRUE END OF PASS, IN THIS KIND
                                                ;OF EXERCISER PROGRAM. THE EXERCISER RESUMES FROM
                                                ;THE POINT IT LEFT OFF, AFTER TYPING OUT THE END IF
                                                ;PASS MESSAGE.
000000                  XXDPMD: .WORD   0       ;LOW BYTE CONTAINS ADDRESS OF RK05 DRIVE
                                                ;WHICH PROGRAM WAS LOADED FROM; HIGH BYTE
                                                ;CONTAINS THE RK05 'XXDP' CODE.

                        ;ASCII MESSAGES

005015  045523  000105  MSG1:   .ASCIZ  <15><12>/SKE/
005015  041527  000105  MSG2:   .ASCIZ<15><12>/WCE/
005015  051503  000105  MSG3:   .ASCIZ<15><12>  /CSE/
005015  040510  042122  MSG4:   .ASCIZ  <15><12>/HARD EROR/
042440  047522  000122
047440  020116  047504  MSG5:   .ASCIZ/ ON DOING /
047111  020107     000
   127  044522  042524  MSG6:   .ASCIZ  /WRITE/
   000
   122  040505  000104  MSG7:   .ASCIZ  /READ/
051127  020124  044103  MSG8:   .ASCIZ  /WRT CHK/
000113
042122  041440  045510  MSG9:   .ASCIZ  /RD CHK/
   000
   015  040412  047502  MSG10:  .ASCIZ  <15><12>/ABORTED/<15><12>
052122  042105  005015
   000
   123  042505  000113  MSG11:  .ASCIZ  /SEEK/
005015  041520  000075  MSG12:  .ASCIZ  <15><12>/PC=/
044120  051531  041040  MSG13:  .ASCIZ  /PHYS BA=/
```

```
000222  036501  000000
000225  000015  047012  020117  MSG14:  .ASCIZ  <15><12>/NO DRVS PRSNT/
000232  051104  051526  050040
000240  051522  052116  000000
000245  000015  042012  053122  MSG15:  .ASCIZ  <15><12>/DRVE # DIDN'T INTERUPT AFTER /
000252  020105  020043  044524
000260  047104  052047  044440
000266  052116  051105  050125
000274  020124  043101  042524
000302  020122  000000
000305  000015  045412  054505  MSG16:  .ASCIZ  <15><12>/KEY-8   BUSY-7/
000312  034055  020040  041040
000320  051525  026531  000067
000326  051440  020122  047516  MSG17:  .ASCII  / SR NO/
000334  000072                  MSG18:  .ASCIZ  /:/
000336  005015  042040  047522  MSG19:  .ASCIZ  <15><12>/ DROPPED DRIVE # /
000344  050120  042105  042040
000352  044522  042526  021440
000360  000040
000362  005015  051104  053111  MSG20:  .ASCIZ  <15><12>/DRIVE/
000370  000105
000372  020054  000000          MSG24:  .ASCIZ  /, /
000375  000106  000000          MSG25:  .ASCIZ  /F/
000377  000015  042012  044522  MSG26:  .ASCIZ  <15><12>/DRIVE  WRDS WRITN  WRDS READ    CSE    WCE DATERR     HE  /
000404  042526  020040  051127
000412  051504  053440  044522
000420  047124  020040  051127
000426  051504  051040  040505
000434  020104  020040  041440
000442  042523  020040  020040
000450  041527  020105  040504
000456  042524  051122  020040
000464  020040  044040  020105
000472  000040
000474  005015  051104  053111  MSG26A: .ASCIZ  <15><12>/DRIVE     SKE  ABORT    SIN/
000502  020105  020040  020040
000510  045523  020105  040440
000516  047502  052122  020040
000524  020040  044523  000116
000532  005015  047125  041101  MSG27:  .ASCIZ  <15><12>/UNABLE TO CLEAR ERROR AFTER THREE TRIES/
000540  042514  052040  020117
000546  046103  040505  020122
000554  051105  047522  020122
000562  043101  042524  020122
000570  044124  042522  020105
000576  051124  042511  000123
000604  005015  051105  047522  MSG28:  .ASCIZ  <15><12>/ERROR CONDITION CLEARED ON RETRY # /
000612  020122  047503  042116
000620  052111  047511  020116
000626  046103  040505  042522
000634  020104  047117  051040
000642  052105  054522  021440
000650  000040
000652  005015  044524  042515  MSG29:  .ASCIZ  <15><12>/TIME /
000660  000040
```

```
   640  002662      040                 BLN%S3: .ASCII
   641  002666      040                 BLN%S2: .ASCII
   642  002664  000040                  BLN%S1: .ASCII
   643                                          .EVEN
```

```
                                .SBTTL  ERROR POINTER TABLE

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

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

002666                          $ERRTB:
                                ;*THERE ARE TWO CLASSES OF ERRORS:
                                ;*1. ERRORS IN EXERCISER PART OF THE PROGRAM - ERROR NUMBERS BELOW 100
                                ;*2. ERRORS IN THE NON-EXERCISER PART OF THE PROGRAM - ERROR NUMBERS EQUAL
                                ;*TO AND GREATER THAN 100.
                                ;*THE DOCUMENT CONTAINS MORE INFORMATION ON THESE.
                                ;*THE FOLLOWING ERRORS OCCUR IN THE EXERCISER PART OF THE PROGRAM.


                                ;ITEM   1

002666  027530                          EM1     ;ERROR ON WRITE
002670  031626                          DH1     ;PC     RKCS    RKER    RKDS    RKDA
002672  032320                          DT1     ;$ERRPC $REG0   $REG1   $REG2   $REG3
002674  000000                          0

                                ;ITEM   2

002676  027546                          EM2     ;ATTEMPT TO INITIATE FUNCTION ON 'BUSY' DRIVE
002700  031674                          DH2     ;PC     DRIVE
002702  032334                          DT2     ;$ERRPC $REG0
002704  000000                          0

                                ;ITEM   3

002706  027621                          EM3     ;CONTROL READY NOT SET
002710  031626                          DH1     ;PC     RKCS    RKER    RKDS    RKDA
002712  032320                          DT1     ;$ERRPC $REG0   $REG1   $REG2   $REG3
002714  000000                          0

                                ;ITEM   4

002716  027644                          EM4     ;R/W/S READY NOT SET
002720  031626                          DH1     ;PC     RKCS    RKER    RKDS    RKDA
002722  032320                          DT1     ;$ERRPC $REG0   $REG1   $REG2   $REG3
002724  000000                          0

                                ;ITEM   5

002726  027667                          EM5     ;CONTROL READY NOT SET AFTER FIRST INTERRUPT ON ISSUING SEEK
002730  031626                          DH1     ;PC     RKCS    RKER    RKDS    RKDA
002732  032320                          DT1     ;$ERRPC $REG0   $REG1   $REG2   $REG3
```

```
000700  002734  000000                    0
000701
000702
000703                              ;ITEM   6
000704
000705  002736  027754                    EM6     ;WRONG BITS IN RKCS, EXPECT SEEK
000706  002740  031626                    DH1     ;PC     RKCS    RKER    RKDS    RKDA
000707  002742  032320                    DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
000708  002744  000000                    0
000709
000710                              ;ITEM   7
000711
000712  002746  030013                    EM7     ;'BUSY' FLAG CLEAR ON INTERRUPTING DRIVE
000713  002750  031674                    DH2     ;PC     DRIVE
000714  002752  032334                    DT2     ;SERRPC $REG0
000715  002754  000000                    0
000716
000717                              ;ITEM   10
000718
000719  002756  030060                    EM10    ;'POSITIONING' FLAG FOR INTERRUPTING DRIVE CLEAR
000720  002760  031674                    DH2     ;PC     DRIVE
000721  002762  032334                    DT2     ;SERRPC $REG0
000722  002764  000000                    0
000723
000724                              ;ITEM   11
000725
000726  002766  030135                    EM11    ;'ERR'OR SET AFTER FIRST INTERRUPT ON ISSUING SEEK
000727  002770  031626                    DH1     ;PC     RKCS    RKER    RKDS    RKDA
000728  002772  032320                    DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
000729  002774  000000                    0
000730
000731                              ;ITEM   12
000732
000733  002776  030215                    EM12    ;SCP SET AFTER FIRST INTERRUPT ON ISSUING SEEK
000734  003000  031626                    DH1     ;PC     RKCS    RKER    RKDS    RKDA
000735  003002  032320                    DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
000736  003004  000000                    0
000737
000738                              ;ITEM   13
000739
000740  003006  030267                    EM13    ;CONTROL READY NOT SET AFTER SEEK DONE INTERRUPT
000741  003010  031626                    DH1     ;PC     RKCS    RKER    RKDS    RKDA
000742  003012  032320                    DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
000743  003014  000000                    0
000744
000745                              ;ITEM   14
000746
000747  003016  030342                    EM14    ;INTERRUPTING DRIVE (SEEK DONE) WAS NOT 'BUSY'
000748  003020  031626                    DH1     ;PC     RKCS    RKER    RKDS    RKDA
000749  003022  032320                    DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
000750  003024  000000                    0
000751
000752                              ;ITEM   15
000753
000754  003026  030415                    EM15    ;R/W/S READY NOT SET FOR INTERRUPTING DRIVE (SEEK DONE)
000755  003030  031626                    DH1     ;PC     RKCS    RKER    RKDS    RKDA
```

```
                                        DT1     ;$ERRPC $REG0   $REG1   $REG2   $REG3
                                        0

                        ;ITEM   16

                                        EM16    ;'SIN' ERROR
                                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
                                        DT1     ;$ERRPC $REG0   $REG1   $REG2   $REG3
                                        0

                        ;ITEM   17

                                        EM17    ;'ERR'OR ON DOING SEEK
                                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
                                        DT1     ;$ERRPC $REG0   $REG1   $REG2   $REG3
                                        0

                        ;ITEM   20

                                        EM20    ;SCP DID NOT SET AFTER SEEK WAS DONE
                                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
                                        DT1     ;$ERRPC $REG0   $REG1   $REG2   $REG3
                                        0

                        ;ITEM   21

                                        EM21    ;SOFT ERROR
                                        DH21    ;$ERRPC RKCS    RKER    RKDS    RKDA:   DRV#
                                                ;CYL    SUR     SEC
                                        DT21    ;$ERRPC $REG0   $REG1   $REG2           $REG3
                                                ;$REG4  $REG5   $REG6
                                        0

                        ;ITEM   22

                                        0
                                        DH21    ;$ERRPC RKCS    RKER    RKDS    RKDA:   DRV#
                                                ;CYL    SUR     SEC
                                        DT21    ;$ERRPC $REG0   $REG1   $REG2           $REG3
                                                ;$REG4  $REG5   $REG6
                                        0

                        ;ITEM   23

                                        EM23    ;DATA (COMPARISON) ERROR
                                        DH23    ;PC     RKBA    EXPCT   RECVD   RKDA
                                        DT1     ;$ERRPC $REG0   $REG1   $REG2   $REG3
                                        0

                        ;ITEM   24

                                        EM24    ;CONTROL READY CLEAR ON  INTERRUPT AFTER Rk FUNCTION
                                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
                                        DT1     ;$ERRPC $REG0   $REG1   $REG2   $REG3
                                        0
```

```
                                ;ITEM   25
                                
003126  000000                        0
003130  032353                        DH25    ;PC     RKCS    RKER    RKDS    RKDA    DRIVE #
003132  032364                        DT25    ;SERRPC $REG0   $REG1   $REG2   $REG3   $REG4
003134  000000                        0

                                ;ITEM   26

003136  030721                        EM26    ;STUCK IN LOOP, 8 Q-COMMANDS SHOULD BE DONE BY NOW
003140  031626                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
003142  032320                        DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
003144  000000                        0

                                ;ITEM   27

003146  030774                        EM27    ;ATTEMPT TO DO WRITE CHECK BEFORE WRITE
003150  032130                        DH27    ;PC     KEY     FUNCTION CODE
003152  032402                        DT103   ;PC     $REG0   $REG1
003154  000000                        0

                                ;ITEM   30

003156  031035                        EM30    ;ATTEMPT TO REEXECUTE A COMMAND IN PROGRESS OR ALREADY FINISHED
003160  032211                        DH30    ;PC     KEY
003162  032334                        DT2     ;SERRPC $REG0
003164  000000                        0

                                ;ITEM   31

003166  031130                        EM31    ;'FUNCTION IN PROGRESS' FLAG FOR INTERRUPTING DRIVE IS NOT SET
003170  031674                        DH2     ;PC     DRIVE
003172  032334                        DT2     ;SERRPC $REG0
003174  000000                        0

                                ;ITEM   32

003176  031221                        EM32    ;UNEXPECTED DRIVE INTERRUPTED
003200  032163                        DH103   ;PC     EXPCT   RECVD
003202  032402                        DT103   ;SERRPC $REG0   $REG1
003204  000000                        0

                                ;ITEM   33

003206  031253                        EM33    ;WRONG FUNCTION CODE IN RKCS AFTER INTERRUPT
003210  032163                        DH103   ;PC     EXPCT   RECVD
003212  032402                        DT103   ;SERRPC $REG0   $REG1
003214  000000                        0

                                ;ITEM   34

003216  031330                        EM34    ;DRIVE READY CLEAR
003220  031626                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
003222  032320                        DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
003224  000000                        0
```

```
                                ;ITEM   35
                                
003226  031347                        EM35    ;DRIVE POWER LOW
003230  031626                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
003232  032320                        DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
003234  000000                        0

                                ;ITEM   36

003236  031365                        EM36    ;DRIVE UNSAFE
003240  031626                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
003242  032320                        DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
003244  000000                        0

                                ;ITEM   37

003246  031401                        EM37    ;WPS SET
003250  031626                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
003252  032320                        DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
003254  000000                        0

                                ;*
                                ;*THE FOLLOWING ERRORS OCCUR IN THE NON-EXERCISER PART OF THE PROGRAM.
                                ;*

                                ;ITEM   100

003256  030616                        EM23    ;DATA (COMPARISON) ERROR
003260  032006                        DH23    ;PC     RKBA    EXPCT   RECVD   RKDA
003262  032320                        DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
003264  000000                        0

                                ;ITEM   101

003266  031411                        EM101   ;INTERRUPT DID NOT OCCUR AFTER WRITE
003270  031626                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
003272  032320                        DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
003274  000000                        0

                                ;ITEM   102

003276  031451                        EM102   ;'ERR'OR SET
003300  031626                        DH1     ;PC     RKCS    RKER    RKDS    RKDA
003302  032320                        DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
003304  000000                        0

                                ;ITEM   103

003306  031465                        EM103   ;RKDA   INCREMENTED WRONGLY
003310  032163                        DH103   ;PC     EXPCT   RECVD
003312  032402                        DT103   ;SERRPC $REG0   $REG1
003314  000000                        0

                                ;ITEM   104

003316  031513                        EM104   ;RKBA INCREMENTED WRONGLY
```

```
003320  032163                  DH103   ;PC     EXPCT   RECVD
003322  032402                  DT103   ;SERRPC $REG0   $REG1
003324  000000                  0

                        ;ITEM   105

003326  031541                  EM105   ;RKWC DID NOT OVERFLOW TO 0
003330  032225                  DH105   ;PC     RKDA    RKWC
003332  032402                  DT103   ;SERRPC $REG0   $REG1
003334  000000                  0

                        ;ITEM   106

003336  031571                  EM106   ;MEX BITS INCORRECT
003340  031626                  DH1     ;PC     RKCS    RKER    RKDS    RKDA
003342  032320                  DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
003344  000000                  0

                        ;ITEM   107

003346  030616                  EM23    ;DATA (COMPARISON) ERROR ON READ
003350  032163                  DH103   ;PC     EXPCT   RECVD
003352  032402                  DT103   ;SERRPC $REG0   $REG1
003354  000000                  0

                        ;ITEM   110

003356  031610                  EM110   ;WRITE CHECK ERROR
003360  032252                  DH110   ;PC     RKCS    RKER    RKBA    RKDA
003362  032320                  DT1     ;SERRPC $REG0   $REG1   $REG2   $REG3
003364  000000                  0
```

```
                                        ;IF POWER FAILED, ON RETURN OF POWER ENTER HERE.
                                        
003366  004737  022536          PFSTRT: JSR     PC,WAITIME      ;WAIT SOME TIME
003372  105237  001253                  INCB    FRSTRT          ;INDICATE THAT THE STATISTICS HAVE
                                                                ;TO BE SAVED, ON RETRN FROM PWR FAIL.
                                        
                                        
                                        
                                        
003376  000005                  START:  RESET                   ;CLEAR THE BUS
                                .SBTTL  INITIALIZE THE COMMON TAGS
                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
003400  012706  OC.100                   MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
003404  005026                          CLR     (R6)+           ;;CLEAR MEMORY LOCATION
003406  022706  001140                  CMP     #SWR,R6 ;;DONE?
003412  001374                          BNE     .-6             ;;LOOP BACK IF NO
003414  012706  001100                  MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                ;;INITIALIZE A FEW VECTORS
003420  012737  027102  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
003426  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
003434  012737  027246  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
003442  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
003450  012737  027346  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
003456  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
003464  012737  003464  001106          MOV     #..,$LPADR      ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
003472  012737  003472  001110          MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
                                ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
003500  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
003504  012737  003540  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
003512  012737  177570  001140          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
003520  012737  177570  001142          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
003526  022777  177777  175404          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
003534  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                ;;AND  THE HARDWARE SWR IS NOT = -1
003536  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
003540  012716  003546          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
003544  000002                          RTI
003546  012737  000176  001140  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
003554  012737  000174  001142          MOV     #DISPREG,DISPLAY
003562  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
                                
                                .SBTTL  TYPE PROGRAM NAME
                                ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
003566  005227  177777                  INC     #-1             ;;FIRST TIME?
003572  001052                          BNE     67$             ;;BRANCH IF NO
003574  104401  003632                  TYPE    ,68$            ;;TYPE ASCIZ STRING
                                .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
003600  005737  000042                  TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
003604  001006                          BNE     67$             ;;BRANCH IF YES
003606  023727  001140  000176          CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
003614  001005                          BNE     70$             ;;BRANCH IF NO
003616  104406                          GTSWR                   ;;GET SOFT-SWR SETTINGS
003620  000403                          BR      70$
003622  112737  000001  001134  69$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
003630                          70$:
```

```
                        BR      67$             ;;GET OVER THE ASCIZ
;;68$:                  .ASCIZ  <CRLF>*RK11/RK05 PERFORMANCE EXERCISER*<15><12>*MAINDEC-11-DZRKH-F*<CRLF
67$:
                        MOV     #$ERROR,@#EMTVEC        ;EMT VECTOR FOR ERROR ROUTINE
                        MOV     PPRLVL,@#EMTVEC+2       ;LEVEL 5
                        MOV     #KWSRVE,@#KWLVEC        ;KW11L CLOCK SERVICE
                        MOV     KWPLVL,@#KWLVEC+2       ;LEVEL 7

;THE FOLLOWING CODE FINDS OUT THE PROGRAM CONTROL MODE:
;PAPER TAPE (MANUAL), ACT11, RKDP CHAIN OR DUMP


                        CLR     XXDPMD          ;CLEAR 'XXDP' LOAD DEVICE STORAGE
                        CMPB    #2,41           ;LOADED FROM AN RK05 ?
                        BNE     ST2             ;BR IF NOT
                        MOV     40,XXDPMD       ;GET DEVICE INDICATOR AND DRIVE ADDRESS OF
                                                ;LOADING RK05
                        CMPB    #10,XXDPMD      ;VALID DRIVE ADDRESS ?
                        BHI     2$              ;BR IF YES
                        CLRB    XXDPMD          ;CHANGE TO DRIVE ZERO
2$:                     TST     42              ;CHAIN MODE OR ACT11 AUTO ACCEPT ?
                        BEQ     3$              ;BR IF NEITHER
                        TYPE    ,72$            ;;TYPE ASCIZ STRING
                        BR      71$             ;;GET OVER THE ASCIZ
;;72$:                  .ASCIZ  <15><12>/NOT TESTING DRIVE /
71$:
                        CLR     -(SP)           ;CLEAR WORD ON STACK
                        MOVB    XXDPMD,(SP)     ;GET DRIVE ADDRESS
                        TYPOS                   ;TYPE THE ADDRESS
                        .BYTE   1               ;ONLY 1 CHARACTER
                        .BYTE   0               ;SUPRESS LEADING ZEROS
                        BR      ST2             ;GET NUMBER OF DRIVES
3$:                     INC     #-1             ;FIRST TIME THROUGH HERE ?
                        BNE     ST2             ;BR IF NOT
                        TYPE    ,74$            ;;TYPE ASCIZ STRING
                        BR      73$             ;;GET OVER THE ASCIZ
;;74$:                  .ASCIZ  <15><12>/TO TEST DRIVE /
73$:
                        CLR     -(SP)           ;CLEAR WORD ON THE STACK
                        MOVB    XXDPMD,(SP)     ;GET DRIVE ADDRESS
                        TYPOS                   ;TYPE THE DRIVE ADDRESS
                        .BYTE   1               ;ONLY 1 CHARACTER
                        .BYTE   0               ;SUPRESS LEADING ZEROS
                        TYPE    ,76$            ;;TYPE ASCIZ STRING
                        BR      75$             ;;GET OVER THE ASCIZ
;;76$:                  .ASCIZ  / HALT PROGRAM, REMOVE RKDP PACK AND REPLACE IT/<15><12>
75$:
                        TYPE    ,78$            ;;TYPE ASCIZ STRING
                        BR      77$             ;;GET OVER THE ASCIZ
;;78$:                  .ASCIZ  /WITH A WORK PACK, CLEAR LOCATION 4O, AND RESTART PROGRAM/
77$:


ST2:                    CON.RESET
                        CLR     DRVPRS          ;FIND WHICH DRIVE #'S ARE PRESENT
```

```
1067  004332  005000                        CLR     R0
1068  004334  005002                        CLR     R2
1069  004336  005037  001254                CLR     PDR             ;CLEAR DRIVES PRESENT TABLE
1070  004342  005037  001256                CLR     PDR+2
1071  004346  005037  001260                CLR     PDR+4
1072  004352  005037  001262                CLR     PDR+6
1073  004356  012701  001254                MOV     #PDR,R1
1074  004362  012703  001306                MOV     #KEY,R3
1075  004366  010277  174636        1$:     MOV     R2,@RKDA        ;SELECT A DRIVE
1076  004372  032777  000200  174616        BIT     #200,@RKDS      ;IS IT IN SYSTEM?
1077  004400  001415                        BEQ     3$              ;NO
1078  004402  010237  001502                MOV     R2,QDRV         ;LOAD DRIVE ADDRESS INTO QDRV
1079  004406  104420                        DRV.RESET               ;RESET THE DRIVE
1080  004410  005737  002060                TST     XXDPMD          ;PROGRAM LOADED FROM AN RK05 ?
1081  004414  001403                        BEQ     2$              ;BR IF NOT
1082  004416  120037  002060                CMPB    R0,XXDPMD       ;LOADED FROM THIS RK05 ?
1083  004422  001404                        BEQ     3$              ;BR IF YES
1084  004424  110021                2$:     MOVB    R0,(R1)+        ;STORE THE DRIVE NUMBER
1085  004426  010223                        MOV     R2,(R3)+        ;STORE ADDRESS IN KEY TABLE
1086  004430  005237  001264                INC     DRVPRS          ;BUMP THE NUMBER OF DRIVES COUNTER
1087  004434  062702  020000        3$:     ADD     #20000,R2       ;NEXT DRIVE ADDRESS
1088  004440  005200                        INC     R0              ;NEXT DRIVE NUMBER
1089  004442  022700  000010                CMP     #8.,R0          ;DONE ALL DRIVES???
1090  004446  001347                        BNE     1$              ;LOOP TILL DONE
1091  004450  013703  001264                MOV     DRVPRS,R3       ;FIND WHICH DRIVES ARE TYPE F
1092  004454  001510                        BEQ     ST4             ;BR IF NOT DRIVES PRESENT
1093  004456  012701  001254                MOV     #PDR,R1
1094  004462  005000                        CLR     R0
1095  004464  005002                        CLR     R2
1096  004466  104401  002362                TYPE    ,MSG20
1097  004472  111102        4$:     MOVB    (R1),R2         ;GET DRIVE NUMBER
1098  004474  010200                        MOV     R2,R0
1099  004476  002472                        BLT     9$
1100
1101  004500  104401  002372                TYPE    .MSG24
1102
1103  004504  010246                        MOV     R2,-(SP)        ;TYPE THE DRIVE NUMBER
1104  004506  104403                        TYPOS
1105  004510     001                        .BYTE   1
1106  004511     000                        .BYTE   0
1107  004512  000241                        CLC                     ;MOVE DRIVE NUMBER TO BITS 15,14,13
1108  004514  006002                        ROR     R2              ;BIT0 TO CARRY
1109  004516  006002                        ROR     R2              ;BIT0 TO BIT15
1110  004520  006002                        ROR     R2              ;BIT0 TO BIT14
1111  004522  006002                        ROR     R2              ;BIT0 TO BIT13
1112  004524  042702  017777                BIC     #17777,R2       ;CLEAR ANY EXTRANEOUS BITS
1113
1114  004530  010237  001502                MOV     R2,QDRV
1115  004534  104420                        DRV.RESET               ;RESET THE DRIVE VIA QDRV
1116
1117  004536  032702  020000                BIT     #20000,R2       ;EVEN DRIVE NUMBER???
1118  004542  001003                        BNE     5$              ;NO - CLEAR BIT
1119
1120  004544  052702  020000                BIS     #20000,R2       ;MAKE IT AN ODD DRIVE
1121  004550  000402                        BR      6$
1122
```

```
1123  004552  042702  020000          5$:     BIC     #20000,R2       ;MAKE IT AN EVEN DRIVE
1124
1125  004556  010277  174446          6$:     MOV     R2,@RKDA        ;SELECT THE NEW DRIVE
1126  004562  032777  000200  174426          BIT     #200,@RKDS      ;MAKE SURE DRIVE IS IN SYSTEM
1127  004570  001420                          BEQ     8$              ;IF NOT, SKIP THIS TEST
1128
1129  004572  012777  000011  174422          MOV     #11,@RKCS       ;START A SEEK TO CYL 3
1130  004600  104417                          CON.RDY                 ;WAIT FOR CONTROLLER
1131  004602  032777  000100  174406          BIT     #100,@RKDS      ;IS IT IN MOTION???
1132  004610  001010                          BNE     8$              ;NO - J TYPE DRIVE
1133
1134  004612  152711  000200                  BISB    #200,(R1)       ;YES - SET THE F TYPE BIT
1135  004616  104401  002375                  TYPE    .MSG25
1136
1137  004622  032777  000100  174366  7$:     BIT     #100,@RKDS      ;WAIT FOR HEADS TO STOP
1138  004630  001774                          BEQ     7$
1139
1140  004632  105737  001253          8$:     TSTB    FRSTRT
1141  004636  001012                          BNE     9$
1142
1143  004640  032777  000002  174272          BIT     #SW1,@SWR       ;SERIAL NO. SW SET?
1144  004646  001406                          BEQ     9$              ;NO
1145
1146  004650  104401  002326                  TYPE    .MSG17          ;TYPE "SR  NO"
1147  004654  104413                          RODEC                   ;READ FROM TTY INPUT
1148  004656  006300                          ASL     R0              ;SAVE SERIAL NO FOR THE DRIVE
1149  004660  012660  001266                  MOV     (SP)+,SRNO(R0)
1150
1151  004664  005201          9$:     INC     R1
1152  004666  005303                  DEC     R3
1153  004670  003300                  BGT     4$
1154  004672  104401  001213                  TYPE    .$CRLF
```

```
                                        ;'MAXBA' IS THE HIGHEST BUS ADDRESS (MEMORY) TO WHICH DATA TRANSFERS CAN
                                        ;BE DONE BY THE PROGRAM.
                                        ;'MAXBA' IS FIGURED USING THE FOLLOWING ALGORITHM:

                                        ;1.  IF KT11 IS NOT PRESENT,
                                        ;A.  AND THE PROGRAM IS RUN UNDER XXDP, THEN THE TOP 1.5 K IS RESERVED
                                        ;AND THE  'MAXBA' IS COMPUTED ($LSTAD-6000).
                                        ;B.  AND THE PROGRAM IS NOT RUNNING UNDER XXDP, THEN THE TOP 320 WORDS
                                        ;ARE RESERVED FOR 'MOM',LOADER,ETC. AND THE 'MAXBA' IS COMPUTED ($LSTAD-500).

                                        ;2. IF KT11 IS PRESENT,
                                        ;A.  AND MORE THAN 28K MEMORY IS PRESENT, THEN THE MAXIMUM BUS ADDRESS
                                        ;IS 147776 (OCTAL).
                                        ;B.  AND LESS THAN 28K IS PRESENT, THEN THE TOP 2K IS RESERVED FOR RKDP
                                        ;MONITOR AND 'MAXBA' IS COMPUTED.
                                        ;FIGURE OUT THE AVAILABLE MEMORY AND 'MAXBA'

004676  004737  017374          ST4:    JSR     PC,$SIZE        ;GO SIZE THE MEMORY
004702  012702  002052                  MOV     #BASEBA,R2      ;INITIALIZE POINTERS
004706  012703  002054                  MOV     #MAXBA,R3
004712  005737  017432                  TST     $KT11           ;KT11 AVAILABLE?
004716  100022                          BPL     4$              ;NO
004720  013700  017700                  MOV     $LSTBK,R0       ;GET THE LAST BANK OF MEMORY
004724  020027  001540                  CMP     R0,#1540        ;28K OR MORE?
004730  002012                          BGE     3$              ;YES

004732  162700  000040                  SUB     #40,R0          ;BACK UP 2 K'S (RKDP MONITOR, ETC.)
004736  012701  177772                  MOV     #-6,R1          ;AND FORM THE MAXIMUM BUS ADDRESS
                                                                ;FOR DATA TRANSFER
004742  006300                  1$:     ASL     R0
004744  005201                          INC     R1
004746  001375                          BNE     1$
004750  162700  000002                  SUB     #2,R0
004754  000415                  2$:     BR      6$

004756  012713  147776          3$:     MOV     #147776,(R3)    ;FOR 28K OR MORE, THIS IS THE 'MAXBA'
004762  000413                          BR      7$

004764  013700  017676          4$:     MOV     $LSTAD,R0       ;KT11 NOT PRESENT, GET THE LAST
                                                                ;AVAILABLE ADDRESS

004770  005737  000040          5$:     TST     @#40            ;'XXDP' LOADED PROGRAM ?
004774  001003                          BNE     8$              ;YES
004776  162700  000500                  SUB     #500,R0         ;NO, SAVE THE LAST 320 WORDS
005002  000402                          BR      6$
005004  162700  006000          8$:     SUB     #6000,R0        ;SAVE THE LAST 1.5K OF MEMORY (RKDP
                                                                ;MONITOR, ETC.)
005010  010013                  6$:     MOV     R0,(R3)         ;SAVE THE MAXIMUM BUS ADDRESS(MAXBA) TO
                                                                ;WHICH DATA TRANSFER CAN BE DONE SAFELY
005012  012712  032412          7$:     MOV     #PGEND,(R2)     ;'BASEBA'
005016  032777  000100  174114          BIT     #SW06,@SWR
005024  001510                          BEQ     ST3
005026  104401  005034                  TYPE    ,65$            ;;TYPE ASCIZ STRING
005032  000432                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12>/TYPE OCTAL BUS ADDRESSES FOR DATA XFER, BETWEEN /
005120                          64$:
```

```
1211  005120  011246                          MOV     (R2),-(SP)      ;'BASEBA'
1212  005122  104402                          TYPOC
1213  005124  104401  005132                  TYPE    ,67$            ;;TYPE ASCIZ STRING
1214  005130  000402                          BR      66$             ;;GET OVER THE ASCIZ
1215                                  ;;67$:  .ASCIZ  / 8 /
1216  005136                          66$:
1217  005136  011346                          MOV     (R3),-(SP)      ;'MAXBA'
1218  005140  104402                          TYPOC
1219  005142                          9$:
1220  005142  104401  005150                  TYPE    ,69$            ;;TYPE ASCIZ STRING
1221  005146  000407                          BR      68$             ;;GET OVER THE ASCIZ
1222                                  ;;69$:  .ASCIZ  <15><12>/LO LIMIT? /
1223  005166                          68$:
1224  005166  104412                          RDOCT
1225  005170  012600                          MOV     (SP)+,R0
1226  005172  020012                          CMP     R0,(R2)         ;CORRECT LO LIMIT?
1227  005174  103762                          BLO     9$
1228  005176  020013                          CMP     R0,(R3)         ;CORRECT LO LIMIT?
1229  005200  103360                          BHIS    9$
1230  005202  010012                          MOV     R0,(R2)         ;'BASEBA'
1231  005204                          10$:
1232  005204  104401  005212                  TYPE    ,71$            ;;TYPE ASCIZ STRING
1233  005210  000407                          BR      70$             ;;GET OVER THE ASCIZ
1234                                  ;;71$:  .ASCIZ  <15><12>/HI LIMIT? /
1235  005230                          70$:
1236  005230  104412                          RDOCT
1237  005232  012600                          MOV     (SP)+,R0
1238  005234  020013                          CMP     R0,(R3)         ;CORRECT HI LIMIT?
1239  005236  101362                          BHI     10$
1240  005240  020012                          CMP     R0,(R2)         ;CORRECT LO LIMIT?
1241  005242  101760                          BLOS    10$
1242  005244  010013                          MOV     R0,(R3)         ;'MAXBA'
1243
1244  005246  023727  002054  037476  ST3:   CMP     MAXBA,#37476    ;8K MEMORY - CLOBBER XXDPT
1245  005254  002003                          BGE     1$
1246  005256  012737  037476  002054          MOV     #37476,MAXBA    ;BUT SAVE LOADER
1247  005264  105737  001253          1$:     TSTB    FRSTRT          ;PROGRAM RESTARTED AT 210?
1248  005270  001402                          BEQ     BCTST           ;NO
1249  005272  000137  007716                  JMP     EXRCSR          ;YES, SKIP TEST 1 TO 7
```

B04


```
                                        ;THIS IS THE BEGINING OF THE CONSTRAINED TESTS AIMED AT CHECKING THE
                                        ;DIFFERENT BOUNDARY CONDITIONS OF RK11/RK05

                                        ;FIND OUT THE DRIVE NUMBER TO BE TESTED.
005276  012737  001306  001476  BGTST:  MOV     #KEY.DRVPTR,    ;INITIALIZE PTR TO DRV#
005304  013737  001264  001500          MOV     DRVPRS,DRVCNT   ;NUMBER OF DRIVES PRESENT
005312  017737  174160  001502  NXTDRV: MOV     @DRVPTR,QDRV    ;SAVE DRIVE #(BITS 15-13)
005320  062737  000002  001476          ADD     #2.DRVPTR       ;INCRMENT PTR TO NXT DRV#
005326  005337  001500                  DEC     DRVCNT          ;DONE ALL DRIVES?
005332  100002                          BPL     TST1            ;NO, GO TEST THIS DRIVE
005334  000137  007716                  JMP     EXPCSR          ;ALL DONE, GO TO EXERCISER PART
```

```
                                ;;*****************************************************************
                                ;*TEST 1        PERFORM WRITE OF 401 WORDS (1 SECTOR + 1 WORDS
                                ;THIS TEST PERFORMS A WRITE OF 401 WORDS (1 SECTOR + 1WORD, AND
                                ;CHECKS IF RKDA,RKBA,RKWC INCREMENTED CORRECTLY.WRITING IS DONE
                                ;ON CYLINDER 0, SURFACE 0, SECTORS 0,1 AND 10,11. IT SHOULD BE
                                ;NOTED THAT THIS IS A BOUNDARY CONDITION TRANSFER. THE VALIDITY
                                ;OF THE TRANSFER IS CHECKED IN THE NEXT TEST.
                                ;DATA PATTERN WRITTEN IS 111111.
                                ;;*****************************************************************
005340  000004               T1:    SCOPE

005342  013701  001502               MOV     @DRV,R1         ;GET RKDA
005346  010102                       MOV     R1,R2           ;SAVE RKDA
005350  062702  000002               ADD     #2,R2           ;EXPCTD RKDA AFTER WRITE IS DONE

005354  012737  005362  001110       MOV     #1$,$LPERR      ;RETURN ADDRESS FOR LUPING

005362  104416               1$:     CON.RESET
005364  104420                       DRV.RESET
005366  104416                       CON.RESET               ;CLEAR MASK BITS IN POLLING LOGIC
005370  012737  111111  032412 2$:    MOV     #111111,@BUF    ;PATTERN TO BE WRITTEN
005376  012703  000401               MOV     #401,R3         ;WORD COUNT FOR WRITE
005402  004737  006230               JSR     PC,@DOWRITE     ;GO DO WRITE

005406  104101                       ERROR   101             ;INTERRUPT DID NOT OCCUR AFTER WRITE
005410  004737  020020               JSR     PC,CHKCS        ;CHECK ERROR BIT IN RKCS
005414  104102                       ERROR   102             ;ERROR BIT IN RKCS SET ON DOING WRITE
005416  004737  020034               JSR     PC,CHKDA        ;CHECK IF RKDA INCREMENTED RIGHT
005422  104103                       ERROR   103             ;RKDA DID NOT INCREMENT RIGHT AFTER
                                                             ;A WRITE OF 401 WORDS.
005424  004737  020136               JSR     PC,CHKWC        ;CHECK IF RKWC OVERFLOWED TO 0
005430  104105                       ERROR   105             ;RKWC DID NOT OVERFLOW TO 0 AFTER
                                                             ;A WRITE OF 401 WORDS.
005432  032701  000010               BIT     #10,R1          ;SECTORS 10,11 WRITTEN?
005436  001005                       BNE     TST2            ;YES
005440  062701  000012               ADD     #12,R1          ;RKDA TO BE USED NEXT (SEC 10)
005444  062702  000016               ADD     #16,R2          ;EXPCTD RKDA AFTER WRITE IS DONE
005450  000747                       BR      2$              ;GO WRITE SECS 10,11
```

```
                                ;;*****************************************************************
                                ;;TEST 2        READ & CHECK THAT 401 WORD WRITE WAS DONE CORRECTLY
                                ;THIS TEST PERFORMS A READ OF THE 401 WORDS WRITTEN IN THE
                                ;PREVIOUS TEST AND CHECKS THAT THEY WERE CORRECTLY READ.MOREOVER
                                ;IT CHECKS THAT ONLY ONE NON-ZERO WORD (401TH) WAS WRITTEN IN THE
                                ;SECOND SECTOR AND THE REST OF THE WORDS ARE ALL ZEROS.
                                ;;*****************************************************************
005452  000004                  TST2:   SCOPE

005454  013701  001502                  MOV     @DRV,R1         ;GET DRIVE #
005460  012737  005466  001110          MOV     #1$,$LPERR      ;ADDRESS FOR LUPING ON EROR
005466  104416                  1$:     CON.RESET
005470  104420                          DRV.RESET
005472  104416                          CON.RESET

                                                                ;CLEAN UP THE DATA BUFFER
005474  004737  006360                  JSR     PC,CLEANBUF     ;INTO WHICH READ WILL
                                                                ;BE DONE
005500  012703  001000                  MOV     #1000,R3        ;WORD COUNT

005504  004737  006350                  JSR     PC,DOREAD       ;GO DO A READ OF 2 SECTORS
                                                                ;FROM DISK ADDRESS GIVEN IN R1
005510  104101                          ERROR   101             ;INTERRUPT DID NOT OCCUR AFTER
                                                                ;READ OF 401 WORDS WAS DONE.
005512  004737  020020                  JSR     PC,CHKCS        ;CHECK IF EROR BIT IN RKCS SET?
005516  104102                          ERROR   102             ;EROR BIT IN RKCS SET ON DOING A
                                                                ;READ OF 401 WORDS.
005520  012704  032412                  MOV     #DBUF,R4        ;STARTING BUS ADDRESS, INTO WHICH READ
005524  010402                          MOV     R4,R2           ;WAS DONE
005526  004737  020056                  JSR     PC,CHKBA        ;CHECK IF RKBA INCREMENTED RIGHT
005532  104104                          ERROR   104             ;RKBA DID NOT INCREMENT RIGHT AFTER READ
                                                                ;OF 401 WORDS.
005534  012705  177764                  MOV     #-14,R5         ;ALLOW 12 ERRORS, AT THE MOST
005540  022712  111111          2$:     CMP     #111111,(R2     ;CORRECT DATA READ?
005544  001410                          BEQ     3$              ;YES
005546  012737  111111  001164          MOV     #111111,$REG1   ;GET EXPCTD DATA WORD
005554  004737  005644                  JSR     PC,ERINF1       ;GET ERROR INFORMATION
005560  104100                          ERROR   100             ;DATA ERROR OCCURRED WHEN A
                                                                ;READ OF 401 WORDS WAS DONE
                                                                ;THE DISK ADDRESS FROM WHERE
                                                                ;THE DATA WAS READ INCORRECTLY
                                                                ;IS GIVEN IN THE ERROR MESSAGE

005562  005205                          INC     R5              ;REPORT 12 ERORS AT MOST
005564  001421                          BEQ     6$
005566  005722                  3$:     TST     (R2)+           ;INCREMENT POINTER
005570  020227  033414                  CMP     R2,#DBUF+1002   ;CHECKED ALL 401 WORDS?
005574  001361                          BNE     2$

005576  005712                  4$:     TST     (R2)            ;CHECK THAT REST OF 377 WORDS
005600  001407                          BEQ     5$              ;ARE ALL 0'S
005602  005037  001164                  CLR     $REG1           ;GET EXPCTD DATA WORD (0)
005606  004737  005644                  JSR     PC,ERINF1       ;GET ERROR INFO
005612  104100                          ERROR   100             ;DATA ERROR.  IN A PREVIOUS
                                                                ;TEST A WRITE OF 401 WORDS
                                                                ;(1 SECTOR + 1 WORD) WAS DONE
```

```
                                                        ;NOW THESE 2 SECTORS WERE
                                                        ;READ IN THE SECOND SECTOR
                                                        ;THE FIRST WORD IS A NON-ZERO
                                                        ;WORD (WHICH WAS WRITTEN BEFORE)
                                                        ;THE REST OF 377 WORD
                                                        ;SHOULD BE ALL ZEROS, IF
                                                        ;THE WRITE WAS DONE CORRECTLY
                                                        ;(& READ IS DONE CORRECTLY)
005614  005205                    INC     R5              ;REPORT 12 ERORS AT MOST
005616  001404                    BEQ     6$
005620  005722              5$:   TST     (R2)+           ;ALL WORDS CHECKED?
005622  020227  034412            CMP     R2,#DBUF+2000
005626  001363                    BNE     4$              ;IF NOT GO BAK

005630  032701  000010      6$:   BIT     #10,R1          ;WERE SECTORS 10,11 READ
005634  001030                    BNE     TST3            ;YES
005636  062701  000012            ADD     #12,R1          ;FROM NEW RKDA, SEC 10
005642  000711                    BR      1$              ;GO BACK AND READ FROM SECS 10.11

                        ;ERINF1
                        ;AT THE TIME OF ENTRY:
                        ;R2 CONTAINS ERRORING BUS ADDRESS (WHERE DATA ERROR OCCURRED).
                        ;(R2) CONTAINS BAD DATA THAT WAS READ BACK FROM DISK.
                        ;R1 CONTAINS DISK ADDRESS WHERE READ BEGAN.

005644  010237  001162  ERINF1: MOV     R2,$REG0        ;GET BUS ADDRESS OF DATA ERROR
005650  011237  001166          MOV     (R2),$REG2      ;GET BAD DATA WORD (READ)
005654  010146                  MOV     R1,-(SP)
005656  020227  033410          CMP     R2,#DBUF+776    ;FIGURE OUT THE DISK ADDRESS
005662  003001                  BGT     1$              ;WHERE DATA ERROR OCCURRED
005664  005316                  DEC     (SP)
005666  005216            1$:   INC     (SP)
005670  032716  000010          BIT     #10,(SP)
005674  001405                  BEQ     2$
005676  032716  000004          BIT     #4,(SP)
005702  001402                  BEQ     2$
005704  062716  000004          ADD     #4,(SP)
005710  012637  001170      2$: MOV     (SP)+,$REG3
005714  000207                  RTS     PC
```

```
                                ;;*****************************************************************
                                ;*TEST 3         PERFORM WRITE OF 12 SECTORS + 1 WORD
                                ;THIS TEST CHECKS FOR ANOTHER BOUNDARY CONDITION.  IT
                                ;PERFORMS A WRITE OF 12 SECTORS + 1 WORD.  RKDA,RKBA,
                                ;RKWC ARE CHECKED TO SEE IF THEY ARE INCREMENTED CORRECTLY.
                                ;VALIDITY OF THE DATA WRITTEN IS CHECKED IN THE NEXT
                                ;TEST.  DATA IS WRITTEN ON SECTORS 0-11, SURFACE 0
                                ;CYLINDER 0 (6001TH WORD ON SECTOR 0, SURFACE 1, CYL 0).
                                ;ALSO ON SECTORS 0-11, SURFACE 1 (6001TH WORD ON SECTOR
                                ;0, CYL 1)
                                ;;*****************************************************************
005716  000004                T3:     SCOPE
005720  013701  001502                MOV     @DRV,R1         ;GET DRIVE #
005724  012737  005744  001110        MOV     #1$,$LPERR      ;LUP ON EROR TO '1$'
005732  010102                        MOV     R1,R2
005734  062702  000021                ADD     #21,R2
005740  012703  006001                MOV     #6001,R3
005744  104416                1$:     CON.RESET
005746  104420                        DRV.RESET
005750  104416                        CON.RESET

005752  012737  044444  032412        MOV     #44444,DBUF     ;PATTERN TO BE WRITTEN

005760  004737  006230                JSR     PC,DOWRITE      ;GO DO WRITE

005764  104101                        ERROR   101             ;INTERUPT DID NOT OCCUR ON
                                                                ;COMPLETION OF WRITE
005766  004737  020020                JSR     PC,CHKCS        ;CHECK IF EROR BIT IN RKCS SET
005772  104102                        ERROR   102             ;EROR BIT IN RKCS SET ON DOING WRITE
005774  004737  020034                JSR     PC,CHKDA        ;CHECK IF RKDA INCREMENTED RIGHT
006000  104103                        ERROR   103             ;RKDA DID NOT INCREMENT CORRECTLY
                                                                ;AFTER A WRITE OF 6001 (OCTAL) WORDS.
                                                                ;(12 SECTORS + 1)
006002  004737  020136                JSR     PC,CHKWC        ;CHECK IF RKWC OVERFLOWED TO 0
006006  104105                        ERROR   105             ;RKWC DID NOT OVERFLOW TO 0
006010  032701  000020                BIT     #20,R1          ;WRITTEN ON SURFACE 1?
006014  001006                        BNE     TST4            ;YES
006016  010201                        MOV     R2,R1
006020  062702  000020                ADD     #20,R2          ;SURFACE 1
006024  012703  005401                MOV     #5401,R3        ;WORD COUNT
006030  000745                        BR      1$              ;GO WRITE SURFACE 1
```

```
                                ;;*****************************************************************
                                ;*TEST 4         READ & CHECK THAT 6001 WORD WRITE WAS DONE CORRCTLY
                                ;THIS TEST CHECKS THAT THE 6001-WORD WRITE THAT WAS DONE IN THE
                                ;PREVIOUS TEST WAS CORRECT, ESPECIALLY THE LAST 401 WORDS. THE
                                ;FIRST WORD OF THE SECTOR( IN WHICH THE 6001TH WORD) IS WRITTEN
                                ;IS THE ONLY NON-ZERO WORD IN THAT SECTOR, THE REST 377 WORDS ARE
                                ;ALL ZEROS, IF THE WRITING WAS DONE CORRECTLY.
                                ;;*****************************************************************
006032  000004                TST4:   SCOPE
006034  013701  001502                MOV     @DRV,R1         ;GET DRIVE #
006040  062701  000013                ADD     #13,R1          ;DISK ADDRESS FROM WHERE READ IS DONE
006044  012737  006052  001110        MOV     #1$,$LPERR
006052  104416                1$:     CON.RESET
006054  104420                        DRV.RESET
006056  104416                        CON.RESET

006060  004737  006360                JSR     PC,CLEANBUF     ;CLEAN UP THE BUFFER INTO WHICH
                                                                ;READ WILL BE DONE
                                                                ;SET UP RKDA
                                                                ;SECTOR 11, SURFACE 0
006064  012703  001000                MOV     #1000,R3        ;WORD COUNT

006070  004737  006350                JSR     PC,DOREAD       ;GO READ 1000 WORDS (2 SECS)
006074  104101                        ERROR   101             ;INTERRUPT DID NOT OCCUR AFTER
                                                                ;COMPLETION OF READ
006076  004737  020020                JSR     PC,CHKCS        ;CHECK IF EROR BIT IN RKCS SET
006102  104102                        ERROR   102             ;EROR (RKCS) SET ON DOING READ
006104  012704  032412                MOV     #DBUF,R4        ;STARTING BA OF DATA BUFER
006110  010402                        MOV     R4,R2
006112  004737  020056                JSR     PC,CHKBA        ;RKBA INCREMENTED CORRECTLY?
006116  104104                        ERROR   104             ;RKBA DID NOT INCREMENT CORRECTLY
006120  012705  177764                MOV     #-14,R5
006124  022712  044444        2$:     CMP     #44444,(R2)     ;DATA WORD OK?
006130  001410                        BEQ     3$
006132  012737  044444  001164        MOV     #44444,$REG1    ;NO, GET EXPCTD DATA WORD
006140  004737  005644                JSR     PC,ERINF1       ;GET, OTHER ERROR INFO
006144  104100                        ERROR   100             ;DATA ERROR.  A WRITE OF 6001
                                                                ;WORDS (12 SECS + 1 WORD) WAS DONE
                                                                ;IN A PREVIOUS TEST.  THE LAST TWO
                                                                ;SECTORS (LAST 401 WORDS) WERE READ
                                                                ;BACK.  THIS ERROR INDICATES THAT
                                                                ;SEC #11 (LAST BUT ONE SECTOR) GAVE
                                                                ;BAD DATA WORDS
006146  005205                        INC     R5              ;REPORT 12 ERORS AT MOST
006150  001421                        BEQ     6$
006152  005722                3$:     TST     (R2)+           ;INCREMENT POINTER TO BA
006154  020227  033414                CMP     R2,#DBUF+1002   ;CHECKED 401 WORDS?
006160  001361                        BNE     2$
006162  005712                4$:     TST     (R2)            ;CHECK THAT THE REMAINING 377
006164  001407                        BEQ     5$              ;WORDS OF THE LAST SECTOR (SEC #0)
006166  005037  001164                CLR     $REG1           ;WERE READ BACK AS 0'S
006172  004737  005644                JSR     PC,ERINF1
006176  104100                        ERROR   100             ;DATA ERROR.  IF WRITE WAS DONE CORRECTLY
                                                                ;IN THE PREVIOUS TEST, THE LAST SECTOR
                                                                ;OF THE DATA BLOCK (12 SECS + 1 WORD)
                                                                ;SHOULD CONTAIN ONLY 1 (FIRST) WORD
```

```
1493                                                    ;AS NON-ZERO, THE REST 377 SHOULD BE
1494                                                    ;ALL 0'S.  THIS ERROR INDICATES THAT
1495                                                    ;THE SOME OF 377 WORDS
1496                                                    ;WERE NOT CORRECT
1497  006200  005205                    INC     R5     ;REPORT 12 ERORS AT MOST
1498  006202  001404                    BEQ     6$
1499  006204  005722            5$:     TST     (R2)+  ;INCREMENT POINTER
1500  006206  020227  034412           CMP     R2,#DBUF+2000  ;CHECKED ALL WORDS?
1501  006212  001363                    BNE     4$     ;NO
1502
1503  006214  032701  000020    6$:     BIT     #20,R1 ;DONE CHECKING FOR SURFACE 1?
1504  006220  001070                    BNE     TST5   ;YES
1505  006222  062701  000020           ADD     #20,R1 ;SO SET UP FOR SURFACE 1
1506  006226  000711                    BR      1$     ;GO BACK & READ SURFACE 1
```

```
                                        ;DOWRITE
                                        ;THIS ROUTINE PERFORMS A WRITE ON A DISK AT THE TIME OF ENTRY, R1 CONTAINS
                                        ;DISK ADDRESS (RKDA) WHERE WRITE IS TO BE DONE, R3 CONTAINS THE WORD COUN
                                        ;(RKWC), 'DBUF' CONTAINS THE DATA TO BE WRITTEN. NOTE IBA BIT IS SET.

                                        ;WRITE IS DONE IN INTERRUPT MODE. IF THE INTERRUPT DOES NOT OCCUR WITHIN
                                        ;A CERTAIN TIME, RETURN IS MADE TO THE ERROR MESSAGE FOLLOWING THE 'JSR'
                                        ;CALL. IF THE INTERRUPT OCCURS, RETURN ADDRESS IS ADJUSTED TO SKIP OVER
                                        ;THE ERROR MESSAGE.

006230  012777  004002  172764  DOWRITE: MOV     #4002,@RKCS     ;WRITE, IBA
006236  010177  172766          DOXFER: MOV     R1,@RKDA        ;ADDRESS THE DRIVE
006242  010377  172756                  MOV     R3,@RKWC        ;XFER THIS # OF WORDS
006246  005477  172752                  NEG     @RKWC
006252  012777  032412  172746          MOV     #DBUF,@RKBA     ;USE THIS BUS ADDRESS
006260  012777  006340  172752          MOV     #3$,@RKVEC      ;SET UP INTERRUPT VECTOR
006266  005046                          CLR     -(SP)           ;NEW PSW
006270  012746  006276                  MOV     #1$,-(SP)       ;SET NEW PC TO STACK **********
006274  000002                          RTI
006276  052777  000101  172716  1$:     BIS     #101,@RKCS      ;SET IDE, GO (WRITE,IBA, READ)
006304  005037  001466                  CLR     CICNT
006310  012737  177760  001470          MOV     #-20,CICNT1
006316  005237  001466          2$:     INC     CICNT           ;WAIT  FOR INTERRUPT
006322  001375                          BNE     .-4

006324  005237  001470                  INC     CICNT1
006330  001372                          BNE     2$

006332  004737  021740                  JSR     PC,GT4RG        ;TIMED OUT, INTERRUPT DID NOT OCCJR
006336  000207                          RTS     PC              ;RETURN TO THE EROR MEASGE

006340  022626          3$:     CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
006342  062716  000002          ADD     #2,(SP)         ;ADJUST RETURN ADDRESS TO SKIP OVER
006346  000207                  RTS     PC              ;EROR MESAGE ON RETURN
```

```
                                        ;THIS ROUTINE PERFORMS A READ ON THE DISK.AT THE TIME OF ENTRY R1 CONTAINS
                                        ;THE DISK ADDRESS FROM WHERE THE READ IS TO BE DONE. R2 CONTAINS THE WORD
                                        ;COUNT (RKWC). READ WILL BE DONE INTO DATA BUFFER AT 'DBUF'.

                                        ;READ IS DONE IN INTERRUPT MODE. IF THE INTERRUPT DOES NOT OCCUR WITHIN
                                        ;A CERTAIN TIME, RETURN IS MADE TO THE ERROR MESSAGE FOLLOWING THE 'JSR'
                                        ;CALL. IF THE INTERRUPT OCCURS AS EXPECTED, RETURN ADDRESS IS ADJUSTED
                                        ;TO SKIP OVER THE ERROR MESSAGE.

001550  006350  012777  000004  172644  DOREAD: MOV     #4,@RKCS        ;READ
001551  006356  000727                          BR      DOXFER
                                        ;CLEANBUF
                                        ;CLEANS OUT THE DATA BUFFER (ALL WORDS WRITTEN TO 177777) INTO WHICH THE
                                        ;READ FROM THE DISK WILL BE DONE.  DATA BUFFER STARTS AT 'DBUF'AND IS
                                        ;1000 (OCTAL) WORDS LONG.

001559  006360  012702  177000          CLEANBUF:MOV    #-1000,R2       ;SET COUNT
001560  006364  012705  032412                  MOV     #DBUF,R5        ;INITIALIZE BA
001561  006370  012725  022222          1$:     MOV     #22222,(R5)+
001562  006374  005202                          INC     R2              ;DONE ALL WORDS?
                                                                        ;BUFFER STARTING AT (PHYSICAL) BUS
                                                                        ;ADDRESS 177000 (177000-200776)
001565  006376  001374                          BNE     1$
001566  006400  000207                          RTS     PC              ;YES RETURN
```

```
1567                                    ;;*****************************************************************
1568                                    ;*TEST 5        CHECK DATA TRANSFER AROUND 32K BOUNDARY
1569                                            ;*THIS TEST PERFORMES A WRITE OF 2 SECTORS ON THE DISK FROM MEMORY
1570                                            ;*LOCATIONS AROUND THE 32K BOUNDARY.  SECTORS 0,1, CYL 0, SURFACE
1571                                            ;*0 ARE WRITTEN.  PHYSICAL BUS ADDRESSES FOR THE DATA BUFFER:
1572                                            ;* 177000 TO 200776 I.E. (32K-256) TO (32K+255)
1573
1574                                            ;*CHECKING IS DONE TO SEE IF MEX BITS, RKBA,RKDA,RKWC INCREMENTED
1575                                            ;*CORRECTLY.  THEN DATA BUFFER IS CLEARED OUT AND A READ IS DONE
1576                                            ;*INTO IT.  A CHECK IS MADE TO SEE IF THE CORRECT DATA WAS RECIEVED.
1577                                            ;*ONLY 12 DATA ERRORS ARE REPORTED.
1578                                    ;;*****************************************************************
1579  006402  000004                    TST5:   SCOPE
1580  006404  023727  017700  002000            CMP     $LSTBK,#2000    ;33K OR MORE OF MEMORY?
1581  006412  103002                            BHIS    1$              ;YES
1582  006414  000137  006764                    JMP     TST6            ;IF NOT, DONT DO THIS TEST
1583  006420  012737  001600  172352  1$:       MOV     #1600,@#KIPAR5  ;MAP 28-32K THRU PAR 5
1584  006426  012737  002000  172354            MOV     #2000,@#KIPAR6  ;MAP 32-36K THRU PAR 6
1585  006434  012737  000001  177572            MOV     #1,@#SR0        ;TURN ON MEMORY MANAGEMENT
1586
1587                                    ;SET UP DATA BUFFER (1000 OCTAL WORDS LONG) FOR WRITING TWO SECTORS
1588                                    ;ON THE DISK.  THE TRANSFER IS DONE AROUND THE 32K BOUNDARY FROM
1589                                    ;BUS ADDRESS (PHYSICAL) 177000 TO 200776, (32K-256) TO (32+256)
1590
1591                                    ;DATA IN THE BUFFER IS A COUNT PATTERN STARTING FROM 1 FOR THE FIRST
1592                                    ;WORD TO 1000 FOR THE LAST WORD.
1593                                    ;PHYSICAL BUFFER ADDRESS:  177000 TO  200776 (32K-256 TO 32K+256)
1594  006442  012737  006450  001110            MOV     #2$,$LPERR      ;LUP TO 2$ ON EROR (SW 9)
1595  006450  104416            2$:     CON.RESET
1596  006452  104420                    DRV.RESET
1597
1598  006454  012700  000001                    MOV     #1,R0           ;INITIALIZE DATA PATTERN TO BE
1599                                                                    ;WRITTEN
1600  006460  012701  137000                    MOV     #137000,R1      ;BA TO START PHYSICAL ADDRESS=177000
1601  006464  010021            3$:     MOV     R0,(R1)+        ;WRITE COUNT PATTERN (1-1000)
1602  006466  005200                    INC     R0              ;INTO DATA BUFFER (PHYS ADDRES
1603  006470  020027  001001                  CMP     R0,#1001        ;177000 TO 200776)
1604  006474  001373                    BNE     3$
1605  006476  013777  001502  172524          MOV     @DRV,@RKDA      ;SUR 0, SEC 0, CYL 0
1606  006504  012777  177000  172512          MOV     #-1000,@RKWC    ;WORD COUNT =2 SECS
1607  006512  012777  177000  172506          MOV     #177000,@RKBA   ;BUS ADDRESS.
1608  006520  012777  000003  172474          MOV     #3,@RKCS        ;WRITE,GO
1609  006526  104417                    CON.RDY                         ;WAIT FOR CNTROL RDY
1610
1611  006530  004737  020020                  JSR     PC,CHKCS        ;ANY EROR IN RKCS?
1612  006534  104102                    ERROR   102                     ;'ERR' SET IN RKCS, ON DOING A
1613                                                                    ;WRITE OF SECTORS (0,1) FROM
1614                                                                    ;(PHYSICAL) BUS ADDRESSS 177000
1615                                                                    ;(177000 TO 200776)
1616  006536  004737  020112                  JSR     PC,CHKMEX
1617                                                                    ;CHECK THAT RKBA OVERFLOWED INTO
1618                                                                    ;EXTENDED MEM. BIT (0) OF RKCS (BIT 4)
1619                                                                    ;EX MEM BIT 0 SET?
1620                                                                    ;GET RKCS,ER,DS,DA
1621  006542  104106                    ERROR   106                     ;MEX BITS INCORRECT, BIT 4 OF RKCS
1622                                                                    ;(MEX BIT 0) SHOULD HAVE SET
```

```
                                                        ;AFTER RKBA OVERFLOWED ON DOING
                                                        ;A TRANSFER OF 2 SECTORS FROM BUS
                                                        ;ADDRESS (PHYSICAL) STARTING AT 177000
006544  012703  001000          MOV     #1000,R3      ;WORD COUNT
006550  012704  177000          MOV     #177000,R4    ;STARTING BUS ADDRESS
006554  004737  020056          JSR     PC,CHKBA      ;CHECK IF RKBA INCREMENTED CORRECTLY
006560  104104                  ERROR   104           ;;RKBA DID NOT INCREMENT CORRECTLY
                                                        ;AFTER WRITE IF 2 SECTORS FROM A DATA
                                                        ;BUFFER STARTING AT (PHYSICAL) BUS
                                                        ;ADDRESS (177000-200776)
006562  013702  001502          MOV     @DRV,R2       ;GET EXPECTED
006566  062702  000002          ADD     #2,R2         ;DISK ADDRESS
006572  004737  020034          JSR     PC,CHKDA      ;CHECK IF RKDA INCREMENTED CORRECTLY
006576  104103                  ERROR   103           ;RKDA INCREMENTED WRONGLY AFTER
                                                        ;A WROTE OF 2 SECTOR (0,1) FROM
                                                        ;DATA BUFFER STARTING AT BUS
                                                        ;ADDRESS (PHYSICAL) 177000.

006600  004737  020136          JSR     PC,CHKWC      ;CHECK IF RKWC OVERFLOWED CORRECTLY
006604  104105                  ERROR   105           ;RKWC DID NOT OVERFLOW TO 0 ON
                                                        ;DOING A WRITE OF 2 SECTORS FROM
                                                        ;BA = 177000

                                                        ;NOW, READ IS DONE OF THE DATA
                                                        ;THAT WAS WRITTEN TO SEE IF IT
                                                        ;CAN BE READ CORRECTLY

006606  012737  006614  001110  MOV     #4$,$LPERR    ;LUP TO 4$ ON EROR (SW 9)
006614  104416          4$:     CON.RESET
006616  104420                  DRV.RESET

006620  012701  137000          MOV     #137000,R1    ;CLEAR THE 1000-WORD DATA
006624  005021          5$:     CLR     (R1)+         ;BUFFER (PA 177000 TO 200776)
006626  020127  141000          CMP     R1,#141000    ;ALL DONE?
006632  001374                  BNE     5$

                                                        ;NOW, READ BACK INTO THE
                                                        ;SAME BUFFER 2 SECTORS
                                                        ;WRITTEN PREVIOUSLY

006634  013777  001502  172366  MOV     @DRV,@RKDA    ;ADDRESS THE DRIVE CYL 0, SEC 0, 0
006642  012777  177000  172354  MOV     #-1000,@RKWC  ;READ 2 SECTORS
006650  012777  177000  172350  MOV     #177000,@RKBA ;INTO THIS BUS ADDRESS
006656  012777  000005  172336  MOV     #5,@RKCS      ;READ, GO

006664  104417                  CON.RDY               ;WAIT FOR CNTROL RDY

006666  004737  020020          JSR     PC,CHKCS      ;ANY ERROR IN RKCS?
006672  104102                  ERROR   102           ;ERROR BIT SET IN RKCS ON DOING
                                                        ;A READ OF 2 SECTORS (0,1), CYL 0,
                                                        ;SUR 0, INTO DATA BUFFER STARTING
                                                        ;AT BUS ADDRESS 1770000, NOTE AFTER
                                                        ;1777776, RKBA WILL OVERFLOW (0)
                                                        ;INTO MEX BITS (BIT 4) OF RKCS.
                                                        ;IF THE ENTIRE TRANSFER (1000 WORD)
                                                        ;WAS DONE RKBA WILL CONTAIN 1000
```

```
                                                        ;AND BIT 4 OF RKCS (NEX) WILL BE SET.

006674  012705  177764        6$:     MOV     #-14,R5         ;REPORT ONLY 12 ERRORS.
006700  012702  137000                 MOV     #137000,R2      ;STARTING ADDRESS OF BUFFER
                                                                ;(PA=177000)
006704  012701  000001                 MOV     #1,R1           ;INITIALIZE DATA PATTERN

006710  020112                 7$:     CMP     R1,(R2)         ;CORRECT DATA WORD RECVD?
006712  001414                         BEQ     8$
006714  005705                         TST     R5              ;REPORT THIS ERROR?
006716  001420                         BEQ     9$
006720  005205                         INC     R5              ;COUNT ERORS

006722  010137  001162                 MOV     R1,$REG0        ;GET EXPCTED DATA WORD

006726  011237  001164                 MOV     (R2),$REG1      ;GET DATA WORD RECVD
006732  104107                         ERROR   107             ;DATA COMPARISON ERROR ON DOING A
                                                                ;READ OF 2 SECTORS (0,1, CYL 0, SURFACE 0)
                                                                ;INTO DATA BUFFER (PHYSICAL ADDRESS
                                                                ;177000 TO 200776)

006734  104421  002214                 TYPMSG  ,MSG13          ;TYPE 'PHYSICAL BUS ADDRESS'
006740  004737  017702                 JSR     PC,TYPDBO       ;TYPE THE 6 DIGIT PHYSICAL BUS ADDRESS
                                                                ;WHERE THE DATA ERROR OCCURRED.

006744  062702  000002        8$:     ADD     #2,R2           ;INCREMENT POINTER TO BA
006750  005201                         INC     R1
006752  022701  001001                 CMP     #1001,R1        ;CHECKED THE ENTIRE BUFFER?
006756  001354                         BNE     7$

                                                        ;**OFF
006760  005037  177572        9$:     CLR     @#SR0           ;TURN OFF MEMORY MANAGEMENT
```

```
                                ;;*****************************************************************
                                ;*TEST 6          CHECK DATA TRANSFER FROM 28K TO 32K
                                        ;*THIS TEST DOES A WRITE OF 4K WORDS FROM A BUFFER LOCATED AT 28K
                                        ;*THEN THE DATA IS READ BACK INTO THE SAME BUFFER(28K-32K) AND IS
                                        ;*CHECKED TO SEE IF IT IS CORRECT.  NOTE THAT THE BUFFER IS FILLED
                                        ;*WITH ALL 1'S BEFORE DOING THE READ.

                                        ;*THE WRITE IS DONE STARTING AT CYLINDER 0, SECTOR 0, SURFACE 0.
                                ;;*****************************************************************
006764  000004                TST6:   SCOPE

006766  023727  017700  001740          CMP     $LSTBK,#1740    ;32K OR MORE OF MEMORY?
006774  103002                        BHIS    1$              ;YES
006776  000137  007320                JMP     TST7            ;IF NOT, DONT DO THIS TEST
007002  012737  001600  172352  1$:     MOV     #1600,@#KIPAR5  ;MAP 28-32K THRU PAR 5
007010  012737  000001  177572          MOV     #1,@#SR0        ;TURN ON MEM MANAGEMENT

                                ;WRITE A COUNT PATTERN (1-10000) INTO DATA BUFFER (PHYSICAL ADDRESS
                                ;160000-177776).  THIS DATA BUFFER WILL BE USED FOR WRITING ON THE DISK.

007016  012737  007024  001110          MOV     #2$,$LPERR      ;LUP TO 2$ ON EROR
007024  104416                2$:     CON.RESET
007026  104420                        DRV.RESET
007030  012700  000001                MOV     #1,R0           ;INITIALIZE DATA PATTERN TO BE WRITTEN
007034  012701  120000                MOV     #120000,R1      ;INITIALIZE BA (PA=160000) 28K
007040  010021                3$:     MOV     R0,(R1)+        ;WRITE COUNT PATTERNS (1-10000)
007042  005200                        INC     R0              ;INTO DATA BUFFER (PA 160000 TO
007044  020027  010001                CMP     R0,#10001       ;177776, 28K-32K)
007050  001373                        BNE     3$

007052  013777  001502  172150          MOV     @DRV,@RKDA      ;WRITE ON SEC 0, CYL 0, SUR1
007060  012777  170000  172136          MOV     #-10000,@RKWC   ;4K WORDS
007066  012777  160000  172132          MOV     #160000,@RKBA   ;FROM THIS BUS ADDRESS
007074  012777  000003  172120          MOV     #3,@RKCS        ;WRITE, GO

007102  104417                        CON.RDY                 ;WAIT FOR CONTROL READY

007104  004737  020020                JSR     PC,CHKCS        ;ANY ERROR IN RKCS?
007110  104102                        ERROR   102             ;'ERR' BIT SET IN RKCS ON DOING
                                                                ;A WRITE OF 4K WORDS FROM 160000
                                                                ;(28K-32K).  DISK WRITE BEGAN ON
                                                                ;SEC 0, CYL 0, SUR 0.  IF ALL 4K
                                                                ;WORDS WERE WRITTEN RKBA SHOULD OVERFLOW
                                                                ;AND CONTAIN 0.  BIT 4 OF RKCS
                                                                ;(MEX BIT) SHOULD BE 1

007112  004737  020112                JSR     PC,CHKMEX       ;CHECK IF RKBA OVERFLOWED AND MEX
                                                                ;BITS (4) IN RKCS WAS SET.
007116  104106                        ERROR   106             ;;MEX BIT 4 NOT SET AFTER OVERLFOW OF
                                                                ;RKBA.  WRITE OF 4K WORDS (28K-32K) WAS DONE.

                                                                ;RETURN HERE IF NO ERROR
007120  012703  010000                MOV     #10000,R3       ;WORD COUNT
007124  012704  160000                MOV     #160000,R4      ;STARTING BUS ADDRESS
007130  004737  020056                JSR     PC,CHKBA        ;CHECK IF RKBA INCREMENTED CORRECTLY
007134  104104                        ERROR   104             ;RKBA DID NOT OVERFLOW TO AFTER A WRITE IF 4K
```

```
                                                        ;WORDS (160000 TO 177776)
                                                        ;
007136  004737  020136          JSR     PC,CHKWC       ;CHECK RKWC OVERFLOWED CORRECTLY
007142  104135                  ERROR   105            ;RKWC DID NOT OVEFLOW TO 0
                                                        ;AFTER A WRITE OF 4K WORD (160000
                                                        ;TO 177776)
                                                        ;
                                                        ;
007144  012737  007152  001110  4$:     MOV     #4$,$_PERR     ;RETURN ADDRESS FOR LUPING
007152  104416                  CON.RESET
007154  104420                  DRV.RESET
                                                        ;
007156  012701  120000          5$:     MOV     #120000,R1     ;CLEAR THE DATA BUFFER BEFORE
007162  005021                  CLR     (R1)+          ;DOING A READ INTO IT
007164  022701  140000          CMP     #140000,R1
007170  001374                  BNE     5$
                                                        ;
007172  013777  001502  172030  MOV     @DRV,@RKDA     ;READ FROM SEC 0, SUR 0, CYL 0
007200  012777  170000  172016  MOV     #-10000,@RKWC  ;4K WORDS
007206  012777  160000  172012  MOV     #160000,@RKBA  ;INTO THIS BUS ADDRESS
                                                        ;
007214  012777  000005  172000  MOV     #5,@RKCS       ;READ, GO
007222  104417                  CON.RDY                ;WAIT FOR CNTROL RDY
                                                        ;
007224  004737  020020          JSR     PC,CHKCS       ;ANY ERROR IN RKCS?
007230  104102                  ERROR   102            ;ERROR BIT SET IN RKCS ON DOING
                                                        ;A READ OF 4K WORDS INTO MEMORY
                                                        ;(160000-177776)
007232  012705  177764          MOV     #-14,R5        ;REPORT 12 ERRORS AT MOST
007236  012702  120000          MOV     #120000,R2     ;STARTING ADDRESS OF BUFFER
                                                        ;(PA=160000)
007242  012701  000001          MOV     #1,R1          ;INITIALIZE DATA PATTERN
                                                        ;
007246  020112          6$:     CMP     R1,(R2)        ;CORRECT DATA WORD?
007250  001413                  BEQ     7$
007252  010137  001162          MOV     R1,$REG0       ;GET EXPCTD DATA WORD
007256  011237  001164          MOV     (R2),$REG1     ;GET DATA WORD RECVD
007262  104107                  ERROR   107            ;DATA ERROR ON DOING A READ OF
                                                        ;4K WORDS STARTING FROM SEC 0,
                                                        ;CYL 0, SUR 0 INTO MEMORY (160000-
                                                        ;177776)
007264  104421  002214          TYPMSG  ,MSG13         ;TYPE 'PHYSICAL BUS ADDRESS'
007270  004737  017702          JSR     PC,TYPOBO      ;TYPE OUT THE PHYSICAL BUS ADDRESS
                                                        ;WHERE DATA
007274  005205                  INC     R5             ;ERROR OCCURRED.  R2 CONTAINS
007276  001406                  BEQ     8$             ;THE VIRTUAL ADDRESS
                                                        ;
007300  062702  000002  7$:     ADD     #2,R2          ;POINTER TO NEXT BA
007304  005201                  INC     R1             ;NEXT PATTERN
007306  022701  001000          CMP     #1000,R1       ;ALL DONE?
007312  001355                  BNE     6$             ;NO
                                                        ;
007314  005037  177572  8$:     CLR     @#SR0          ;TURN OFF MEM MANAGEMENT
```

```
                                ;;*****************************************************************
                                ;*TEST 7          PERFORM THE LARGEST POSSIBLE DATA TRANSFER
                                ;THIS TEST PERFORMS THE LARGEST DATA TRANSFER POSSIBLE
                                ;WITHIN AVAILABLE MEMORY.

                                ;1) IF KT11 IS PRESENT A WRITE OF 16K WORDS IS DONE ON
                                ;THE DISK (PROVIDED 28K OR MORE IS PRESENT).

                                ;2) IF KT11 IS NOT PRESENT THEN ALL BUT TOP 1.5K OF MEMORY WILL BE USED
                                ;FOR WRITING (RKDP MONITOR).

                                ;ALL DATA TRANSFERS ARE DONE STARTING AT BA 'PGEND'.
                                ;ALL WRITES ARE DONE BEGINNING AT SECTOR 0, CYLINDER 0,
                                ;SURFACE 0.

                                ;AFTER DOING THE 'WRITE' A 'WRITE CHECK' IS DONE
                                ;TO SEE IF THE WRITE WAS DONE CORRECTLY.  ANY WRITE
                                ;CHECK ERROR IS REPORTED.
                                ;;*****************************************************************
007320  000004                  ST7:    SCOPE
007322  005737  017432                  TST     $KT11           ;MEMORY MANAGEMENT PRESENT?
007326  100004                  BPL     1$                      ;NO
                                                                ;YES
007330  023727  017700  001540          CMP     $LSTBK,#1540    ;28K OR MORE?
007336  002034                  BGE     XFR16K                  ;YES

007340  013703  002054          1$:     MOV     MAXBA,R3        ;FIGURE OUT THE MAXIMUM
007344  162703  032412                  SUB     #PGEND,R3       ;XFER THAT CAN BE DONE
007350  000241                  CLC
007352  006003                  ROR     R3                      ;FROM 'PGEND' TO THE
                                                                ;'MAXBA'
007354  005001                  CLR     R1
007356  010346                  MOV     R3,-(SP)                ;PUT DIVIDEND ON STACK (LO)
007360  005046                  CLR     -(SP)                   ;(HIGH PART)
007362  012746  000400          MOV     #400,-(SP)              ;DIVISOR
007366  004737  025120          JSR     PC,@#$DIV               ;GO TO DIVIDE ROUTINE
007372  005726                  TST     (SP)+                   ;POP OFF REMAINDER FROM STACK
007374  001401                  BEQ     2$
007376  005201                  INC     R1                      ;GET # OF SECTORS REQUIRED TO
                                                                ;DO WRITE OF # OF WORDS
007400  062601                  2$:     ADD     (SP)+,R1        ;(CONTAINED IN R0). R1 CONTAINS
                                                                ;# OF SECTORS
007402  005002                  CLR     R2                      ;FORM THE EXPECTED DISK
007404  162701  000014          3$:     SUB     #14,R1          ;ADDRESS - AFTER THE WRITE
007410  100403                  BMI     4$                      ;IS DONE.
007412  062702  000020          ADD     #20,R2
007416  000772                  BR      3$
007420  062701  000014          4$:     ADD     #14,R1          ;R2 CONTAINS EXPCTD RKDA
007424  050102                  BIS     R1,R2                   ;AFTER WRITE IS DONE
007426  000404                  BR      XFR

007430  012703  040000          XFR16K: MOV     #40000,R3       ;# OF WORDS = 16K
007434  012702  000124                  MOV     #124,R2         ;RKDA SHOULD INCREMENT TO
                                                                ;THIS AFTER A TRANSFER OF 16K
                                                                ;WORDS STARTING AT DISK
                                                                ;ADDRESS = 0 (CYL 2,SUR 1,SEC 4)
```

```
1876
1877  007440  053702  001502          XFR:    BIS     @DRV,R2         ;ADD THE DRIVE # TO
1878                                                                  ;EXPCTD RKDA AFTER XFER
1879  007444  012737  007452  001110          MOV     #1$,$LPERR      ;LUP BAK TO '1$' ON ERROR
1880                                                                  ;(SW 9)
1881  007452  104416                  1$:     CON.RESET
1882  007454  104420                          DRV.RESET
1883  007456  013777  001502  171544          MOV     @DRV,@RKDA      ;ADDRESS THE DRIVE, CYL 0,SUR 0,
1884                                                                  ;SEC 0
1885  007464  010377  171534                  MOV     R3,@RKWC
1886  007470  005477  171530                  NEG     @RKWC           ;WORD COUNT (IF MORE THAN
1887                                                                  ;28K IS AVAILABLE A TRANSFER
1888                                                                  ;OF 20K WILL BE DONE, IF
1889                                                                  ;LESS THAN 28K, THE
1890                                                                  ;LARGEST TRANSFER WITHIN THE
1891                                                                  ;AVAILABLE MEMORY WILL
1892                                                                  ;BE DONE. IN BOTH
1893                                                                  ;CASES, DATA TRANSFER
1894                                                                  ;WILL BE DONE STARTING
1895                                                                  ;AT 'PGEND'
1896  007474  012777  032412  171524          MOV     #PGEND,@RKBA    ;START WRITE FROM HERE
1897  007502  012777  000003  171512          MOV     #3,@RKCS        ;WRITE, GO
1898
1899  007510  104417                          CON.RDY                 ;WAIT FOR CONTROL READY
1900
1901  007512  004737  020020                  JSR     PC,CHKCS        ;CHCK RKCS FOR ERROR?
1902  007516  104102                          ERROR   102             ;ERROR BIT SET IN RKCS ON
1903                                                                  ;DOING A LARGE 'WRITE'
1904
1905  007520  004737  020034                  JSR     PC,CHKDA        ;CHECK IF RKDA INCREMENTED CORRECTLY?
1906  007524  104103                          ERROR   103             ;RKDA DID NOT INCREMENT
1907                                                                  ;CORRECTLY
1908
1909  007526  012704  032412                  MOV     #PGEND,R4
1910  007532  004737  020056                  JSR     PC,CHKBA        ;CHECK THAT RKBA INCREMENTED
1911                                                                  ;CORRECTLY?
1912  007536  104104                          ERROR   104             ;RKBA DID NOT INCREMENT
1913                                                                  ;CORRECTLY
1914
1915  007540  004737  020136                  JSR     PC,CHKWC        ;CHECK THAT RKWC OVERFLOWED
1916  007544  104105                          ERROR   105             ;RKWC DID NOT OVERFLOW TO
1917                                                                  ;ZERO AFTER A WRITE
1918
1919  007546  012737  007554  001110          MOV     #2$,$LPERR      ;LUP BAK TO '2$' ON EROR (SW 9)
1920  007554  104416                  2$:     CON.RESET
1921  007556  104420                          DRV.RESET
1922  007560  013777  001502  171442  3$:     MOV     @DRV,@RKDA      ;ADDRESS THE DRIVE, CYL 0,SEC 0,SUR 0
1923  007566  010377  171432                  MOV     R3,@RKWC
1924  007572  005477  171426                  NEG     @RKWC
1925  007576  012777  032412  171422          MOV     #PGEND,@RKBA    ;STARTING BA
1926
1927  007604  012777  000407  171410  4$:     MOV     #407,@RKCS      ;WRITE CHECK, SSE, GO
1928
1929  007612  104417                          CON.RDY                 ;WAIT FOR CONTROL RDY
1930
1931  007614  004737  020020                  JSR     PC,CHKCS        ;ANY ERROR IN RKCS
```

```
                        ERROR   102
                ;
                BIT     #BIT14,@RKCS    ;SKIP CHECKING FOR WCE IF HE SET
                BNE     7$
                BIT     #WCE,@RKER      ;WRITE CHECK ERROR?
                BEQ     6$              ;NO
                ;
                JSR     PC,GT4RG        ;GET RKCS,ER,DS,DA
                MOV     @RKBA,$REG2
                ERROR   110             ;WRITE CHECK ERROR. RKDA GIVES THE DISK ADDRESS
                                        ;WHERE WCE OCCURRED. (NOTE THE SECTOR IN
                                        ;ERROR IS OBTAINED BY BACKING OFF 1 SECTOR..
                                        ;NOTE THAT THE DATA BUFFER WHICH WAS WRITE
                                        ;CHECKED IS NOT ON A SECTOR BOUNDARY
                                        ;(LIKE 256, 512 WORD ETC.), BUT IS SOME
                                        ;SECTORS & A FRACTION (LIKE 300 WORDS ETC.)
                ;
6$:             TST     @RKWC           ;WAS THE ENTIRE DATA BUFFER
                BEQ     7$              ;WRITE CHECKED?
                ;
                MOV     @RKWC,R5
                BIC     #177760,R5      ;FORM THE RKBA AND RKWC
                ASL     R5
                SUB     R5,@RKBA        ;TO BE USED FOR DOING
                                        ;WRITE-CHECK IF THE REST
                BIC     #17,@RKWC       ;OF THE DATA BUFFER
                ;
                BR      4$              ;GO DO WRT-CHK FOR
                                        ;REST OF THE BUFFER
                ;
                ;GO CHECK THE REST OF THE DRIVES.
                ;
7$:             JMP     NXTDRV
```

```
                                .SBTTL  EXERCISER PROGRAM

                                ;BEGINING OF THE EXERCISER PART OF THE PROGRAM.
                                ;IF THE PROGRAM WAS RESTARTED AT 210, THEN THE STATISTICS COLLECTED
                                ;SO FAR WILL NOT BE CLEARED.


007716  104416                  EXRCSR: CON.RESET
007720  012700  001306                  MOV     #KEY,R0         ;CLEAR UP THE LOCATIONS FROM
007724  005020                  1$:     CLR     -(R0)+          ;'KEY' TO 'KWHR' (EXCLUDED)
007726  020027  001552                  CMP     R0,#KWHR
007732  001374                          BNE     1$
007734  105737  001253                  TSTB    FRSTRT          ;RESTARTED AT 210?
007740  001045                          BNE     3$              ;YES, SAVE THE STATISTICS COLLECTED
                                                                ;UPTILL NOW, DONT CLEAR THEM

007742  005020                  2$:     CLR     (R0)+           ;CLEAR LOCATIONS FROM 'HECN'
007744  020027  002032                  CMP     R0,#PCMND       ;TO 'PCMND' (EXCLUDED)
007750  001374                          BNE     2$

007752  012700  001554                  MOV     #KWMIN,R0       ;INITIALIZE COUNTS FOR MINS.
007756  012701  177704                  MOV     #-60.,R1        ;SECS. KW11
007762  010120                          MOV     R1,(R0)+
007764  010120                          MOV     R1,(R0)+
007766  010120                          MOV     R1,(R0)+

007770  012700  025636                  MOV     #RSDRVL,R0      ;INITIALIZE PTR TO RANDOM NO. SEEDS
007774  012720  123456                  MOV     #123456,(R0)+   ;USED BY THE RANDOM NUMBER GENERATOR
010000  012720  176543                  MOV     #176543,(R0)+   ;SET UP RANDOM NUMBER SEEDS TO BE
010004  012720  001201                  MOV     #1201,(R0)+
010010  012720  062465                  MOV     #62465,(R0)+
010014  012720  176105                  MOV     #176105,(R0)+
010020  012720  174532                  MOV     #174532,(R0)+
010024  012720  157650                  MOV     #157650,(R0)+
010030  012720  030753                  MOV     #30753,(R0)+
010034  012720  131547                  MOV     #131547,(R0)+
010040  012720  032070                  MOV     #32070,(R0)+
010044  012720  123456                  MOV     #123456,(R0)+
010050  012720  176543                  MOV     #176543,(R0)+


010054  013737  001236  002056  3$:     MOV     PCNTR,REPCNT    ;REPETITION COUNT. WHEN THIS COUNT GOES
                                                                ;TO 0, IT'S CONSIDERED TO BE AN END OF PASS.
                                                                ;THE NEXT PASS WILL START WILL START RIGHT
                                                                ;FROM WHERE THE EXERCISER LEFT OFF.

010062  004737  022564                  JSR     PC,CHDPRS       ;CHECK IF ANY DRIVES ARE PRESENT
                                                                ;IF NONE, GO TO $EOP, END OF PASS


010066  012746  177777                  MOV     #177777,-(SP)   ;PUT LOW DIVIDEND ON STACK
010072  005046                          CLR     -(SP)           ;CLEAR HIGH DIVIDEND AND PUSH
                                                                ;IT ON STACK
010074  013746  001264                  MOV     DRVPRS,-(SP)    ;PUSH DIVISOR ON STACK
```

```
2021  010100  004737  025120            JSR     PC,@#$DIV       ;GO TO THE 'DIVIDE' SUBROUTINE
2022  010104  005726                    TST     (SP)+           ;DISCARD THE REMAINDER. QUOTIENT IS
2023                                                            ;NOW ON TOP OF THE STACK
2024  010106  012637  001520            MOV     (SP)+,DRMAP     ;GET MAPPING FACTOR FOR DRIVES
2025  010112  012737  000504  001522    MOV     #504,CYLMAP     ;GET MAPPING FACTOR FOR CYLINDERS
2026  010120  012737  012527  001524    MOV     #5463.,SECMAP   ;GET MAPPING FACTOR FOR SECTORS
2027  010126  012737  031463  001526    MOV     #13107.,FNMAP   ;GET MAPPING FACTOR FOR FUNCTION
2028
2029  010134  013700  002054            MOV     MAXBA,R0        ;COMPUTE THE MAXIMUM ALLOWABLE
2030  010140  163700  002052            SUB     BASEBA,R0       ;WORD COUNT FOR DATA TRANSFERS
2031  010144  000241                    CLC
2032  010146  006000                    ROR     R0              ;CONVERT TO WORDS
2033
2034  010150  012746  177777            MOV     #177777,-(SP)   ;PUT LOW DIVIDEND ON STACK
2035  010154  005046                    CLR     -(SP)           ;CLEAR HIGH DIVIDEND AND PUSH
2036                                                            ;IT ON STACK
2037  010156  010046                    MOV     R0,-(SP)        ;PUSH DIVISOR ON STACK
2038  010160  004737  025120            JSR     PC,@#$DIV       ;GO TO THE 'DIVIDE' SUBROUTINE
2039  010164  005726                    TST     (SP)+           ;DISCARD THE REMAINDER. QUOTIENT IS
2040                                                            ;NOW ON TOP OF THE STACK
2041  010166  005216                    INC     (SP)
2042  010170  012637  001530            MOV     (SP)+,BAMAP     ;SAVE THE MAPPING FACTOR FOR BUS ADDRESS
```

```
                                ;THE ENTIRE DISK (ALL DRIVES) IS WRITTEN WITH RANDOM PATTERNS. THE FIRST
                                ;WORD OF EACH SECTOR GIVES THE NUMBER OF WORDS (2'S COMPLEMENT) WRITTEN IN
                                ;THAT SECTORS. REST OF THE DATA WORDS FOR THE SECTOR ARE GENERATED USING
                                ;THE ABSOLUTE DISK ADDRESS AS THE RANDOM SEED.
                                ;IF THE PROGRAM WAS RESTARTED AT 210 THEN CHECK IF SW 4 IS SET. IF IT IS
                                ;THEN DO NOT REWRITE THE DISK WITH RANDOM PATTERNS. IF SW 4 IS NOT SET THEN
                                ;ALL THE DISKS (PRESENT) ARE WRITTEN WITH RANDOM PATTERNS.

010174  105737  001253        WRDSK:  TSTB    FRSTRT          ;RESTARTED AT 210?
010200  001407                         BEQ     1$              ;NO
010202  105037  001253                 CLRB    FRSTRT          ;YES, CLEAR THE RESTART FLAG
010206  032777  000020  170724        BIT     #SW4,@SWR       ;SW 4 SET?
010214  001401                         BEQ     1$              ;NO
010216  000540                         BR      BEGEX1          ;YES, DONT REWRITE ALL DISKS WITH
                                                                ;RANDOM PATTERNS
010220  012737  010236  001110  1$:    MOV     #2$,$LPERR      ;LJP TO '2$' ON EROR, SW 9 SET!
010226  012702  001254                 MOV     #PDR,R2         ;POINTER TO DRIVE #'S TABLE
010232  013703  001264                 MOV     DRVPRS,R3       ;# OF DRIVES PRESENT
010236  012700  011410          2$:    MOV     #4872.,R0       ;NUMBER OF SECTORS PER DISK
010242  112201                         MOVB    (R2)+,R1        ;GET THE FIRST AVAILABLE DRIVE
010244  042701  177770                 BIC     #177770,R1      ;POSITION THE BITS (15,14,13)
010250  010137  001502                 MOV     R1,@DRV
010254  000241                         CLC
010256  006001                         ROR     R1
010260  006001                         ROR     R1
010262  006001                         ROR     R1
010264  006001                         ROR     R1
010266  010177  170736                 MOV     R1,@#RKDA       ;BASE DISK ADDRESS

010272  013704  002054                 MOV     MAXBA,R4        ;CALCULATE MAXIMUM BUFFER
010276  163704  002052                 SUB     BASEBA,R4
010302  006204                         ASR     R4              ;CONVERT TO WORDS
010304  042704  000377                 BIC     #377,R4         ;KEEP ONLY WHOLE BLOCKS
010310  000304                         SWAB    R4
010312  020427  000014                 CMP     R4,#12.         ;MAX OF 12 SECTORS
010316  003402                         BLE     3$
010320  012704  000014                 MOV     #12.,R4

010324  010401          3$:    MOV     R4,R1
010326  020400                 CMP     R4,R0
010330  003401                 BLE     4$
010332  010001                 MOV     R0,R1
010334  000301          4$:    SWAB    R1
010336  005401                 NEG     R1
010340  010137  010354                 MOV     R1,5$
010344  010177  170654                 MOV     R1,@RKWC
010350  004537  016612                 JSR     R5,GENBUF       ;GENERATE RANDOM DATA BUFER
010354  000000          5$:    .WORD   0
010356  032412                 .WORD   DBUF            ;STARTING ADDRESS OF DATA BUFER

010360  012777  032412  170640        MOV     #DBUF,@RKBA     ;FROM THIS BUS ADDRESS
010366  012777  000003  170626        MOV     #3,@RKCS        ;WRITE, GO

010374  104417                 CON.RDY                 ;WAIT FOR CONTROL RDY
010376  004737  020020                 JSR     PC,CHKCS        ;ANY ERROR?
010402  104001                 ERROR   1               ;AN ERROR OCCURED WHILE DOING WRITE
```

```
                                                        ;ON THE DISK. YOU ARE ADVISED TO USE
                                                        ;BASIC AND DYNAMIC TESTS.

010404  032777  000400  170526          BIT     #BIT8,@SWR      ;TYPE CURRENT STATUS
010412  001435                          BEQ     6$
010414  032700  000377                  BIT     #377,R0
010420  001032                          BNE     6$
010422  104401  010430                  TYPE    ,65$            ;;TYPE ASCIZ STRING
010426  000421                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12>/WRITTING RANDOM PATTERN, DRIVE /
010472                          64$:
010472  013746  001502                  MOV     @DRV,-(SP)
010476  104403                          TYPOS
010500     001                          .BYTE   1
010501     000                          .BYTE   0

010502  104401  001213                  TYPE    ,$CRLF
010506  104407                  6$:     CKSWR                   ;CHECK FOR SOFTWARE SWR CHANGE
010510  160400                          SUB     R4,R0           ;DECREMENT SECTOR COUNT
010512  003304                          BGT     3$

010514  005303                          DEC     R3              ;MORE DRIVES TO DO?
010516  001247                          BNE     2$

                                ;IF SW 3 IS SET, ENABLE THE LINE CLOCK AND INITIALIZE COUNTS.

010520  032777  000010  170412  BEGEX1: BIT     #SW3,@SWR       ;KW11L CLOCK PRESENT?
010526  001403                          BEQ     BEGNEX          ;IF NOT, SKIP. NOTE:IF KW11L IS
                                                                ;NOT PRESENT SW3 SHOULD NOT BE SET
                                                                ;OTHERWISE, A TIMEOUT WILL OCCUR.
010530  052777  000100  170476          BIS     #BIT6,@KWLS     ;ENABLE KW11L CLOCK
                                                                ;SERVICED AT PRIORITY 7 (KWSRVE
```

```
                        ;THE PROGRAM IS GOING TO LOOP BACK TO THIS POINT AT THE END OF A PASS.

010536  104416          BEGNEX: CON.RESET               ;CLEAR EVERYTHING IN DRIVES
010540  012706  001100          MOV     #STACK,SP       ;RESET STACK
010544  005737  001264          TST     DRVPRS          ;ANY DRIVES LEFT IN SYSTEM?
010550  001402                  BEQ     GMNGER
010552  004737  014406          JSR     PC,GEN8RQ       ;GO GENERATE 8 COMMANDS FOR THE Q



                        ;CHECK IF THERE IS ANY UNFINISHED COMMAND IN THE Q, WAITING TO BE EXECUTED.
                        ;IF THERE IS NONE, GO TO THE 'GEN8RQ' AND GENERATE 8 REQUESTS (COMMANDS),
                        ;AND PUT THEM IN THE Q. IF THERE IS AN UNFINISHED COMMAND, FIND OUT IF
                        ;THERE IS A PRIORITY COMMAND TO BE EXECUTED IMMEDIATELY.

010556  013746  001244  GMNGER: MOV     PPRLVL,-(SP)    ;NEW PSW , RAISE PRIORITY
010562  012746  010570          MOV     #1$,-(SP)       ;RETURN PC ***************
010566  000002                  RTI

010570  005737  001264  1$:     TST     DRVPRS          ;ANY DRIVES IN SYSTEM?
010574  001040                  BNE     2$
010576  104401  010604          TYPE    ,65$            ;;TYPE ASCIZ STRING
010602  000432                  BR      64$             ;;GET OVER THE ASCIZ
                        ;;65$:  .ASCIZ  <15><12>/HALTING - PRESS CONTINUE TO RESTART AT '200'/<15><12><12><12>
010670                  64$:
010670  000000                  HALT
010672  000137  003376          JMP     START

010676  012700  001306  2$:     MOV     #KEY,R0
010702  005720          3$:     TST     (R0)+           ;ANY UNFINISHED COMMAND
010704  100006                  BPL     4$              ;IN Q.
010706  020027  001326          CMP     R0,#KEY+20
010712  001373                  BNE     3$
010714  004737  014406          JSR     PC,GEN8RQ       ;IF NOT, GO GENERATE 8 MORE COMMANDS
010720  000460                  BR      CHFAFN

010722  012700  001306  4$:     MOV     #KEY,R0
010726  032710  010000  5$:     BIT     #BIT12,(R0)     ;ANY HIGH PRIORITY COMMAND IN Q
010732  001404                  BEQ     6$
010734  005710                  TST     (R0)            ;FINISHED?
010736  100402                  BMI     6$              ;YES
010740  105710                  TSTB    (R0)            ;IN EXECUTION?
010742  100165                  BPL     PRICMND         ;NO, GO PROCESS HIGH PRIORITY

010744  005720          6$:     TST     (R0)+           ;CHECK THE ENTIRE Q
010746  020027  001326          CMP     R0,#KEY+20
010752  001365                  BNE     5$



                        ;FIND OUT IF THERE IS A WRITE CHECK FUNCTION TO BE DONE IMMEDIATELY AFTER
                        ;A WRITE, THAT WAS DONE PREVIOUSLY.

010754  005737  001456          TST     WCFLG           ;IS WRITE CHECK TO FOLLOW
010760  100040                  BPL     CHFAFN          ;WRITE? IF NOT, BRANCH
                                                        ;YES
```

```
2187  010762  013700  001456                  MOV     WCFLG,R0        ;GET WC FLAG
2188  010766  042700  177400                  BIC     #177400,R0      ;LOWER BYTE CONTAINS KEY#X2 (OFFSET FROM
2189                                                                    ;KEY), OF THE WRITE FUNCTION
2190  010772  016001  002032                  MOV     PCMND(R0),R1    ;GET POINTER
2191  010776  062700  001306                  ADD     #KEY,R0         ;FROM ADDRESS OF THE KEY
2192                                                                    ;WHICH WAS USED FOR PREVIOUS
2193                                                                    ;WRITE
2194  011002  022761  000002  000002          CMP     #2,2(R1)        ;CHECK THAT THE FUNCTION
2195  011010  001413                          BEQ     7$              ;WAS A WRITE
2196  011012  011037  001162                  MOV     (R0),$REG0      ;GET KEY CONTENTS
2197  011016  016137  000002  001164          MOV     2(R1),$REG1     ;GET THE FUNCTION INDICATED BY THIS KEY
2198  011024  104027                          ERROR   27              ;IF NOT, ERROR
2199                                                                    ;BEFORE DOING A WRITE CHECK A WRITE IS
2200                                                                    ;ALWAYS DONE. OCCURANCE OF THIS ERROR
2201                                                                    ;INDICATES THAT SOMEHOW AN ATTEMPT IS BEING
2202                                                                    ;MADE TO DO WRITE CHECK BEFORE A WRITE IS
2203                                                                    ;PERFORMED. THE KEY IN ERROR MESSAGE WAS
2204                                                                    ;THE ONE WHICH GAVE RISE TO THIS ATTEMPT.
2205                                                                    ;THE FUNCTION CODE IS THE FUNCTION ASSOCIATED
2206                                                                    ;WITH THAT KEY
2207  011026  005037  001456                  CLR     WCFLG           ;ABORT THIS WRITE CHECK
2208  011032  052710  100000                  BIS     #BIT15,(R0)
2209  011036  000647                          BR      QMNGER
2210  011040  012761  000006  000002  7$:     MOV     #6,2(R1)        ;SET UP BITS FOR WRT CHK
2211                                                                    ;NOW
2212  011046  042710  174340                  BIC     #174340,(R0)    ;CLEAR OUT THE UNNECESSARY
2213                                                                    ;FLAGS FROM THE KEY
2214  011052  052710  000100                  BIS     #BIT6,(R0)      ;SET FLAG FOR WRITE CHECK, FOR
2215                                                                    ;THIS KEY
2216  011056  000137  011520                  JMP     EXCUT
2217
2218                                                                    ;NO HIGH PRIORITY COMMAND IN Q
```

```
2219                                    ;NO HIGH PRIORITY COMMAND WAS FOUND IN THE Q. FIND OUT THE FIRST AVAILABLE
2220                                    ;COMMAND IN THE Q, FOR EXECUTION.
2221  011062  005300                    CHFAFN: CLR     R0              ;WAIT FOR ANY IMMEDIATE INTERUPT
2222  011064  005046                            CLR     -(SP)           ;NEW PSW
2223  011066  012746  011074                    MOV     #1$,-(SP)       ;RETURN FOR RTI
2224  011072  000002                            RTI
2225
2226
2227  011074  105200                    1$:     INCB    R0
2228  011076  001376                            BNE     .-2
2229  011100  013746  001244                    MOV     PPRLVL,-(SP)    ;NEW PSW, LOCK OUT CPU
2230  011104  012746  011112                    MOV     #2$,-(SP)       ;RETURN FOR RTI *************
2231  011110  000002                            RTI
2232
2233
2234  011112  012700  001306            2$:     MOV     #KEY,R0
2235  011116  005710                    CH1:    TST     (R0)            ;UNFINISHED COMMAND?
2236  011120  100436                            BMI     CH2
2237  011122  105710                            TSTB    (R0)            ;IN PROGRESS?
2238  011124  100434                            BMI     CH2
2239  011126  011001                            MOV     (R0),R1
2240  011130  042701  177770                    BIC     #177770,R1
2241  011134  105761  001426                    TSTB    BUSY(R1)        ;IS THIS DRIVE BUSY?
2242  011140  100426                            BMI     CH2
2243  011142  105761  001436                    TSTB    POS(R1)         ;HAS THIS DRIVE BEEN POSITIONED
2244                                            ;FOR ANY OTHER COMMAND.  IF YES,
2245                                            ;SKIP.  IF NOT, PROCEED
2246  011146  001023                            BNE     CH2
2247
2248                                            ;CHECK IF THERE IS AY OTHER COMMAND
2249  011150  010002                            MOV     R0,R2           ;ON A DRIVE THAT IS NOT THE SAME
2250                                            ;AS THE PREVICUS DRIVE.  THIS COMMAND
2251  011152  000414                            BR      2$              ;SHOULD NOT BE IN PROGRESS
2252                                            ;AND SHOULD NOT HAVE BEEN COMPLETED
2253  011154  005712                    1$:     TST     (R2)            ;UNFINISHED COMMAND?
2254  011156  100412                            BMI     2$
2255  011160  105712                            TSTB    (R2)            ;IN PROGRESS?
2256  011162  100410                            BMI     2$
2257  011164  011203                            MOV     (R2),R3
2258  011166  042703  177770                    BIC     #177770,R3
2259  011172  105763  001426                    TSTB    BUSY(R3)        ;IS THE DRIVE BUSY?
2260  011176  100402                            BMI     2$
2261  011200  020301                            CMP     R3,R1           ;IS THIS COMMAND ON THE SAME DRIVE?
2262  011202  001447                            BEQ     POSTION         ;IF YES, GO AND POSITION THE COMMAND
2263                                            ;POINTED TO BY R0, (BECAUSE THERE IS
2264                                            ;ONE MORE COMMAND THAT CAN BE PERFORMED
2265                                            ;ON THE SAME DRIVE)
2266  011204  005722                    2$:     TST     (R2)+           ;CHECK REST OF THE Q
2267  011206  020227  001326                    CMP     R2,#KEY+20
2268  011212  001360                            BNE     1$
2269
2270  011214  000470                            BR      EXNSK           ;IF THERE WAS NO EXECUTABLE COMMAND
2271                                            ;ON ANY OTHER DRIVE, THEN EXECUTE
2272                                            ;COMMAND POINTED TO BY R0
2273  011216  005720                    CH2:    TST     (R0)+           ;CHECK ENTIRE Q
2274  011220  020027  001326                    CMP     R0,#KEY+20
```

```
2275  011224  001334                    BNE     CH1
2276
2277
2278                              ;NO (UNPOSITIONED) EXECUTABLE COMMAND WAS FOUND IN THE Q. CHECK IF THERE
2279                              ;IS ANY POSITIONED COMMAND IN THE Q. WAITING TO BE EXECUTED.
2280
2281  011226  105777  167770            TSTB    @RKCS           ;IF THE CONTROLLER IS BUSY GO TO
2282  011232  100402                    BMI     1$              ;STATUS AND WAIT FOR INTERRUPTS
2283  011234  000137  021344            JMP     STATUS          ;IF THE CONTROLLER IS NOT BUSY FIND
2284
2285  011240  012700  001306    1$:     MOV     #KEY,R0         ;ANY POSITIONED COMMAND AND EXECUTE
2286  011244  032710  000020    2$:     BIT     #BIT4,(R0)
2287  011250  001414                    BEQ     3$              ;IT
2288  011252  005710                    TST     (R0)            ;MAKE SURE COMMAND IS POSITIONED
2289  011254  100412                    BMI     3$
2290  011256  105710                    TSTB    (R0)            ;COMMAND IS UNFINISHED,
2291  011260  100410                    BMI     3$              ;IT IS NOT IN PROGRESS,
2292  011262  011001                    MOV     (R0),R1         ;THE DRIVE IS NOT IN BUSY
2293  011264  042701  177770            BIC     #177770,R1
2294  011270  105761  001426            TSTB    BUSY(R1)
2295  011274  100402                    BMI     3$
2296  011276  000137  011520            JMP     EXCUT           ;GO EXECUTE THE COMMAND IF THE
2297
2298  011302  005720    3$:     TST     (R0)+           ;ABOVE CONDITIONS ARE SATISFIED
2299  011304  020027  001326            CMP     R0,#KEY+20              ;CHECK ALL COMMANDS IN Q
2300  011310  001355                    BNE     2$
2301  011312  000137  021344            JMP     STATUS
2302
2303
2304
2305                              ;ENTER HERE IF THERE IS A PRIORITY COMMAND TO BE EXECUTED.
2306
2307
2308  011316  000137  011520    PRICMN: JMP     EXCUT           ;GO EXECUTE NON-SEEK COMMAND.
2309
2310                              ;ENTER THIS IF A COMMAND IS TO BE PREPOSITIONED (BEFORE EXECUTING A
2311                              ;FUNCTION)
2312
2313  011322  032710  000020    POSTION: BIT    #BIT4,(R0)      ;ALREADY POSITIONED?
2314  011326  001333                    BNE     CH2             ;YES, GO BACK AND CHECK IF REST OF THE
2315                                                            ;COMMANDS IN THE Q ARE TO BE POSITIONED
2316
2317  011330  004737  012072            JSR     PC,POSK         ;GO CHECK, & SET UP FLAGS
2318  011334  004737  020256            JSR     PC,POSCMND      ;SAVE INFO ABOUT PRESENT & PAST COMAND
2319  011340  012777  000111  167654    MOV     #111,@RKCS      ;POSITION THE COMMAND
2320  011346  005046                    CLR     -(SP)           ;NEW PSW, DROP PRIORITY
2321  011350  012746  011356            MOV     #1$,-(SP)       ;RETURN FOR RTI
2322  011354  000002                    RTI
2323  011356                    1$:
2324  011356  105737  001535            TSTB    INT1FL
2325  011362  001775                    BEQ     .-4             ;WAIT FOR INTERRUPT
2326  011364  012777  013164  167646    MOV     #INTHND,@RKVEC  ;RE-ESTABLISH RK INTERRUPT VECTOR
2327  011372  000137  011062            JMP     CHFAFN          ;GO BACK AND CHECK IF ANY COMMANDS TO BE
2328                                                            ;POSITIONED OR EXECUTED
2329
2330
```

```
2331                                                    ;IS THERE ANY POSITIONED COMMAND IN
2332                                                    ;THE Q.  FIND OUT? IF THERE IS
2333                                                    ;ONE EXECUTE THE POSITIONED COMMAND.
2334                                                    ;BUT FIRST POSITION THE COMMAND (KEY)
2335                                                    ;POINTED TO BY R0
2336
2337  011376  012701  001306          EXNSK:  MOV     #KEY,R1
2338  011402  032711  000020          1$:     BIT     #BIT4,(R1)      ;HEADS POSITIONED?
2339  011406  001412                          BEQ     2$
2340  011410  005711                          TST     (R1)            ;FUNCTION COMPLETED?
2341  011412  100410                          BMI     2$              ;YES, BRANCH
2342  011414  105711                          TSTB    (R1)            ;FUNCTION IN PROGRESS?
2343  011416  100406                          BMI     2$
2344  011420  011102                          MOV     (R1),R2
2345  011422  042702  177770                 BIC     #177770,R2
2346  011426  105762  001426                 TSTB    BUSY(R2)        ;DRIVE BUSY?
2347  011432  100005                          BPL     3$
2348
2349  011434  005721                  2$:     TST     (R1)+           ;CHECK ALL COMMANDS IN Q
2350  011436  020127  001326                 CMP     R1,#KEY+20
2351  011442  001357                          BNE     1$
2352
2353  011444  000425                          BR      EXCUT           ;NO POSITIONED COMMAND WAS
2354                                                                  ;FOUND IN THE Q. SO EXECUTE
2355                                                                  ;COMMAND POINTED TO BY R0
2356
2357
2358                                                                  ;AN ALREADY POSITIONED COMMAND HAS
2359                                                                  ;BEEN FOUND.
2360  011446  01C137  0C1536          3$:     MOV     R1,SAVKEY       ;SAVE POINTER TO THE COMMAND(KEY)
2361                                                                  ;WHICH IS ALREADY POSITIONED
2362  011452  004737  012072                  JSR     PC,POSK         ;GO AND POSITION THE COMMAND(KEY)
2363                                                                  ;POINTED TO BY R0
2364  011456  004737  020256                  JSR     PC,POSCMND      ;SAVE INFO ABOUT PAST & PRESENT COMAND
2365  011462  012777  000111  167532         MOV     #111,@RKCS      ;SEEK, IDE, GO
2366  011470  005046                          CLR     -(SP)           ;ALLOW FIRST INTERRUPT
2367  011472  012746  011500                 MOV     #4$,-(SP)       ;RETURN FOR RTI **********
2368  011476  000002                          RTI
2369
2370
2371  011500  105737  001535          4$:     TSTB    INT1FL          ;DID INTERRUPT OCCUR?
2372  011504  001775                          BEQ     4$              ;BR IF NOT
2373  011506  012777  013164  167524         MOV     #INTHND,@RKVEC  ;REESTABLISH INTERRUPT ADDRESS
2374  011514  013700  001536                 MOV     SAVKEY,R0       ;RESTORE THE SAVED POINTER TO KEY
```

```
                                                        ;EXECUTE THE COMMAND POINTED TO BY RC
                                                        ;R0 CONTAINS THE POINTER TO THE
                                                        ;COMMAND KEY
011520  011001          EXCUT:  MOV     (R0),R1         ;GET DRIVE NO
011522  042701  177770          BIC     #177770,R1
011526  005710                  TST     (R0)            ;THIS COMMAND UNFINISHED?
011530  100004                  BPL     1$
011532  011037  001162          MOV     (R0),$REG0      ;GET KEY
011536  104030                  ERROR   30              ;IF NOT, ERROR
                                                        ;AN ATTEMPT WAS MADE TO REEXECUTE A COMMAND
                                                        ;THAT HAS ALREADY BEEN EXECUTED BEFORE.
                                                        ;(ON DRIVE NO. GIVEN IN ERROR MESSAGE.
011540  000512                  BR      ABRT1
011542  105710          1$:     TSTB    (R0)            ;IS IT IN PROGRESS?
011544  100004                  BPL     3$
011546  011037  001162          MOV     (R0),$REG0      ;GET KEY
011552  104030                  ERROR   30              ;IF YES, ERROR

011554  000504                  BR      ABRT1           ;AN ATTEMPT WAS MADE TO REEXECUTE A COMMAND
                                                        ;THAT IS IN PROGRESS (ON DRIVE NO. GIVEN
                                                        ;IN EROR MESAGE.

011556  105761  001426          TSTB    BUSY(R1)        ;IS THE DRIVE BUSY?
011562  100004                  BPL     4$
011564  010137  001162          MOV     R1,$REG0        ;GET DRIVE #
011570  104002                  ERROR   2               ;'BUSY' FLAG FOR THE DRIVE (CONTAINED
011572  000470                  BR      ABRT            ;IN R1) IS SET, INDICATING THAT THE DRIVE
                                                        ;IS 'BUSY' AND ENGAGED IN AN ACTIVITY.
                                                        ;STILL AN ATTEMPT WAS MADE TO INITIATE
                                                        ;A FUNCTION ON THIS DRIVE.  THIS IS AN
                                                        ;UNEXCEPTED ERROR CONDITION.

011574  105777  167422          TSTB    @RKCS   4$:     ;CONTROL READY SET?
011600  100424                  BMI     5$              ;YES
011602  004737  021740          JSR     PC,GT4RG        ;GET RKCS, ER, DS, DA
011606  104003                  ERROR   3               ;CONTROL READY IS NOT SET.  THIS IS AN
011610  000461                  BR      ABRT            ;UNEXPECTED ERROR CONDITION AT THIS
                                                        ;POINT OF EXECUTION, CONTROL SHOULD
                                                        ;BE NORMALLY READY.

011612  011002          5$:     MOV     (R0),R2
011614  000302                  SWAB    R2
011616  042702  177770          BIC     #177770,R2      ;FORM THE ADDRESS OF THE
011622  006302                  ASL     R2              ;PARAMETER LIST FOR THIS
011624  010204                  MOV     R2,R4           ;COMMAND
011626  016205  002032          MOV     PCMND(R2),R5

011632  011577  167372          MOV     (R5),@RKDA      ;GET THE FIRST ITEM FROM LIST
                                                        ;DISK ADDRES
011636  032777  000100  167352  BIT     #RWS,@RKDS      ;R/W/S RDY SET?
011644  001006                  BNE     6$              ;YES
011646  010137  001250          MOV     R1,SRDRV        ;GET DRIVE #, FOR TYPING SERIAL #
011652  004737  021740          JSR     PC,GT4RG        ;GET RKCS, ER, DS, DA
011656  104004                  ERROR   4               ;R/W/S RDY IS NOT SET FOR THE DRIVE.
011660  000435                  BR      ABRT            ;A (NON-SEEK) FUNCTION WAS SUPPOSED
                                                        ;TO BE EXECUTED ON THIS DRIVE.  THIS IS
                                                        ;AN UNEXPECTED ERROR CONDITIONS AT THIS
```

```
                                                                ;POINT OF EXECUTION R/W/S RDY SHOULD
                                                                ;BE NORMALLY SET.
011662  016503  000002          6$:     MOV     2(R5),R3        ;GET FUNCTION TO BE DONE

011666  122703  000002                  CMPB    #2,R3           ;IS IT A WRITE FUNCTION?
011672  001437                          BEQ     WRFNC           ;YES, IT IS WRITE
                                                                ;IT'S NOT A WRITE FUNCTION

011674  016503  000002          NWRFNC: MOV     2(R5),R3        ;GET FUNCTION TO BE DONE
011700  052703  000501                  BIS     #501,R3         ;SET SSE,IDE,GO BITS
011704  016577  000004  167312        MOV     4(R5),@RKWC     ;GET WORD COUNT
011712  016577  000006  167306        MOV     6(R5),@RKBA     ;GET BUS ADDRESS

011720  004737  020300                  JSR     PC,FNCMND       ;SAVE INFO ABOUT PAST & PRESENT COMAND

011724  010377  167272                  MOV     R3,@RKCS        ;SET SSE.IDE, FUNCTION, GO

011730  052710  000200                  BIS     #BIT7,(R0)      ;SET FLAG INDICATING FUNCTION
011734  052704  000200                  BIS     #BIT7,R4        ;IN PROGRESS
                                                                ;R4 CONTAINS OFFSET TO THE COMMAND KEY
                                                                ;(FROM 'KEY') BITS 0-3, BIT 7 IS SET
011740  110461  001426                  MOVB    R4,BUSY(R1)     ;SET FLAG INDICATING DRIVE BUSY
011744  110437  001534                  MOVB    R4,INTFLG       ;SET FLAG FOR INTERUPT USE
011750  000137  021344                  JMP     STATUS

011754  004737  014334          ABRT:   JSR     PC,DRVABT       ;ABORT THE FUNCTION
011760  004737  016446                  JSR     PC,CHKDRV       ;GO CHECK, DRIVE ERRORS
011764  000240                          NOP
011766  000137  010556          ABRT1:  JMP     @MNGER
```

```
                                                                ;THE FUNCTION TO BE EXECUTED IS A
                                                                ;WRITE FUNCTION
012772  016537  000004  012012  WRFNC:  MOV     4(R5),1$       ;GET # OF WORDS TO BE WRITTEN
012000  016537  000006  012014          MOV     6(R5),2$       ;GET STARTING BA OF BUFFER
012006  004537  016612                  JSR     R5,GENBUF      ;GO GENERATE BUFFER
012012  000000                  1$:     .WORD   0              ;SAVE # OF WORDS
012014  000000                  2$:     .WORD   0              ;SAVE STARTING BUS ADDRESS OF BUFFER
012016  052703  000101                  BIS     #101,R3        ;SET IDE AND GO BIT
012022  013777  012012  167174          MOV     1$,@RKWC       ;SET WORD COUNT
012030  013777  012014  167170          MOV     2$,@RKBA       ;SET BUS ADDRESS
012036  004737  020300                  JSR     PC,FNCMND      ;SAVE INFO ABOUT PAST & PRESENT COMAND

012042  010377  167154                  MOV     R3,@RKCS       ;ISSUE WRITE,IDE,GO
012046  052710  000200                  BIS     #BIT7,(R0)     ;SET FLAG INDICATING FUNCTION IN
012052  052704  000200                  BIS     #BIT7,R4       ;PROGRESS

012056  110461  001426                  MOVB    R4,BUSY(R1)    ;SET FLAG INDICATING DRIVE BUSY
012062  110437  001534                  MOVB    R4,INTFLG      ;SET FLAG FOR INTERUPT USE
                                                               ;R4 CONTAINS OFFSET TO THE COMMAND KEY
                                                               ;(FROM 'KEY') BITS 0-3, BIT 7 IS SET
012066  000137  021344                  JMP     STATUS
```

```
2481  012072  011001          POSK:   MOV     (R0),R1         ;INITIAL CHECKING PRIOR TO DOING
2482  012074  042701  177770          BIC     #177770,R1      ;POSITIONING COMMAND POINTED TO BY R0
2483  012100  105761  001426          TSTB    BUSY(R1)        ;DRIVE BUSY?
2484  012104  100004                  BPL     1$
2485  012106  010137  001162          MOV     R1,$REGD        ;GET DRIVE # FOR WHICH 'BUSY' IS SET
2486  012112  104002                  ERROR   2               ;'BUSY' FLAG FOR THE DRIVE (CONTAINED
2487  012114  000470                  BR      7$              ;IN R1) IS SET, INDICATING THAT THE DRIVE
2488                                                          ;IS 'BUSY' AND ENGAGED IN AN ACTIVITY,
2489                                                          ;STILL AN ATTEMPT WAS MADE TO INITIATE
2490                                                          ;POSITIONINGN ON THIS DRIVE.  THIS IS AN
2491                                                          ;UNEXCEPTED ERROR CONDITION.
2492  012116  105777  167100          1$:     TSTB    @RKCS           ;CONTROL READY SET?
2493  012122  100404                  BMI     2$              ;YES
2494  012124  004737  021740                  JSR     PC,GT4RG        ;GET RKCS, ER, DS, DA
2495  012130  104003                  ERROR   3               ;CONTROL READY IS NOT SET.  THIS IS AN
2496  012132  000454                  BR      6$              ;UNEXPECTED ERROR CONDITION AT THIS
2497                                                          ;POINT OF EXECUTION, CONTROL SHOULD
2498                                                          ;BE NORMALLY READY.
2499  012134  011002          2$:     MOV     (R0),R2
2500  012136  000302                  SWAB    R2
2501  012140  042702  177770          BIC     #177770,R2
2502  012144  006302                  ASL     R2
2503  012146  016203  002032          MOV     PCMND(R2),R3    ;STARTING WORD OF COMMAND TABLE
2504  012152  011377  167052          MOV     (R3),@RKDA
2505  012156  032777  000100  167032  BIT     #RWS,@RKDS      ;R/W/S RDY SET?
2506  012164  001006                  BNE     3$              ;YES
2507  012166  010137  001250          MOV     R1,SRDRV        ;GET DRIVE #, FOR TYPING SERIAL #
2508  012172  004737  021740                  JSR     PC,GT4RG        ;GET RKCS, ER, DS, DA
2509  012176  104004                  ERROR   4               ;R/W/S RDY IS NOT SET FOR THE DRIVE.  A
2510  012200  000431                  BR      6$              ;(POSITIONING) SEEK WAS SUPPOSED TO BE
2511                                                          ;BE EXECUTED ON THIS DRIVE.  THIS IS
2512                                                          ;AN UNEXPECTED ERROR CONDITION.  AT THIS
2513                                                          ;POINT OF EXECUTION R/W/S RDY SHOULD
2514                                                          ;BE NORMALLY SET.
2515  012202  110261  001426          3$:     MOVB    R2,BUSY(R1)     ;SET FLAG INDICATING DRIVE BUSY
2516  012206  152761  000200  001426          BISB    #BIT7,BUSY(R1)
2517  012214  032710  000010                  BIT     #BIT3,(R0)      ;IS THIS A SEEK COMMAND
2518  012220  001006                  BNE     4$
2519  012222  112761  000377  001436          MOVB    #377,POS(R1)    ;SET FLAG INDICATING, THIS DRIVE POSITIONS
2520  012230  052710  000020                  BIS     #BIT4,(R0)      ;SET FLAG INDICATING THIS COMMAND
2521  012234  000402                  BR      5$
2522  012236  052710  000200          4$:     BIS     #BIT7,(R0)      ;POSITIONED.  SET FLAG INDICATING
2523                                                          ;FUNCTION IN PROGRESS
2524  012242  012777  012304  166770  5$:     MOV     #INTISK,@RKVEC  ;SET UP RK11 VECTOR
2525  012250  013777  001244  166764          MOV     PPRLVL,@RKSTAT  ;PSW ON INTERRUPT
2526  012256  105037  001535                  CLRB    INTIFL          ;CLEAR FLAG INDICATING - INTERRUPT
2527  012262  000207                  RTS     PC              ;OCCURRED
2528
2529  012264  004737  014334          6$:     JSR     PC,DRVABT       ;ABORT THE FUNCTION
2530  012270  004737  016446                  JSR     PC,CHKDRV       ;GO CHECK, DRIVE ERRORS
2531  012274  000240                  NOP
2532  012276  005726                  7$:     TST     (SP)+           ;POP THE RETURN ADDRESS
2533  012300  000137  010556                  JMP     @MNGER
```

```
                                        ;AFTER ISSUING A SEEK FOR POSITIONING, AN INTERRUPT IS ALLLOWED TO TAKE
                                        ;*PLACE. THIS HANDLER SERVICES THE FIRST INTERRUPT, WHICH OCCURS AS A RESULT
                                        ;OF THE SEEK BEING ACCEPTED.

012304  105237  001535        INTISK: INCB    INT1FL          ;INDICATE THAT INTERRUPT TOOK PLACE
012310  053766  001244  000002        BIS     PPRLVL,2(SP)    ;CPU PRIORITY TO 5 ON RETURN FROM
                                                              ;INTERRUPT

012316  004737  020200                JSR     PC,CHKCRDY      ;CONTROL READY SET?
012322  104005                        ERROR   5               ;CONTROL READY NOT SET AFTER THE FIRST
                                                              ;INTERRUPT ON INITIATING SEEK

012324  032777  020000  166670        BIT     #SCP,@RKCS      ;SCP BIT SET?
012332  001403                        BEQ     1$
012334  004737  022130                JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE # FOR
                                                              ;TYPING SERIAL DRIVE #
012340  104012                        ERROR   12              ;SCP SET AFTER FIRST INTERRUPT ON
                                                              ;ACCEPTING SEEK.  A SEEK WAS INITIATED,
                                                              ;AS A RESULT OF WHICH (THIS, FIRST
                                                              ;INTERRUPT OCCURRED, BUT SCP SHOULD
                                                              ;NOT BE SET AFTER THE FIRST INTERRUPT.
                                                              ;(IT GETS SET ONLY AFTER THE SEEK
                                                              ;IS DONE).
                                                              ;THIS IS THE FIRST INTERRUPT
                                                              ;AFTER ISSUING SEEK

012342  017700  166654        1$:     MOV     @RKCS,R0
012346  042700  177760                BIC     #177760,R0      ;CHECK THERE IS A SEEK FUNCTION
012352  022700  000010                CMP     #10,R0          ;IN RKCS
012356  001403                        BEQ     2$
012360  004737  021740                JSR     PC,GT4RG        ;GET RKCS,ER,DS,DA
012364  104006                        ERROR   6               ;RKCS DOES NOT CONTAIN 'SEEK' FUNCTION.
                                                              ;A SEEK WAS INITIATED AS A RESULT OF WHICH
                                                              ;(THIS) FIRST INTERRUPT OCCURRED.  RKCS
                                                              ;SHOULD CONTAIN THE SEEK FUNCTION BITS.
                                                              ;BUT IT DID NOT

012366  017700  166636        2$:     MOV     @RKDA,R0        ;GET THE DRIVE # FROM RKDA
012372  042700  017777                BIC     #17777,R0
012376  000241                        CLC
012400  006100                        ROL     R0
012402  006100                        ROL     R0
012404  006100                        ROL     R0
012406  006100                        ROL     R0
012410  010001                        MOV     R0,R1
012412  105761  001426                TSTB    BUSY(R1)        ;CHECK THIS DRIVE NO. WAS BUSY
012416  100403                        BMI     3$              ;OK, IF IT WAS
012420  010137  001162                MOV     R1,$REG0        ;GET DRIVE #(FROM RKDA)
012424  104007                        ERROR   7               ;'BUSY' FLAG FOR THE DRIVE WAS NOT SET.
                                                              ;THE DRIVE # (IN RKDA) WHICH CAUSED (?)
                                                              ;THIS (FIRST) INTERRUPT SHOULD HAVE BEEN
                                                              ;'BUSY' (SOFTWARE FLAG).  NOTE WHENEVER
                                                              ;ANY OPERATION IS INITIATED ON ANY DRIVE
                                                              ;'BUSY' FLAG FOR THAT DRIVE IS SET.

012426  116100  001426        3$:     MOVB    BUSY(R1),R0
012432  042700  177600                BIC     #177600,R0      ;FORM THE ADDRESS OF
012436  062700  001306                ADD     #KEY,R0         ;THIS KEY
```

```
                                                                
012442  032710  000020            BIT     #BIT4,(R0)      ;IS THE KEY ACTIVE FOR 'POSITIONING'?
012446  001003                    BNE     4$
012450  010137  001162            MOV     R1,$REG0        ;GET DRIVE NUMBER
012454  104010                    ERROR   10              ;POSITIONING FLAG (IN THE KEY) IS NOT
                                                        ;SET FOR THE INTERRUPTING DRIVE (GIVEN
                                                        ;IN EROR MESAGE)
                                                                
012456  105761  001436    4$:     TSTB    POS(R1)         ;IS THE 'POSITIONING' FLAG SET?
012462  001003                    BNE     5$
012464  010137  001162            MOV     R1,$REG0        ;GET DRIVE # FROM RKDA
012470  104010                    ERROR   10              ;THIS INTERRUPT IS SUPPOSED TO BE AS
                                                        ;A RESULT OF INITIATING A (POSITIONING)
                                                        ;SEEK.  WHENEVER A SEEK IS INITIATED
                                                        ;TO POSITION THE HEADS THE POSITIONING
                                                        ;FLAG (POS#) IS SET. OCCURANCE OF THIS
                                                        ;ERROR INDICATED THAT THE DRIVE #
                                                        ;(FROM RKDA)GIVING THIS INTERRUPT DID
                                                        ;NOT HAVE ITS POSITIONING FLAG SET.
                                                                
012472  005777  166524    5$:     TST     @RKCS           ;ANY ERROR?
012476  100044                    BPL     8$              ;NO - RETURN
                                                                
012500  032737  000040  001474    BIT     #BIT5,ERCODE
012506  001012                    BNE     6$              ;SAME ERROR
012510  042737  000040  001474    BIC     #BIT5,ERCODE
012516  001026                    BNE     7$
012520  052737  000040  001474    BIS     #BIT5,ERCODE
                                                                
012526  004737  022130            JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE # FOR
                                                        ;TYPING SERIAL DRIVE #
012532  104011                    ERROR   11              ;BIT 15, 'ERR' SET IN RKKCS AFTER FIRST
                                                        ;INTERRUPT - WHICH OCCURRED AFTER A
                                                        ;POSITIONING SEEK WAS INITIATED.  RKER
                                                        ;WILL CONTAIN ERROR BIT/S
012534  042710  000020    6$:     BIC     #BIT4,(R0)      ;CLEAR 'POSITIONING' BIT
012540  105061  001426            CLRB    BUSY(R1)        ;CLEAR 'BUSY' FLAG
012544  105061  001436            CLRB    POS(R1)         ;CLEAR 'POSITIONING' FLAG
                                                                
012550  004737  015714            JSR     PC,CLRERR       ;CLEAR THE ERROR
012554  052710  010000            BIS     #BIT12,(R0)     ;INDICATE HIGH PRIORITY ON
012560  105261  001446            INCB    RETRY(R1)       ;INCREMENT RETRY COUNT
012564  126127  001446  000003    CMPB    RETRY(R1),#3    ;DONE RETRIES?
012572  003406                    BLE     8$              ;NO
                                                                
012574  004737  014334    7$:     JSR     PC,DRVABT       ;ABORT THE FUNCTION
012600  005061  001446            CLR     RETRY(R1)
012604  005037  001474            CLR     ERCODE
                                                                
012610  000002    8$:     RTI
```

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                                                        ;THIS ROUTINE IS ENTERED UPON COMPLETION
                                                        ;OF A SEEK OPERATION UNDER INTERRUPT MODE
012612  004737  020200          SKCMP:  JSR     PC,CHKCRDY      ;CONTROL READY SET?
012616  104013                  ERROR   13              ;CONTROL RDY NOT SET, AFTER A SEEK
                                                        ;DONE INTERRUPT!
012620  017746  166372          1$:     MOV     @RKDS,-(SP)     ;GET DRIVE # THAT INTERRUPTED
012624  004737  022076          JSR     PC,CROTLF       ;ROTATE BITS 15,14,13 TO POSITION
                                                        ;0,1,2
012630  012601                  MOV     (SP)+,R1        ;GET THE ROTATED BITS (DRIVE ID BITS)
012632  105761  001426          TSTB    BUSY(R1)        ;CHECK THAT DRIVE WAS BUSY
012636  100403                  BMI     2$
012640  004737  021740          JSR     PC,GT4RG
012644  104014                  ERROR   14              ;'BUSY' FLAG FOR THE INTERRUPTING DRIVE
                                                        ;(RKDS) WAS NOT SET.  DRIVE # (15,14,13 - RKDS)
                                                        ;INTERRUPTED AFTER SEEK WAS COMPLETE, BUT
                                                        ;'BUSY' FLAG CORRSPONDING TO THAT DRIVE
                                                        ;WAS CLEAR.  IF THE CORRECT DRIVE WAS
                                                        ;INTERRUPTING 'BUSY' FLAG SHOULD HAVE
                                                        ;BEEN SET.
012646  116100  001426          2$:     MOVB    BUSY(R1),R0     ;FORM THE ADDRESS OF THE
012652  042700  177600          BIC     #177600,R0      ;KEY
012656  062700  001306          ADD     #KEY,R0
012662  032710  000020          BIT     #BIT4,(R0)      ;CHECK THAT POSITION BIT WAS SET
012666  001003                  BNE     3$
012670  010137  001162          MOV     R1,$REG0        ;GET DRIVE NUMBER
012674  104010                  ERROR   10              ;POSITIONING FLAG (IN KEY) IS NOT SET
                                                        ;SET FOR INTERRUPTING DRIVE (GIVEN IN EROR
                                                        ;MESAGE)
012676  105761  001436          3$:     TSTB    POS(R1)         ;CHECK POSITIONING FLAG WAS SET
012702  001003                  BNE     4$
012704  010137  001162          MOV     R1,$REG0
012710  104010                  ERROR   10              ;  POSITIONING' FLAG WAS CLEAR.  WHEN
                                                        ;GOING A (POSITIONING) SEEK, THE FLAG
                                                        ;'POS#' IS SET TO INDICATE THAT DRIVE
                                                        ;IS POSITIONING HEADS (SEEKING).  THIS
                                                        ;ERROR INDICATES THAT FOR THE INTERRUPTING
                                                        ;DRIVE (RKDS) POSITIONING FLAG WAS
                                                        ;NOT SET.
012712  004737  016446          4$:     JSR     PC,CHKDRV       ;GO, CHECK FOR DRV ERORS (DPL,DRU,DRY,WPS)
012716  000501                  BR      PFTERR          ;IF THERE IS A DRV EROR, RETURN HERE
                                                        ;THE DRIVE HAS BEEN DESELECTED, ALL
                                                        ;FURTHER COMANDS ON THAT DRIVE ABORTED
                                                        ;RETURRN HERE IF NO DRIVE ERRORS
012720  017777  166272  166302          MOV     @RKDS,@RKDA     ;GET THE DRIVE # FROM DRIVE ID BITS
                                                        ;IN RKDS AND ADDRESS THE DRIVE
012726  032777  000100  166262          BIT     #RWS,@RKDS      ;R/W/S RDY SET?
012734  001005                  BNE     5$              ;YES
012736  004737  021740          JSR     PC,GT4RG        ;GET RKCS,ER,DS,DA
012742  010137  001250          MOV     R1,$RDRV        ;GET DRIVE #, FOR TYPING SERIAL #
012746  104015                  ERROR   15              ;R/W/S RDY NOT SET FOR INTERRUPTING
                                                        ;DRIVE (RKDS), AFTER SEEK WAS COMPLETED.
012750  032777  001000  166240  5$:     BIT     #SIN,@RKDS      ;'SIN' ERROR?
012756  001007                  BNE     PSINER          ;YES, BRANCH
```

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2696  012760  032777  040000  166234          BIT     #HE,@RKCS       ;ANY HARD ERROR?
2697  012766  001060                          BNE     PORKER          ;YES
2698                                          ;NO ERRORS DETECTED ON POSITIONING
2699  012770  105061  001426                  CLRB    BUSY(R1)        ;CLEAR BUSY FLAG FOR THIS DRIVE
2700  012774  000207                          RTS     PC
```

```
2701                                                    ;THERE WAS A 'SIN' ERROR ON
2702                                                    ;DOING POSITIONING (SEEK)
2703  012776  004737  021740          PSINER: JSR     PC,GT4RG
2704  013002  010137  001250                  MOV     R1,SRDRV        ;GET DRIVE #, FOR TYPING SERIAL #
2705  013006  104016                          ERROR   16              ;'SIN' ON DOING (POSITIONING) SEEK
2706  013010  042710  000020                  BIC     #BIT4,(R0)      ;CLEAR 'POSITIONING' BIT
2707  013014  105061  001436                  CLRB    POS(R1)         ;CLEAR POSITTIONING FLAG
2708  013020  105061  001426                  CLRB    BUSY(R1)        ;CLEAR BUSY FLAG FOR THIS DRIVE
2709  013024  004737  016060                  JSR     PC,CLRSIN       ;CLEAR 'SIN' ERROR
2710
2711  013030  004737  016172                  JSR     PC,SINCNT       ;KEEP COUNT OF 'SIN' ERRORS. IF MORE
2712                                                                  ;THAN 'MAX' DESELECT THE DRIVE
2713  013034  000432                          BR      PFTERR          ;RETUN HERE IF COUNT=MAX
2714
2715                                                                  ;RETURN HERE IF COUNT LESS THAN MAX
2716  013036  105261  001446          PSRTRY: INCB    RETRY(R1)       ;INCRMNT REETRY COUNT
2717  013042  105061  001436                  CLRB    POS(R1,         ;CLEAR POSITION FLAG
2718  013046  105061  001426                  CLRB    BUSY(R1)        ;CLEAR BUSY FLAG
2719  013052  122761  000003  001446          CMPB    #3,RETRY(R1)    ;DONE ALL RETRIES?
2720  013060  001403                          BEQ     1$              ;YES
2721  013062  052710  010000                  BIS     #BIT12,(R0)     ;SET HI PRIORITY ON RETRY
2722  013066  000207                          RTS     PC              ;RETURN
2723
2724  013070  052710  104000          1$:     BIS     #104000,(R0)    ;INDICATE COMMAND ABORTED
2725  013074  105061  001446                  CLRB    RETRY(R1)       ;CLEAR RETRY COUNT FOR FUTURE USE
2726  013100  010102                          MOV     R1,R2
2727  013102  006302                          ASL     R2
2728  013104  005262  001672                  INC     ABORT(R2)       ;INCREMENT ABORT COUNT
2729  013110  042710  010000                  BIC     #BIT12,(R0)     ;CLR HI PRIORITY  BIT
2730  013114  104421  002165                  TYPMSG  ,MSG10          ;PRINT ABORT MESSAGE
2731  013120  000207                          RTS     PC
2732
2733  013122  042710  010000          PFTERR: BIC     #BIT12,(R0)     ;CLEAR HI PRIORITY BIT IF SET
2734  013126  000207                          RTS     PC
2735
2736  013130  004737  021740          PORKER: JSR     PC,GT4RG        ;IF ANY ERROR BIT IN RKCS SET
2737  013134  010137  001250                  MOV     R1,SRDRV        ;GET DRIVE #, FOR TYPING SERIAL #
2738  013140  104017                          ERROR   17              ;ON DOING POSITIONING (SEEK)
2739                                                                  ;ENTER HERE
2740
2741  013142  004737  015714                  JSR     PC,CLRERR       ;GO CLEAR THE HARD ERROR
2742  013146  042710  000020                  BIC     #BIT4,(R0)      ;CLEAR POSITIONING BIT IN KEY
2743  013152  105061  001436                  CLRB    POS(R1)         ;CLEAR POSITIONING FLAG FOR THIS DRIVE
2744  013156  105061  001426                  CLRB    BUSY(R1)        ;CLEAR BUSY FLAG FOR THIS DRIVE
2745  013162  000725                          BR      PSRTRY
```

```
2746
2747
2748
2749  013164  105037  001534          INTHND: CLRB    INTFLG          ;ENTER THIS ROUTINE WHEN AN INTERRUPT
2750                                                                  ;OCCURS. NOTE THERE IS ONE OTHER
2751  013170  013766  001244  000002          MOV     PPRLVL,2(SP)    ;INTERRUPT ROUTINE- 'INTISK'
2752  013176  004737  020200                  JSR     PC,CHKCRDY      ;CLEAR FLAG TO INDICATE THAT
2753  013202  104024                          ERROR   24              ;AN INTERRUPT OCCURED.
2754                                                                  ;CPU PRIORITY TO 5 ON RTI
2755  013204  032777  020000  166010  1$:     BIT     #SCP,@RKCS      ;CONTROL READY SET?
2756  013212  001403                          BEQ     2$              ;CONTROL RDY CLEAR AFTER INTRUPT ON COMPLETION
2757  013214  004737  012612                  JSR     PC,SKCMP        ;OF FUNCTION, IT SHOULD BE SET
2758  013220  000002                          RTI                     ;SCP SET? SEARCH COMPLETE?
2759  013222  017746  166002          2$:     MOV     @RKDA,-(SP)     ;GO TO SEEK COMPLETE ROUTINE
2760
2761                                                                  ;GET THE DRIVE # TO WHICH
2762  013226  004737  022076                  JSR     PC,CROTLF       ;THE COMMAND WAS ISSUED UNDER
2763                                                                  ;INTERRUPT MODE
2764  013232  012605                          MOV     (SP)+,R5        ;ROTATE BITS 15,14,13 TO POSITION
2765  013234  105765  001426                  TSTB    BUSY(R5)        ;0,1,2
2766  013240  100403                          BMI     3$              ;POP OFF THE DRIVE # FROM THE STACK
2767  013242  010537  001162                  MOV     R5,$REGO        ;CHECK THAT DRIVE WAS BUSY
2768  013246  104007                          ERROR   7
2769                                                                  ;'BUSY' FLAG FOR THE INTERUPTING DRIVE
2770                                                                  ;WAS NOT SET.  WHENEVER ANY ACTIVITY
2771                                                                  ;IS INITIATED ON A DRIVE, THE (SOFTWARE)
2772                                                                  ;'BUSY' FLAG IS SET TO INDICATE THAT
2773                                                                  ;DRIVE IS BUSY DOING SOMETHING.
2774                                                                  ;OCCURANCE OF THIS ERROR INDICATES
2775                                                                  ;THAT THE 'BUSY' FLAG FOR THE INTERRUPTING
2776  013250  105065  001436          3$:     CLRB    POS(R5)         ;DRIVE (RKDA) IS CLEAR!
2777  013254  116500  001426                  MOVB    BUSY(R5),R0     ;CLEAR THE POSITION FLAG
2778  013260  042700  177760                  BIC     #177760,R0      ;GET THE ADDRESS OF THE
2779  013264  062700  001306                  ADD     #KEY,R0         ;COMMAND KEY
2780  013270  032710  000010                  BIT     #BIT3,(R0)      ;CHECK IT'S NOT A SEEK FUNCTION
2781  013274  001401                          BEQ     4$
2782  013276  104020                          ERROR   20              ;(SOFTWARE) FLAG FOR THE INTERRUPTING
2783                                                                  ;DRIVE (RKDA) INDICATES THAT A SEEK
2784                                                                  ;FUNCTION WAS BEING EXECUTED ON THE
2785                                                                  ;DRIVE.  IF THAT'S THE CASE, SCP BIT SHOULD
2786                                                                  ;HAVE SET ON SEEK DONE INTRUPT, BUT IT
2787                                                                  ;WAS NOT.  NOTE, HERE THERE IS A CHANGE
2788                                                                  ;OF MULTIPLE ERRORS OR ERROR
2789                                                                  ;MISINTERPRETATION
2790  013300  105710                  4$:     TSTB    (R0)            ;CHECK THAT FUNCTION IN
2791  013302  100403                          BMI     5$              ;PROGRESS BIT WAS SET
2792  013304  010537  001162                  MOV     R5,$REGO        ;GET DRIVE NUMBER
2793  013310  104031                          ERROR   31              ;IF NOT, ERROR
2794                                                                  ;'FUNCTION IN PROGRESS' FLAG (IN THE KEY)
2795                                                                  ;WAS NOT SET FOR THE INTERRUPTING DRIVE.
2796                                                                  ;IF THIS DRIVE WAS BUSY DOING THE
2797                                                                  ;FUNCTION, THE ABOVE FLAG SHOULD BE SET.
2798  013312  011002                  5$:     MOV     (R0),R2         ;CHECK THAT THE INTERRUPTING
2799  013314  042702  177770                  BIC     #177770,R2      ;DRIVE (IN RKDA) IS THE SAME AS
2800  013320  020502                          CMP     R5,R2           ;THE DRIVE IN THE KEY
2801  013322  001405                          BEQ     6$
```

```
 2822  013324  010537  001162            MOV     R5,$REGO        ;GET EXPCTD DRIVE NO.
 2823  013330  010237  001164            MOV     R2,$REG1        ;GET DRIVE NO. RECVD
 2824  013334  104032                    ERROR   32              ;UNEXPECTED DRIVE NO. INTERRUPTED
 2825  013336  006302                6$: ASL     R2
 2826  013340  011003                    MOV     (R0),R3
 2827  013342  010037  001536            MOV     R0,SAVKEY
 2828  013346  000303                    SWAB    R3
 2829  013350  042703  177770            BIC     #177770,R3      ;GET POSITION OF THE PARAMETER
 2830  013354  006303                    ASL     R3              ;LIST FROM THE KEY
 2831  013356  017704  165640            MOV     @RKCS,R4
 2832  013362  042704  177761            BIC     #177761,R4      ;CLEAR ALL BUT FUNCTION CODE
 2833  013366  016305  002032            MOV     PCMND(R3),R5    ;CHECK THAT THE FUNCTION IN
 2834                                                            ;RKCS AND THE KEY ARE SAME.
 2835  013372  126504  000002            CMPB    2(R5),R4
 2836
 2837  013376  001406                    BEQ     7$              ;IF NOT, ERROR
 2838  013400  016537  000002  001162    MOV     2(R5),$REGO     ;GET EXPCTD FUNCTION CODE IN RKCS
 2839  013406  010437  001164            MOV     R4,$REG1        ;GET CODE RECVD
 2840  013412  104033                    ERROR   33              ;FUNCTION CODE THAT IS IN RKCS AFTER THIS
 2841                                                            ;INTERRUPT OCCURED IS NOT THE EXPECTED ONE
 2842  013414  042710  000200        7$: BIC     #BIT7,(R0)      ;CLEAR 'FUNCTION IN PROGRESS' BIT
 2843  013420  142761  000200  001426    BICB    #BIT7,BUSY(R1)  ;CLEAR BUSY FLAG FOR THIS DRIVE
 2844  013426  004737  016446            JSR     PC,CHKDRV       ;CHECK FOR DRIVE ERRORS
 2845  013432  000002                    RTI                     ;IF THERE WAS ANY DRIVE EROR
 2846                                                            ;DESELECT THE DRIVE AND EXIT
 2847                                                            ;IF NO ERROR, RETURN HERE
 2848  013434  032777  001000  165554    BIT     #SIN,@RKDS      ;SIN ERROR?
 2849  013442  001426                    BEQ     10$
 2850  013444  004737  022130            JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE # FOR
 2851                                                            ;TYPING SERIAL DRIVE #
 2852  013450  104016                    ERROR   16              ;SIN ERROR
 2853  013452  004737  016060            JSR     PC,CLRSIN
 2854  013456  004737  016172            JSR     PC,SINCNT       ;HELP COUNT OF SIN'S. IF MORE
 2855                                                            ;THAN MAXM ALLOWABLE, DESELECT THE DRIVE
 2856  013462  000002                    RTI                     ;RETURN HERE IF COUNT=MAX
 2857                                                            ;RETURN HERE IF LESS THAN MAX
 2858  013464  105261  001446            INCB    RETRY(R1)
 2859  013470  122761  000003  001446    CMPB    #3,RETRY(R1)
 2860  013476  001405                    BEQ     8$
 2861  013500  052710  010000            BIS     #BIT12,(R0)
 2862  013504  042710  000020            BIC     #BIT4,(R0)
 2863  013510  000002                    RTI
 2864
 2865  013512  004737  014334        8$: JSR     PC,DRVABT       ;ABORT THIS FUNCTION
 2866  013516  000002                9$: RTI
 2867
 2868  013520  032777  040000  165474 10$: BIT     #HE,@RKCS       ;HARD ERROR?
 2869  013526  001076                    BNE     HRDERR
 2870  013530  032777  100000  165464    BIT     #ERR,@RKCS      ;SOFT ERROR?
 2871  013536  001002                    BNE     SFTERR          ;YES
 2872  013540  000137  014206            JMP     NOEROR          ;NO
```

```
                                                                ;THERE WAS A SOFT ERROR
                                                                ;
                                                                ;
013544  032777  000001  165446  SFTERR: BIT     #WCE.@RKER      ;WCE?
013552  001417                  BEQ     1$
                                                                ;
013554  032737  000001  001474          BIT     #BIT0,ERCODE    ;ALREADY WORKING ON A WC ERROR?
013562  001054                  BNE     3$                      ;YES - IGNORE THIS ONE
013564  042737  000001  001474          BIC     #BIT0,ERCODE    ;ANY OTHER ERROR?
013572  001052                  BNE     4$                      ;YES - ABORT THIS FUNCTION
013574  052737  000001  001474          BIS     #BIT0,ERCODE    ;SET THE WC ERROR BIT
                                                                ;
013602  005262  001632                  INC     WCECN(R2)       ;INCREMENT WCE COUNT FOR
013606  104421  002070                  TYPMSG  .MSG2           ;THIS DRIVE
                                                                ;
013612  032777  000002  165400  1$:     BIT     #CSE.@RKER      ;CSE?
013620  001417                  BEQ     2$
                                                                ;
013622  032737  000002  001474          BIT     #BIT1,ERCODE    ;ALREADY WORKING ON A CS ERROR?
013630  001031                  BNE     3$                      ;YES - IGNORE THIS ONE
013632  042737  000002  001474          BIC     #BIT1,ERCODE    ;ANY OTHER ERROR?
013640  001027                  BNE     4$                      ;YES - ABORT THIS FUNCTION
013642  052737  000002  001474          BIS     #BIT1,ERCODE    ;SET THE CS ERROR BIT
                                                                ;
013650  005262  001652                  INC     CSECN(R2)       ;INCREMENT CSE COUNT FOR THIS DRIVE
013654  104421  002076                  TYPMSG  .MSG3
013660  104421  002120  2$:     TYPMSG  .MSG5
013664  004737  021644          JSR     PC,TYPFN        ;GO TYPE OUT THE FUNCTION THAT GAVE ERROR
013670  004737  021772          JSR     PC,GETINF
013674  004737  022134          JSR     PC,GTSDRV       ;SAVE DRIVE #, FOR TYPING SERIAL #
013700  104021                  ERROR   21              ;SOFT ERROR ON PERFORMING A DATA
                                                        ;TRANSFER RKDA PRINTED OUT IN ERROR
                                                        ;MESSAGE IS BROKEN DOWN INTO DRVE #,
                                                        ;CYL # SEC #, SUR #
013702  022704  000004          CMP     #4,R4           ;WAS IT A READ FUNCTION?
013706  001002                  BNE     3$
013710  004737  017016          JSR     PC,DATCHK       ;GO CHECK THE DATA READ
                                                        ;
013714  000137  014066  3$:     JMP     CMNERR
013720  000137  014124  4$:     JMP     CMNABT
```

```
                                                        ;IF THERE WAS A HARD
                                                        ;ERROR DURING THE DATA
                                                        ;TRANSFER ENTER HERE

013724  032777  010000  165266  HRDERR: BIT     #SKE,@RKER      ;SKE?
013732  001421                  BEQ     1$

013734  032737  000004  001474          BIT     #BIT2,ERCODE    ;ALREADY WORKING ON A SK ERROR?
013742  001051                  BNE     CMNERR          ;YES - IGNORE THIS ONE
013744  042737  000004  001474          BIC     #BIT2,ERCODE    ;ANY OTHER ERROR?
013752  001064                  BNE     CMNABT          ;YES - ABORT THIS FUNCTION
013754  052737  000004  001474          BIS     #BIT2,ERCODE    ;SET THE SK ERROR BIT

013762  005262  001602                  INC     SKECN(R2)       ;INCREMENT COUNT FOR SKE
013766  005262  001562                  INC     HECN(R2)        ;ON THIS DRIVE

013772  104421  002062                  TYPMSG  ,MSG1

013776  032777  167740  165214  1$:     BIT     #167740,@RKER   ;ANY HE BESIDES SKE?
014004  001417                  BEQ     2$

014006  032737  000010  001474          BIT     #BIT3,ERCODE    ;ALREADY WORKING ON A HE ERROR?
014014  001024                  BNE     CMNERR          ;YES - IGNORE THIS ONE
014016  042737  000010  001474          BIC     #BIT3,ERCODE    ;ANY OTHER ERROR?
014024  001037                  BNE     CMNABT          ;YES - ABORT THIS FUNCTION
014026  052737  000010  001474          BIS     #BIT3,ERCODE    ;SET THE HE ERROR BIT

014034  005262  001562                  INC     HECN(R2)        ;INCREMENT HE COUNT FOR
014040  104421  002104                  TYPMSG  ,MSG4           ;THIS DRIVE

014044  104421  002120          2$:     TYPMSG  ,MSG5           ;PRINT 'ON DOING'
014050  004737  021644                  JSR     PC,TYPFN        ;GO PRINT OUT THE FUNCTION
                                                        ;WHICH GAVE THIS ERROR .

014054  004737  021772                  JSR     PC,GETINF
014060  004737  022134                  JSR     PC,GTSDRV       ;SAVE DRIVE #, FOR TYPING SERIAL #
014064  104022                  ERROR   22              ;HARD ERROR ON DOING DATA XFER

014066  105261  001446  CMNERR: INCB    RETRY(R1)       ;INCREMENT RETRY COUNT
014072  122761  000003  001446          CMPB    #3,RETRY(R1)    ;3 TRIES IN ALL?
014100  001411                  BEQ     CMNABT          ;YES, ABORT THIS FUNCTION

014102  052777  010000  165426          BIS     #BIT12,@SAVKEY  ;INDICATE HIGH PRIORITY ON RETRY
014110  042777  000020  165420          BIC     #BIT4,@SAVKEY   ;CLEAR 'POSITIONING HEADS', IF SET
014116  004737  015714                  JSR     PC,CLRERR       ;CLEAR THIS ERROR
014122  000002                  RTI

014124  005037  001474  CMNABT: CLR     ERCODE          ;CLEAR ERROR CODE
014130  104421  002532                  TYPMSG  ,MSG27
014134  004737  014334                  JSR     PC,DRVABT       ;ABORT THE FUNCTION
014140  032777  010000  165052          BIT     #SKE,@RKER      ;SEEK ERROR?
014146  001416                  BEQ     3$              ;NO
014150  104416                  CON.RFSET               ;RESET THE CONTROLLER
014152  010137  001502                  MOV     R1,QDRV         ;SET DRIVE NUMBER
014156  000241                  CLC                     ;CLEAR THE 'C' BIT
014160  006037  001502                  ROR     QDRV            ;LEFT JUSTIFY DRIVE NUMBER
```

```
 2940  014164  006C3C  00:502                    ROR     @DRV            ;LEFT JUSTIFY DRIVE NUMBER
 2942  014170  006C3C  00:502                    ROR     @DRV            ;LEFT JUSTIFY DRIVE NUMBER
 2944  014174  006C3C  00:502                    ROR     @DRV            ;LEFT JUSTIFY DRIVE NUMBER
 2946  014200  104420                           DRV.RESET               ;RESET THE DRIVE
 2950  014202  104416                           CON.RESET               ;RESET THE CONTROLLER
 2952  014204  000002                    38:     RTI                     ;THIS DATA TRANSFER
```

```
                                                                        ;IF THERE WAS NO HARD OR
                                                                        ;SOFT ERROR ON DATA TRANSFER
                                                                        ;ENTER HERE
014206  105761  001446        NOEPOR: TSTB    RETRY(R1)
014212  001406                        BEQ     1$
014214  104421  002604                TYPMSG  .MSG28
014220  116146  001446                MOVB    RETRY(R1),-SP
014224  104403                        TYPOS
014226     002                        .BYTE   2
014227     000                        .BYTE   0
014230  005037  001474        1$:     CLR     ERCODE
014234  105061  001446                CLRB    RETRY(R1)
014240  042777  010000  165270        BIC     #BIT12,@SAVKEY  ;CLEAR PRIORITY BIT IF SET
014246  004737  020714                JSR     PC,STASTC       ;GO, COLLECT STATISTICS ON THIS
                                                              ;DATA TRANSFER

014252  022704  000004                CMP     #4,R4           ;WAS IT A 'READ' FUNCTION?
014256  001002                        BNE     2$
014260  004737  017016                JSR     PC,DATCHK       ;IF IT WAS 'READ', CHECK THE DATA


014264  022704  000002        2$:     CMP     #2,R4           ;WAS IT A 'WRITE' FUNCTION?
014270  001011                        BNE     3$
014272  032777  000040  165236        BIT     #BIT5,@SAVKEY   ;IS 'WRT CHK' TO FOLLOW THIS
014300  001412                        BEQ     4$              ;'WRT' FUNCTION?
014302  052703  100000                BIS     #BIT15,R3       ;SET FLAG BIT TO INDICATE
                                                              ;THAT WRITE CHECK SHOULD
                                                              ;FOLLOW THIS WRITE
014306  010337  001456                MOV     R3,WCFLG        ;SET UP WC FLAG TO INDICATE
                                                              ;THE ABOVE. THE LOWER BYTE
                                                              ;CONTAINS THE POINTER TO THE
                                                              ;COMMAND LIST, WHICH WILL
                                                              ;BE USED, FOR DOING WRITE CHECK
014312  000407                        BR      5$              ;IF WRITE CHECK IS TO BE DONE, DONT
                                                              ;SET BIT 15 OF THE KEY TILL WRT CHK
                                                              ;IS DONE

014314  022704  000006        3$:     CMP     #6,R4           ;WRT CHK FUNCTION?
014320  001002                        BNE     4$
014322  005037  001456                CLR     WCFLG           ;CLEAR WR CHK FLAG

014326  052710  100000        4$:     BIS     #BIT15,(R0)     ;SET FLAG TO INDICATE THIS
014332  000002                5$:     RTI                     ;FUNCTION IS COMPLETED
```

```
                                                        ;ABORT THE FUNCTION ON DRIVE POINTED TO BY R1
                                                        ;CLEAR ASSOCIATED FLAGS
                                                        ;DROP THE DRIVE IF MORE THAN 8. ABORTS

014334  010246                      DRVABT: MOV     R2,-(SP)        ;SAVE R2
014336  105061  001446                      CLRB    RETRY(R1)
014342  052710  104000                      BIS     #104000,(R0)    ;INDICATE THAT FUNCTION IS ABORTED
014346  042710  010000                      BIC     #BIT12,(R0)     ;CLEAR HIGH PRIORITY BIT IF SET
014352  010102                      MOV     R1,R2
014354  006302                      ASL     R2
014356  005262  001672                      INC     ABORT(R2)
014362  026227  001672  000010              CMP     ABORT(R2),#10
014370  003402                      BLE     1$
014372  000137  016220                      JMP     DSELCT          ;DROP THE DRIVE
014376  012602                  1$: MOV     (SP)+,R2        ;RESTORE R2
014400  104401  002165                      TYPE    ,MSG10          ;TYPE "ABORTED"
014404  000207                      RTS     PC              ;RETURN
```

```
                                        ;THIS ROUTINE GENERATES THE 8 COMMAND REQUESTS AND PUT THEM IN THE QUEUE. THE
                                        ;FOLLOWING PARAMETERS ARE GENERATED RANDOMLY:
                                        ;1.  DRIVE NUMBER ON WHICH THE COMMAND WILL BE PERFORMED.
                                        ;2.  FUNCTION TO BE PERFORMED.
                                        ;3.  DISK ADDRESS - CYLINDER, SURFACE, SECTOR.
                                        ;4.  STARTING BUS ADDRESS.
                                        ;5.  WORD COUNT FOR DATA TRANSFER.

                                        ;THE QUEUE IS LOCATED AT 'CMND' (TO 'CMND8').

014406  104407                  GEN8RQ: CKSWR
014410  005337  002056                  DEC     REPCNT          ;DECREMENT REPETITION COUNT
014414  001025                          BNE     1$              ;CONTINUE IF NOT 0
014416  013737  001236  002056          MOV     PCNTR,REPCNT    ;REESTABLISH PEPETITION COUNT FOR EXERCISER
014424  104401  014432                  TYPE    ,65$            ;;TYPE ASCIZ STRING
014430  000407                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12>/END OF PASS/
014450                          64$:
014450  013746  001100                  MOV     $PASS,-(SP)
014454  005216                          INC     (SP)
014456  104405                          TYPDS
014460  004737  021024                  JSR     PC,REPSTAT
014464  000137  022612                  JMP     $EOP

014470  032777  000400  164442  1$:     BIT     #SW8,@SWR
014476  001422                          BEQ     2$
014500  032777  000001  164432          BIT     #SW00,@SWR      ;SWITCH 0 SET ?
014506  001410                          BEQ     8$              ;BR IF NOT
014510  005727                          TST     (PC)+           ;CHECK INDICATOR
014512  000000                  7$:     .WORD   0               ;TYPE TIME INDICATOR
014514  001013                          BNE     2$              ;BR IF TIME ALREADY TYPED
014516  005237  014512                  INC     7$              ;INCREMENT THE INDICATOR
014522  004737  026556                  JSR     PC,TIMTYP       ;TYPE THE TIME (IF SWR 03 SET)
014526  000406                          BR      2$              ;CONTINUE
014530  005037  014512          8$:     CLR     7$              ;CLEAR THE INDICATOR
014534  104401  001213                  TYPE    ,$CRLF
014540  004737  021024                  JSR     PC,REPSTAT
014544  032777  000040  164366  2$:     BIT     #SW5,@SWR       ;HALT?
014552  001401                          BEQ     3$              ;NO
014554  000000                          HALT                    ;YES, PRESSING CONTINUE RESUMES PROG EXECUTION

014556  004737  022564          3$:     JSR     PC,CHDPRS       ;CHECK IF ANY DRIVES PRESENT
014562  012700  001306          4$:     MOV     #KEY,R0
014566  010004                          MOV     R0,R4
014570  005001                          CLR     R1
014572  010120                  5$:     MOV     R1,(R0)+        ;CLEAR THE 8 COMMAND KEYS
014574  062701  000400                  ADD     #400,R1         ;BITS 8,9,10 INDICATE THEIR
014600  022701  004000                  CMP     #4000,R1        ;POSITION 0,1,2,3,4,5,6,7
014604  001372                          BNE     5$
014606  012700  001326                  MOV     #CMND,R0        ;CLEAR THE PARAMETER TABLE
014612  010005                          MOV     R0,R5
014614  012701  177740                  MOV     #-40,R1         ;FOR THE 8 COMMANDS IN Q
014620  005020                  6$:     CLR     (R0)+           ;(8X4) WORDS IN ALL
014622  005201                          INC     R1
014624  001375                          BNE     6$
```

```
3073  014626  004737  015676                JSR     PC,CLRFLGS      ;CLEAR THE FLAGS PERTAINING TO THE 8
3074                                                                  ;COMMANDS IN THE Q
3075                                                                  ;R4 CONTAINS 'KEY'
3076                                                                  ;R5 CONTAINS 'CMND'
3077  014632  022737  000001  001264  GEN1:   CMP     #1,DRVPRS       ;ONLY 1 DRV PRESENT?
3078  014640  001002                        BNE     22$             ;NO
3079  014642  005000                        CLR     R0              ;YES
3080  014644  000420                        BR      3$
3081  014646  004737  025504          22$:  JSR     PC,$RAND        ;GENERATE A RANDOM NUMBER
3082                                                                  ;GET A RANDOM DRIVE NUMBER
3083                                                                  ;FROM THE AVAILABLE DRIVES
3084  014652  025636                        RSDRVL
3085
3086  014654  013746  025640                MOV     RSDRVH,-(SP)    ;PUT LOW DIVIDEND ON STACK
3087  014660  005046                        CLR     -(SP)           ;CLEAR HIGH DIVIDEND AND PUSH
3088                                                                  ;IT ON STACK
3089  014662  013746  001520                MOV     DRMAP,-(SP)     ;PUSH DIVISOR ON STACK
3090  014666  004737  025120                JSR     PC,@#$DIV       ;GO TO THE 'DIVIDE' SUBROUTINE
3091  014672  005726                        TST     (SP)+           ;DISCARD THE REMAINDER. QUOTIENT IS
3092                                                                  ;NOW ON TOP OF THE STACK
3093  014674  012600                        MOV     (SP)+,R0
3094  014676  020037  001264                CMP     R0,DRVPRS       ;MAKE SURE CORRECT MAPPING IS DONE
3095  014702  001001                        BNE     3$
3096  014704  005300                        DEC     R0              ;'QDRVE' CONTAINS RANDOM DRIVE NO.
3097  014706  005037  001502          3$:   CLR     QDRV
3098  014712  116037  001254  001502        MOVB    PDR(R0),QDRV
3099  014720  105737  001502                TSTB    QDRV            ;TEST IF TYPE F DRIVE
3100  014724  100016                        BPL     32$             ;NOT IF POSITIVE
3101
3102  014726  142737  000200  001502        BICB    #200,QDRV       ;CLEAR THE FLAG BIT
3103  014734  132737  000001  001502        BITB    #1,QDRV         ;ODD OR EVEN DRIVE ADDRESS
3104  014742  001404                        BEQ     31$
3105
3106  014744  005737  015632                TST     ODDEVN          ;MUST HAVE BEEN AN ODD ONE
3107  014750  001730                        BEQ     GEN1            ;INSURE THAT ODDS WHAT WE WANT
3108  014752  000403                        BR      32$
3109
3110  014754  005737  015632          31$:  TST     ODDEVN          ;MUST HAVE BEEN AN EVEN ONE
3111  014760  001332                        BNE     22$             ;NO GOOD - TRY AGAIN
3112
3113  014762  004737  025504          32$:  JSR     PC,$RAND        ;GENERATE A RANDOM NUMBER
3114  014766  025642                        RSFUNL
3115
3116  014770  013746  025644                MOV     RSFUNH,-(SP)    ;PUT LOW DIVIDEND ON STACK
3117  014774  005046                        CLR     -(SP)           ;CLEAR HIGH DIVIDEND AND PUSH
3118                                                                  ;IT ON STACK
3119  014776  013746  001526                MOV     FNMAP,-(SP)     ;PUSH DIVISOR ON STACK
3120  015002  004737  025120                JSR     PC,@#$DIV       ;GO TO THE 'DIVIDE' SUBROUTINE
3121  015006  005726                        TST     (SP)+           ;DISCARD THE REMAINDER. QUOTIENT IS
3122                                                                  ;NOW ON TOP OF THE STACK
3123  015010  021627  000003                CMP     (SP),#3         ;MAKE SURE CORRECT FUNCTION IS SELCTD
3124  015014  001001                        BNE     20$
3125  015016  005316                        DEC     (SP)
3126  015020  012637  001512          20$:  MOV     (SP)+,QFNC      ;THE FUNCTION THAT CAN BE PERFORMED
3127
3128  015024  004737  025504                JSR     PC,$RAND        ;GENERATE A RANDOM NUMBER
```

```
3129  015030  025646                          RSCYLL
3130
3131  015032  013746  025650                  MOV     RSCYLH,-(SP)    ;PUT LOW DIVIDEND ON STACK
3132  015036  005046                          CLR     -(SP)           ;CLEAR HIGH DIVIDEND AND PUSH
3133                                                                  ;IT ON STACK
3134  015040  013746  001522                  MOV     CYLMAP,-(SP)    ;PUSH DIVISOR ON STACK
3135  015044  004737  025120                  JSR     PC,@#$DIV       ;GO TO THE 'DIVIDE' SUBROUTINE
3136  015050  005726                          TST     (SP)+           ;DISCARD THE REMAINDER. QUOTIENT IS
3137                                                                  ;NOW ON TOP OF THE STACK
3138  015052  012637  001504                  MOV     (SP)+,QCYL      ;(FROM 0-312)
3139  015056  022737  000313  001504          CMP     #313,QCYL
3140  015064  001002                          BNE     4$
3141  015066  005337  001504                  DEC     QCYL            ;'QCYL' CONTAINS RANDOM CYLINDER NO.
3142
3143  015072                          4$:
3144
3145  015072  013746  025650                  MOV     RSCYLH,-(SP)    ;PUT LOW DIVIDEND ON STACK
3146  015076  005046                          CLR     -(SP)           ;CLEAR HIGH DIVIDEND AND PUSH
3147                                                                  ;IT ON STACK
3148  015100  013746  001524                  MOV     SECMAP,-(SP)    ;PUSH DIVISOR ON STACK
3149  015104  004737  025120                  JSR     PC,@#$DIV       ;GO TO THE 'DIVIDE' SUBROUTINE
3150  015110  005726                          TST     (SP)+           ;DISCARD THE REMAINDER. QUOTIENT IS
3151                                                                  ;NOW ON TOP OF THE STACK
3152  015112  012637  001510                  MOV     (SP)+,QSEC      ;(BETWEEN 0-13/8)
3153  015116  022737  000014  001510          CMP     #14,QSEC
3154  015124  001002                          BNE     5$
3155  015126  005337  001510                  DEC     QSEC            ;'QSEC' CONTAINS RANDOM SEC #
3156
3157  015132  022737  077777  025650  5$:     CMP     #77777,RSCYLH   ;SELECT SURFACE # RANDOMLY
3158  015140  101005                          BHI     6$
3159  015142  012737  000020  001506          MOV     #BIT4,QSUR      ;SURFACE 1
3160                                                                  ;R1 CONTAINS THE MAXM WORD COUNT BASED ON
3161                                                                  ;AVAILABLE DISK SPACE.
3162                                                                  ;R2 CONTAINS THE MAXM WORD COUNT BASED ON
3163                                                                  ;AVAILABLE MEMORY SPACE.
3164  015150  005001                          CLR     R1
3165  015152  000404                          BR      7$
3166
3167  015154  005037  001506          6$:     CLR     QSUR            ;SURFACE 0
3168  015160  012701  000014                  MOV     #14,R1          ;14 SECTORS ON SUR 0
3169
3170                                  ;ASSUMING THAT ENOUGH MEMORY IS AVAILABLE THE MAXIMUM TRANSFER THAT CAN
3171                                  ;TAKE PLACE IS 20K WORDS. IF THE RANDOM CYLINDER # > OR = TO 307 AND THE
3172                                  ;SURFACE IS 1, CHANCES ARE THAT THE NUMBER OF WORDS TO BE TRANSFERRED MAY
3173                                  ;BE GREATER THAN THE SPACE AVAILABLE ON THE DISK.  IN THAT CASE, THE WORDS
3174                                  ;COUNT IS TO BE SELECTED IN SUCH AWAY THAT THIS OVERFLOW DOES NOT OCCUR.
3175
3176  015164  023727  001504  000306  7$:     CMP     QCYL,#306       ;IS THE RANDOM CYL # GREATER THAN 306?
3177  015172  002003                          BGE     9$
3178  015174  012701  177777          8$:     MOV     #177777,R1      ;IF YES, MAKE SURE THAT THE
3179  015200  000431                          BR      21$             ;WORD COUNT IS SELECTED PROPERLY
3180                                                                  ;COMPUTE MAXM WORD COUNT BASED ON
3181                                                                  ;AVAILABLE DISK SPACE
3182  015202  012700  000014          9$:     MOV     #14,R0          ;COMPUTE # OF SECTORS AVAILABLE ON
3183  015206  163700  001510                  SUB     QSEC,R0         ;CYLINDERS SELECTED
3184  015212  060001                          ADD     R0,R1
```

```
3185  015214  012703  000312            MOV     #312,R3         ;COMPUTE # OF SECTORS AVAILABLE
3186  015220  163703  001504            SUB     QCYL,R3         ;BEYOND THE CYLINDER SELECTED
3187  015224  012746  000030            MOV     #30,-(SP)               ;;PUT THE MULTIPLER ON THE STACK
3188  015230  010346                    MOV     R3,-(SP)                ;;PUT THE MULTIPLICAND ON THE STACK
3189  015232  004737  025006            JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
3190  015236  012616                    MOV     (SP)+,(SP)      ;;DISREGARD THE MSB'S
3191  015240  012603                    MOV     (SP)+,R3                ;;GET THE LSB'S OF THE PRODUCT
3192  015242  060103                    ADD     R1,R3           ;COMPUTE TOTAL # OF SECTORS AVAILABLE
3193  015244  012746  000400            MOV     #400,-(SP)              ;;PUT THE MULTIPLER ON THE STACK
3194  015250  010346                    MOV     R3,-(SP)                ;;PUT THE MULTIPLICAND ON THE STACK
3195  015252  004737  025006            JSR     PC,@#$MULT      ;;CALL THE MULTPLY ROUTINE
3196  015256  012616                    MOV     (SP)+,(SP)      ;;DISREGARD THE MSB'S
3197  015260  012603                    MOV     (SP)+,R3                ;;GET THE LSB'S OF THE PRODUCT
3198  015262  010301                    MOV     R3,R1           ;COMPUTE TOTAL # OF WORDS-SPACE
3199                                                            ;AVAILABLE ON DISK FROM THE SELECTED
3200                                                            ;CYL #
3201                                                            ;COMPUTE MAXM WORD COUNT BASED ON
3202                                                            ;AVAILABLE MEMORY SPACE.
3203  015264  004737  025504    21$:    JSR     PC,$RAND        ;GENERATE RANDOM NUMBER
3204  015270  025652                    RSBAL
3205
3206  015272  013746  025654            MOV     RSBAH,-(SP)     ;PUT LOW DIVIDEND ON STACK
3207  015276  005046                    CLR     -(SP)           ;CLEAR HIGH DIVIDEND AND PUSH
3208                                                            ;IT ON STACK
3209  015300  013746  001530            MOV     BAMAP,-(SP)     ;PUSH DIVISOR ON STACK
3210  015304  004737  025120            JSR     PC,@#$DIV       ;GO TO THE 'DIVIDE' SUBROUTINE
3211  015310  005726                    TST     (SP)+           ;DISCARD THE REMAINDER. QUOTIENT IS
3212                                                            ;NOW ON TOP OF THE STACK
3213  015312  012637  001514            MOV     (SP)+,QBUSAD    ;BE USED
3214  015316  006337  001514            ASL     QBUSAD
3215  015322  063737  002052  001514    ADD     BASEBA,QBUSAD   ;FORM THE RANDOM BUS-ADDRESS
3216                                                            ;BY ADDING RANDOM OFFSET TO
3217                                                            ;THE BASE BUS-ADDRESS
3218  015330  013703  002054            MOV     MAXBA,R3        ;COMPUTE # OF WORDS THAT
3219  015334  163703  001514            SUB     QBUSAD,R3       ;CAN BE TRANSFERRED, USING THE
3220  015340  000241                    CLC
3221  015342  006003                    ROR     R3              ;ABOVE GENERATED BUS-ADDRESS WITHOUT
3222  015344  010302                    MOV     R3,R2           ;CAUSING A NXM
3223
3224  015346  020201            10$:    CMP     R2,R1           ;SELECT SMALLER OF THE TWO
3225  015350  103401                    BLO     11$             ;WORD-COUNTS THAT WILL BE
3226                                                            ;USED FOR GENERATING A RANDOM
3227  015352  010103                    MOV     R1,R3           ;WORD COUNT)
3228
3229                                                            ;R3 CONTAINS THE MAXM WORD COUNT
3230                                                            ;POSSIBLE. COMPUTE THE WORD COUNT
3231                                                            ;MAPPING FACTOR FROM THIS.
3232  015354            11$:
3233
3234  015354  012746  177777            MOV     #177777,-(SP)   ;PUT LOW DIVIDEND ON STACK
3235  015360  005046                    CLR     -(SP)           ;CLEAR HIGH DIVIDEND AND PUSH
3236                                                            ;IT ON STACK
3237  015362  010346                    MOV     R3,-(SP)        ;PUSH DIVISOR ON STACK
3238  015364  004737  025120            JSR     PC,@#$DIV       ;GO TO THE 'DIVIDE' SUBROUTINE
3239  015370  005726                    TST     (SP)+           ;DISCARD THE REMAINDER. QUOTIENT IS
3240                                                            ;NOW ON TOP OF THE STACK
```

```
3241  015372  005216                          INC     (SP)
3242  015374  012637  001532                  MOV     (SP)+,WCMAP     ;WORD COUNT MAPPING FACTOR
3243
3244  015400  004737  025504                  JSR     PC,$RAND        ;GENERATE A RANDOM NUMBER
3245  015404  025656                          RSWCL
3246
3247  015406  013746  025660                  MOV     RSWCH,-(SP)     ;PUT LOW DIVIDEND ON STACK
3248  015412  005046                          CLR     -(SP)           ;CLEAR HIGH DIVIDEND AND PUSH
3249                                                                  ;IT ON STACK
3250  015414  013746  001532                  MOV     WCMAP,-(SP)     ;PUSH DIVISOR ON STACK
3251  015420  004737  025120                  JSR     PC,@#$DIV       ;GO TO THE 'DIVIDE' SUBROUTINE
3252  015424  005726                          TST     (SP)+           ;DISCARD THE REMAINDER. QUOTIENT IS
3253                                                                  ;NOW ON TOP OF THE STACK
3254  015426  012637  001516                  MOV     (SP)+,QWRCNT    ;'QWRCNT' CONTAINS THE RANDOM
3255                                                                  ;WORD COUNT THAT WILL BE USED
3256  015432  005737  001516                  TST     QWRCNT          ;MAKE SURE THE WORD COUNT IS
3257  015436  003004                          BGT     12$             ;NOT 0
3258  015440  005437  001516                  NEG     QWRCNT          ;TAKE CARE OF ZERO AND NEG NMBRS
3259  015444  005237  001516                  INC     QWRCNT
3260  015450  113700  001502          12$:    MOVB    QDRV,R0
3261  015454  000241                          CLC
3262  015456  006000                          ROR     R0
3263  015460  006000                          ROR     R0              ;POSITION THE DRIVE NUMBER IN
3264  015462  006000                          ROR     R0              ;BITS 15,14,13
3265  015464  006000                          ROR     R0
3266  015466  013701  001504                  MOV     QCYL,R1
3267  015472  000301                          SWAB    R1
3268  015474  000241                          CLC
3269  015476  006001                          ROR     R1              ;POSITION THE CYLINDER NUMBER
3270  015500  006001                          ROR     R1              ;IN BITS 12-5
3271  015502  006001                          ROR     R1
3272  015504  050100                          BIS     R1,R0
3273  015506  053700  001510                  BIS     QSEC,R0         ;R0 CONTAINS THE COMPLETE DISK
3274  015512  053700  001506                  BIS     QSUF,R0         ;ADDRESS
3275  015516  010025                          MOV     R0,(R5)+        ;INSERT RKDA IN THE PARAMETER TABLE
3276                                                                  ;(FOR THE 8 COMMANDS)
3277                                                                  ;WHICH FUNCTION?
3278                                                                  ;0-READ CHECK, 1-READ, 2-WRITE
3279  015520  022737  000001  001512          CMP     #1,QFNC
3280  015526  001412                          BEQ     2$              ;READ
3281  015530  003014                          BGT     14$             ;READ CHECK
3282  015532  012725  000002          1$:     MOV     #2,(R5)+        ;WRITE FUNCTION CODE
3283  015536  023727  025660  077777          CMP     RSWCH,#77777    ;SHOULD WRITE CHECK BE DONE
3284  015544  101010                          BHI     15$             ;AFTER THE WRITE?
3285  015546  052714  000040                  BIS     #BIT5,(R4)      ;SET FLAG IN KEY TO INDICATE
3286                                                                  ;THAT WRITE CHECK SHOULD BE
3287                                                                  ;DONE FOLLOWING THE WRITE
3288  015552  000405                          BR      15$
3289
3290  015554  012725  000004          2$:     MOV     #4,(R5)+        ;READ FUNCTION CODE
3291  015560  000402                          BR      15$
3292
3293  015562  012725  000012          14$:    MOV     #12,(R5)+       ;READ CHECK FUNCTION CODE
3294
3295  015566  013715  001516          15$:    MOV     QWRCNT,(R5)     ;INSERT THE WORD COUNT (RKWC)
3296  015572  005425                          NEG     (R5)+           ;(2'S COMPLEMENT)
```

```
3297  015574  013725  001514                MOV     QBUSAD,(R5)+    ;INSERT THE BUS ADDRESS (RKBA) FOR
3298                                                                  ;THIS COMMAND IN THE PARAMETER
3299                                                                  ;TABLE
3300  015600  053724  001502        16$:    BIS     QDRV,(R4)+      ;SET THE DRIVE NUMBER INSIDE
3301                                                                  ;THE KEY FOR THIS COMMAND
3302  015604  020427  001326                CMP     R4,#KEY+20      ;GENERATED 8 COMMANDS IN
3303                                                                  ;THE QUEUE?
3304  015610  001402                        BEQ     17$
3305  015612  000137  014632                JMP     GEN1            ;IF NOT, GO BACK AND GENERATE
3306                                                                  ;THE NEXT COMMAND AND THE
3307                                                                  ;PARAMETERS (RKWC, BA, DA)
3308  015616  005237  015632        17$:    INC     ODDEVN          ;CHANGE FROM ODD/EVEN TO EVEN/ODD
3309  015622  042737  177776  015632        BIC     #177776,ODDEVN  ;KEEP ONLY ONE BIT
3310  015630  000207                        RTS     PC              ;ALL 8 COMMANDS HAVE BEEN
3311                                                                  ;GENERATED IN THE TASK-QUEUE
3312  015632  000000        ODDEVN: 0
```

```
                                ;ENTER THIS CODE IF SW 9 HAS BEEN SET AND LOOPING HAS TO BE DONE ON ERROR
                                ;CONTROL IS TRANFERRED TO THIS, ON RETURN FROM THE ERROR HANDLER '$ERROR'.


015634  004737  015714        EXCRLUP: JSR     PC,CLRERR      ;WAIT FOR OTHER DRIVES TO GET DONE
                                                              ;THEN ISSUE A CONTROL RESET
015640  010146                        MOV     R1,-(SP)
015642  012701  001306                MOV     #KEY,R1        ;CLEAR OUT THE COMMAND-KEYS
015646  042721  114220        1$:     BIC     #114220,(R1)+
015652  020127  001326                CMP     R1,#KEY+20
015656  001373                        BNE     1$
015660  012601                        MOV     (SP)+,R1
015662  004737  015676                JSR     PC,CLRFLGS     ;CLEAR OUT THE VARIOUS FLAGS PERTAINING
                                                              ;TO THE 8 COMMANDS IN THE Q
015666  012706  001100                MOV     #STACK,SP      ;REESTABLISH STACK POINTER
015672  000137  010556                JMP     QMNGER         ;START OVER AGAIN, PROCESS THE COMMANDS
                                                              ;IN THE Q AGAIN. NOTE THAT ON LOOPING
                                                              ;(ON EROR, WITH SW 9) AN ATTEMPT IS MADE
                                                              ;TO RECREATE THE SET OF EVENTS WHICH LED TO
                                                              ;ERROR.



                                ;CLRFLGS
                                ;THIS ROUTINE CLEARS OUT THE VARIOUS FLAGS USED FOR THE 8 COMMANDS IN THE QUEUE.

015676  012700  001426        CLRFLGS: MOV     #BUSY,R0       ;CLEAR THE 8 BUSY FLAGS
015702  005020                1$:     CLR     (R0)+
015704  020027  001462                CMP     R0,#QSCNT+2    ;ALL DONE?
015710  001374                        BNE     1$             ;NO
015712  000207                        RTS     PC
```

```
                                        ;CLRERR
                                        ;THIS ROUTINE IS ENTERED WHEN A HARD ERROR HAS OCCURRED AND IT HAS TO BE
                                        ;CLEARED.  THE DRIVES THAT HAVE BEEN BUSY ARE CHECKED TO SEE IF THEIR R/W/S
                                        ;RDY BIT HAS SET.  WHEN R/W/S IS SET, CHECKING IS DONE FOR ANY ERROR. IF A
                                        ;ERROR OCCURED IT IS REPORTED, IF NOT, APPROPRIATE FLAGS ARE SET AND
                                        ;CLEARED FOR THAT DRIVE. AFTER ABOVE IS DONE FOR ALL DRIVES THAT HAVE BEEN
                                        ;SEEKING, A CONTROL RESET IS ISSUED TO CLEAR THE HARD ERROR.

015714  010446          CLRERR: MOV     R4,-(SP)        ;SAVE R4, R4 ON THE STACK
015716  010546                  MOV     R5,-(SP)
015720  005005                  CLR     R5
015722  005077  163302          CLR     @RKDA

015726  105765  001426    1$:   TSTB    BUSY(R5)        ;WAS THIS DRIVE BUSY SEEKING?
015732  100035                  BPL     4$              ;NO
015734  005037  001472          CLR     TIMER
015740  032777  000100  163250  2$:   BIT     #RWS,@RKDS      ;R/W/S SET?
015746  001015                  BNE     3$              ;YES
015750  005237  001472          INC     TIMER           ;KEEP TIME
015754  001371                  BNE     2$              ;WAIT FOR R/W/S RDY
015756  004737  022130          JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE # FOR
                                                        ;TYPING SERIAL DRIVE #
015762  104004                  ERROR   4               ;R/W/S READY DID NOT SET
                                                        ;FOR THIS DRIVE, WAITED LONG ENOUGH.
015764  032777  001000  163224          BIT     #SIN,@RKDS      ;SIN ERROR ON THIS DRIVE?
015772  001403                  BEQ     3$
015774  004737  022130          JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE # FOR
                                                        ;TYPING SERIAL DRIVE #
016000  104016                  ERROR   16              ;SIN OCCURED ON THIS DRIVE

016002  116504  001426    3$:   MOVB    BUSY(R5),R4     ;FORM THE ADDRESS OF THE
016006  042704  177760          BIC     #177760,R4      ;KEY WHICH MADE THIS DRIVE
016012  062704  001306          ADD     #KEY,R4 ;BUSY

016016  042714  010000          BIC     #10000,(R4)     ;CLEAR HIGH PRIORITY BIT, IF SET
016022  105065  001426          CLRB    BUSY(R5)        ;MAKE THIS DRIVE FREE, AVAILABLE


016026  062777  020000  163174  4$:   ADD     #20000,@RKDA    ;ADDRESS THE NEXT POSSIBLE DRIVE
016034  005205                  INC     R5              ;INCREMENT COUNT
016036  022705  000010          CMP     #10,R5          ;ALL DONE
016042  001331                  BNE     1$              ;NO

016044  004737  020246          JSR     PC,CRCMND       ;SAVE INFO ABOUT THE PAST & PRESENT COMAND
016050  104416          CON.RESET
016052  012605          MOV     (SP)+,R5        ;RESTORE R4,R5
016054  012604          MOV     (SP)+,R4
016056  000207          RTS     PC              ;RETURN
```

```
                                        ;CLRSIN
                                        ;THIS ROUTINE IS ENTERED WHEN THERE IS A 'SIN' ERROR.  AT TIME OF ENTRY
                                        ;RKDA CONTAINS THE DRIVE # THAT GAVE 'SIN'.  A DRIVE RESET IS DONE ON THAT
                                        ;DRIVE.  AFTER IT IS DONE, ROUTINE 'CLRHE' IS ENTERED, TO WAIT FOR THE
                                        ;OTHER DRIVES THAT HAVE BEEN DOING SEEKS.  WHEN ALL THE DRIVES GIVE
                                        ;'R W/S RDY', A CONTROL RESET IS DONE, RETURN IS MADE BACK TO THIS
                                        ;ROUTINE-'CLRSIN'- AND FINALLY CONTROL IS TRANSFERRED BACK TO THE MAIN
                                        ;PROGRAM.

016060  017737  163144  001516  CLRSIN: MOV     @RKDA,@WRCNT    ;SAVE DISK ADDRESS
016066  004737  015714                  JSR     PC,CLRERR       ;GO, WAIT FOR OTHER DRIVES TO COMPLETE
                                                                ;THEIR SEEKS(IF THEY ARE DOING ANY)
                                                                ;THEN DO CON.RESET TO CLR THE EROR.
016072  013777  001516  163130          MOV     @WRCNT,@RKDA    ;ADDRESS THE DRIVE AGAIN
016100  004737  020222                  JSR     PC,DRCMND       ;SAVE INFO ABOUT THE PAST & PRESENT COMAND
016104  012777  000015  163110          MOV     #15,@RKCS       ;DO DRIVE RESET ON THE
                                                                ;DRIVE
                                                                ;INDICATED IN RKDA
016112  104417                          CON.RDY
016114  005037  001472                  CLR     TIMER
016120  032777  000100  163070  1$:     BIT     #RWS,@RKDS      ;WAIT FOR R/W/S RDY TO SET
016126  001015                          BNE     2$
016130  005237  001472                  INC     TIMER
016134  001371                          BNE     1$
016136  004737  022130                  JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE # FOR
                                                                ;TYPING SERIAL DRIVE #
016142  104004                          ERROR   4               ;R/W/S RDY DID NOT SET AFTER
                                                                ;DOING DRIVE RESET, TIMED OUT
016144  032777  001000  163044          BIT     #SIN,@RKDS
016152  001403                          BEQ     2$
016154  004737  022130                  JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE # FOR
                                                                ;TYPING SERIAL DRIVE #
016160  104016                          ERROR   16              ;A DRIVE RESET WAS DONE ON THIS DRIVE
                                                                ;TO CLEAR 'SIN', BUT 'SIN' DID NOT GET
                                                                ;CLEARED

016162  004737  020246          2$:     JSR     PC,CRCMND       ;SAVE INFO ABOUT THIS COMMAND
016166  104416                          CON.RESET               ;DO IT TO CLEAR OUT MASK F FS
016170  000207                          RTS     PC              ;EXIT FROM THIS ROUTINE
```

```
                                ;SINCNT
                                ;THIS ROUTINE IS ENTERED WHEN A 'SIN' ERROR OCCURS.  THE 'SIN' COUNT FOR
                                ;THE DRIVE GIVING 'SIN' IS INCREMENTED.  IF MORE THAN 5 'SIN' ERRORS
                                ;OCCURRED THE DRIVE IS DESELECTED.  AT THE TIME OF ENTRY R1 CONTAINS THE
                                ;DRIVE NUMBER THAT GAVE 'SIN' ERROR.
                                ;CALL:  JSR     PC,SINCNT
                                ;       -----           RETURN HERE IF SIN COUNT (MAXIMUM ALLOWABLE)
                                ;                       WAS EXCEEDED.
                                ;       -----           RETURN HERE IF TOTAL SIN COUNT LESS THAN MAXIMUM
                                ;                       ALLOWABLE.
                                ;
                                ;
016172  105261  001622          SINCNT: INCB    SINCN(R1)       ;INCREMENT 'SIN' COUNT FOR THIS DRIVE
016176  122761  000005  001622          CMPB    #5,SINCN(R1)    ;5 ERRORS OCCURRED?
016204  101403                        BLOS    1$              ;YES
016206  062716  000002                ADD     #2,(SP)         ;ADJUST PC FOR RETURN TO THE RIGHT POINT
016212  000207                        RTS     PC              ;RETURN
                                ;
016214  000137  016220          1$:     JMP     DSELCT          ;5 ERRORS OCCURRED, GO DESELECT
```

```
                        ;DSELCT
                        ;THIS ROUTINE IS ENTERED WHEN A DRIVE IS TO BE DESELECTED (TAKEN
                        ;OUT OF SELECTION LIST), BECAUSE THE FATAL ERRORS ON THAT DRIVE
                        ;HAS REACHED A MAXIMUM COUNT.  R1 CONTAINS THE DRIVE NUMBER THAT
                        ;THAT IS TO BE DESELECTED. THE DRIVE IS DESELECTED IF 1. TOTAL SIN COUNT
                        ;FOR THAT DRIVE REACHES THE MAXIMUM ALLOWABLE  2. IF  A FATAL ERROR
                        ;LIKE DRIVE UNSAFE, DRIVE POWER LOW OCCURS.  3. IF  WPS GETS SET, OR DR
                        ;IS CLEAR.

016260  012700  000253  DSELCT: MOV     #PDR-1,R5
                               MOV     DRVPRS,R2       ;NUMBER OF DRIVES BEING TESTED
016266  062702  000253          ADD     #PDR-1,R2       ;FOR END ADDRESS OF TABLE
016272  005205          1$:     INC     R5              ;LOCATE THE DRIVE (TO BE
016274  111503                  MOVB    (R5),R3         ;DESELECTED) IN THE TABLE
016276  042703  177600          BIC     #177600,R3      ;DROP THE F FLAG
016302  020301                  CMP     R3,R1           ;IS THIS THE ONE
016304  001403                  BEQ     2$              ;CONTAINING AVAILABLE DRIVES
016306  020502                  CMP     R5,R2           ;FINISHED ?
016310  103770                  BLO     1$              ;BR IF NOT
016312  000472                  BR      11$             ;DRIVE WAS NOT FOUND IN TABLE, EXIT
016314  111502          2$:     MOVB    (R5),R2         ;GET THE DRIVE NUMBER
016316  023527  000264  5$:     CMP     R5,#PDR+10      ;IS THIS DRIVE # THE LAST ENTRY IN TABLE?
016322  001406                  BEQ     4$              ;YES
016324  010504                  MOV     R5,R4
016326  005205                  INC     R5              ;IF NOT, TAKE OUT THIS DRIVE # FROM
016330  112524          3$:     MOVB    (R5)+,(R4)+     ;THE MIDDLE AND PUSH UP THE
016332  022704  001263          CMP     #PDR+7,R4       ;REST OF THE ENTRIES
016336  001374                  BNE     3$
016340  105065  177777  4$:     CLRB    -1(R5)          ;CLEAR LAST ENTRY IN TABLE

                        ;THE DRIVE # TYPED OUT WAS DESELECTED
                        ;BECAUSE ERROR COUNT EXCEEDED THE
                        ;MAXIMUM ALLOWABLE
016342  104401  002336          TYPE    ,MSG19          ;TYPE "DRVE DROPPED"
016346  010146                  MOV     R1,-(SP)        ;PUSH DRIVE NUMBER ON STACK
016350  104403                  TYPOS                   ;TYPE IT ON THE TERMINAL
016352     001                  .BYTE   1
016353     000                  .BYTE   0
016354  004737  026664          JSR     PC,SNOTYP       ;GO TYPE OUT SERIAL NO OF THE DRIVE,
                                                        ;IF SW 1 IS SET.
016360  005337  001264          DEC     DRVPRS          ;DECREMENT THE TOTAL NUMBER OF
                                                        ;DRIVES PRESENT
016364  004737  022564          JSR     PC,CHDPRS       ;CHECK IF ANY DRIVES PRESENT
                                                        ;IF NONE GOT TO END OF PASS, SEOP

016370  012746  177777          MOV     #177777,-(SP)   ;PUT LOW DIVIDEND ON STACK
016374  005046                  CLR     -(SP)           ;CLEAR HIGH DIVIDEND AND PUSH
                                                        ;IT ON STACK
016376  013746  001264          MOV     DRVPRS,-(SP)    ;PUSH DIVISOR ON STACK
016402  004737  025120          JSR     PC,@#$DIV       ;GO TO THE 'DIVIDE' SUBROUTINE
016406  005726                  TST     (SP)+           ;DISCARD THE REMAINDER. QUOTIENT IS
                                                        ;NOW ON TOP OF THE STACK
016410  012637  001520          MOV     (SP)+,DRMAP     ;TO BE USED FOR GENERATING RANDOM
                                                        ;DRIVE NUMBERS.
```

```
 3507  016360  012704  001306          MOV     #KEY,R4         ;DESELECT THE COMMANDS
 3508  016364  011405          6$:     MOV     (R4),R5           ; IN THE 'COMMAND 2' CORRESPONDING
 3509  016366  042705  177770          BIC     #177770,R5        ; TO THE DESELECTED DRIVE
 3510  016372  020105                  CMP     R1,R5
 3511  016374  001002                  BNE     7$
 3512  016376  052714  104000          BIS     #104000,(R4)    ;INDICATE COMMAND DESELECTED
 3513  016402  005724          7$:     TST     (R4)+           ;(AND COMPLETED)
 3514  016404  022704  001326          CMP     #KEY+20,R4
 3515  016410  001365                  BNE     6$
 3516
 3517  016412  105702          8$:     TSTB    R2              ;'F' TYPE DRIVE ?
 3518  016414  100012                  BPL     11$             ;NO - JUST EXIT
 3519  016416  032701  000001          BIT     #1,R1           ;ODD OR EVEN DRIVE NUMBER
 3520  016422  001403                  BEQ     9$
 3521  016424  042701  000001          BIC     #1,R1
 3522  016430  000402                  BR      10$
 3523  016432  052701  000001  9$:     BIS     #1,R1
 3524  016436  000137  016220  10$:    JMP     DSELCT          ;DROP CORRESPONDING DRIVE
 3525
 3526
 3527  016442  000137  013536  11$:    JMP     BEGNEX          ;GO RESTART EXERSISOR PART OF TEST
```

```
                                        ;CHKDRV
                                        ;THIS ROUTINE CHECKS FOR FATAL ERRORS OF THE DRIVE LIKE DPL, DRV
                                        ;WPS.  IF ANY ONE OF THESE ERRORS OCCUR THE DRIVE IS DESELECTED
                                        ;AND NO MORE FUNCTIONS WILL BE PERFORMED ON THAT DRIVE.  R1
                                        ;CONTAINS THE DRIVE NUMBER TO BE CHECKED.

                                        ;*NOTE 1: IN THE ERROR MESSAGE WHERE RKDA IS PRINTED OUT, IT GIVES
                                        ;*ONLY THE DRIVE NUMBER (NOT CYLINDER, SUFACE AND SECTOR).

                                        ;CALL:  JSR     PC,CHKDRV
                                        ;       ----- RETURN HERE IF ANY FATAL ERROR OCCURED
                                        ;       ----- RETURN HERE IF THERE WAS NO FATAL ERROR

016446  017746  162556          CHKDRV: MOV     @RKDA,-(SP)     ;SAVE RKDA
016452  010146                          MOV     R1,-(SP)        ;GET DRIVE #
016454  000241                          CLC
016456  006016                          ROR     (SP)
016460  006016                          ROR     (SP)
016462  006016                          ROR     (SP)
016464  006016                          ROR     (SP)
016466  012677  162536                  MOV     (SP)+,@RKDA     ;ADDRESS THE DRIVE TO BE CHECKED
016472  032777  010000  162516          BIT     #DPL,@RKDS      ;DRIVE POWER LOW?
016500  001403                          BEQ     1$
016502  004737  022130                  JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE #
                                                                ;FOR TYPING SERIAL NUMBER
016506  104035                          ERROR   35              ;DRIVE POWER LO, *NOTE 1 ABOVE
016510  032777  002000  162500  1$:     BIT     #DRU,@RKDS      ;DRIVE
016516  001403                          BEQ     2$
016520  004737  022130                  JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE #
                                                                ;FOR TYPING SERIAL NUMBER
016524  104036                          ERROR   36              ;DRIVE UNSAFE BIT IS SET
                                                                ;*NOTE 1 ABOVE
016526  032777  000040  162462  2$:     BIT     #WPS,@RKDS      ;WRITE PROTECT SET?
016534  001403                          BEQ     3$
016536  004737  022130                  JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE #
                                                                ;FOR TYPING SERIAL NUMBER
016542  104037                          ERROR   37              ;WPS SET, CHECK WRTE PROTECT SWTCH ON DRIVE
                                                                ;*NOTE 1 ABOVE
016544  032777  000200  162444  3$:     BIT     #DRY,@RKDS      ;DRIVE READY CLEAR?
016552  001004                          BNE     4$
016554  004737  022130                  JSR     PC,RG4SDR       ;GET RKCS, ER, DS, DA AND DRIVE #
                                                                ;FOR TYPING SERIAL NUMBER
016560  104034                          ERROR   34              ;DRIVE READY CLEAR, SHOULD BE SET
                                                                ;*NOTE 1 ABOVE
016562  000411                          BR      5$

016564  032777  012040  162424  4$:     BIT     #12040,@RKDS    ;ANY ERROR?
016572  001005                          BNE     5$              ;YES
016574  012677  162430                  MOV     (SP)+,@RKDA     ;RESTORE RKDA
016600  062716  000002                  ADD     #2,(SP)         ;ADJUST RETURN ADDRESS
016604  000207                          RTS     PC

016606  000137  016220          5$:     JMP     DSELCT
```

```
                                ;GENBUF
                                ;THIS ROUTINE GENERRAES A BUFFER FULL OF RANDOM DATA WORDS. THIS BUFFER
                                ;IS THEN USED TO WRITE DATA ON THE DISK.  AT THE TIME OF ENTRY, RKDA
                                ;CONTAINS THE DISK ADDRESS WHERE WRITE WILL BE DONE. SEED WORDS USED FOR
                                ;THE RANDOM NUMBERS ARE:
                                ;       1) ABSOLUTE DISK ADDRESS (DRIVE #, CYL #, SEC #, SUR #) - $HINUM
                                ;       2) COMPLEMENT OF THE ABOVE WORD
                                ;CALL:  JSR     R5,GENBUF
                                ;       X               ;X IS THE WORD COUNT (2'S COMPLEMENT.
                                ;       Y               ;Y IS THE STARTING ADDRESS OF THE
                                                        ;MEMORY BUFFER.

016612  104414                  GENBUF: SAVREG                  ;SAVE REGISTERS
016614  016504  000002                  MOV     2,R5),R4        ;GET STARTING ADDRESS OF BUFFER
016620  011503                          MOV     (R5),R3         ;GET WORD COUNT (# OF WORDS TO
                                                                ;BE GENERATED)

016622  017702  162402                  MOV     @RKDA,R2
016626  010237  025664          1$:     MOV     R2,RSDTH        ;GET THIS RANDOM SEED
016632  010237  025662                  MOV     R2,RSDTL
016636  005137  025662                  COM     RSDTL           ;GET LO RANDOM SEED

016642  022703  177400                  CMP     #-400,R3        ;IF THE BUFFER IS MORE THAN
016646  003003                          BGT     2$              ;ONE SECTOR (400 WORDS) LONG,
016650  010305                          MOV     R3,R5           ;GENERATE THE BUFFER IN SUCH
016652  005003                          CLR     R3              ;A WAY THAT EACH SECTOR
016654  000404                          BR      3$              ;BEGINS WITH RANDOM DATA

016656  062703  000400          2$:     ADD     #400,R3         ;WORDS GENERATED USING THAT
016662  012705  177400                  MOV     #-400,R5        ;SECTOR ADDRESS AS THE RANDOM
                                                                ;SEED
016666  010524                  3$:     MOV     R5,(R4)+        ;FIRST WORD OF EVERY SECTOR IS
                                                                ;A WORD COUNT (2'S COMP) INDICATING #
                                                                ;OF WORDS ACTUALLY WRITTEN IN THAT SECTOR
016670  005205                          INC     R5              ;ALL DONE?
016672  001427                          BEQ     8$

016674  004737  025504          4$:     JSR     PC,$RAND        ;GENERATE DATA WORDS
016700  025662                          RSDTL
016702  012737  000002  017012          MOV     #2,RCNT
016710  013737  025664  017014          MOV     RSDTH,RNUM
016716  000406                          BR      6$
016720  005337  017012          5$:     DEC     RCNT
016724  001763                          BEQ     4$
016726  013737  025662  017014          MOV     RSDTL,RNUM
016734  005737  017014          6$:     TST     RNUM
016740  001767                          BEQ     5$
016742  013724  017014                  MOV     RNUM,(R4)+      ;FILL THE BUFFER. DON'T USE
016746  005205                          INC     R5              ;ALL DONE?
016750  001351                          BNE     4$              ;NO

016752  005703                  8$:     TST     R3              ;ANY MORE DATA WORDS (FOR
016754  001412                          BEQ     10$             ;REST OF THE SECTORS)?
                                                                ;YES
016756  010246                          MOV     R2,-(SP)
016760  042716  177760                  BIC     #177760,(SP)    ;(ABSOLUTE DISK ADDRESS & ITS
```

```
3637  016764  022726  000013          CMP     #13.(SP)+       ;COMPLEMENT) TO USE FOR
3638  016770  001002                  BNE     9$              ;GENERATING DATA WORDS
3639  016772  062702  000004          ADD     #4,R2           ;OF THE NEXT BLOCK
3640
3641  016776  005202                  9$:     INC     R2              ;HI RANDOM SEED
3642  017000  000?12                  BR      1$
3643
3644  017002  104415                  10$:    RESREG                  ;RESTORE REGISTERS
3645  017004  062705  000004          ADD     #4,R5           ;ADJUST RETURN ADDRESS
3646  017010  000205                  RTS     R5              ;RETURN
3647
3648  017012  000000                  RCNT:   0
3649  017014  000000                  RNUM:   0
```

```
                                ;DATCHK
                                ;THIS ROUTINE IS ENTERED WHEN THE DATA THAT WAS READ FROM THE DISK IS TO
                                ;BE CHECKED.  AT THE TIME OF ENTRY R3 CONTAINS THE OFFSET OF  POINTER TO
                                ;THE ADDRESS OF THE PARAMETER LIST (RKCS,DA,WC,BA). DATA IS CHECKED IN
                                ;BLOCKS OF 1 SECTOR (400 WORDS).  EACH BLOCK IS GENERATED USING THE SECTOR
                                ;ADDRESS (AND ITS COMPLEMENT) AS RANDOM SEEDS.  WHEN A DATA MISCOMPARISON
                                ;OCCURS THE BUS ADDRESS, EXPECTED AND RECEIVED DATA ARE REPORTED.

017016  104414          DATCHK: SAVREG                  ;SAVE R0-R5
017020  016303  002032          MOV     PCMND(R3),R3    ;GET ADDRESS OF THE PARAMETER
                                                        ;TABLE
017024  016304  000004          MOV     4(R3),R4        ;GET WORD COUNT (2'S COMP)
017030  016305  000006          MOV     6(R3),R5        ;GET BUS ADDRESS
017034  011301                  MOV     (R3),R1         ;GET DISK ADDRESS

017036  010146                  MOV     R1,-(SP)
017040  004737  022076          JSR     PC,CROTLF       ;ROTATE BITS 15,14,13 TO
                                                        ;0,1,2
017044  012602                  MOV     (SP)+,R2        ;POP OFF DRIVE # FROM THE STACK
017046  006302                  ASL     R2
017050  062702  001712          ADD     #DATER,R2       ;FORM THE ADDRESS OF DATA ERROR COUNT
                                                        ;FOR THIS DRIVE
017054  012737  177764  001540  MOV     #-14,ECOUNT
017062  011337  025664          MOV     (R3),RSDTH      ;CREATE RANDOM SEEDS TO
017066  013737  025664  025662  MOV     RSDTH,RSDTL     ;BE USED FOR CHECKING DATA
017074  005137  025662          COM     RSDTL

017100  022704  177400    1$:   CMP     #-400,R4        ;DATA IS CHECKED IN 1 SECTOR
017104  003003                  BGT     2$              ;BLOCKS. EACH SECTOR IS GENERATED
017106  010403                  MOV     R4,R3           ;USING THAT SECTOR ADDRESS
017110  005004                  CLR     R4              ;AS THE RANDOM SEED
017112  000404                  BR      3$

017114  062704  000400    2$:   ADD     #400,R4
017120  012703  177400          MOV     #-400,R3
017124  012500            3$:   MOV     (R5)+,R0        ;SAVE THE FIRST WORD OF THE SECTOR.
                                                        ;FIRST WORD OF EVERY SECTOR IS A COUNT
                                                        ;(2'S COMP) INDICATING # OF WORDS ACTUALY
                                                        ;WRITTEN IN THAT SECTOR
017126  005200                  INC     R0              ;INCREMENT COUNT OF # OF WORDS  (WRITEN)
                                                        ;IN THE SECTOR
017130  005203                  INC     R3              ;INCRMENT COUNT OF DATA WORDS TO BE CHECKED
017132  001465                  BEQ     14$             ;BRANCH, IF DONE

017134  004737  025504    4$:   JSR     PC,$RAND        ;GENERATE RANDOM DATA WORD
017140  025662                  RSDTL
017142  012737  000002  017012  MOV     #2,RCNT
017150  013737  025664  017014  MOV     RSDTH,RNUM
017156  000406                  BR      10$
017160  005337  017012    9$:   DEC     RCNT
017164  001763                  BEQ     4$
017166  013737  025662  017014  MOV     RSDTL,RNUM
017174  005737  017014   10$:   TST     RNUM
017200  001767                  BEQ     9$

017202  005700                  TST     R0
```

```
3706  017204  001401                      BEQ     5$
3707  017206  005200                      INC     R0
3708
3709  017210  023715  017014      5$:     CMP     RNUM,(R5)       ;EXPCTD WORD = RECVD WORD?
3710  017214  001431                      BEQ     8$              ;YES
3711
3712  017216  005700                      TST     R0
3713  017220  001005                      BNE     6$
3714  017222  005715                      TST     (R5)
3715  017224  001425                      BEQ     8$
3716  017226  005037  001164              CLR     $REG1
3717  017232  000403                      BR      7$
3718
3719  017234  013737  017014  001164  6$: MOV     RNUM,$REG1      ;SAVE EXPCTD DATA WORD
3720  017242  005212                  7$: INC     (R2)            ;INCRMNT DATA EROR COUNT FOR THIS DRVE
3721  017244  005737  001540              TST     ECOUNT          ;STORE ONLY 12 (DEC) DATA ERRORS
3722  017250  001413                      BEQ     8$              ;IF MORE EXIT
3723  017252  010537  001162              MOV     R5,$REG0        ;SAVE ERROR BUS ADDRESS
3724  017256  011537  001166              MOV     (R5),$REG2      ;SAVE ERROR DATA WORD
3725  017262  010137  001170              MOV     R1,$REG3
3726  017266  004737  022134              JSR     PC,GTSDRV       ;SAVE DRIVE #, FOR TYPING SERIAL #
3727  017272  104023                      ERROR   23              ;DATA (COMPARISON) ERROR ON DOING
3728                                                            ;READ FROM DISK NORMALLY ONLY 12 DATA
3729                                                            ;ERRORS WILL BE REPORTED.  THROUGH
3730                                                            ;CHECKING WILL BE DONE, ERRORS
3731                                                            ;EXCEEDING 12 WON'T BE REPORTED.  IF
3732                                                            ;YOU WANT MORE, CHANGE 'ECOUNT' TO
3733                                                            ;WHATEVER # OF ERRORS YOU WANT REPORTED
3734  017274  005237  001540              INC     ECOUNT
3735
3736  017300  005725              8$:     TST     (R5)+
3737  017302  005203                      INC     R3              ;DONE CHECKING?
3738  017304  001313                      BNE     4$
3739
3740  017306  005704              14$:    TST     R4              ;ANY MORE SECTOR BLOCKS
3741  017310  001427                      BEQ     17$             ;TO CHECK? IF NOT, EXIT
3742
3743  017312  010146                      MOV     R1,-(SP)
3744                                                            ;GET THE NEW RANDOM SEEDS
3745  017314  042716  177760              BIC     #177760,(SP)    ;(ABSOLUTE DISK ADDRESS & ITS COMPLEMENT)
3746  017320  022726  000013              CMP     #13,(SP)+       ;TO USE FOR GENERATING DATA WORDS
3747  017324  001002                      BNE     15$             ;OF THE NEXT BLOCK
3748  017326  062701  000004              ADD     #4,R1
3749
3750  017332  005201              15$:    INC     R1
3751  017334  032777  000002  161656      BIT     #CSE,@RKER      ;IF THERE WAS A CSE THEN CHECK
3752  017342  001403                      BEQ     16$             ;ONLY THOSE SECTORS THAT WERE READ
3753  017344  020177  161660              CMP     R1,@RKDA
3754  017350  001407                      BEQ     17$
3755  017352  010137  025664      16$:    MOV     R1,RSDTH
3756  017356  010137  025662              MOV     R1,RSDTL
3757  017362  005137  025662              COM     RSDTL
3758  017366  000644                      BR      1$
3759  017370  104415              17$:    RESREG                  ;RESTORE R0-R5
3760  017372  000207                      RTS     PC
```

```
                                .SBTTL  ROUTINE TO SIZE MEMORY
                                ;;*****************************************************************
                                ;*CALL:
                                ;*      JSR     PC,$SIZE
                                ;*      RETURN
                                ;*$LSTAD WILL CONTAIN:
                                ;*      WITH KT11 OPTION        -- LAST VIRTUAL ADDRESS OF THE LAST BANK
                                ;*      WITHOUT KT11 OPTION     -- LAST ABSOLUTE ADDRESS OF AVAILABLE MEMORY
                                ;*$LSTBK WILL CONTAIN THE LAST BANK AS A SAF
                                ;*$KT11 IS THE MEMORY MANAGEMENT KEY
                                ;*BIT07 = 0 DON'T USE MEMORY MANAGEMENT
                                ;*      MUST BE SETUP BEFORE THE CALL
                                ;*BIT15 = 0 DON'T HAVE MEMORY MANAGEMENT OPTION
                                ;*      DETERMINED BY ROUTINE
                                
017374  010046          $SIZE:  MOV     R0,-(SP)        ;;SAVE R0 ON THE STACK
017376  010146                  MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
017400  010246                  MOV     R2,-(SP)        ;;SAVE R2 ON THE STACK
017402  010346                  MOV     R3,-(SP)        ;;SAVE R3 ON THE STACK
017404  013746  000004          MOV     @#ERRVEC,-(SP)  ;;SAVE PRESENT ERROR VECTOR PS & PC
017410  013746  000006          MOV     @#ERRVEC+2,-(SP)
017414  010600                  MOV     SP,R0           ;;SAVE THE STACK POINTER
                                ;;SET THE ERRVEC PS TO THE PRESENT PS
017416  104400                  TRAP                    ;;PUSH OLD PSW AND PC ON STACK
017420  012637  000006          MOV     (SP)+,@#ERRVEC+2        ;;SAVE THE PSW IN @#ERRVEC+2
017424  012701  003776          MOV     #3776,R1        ;;SETUP ADDRESS
017430  105727                  TSTB    (PC)+           ;;USE MEMORY MANAGEMENT?
017432  000200          $KT11:  .WORD   200             ;;SET TO USE MEMORY MANAGEMENT
017434  100062                  BPL     $CORE           ;;BR IF NO
017436  012737  017574  000004  MOV     #$KTNEX,@#ERRVEC        ;;SET FOR TIMEOUT
017444  005737  177572          TST     @#SR0           ;;KT11 ARE YOU THERE?
017450  052737  100000  017432  BIS     #100000,$KT11   ;;YES--SET KT11 KEY
017456  005046                  CLR     -(SP)           ;;INITIALIZE FOR "PAR" LOADING
017460  012702  172340          MOV     #KIPAR0,R2      ;;ADDRESS OF FIRST "PAR"
017464  012703  000010          MOV     #10,R3          ;;LOAD EIGHT "PAR.'S" AND EIGHT "PDR.'S"
017470  012762  077406  177740  1$:     MOV     #77406,-40(R2)  ;;PDR = 4K, UP, READ/WRITE
017476  011622                  MOV     (SP),(R2)+      ;;LOAD "PAR"
017500  062716  000200          ADD     #200,(SP)       ;;UPDATE FOR NEXT "PAR"
017504  077307                  SOB     R3,1$           ;;LOOP UNTIL ALL EIGHT ARE LOADED
017506  012742  177600          MOV     #177600,-(R2)   ;;SETUP KIPAR7 FOR I/O
017512  005042                  CLR     -(R2)           ;;SETUP KIPAR6 FOR TESTING
017514  012737  017532  000004  MOV     #2$,@#ERRVEC    ;;CATCH TIMEOUT IF NO SR3
017522  012737  000020  172516  MOV     #20,@#SR3       ;;ENABLE 22 BIT MODE
017530  000401                  BR      3$              ;;THIS PDP-11 HAS A SR3 REGISTER
017532  022626          2$:     CMP     (SP)+,(SP)+     ;;CLEAN OFF THE STACK--NO SR3
017534  005237  177572  3$:     INC     @#SR0           ;;TURN ON MEMORY MANAGEMENT
017540  012737  017564  000004  MOV     #$KTOUT,@#ERRVEC        ;;SET FOR TIME OUT
017546  005737  143776  4$:     TST     @#143776        ;;TRAP ON NON-EX-MEM
017552  062712  000040          ADD     #40,(R2)        ;;MAKE A 1K STEP
017556  023712  172356          CMP     @#KIPAR7,(R2)   ;;LAST ONE?
017562  101371                  BHI     4$              ;;NO--TRY IT
017564  011202          $KTOUT: MOV     (R2),R2         ;;GET LAST BANK+1
017566  005037  177572          CLR     @#SR0           ;;TURN OFF MEMORY MANAGEMENT
017572  000421                  BR      $SIZEX
017574  042737  100000  017432  $KTNEX: BIC     #100000,$KT11   ;;KT11 NON-EXISTENT
```

```
MAINDEC-11-DZRKH-F     MACY11 27(1006)  04-OCT-76  13:29  PAGE 87
DZRKHF.P11    22-SEP-76 08:57           ROUTINE TO SIZE MEMORY                                SEQ 0100

  3817  017602  012737  017632  000004  $CORE:  MOV     #$CROUT,@#ERRVEC ;;SET FOR TIMEOUT
  3818  017610  005002                  CLR     R2               ;;SET UP BANK
  3819  017612  062701  004000          1$:     ADD     #4000,R1         ;;INCREMENT BY 1K
  3820  017616  062702  000040                  ADD     #40,R2           ;;1K STEP
  3821  017622  005711                  TST     (R1)             ;;TRAP ON TIME OUT
  3822  017624  022701  177776                  CMP     #177776,R1       ;;LAST ONE
  3823  017630  001370                  BNE     1$               ;;NO--TRY AGAIN
  3824  017632  162701  004000          $CROUT: SUB     #4000,R1
  3825  017636  162702  000040          $SIZEX: SUB     #40,R2           ;;DROP BACK
  3826  017642  010006                  MOV     R0,SP            ;;RESTORE THE STACK
  3827  017644  012637  000006                  MOV     (SP)+,@#ERRVEC+2 ;;RESTORE ERROR VECTOR
  3828  017650  012637  000004                  MOV     (SP)+,@#ERRVEC
  3829  017654  010137  017676                  MOV     R1,$LSTAD        ;;LAST ADDRESS
  3830  017660  010237  017700                  MOV     R2,$LSTBK        ;;LAST BANK
  3831  017664  012603                  MOV     (SP)+,R3         ;;RESTORE R3
  3832  017666  012602                  MOV     (SP)+,R2         ;;RESTORE R2
  3833  017670  012601                  MOV     (SP)+,R1         ;;RESTORE R1
  3834  017672  012600                  MOV     (SP)+,R0         ;;RESTORE R0
  3835  017674  000207                  RTS     PC
  3836  017676  000000          $LSTAD: .WORD   0                ;;CONTAINS THE LAST ADDRESS
  3837  017700  000000          $LSTBK: .WORD   0                ;;CONTAINS THE LAST BANK
```

```
                                        ;TYPDBO
                                        ;THIS ROUTINE CONVERTS A VIRTUAL ADDRESS TO PHYSICAL ADDRESS AND TYPES
                                        ;OUT THE 6 DIGIT PHYSICAL ADDRESS. R2 CONTAINS VIRTUAL ADDRESS AT THE TIME
                                        ;OF ENTRY.
                                        ;TYPE OUT IS INHIBITED IF SW 13 IS SET.

017702  032777  020000  161230  TYPDBO: BIT     #SW13,@SWR      ;INHIBIT TYPEOUT?
017710  001042                  BNE     2$              ;YES
017712  010346                  MOV     R3,-(SP)
017714  010446                  MOV     R4,-(SP)
017716  010546                  MOV     R5,-(SP)

017720  010246                  MOV     R2,-(SP)        ;PUSH VA ON STACK
017722  004737  022076          JSR     PC,CROTLF       ;ROTATE BITS 15,14,13 INTO 2,1,0
017726  012603                  MOV     (SP)+,R3        ;FORM OFFSET TO BE USED
017730  006303                  ASL     R3              ;FOR KIPAR

017732  016304  172340          MOV     KIPAR0(R3),R4   ;GET THE BASE PAGE ADDRESS FROM
                                                        ;KIPAR
017736  005003                  CLR     R3              ;ROTATE LEFT 6 TIMES (MULTIPLY
017740  012705  177772          MOV     #-6,R5          ;BY 100 OCTAL) TO GET THE
017744  006104          1$:     ROL     R4              ;BASE BUS ADDRESS (PHYSICAL)
017746  005205                  INC     R5              ;R3 CONTAINS MSB-2 BITS
017750  001375                  BNE     1$


017752  010246                  MOV     R2,-(SP)        ;STRIP OFF TOP 3 BITS FROM  VA 3

017754  042716  160000          BIC     #160000,(SP)    ;GET THE OFFSET INSIDE THE PAGE
017760  062604                  ADD     (SP)+,R4        ;FORM THE ENTIRE PHYSICAL
017762  005503                  ADC     R3              ;ADDRESS. R4 CONTAINS LOWER 16 BITS
                                                        ;R3 CONTAINS TOP 2 BITS
017764  010437  001162          MOV     R4,$REG0        ;SAVE LOWER 16 BITS OF PA
017770  010337  001164          MOV     R3,$REG1        ;SAVE TOP 2 BITS OF PA
017774  012746  001162          MOV     #$REG0,-(SP)    ;PUSH POINTER TO PA ON STACK
020000  004737  024372          JSR     PC,@#$DB2O      ;CONVERT THE 18 BIT BINARY
                                                        ;ADDRESSS TO OCTAL ASICZ NUMBERS ON RETURN
                                                        ;POINTER TO THE FIRST ASCIZ CHARACTERS
                                                        ;IS ON STACK
020004  004737  024722          JSR     PC,@#SUPRS      ;TYPE OUT THE OCTAL 6 DIGIT
                                                        ;PHYSICAL ADDRESS.

020010  012605                  MOV     (SP)+,R5
020012  012604                  MOV     (SP)+,R4
020014  012603                  MOV     (SP)+,R3

020016  000207          2$:     RTS     PC
```

```
                                        ;CHKCS
                                        ;THIS ROUTINE CHECKS IF BIT 15 OF RKCS WAS SET. IF IT WAS SET RTN IS MADE TO
                                        ;THE ERROR MESSAGE FOLLOWING THE JSR CALL. IF NOT, THE ERROR MADE TO SKIP
                                        ;OVER THE ERROR MESSAGE.

020020  005777  161176          CHKCS:  TST     @RKCS           ;BIT 15 SET?
020024  100073                          BPL     COMRET          ;NO
020026  004737  021740                  JSR     PC,GT4RG        ;YES. GET RKCS, ER, DS, DA
020032  000207                          RTS     PC              ;RETURN TO THE ERROR MESSAGE

                                        ;CHKDA
                                        ;THIS ROUTINE CHECKS IF RKDA INCREMENTED CORRECTLY. IF NOT, RETURN IS MADE
                                        ;TO THE ERROR MESSAGE FOLLOWING THE JSR CALL. IF YES, RETURN IS MADE TO
                                        ;SKIP OVER THE ERROR MESSAGE.
                                        ;AT THE TIME OF ENTRY, R2 CONTAINS THE EXPECTED RKDA.

020034  020277  161170          CHKDA:  CMP     R2,@RKDA        ;DID RKDA INCREMENT CORRECTLY?
020040  001465                          BEQ     COMRET          ;YES
020042  010237  001162                  MOV     R2,$REG0        ;GET EXPCTD RKDA
020046  017737  161156  001164          MOV     @RKDA,$REG1     ;GET RKDA RECVD
020054  000207                          RTS     PC              ;RETURN TO THE ERROR MESSAGE

                                        ;CHKBA
                                        ;THIS ROUTINE CHECKS IF RKBA INCREMENTED CORRECTLY. IF NOT, RETURN IS MADE
                                        ;TO THE ERROR MESSAGE FOLLOWING THE JSR CALL. IF YES, RETURN IS MADE TO
                                        ;SKIP OVER THE ERROR MESSAGE.
                                        ;AT THE TIME OF ENTRY, R3 CONTAINS THE WORD COUNT (# OF WORDS TRANSFERRED)
                                        ;R4 CONTAINS THE BUS ADDRESS WHERE THE TRANSFER STARTED.

020056  000241          CHKBA:  CLC
020060  006103                  ROL     R3              ;FORM THE EXPCTD BUS ADDRESS
020062  060304                  ADD     R3,R4
020064  000241                  CLC
020066  006003                  ROR     R3
020070  020477  161132          CMP     R4,@RKBA        ;DID RKBA INCREMENT CORRECTLY?
020074  001447                  BEQ     COMRET          ;YES
020076  010437  001162          MOV     R4,$REG0        ;GET EXPCTD RKBA
020102  000207                  RTS     PC              ;RETURN TO THE EROR MESAGE

020104  017737  161116  001164          MOV     @RKBA,$REG1     ;GET RKBA RECVD
                                        ;CHKMEX
                                        ;THIS ROUTINE CHECKS THAT RKBA OVERFLOWED AND MEX BIT WAS SETIN RKCS (BIT 4)
                                        ;IF RKBA OVERFLOWED CORRECTLY, THE RETURN ADDRESS IS ADJUSTED TO SKIP THE
                                        ;ERROR MESSAGE ON RETURN.

020112  017746  161104          CHKMEX: MOV     @RKCS,-(SP)     ;GET RKCS
020116  042716  177717                  BIC     #177717,(SP)    ;GET MEX BITS 4,5
020122  022726  000020                  CMP     #BIT4,(SP)+     ;CHECK BIT 4 SET?
020126  001432                          BEQ     COMRET          ;YES, OK
020130  004737  021740                  JSR     PC,GT4RG        ;SAVE RKCS,ER,DS,DA
020134  000207                          RTS     PC              ;RETURN
```

```
                                        ;CHKWC
                                        ;THIS ROUTINE CHECKS IF RKWC OVERFLOWED CORRECTLY AFTER A DATA TRANSFER
                                        ;IF IT DID NOT, RETURN IS MADE TO THE ERROR MESSAGE. IF IT DID, RETURN IS
                                        ;MADE TO SKIP OVER THE ERROR MESSAGE.

020136  005777  161062        CHKWC:  TST     @RKWC           ;RKWC OVERFLOWED?
020142  001424                BEQ     COMRET          ;YES
020144  017737  161060  001162        MOV     @RKDA,$REG0
020152  017737  161046  001164        MOV     @RKWC,$REG1
020160  000207                        RTS     PC              ;RETURN TO THE EROR MESAGE


                                        ;CHKRWS
                                        ;THIS ROUTINE CHECKS IF R/W/S RDY BIT IN RKDS IS SET. IF IT IS NOT SET RETURN
                                        ;IS MADE TO THE ERROR MESSAGE FOLLOWING THE JSR CALL. IF IT IS, THE RETURN
                                        ;ADDRESS IS ADJUSTED TO SKIP OVER THE ERROR MESSAGE ON RERTURN.

020162  032777  000100  161026  CHKRWS: BIT     #RWS,@RKDS      ;RWS RDY SET?
020170  001011                BNE     COMRET          ;YES
020172  004737  021740                JSR     PC,GT4RG        ;GET RKCS, ER, DS, DA
020176  000207                        RTS     PC              ;RETURN TO THE ERROR MESSAGE


                                        ;CHKCRDY
                                        ;THIS ROUTINE CHECKS IF CONTROL READY BIT IN RKCS IS SET. IF IT IS NOT,
                                        ;RETURN IS MADE TO THE ERROR MESSAGE FOLLOWING THE JSR CALL. IF IT IS,
                                        ;RETURN ADDRESS IS ADJUSTED TO SKIP OVER THE ERROR MESSAGE.

020200  105777  161016        CHKCRDY: TSTB   @RKCS           ;CONTROL READY SET?
020204  100403                BMI     COMRET          ;YES
020206  004737  021740                JSR     PC,GT4RG        ;GET RKCS, ER, DS, DA
020212  000207                        RTS     PC              ;RETURN TO THE EROR MESAGE

020214  062716  000002        COMRET: ADD     #2,(SP)         ;ADJUST RETURN ADDRESS TO SKIP OVER MESAGE
020220  000207                        RTS     PC
```

```
                                ;THIS ROUTINE KEEPS A HISTORY OF THE COOMANDS THAT ARE BEING EXECUTED
                                ;ON THE RK11. 'PRSFNC' CONTAINS INFORMATION ABOUT THE PRESENT COMMAND
                                ;WHICH IS ABOUT TO BE INITIATED. 'PSTFNC' CONTAINS INFORMATION ABOUT THE
                                ;COMMAND THAT WAS EXECUTED BEFORE THIS NEW ONE. THERE ARE MULTIPLE POINTS
                                ;OF ENTRY DEPENDING ON THE TYPE OF COMMAND BEING PRESENTLY INITIATED:

                                ;DRCMND - ENTERED WHEN A DRIVE RESET IS BEING INITIATED. DRIVE # IS SAVED
                                ;IN BITS 0-2 OF 'PRSCMND' AND BIT 8 IS SET.

                                ;CRCMND - ENTERED WHEN A CONTROL RESET IS BEING INITIATED. BIT 14 OF
                                ;'PRSCMND' IS SET.

                                ;POSCMND - ENTERED WHEN A POSITIONING SEEK IS BEING INITIATED. BITS 0-2
                                ;CONTAIN THE DRIVE NUMBER ON WHICH THE POSITIONING SEEK WAS DONE. ALSO
                                ;BIT 7 IS SET.

                                ;IN ALL ABOVE CASES BIT 15 OF 'PRSCMND' IS SET.

                                ;FNCMND - ENTERED WHEN A COMMAND OTHER THAN ANY ONE OF THE ABOVE IS BEING
                                ;INITIATED (EX: READ, WRITE, ETC).
                                ;THE OFFSET TO THE COMMAND KEY (BASE=KEY) IS SAVED IN BITS 0-3 OF 'PSRCMND'.

                                ;IT SHOULD BE NOTED THAT CONTENTS OF 'PRSFNC' ARE PUSHED INTO 'PSTFNC'
                                ;AND SAVED, BEFORE PUTTING INFO ABOUT THE PRESENT COMMAND IN 'PRSFNC'.

                                ;R0 CONTAINS ADDRESS OF THE COMMAND KEY, AT THE TIME OF ENTRY.

020222  012737  100400  001512  DRCMND: MOV     #BIT15+BIT8,QFNC
020230  017746  160774                  MOV     @RKDA,-(SP)             ;SAVE DRIVE #
020234  004737  022076                  JSR     PC,CRLF
020240  052637  001512                  BIS     (SP)+,QFNC
020244  000424                          BR      P2

020246  012737  140000  001512  CRCMND: MOV     #BIT15+BIT14,QFNC
020254  000420                          BR      P2

020256  011037  001512          POSCMND:        MOV     (R0),QFNC
020262  042737  177770  001512          BIC     #177770,QFNC            ;GET DRIVE NO.
020270  052737  100200  001512          BIS     #BIT15+BIT7,QFNC
020276  000407                          BR      P2

020300  005037  001512          FNCMND: CLR     QFNC
020304  010046                  P1:     MOV     R0,-(SP)
020306  162716  001306                  SUB     #KEY,(SP)
020312  052637  001512                  BIS     (SP)+,QFNC

020316  013737  001462  001464  P2:     MOV     PRSFNC,PSTFNC
020324  013737  001512  001462          MOV     QFNC,PRSFNC
020332  000207                          RTS     PC
```

```
                                        ;HISTRY
                                        ;THIS ROUTINE TYPES OUT INFORMATION ABOUT THE FUNCTION THAT WAS
                                        ;BEING PERFORMED ON THE RK AT THE TIME OF ERROR AND THE FUNCTION
                                        ;THAT WAS PERFORMED JUST BEFORE THAT FUNCTION (WHICH LED TO
                                        ;THE ERROR). THIS ROUTINE IS CALLED WHEN AN ERROR OCCURS AND SW 12
                                        ;IS SET.

020334  010046                  HISTRY: MOV     R0,-(SP)
020336  010146                          MOV     R1,-(SP)

020340  012700  001462                  MOV     #PRSFNC,R0
020344  104401  020654                  TYPE    ,MH1
020350  104401  020700                  TYPE    ,MH3
020354  104401  020670                  TYPE    ,MH2
020360  005710                  6$:     TST     (R0)
020362  100053                          BPL     3$              ;READ, READ CHECK, WRITE, WRITE CHECK, SEEK
020364  105710                          TSTB    (R0)
020366  100427                          BMI     2$              ;POSITIONING (SEEK)
020370  032710  040000                  BIT     #BIT14,(R0)
020374  001014                          BNE     1$              ;CONTROL RESET

020376  104401  020404                  TYPE    ,65$            ;;TYPE ASCIZ STRING
020402  000412                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  /RESET ON DRV /
020424                          64$:
020424  000425                          BR      7$

020426                          ;5$:
020426  104401  020434                  TYPE    ,67$            ;;TYPE ASCIZ STRING
020432  000404                          BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  /CRESET/
020444                          66$:
020444  000463                          BR      4$

020446                          2$:
020446  104401  020454                  TYPE    ,69$            ;;TYPE ASCIZ STRING
020452  000412                          BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$:  .ASCIZ  /POSITIONING DRIVE /
020500                          68$:
020500  011046                  7$:     MOV     (R0),-(SP)
020502  042716  177770                  BIC     #177770,(SP)    ;TYPE DRIVE NO.
020506  104402                          TYPOC
020510  000441                          BR      4$

020512  011001                  3$:     MOV     (R0),R1
020514  016101  002032                  MOV     PCMND(R1),R1    ;GO TYPE OUT THE FUNCTION
020520  016104  000002                  MOV     2(R1),R4        ;BEING PERFORMED
020524  004737  021E44                  JSR     PC,TYPFN
020530  104401  020536                  TYPE    ,71$            ;;TYPE ASCIZ STRING
020534  000403                          BR      70$             ;;GET OVER THE ASCIZ
                                ;;71$:  .ASCIZ  <15><12>/DA=/
020544                          70$:
020544  011146                          MOV     (R1),-(SP)      ;TYPE OUT DISK ADDRESS
020546  104402                          TYPOC
020550  104401  020556                  TYPE    ,73$            ;;TYPE ASCIZ STRING
020554  000403                          BR      72$             ;;GET OVER THE ASCIZ
```

```
                                ;;?3$:  .ASCIZ    BA=
                                ?2$:
                                        MOV     6.R1,-(SP
                                        TYPOC
                                        TYPE    ,?5$            ;;TYPE ASCIZ STRING
                                        BR      ?4$             ;;GET OVER THE ASCIZ
                                ;;?5$:  .ASCIZ    WC=
                                ?4$:
                                        MOV     4.R1,-(SP
                                        TYPOC
                                4$:     CMP     R0,#PSTFNC
                                        BEQ     5$
                                        TST     (R0)+
                                        TYPE    ,MH1
                                        TYPE    ,MH4
                                        TYPE    ,MH2
                                        BR      6$
                                5$:     TYPE    ,$CRLF
                                        MOV     (SP)+,R1
                                        MOV     (SP)+,R0
                                6$:     RTS     PC
                                MH1:    .ASCIZ  <15><12>/FUNCTION /
                                MH2:    .ASCIZ  / ERROR /
                                MH3:    .ASCIZ  /AT/
                                MH4:    .ASCIZ  /PRIOR TO/
                                        .EVEN
```

```
                                        ;STATSTC
                                        ;AT THE TIME OF ENTRY R1 CONTAINS THE DRIVE NUMBER FOR WHICH THE STATISTIC
                                        ;S TO BE OBTAINED.  R5 CONTAINS THE POINTER TO THE PARAMETER TABLE FOR
                                        ;THE COMMAND EXECUTED ON THE ABOVE DRIVE. R4 CONTAINS THE FUNCTION CODE
                                        ;(WRITE, READ, ETC) FOR WHICH STATISTICS ARE TO BE TAKEN.

020714  010046          STATSTC:MOV     R0,-(SP)        ;PUSH R0, R2, R3 ONTO THE
020716  010246                  MOV     R2,-(SP)        ;STACK
020720  010346                  MOV     R3,-(SP)

020722  005002                  CLR     R2
020724  005701                  TST     R1              ;DRIVE 0?
020726  001404                  BEQ     2$              ;FORM THE OFFSET FOR THE
020730  062702  000004    1$:   ADD     #4,R2           ;'WORDS XFERRED COUNTS'-
020734  005301                  DEC     R1              ;NWRTL, NRDL
020736  001374                  BNE     1$
020740  016500  000034    2$:   MOV     4(R5),R0        ;GET WORD COUNT (RKWC) FROM
020744  005400                  NEG     R0              ;THE PARAMETER TABLE

020746  005777  160250          TST     @RKCS           ;ANY ERROR DURING THE XFER?
020752  100004                  BPL     3$
                                                        ;YES,
020754  017703  160244          MOV     @RKWC,R3        ;GET THE # OF WORDS THAT
020760  005403                  NEG     R3              ;WERE ACTUALLY X-FERRED
020762  160300                  SUB     R3,R0

020764  022704  000002    3$:   CMP     #2,R4           ;WRITE FUNCTION?
020770  001005                  BNE     5$
                                                        ;YES, ADD THE # OF WORDS
020772  060062  001732    4$:   ADD     R0,NWRTL(R2)    ;XFERRED (WRITE)
020776  005562  001734          ADC     NWRTH(R2)       ;NOTE IT'S 2-WORD COUNT LO, HI
021002  000404                  BR      6$

021004  060062  001772    5$:   ADD     R0,NRDL(R2)     ;ADD THE # OF WORDS READ
                                                        ;NOTE THAT WRT CHK,
                                                        ;READ CHK ARE ALSO CONS-
                                                        ;IDERED TO BE 'READ'
021010  005562  001774          ADC     NRDH(R2)        ;CARRY OVER TO THE HI WORD

021014  012603    6$:   MOV     (SP)+,R3        ;POP R3,R2,R0 FROM THE STACK
021016  012602          MOV     (SP)+,R2
021020  012600          MOV     (SP)+,R0
021022  000207          RTS     PC
```

```
                                        ;REPSTAT
                                        ;THIS ROUTINE REPORTS ERROR STATISTICS AND DATA-TRANSFER STATISTICS.

021024  104401  002377        REPSTA: TYPE    ,MSG26
021030  013700  001264                MOV     DRVPRS,R0
021034  012701  001254                MOV     #PDR,R1

021040  104401  001213        1$:     TYPE    ,$CRLF
021044  112102                        MOVB    (R1)+,R2
021046  042702  177770                BIC     #177770,R2
021052  010246                        MOV     R2,-(SP)
021054  104403                        TYPOS
021056     003                        .BYTE   3
021057     000                        .BYTE   0
021060  104401  002662                TYPE    .BLNKS3

021064  005004                        CLR     R4
021066  010203                        MOV     R2,R3
021070  001404                        BEQ     3$
021072  062704  000004        2$:     ADD     #4,R4
021076  005303                        DEC     R3
021100  001374                        BNE     2$

021102  104401  002664        3$:     TYPE    ,BLNKS1
021106  010446                        MOV     R4,-(SP)
021110  062716  001732                ADD     #NWRTL,(SP)
021114  004737  024512                JSR     PC,$DB2D
021120  004737  024722                JSR     PC,SUPRS
021124  104401  002664                TYPE    ,BLNKS1
021130  010446                        MOV     R4,-(SP)
021132  062716  001772                ADD     #NRDL,(SP)
021136  004737  024512                JSR     PC,$DB2D
021142  004737  024722                JSR     PC,SUPRS

021146  006302                        ASL     R2

021150  104401  002664                TYPE    ,BLNKS1
021154  016246  001652                MOV     CSECN(R2),-(SP)
021160  104405                        TYPDS

021162  104401  002664                TYPE    ,BLNKS1
021166  016246  001632                MOV     WCECN(R2),-(SP)
021172  104405                        TYPDS

021174  104401  002664                TYPE    ,BLNKS1
021200  016246  001712                MOV     DATER(R2),-(SP)
021204  042716  100000                BIC     #100000,(SP)    ;DONT TYPE A NEGATIVE NO.
021210  104405                        TYPDS

021212  104401  002664                TYPE    ,BLNKS1
021216  016246  001562                MOV     HECN(R2),-(SP)
021222  104405                        TYPDS

021224  005300                        DEC     R0              ;FINISHED WITH THE DRIVES ?
021226  001304                        BNE     1$              ;BR IF NOT
021230  104401  002474                TYPE    ,MSG26A         ;REST OF SUMMARY MESSAGE
```

```
 4206  021234  013700  001264          MOV     DRVPRS,R0       ;NUMBER OF DRIVES
 4207  021240  012701  001254          MOV     #FDR,R1         ;'DRIVES PRESENT' TABLE ADDRESS
 4208  021244  104401  001213    4$:   TYPE    ,$CRLF          ;CR-LF
 4209  021250  112102                  MOVB    (R1)+,R2        ;DRIVE ADDRESS
 4210  021252  042702  177770          BIC     #177770,R2      ;LEAVE ONLY DRIVE NUMBER
 4211  021256  010246                  MOV     R2,-(SP)        ;PUT ON STACK FOR TYPECUT
 4212  021260  104403                  TYPOS                   ;TYPE IT IN OCTAL
 4213  021262     003                  .BYTE   3               ;TYPE 3 CHARACTERS
 4214  021263     000                  .BYTE   0               ;SUPRESS LEADING ZEROS
 4215  021264  104401  002662          TYPE    ,BLNKS3         ;3 BLANKS
 4216  021270  006302                  ASL     R2              ;CONVERT TO A WORD TABLE INDEX
 4217  021272  104401  002664          TYPE    ,BLNKS1
 4218  021276  016246  001602          MOV     $KEON(R2),-(SP
 4219  021302  104405                  TYPDS
 4220
 4221
 4222  021304  104401  002664          TYPE    ,BLNKS1
 4223  021310  016246  001672          MOV     ABORT(R2),-(SP)
 4224  021314  104405                  TYPDS
 4225
 4226  021316  006202                  ASR     R2
 4227  021320  104401  002664          TYPE    ,BLNKS1
 4228  021324  116246  001622          MOVB    $INCN.R2),-(SP)
 4229  021330  104405                  TYPDS
 4230
 4231  021332  005300                  DEC     R0
 4232  021334  001343                  BNE     4$
 4233  021336  004737  026556          JSR     PC,TIMTYP       ;TYPE THE TIME
 4234  021342  000207                  RTS     PC
```

```
                                        ;STATUS
                                        ;THIS ROUTINE IS NORMALLY ENTERED WHEN THE PROGRAM IS WAITING FOR THE
                                        ;CONTROLLER TO FINISH WHAT IT IS DOING. THERE ARE TWO DOUBLE PRECISION
                                        ;COUNTS KEPT IN THIS ROUTINE.
                                        ;CICNT,CICNT1
                                        ;THIS COUNT KEEPS TRACK OF HOW LONG THE CONTROLLER HAS BEEN BUSY AFTER
                                        ;A COMMAND WAS INITIATED. THE CONTROLLER SHOULD FINISH WHATEVER IT IS DOING
                                        ;BEFORE THIS COUNT EXPIRES. IF IT DOES NOT, THERE IS AN ERROR CONDITION AND
                                        ;IT IS SO REPORTED.

                                        ;QSCNT
                                        ;THIS COUNT IS INITIALIZED EVERY TIME 8 COMMANDS ARE GENERATED. THE COUNT
                                        ;IS INCREMENTED EVERY TIME THIS ROUTINE IS ENTERED. ALL THE 8 COMMANDS
                                        ;SHOULD BE DONE BEFORE THIS COUNT EXPIRES. IF THEY DO NOT AN ERROR CONDITION
                                        ;IS REPORTED. THIS COUNT HAS BEEN KEPT PRIMARILY TO INSURE THAT THE PROGRAM
                                        ;DOES NOT GET CAUGHT IN AN INDEFINITE LOOP, BECAUSE OF AN ERROR CONDITION.

021344  005046          STATUS: CLR     -(SP)           ;DROP PRIORITY AND WAIT FOR INT
021346  012746  021354          MOV     #1$,-(SP)       ;RETURN FOR RTI
021352  000002                  RTI
                                                        ;NOTE THAT THE INTERRUPTS ARE ALLOWED ONLY
                                                        ;AT CERTAIN PLACES IN THE PROGRAM, BECAUSE
                                                        ;IT MAKES TROUBLESHOOTING OF FAILURES EASY.
                                                        ;OTHER PLACES WHERE INTERRUPTS ARE ALLOWED
                                                        ;TO TAKE PLACE:
                                                        ;'CHFAFN',  FIRST INTERRUPT AFTER ISSUING
                                                        ;A SEEK FUNCTION.

021354  005237  001460          1$:     INC     QSCNT
021360  001456                  BEQ     QERROR
021362  105777  157634          TSTB    @RKCS
021366  100514                  BMI     CNOBSY

021370  005037  001466          CLR     CICNT
021374  012737  177761  001470  MOV     #-17,CICNT1

021402  105737  001534  CBSY:   TSTB    INTFLG          ;FOR A NON-SEEK COMAND:
                                                        ;INTFLG- BIT 7 IS SET, BITS 0-3 CONTAIN
                                                        ;OFFSET TO THE COMMAND KEY (FROM KEY),
                                                        ;FOR WHICH THIS INTERUPT IS EXPCTD.
                                                        ;WHEN THE INTERUPT OCCURS & 'INTHND' IS
                                                        ;ENTERED 'INTFLG' IS CLEARED.
021406  001507                  BEQ     SEXIT
021410  005237  001466          INC     CICNT
021414  001372                  BNE     CBSY
021416  005237  001470          INC     CICNT1
021422  001367                  BNE     CBSY

                                        ;TIMED OUT WHILE WAITING FOR THE INTRUPT.
                                        ;ONE OF THE COMMANDS DID NOT INTERRUPT
021424  113700  001534  NIEROR: MOVB    INTFLG,R0
021430  042700  177760          BIC     #177760,R0
021434  010003                  MOV     R0,R3
021436  062700  001306          ADD     #KEY,R0
021442  011037  001172          MOV     (R0),$REG4
021446  042737  177770  001172  BIC     #177770,$REG4
```

```
4291  021454  013737  001172  001250          MOV     $REG4,SRDRV     ;GET DRIVE #, FOR TYPING SERIAL #
4292
4293  021462  104421  002245                  TYPMSG  ,MSG15          ;PRINT 'DRVE # DIDN'T INTRUPT AFTER'
4294  021466  016305  002032                  MOV     PCMND(R3),R5
4295  021472  016504  000002                  MOV     2(R5),R4
4296  021476  004737  021644                  JSR     PC,TYPFN
4297  021502  004737  021740                  JSR     PC,GT4RG
4298  021506  104025                          ERROR   25              ;COMMAND TYPED OUT IN EROR MESAGE DID
4299                                                                  ;NOT INTERJPT ON COMPLETION.
4300  021510  052710  104000                  BIS     #BIT15+BIT11,(R0)       ;INDICATE THAT FUNCTION IS ABORTED
4301  021514  000444                          BR      SEXIT
4302
4303
4304  021516  005037  001460          QERROR: CLR     QSCNT           ;REESTABLISH COUNT
4305  021522  004737  021740                  JSR     PC,GT4RG
4306  021526  104026                          ERROR   26              ;ALL 8 COMMANDS SHOULD BE DONE BY NOW, TIMED
4307                                                                  ;OLT. THE PROGRAM IS WAITING FOR ONE OF THE
4308                                                                  ;COMMANDS IN THE Q TO BE FINISHED AND THIS
4309                                                                  ;DID NOT HAPPEN OR FOR SOME OTHER REASON THE
4310                                                                  ;'FINISHED' FLAG (BIT 15) OF ONE OF THE 8
4311                                                                  ;COMMAND KEYS WAS NOT SET. VARIOUS FLAGS 'POS'(-7,
4312                                                                  ;'BUSY'(-7), 'KEY'(-8) CONTAIN INFORMATION
4313                                                                  ;ABOUT THE STATUS OF THE SYSTEM.
4314
4315  021530  032777  020000  157402          BIT     #SW13,@SWR      ;INHIBIT TYPEOUT?
4316  021536  001024                          BNE     2$              ;YES
4317  021540  104401  002305                  TYPE,   MSG16
4318  021544  012700  001306                  MOV     #KEY,R0
4319  021550  012701  001426                  MOV     #BUSY,R1
4320  021554  012702  177770                  MOV     #-10,R2
4321  021560  104401  001213          1$:     TYPE    ,$CRLF
4322  021564  012046                          MOV     (R0)+,-(SP)     ;TYPE OUT CONTENTS OF ALL KEYS
4323  021566  104402                          TYPOC                   ;KEY-KEY8
4324  021570  104401  002662                  TYPE    ,BLNKS3
4325  021574  005046                          CLR     -(SP)
4326  021576  112116                          MOVB    (R1)+,(SP)      ;TYPE OUT CONTENTS OF ALL BUSY FLAGS
4327  021600  104403                          TYPOS                   ;BUSY-BUSY7
4328  021602     003                          .BYTE   3
4329  021603     000                          .BYTE   0
4330  021604  005202                          INC     R2              ;DONE?
4331  021606  001364                          BNE     1$              ;NO
4332
4333  021610  004737  015714          2$:     JSR     PC,CLRERR       ;MAKE SURE THERE IS NO HEAD MOVEMENT ON
4334                                                                  ;ANY DRIVE & THEN DO CONTROL RESET
4335  021614  000137  010536                  JMP     BEGNEX          ;GO, BAK AND CONTINUE
4336
4337  021620  005004          CNOBSY: CLR     R4
4338  021622  005204                  INC     R4
4339  021624  001376                  BNE     .-2
4340  021626  013746  001244          SEXIT:  MOV     PPRLVL,-(SP)
4341  021632  012746  021640                  MOV     #RTIPC7,-(SP)   ;RETURN FOR RTI **********
4342  021636  000002                          RTI
4343
4344  021640  000137  010556          RTIPC7: JMP     QMNGER
```

```
                                        ;TYPFN
                                        ;ROUTINE TO TYPE OUT THE FUNCTION (READ,WRITE,ETC) ;R4 CONTAINS THE
                                        ;FUNCTION CODE AT THE TIME OF ENTRY.
                                        ;SW 13, IF SET INHIBITS TYPEOUT.

021644  032777  020000  157266  TYPFN:  BIT     #SW13,@SWR      ;INHIBIT TYPEOUT?
021652  001031                          BNE     5$              ;YES
021654  020427  000002                  CMP     R4,#2           ;WRITE?
021660  001002                          BNE     1$
021662  104401  002133                  TYPE    ,MSG6
021666  022704  000004          1$:     CMP     #4,R4           ;READ?
021672  001002                          BNE     2$
021674  104401  002141                  TYPE    ,MSG7
021700  022704  000012          2$:     CMP     #12,R4          ;READ CHECK?
021704  001002                          BNE     3$
021706  104401  002156                  TYPE    ,MSG9
021712  022704  000006          3$:     CMP     #6,R4           ;WRITE CHECK?
021716  001002                          BNE     4$
021720  104401  002146                  TYPE    ,MSG8
021724  022704  000010          4$:     CMP     #10,R4          ;SEEK?
021730  001002                          BNE     5$
021732  104401  002201                  TYPE    ,MSG11
021736  000207                  5$:     RTS     PC
```

```
                                        ;GT4RG
                                        ;GET CONTENTS OF RKCS, RKER, RKDS, RKDAA
                                        ;
021740  017737  157264  001170   GT4RG: MOV     @RKDA,$REG3
021746  017737  157250  001162   GT3RG: MOV     @RKCS,$REG0
021754  017737  157240  001164          MOV     @RKER,$REG1
021762  017737  157230  001166          MOV     @RKDS,$REG2
021770  000207                          RTS     PC
                                        ;
                                        ;GETINF
                                        ;THIS ROUTINE GETS CONTENTS OF RKCE, RKER, RKDS. THEN IT BREAKS DOWN THE
                                        ;CONTENTS OF RKDA INTO ITS COMPONENT: CYLINDER, SECTOR, SURFACE AND DRIVE
                                        ;NUMBER.
                                        ;
021772  004737  021746          GETINF: JSR     PC,GT3RG
021776  010046                          MOV     R0,-(SP)
022000  010146                          MOV     R1,-(SP)
022002  010246                          MOV     R2,-(SP)
022004  012700  001200                  MOV     #$REG6+2,R0
022010  017701  157214                  MOV     @RKDA,R1
022014  010102                          MOV     R1,R2
022016  042702  177760                  BIC     #177760,R2
022022  010240                          MOV     R2,-(R0)
022024  006201                          ASR     R1
022026  006201                          ASR     R1
022030  006201                          ASR     R1
022032  006201                          ASR     R1
022034  010102                          MOV     R1,R2
022036  042702  177776                  BIC     #177776,R2
022042  010240                          MOV     R2,-(R0)
022044  006201                          ASR     R1
022046  010102                          MOV     R1,R2
022050  042702  177400                  BIC     #177400,R2
022054  010240                          MOV     R2,-(R0)
022056  000301                          SWAB    R1
022060  042701  177770                  BIC     #177770,R1
022064  010140                          MOV     R1,-(R0)
022066  012602                          MOV     (SP)+,R2
022070  012601                          MOV     (SP)+,R1
022072  012600                          MOV     (SP)+,R0
022074  000207                          RTS     PC
```

```
                                        ;CROTLF
                                        ;CALL:  MOV     #NO,-(SP)       ;PUSH NO. TO BE ROTATED ON STACK
                                        ;       JSR     PC,CROTLF
                                        ;THIS ROUTINE ROTATES BITS 15, 14, 13 OF A WORD INTO BITS 2, 1, 0. THE
                                        ;REST OF THE BITS OF THE ROTATED WORD ARE CLEARED.

 022076  042766  017777  000002  CROTLF: BIC     #17777,2(SP)
 022104  000241                          CLC
 022106  006166  000002                  ROL     2(SP)
 022112  006166  000002                  ROL     2(SP)
 022116  006166  000002                  ROL     2(SP)
 022122  006166  000002                  ROL     2(SP)
 022126  000207                          RTS     PC


                                        ;RG4SDRV
                                        ;CALL:  JSR     PC,RG4SDRV
                                        ;THIS ROUTINE GETS THE CONTENTS OF RKDS, RKER, RKCS, RKDA. THEN
                                        ;IT SAVES THE DRIVE NUMBER FROM RKDA IN 'SRDRV'.
 022130  004737  021740          RG4SDR: JSR     PC,GT4RG        ;GET RKCS, ER, DS, DA


                                        ;GTSDRV
                                        ;CALL:  JSR     PC,GTSDRV
                                        ;THIS ROUTINE EXTRACTS THE DRIVE # FROM RKDA (BITS 15,14,13) AND SAVES
                                        ;IT IN "SRDRV" (BITS 0,1,2)

 022134  017746  157070          GTSDRV: MOV     @RKDA,-(SP)     ;GET BITS 15,14,13 FROM RKDA
 022140  004737  022076                  JSR     PC,CROTLF
 022144  012637  001250                  MOV     (SP)+,SRDRV     ;SAVE THE DRIVE #
 022150  000207                          RTS     PC
```

```
                                        .SBTTL  DRV.RESET - DRIVE RESET ROUTINE
                                ;DRV.RESET - DRIVE RESET ROUTINE
                                ;IF R/W/S RDY DOES NOT SET WITHIN A CERTAIN TIME OF DOING DRIVE RESET
                                ;AN ERROR IS REPORTED.

022152  005037  022262          DR.RST: CLR     TIMOUT
022156  013777  001502  157044          MOV     @DRV,@RKDA
022164  012777  000015  157030          MOV     #15.,@RKCS
022172  104417                          CON.RDY
022174  032777  000100  157014  1$:     BIT     #100.,@RKDS     ;DID R/W/S RDY SET?
022202  001026                          BNE     2$              ;YES
022204  012746  177760                  MOV     #-20,-(SP)      ;NO, WAIT FOR R/W/S
022210  005216                          INC     (SP)
022212  001376                          BNE     .-2
022214  005726                          TST     (SP)+
022216  005237  022262                  INC     TIMOUT
022222  001364                          BNE     1$
022224  032777  020000  156706          BIT     #SW13,@SWR      ;INHIBIT TYPEOUT?
022232  001012                          BNE     2$              ;YES
022234  104401  001213                  TYPE    .$CRLF          ;TIMED OUT, R/W/S RDY DID NOT SET
022240  104401  027644                  TYPE    .EM4            ;REPORT ERROR
022244  104401  002206                  TYPE    ,MSG12
022250  011646                          MOV     (SP),-(SP)
022252  162716  000002                  SUB     #2,(SP)
022256  104402                          TYPOC
022260  000002                  2$:     RTI
022262  000000                  TIMOUT: 0
```

```
                                        .SBTTL  CON.RESET - CONTROL RESET ROUTINE
                                ;CON.RESET
                                ;CONTROL RESET ROUTINE
                                ;CON.RDY
                                ;CONTROL READY ROUTINE

 022264  012777  000001  156730 CN.RST: MOV     #1,@RKCS
 022272  005037  001472       CN.RDY: CLR     TIMER
 022276  105777  156720       1$:     TSTB    @RKCS           ;DID CONTROL RDY SET?
 022302  100451                       BMI     2$              ;YES
 022304  012746  177750               MOV     #-30.,-(SP)     ;WAIT FOR CNTRL RDY
 022310  005216                       INC     (SP)
 022312  001376                       BNE     .-2
 022314  005726                       TST     (SP)+
 022316  005237  001472               INC     TIMER
 022322  001365                       BNE     1$
 022324  032777  020000  156606       BIT     #SW13,@SWR      ;INHIBIT TYPEOUT?
 022332  001035                       BNE     2$              ;YES
 022334  104401  002206               TYPE    ,MSG12          ;CNTRL RDY DID NOT SET, REPORT ERROP
 022340  011646                       MOV     (SP),-(SP)
 022342  162716  000002               SUB     #2,(SP)
 022346  104402                       TYPOC
 022350  104401  022356               TYPE    ,65$            ;;TYPE ASCIZ STRING
 022354  000421                       BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12>/CONTROLLER NOT READY -   RKCS=/
 022420                         64$:
 022420  017746  156576               MOV     @RKCS,-(SP)
 022424  104402                       TYPOC
 022426  000002               2$:     RTI
```

```
                                        .SBTTL  TYPMSG - TYPE MESSAGE ROUTINE (SW13)
                                ;TYPMSG
                                ;THIS ROUTINE IS USED FOR MESSAGE TYPEOUTS. IF SW 13 IS SET THE TYPEOUT
                                ;IS SKIPPED.
                                ;CALL:  TYPMSG
                                ;       POINTER                 ;POINTER TO THE ASCII MESSAGE STRING

022430  032777  020000  156502  TY.MSG: BIT     #SW13,@SWR      ;INHIBIT TYPEOUT?
022436  001005                          BNE     2$              ;YES
022440  017637  000000  022450          MOV     @(SP)+,1$       ;GET POINTER TO ASCII STRING
022446  104401                          TYPE
022450  000000                  1$:     .WORD   0

022452  062716  000002          2$:     ADD     #2,(SP)         ;ADJUST RETURN ADDRESS TO SKIP OVER POINTER
022456  000002                          RTI
```

```
                                        .SBTTL  KWSRVE - KW11L CLOCK SERVICE ROUTINE
                                ;THIS ROUTINE SERVICES THE INTERRUPT FROM THE KW11L LINE CLOCK
                                ;AND KEEPS TRACK OF ELAPSED TIME.
                                ;KWCOUNT- CONTAINS CYCLES (PER SECOND) (2'S COMPLEMENT)
                                ;KWSEC- CONTAINS SECONDS (2'S COMPLEMENT)
                                ;KWMIN- CONTAINS MINUTES (2'S COMPLEMENT)
                                ;KWHR- CONTAINS HOURS (2'S COMPLEMENT)

022460  005237  001560          KWSRVE: INC     KWCOUNT         ;COUNT 60 CPS
022464  001401                          BEQ     1$              ;OVERFLOWED?
022466  000002                          RTI
022470  012737  177704  001560  1$:     MOV     #-60.,KWCOUNT   ;RESET 60 CPS COUNT
022476  005237  001556                  INC     KWSEC           ;COUNT SECONDS
022502  001401                          BEQ     2$              ;OVERFLOWED?
022504  000002                          RTI                     ;RETURN
022506  012737  177704  001556  2$:     MOV     #-60.,KWSEC     ;RESET "SECONDS" COUNT
022514  005237  001554                  INC     KWMIN           ;COUNT MINUTES
022520  001005                          BNE     3$              ;OVERFLOWED?
022522  012737  177704  001554          MOV     #-60.,KWMIN     ;RESET "MINUTES" COUNT
022530  005237  001552                  INC     KWHR            ;COUNT HOURS

022534  000002                  3$:     RTI                     ;RETURN

                                ;WATIME
                                ;ROUTINE PROVIDES SOME WAITING TIME.

022536  013746  022560          WATIME: MOV     2$,-(SP)        ;COUNTER VALUE
022542  005237  022562          1$:     INC     3$              ;COUNT
022546  001375                          BNE     1$              ;HANG IN THERE UNTIL COUNT WRAPS AROUND
022550  005216                          INC     (SP)            ;COUNT AGAIN
022552  001373                          BNE     1$              ;GO THROUGH MINOR LOOP AGAIN
022554  005726                          TST     (SP)+           ;RESTORE THE STACK POINTER
022556  000207                          RTS     PC              ;RETURN
022560  177730                  2$:     .WORD   177730          ;VALUE FOR APPROX 15 SEC DELAY
022562  000000                  3$:     .WORD   0               ;"MINOR" LOOP COUNTER
```

```
                                ;CHPDRS
                                ;THIS ROUTINE CHECKS IF THERE ANY DRIVES PRESENT (ON LINE), IF THERE
                                ;ARE, A RETURN IS MADE. IF THERE ARE NONE PRESENT, A MESSAGE IS PRINTED OUT.
                                ;THE STACK POINTER IS RE-INITIATED TO 1100 AND CONTROL IS TRANSFERED
                                ;TO THE END OF PASS ROUTINE, SEOP. BEFORE PASSING CONTROL TO SEOP, SOME
                                ;TIME IS KILLED (WATIME). THIS IS DONE TO KEEP THE NUMBER OF MESSAGES
                                ;(END OF PASS #X) TO A SMALL AMOUNT.

[illegible]  [illegible]  [illegible]  001264  CHOPRS: TST     DRVPRS          ;ANY DRIVES PRESENT?
[illegible]  [illegible]  [illegible]                  BEQ     1$              ;NO
[illegible]  [illegible]  [illegible]                  RTS     PC              ;YES, EXIT
[illegible]  [illegible]  [illegible]  002225  1$:     TYPE    ,MSG14          ;NO, GIVE A MESSAGE
[illegible]  [illegible]  [illegible]  022536          JSR     PC,WATIME       ;KILL SOME TIME
[illegible]  [illegible]  [illegible]  001100          MOV     #STACK,SP       ;REINITIALIZE STACK
[illegible]  [illegible]  [illegible]                  JMP     SEOP            ;GO TO END OF PASS ROUTINE
```

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

 4565  022612                   SEOP:
 4566  022612  000004                   SCOPE
 4567  022614  005037  001102           CLR     $TSTNM          ;;ZERO THE TEST NUMBER
 4568  022620  005237  001100           INC     $PASS           ;;INCREMENT THE PASS NUMBER
 4569  022624  042737  100000  001100   BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
 4570  022632  005327                   DEC     (PC)+           ;;LOOP?
 4571  022634  000001           SECPCT: .WORD   1
 4572  022636  003013                   BGT     $DOAGN          ;;YES
 4573  022640  012737                   MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
 4574  022642  000001           SENDCT: .WORD   1
 4575  022644  022634                   SECPCT
 4576  022646  013700  000042   $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
 4577  022652  001405                   BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
 4578  022654  000005                   RESET                   ;;CLEAR THE WORLD
 4579  022656  004710           $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
 4580  022660  000240                   NOP                     ;;SAVE ROOM
 4581  022662  000240                   NOP                     ;;FOR
 4582  022664  000240                   NOP                     ;;ACT11
 4583  022666                   $DOAGN:
 4584  022666  000137                   JMP     @(PC)+          ;;RETURN
 4585  022670  010556           $RTNAD: .WORD   @MNGER
```

```
                                .SBTTL  TTY INPUT ROUTINE

                                ;;*****************************************************************
                                .ENABL  LSB

                                ;;*****************************************************************
                                ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                                ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
                                ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
                                ;*WHEN OPERATING IN TTY FLAG MODE.
022672  022737  000176  001140  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
022700  001074                         BNE     15$             ;;BRANCH IF NO
022702  105777  156236                 TSTB    @$TKS           ;;CHAR THERE?
022706  100371                         BPL     15$             ;;IF NO, DON'T WAIT AROUND
022710  117746  156232                 MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
022714  042716  177600                 BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
022720  022726  000007                 CMP     #7,(SP)+        ;;IS IT A CONTROL G?
022724  001062                         BNE     15$             ;;NO, RETURN TO USER
022726  123727  001134  000001         CMPB    $ALTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
022734  001456                         BEQ     15$             ;;BRANCH IF YES

022736  104401  023417                 TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
022742  104401  023424         $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
022746  013746  000176                 MOV     SWREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
022752  104402                         TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS
022754  104401  023435                 TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
022760  005046                 19$:    CLR     -(SP)           ;;CLEAR COUNTER
022762  005046                         CLR     -(SP)           ;;THE NEW SWR
022764  105777  156154         7$:     TSTB    @$TKS           ;;CHAR THERE?
022770  100375                         BPL     7$              ;;IF NOT TRY AGAIN

022772  117746  156150                 MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
022776  042716  177600                 BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII


023002  021627  000025         9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
023006  001005                         BNE     10$             ;;BRANCH IF NOT
023010  104401  023412                 TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
023014  062706  000006         20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
023020  000757                         BR      19$             ;;LET'S TRY IT AGAIN


023022  021627  000015         10$:    CMP     (SP),#15        ;;IS IT A <CR>?
023026  001022                         BNE     16$             ;;BRANCH IF NO
023030  005766  000004                 TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
023034  001403                         BEQ     11$             ;;BRANCH IF YES
023036  016677  000002  156074         MOV     2(SP),@SWR      ;;SAVE NEW SWR
023044  062706  000006         11$:    ADD     #6,SP           ;;CLEAR UP STACK
023050  104401  001213         14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
023054  123727  001135  000001         CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
023062  001003                         BNE     15$             ;;BRANCH IF NOT
023064  012777  000100  156052         MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
023072  000002                 15$:    RTI                     ;;RETURN
023074  004737  024322         16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
023100  021627  000060                 CMP     (SP),#60        ;;CHAR < 0?
```

```
 4650  023154  002420                        BLT     18$             ;;BRANCH IF YES
 4651  023156  021627  000067                CMP     (SP),#67        ;;CHAR > 7?
 4652  023162  003415                        BGT     18$             ;;BRANCH IF YES
 4653  023164  042726  000060                BIC     #60,(SP)+       ;;STRIP-OFF ASCII
 4654  023170  005766  000002                TST     2(SP)           ;;IS THIS THE FIRST CHAR
 4655  023174  001403                        BEQ     17$             ;;BRANCH IF YES
 4656  023176  006316                        ASL     (SP)            ;;NO, SHIFT PRESENT
 4657  023200  006316                        ASL     (SP)            ;;   CHAR OVER TO MAKE
 4658  023202  006316                        ASL     (SP)            ;;   ROOM FOR NEW ONE.
 4659  023204  005266  000002        17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
 4660  023210  056616  177776                BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
 4661  023214  000707                        BR      7$              ;;GET THE NEXT ONE
 4662  023216  104401  001212        18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
 4663  023222  000720                        BR      20$             ;;SIMULATE CONTROL-U
 4664                                .DSABL  LSB
 4665
 4666
 4667                                ;;*****************************************************************
 4668                                ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
 4669                                ;*CALL:
 4670                                ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
 4671                                ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
 4672                                ;*                              ;;WITH PARITY BIT STRIPPED OFF
 4673                                ;
 4674
 4675  023224  011646                $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
 4676  023226  016666  000004  000002        MOV     4(SP),2(SP)     ;;SAVE THE PS
 4677  023234  105777  155754        1$:     TSTB    @$TKS           ;;WAIT FOR
 4678  023240  100375                        BPL     1$              ;;A CHARACTER
 4679  023242  117766  155750  000004        MOVB    @$TKB,4(SP)     ;;READ THE TTY
 4680  023250  042766  177600  000004        BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
 4681  023256  026627  000004  000023        CMP     4(SP),#23       ;;IS IT A CONTROL-S?
 4682  023264  001013                        BNE     3$              ;;BRANCH IF NO
 4683  023266  105777  155722        2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
 4684  023272  100375                        BPL     2$              ;;LOOP UNTIL ITS THERE
 4685  023274  117746  155716                MOVB    @$TKB,-(SP)     ;;GET CHARACTER
 4686  023300  042716  177600                BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
 4687  023304  022627  000021                CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
 4688  023310  001366                        BNE     2$              ;;IF NOT DISCARD IT
 4689  023312  000750                        BR      1$              ;;YES, RESUME
 4690  023314  026627  000004  000140  3$:    CMP     4(SP),#140      ;;IS IT UPPER CASE?
 4691  023322  002407                        BLT     4$              ;;BRANCH IF YES
 4692  023324  026627  000004  000175        CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
 4693  023332  003003                        BGT     4$              ;;BRANCH IF YES
 4694  023334  042766  000040  000004        BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
 4695  023342  000002                4$:     RTI                     ;;GO BACK TO USER
 4696                                ;;*****************************************************************
 4697                                ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
 4698                                ;*CALL:
 4699                                ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
 4700                                ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
 4701                                ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
 4702
 4703  023344  010346                $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
 4704  023346  012703  023472        1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
 4705  023352  022703  023502        2$:     CMP     #$TTYIN+80.,R3  ;;BUFFER FULL?
```

```
 4706  023306  101405                        BLOS    4$              ;;BR IF YES
 4707  023310  104410                        ROCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
 4708  023312  112613                        MOVB    (SP)+,(R3)      ;;GET CHARACTER
 4709  023314  122713  000177          10$:  CMPB    #177,(R3)       ;;IS IT A RUBOUT
 4710  023320  001003                        BNE     3$              ;;SKIP IF NOT
 4711  023322  104401  001212          4$:   TYPE    ,$QUES          ;;TYPE A '?'
 4712  023326  000763                        BR      1$              ;;CLEAR THE BUFFER AND LOOP
 4713  023330  111337  023400          3$:   MOVB    (R3),9$         ;;ECHO THE CHARACTER
 4714  023334  104401  023400                TYPE    ,9$
 4715  023340  122723  000015                CMPB    #15,(R3)+       ;;CHECK FOR RETURN
 4716  023344  001356                        BNE     2$              ;;LOOP IF NOT RETURN
 4717  023346  105063  177777                CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
 4718  023352  104401  001214                TYPE    ,$LF            ;;TYPE A LINE FEED
 4719  023356  012603                        MOV     (SP)+,R3        ;;RESTORE R3
 4720  023360  011646                        MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
 4721  023362  016666  000004  000002        MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
 4722  023370  012766  023402  000004        MOV     #STTYIN,4(SP)
 4723  023376  000002                        RTI                     ;;RETURN
 4724  023400     000                9$:    .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
 4725  023401     000                        .BYTE   0               ;;TERMINATOR
 4726  023402  000010             $TTYIN:   .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
 4727  023412  052536  005015       000    $CNTLU:   .ASCIZ  /↑U/<15><12>    ;;CONTROL "U"
 4728  023417     136  006507  000012    $CNTLG:   .ASCIZ  /↑G/<15><12>    ;;CONTROL "G"
 4729  023424  005015  053523  020122    $MSWR:    .ASCIZ  <15><12>/SWR = /
 4730  023432  020075     000
 4731  023435     040  047040  053505    $MNEW:    .ASCIZ  /  NEW =
 4732  023442  036440  000040
```

```
                                .SBTTL  READ AN OCTAL NUMBER FROM THE TTY

                                ;;**************************************************************
                                ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                                ;*CHANGE IT TO BINARY.
                                ;*CALL:
                                ;*      RDOCT                   ;;READ AN OCTAL NUMBER
                                ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT

023446  011646                 $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
023450  016666  000004  000002          MOV     4(SP),2(SP)     ;;INPUT NUMBER
023456  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
023460  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
023462  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
023464  104411                 1$:     RDLIN                   ;;READ AN ASCIZ LINE
023466  012600                         MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
023470  005001                         CLR     R1              ;;CLEAR DATA WORD
023472  005002                         CLR     R2
023474  112046                 2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
023476  001412                         BEQ     3$              ;;IF ZERO GET OUT
023500  006301                         ASL     R1              ;;*2
023502  006102                         ROL     R2
023504  006301                         ASL     R1              ;;*4
023506  006102                         ROL     R2
023510  006301                         ASL     R1              ;;*8
023512  006102                         ROL     R2
023514  042716  177770                 BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
023520  062601                         ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
023522  000764                         BR      2$              ;;LOOP
023524  005726                 3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
023526  010166  000012                 MOV     R1,12(SP)       ;;SAVE THE RESULT
023532  010237  023546                 MOV     R2,$HIOCT
023536  012602                         MOV     (SP)+,R2        ;;POP STACK INTO R2
023540  012601                         MOV     (SP)+,R1        ;;POP STACK INTO R1
023542  012600                         MOV     (SP)+,R0        ;;POP STACK INTO R0
023544  000002                         RTI                     ;;RETURN
023546  000000                 $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
```

```
                        .SBTTL  READ A DECIMAL NUMBER FROM THE TTY

                        ;;**********************************************************************
                        ;*THIS ROUTINE WILL READ A DECIMAL (ASCII) NUMBER FROM THE TTY AND
                        ;*CHANGE IT TO BINARY. IF TOO MANY CHARACTERS OR ANY ILLEGAL CHARACTERS
                        ;*ARE READ A "?" FOLLOWED BY A CARRIAGE RETURN-LINE FEED WILL BE TYPED.
                        ;*THE COMPLETE NUMBER MUST BE RETYPED. THE INPUT IS TERMINATED BY THE
                        ;*USER TYPING A CARRIAGE RETURN. THE RANGE OF THE INPUT NUMBER IS
                        ;*POSITIVE 32767 TO NEGATIVE 32768.
                        ;*CALL:
                        ;*      RDDEC                   ;;READ A DECIMAL NUMBER
                        ;*      RETURN HERE             ;;NUMBER IS ON TOP OF THE STACK
                        ;
023550  011646          $RDDEC: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR
023552  016666  000004  000002        MOV     4(SP),2(SP)     ;;THE INPUT NUMBER
023560  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
023562  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
023564  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
023566  104411          1$:     RDLIN                   ;;READ AN ASCIZ LINE
023570  012600                        MOV     (SP)+,R0        ;;ADDRESS OF 1ST CHAR.
023572  010037  023716                MOV     R0,6$           ;;SAVE INCASE OF BAD INPUT
023576  005046                        CLR     -(SP)           ;;CLEAR DATA WORD
023600  005002                        CLR     R2              ;;SIGN SET POSITIVE
023602  122710  000055                CMPB    #'-,(R0)        ;;SEE IF A MINUS SIGN WAS TYPED
023606  001001                        BNE     2$              ;;BR IF NO MINUS SIGN
023610  112002                        MOVB    (R0)+,R2        ;;SAVE FOR LATER USE
023612  112001          2$:     MOVB    (R0)+,R1        ;;PICKUP THIS CHARACTER
023614  001424                        BEQ     3$              ;;GET OUT IF ZERO
023616  122701  000060                CMPB    #'0,R1          ;;MAKE SURE THIS CHARACTER
023622  003032                        BGT     5$              ;;IS A DIGIT BETWEEN 0 & 9
023624  122701  000071                CMPB    #'9,R1
023630  002427                        BLT     5$
023632  032716  170000                BIT     #170000,(SP)    ;;DON'T LET NUMBER GET TO BIG
023636  001024                        BNE     5$              ;;BR IF NUMBER WOULD OVERFLOW
023640  006316                        ASL     (SP)            ;;*2
023642  011646                        MOV     (SP),-(SP)      ;;SAVE FOR LATER
023644  006316                        ASL     (SP)            ;;*4
023646  006316                        ASL     (SP)            ;;*8.
023650  062616                        ADD     (SP)+,(SP)      ;;*10.
023652  102416                        BVS     5$              ;;OVERFLOW ISN'T ALLOWED
023654  162701  000060                SUB     #'0,R1          ;;STRIP AWAY THE ASCII JUNK
023660  060116                        ADD     R1,(SP)         ;;ADD IN THIS DIGIT
023662  102412                        BVS     5$              ;;OVERFLOW ISN'T ALLOWED
023664  000752                        BR      2$              ;;LOOP
023666  005702          3$:     TST     R2              ;;CHECK IF NUMBER IS NEG
023670  001401                        BEQ     4$              ;;BR IF NO
023672  005416                        NEG     (SP)            ;;YES--NEGATE THE NUMBER
023674  012666  000012          4$:     MOV     (SP)+,12(SP)    ;;SAVE THE RESULT
023700  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
023702  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
023704  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
023706  000002                        RTI                     ;;RETURN

023710  005726          5$:     TST     (SP)+           ;;CLEAN PARTIAL NUMBER FROM STACK
023712  105010                        CLRB    (R0)            ;;SET A TERMINATOR
```

```
 4827  023714  104401                    TYPE                    ;;TYPE THE INPUT UP TO BAD CHAR.
 4828  023716  000000              6$:   .WORD   0               ;;POINTER GOES HERE
 4829  023720  104401  001212            TYPE    $QUES           ;;"?" "CR" &"LF"
 4830  023724  000720                    BR      1$              ;;TRY AGAIN
```

```
                                .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

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

023726                          $TYPDS:
023726  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
023730  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
023732  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
023734  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
023736  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
023740  012746  020200                 MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
023744  016605  000020                 MOV     20(SP),R5       ;;GET THE INPUT NUMBER
023750  100004                         BPL     1$              ;;BR IF INPUT IS POS.
023752  005405                         NEG     R5              ;;MAKE THE BINARY NUMBER POS.
023754  112766  000055  000001         MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
023762  005000                 1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
023764  012703  024142                 MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
023770  112723  000040                 MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
023774  005002                 2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
023776  016001  024132                 MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
024002  160105                 3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
024004  002402                         BLT     4$              ;;BR IF DONE
024006  005202                         INC     R2              ;;INCREASE THE BCD DIGIT BY 1
024010  000774                         BR      3$
024012  060105                 4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
024014  005702                         TST     R2              ;;CHECK IF BCD DIGIT=0
024016  001002                         BNE     5$              ;;FALL THROUGH IF 0
024020  105716                         TSTB    (SP)            ;;STILL DOING LEADING 0'S?
024022  100407                         BMI     7$              ;;BR IF YES
024024  106316                 5$:     ASLB    (SP)            ;;MSD?
024026  103003                         BCC     6$              ;;BR IF NO
024030  116663  000001  177777         MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
024036  052702  000060         6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
024042  052702  000040         7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
024046  110223                         MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
024050  005720                         TST     (R0)+           ;;JUST INCREMENTING
024052  020027  000010                 CMP     R0,#10          ;;CHECK THE TABLE INDEX
024056  002746                         BLT     2$              ;;GO DO THE NEXT DIGIT
024060  003002                         BGT     8$              ;;GO TO EXIT
024062  010502                         MOV     R5,R2           ;;GET THE LSD
024064  000764                         BR      6$              ;;GO CHANGE TO ASCII
024066  105726                 8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
024070  100003                         BPL     9$              ;;BR IF NO
024072  116663  177777  177776         MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
024100  105013                 9$:     CLRB    (R3)            ;;SET THE TERMINATOR
024102  012605                         MOV     (SP)+,R5        ;;POP STACK INTO R5
024104  012603                         MOV     (SP)+,R3        ;;POP STACK INTO R3
024106  012602                         MOV     (SP)+,R2        ;;POP STACK INTO R2
```

```
 4887  024110  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
 4888  024112  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
 4889  024114  104401  024142                TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
 4890  024120  016666  000002  000004        MOV     2(SP),4(SP)     ;;ADJUST THE STACK
 4891  024126  012616                        MOV     (SP)+,(SP)
 4892  024130  000002                        RTI                     ;;RETURN TO USER
 4893  024132  023420                $DTBL:  10000.
 4894  024134  001750                        1000.
 4895  024136  000144                        100.
 4896  024140  000012                        10.
 4897  024142  000004                $DBLK:  .BLKW   4
```

```
                                .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
                                ;*

024152  105737  001157  $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
024156  100002                  BPL     1$              ;;BR IF YES
024160  000000                  HALT                    ;;HALT HERE IF NO TERMINAL
024162  000407                  BR      3$              ;;LEAVE
024164  010046          1$:     MOV     R0,-(SP)        ;;SAVE R0
024166  017600  000002          MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
024172  112046          2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
024174  001005                  BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
024176  005726                  TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
024200  012600          60$:    MOV     (SP)+,R0        ;;RESTORE R0
024202  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
024206  000002                  RTI                     ;;RETURN
024210  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
024214  001430                  BEQ     8$
024216  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
024222  001006                  BNE     5$
024224  005726                  TST     (SP)+           ;;POP  <CR><LF> EQUIV
024226  104401                  TYPE                    ;;TYPE A CR AND LF
024230  001213                  $CRLF
024232  105037  024366                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
024236  000755                  BR      2$              ;;GET NEXT CHARACTER
024240  004737  024322          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
024244  123726  001156          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
024250  001350                  BNE     2$              ;;IF NO GO GET NEXT CHAR.
024252  013746  001154                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                        ;;AND THE NULL CHAR.
024256  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
024262  002770                  BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
024264  004737  024322                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
024270  105337  024366                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
024274  000770                  BR      7$              ;;LOOP

                                ;HORIZONTAL TAB PROCESSOR

024276  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
024302  004737  024322          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
024306  132737  000007  024366          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
024314  001372                  BNE     9$              ;;TAB STOP
024316  005726                  TST     (SP)+           ;;POP SPACE OFF STACK
```

```
MACY11-11-DZRKH-F     MACY11 27(1006)  04-OCT-76  13:29  PAGE 117
DZRKHF.P11    22-SEP-76 08:57          TYPE ROUTINE                                    SEQ 0130

 4954  024320  000724                        BR      2$                ;;GET NEXT CHARACTER
 4955  024322  105777  154622          $TYPEC: TSTB    @$TPS             ;;WAIT UNTIL PRINTER IS READY
 4956  024326  100375                        BPL     $TYPEC
 4957  024330  116677  000002  154614        MOVB    2(SP),@$TPB       ;;LOAD CHAR TO BE TYPED INTO DATA REG.
 4958  024336  122766  000015  000002        CMPB    #CR,2(SP)         ;;IS CHARACTER A CARRIAGE RETURN?
 4959  024344  001003                        BNE     1$                ;;BRANCH IF NO
 4960  024346  105037  024366                CLRB    $CHARCNT          ;;YES--CLEAR CHARACTER COUNT
 4961  024352  000406                        BR      $TYPEX            ;;EXIT
 4962  024354  122766  000012  000002  1$:   CMPB    #LF,2(SP)         ;;IS CHARACTER A LINE FEED?
 4963  024362  001402                        BEQ     $TYPEX            ;;BRANCH IF YES
 4964  024364  105237  024366                INCB    $CHARCNT          ;;COUNT THE CHARACTER
 4965  024370  000000                $CHARCNT:.WORD  0                 ;;CHARACTER COUNT STORAGE
 4966  024372  000207                $TYPEX: RTS     PC
 4967
```

```
                        .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,@#$OB20      ;;CALL THE ROUTINE
                        ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK

[illegible] 024372 104414       $OB20:  SAVREG                  ;;SAVE ALL REGISTERS
[illegible] 024374 016601 000002        MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
[illegible] 024400 012705 024[illegible]        MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
[illegible] 024404 012704 000014        MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
[illegible] 024410 012703 177770        MOV     #^C7,R3         ;;MASK
[illegible] 024414 012100               MOV     (R1)+,R0        ;;LOWER WORD
[illegible] 024416 012101               MOV     (R1)+,R1        ;;HIGH WORD
[illegible] 024420 005002               CLR     R2              ;;TERMINATOR
[illegible] 024422 110245       1$:     MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
[illegible] 024424 010002               MOV     R0,R2           ;;GET THIS DIGIT
[illegible] 024426 005304               DEC     R4              ;;COUNT THIS CHARACTER
[illegible] 024430 003007               BGT     3$              ;;BR IF NOT THE LAST DIGIT
[illegible] 024432 001405               BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
[illegible] 024434 005205               INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
[illegible] 024436 010566 000002        MOV     R5,2.SP         ;;ASCIZ CHAR. & PUT IT ON THE STACK
[illegible] 024442 104[illegible]       RESREG                  ;;RESTORE ALL REGISTERS
[illegible] 024444 000207               RTS     PC              ;;RETURN TO USER
[illegible] 024446 006203       2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
[illegible] 024450 006001       3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
[illegible] 024452 006000               ROR     R0              ;;      THE NEXT OCTAL DIGIT
[illegible] 024454 006001               ROR     R1
[illegible] 024456 006000               ROR     R0
[illegible] 024460 006001               ROR     R1
[illegible] 024462 006000               ROR     R0
[illegible] 024464 040302               BIC     R3,R2           ;;MASK OUT ALL JUNK
[illegible] 024466 062702 000060        ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
[illegible] 024[illegible] 000753       BR      1$              ;;GO PUT IT IN THE DATA TABLE
[illegible] 024[illegible] 000016       $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


024512  [illegible]             $DB2D:  SAVREG                  ;;SAVE REGISTERS
024514  016602  000002                  MOV     2(SP),R2        ;;PICKUP THE DATA POINTER
024520  012700  024672                  MOV     #$DECVL,R0      ;;GET ADDRESS OF "$DECVL" STRING
024524  010066  000002                  MOV     R0,2(SP)        ;;PUT ADDRESS OF ASCIZ STRING ON STACK
024530  012201                          MOV     (R2)+,R1        ;;PICKUP THE BINARY NUMBER
024532  012202                          MOV     (R2)+,R2
024534  012737  000012  002610          MOV     #10.,4$         ;;SET UP TO DO 10 CONVERSIONS
024542  012704  024622                  MOV     #$TNPWR,R4      ;;ADDRESS OF TEN POWER
024546  012705  024624                  MOV     #$TNPWR+2,R5
024552  005003                  1$:     CLR     R3              ;;CLEAR PARTIAL
024554  161401                  2$:     SUB     (R4),R1         ;;SUBTRACT TEN POWER
024556  005602                          SBC     R2
024560  161502                          SUB     (R5),R2
024562  002402                          BLT     3$              ;;BR IF TEN POWER TO LARGE
024564  005203                          INC     R3              ;;ADD 1 TO PARTIAL
024566  000772                          BR      2$              ;;LOOP
024570  062401                  3$:     ADD     (R4)+,R1        ;;RESTORE SUBTRACTED VALUE
024572  005502                          ADC     R2
024574  062402                          ADD     (R4)+,R2
024576  022525                          CMP     (R5)+,(R5)+     ;;MOVE TO NEXT TEN POWER
024600  052703  000060                  BIS     #'0,R3          ;;CHANGE PARTIAL TO ASCII
024604  110320                          MOVB    R3,(R0)+        ;;SAVE IT
024606  005327                          DEC     (PC)+           ;;DONE?
024610  000000                  4$:     .WORD   0
024612  001357                          BNE     1$              ;;BR IF NO
024614  105020                          CLRB    (R0)+           ;;TERMINATOR
024616  104415                          RESREG                  ;;RESTORE REGISTERS
024620  000207                          RTS     PC              ;;RETURN
024622  145000                  $TNPWR: 145000                  ;;1.0E09
024624  035632                          35632
024626  160400                          160400                  ;;1.0E08
024630  002765                          2765
024632  113200                          113200                  ;;1.0E07
024634  000230                          230
024636  041100                          041100                  ;;1.0E06
024640  000017                          17
024642  103240                          103240                  ;;1.0E05
024644  000001                          1
024646  023420                          23420                   ;;1.0E04
024650  000000                          0
024652  001750                          1750                    ;;1.0E03
024654  000000                          0
024656  000144                          144                     ;;1.0E02
```

```
 5063  024660  000000                    0
 5064  024662  000012                    12                  ;;1.0E01
 5065  024664  000000                    0
 5066  024666  000001                    1                   ;;1.0E00
 5067  024670  000000                    0
 5068  024672  000014  $DECVL: .BLKB   12.                   ;;RESERVE STORAGE FOR ASCIZ STRING
```

```
                                        .SBTTL  SUPRS - TYPE NUMERICAL ASCIZ STRING, REPLACE LEADING 0'S BY BLANKS
                                        .SBTTL  SUPRSL - TYPE NUMERICAL ASCIZ STRING, LEFT JUSTIFY
                                        ;NOT FROM SYSMAC

024706  010046                  SUPRSL: MOV     R0,-(SP)        ;SAVE R0
024710  005037  024776                  CLR     SUP2
024714  016600  000004                  MOV     4(SP),R0
024720  000405                          BR      SUP1

024722  010046                  SUPRS:  MOV     R0,-(SP)        ;SAVE R0
024724  016600  000004                  MOV     4(SP),R0        ;PICKUP THE POINTER
024730  010037  024776                  MOV     R0,SUP2         ;SAVE FOR TYPING
024734                          SUP1:
024734  105710                  1$:     TSTB    (R0)            ;TERMINATOR?
024736  001406                          BEQ     2$              ;BR IF YES
024740  122710  000060                  CMPB    #'0,(R0)        ;IS THIS AN ASCII "0"?
024744  001006                          BNE     4$              ;NO
024746  112720  000040                  MOVB    #40,(R0)+       ;REPLACE IT WITH "BLANK"
024752  000770                          BR      1$
024754  005300                  2$:     DEC     R0              ;BACKUP BY 1
024756  112710  000060                  MOVB    #'0,(R0)        ;ASCII "0"
024762  005737  024776          4$:     TST     SUP2            ;LEFT JUSTIFY?
024766  001002                          BNE     5$              ;NO
024770  010037  024776                  MOV     R0,SUP2         ;YES
024774  104401                  5$:     TYPE                    ;GO TYPE
024776  000000                  SUP2:   .WORD   0
025000  012600                          MOV     (SP)+,R0        ;RESTORE R0
025002  026616                          MOV     2(SP)+,(SP)     ;RESTORE THE STACK
025004  000207                          RTS     PC              ;RETURN
```

```
                        .SBTTL  INTEGER MULTIPLY ROUTINE

                        ;;*****************************************************************
                        ;*CALL
                        ;*      MOV     MULTIPLER,-(SP)
                        ;*      MOV     MULTIPLICAND,-(SP)
                        ;*      JSR     PC,@#$MULT
                        ;*      RETURN  ;;PRODUCT IS ON THE STACK
                        ;*
                        ;*      STACK   PRODUCT
                        ;*      -----   -------
                        ;*      TOP     LSB'S
                        ;*      +2      MSB'S

025006                  $MULT:
025006  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
025010  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
025012  010246                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
025014  005046                  CLR     -(SP)           ;;CLEAR THE SIGN KEY
025016  016601  000012          MOV     12(SP),R1       ;;GET THE MULTIPLICAND
025022  100002                  BPL     1$              ;;BR IF PLUS
025024  005216                  INC     (SP)            ;;SET THE SIGN KEY
025026  005401                  NEG     R1              ;;MAKE THE MULTIPLICAND POSTIVE
025030  016602  000014  1$:     MOV     14(SP),R2       ;;GET THE MULTIPLIER
025034  100002                  BPL     2$              ;;BR IF PLUS
025036  005316                  DEC     (SP)            ;;UPDATE THE SIGN KEY
025040  005402                  NEG     R2              ;;MAKE THE MULTIPLIER POSTIVE
025042  012746  000021  2$:     MOV     #17.,-(SP)      ;;SET THE LOOP COUNT
025046  005000                  CLR     R0              ;;SETUP FOR THE MULTIPLY LOOP
025050  103001  3$:             BCC     4$              ;;DON'T ADD IF MULTIPLICAND = 0
025052  060200                  ADD     R2,R0
025054  006000  4$:             ROR     R0              ;;POSITION THE PARITIAL PRODUCT AND
025056  006001                  ROR     R1              ;;THE MULTIPLICAND
025060  005316                  DEC     (SP)            ;;HAS ALL BITS OF THE MULTIPLICAND BEEN DONE?
025062  001372                  BNE     3$              ;;BR IF NO
025064  022616                  CMP     (SP)+,(SP)      ;;SHOULD PRODUCT BE NEGATIVE?
025066  001403                  BEQ     5$              ;;GO TO EXIT IF NO
025070  005400                  NEG     R0              ;;YES--SO MAKE IT SO
025072  005401                  NEG     R1
025074  005600                  SBC     R0
025076  005726  5$:             TST     (SP)+           ;;CLEAR SIGN INFO. OFF OF STACK
025100  010066  000012          MOV     R0,12(SP)       ;;PUT THE PRODUCT ON THE STACK (MSB'S)
025104  010166  000010          MOV     R1,10(SP)       ;;LSB'S
025110  012602                  MOV     (SP)+,R2        ;;POP STACK INTO R2
025112  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
025114  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
025116  000207                  RTS     PC
```

```
                                .SBTTL  INTEGER DIVIDE ROUTINE

                                ;*CALL:
                                ;*      MOV     LOW DIVIDEND,-(SP)      ;THE HIGH DIVIDEND MUST BE < 1/2
                                ;*      MOV     HIGH DIVIDEND,-(SP)     ;       AS LARGE AS THE DIVISOR
                                ;*      MOV     DIVISOR,-(SP)
                                ;*      JSR     PC,$DIV
                                ;*      RETURN                          ;QUOTIENT & REMAINDER ARE ON THE STACK
                                ;*      "V"=0   IMPLIES NO ERROR
                                ;*      "V"=1   IMPLIES ERROR OCCURRED
                                ;*              "C"=0   DIVIDE OVERFLOW OCCURRED
                                ;*              "C"=1   ATTEMPTED TO DIVIDE BY ZERO
                                ;*
                                ;*
                                ;*      STACK   NO ERROR        OVERFLOW        DIVIDE BY ZERO
                                ;*      -----   --------        --------        --------------
                                ;*      TOP     REMAINDER       ALL ZEROS       ALL ONES
                                ;*      +2      QUOTIENT        ALL ZEROS       ALL ONES

025120  013746  000034          $DIV:   MOV     34,-(SP)        ;SAVE CURRENT TRAP VECTOR
025124  012737  025134  000034          MOV     #1$,34          ;SET UP TRAP VECTOR
025132  104400                          TRAP
025134  012716  025156          1$:     MOV     #2$,(SP)        ;REPLACE NEW PC
025140  016637  000004  000034          MOV     4(SP),34        ;RESTORE OLD TRAP VECT
025146  016666  000002  000004          MOV     2(SP),4(SP)     ;SAVE PSW
025154  000002                          RTI                     ;RESTORE PSW

025156  042716  000017          2$:     BIC     #17,(SP)        ;STRIP AWAY CONDITION CODES
025162  010046                          MOV     R0,-(SP)        ;PUSH R0 ON STACK
025164  010146                          MOV     R1,-(SP)        ;PUSH R1 ON STACK
025166  010246                          MOV     R2,-(SP)        ;PUSH R2 ON STACK
025170  010346                          MOV     R3,-(SP)        ;PUSH R3 ON STACK
025172  005046                          CLR     -(SP)           ;SAVE A PLACE FOR SIGNS
025174  012746  000021                  MOV     #17.,-(SP)      ;SETUP THE ITERATION COUNTER
025200  016601  000024                  MOV     24(SP),R1       ;PICKUP THE DIVIDEND
025204  016600  000022                  MOV     22(SP),R0
025210  100005                          BPL     3$              ;CHECK THE SIGN
025212  105366  000003                  DECB    3(SP)           ;KEEP TRACK OF THE SIGN
025216  005400                          NEG     R0              ;AND NEGATE THE ORIGINAL
025220  005401                          NEG     R1              ;NUMBER
025222  005600                          SBC     R0
025224  016602  000020          3$:     MOV     20(SP),R2       ;PICKUP THE DIVISOR
025230  022702  000001                  CMP     #1,R2           ;IF THE DIVISOR IS 1 SKIP THE REST
025234  001463                          BEQ     13$             ;YES
025236  005702                          TST     R2
025240  002407                          BLT     4$              ;CHECK THE SIGN
025242  003011                          BGT     5$              ;DIVISOR OF 0 IS A NO-NO
025244  052766  000003  000014          BIS     #3,14(SP)       ;SET "V" & "C"
025252  012700  177777                  MOV     #-1,R0          ;SET REMAINDER TO ALL ONES
025256  000424                          BR      9$              ;EXIT
025260  005266  000002          4$:     INC     2(SP)           ;KEEP TRACK OF DIVISORS SIGN
025264  000401                          BR      6$
025266  005402                  5$:     NEG     R2              ;NEGATE THE ORIGINAL NUMBER
025270  000241                  6$:     CLC                     ;CLEAR "C"
025272  000405                          BR      8$              ;START FORMING QUOTIENT
025274  006100                  7$:     ROL     R0              ;POSITION MSB'S
```

```
005201  025276  010003                        MOV     R0,R3           ;COPY
005202  025300  060203                        ADD     R2,R3           ;COMPARE DIVIDEND & DIVISOR
005203  025302  103001                        BCC     8$              ;BR IF DIVIDEND > DIVISOR
005204  025304  010300                        MOV     R3,R0           ;REMAINDER AFTER THIS LOOP
005205  025306  006101              9$:       ROL     R1              ;QUOTIENT BIT ENTERS HERE
005206  025310  005316                        DEC     (SP)            ;DONE?
005207  025312  001370                        BNE     7$              ;BR IF NO
005208  025314  005701                        TST     R1              ;OVERFLOW?
005209  025316  100005                        BPL     10$             ;BR IF NO
005210  025320  052766  000002  000014        BIS     #2,14(SP)       ;SET "V" IN RETURN STATUS WORD
005211  025326  005000                        CLR     R0              ;SET REMAINDER TO ALL ZEROS
005212  025330  010001              9$:       MOV     R0,R1           ;COPY REMAINDER INTO QUOTIENT
005213  025332  005726              10$:      TST     (SP)+           ;CLEAR COUNTER FROM STACK
005214  025334  005716                        TST     (SP)            ;REMAINDER SIGN CORRECTION NEEDED?
005215  025336  002004                        BGE     11$             ;BR IF NO
005216  025340  005400                        NEG     R0              ;NEGATE REMAINDER
005217  025342  105066  000001                CLRB    1(SP)           ;CLEAR SIGN
005218  025346  005316                        DEC     (SP)            ;BUT DON'T FORGET QUOTIENT
005219  025350  005726              11$:      TST     (SP)+           ;QUOTIENT SIGN CORRECTION NEEDED?
005220  025352  001401                        BEQ     12$             ;BR IF NO
005221  025354  005401                        NEG     R1              ;NEGATE QUOTIENT
005222  025356  010166  000020      12$:      MOV     R1,20(SP)       ;RETURN QUOTIENT AND
005223  025362  010066  000016                MOV     R0,16(SP)       ;REMAINDER TO USER
005224  025366  012603                        MOV     (SP)+,R3        ;POP STACK INTO R3
005225  025370  012602                        MOV     (SP)+,R2        ;POP STACK INTO R2
005226  025372  012601                        MOV     (SP)+,R1        ;POP STACK INTO R1
005227  025374  012600                        MOV     (SP)+,R0        ;POP STACK INTO R0
005228  025376  012666  000002                MOV     (SP)+,2(SP)     ;SETUP TO RETURN CONDITION CODES
005229  025402  000002                        RTI                     ;RETURN
005230  025404  022626              13$:      CMP     (SP)+,(SP)+     ;POP THE STACK
005231  025406  000763                        BR      12$
```

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

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

005410                          $SAVREG:
005410  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
005412  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
005414  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
005416  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
005420  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
005422  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
005424  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
005430  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
005434  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
005440  016646  000022                  MOV     22 SP),-(SP)    ;;SAVE PC OF CALL
005444  000002                          RTI

                                 *RESTORE R0-R5
                                ;*CALL:
                                ;*      RESREG
005446                          $RESREG:
005446  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
005452  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
005456  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
005462  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
005466  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
005470  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
005472  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
005474  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
005476  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
005500  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
005502  000002                          RTI
```

```
                                .SBTTL  RANDOM NUMBER GENERATOR ROUTINE
                                ;*CALL:
                                ;*      JSR     PC,$RAND        ;CALL THE ROUTINE
                                ;*      RETURN                  ;RETURN HERE THE RANDOM
                                ;*                              ;NUMBER WILL BE IN
                                ;*                              ;$HINUM,$LONUM
025504                          $RAND:
025504  010046                          MOV     R0,-(SP)        ;PUSH R0 ON STACK
025506  010146                          MOV     R1,-(SP)        ;PUSH R1 ON STACK
025510  010246                          MOV     R2,-(SP)        ;PUSH R2 ON STACK
025512  010346                          MOV     R3,-(SP)        ;PUSH R3 ON STACK
025514  010446                          MOV     R4,-(SP)        ;PUSH R4 ON STACK
025516  017604  000012                  MOV     12(SP),R4       ;GET POINTER TO THE SAVED SEEDS
                                                                ;FOR GENERATING THIS RANDOM NUMBER
025522  011400                          MOV     (R4),R0         ;GET LO NUMBER SEED
025524  016401  000002                  MOV     2(R4),R1        ;GET HIGH NUMBER SEED
025530  012703  177771                  MOV     #-7,R3          ;SET SHIFT COUNT
025534  005002                          CLR     R2              ;ZERO R2
025536  006300                  1$:     ASL     R0              ;SHIFT R0 LEFT AND
025540  006101                          ROL     R1              ;ROTATE CARRY INTO R1 AND
025542  006102                          ROL     R2              ;ROTATE CARRY INTO R2
025544  005203                          INC     R3              ;CHECK FOR DONE
025546  001373                          BNE     1$              ;CONTINUE SHIFT LOOP
025550  061400                          ADD     (R4),R0         ;ADD NUMBER TO MAKE X 129
025552  005501                          ADC     R1              ;PROPOGATE CARRY
025554  066401  000002                  ADD     2(R4),R1        ;ADD NUMBER TO MAKE X 129
025560  005502                          ADC     R2              ;PROPOGATE CARRY
025562  062700  001057                  ADD     #1057,R0        ;ADD LOW CONSTANT
025566  005501                          ADC     R1              ;PROPOGATE CARRY
025570  005502                          ADC     R2              ;PROPOGATE CARRY
025572  062701  047401                  ADD     #47401,R1       ;ADD HIGH CONSTANT
025576  005502                          ADC     R2              ;PROPOGATE CARRY
025600  062702  000006                  ADD     #6,R2           ;ADD HIGHEST CONSTART
025604  060200                          ADD     R2,R0           ;REPRIME R0 WITH HIGHEST DIGIT
025606  005501                          ADC     R1              ;PROPOGATE CARRY
025610  010014                          MOV     R0,(R4)         ;SAVE R0-$LONUM (FOR USE NXT TIME)
025612  010164  000002                  MOV     R1,2(R4)        ;SAVE R1-$HINUM (FOR USE NXT TIME)
025616  012604                          MOV     (SP)+,R4
025620  012603                          MOV     (SP)+,R3        ;POP STACK INTO R3
025622  012602                          MOV     (SP)+,R2        ;POP STACK INTO R2
025624  012601                          MOV     (SP)+,R1        ;POP STACK INTO R1
025626  012600                          MOV     (SP)+,R0        ;POP STACK INTO R0
025630  062716  000002                  ADD     #2,(SP)         ;ADJUST SP FOR CORRECT RETURN
025634  000207                          RTS     PC              ;RETURN
025636  123456          RSDRVL: 123456                          ;RANDOM SEED FOR DRIVE SELECTION (LO)
025640  176543          RSDRVH: 176543                          ;  "    "         (HI)
025642  001201          RSFUNL: 1201                            ;RANDOM SEED FOR FUNCTION
025644  062465          RSFUNH: 62465                           ;  "    "         (HI)
025646  176105          RSCYLL: 176105                          ;RANDOM SEED FOR CYLINDER (LO)
025650  174532          RSCYLH: 174532                          ;  "    "         (HI)
025652  157650          RSBAL:  157650                          ;RANDOM SEED FOR BUS †ADDRESS (LO)
025654  030753          RSBAH:  30753                           ;  "    "         (HI)
025656  131547          RSWCL:  131547                          ;RANDOM SEED FOR WORD COUNT (LO)
025660  032070          RSWCH:  32070                           ;  "    "         (HI)
025662  123456          RSDTL:  123456                          ;RANDOM SEED FOR DATA (LO)
025664  176543          RSDTH:  176543                          ;  "    "         (HI)
```

```
                        .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE

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

025666  017646  000000  $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
025672  116637  000001  026111  MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
025700  112637  026113          MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
025704  062716  000002          ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
025710  000406                  BR      $TYPON
025712  112737  000001  026111  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
025720  112737  000006  026113          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
025726  112737  000005  026110  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
025734  010346                  MOV     R3,-(SP)        ;;SAVE R3
025736  010446                  MOV     R4,-(SP)        ;;SAVE R4
025740  010546                  MOV     R5,-(SP)        ;;SAVE R5
025742  113704  026113          MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
025746  005404                  NEG     R4
025750  062704  000006          ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
025754  110437  026112          MOVB    R4,$OMODE       ;;SAVE IT FOR USE
025760  113704  026111          MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
025764  016605  000012          MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
025770  005003                  CLR     R3              ;;CLEAR THE OUTPUT WORD
025772  006105          1$:     ROL     R5              ;;ROTATE MSB INTO "C"
025774  000404                  BR      3$              ;;GO DO MSB
025776  006105          2$:     ROL     R5              ;;FORM THIS DIGIT
026000  006105                  ROL     R5
026002  006105                  ROL     R5
026004  010503                  MOV     R5,R3
026006  006103          3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
026010  105337  026112          DECB    $OMODE          ;;TYPE THIS DIGIT?
026014  100016                  BPL     7$              ;;BR IF NO
026016  042703  177770          BIC     #177770,R3      ;;GET RID OF JUNK
026022  001002                  BNE     4$              ;;TEST FOR 0
026024  005704                  TST     R4              ;;SUPPRESS THIS 0?
026026  001403                  BEQ     5$              ;;BR IF YES
```

```
 5389  026030  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
 5390  026032  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
 5391  026036  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
 5392  026042  110337  026106                  MOVB    R3,8$           ;;SAVE FOR TYPING
 5393  026046  104401  026106                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
 5394  026052  105337  026110          7$:     DECB    $OCNT           ;;COUNT BY 1
 5395  026056  003347                  BGT     2$              ;;BR IF MORE TO DO
 5396  026060  002402                  BLT     6$              ;;BR IF DONE
 5397  026062  005204                  INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
 5398  026064  000744                  BR      2$              ;;GO DO THE LAST DIGIT
 5399  026066  012605          6$:     MOV     (SP)+,R5        ;;RESTORE R5
 5400  026070  012604                  MOV     (SP)+,R4        ;;RESTORE R4
 5401  026072  012603                  MOV     (SP)+,R3        ;;RESTORE R3
 5402  026074  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
 5403  026102  012616                  MOV     (SP)+,(SP)
 5404  026104  000002                  RTI                     ;;RETURN
 5405  026106     000          8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
 5406  026107     000                  .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
 5407  026110     000          $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
 5408  026111     000          $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
 5409  026112  000000          $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
 5410
```

```
                                .SBTTL  ERROR HANDLER ROUTINE

                                ;*SW15=1        HALT ON ERROR
                                ;*SW13=1        INHIBIT ERROR TYPEOUTS
                                ;*SW12=1        TYPE OUT THE ERROR HISTORY, THE FUNCTION THAT
                                ;               WAS BEING PERFORMED ON RK AT THE TIME OF ERROR AND
                                ;               THE FUNCTION PERFORMED PRIOR TO THAT.
                                ;*NOTE THIS SWITCH OPTION (12) IS MEANINGFUL ONLY FOR ERRORS OCCURING IN THE
                                ;*EXERCISER PART OF THE PROGRAM.
                                ;*SW11=1        DUMP OUT ALL RK REGISTERS
                                ;*SW10=1        BELL ON ERROR
                                ;*SW09=1        LOOP ON ERROR
                                ;*SW03=1        TYPE OUT TIME AT WHICH ERROR OCCURED
                                ;*SW02=1        DROP THE DRIVE AFTER MAXM ERORS ON THIS DRIVE
                                ;*SW01=1        TYPE OUT THE SERIAL NUMBER OF THE ERRORING DRIVE
                                ;*GO TO $ERRTYP ON ERROR

026114  104407          $ERROR: CKSWR                   ;LOOK FOR A 'CONTROL G'
026116  105237  001103          INCB    $ERFLG         ;SET THE ERROR FLAG
026122  001774                  BEQ     $ERROR         ;DON'T LET THE FLAG GO TO ZERO
026124  013777  001102  153010  MOV     $TSTNM,@DISPLAY ;DISPLAY TEST NUMBER AND ERROR FLAG
026132  032777  002000  153000  BIT     #SW10,@SWR     ;BELL ON ERROR?
026140  001402                  BEQ     1$             ;NO - SKIP
026142  104401  001206          TYPE    ,$BELL         ;RING BELL
026146  005237  001112  1$:     INC     $ERTTL         ;COUNT THE NUMBER OF ERRORS

026152  032777  000004  152760  BIT     #SW2,@SWR      ;COUNT # OF ERORS & DROP DRVE?
026160  001415                  BEQ     3$             ;NO
                                                       ;YES
026162  010146                  MOV     R1,-(SP)       ;SAVE R1
026164  013701  001250          MOV     $RDRV,R1       ;GET ERRORING DRIVE #
026170  100410                  BMI     2$             ;IF (SRDRV)= -1, SKIP(BECAUSE THE
                                                       ;EROR WAS NOT ATTRIBUTABLE TO ANY
                                                       ;SPECIFIC DRIVE)
026172  105261  001542          INCB    ERDRV(R1)      ;COUNT # OF ERORS ON THIS DRIVE
026176  126127  001542  000003  CMPB    ERDRV(R1),#3   ;# OF ERORS GREATER THAN ALLOWABLE?
026204  101403                  BLOS    2$             ;NO
026206  000137  016220          JMP     DSELCT         ;DROP THE DRIVE

026212  012601          2$:     MOV     (SP)+,R1       ;RESTORE R1

026214  011637  001116  3$:     MOV     (SP),$ERRPC    ;GET ADDRESS OF ERROR INSTRUCTION
026220  162737  000002  001116  SUB     #2,$ERRPC
026226  005046                  CLR     -(SP)
026230  117716  152662          MOVB    @$ERRPC,(SP)   ;STRIP AND SAVE THE ERROR ITEM CODE
026234  121627  000100          CMPB    (SP),#100      ;FORM THE CO4$ECT ITEMB IF THIS IS AN
026240  002402                  BLT     4$             ;EROR MESAGE EQUAL OR ABOVE 100.
026242  162716  000040          SUB     #40,(SP)       ;NOTE THERE R 2 CLASSES OF ERRORS:
                                                       ;1) $ITEMB'S BELOW 100
                                                       ;2) $ITEMB'S ABOVE 100
                                                       ;SUBTRACTION FACTOR HAS TOBE SUCH THAT
                                                       ;THE CO4$ECT OFFSET IS SELECTED. THIS
                                                       ;FACTOR WILL CHANGE IF THE TOTAL # OF
                                                       ;ERROR MESSAGES IN CLASS 1 CHANGES.
                                                       ;#=100 -LAST ITEM IN # CLASS 1 - 1
```

```
5467  026246  012637  001114          4$:     MOV     (SP)+,$ITEMB
5468  026252  032777  020000  152660          BIT     #SW13,@SWR      ;SKIP TYPEOUT IF SET
5469  026260  001012                          BNE     5$              ;SKIP TYPEOUTS
5470  026262  004737  026370                  JSR     PC,@#$ERRTYP    ;GO TO USER ERROR ROUTINE
5471  026266  104401  001213                  TYPE    .$CRLF
5472
5473  026272  032777  010000  152640          BIT     #SW12,@SWR      ;TYPE ERROR HISTORY?
5474  026300  001403                          BEQ     5$              ;NO
5475  026302  004737  020334                  JSR     PC,HISTRY       ;YES
5476
5477  026306  005777  152626          5$:     TST     @SWR            ;HALT ON ERROR
5478  026312  100002                          BPL     6$              ;SKIP IF CONTINUE
5479  026314  000000                          HALT                    ;HALT ON ERROR!
5480  026316  104407                          CKSWR                   ;LOOK FOR A 'CONTROL G'
5481  026320  032777  001000  152612  6$:     BIT     #SW09,@SWR      ;LOOP ON ERROR SWITCH SET?
5482  026326  001411                          BEQ     7$              ;BR IF NO
5483  026330  123727  001114  000040          CMPB    $ITEMB,#40      ;THERE R 37 ERROR MESSAGES IN CLASS 1
5484  026336  103011                          BHIS    8$
5485  026340  013746  001244                  MOV     PPRLVL,-(SP)    ;LOCK OUT ALL INTERUPTS ON RETURN
5486                                                                  ;FROM THIS EROR HANDLER, IF THE EROR
5487                                                                  ;IS IN EXERCISER & LOOPING IS TO
5488                                                                  ;BE DONE
5489  026344  005726                          TST     (SP)+
5490  026346  012716  015634                  MOV     #EXCRLUP,(SP)   ;IF THIS ERROR CALL WAS FROM EXERCISER
5491                                                                  ;PART OF THE PROGRAM, GO TO 'EXCRLUP'
5492                                                                  ;OTHERWISE RETURN THRU '$LUPERR'
5493
5494  026352  012737  177777  001250  7$:     MOV     #-1,SRDRV       ;RESET SERIAL NO FLAG
5495                                                                  ;IF (SRDRV)=-1, THEN THE SERIAL
5496                                                                  ;NO OF THE DRIVE WILL NOT BE
5497                                                                  ;TYPED OUT.
5498                                                                  ;OTHERWISE, SERIAL NO FOR THE DRIVE
5499                                                                  ;# IN 'SRDRV' WILL BE TYPED.
5500  026360  000002                          RTI
5501  026362  013716  001110          8$:     MOV     $LPERR,(SP)     ;FUDGE RETURN FOR LOOPING
5502  026366  000771                          BR      7$              ;RETURN
```

```
                                .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

                                ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
                                ;*ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE "ERROR TABLE" $ERRTB,
                                ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.

                                $ERRTYP::TYPE   $CRLF           ;"CARRIAGE RETURN" & "LINE FEED"
                                        MOV     R0,-(SP)        ;SAVE R0
                                        CLR     R0              ;PICKUP THE ITEM INDEX
                                        BISB    @#$ITEMB,R0
                                        BNE     1$              ;IF ITEM NUMBER IS ZERO, JUST
                                        MOV     $ERRPC,-(SP)    ;TYPE THE PC OF THE ERROR
                                        TYPOC
                                        BR      5$              ;GET OUT
                                1$:     DEC     R0              ;ADJUST THE INDEX SO THAT IT WILL
                                        ASL     R0              ;WORK FOR THE ERROR TABLE
                                        ASL     R0
                                        ASL     R0
                                        ADD     #$ERRTB,R0      ;FORM TABLE POINTER
                                        MOV     (R0)+,2$        ;PICKUP "ERROR MESSAGE" POINTER
                                        BEQ     4$              ;SKIP TYPEOUT IF NO POINTER
                                        TYPE                    ;TYPE THE "ERROR MESSAGE"
                                2$:     .WORD   0               ;"ERROR MESSAGE" POINTER GOES HERE
                                3$:     TYPE    $CRLF           ;"CARRIAGE RETURN" & "LINE FEED"
026460  104401  001213        4$:     BIT     #SW11,@SWR      ;DUMP OUT RK REGISTERS?
026464  001404                        BEQ     5$
026466  004737  026730                JSR     PC,DMPREG       ;GO TYPE OUT RK REGISTERS
026472  104401  001213                TYPE    ,$CRLF

026476  012037  026500        5$:     MOV     (R0)+,6$        ;PICKUP "DATA HEADER" POINTER
026502  001404                        BEQ     7$              ;SKIP TYPEOUT IF 0
026504  104401                        TYPE                    ;TYPE THE "DATA HEADER"
026506  000000                6$:     .WORD   0               ;"DATA HEADER" POINTER GOES HERE
026510  104401  001213                TYPE    ,$CRLF          ;"CARRIAGE RETURN" & "LINE FEED"
026514  011000                7$:     MOV     (R0),R0         ;PICKUP "DATA TABLE" POINTER
026516  001406                        BEQ     9$

                                                                ;TYPE AN OCTAL NUMBER
026520  013046                8$:     MOV     @(R0)+,-(SP)    ;SAVE @(R0)+ FOR TYPEOUT
026522  104402                        TYPOC                   ;GO TYPE--OCTAL ASCII(ALL DIGITS
026524  104401  002663                TYPE    ,BLNKS2         ;TYPE TWO(2) SPACES
026530  005710                        TST     (R0)            ;IS THERE ANOTHER NUMBER?
026532  001372                        BNE     8$              ;BR IF YES

026534  012600                9$:     MOV     (SP)+,R0        ;RESTORE R0
026536  104401  001213                TYPE    ,$CRLF          ;"CARRIAGE RETURN" & "LINE FEED"
026542  123727  001114  000040        CMPB    $ITEMB,#40      ;SKIP TIME & SERIAL # FOR
                                                                ;NON-EXERCISER ERORS
026550  103004                        BHIS    10$
026552  004737  026564                JSR     PC,TIMTYP       ;TYPE OUT TIME IF SW 3 IS SET
026556  004737  026674                JSR     PC,SNOTYP       ;GO TYPE OUT THE SERIAL # OF THE
                                                                ;ERRORING DRIVE, IF SW 1 IS SET.
026562  000207                10$:    RTS     PC              ;RETURN
```

```
                                              ;TIMTYP
                                              ;THIS ROUTINE TYPES THE TIME IN HOURS:MIN:SECS IF SW 3 IS SET
                                              ;SW 3 SHOULD NOT BE SET IF KW11L IS NOT PRESENT.

026556  032777  000010  152354    TIMTYP: BIT     #SW3,@SWR          ;IS SW 3 SET?
026564  001434                            BEQ     4$                 ;IF NOT SKIP TYPING TIME
026566  104401  002652                    TYPE    ,MSG29             ;"TIME"
026572  104401  002662                    TYPE    ,BLNKS3
026576  104414                            SAVREG                     ;SAVE R0-R4
026600  012700  001552                    MOV     #KWHR,R0           ;INITIALIZE POINTER
026604  012001                            MOV     (R0)+,R1
026606  000404                            BR      2$
026610  012001                    1$:     MOV     (R0)+,R1           ;TYPE OUT
026612  001402                            BEQ     2$
026614  062701  000074                    ADD     #60.,R1
026620  010137  026660            2$:     MOV     R1,5$
026624  012746  026660                    MOV     #5$,-(SP)          ;HOURS:MINS:SECS
026630  004737  024512                    JSR     PC,@#$DB2D         ;CONVERT TO ASCIZ STRING
026634  004737  024706                    JSR     PC,@#$JPRSL        ;GO TYPE
026640  020027  001560                    CMP     R0,#KWSEC+2        ;ALL DONE?
026644  001403                            BEQ     3$
026646  104401  002334                    TYPE    ,MSG18
026652  000756                            BR      1$
026654  104415                    3$:     RESREG                     ;RESTORE R0-R4
026656  000207                    4$:     RTS     PC                 ;RETURN
026660  000000  000000            5$:     .WORD   0,0
```

```
                                    ;SNOTYP
                                    ;THIS ROUTINE TYPES OUT THE SERIAL NUMBER OF THE ERRORING DRIVE. IF SW 1
                                    ;IS SET. NOTE THAT THE SERIAL NUMBER IS TYPED OUT ONLY WHEN THE DRIVE
                                    ;CAN BE IDENTIFIED POSITIVELY, AS THE ONE WHICH GAVE THE ERROR. IF THE
                                    ;ERROR CANNOT BE ATTRIBUTED TO ANY SPECIFIC DRIVE (.SRDRV)= -1) THEN
                                    ;THE SERIAL NUMBER IS NOT TYPED OUT.

026664  032777  000002  152246  SNOTYP: BIT     #SW1,@SWR       ;TYPE OUT SERIAL #?
026672  001415                          BEQ     2$              ;NO
026674  010146                          MOV     R1,-(SP)        ;SAVE R1
026676  013701  001250                  MOV     SRDRV,R1        ;GET ERRORING DRIVE #
026702  006301                          ASL     R1              ;IF (SRDRV)= -1, SKIP (BECAUSE
026704  100407                          BMI     1$              ;THE ERROR WAS NOT ATTRIBUTABLE
                                                                ;TO A SPECIFIC DRIVE)
026706  104401  001213                  TYPE    .$CRLF
026712  104401  002326                  TYPE    ,MSG17          ;TYPE "SR. NO:"
026716  016146  001266                  MOV     SRNO(R1),-(SP)  ;GET THE SERIAL #
026722  104405                          TYPDS                   ;TYPE IT OUT (DECIMAL)

026724  012601                  1$:     MOV     (SP)+,R1        ;RESTORE R1
026726  000207                  2$:     RTS     PC              ;RETURN


                                    ;DMPREG
                                    ;THIS ROUTINE DUMPS OUT ALL RK11 REGISTERS WHEN SW 11 IS SET AND AN ERROR OCCURS.

026730                          DMPREG:
026730  104401  026736                  TYPE    ,65$            ;;TYPE ASCIZ STRING
026734  000441                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <15><12>/ PC    RKDS    RKER    RKCS    RKWC    RKBA    RKDA    RKDB/
027040                          64$:
027040  013746  001116                  MOV     $ERRPC,-(SP)
027044  104402                          TYPOC
027046  104401  002663                  TYPE    ,BLNKS2
027052  010046                          MOV     R0,-(SP)
027054  012700  001216                  MOV     #RKDS,R0
027060  013046                  1$:     MOV     @(R0)+,-(SP)
027062  104402                          TYPOC
027064  104401  002663                  TYPE    ,BLNKS2
027070  020027  001232                  CMP     R0,#RKDB
027074  003771                          BLE     1$
027076  012600                          MOV     (SP)+,R0
027100  000207                          RTS     PC
```

```
                                .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
                                ;*SW09=1         LOOP ON ERROR
                                ;*CALL
                                ;*      SCOPE           ;;SCOPE=IOT
027132                          $SCOPE:
027132  104407                         CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
027134  032777  040000  152026  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
027142  001047                         BNE     $OVER           ;;YES IF SW14=1
                                ;*****START OF CODE FOR THE XOR TESTER*****
027144  000416                 $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                                ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
027146  013746  000004                 MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
027152  012737  027162  000004         MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
027160  005737  177060                 TST     @#177060        ;;TIME OUT ON XOR?
027164  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
027170  000421                         BR      $SVLAD          ;;GO TO THE NEXT TEST
027172  022626                 5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
027174  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
027200  000407                         BR      7$              ;;LOOP ON THE PRESENT TEST
027202                          6$:;*****END OF CODE FOR THE XOR TESTER*****
027202  105737  001103         2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
027206  001412                         BEQ     $SVLAD          ;;BR IF NO
027210  032777  001000  151752         BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
027216  001404                         BEQ     4$              ;;BR IF NO
027220  013737  001110  001106  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
027226  000415                         BR      $OVER
027230  105037  001103         4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
027234  105237  001102         $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
027240  011637  001106                 MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
027244  011637  001110                 MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
027250  005037  001204                 CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
027254  112737  000001  001115         MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
027262  013777  001102  151702  $OVER: MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
027270  013716  001106                 MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
027274  000002                         RTI                     ;;FIXES PS
```

```
                                .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.

027246  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
027250  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
027254  005740                          TST     -(R0)           ;;BACKUP BY 2
027256  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
027260  006300                          ASL     R0              ;;POSITION FOR INDEXING
027262  016000  027302                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
027266  000200                          RTS     R0              ;;GO TO ROUTINE

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

027270  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
027272  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
027300  000002                          RTI                     ;;RESTORE THE PSW

                                .SBTTL  TRAP TABLE

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

                                ;       ROUTINE
                                ;       -------

027302  027270                  $TRPAD: .WORD   $TRAP2
027304  024152                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
027306  025712                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
027310  025666                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
027312  025726                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
027314  023726                          $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)

027316  022742                          $GTSWR  ;;CALL=GTSWR    TRAP+6(104406)  GET SOFT-SWR SETTING

027320  022672                          $CkSWR  ;;CALL=CKSWR    TRAP+7(104407)  TEST FOR CHANGE IN SOFT-SWR
027322  023154                          $RDCHR  ;;CALL=RDCHR    TRAP+10(104410) TTY TYPEIN CHARACTER ROUTINE
027324  023274                          $RDLIN  ;;CALL=RDLIN    TRAP+11(104411) TTY TYPEIN STRING ROUTINE
027326  023446                          $RDOCT  ;;CALL=RDOCT    TRAP+12(104412) READ AN OCTAL NUMBER FROM TTY
027330  023550                          $RDDEC  ;;CALL=RDDEC    TRAP+13(104413) READ A DECIMAL NUMBER FROM TTY
027332  025410                          $SAVREG ;;CALL=SAVREG   TRAP+14(104414) SAVE R0-R5 ROUTINE
027334  025446                          $RESREG ;;CALL=RESREG   TRAP+15(104415) RESTORE R0-R5 ROUTINE
027336  022264                          CN.RST  ;;CALL=CON.RESET        TRAP+16(104416) CONTROL RESET ROUTINE
027340  022272                          CN.RDY  ;;CALL=CON.RDY  TRAP+17(104417) WAIT FOR CONTROL READY
027342  022152                          DR.RST  ;;CALL=DRV.RESET        TRAP+20(104420) DRIVE RESET ROUTINE
027344  022430                          TY.MSG  ;;CALL=TYPMSG   TRAP+21(104421) TYPE MESSAGE ROUTINE, SW13
```

```
                                .SBTTL  POWER DOWN AND UP ROUTINES

                                ;;**********************************************************************
                                ;POWER DOWN ROUTINE
027346  012737  027512  000024 $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
027354  012737  000340  000026         MOV     #340,@#PWRVEC+2  ;;PRIO:7
027362  010046                        MOV     R0,-(SP)         ;;PUSH R0 ON STACK
027364  010146                        MOV     R1,-(SP)         ;;PUSH R1 ON STACK
027366  010246                        MOV     R2,-(SP)         ;;PUSH R2 ON STACK
027370  010346                        MOV     R3,-(SP)         ;;PUSH R3 ON STACK
027372  010446                        MOV     R4,-(SP)         ;;PUSH R4 ON STACK
027374  010546                        MOV     R5,-(SP)         ;;PUSH R5 ON STACK
027376  017746  151536               MOV     @$WR,-(SP)       ;;PUSH @$WR ON STACK
027402  010637  027516               MOV     SP,$$AVR6        ;;SAVE SP
027406  012737  027420  000024       MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
027414  000000                       HALT
027416  000776                       BR      .-2              ;;HANG UP

                                ;;**********************************************************************
                                ;POWER UP ROUTINE
027420  012737  027512  000024 $PWRJP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
027426  013706  027516               MOV     $$AVR6,SP        ;;GET SP
027432  005037  027516               CLR     $$AVR6           ;;WAIT LOOP FOR THE TTY
027436  005237  027516         1$:   INC     $$AVR6           ;;WAIT FOR THE INC
027442  001375                       BNE     1$               ;;OF  WORD
027444  012677  151470               MOV     (SP)+,@$WR       ;;POP STACK INTO @$WR
027450  012605                       MOV     (SP)+,R5         ;;POP STACK INTO R5
027452  012604                       MOV     (SP)+,R4         ;;POP STACK INTO R4
027454  012603                       MOV     (SP)+,R3         ;;POP STACK INTO R3
027456  012602                       MOV     (SP)+,R2         ;;POP STACK INTO R2
027460  012601                       MOV     (SP)+,R1         ;;POP STACK INTO R1
027462  012600                       MOV     (SP)+,R0         ;;POP STACK INTO R0
027464  012737  027346  000024       MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
027472  012737  000340  000026       MOV     #340,@#PWRVEC+2  ;;PRIO:7
027500  104401                       .TYPE                    ;REPORT THE POWER FAILURE
027502  027520               $PWRMG: .WORD   $POWER           ;;POWER FAIL MESSAGE POINTER
027504  012716                       MOV     (PC)+,(SP)       ;;RESTART AT PFSTRT
027506  003366               $PWRAD: .WORD   PFSTRT           ;;RESTART ADDRESS
027510  000002                       RTI
027512  000000               $ILLUP: HALT                     ;;THE POWER UP SEQUENCE WAS STARTED
027514  000776                       BR      .-2              ;; BEFORE THE POWER DOWN WAS COMPLETE
027516  000000               $$AVR6: 0                        ;;PUT THE SP HERE
027520  005015  047520  042527 $POWER: .ASCIZ  <15><12>"POWER"
027526  000122
                                .EVEN
```

```
                                        ;ERROR MESSAGES
                                        
027530 051105 051117 047440  EM1:    .ASCIZ  /EROR ON WRITE/
027536 020116 051127 052111
027544 000105
027546 052101 046505 052120  EM2:    .ASCIZ  /ATEMPT TO INITIATE FUNCTION ON 'BUSY' DRVE/
027554 052040 020117 047111
027562 052111 040511 042524
027570 043040 047125 052103
027576 047511 020116 047117
027604 023440 052502 054523
027612 020047 051104 042526
027620    000
027621    103 052116 047522  EM3:    .ASCIZ  /CNTROL RDY NOT SET/
027626 020114 042122 020131
027634 047516 020124 042523
027642 000124
027644 051057 053457 051457  EM4:    .ASCIZ  "/R/W/S RDY NOT SET"
027652 051040 054504 047040
027660 052117 051440 052105
027666    000
027667    103 052116 047522  EM5:    .ASCIZ  /CNTROL RDY NOT SET AFTER 1ST INTRUPT ON ISSUING SEEK/
027674 020114 042122 020131
027702 047516 020124 042523
027710 020124 043101 042524
027716 020122 051461 020124
027724 047111 051124 050125
027732 020124 047117 044440
027740 051523 044525 043516
027746 051440 042505 000113
027754 051127 047117 020107  EM6:    .ASCIZ  /WRONG BITS IN RKCS, EXPCT SEEK/
027762 044502 051524 044440
027770 020116 045522 051503
027776 020054 054105 041520
030004 020124 042523 045505
030012    000
030013    047 052502 054523  EM7:    .ASCIZ  /'BUSY' FLAG CLEAR ON INTRUPTING DRVE/
030020 020047 046106 043501
030026 041440 042514 051101
030034 047440 020116 047111
030042 051124 050125 044524
030050 043516 042040 053122
030056 000105
030060 050047 051517 052111  EM10:   .ASCIZ  /'POSITIONING' FLAG FOR INTRUPTING DRVE CLEAR/
030066 047511 044516 043516
030074 020047 046106 043501
030102 043040 051117 044440
030110 052116 052522 052120
030116 047111 020107 051104
030124 042526 041440 042514
030132 051101    000
030135    047 051105 023522  EM11:   .ASCIZ  /'ERR'OR SET AFTER 1ST INTERRUPT ON ISSUING SEEK/
030142 051117 051440 052105
030150 040440 052106 051105
030156 030440 052123 044440
030164 052116 051105 052522
```

```
5822  030172  052120  047440  020116
5823  030200  051511  052523  047111
5824  030206  020107  042523  045505
5825  030214     000
5826  030215     123  050103  051440  EM12:   .ASCIZ  .SCP SET AFTER 1ST INTRUPT ON ISSJING SEEK/
5827  030222  052105  040440  052106
5828  030230  051105  030440  052123
5829  030236  044440  052116  052522
5830  030244  052120  047440  020116
5831  030252  051511  052523  047111
5832  030260  020107  042523  045505
5833  030266     000
5834  030267     103  052116  047522  EM13:   .ASCIZ  /CNTROL RDY NOT SET AFTER SEEK DONE INTRUPT/
5835  030274  020114  042122  020131
5836  030302  047516  020124  042523
5837  030310  020124  043101  042524
5838  030316  020122  042523  045505
5839  030324  042040  047117  020105
5840  030332  047111  051124  050125
5841  030340  000124
5842  030342  047111  051124  050125  EM14:   .ASCIZ  /INTRJPTING DRVE (SEEK DONE) WAS NOT 'BUSY'/
5843  030350  044524  043516  042040
5844  030356  053122  020105  051450
5845  030364  042505  020113  047504
5846  030372  042516  020051  040527
5847  030400  020123  047516  020124
5848  030406  041047  051525  023531
5849  030414     000
5850  030415     122  053457  051457  EM15:   .ASCIZ  "R/W/S READY NOT SET FOR INTRUPTING DRVE (SEEK DONE)"
5851  030422  051040  040505  054504
5852  030430  047040  052117  051440
5853  030436  052105  043040  051117
5854  030444  044440  052116  052522
5855  030452  052120  047111  020107
5856  030460  051104  042526  024040
5857  030466  042523  045505  042040
5858  030474  047117  024505     000
5859  030501     123  047111  042440  EM16:   .ASCIZ  /SIN EROR/
5860  030506  047522  000122
5861  030512  042447  051122  047447  EM17:   .ASCIZ  /'ERR'OR ON DOING SEEK/
5862  030520  020122  047117  042040
5863  030526  044517  043516  051440
5864  030534  042505  000113
5865  030540  041523  020120  044504  EM20:   .ASCIZ  /SCP DID NOT SET AFTER SEEK WAS DONE/
5866  030546  020104  047516  020124
5867  030554  042523  020124  043101
5868  030562  042524  020122  042523
5869  030570  045505  053440  051501
5870  030576  042040  047117  000105
5871  030604  047523  052106  042440  EM21:   .ASCIZ  /SOFT EROR/
5872  030612  047522  000122
5873  030616  040504  040524  024040  EM23:   .ASCIZ  /DATA (COMPARISON) EROR/
5874  030624  047503  050115  051101
5875  030632  051511  047117  020051
5876  030640  051105  051117     000
5877  030645     103  052116  047522  EM24:   .ASCIZ  /CNTROL RDY CLR ON INTRUPT AFTER RK FUNCTION/
```

```
5878  030652  020114  042122  020131
5879  030660  046103  020122  047117
5880  030666  044440  052116  052522
5881  030674  052120  040440  052106
5882  030702  051105  051040  020113
5883  030710  052506  041516  044524
5884  030716  047117     000
5885  030721     123  052524  045503  EM26:   .ASCIZ  /STUCK IN LOOP,8 COMANDS SHLDBE DONE BY NOW/
5886  030726  044440  020116  047514
5887  030734  050117  034054  041440
5888  030742  046517  047101  051504
5889  030750  051440  046110  041104
5890  030756  020105  047504  042516
5891  030764  041040  020131  047516
5892  030772  000127
5893  030774  052101  050115  020124  EM27:   .ASCIZ  /ATMPT TO DO WRITE BEFORE WRT CHK/
5894  031002  047524  042040  020117
5895  031010  051127  052111  020105
5896  031016  043502  047506  042522
5897  031024  053440  052122  041440
5898  031032  045510     000
5899  031035     101  046524  052120  EM30:   .ASCIZ  /ATMPT TO REEXECUTE COMMAND-IN PROGRESS OR ALREADY FINISHED/
5900  031042  052040  020117  042522
5901  031050  054105  041505  052125
5902  031056  020105  047503  046515
5903  031064  047101  026504  047111
5904  031072  050040  047522  051107
5905  031100  051505  020123  051117
5906  031106  040440  051114  040505
5907  031114  054504  043040  047111
5908  031122  051511  042510  000104
5909  031130  043047  047125  052103  EM31:   .ASCIZ  /'FUNCTION IN PROGRES' FLG FOR INTRUPTING DRIVE ISN'T SET/
5910  031136  047511  020116  047111
5911  031144  050040  047522  051107
5912  031152  051505  020047  046106
5913  031160  020107  047506  020122
5914  031166  047111  051124  050125
5915  031174  044524  043516  042040
5916  031202  044522  042526  044440
5917  031210  047123  052047  051440
5918  031216  052105     000
5919  031221     125  042516  050130  EM32:   .ASCIZ  /UNEXPCTED DRIVE INTRUPTED/
5920  031226  052103  042105  042040
5921  031234  044522  042526  044440
5922  031242  052116  052522  052120
5923  031250  042105     000
5924  031253     125  042516  050130  EM33:   .ASCIZ  /UNEXPCTD FUNCTION CODE IN RKCS AFTER INTRUPT/
5925  031260  052103  020104  052506
5926  031266  041516  044524  047117
5927  031274  041440  042117  020105
5928  031302  047111  051040  041513
5929  031310  020123  043101  042524
5930  031316  020122  047111  051124
5931  031324  050125  000124
5932  031330  051104  042526  051040  EM34:   .ASCIZ  /DRVE RDY CLEAR/
5933  031336  054504  041440  042514
```

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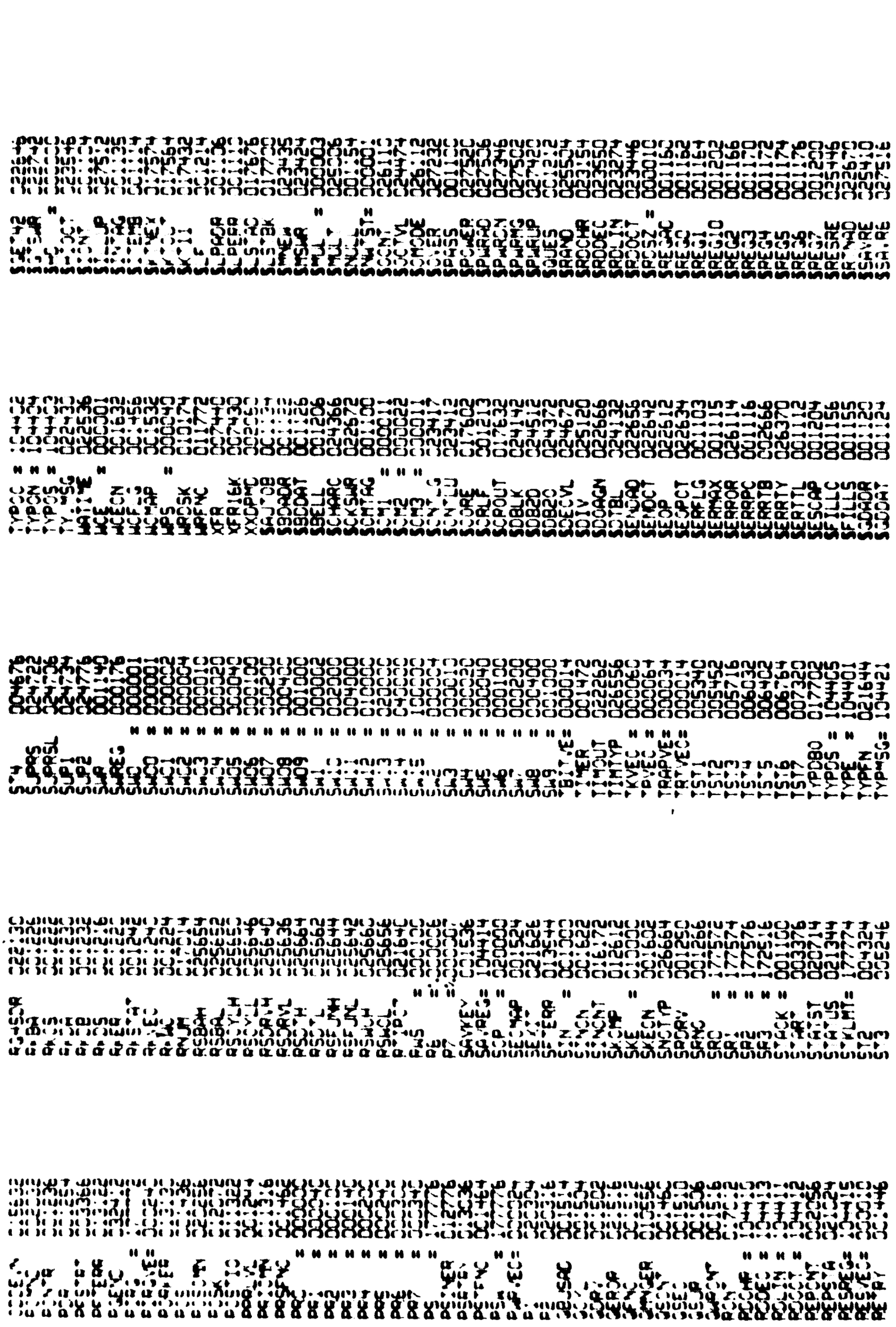
 5934  031344  051101     000
 5935  031347     104  053122  020105  EM35:   .ASCIZ  /DRVE POWER LO/
 5936  031354  047520  042527  020122
 5937  031362  047514     000
 5938  031365     104  053122  020105  EM36:   .ASCIZ  /DRVE UNSAFE/
 5939  031372  047125  040523  042506
 5940  031400     000
 5941  031401     127  051520  051440  EM37:   .ASCIZ  /WPS SET/
 5942  031406  052105     000
 5943  031411     111  052116  051105  EM101:  .ASCIZ  /INTERUPT DIDN'T OCUR AFTER WRTE/
 5944  031416  050125  020124  044504
 5945  031424  047104  052047  047440
 5946  031432  052503  020122  043101
 5947  031440  042524  020122  051127
 5948  031446  042524     000
 5949  031451     047  051105  023522  EM102:  .ASCIZ  /'ERR'OR SET/
 5950  031456  051117  051440  052105
 5951  031464     000
 5952  031465     122  042113  020101  EM103:  .ASCIZ  /RKDA INCRMENTED WRONG/
 5953  031472  047111  051103  042515
 5954  031500  052116  042105  053440
 5955  031506  047522  043516     000
 5956  031513     122  041113  020101  EM104:  .ASCIZ  /RKBA INCRMENTED WRONG/
 5957  031520  047111  051103  042515
 5958  031526  052116  042105  053440
 5959  031534  047522  043516     000
 5960  031541     122  053513  020103  EM105:  .ASCIZ  /RKWC DIDN'T OVRFLO TO 0/
 5961  031546  044504  047104  052047
 5962  031554  047440  051126  046106
 5963  031562  020117  047524  030040
 5964  031570     000
 5965  031571     115  054105  041040  EM106:  .ASCIZ  /MEX BITS WRONG/
 5966  031576  052111  020123  051127
 5967  031604  047117  000107
 5968  031610  051127  042524  041440  EM110:  .ASCIZ  /WRTE CHK EROR/
 5969  031616  045510  042440  047522
 5970  031624  000122
```

```
                                        ;DATA HEADERS
031626  020040  041520  020040  DH1:    .ASCIZ  /  PC     RKCS    RKER    RKDS    RKDA/
031634  020040  051040  041513
031642  020123  020040  051040
031650  042513  020122  020040
031656  051040  042113  020123
031664  020040  051040  042113
031672  000101
                                        
031674  020040  041520  020040  DH2:    .ASCIZ  /  PC     DRV#/
031702  020040  051104  021526
031710     000
                                        
031711     040  050040  020103  DH21:   .ASCIZ  /  PC     RKCS    RKER    RKDS    DRIVE   CYL     SUR     SEC/
031716  020040  020040  045522
031724  051503  020040  020040
031732  045522  051105  020040
031740  020040  045522  051504
031746  020040  042040  044522
031754  042526  020040  020043
031762  054503  020114  020040
031770  020040  052523  020122
031776  020040  020040  042523
032004  000103
                                        
032006  020040  041520  020040  DH23:   .ASCIZ  /  PC     RKBA    EXPCT   RECVD   RKDA/
032014  020040  045522  040502
032022  020040  020040  054105
032030  041520  020124  020040
032036  042522  053103  020104
032044  020040  045522  040504
032052     000
032053     040  050040  020103  DH25:   .ASCIZ  /  PC     RKCS    RKER    RKDS    RKDA    DRVE#/
032060  020040  020040  045522
032066  051503  020040  051040
032074  042513  020122  020040
032102  051040  042113  020123
032110  020040  051040  042113
032116  020101  020040  051104
032124  042526  000043
                                        
032130  020040  041520  020040  DH27:   .ASCIZ  /  PC     KEY     FNCTN CODE/
032136  020040  045440  054505
032144  020040  020040  047106
032152  052103  020116  047503
032160  042504     000
032163     040  050040  020103  DH103:  .ASCIZ  /  PC     EXPCT   RECVD/
032170  020040  042440  050130
032176  052103  020040  051040
032204  041505  042126     000
                                        
032211     040  050040  020103  DH30:   .ASCIZ  /  PC     KEY/
032216  020040  045440  054505
032224     000
032225     040  050040  020103  DH105:  .ASCIZ  /  PC     RKDA    RKWC/
032232  020040  020040  045522
```

```
 6027  032240  040504  020040  051040
 6028  032246  053513  000103
 6029  032252  020040  041520  020040  DH11D:  .ASCIZ  / PC     RKCS    RkER    RKBA    RKDA/
 6030  032260  020040  051040  041513
 6031  032266  020123  020040  051040
 6032  032274  042513  020122  020040
 6033  032302  051040  041113  020101
 6034  032310  020040  051040  042113
 6035  032316  000101
 6036
 6037
 6038                                  .EVEN
 6039
 6040  032320  001116  001162  001164  DT1:    .WORD   $ERRPC,$REG0,$REG1,$REG2,$REG3,0
 6041  032326  001166  001170  000000
 6042
 6043  032334  001116  001162  000000  DT2:    .WORD   $ERRPC,$REG0,0
 6044
 6045  032342  001116  001162  001164  DT21:   .WORD   $ERRPC,$REG0,$REG1,$REG2,$REG3,$REG4,$REG5,$REG6,0
 6046  032350  001166  001170  001172
 6047  032356  001174  001176  000000
 6048  032364  001116  001162  001164  DT25:   .WORD   $ERRPC,$REG0,$REG1,$REG2,$REG3,$REG4,0
 6049  032372  001166  001170  001172
 6050  032400  000000
 6051  032402  001116  001162  001164  DT103:  .WORD   $ERRPC,$REG0,$REG1,0
 6052  032410  000000
 6053
 6054                                  ;THIS IS THE DATA BUFFER USED TO WRITE THE RANDOM PATTERNS ON THE
 6055                                  ;DISK AT THE BEGINING. 400 (OCTAL) WORDS ARE WRITTEN AT A TIME, THUS
 6056                                  ;THIS BUFFER IS 400/8 WORDS LONG.
 6057
 6058  032412                          DBUF:
 6059  032412  000240                  PGEND:  NOP
 6060          000001                          .END
```

```
ABORT   001672
ABRT    011754
ABRT1   011766
BAMAP   001530
BASEBA  002052
BCTST   005276
BEGEX1  010520
BEGNEX  010536
BIT0    =  000001
BIT00   =  000001
BIT01   =  000002
BIT02   =  000004
BIT03   =  000010
BIT04   =  000020
BIT05   =  000040
BIT06   =  000100
BIT07   =  000200
BIT08   =  000400
BIT09   =  001000
BIT1    =  000002
BIT10   =  002000
BIT11   =  004000
BIT12   =  010000
BIT13   =  020000
BIT14   =  040000
BIT15   =  100000
BIT2    =  000004
BIT3    =  000010
BIT4    =  000020
BIT5    =  000040
BIT6    =  000100
BIT7    =  000200
BIT8    =  000400
BIT9    =  001000
BLNKS1  002664
BLNKS2  002663
BLNKS3  002662
BPTVEC= 000014
BUSY    001426
CBSY    021402
CHDPRS  022564
CHFAFN  011062
CHKBA   020056
CHKCRD  020200
CHKCS   020020
CHKDA   020034
CHKDRV  016446
CHKMEX  020112
CHKRWS  020162
CHKWC   020136
CH1     011116
CH2     011216
CICNT   001466
CICNT1  001470
CKSWR   =  104407
CLEANB  006360
CLRERR  015714
CLRFLG  015676
CLRSIN  016060
CMNABT  014124
CMND    001326
CMNERR  014066
CNOBSY  021620
CN.RDY  022272
CN.RST  022264
COMRET  020214
CON.RD= 104417
CON.RE= 104416
CR      =  000015
CRCMND  020246
CRLF    =  000200
CROTLF  022076
CSE     =  000002
CSECN   001652
CYLMAP  001522
DATCHK  017016
DATER   001712
DBUF    032412
DDISP   =  177570
DH1     031626
DH103   032163
DH105   032225
DH110   032252
DH2     031674
DH21    031711
DH23    032006
DH25    032053
DH27    032130
DH30    032211
DISPLA  001142
DISPRE  000174
DMPREG  026730
DOREAD  006350
DOWRIT  006230
DOXFER  006236
DPL     =  010000
DRCMND  020222
DRMAP   001520
DRU     =  002000
DRVABT  014334
DRVCNT  001500
DRVPRS  001264
DRVPTR  001476
DRV.RE= 104420
DRY     =  000200
DR.RST  022152
DSELCT  016220
DSWR    =  177570
DT1     032320
DT103   032402
DT2     032334
DT21    032342
DT25    032364
ECOUNT  001540
EMTVEC= 000030
EM1     027530
EM10    030060
EM101   031411
EM102   031451
EM103   031465
EM104   031513
EM105   031541
EM106   031571
EM11    030135
EM110   031610
EM12    030215
EM13    030267
EM14    030342
EM15    030415
EM16    030501
EM17    030512
EM2     027546
EM20    030540
EM21    030604
EM23    030616
EM24    030645
EM26    030721
EM27    030774
EM3     027621
EM30    031035
EM31    031130
EM32    031221
EM33    031253
EM34    031330
EM35    031347
EM36    031365
EM37    031401
EM4     027644
EM5     027667
EM6     027754
EM7     030013
ERCODE  001474
ERDRV   001542
ERINF1  005644
ERR     =  100000
ERRVEC= 000004
EXCRLU  015634
EXCUT   011520
EXNSK   011376
EXRCSR  007716
FNCMND  020300
FNMAP   001526
FRSTRT  001253
FTITLE  001252
GENBUF  016612
GEN1    014632
GEN8RG  014406
GETINF  021772
GTSDRV  022134
GTSWR   =  104406
GT3RG   021746
GT4RG   021740
HE      =  040000
HECN    001562
HISTRY  020334
HRDERR  013724
HT      =  000011
INTFLG  001534
INTHND  013164
INT1FL  001535
INT1SK  012304
IOTVEC= 000020
KDPAR0= 172360
KDPAR1= 172362
KDPAR2= 172364
KDPAR3= 172366
KDPAR4= 172370
KDPAR5= 172372
KDPAR6= 172374
KDPAR7= 172376
KDPDR0= 172320
KDPDR1= 172322
KDPDR2= 172324
KDPDR3= 172326
KDPDR4= 172330
KDPDR5= 172332
KDPDR6= 172334
KDPDR7= 172336
KEY     001306
KIPAR0= 172340
KIPAR1= 172342
KIPAR2= 172344
KIPAR3= 172346
KIPAR4= 172350
KIPAR5= 172352
KIPAR6= 172354
KIPAR7= 172356
KIPDR0= 172300
KIPDR1= 172302
KIPDR2= 172304
KIPDR3= 172306
KIPDR4= 172310
KIPDR5= 172312
KIPDR6= 172314
KIPDR7= 172316
KWCOUN  001560
KWHR    001552
KWLS    001234
KWLVEC= 000100
KWMIN   001554
KWPLVL  001246
KWSEC   001556
KWSRVE  022460
LF      =  000012
MAXBA   002054
MH1     020654
MH2     020670
MH3     020700
MH4     020703
MMVEC   =  000250
MSG1    002062
MSG10   002165
MSG11   002201
MSG12   002206
MSG13   002214
MSG14   002225
MSG15   002245
MSG16   002305
MSG17   002326
MSG18   002334
MSG19   002336
MSG2    002070
MSG20   002362
MSG24   002372
MSG25   002375
MSG26   002377
MSG26A  002474
MSG27   002532
MSG28   002604
MSG29   002652
MSG3    002076
MSG4    002104
MSG5    002120
MSG6    002133
MSG7    002141
MSG8    002146
MSG9    002156
NIEROR  021424
NOEROR  014206
NRDH    001774
NRDL    001772
NWRFNC  011674
NWRTH   001734
NWRTL   001732
NXTDRV  005312
```



```
$SCOPE  027102     $SWR  = 143000     $TPFLG  001157     $TTYIN  023402     $TYPOS  025656
$SETUP= 000115     $SWRMK= 000000     $TPS    001150     $TYPDS  023726     $XTSTR  027114
$SIZE   017374     $TKB    001146     $TRAP   027246     $TYPE   024152     $$GET4= 000000
$SIZEX  017636     $TKS    001144     $TRAP2  027270     $TYPEC  024322     $OFILL  026111
$$TUP = [illegible] $TN   = 000010     $TRP  = 000022     $TYPEX  024370     .     = 032414
$SVLAC  027224     $TNPWP  024622     $TRPAD  027302     $TYPOC  025712
$SVPC = 000220     $TPB    001152     $TSTNM  001102     $TYPON  025726

. ABS.  032414    000

ERRORS DETECTED:  0
DEFAULT GLOBALS GENERATED:  0

DZRKHF,DZRKHF/LI:ME/NL:MC:MD:CND SOL NSQ=DZRKHF.P11
RUN-TIME: 64 47 1 SECONDS
RUN-TIME RATIO: 297/114=2.6
CORE USED:  30K  (59 PAGES)
```

Spooler running 21 Seconds, [illegible] disk reads, 3 disk writes, 158 pages

[illegible]