RP07

RP07 PERF EXER
CZRJOB0

AH-F965B-MC
FICHE 1 OF 2

APR 1984
digital
Made In USA

RP07

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FICHE 2 OF 2

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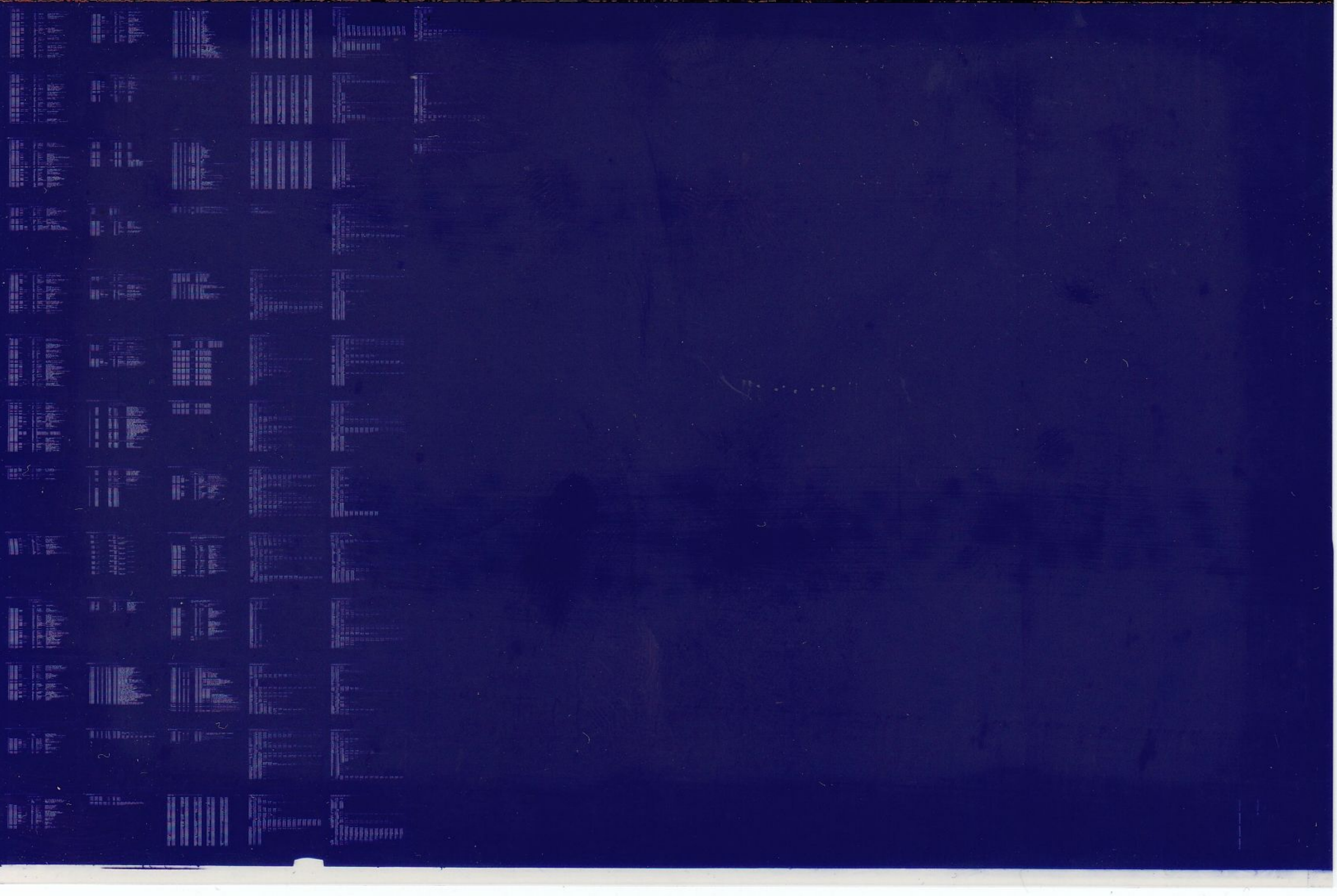

USER DOCUMENTATION

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IDENTIFICATION

PRODUCT CODE: AC-F960B-MC

PRODUCT NAME: CZRJMBO RP07 FRONT-END/ISOLATOR TEST

PRODUCT DATE: DECEMBER 1, 1983

MAINTAINER: CX DIAGNOSTIC ENGINEERING

AUTHOR: MIKE LEAVITT

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1. ABSTRACT

THE RP07 PERFORMANCE EXERCISER PROGRAM IS DESIGNED TO PERFORM AN INTERACTIVE TEST ON RP DISK DRIVES CONNECTED TO A MASSBUS SUBSYSTEM. THE DRIVES MAY BE CONTROLLED BY AN RH70 CONTROLLER. IN ADDITION TO PERFORMING AN INTERACTIVE TEST OF THE DISK DRIVES ON THE SUBSYSTEM, THE PROGRAM IS INTENDED TO BE USED TO VERIFY THAT THE DRIVES UNDER TEST ARE PERFORMING TO THEIR DATA ERROR RATE AND SEEK ERROR RATE (SEE ERROR RATE SPECIFICATIONS).

THE PERFORMANCE EXERCISER PROGRAM WILL EXERCISE DRIVES CONNECTED AS EITHER SINGLE OR DUAL PORT UNITS. DUAL PORT DRIVES ARE TESTED BY LOADING AND RUNNING THE PROGRAM FROM BOTH CONTROLLING SYSTEMS. THE PROGRAM WILL EXERCISE A MIXED SYSTEM OF DUAL PORT AND SINGLE PORT DRIVES.

TO OBTAIN INTERACTIVE TESTING, OPERATIONS ON THE MULTI-DRIVE CONFIGURATIONS ARE OVERLAPPED (OTHER DRIVES ARE PERFORMING SEEK/SEARCH OPERATIONS WHILE ONE DRIVE IS PERFORMING A DATA TRANSFER). OPERATIONS AMONG THE DRIVES ARE OPTIMIZED SO THAT A HIGH SUBSYSTEM DATA TRANSFER RATE OR A HIGH POSITIONING OPERATION RATE IS MAINTAINED.

THE PERFORMANCE OF EACH DRIVE IS MONITORED BY THE PROGRAM. IF A DRIVE EXCEEDS A PRESET NUMBER OF ERRORS IN ANY OF SEVERAL CATEGORIES, THAT DRIVE IS AUTOMATICALLY DEASSIGNED. (THE OPERATOR MAY OVERRIDE THE AUTOMATIC DEASSIGNMENT FEATURE.) THE PROGRAM REPORTS PERFORMANCE STATISTICS FOR EACH DRIVE BEING EXERCISED ON REQUEST FROM THE OPERATOR OR AUTOMATICALLY AT AN INTERVAL DETERMINED BY THE OPERATOR.

ALL DATA TRANSFER COMMANDS EXCEPT WRITE HEADER & DATA AND WRITE CHECK HEADER & DATA ARE USED. RECALIBRATE AND READ-IN PRESET COMMANDS ARE USED AT STARTUP AND DRIVE INITIALIZATION. RECALIBRATE, OFFSET, AND RETURN-TO-CENTERLINE COMMANDS ARE USED DURING ERROR RECOVERY.

THE DATA TRANSFER COMMANDS ARE SELECTED RANDOMLY EXCEPT FOR THE WRITE CHECK COMMANDS. THE WRITE CHECK COMMANDS ARE USED TO VERIFY A PREVIOUS WRITE OPERATION. THUS, WHEN A WRITE COMMAND IS SELECTED, THE DATA WRITTEN IS VERIFIED BY THE APPROPRIATE WRITE CHECK COMMAND.

DEPENDING UPON WHETHER THE PROGRAM HAS BEEN LOADED VIA APT AUTOMATIC MODE OR APT DUMP MODE WILL DETERMINE WHETHER; PROGRAM/OPERATOR COMMUNICATIONS ARE THROUGH THE KEYBOARD, DYNAMIC PROGRAM OPTIONS ARE SELECTED VIA SWITCH REGISTER SETTINGS AND ERRORS ARE REPORTED ON THE CONSOLE TERMINAL.

1.1 GENERAL DOCUMENT NOTES

A. IN REFERENCE TO ALL NUMBERS IN THIS DOCUMENTION. TO INDICATE THE BASE OF A NUMBER LARGER THAN SEVEN. A PERIOD(.) WILL FOLLOW THE NUMBER TO INDICATE DECIMAL OR NO PERIOD WILL FOLLOW THE NUMBER TO INDICATE OCTAL. IF THE NUMBER OCCURS AT THE END OF A SENTENCE, A DOUBLE PERIOD(. .) INDICATES DECIMAL AND A SINGLE PERIOD(.) INDICATES OCTAL. ALSO, ANY REFERENCES TO TIME ARE ALWAYS IN DECIMAL.

2. REQUIREMENTS

2.1 EQUIPMENT

PDP-11 PROCESSOR
20K MEMORY
KW11-L OR KW11-P CLOCK
PROGRAM LOADING DEVICE
TERMINAL
RH11 OR RH70 CONTROLLER
1 TO 8 DISK DRIVES (RP07'S)

2.2 MEDIA

THE PERFORMANCE EXERCISER PROGRAM REQUIRES FORMATTED DISK PACKS GENERATED BY THE RP07 FORMATTER PROGRAM (ISSFMT). THE PACKS MUST BE FORMATTED IN 32. SECTOR (16 BIT) MODE;THE ALTERNATE (30. SECTOR - 18 BIT) MODE IS NOT SUPPORTTED.

2.3 PRELIMINARY PROGRAMS

RP07 FRONT-END TEST
RP07 FUNCTIONAL TEST

3. OPERATING PROCEDURE

3.1 LOADING THE PROGRAM

THE PROGRAM MAY BE LOADED BY EITHER OF THE FOLLOWING MEDIA:

.PAPER TAPE, USING THE STANDARD PAPER TAPE PROCEDURE
.XXDP MEDIA, USING ANY XXDP DEVICE

3.2 STARTING ADDRESSES

200 - START ADDRESS, ALL SWITCHES CLEAR (SEE SECTION 3.4)

WHEN THE PROGRAM IS STARTED, A DATA PATTERN WILL BE WRITTEN TO ALL ON-LINE DRIVES IN A SEQUENTIAL SEEK MODE. UPON COMPLETION OF THE WRITE, THE PROGRAM GOES INTO A TESTING MODE.

204 - RESTART ADDRESS, THE RESTART ADDRESS PROVIDES THE OPERATOR WITH THE ABILITY TO CHANGE THE DEFAULT RP/RH ADDRESSES (SEE SECTION 4.1.2), ANY PROGRAM PARAMETERS (SEE SECTION 4.1) OR CHANGE DRIVE LIMIT PARAMETERS (SEE SECTION 4.2).

3.3 PROGRAM CONTROL

PROVIDED THE PROGRAM HAS BEEN LOADED AND STARTED VIA THE APT DUMP MODE OR THE DIAGNOSTIC IS RUNNING IN STAND ALONE PROCESSOR/DRIVE OPERATIONS ARE INITIATED AND CONTROLLED BY KEYBOARD COMMANDS AND SWITCH REGISTER SWITCH SETTINGS.

HOWEVER, IF THE PROGRAM IS LOADED VIA APT SCRIPT MODE ALL SETUP AND SWITCH REGISTER SETTINGS WILL BE PROVIDED THROUGH THE APT E TABLE. TYPEOUTS FROM THE USER DIAGNOSTIC MAY OR MAYNOT BE INHIBITED DEPENDING UPON WHETHER OR NOT THE APPROPRIATE BIT IN THE E TABLE HAS BEEN SET.

3.4 SWITCH OPTIONS

IF THE PROGRAM IS BEING RUN ON A SWITCHLESS PROCESSOR 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 . THE SETTINGS OF THE 'SOFTWARE' SWITCHES ARE CONTROLLED THROUGH A KEYBOARD ROUTINE WHICH IS CALLED BY TYPING A 'CONTROL G'. THE PROGRAM WILL RECOGNIZE THE 'CONTROL G' AT ANY TIME EXCEPT WHEN THE PROGRAM IS IN KEYBOARD ENTRY MODE, OR IS AT A HIGHER PRIORITY PROCESSING AN DRIVE INTERRUPT. THE 'SOFTWARE' SWITCH VALUES ARE ENTERED AS AN OCTAL NUMBER IN RESPONSE TO THE PROMPT FROM THE SWITCH ENTRY ROUTINE:

'SWR = NNNNNN NEW ='

EACH TIME SWITCH SETTINGS 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 1'S IN THE SWITCHES. 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<14>	NOT USED
SW<13>=1	INHIBIT ERROR TYPEOUT
SW<12>	NOT USED
SW<11>	NOT USED
SW<10>=1	BELL ON ERROR
SW<09>=1	CHANGE END OF PASS TO 1/4 OF NORMAL
SW<09>	NOT USED
SW<08>=1	INHIBIT END OF PASS MESSAGES
SW<07>=1	DISPLAY ALL DATA COMPARE ERRORS
SW<06>=1	DO NOT ALTER THE CURRENT OPERATION PARAMETERS
SW<05>=1	PARTIAL REGISTER DISPLAY IF ERROR; DO NOT DISPLAY ECC CORRECTION RESULTS
SW<04>=1	INHIBIT MAXIMUM ERROR COUNT CHECK; DO NOT DEASSIGN DRIVES WHEN END OF TEST IS REACHED
SW<03>=1	DISPLAY THE SECTOR IN ERROR (BEFORE RETRY ATTEMPTS) IF 'DCK', 'DTE', OR 'WCF' ERRORS OR AFTER THE 28TH RETRY IF UNCORRECTABLE 'DCK' ERROR IF DATA COMPARE ERRORS & SW<07> SET, DISPLAY REST OF BUFFER
SW<02>=1	INHIBIT SUBSYSTEM STATUS TYPEOUT DURING STARTUP

INHIBIT PERFORMANCE REPORT AFTER SPECIFIED TIME
PROMPT 'WRITE ANYWHERE' QUESTION DURING AUTO TEST MODE
SW<01>=1 INHIBIT DATA COMPARE AFTER READ COMMAND, W/O ERROR
SW<00>=1 READ ONLY MODE

3.5 PASS/TEST TERMINATION:

A PASS IN RANDOM 'T' COMMAND MODE OR SEQUENTIAL 'T' COMMAND MODE IS DETERMINED BY EITHER BITS READ OR SEEKS PERFORMED. THE NUMBER OF BITS OR SEEKS REQUIRED FOR A PASS IS DERIVED FROM EITHER THE SOFT ERROR RATE SPECIFICATION OR THE SEEK ERROR RATE SPECIFICATION.

THE SOFT ERROR SPECIFICATION FOR THE RP DRIVE IS NO MORE THAN 1 SOFT ERROR (NON-DISK RELATED) IN 1 X 10↑10 BITS READ. (SEE SECTION 3.5.1 FOR THE 90% CONFIDENCE LEVEL)

THE SEEK ERROR SPECIFICATION FOR THE RP DRIVE IS NO MORE THAN 1 SEEK ERROR IN 1 X 10↑6 SEEKS. (SEE SECTION 3.5.1 FOR THE 90% CONFIDENCE LEVEL)

A PASS IN 'W' OR 'R' COMMAND MODE IS DETERMINED BY THE MAXIMUM DISK ADDRESS LIMITS SETUP BY THE OPERATOR.

3.5.1 PASS TERMINATION

END OF PASS FOR A SINGLE DRIVE IN THE RANDOM 'T' COMMAND MODE OR SEQUENTIAL 'T' COMMAND MODE, IS DETERMINED BY ONE OF THE FOLLOWING CONDITIONS.

A. IF PARAMETER 'ENDING' IS 1, END OF PASS OCCURS WHEN THE DRIVE HAS READ 4.128 X 10↑9 BITS (2.58 X 10↑8 WORDS). IF SW09=1, THE END OF PASS OCCURS WHEN THE DRIVE HAS READ 1.032 X 10↑9 BITS (.645 X 10↑8 WORDS).

B. IF PARAMETER 'ENDING' IS 0, END OF PASS OCCURS WHEN THE DRIVE HAS PERFORMED 1 X 10↑6 SEEKS.

END OF PASS FOR A SINGLE DRIVE IN 'W' OR 'R' COMMAND MODE. IS DETERMINED AS FOLLOWS.

A. WHEN A SEQUENTIAL SEEK IS MADE BEYOND THE MAXIMUM DISK ADDRESS LIMITS SET BY THE OPERATOR, THE PASS IS CONSIDERED ENDED.

3.5.2 TEST TERMINATION

IF SW04 IS CLEAR(0), THE TEST FOR A DRIVE IS TERMINATED WHEN:

A. THE DRIVE HAS COMPLETED THE NUMBER OF PASSES SPECIFIED IN PARAMETER 'PASSES'.
B. THE TOTAL ERRORS ACCUMULATED EXCEED 25. .
C. A FATAL ERROR OCCURS: EM12 OR EM14.
D. OPERATOR DEASSIGNS THE DRIVE
E. THE NUMBER OF PASSES SPECIFIED BY THE MONITOR HAVE BEEN REACHED, WHEN RUNNING IN 'XXDP' CHAIN MODE, 'ACT11' CHAIN MODE OR 'APT' SCRIPT MODE(ANY AUTO MODE).

3.6 RUN TIME

THE EXERCISER PROGRAM MAY BE RUN IN TWO MODES. (SEE SECTION 3.5.1)
THE PROGRAM RUN TIME VARIES GREATLY DEPENDING ON THE OPERATION
MODE SELECTED, THE READ/WRITE RATIO PARAMETER ('RATIO'), AND BY
SWR SWITCHES 0, 1, AND 2.

3.6.1 DATA TRANSFER MODE (DEFAULT)

ONE DRIVE - APPROX. 45 MIN. (TO REACH 4.128 X 10↑9 BITS (2.58 X 10↑8 WORDS)

3.6.2 SEEK VERIFICATION MODE

PARAMETER 'MAX WRD CNT' = 256. (1 SECTOR)
PARAMETER 'MAX TRK' = 'MIN TRK' (SAME VALUES)
PARAMETER 'MAX SEC' = 'MIN SEC' (SAME VALUES)
SW<01> =1 (NO DATA COMPARE)
SW<00> =1 (READ ONLY MODE)

ONE DRIVE - APPROX. 4.0 HRS (TO REACH 1 X 10↑6 SEEKS)

3.7 DUAL PORT OPERATION

A. LOAD THE PERFORMANCE EXERCISER PROGRAM INTO BOTH PROCESSORS.

B. SWITCH THE 'CONTROLLER SELECT' SWITCH TO 'A/B' ON EACH DRIVE WHICH IS TO BE TESTED AS A DUAL PORT DRIVE AND CYCLE THE DRIVES UP.

C. START THE PROGRAM IN EACH PROCESSOR. RUN THE PROGRAM AS THOUGH EACH PROCESSOR WERE RUNNING INDEPENDENTLY OF THE OTHER.

3.8 XXDP, ACT11, APT11 COMPATIBILITY

THIS PROGRAM IS COMPATIBLE WITH ACT11 AND APT11 IN BOTH DUMP AND AUTOMATIC MODES.

THIS PROGRAM IS ALSO, COMPATIBLE WITH XXDP IN DUMP AND CHAIN MODES, AND PROVIDES MEDIA PROTECTION IN THE CASE WHERE THE RP07 IS THE XXDP LOADING DEVICE.

AUTOMATIC MODE OR CHAIN MODE (MONITOR)

1. THE BUS ADDRESS AND CONTROLLER INTERRUPT VECTOR ARE DEFAULTED TO 176700 AND 254 RESPECTIVELY.

DUMP MODE (NO MONITOR)

1. INPUT DIALOGUE PROMPTED AFTER PROGRAM STARTS

3.9 APT ETABLE DEFINITIONS

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

1. SOFTWARE ENVIRONMENT:

   = 1 IF APT SCRIPT MODE
   = 0 IF STANDLONE MODE

2. ENVIRONMENT MODE:

   BIT 7 = 1 ETABLE DOES SIZING
         = 0 PROGRAM DOES SIZING

   BIT 6 = 1 SPOOL MESSAGES TO APT IF SCRIPT MODE
         = 0 DON'T SPOOL TO APT

   BIT 5 = 1 SUPPRESS TTY CONSOLE OUTPUT
         = 0 ALLOW TTY CONSOLE OUTPUT

   BIT 4 TO BIT 0 ARE NOT USED

3. SWITCH 1 (SOFTWARE SWITCH REGISTER)
   IF ENVIRONMENT MODE BIT 7 (SIZING BIT) IS SET TO 1,
   THE SOFTWARE SWITCH REGISTER WILL BE USED, INSTEAD
   OF THE HARDWARE TTY CONSOLE SWITCH REGISTER.

4. SWITCH 2 (USER SWITCH REGISTER)
   NOT USED

5. CPU OPTIONS
   NOT USED

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

7. INTERRUPT VECTOR 1:
   USED WHEN ENVIRONMENT MODE BIT 7 = 1;DEFAULT = 254

8. BUS PRIORITY 1:
   NOT USED.

9. INTERRUPT VECTOR 2:
   NOT USED

10. BUS PRIORITY 2:
    NOT USED

11. BASE ADDRESS:
    USED WHEN ENVIRONMENT MODE BIT 7 = 1;DEFAULT = 176700

12. DEVICE MAP:
    NOT USED

13. CONTROLLER DESCRIPTOR WORDS:
    NOT USED

14. CONTROLLER DESCRIPTOR WORDS:
    NOT USED

```
                                        ;COMMAND INITIATOR
                                        ;
                                        ;CALL
                                        ;       MOV     #DPB,R2         ;ADDRESS OF DRIVE PARAMETER BLOCK
                                        ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     PC,CI????       ;CI???? = CI1, CI3, OR CI4
                                        ;                               ;WHERE:
                                        ;                               ; CI1 = DATA TRANSFER
                                        ;                               ; CI3 = SEARCH REQUESTED BY DATA XFER
                                        ;                               ; CI4 = NO DATA TRANSFER

042066  004737  046246          CI1:    JSR     PC,POPQUE       ;REMOVE REQUEST FROM "DRIVES WAIT" QUEUE
042072  010237  040574                  MOV     R2,TRNSWT       ;PUT REQ. IN TRANSFER WAIT QUEUE
042076  010203                          MOV     R2,R3           ;DPB ADDRESS TO R3
042100  013704  040640                  MOV     RPADR,R4        ;RPCS1 ADDRESS
042104  010164  000010                  MOV     R1,RPCS2(R4)    ;SELECT DRIVE
042110  122762  000135  000002          CMPB    #135,2(R2)      ;IS IT A DIAGNOSTIC COMMAND ?
042116  001011                          BNE     1$              ;BRANCH IF NOT
042120  016246  000004                  MOV     4(R2),-(SP)     ;GET THE ROUTINE NUMBER, PARAMETERS
042124  052716  100000                  BIS     #BIT15,(SP)     ;SET THE DIAGNOSTIC MODE BIT
042130  004037  045210                  JSR     R0,WRT.RP       ;WRITE THE RPMR1 REG
042134  000024                          RPMR1
042136  042750                          CI?
042140  000422                          BR      2$              ;LOAD THE COMMAND AND EXIT

042142  062703  000004          1$:     ADD     #4,R3           ;DESIRED WORD COUNT
042146  062704  000002                  ADD     #2,R4           ;RPWC ADDRESS
042152  012324                          MOV     (R3)+,(R4)+     ;LOAD WORD COUNT
042154  012324                          MOV     (R3)+,(R4)+     ;LOAD BUFFER ADDRESS
042156  012346                          MOV     (R3)+,-(SP)     ;LOAD SECTOR AND TRACK
042160  004037  045210                  JSR     R0,WRT.RP       ;CALL THE LOAD(WRITE) ROUTINE
042164  000006                          RPDA                    ;INDEX OF REGISTER TO LOAD
042166  042750                          CI7                     ;ERROR RETURN ADDRESS
042170  012346                          MOV     (R3)+,-(SP)     ;LOAD CYLINDER ADDRESS
042172  004037  045210                  JSR     R0,WRT.RP
042176  000034                          RPDC
042200  042750                          CI7
042202  004737  042232                  JSR     PC,CI2          ;SEE IF BIT15 SHOULD BE SET IN RPMR1

042206  016246  000002          2$:     MOV     2(R2),-(SP)     ;LOAD "COMMAND+GO", "A17&A16", AND "PSEL"
042212  004037  045210                  JSR     R0,WRT.RP
042216  000000                          RPCS1
042220  042750                          CI7
042222  010137  040626                  MOV     R1,DTUW         ;SET "DATA TRANSFER UNDERWAY"
042226  000137  042712                  JMP     CI5

042232  026262  000012  000156  CI2:    CMP     12(R2),FE1(R2)  ;DATA XFER TO FE CYLINDERS ?
042240  002406                          BLT     1$              ;BR IF NO
042242  012746  100000                  MOV     #BIT15,-(SP)    ;SET THE DIAGNOSTIC MODE BIT
042246  004037  045210                  JSR     R0,WRT.RP       ;WRITE THE RPMR1 REG
042252  000024                          RPMR1
042254  042750                          CI7
042256  000207                  1$:     RTS     PC

042260  013704  040640          CI3:    MOV     RPADR,R4        ;RPCS1 ADDRESS
042264  010164  000010                  MOV     R1,RPCS2(R4)    ;SELECT DRIVE
042270  016246  000012                  MOV     12(R2),-(SP)    ;DESIRED CYLINDER ADDRESS
```

EASILY. THE USER CAN SCAN SCAN DOWN A COLUMN, INSTEAD OF LOOKING THRU THE TYPICAL LONG ERROR REPORT. THE ONE DISADVANTAGE OF THE 132. CHARACTER REPORT, IS THE AMOUNT OF ERROR DATA WHICH CAN BE REPORTED TO THE USER.

THE FOLLOWING QUESTION AND WARNING MESSAGE ONLY APPEAR IN THE FIELD VERSION OF THIS DIAGNOSTIC.

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

A 'N' ANSWER WILL PROCEED WITH TESTING ONLY THE FE CYLINDER AND SKIP THE FOLLOWING QUESTION. A 'Y' ANSWER WILL PROCEED TO NEXT WARNING MESSAGE AND QUESTION. IF THE PROGRAM IS IN "READ ONLY" MODE (SW0=1), THE WARNING MESSAGE WILL BE OMITTED BUT THE QUESTION WILL BE ASKED.

'! CUSTOMER DATA WILL BE OVERWRITTEN !

CONTINUE (L) ?'

A 'Y' ANSWER WILL PROCEED WITH TESTING THE ENTIRE DISK. A 'N' ANSWER WILL PROCEED WITH TESTING ONLY THE FE CYLINDER.

IF ONLY THE FE CYLINDER IS TO BE TESTED, THE FOLLOWING MESSAGE WILL BE PRINTED.

'♣ TESTING FE CYLINDER ONLY ♣'

AT THIS POINT, IF THE PROGRAM IS LOCKED IN "READ ONLY" MODE, THE FOLLOWING MESSAGE WILL BE TYPED. IF THE PROGRAM IS NOT LOCKED IN "READ ONLY" MODE, THE FOLLOWING MESSAGE WILL BE OMITTED.

'♣ PROGRAM IS LOCKED IN 'READ ONLY' MODE ♣'

WHEN THE PROGRAM IS STARTED, THE OPERATOR WILL BE ASKED TO ENTER PARAMETERS. THE FOLLOWING MESSAGE WILL BE DISPLAYED:

'CHANGE PARAMETERS (L) N ?'

IF THE ENTRY IS A 'N' FOLLOWED BY A CARRIAGE RETURN OR JUST A CARRIAGE RETURN (DEFAULT), THE PROGRAM WILL NOT ALLOW ANY PARAMETERS TO CHANGED AND WILL CONTINUE.
IF THE ENTRY IS A 'Y' FOLLOWED BY CARRIAGE RETURN, THE OPERATOR WILL BE ALLOWED TO CHANGE THE PROGRAM PARAMETERS.

THE PROGRAM WILL IDENTIFY THE PARAMETER BY THE NAME GIVEN BELOW, DISPLAY THE CURRENT VALUE OF THE PARAMETER AND WAIT FOR THE ENTRY. THE PROGRAM WILL TYPE 'INVALID ENTRY' IF THE ENTRY IS NOT CORRECT AND WAIT FOR A CORRECT ENTRY TO BE TYPED. (SEE SECTION 4.1.1)

IF THIS IS THE PROGRAM'S FIRST START, THE STATUS OF THE DRIVES ON THE SELECTED MASSBUS SUBSYSTEM WILL BE PRINTED. ON ALL SUBSEQUENT STARTS, THIS TYPEOUT MAY BE INHIBITED BY SETTING SW<02> =1.

THE FOLLOWING IS AN EXAMPLE DRIVE STATUS PRINTOUT:

```
DRIVE STATUS:
  0    ONLINE RP07
  1    LOAD DEVICE
  2    OFFLINE RP07
  3    ONLINE RP07      NON-INTERLEAVED
  4    NOT PRESENT
  5    NOT AN RP07
  6    NOT PRESENT
  7    NOT PRESENT'
```

THE ABOVE DRIVE STATUS SHOWS THAT DRIVE 0 WILL BE TESTED, WHILE DRIVES 1 - 7 WILL NOT BE TESTED.

4.1.1 KEYBOARD ENTRY PARAMETERS

QUESTION #	BASE	DEFAULT VALUE	VALUE RANGE	FUNCTION
1	10.	12800. (SEE NOTE)	6 - 12800.	CONTROLS THE MAXIMUM WORD COUNT USED FOR DATA TRANSFERS NOTE: THE PROGRAM WILL SELECT A MAXIMUM WORD COUNT, WHICH IS DETERMINED BY THE MEMORY AVAILABLE. THE MAX. WORD COUNT ASSIGNED BY THE PROGRAM IS 12800. (1 TRK) WORDS. THE OPERATOR MAY SPECIFIY ANY OTHER MAX. WORD COUNT AS LONG AS THE VALUE SPECIFIED IS AT LEAST 6 WORDS BUT NO LARGER THAN 12800. WORDS OR MEMORY AVAILABLE. (WHICH EVER VALUE IS SMALLER)
2	10.	0	0 - 32767.	DETERMINES THE INTERVAL (IN MINUTES) BETWEEN AUTOMATIC PERFORMANCE REPORT TYPEOUTS; NO TYPEOUT IF THIS PARAMETER IS 0 OR IF SW<02> =1
3	10.	15.	0 - 32767.	DETERMINES THE INTERVAL (IN MINUTES) BETWEEN DATA COMPARES TO MEMORY AFTER A READ DATA COMMAND. ALWAYS DO COMPARE IF THIS PARAMETER IS 0. IF SW01 =1, THEN NO DATA COMPARES WILL BE GRANTED,UNLESS A 'DCK' ERROR OCCURS.
4	10.	1	1 - 32767.	NUMBER OF PASSES TO END OF TEST. (THIS PARAMETER IS NOT USED WHEN THE PROGRAM IS

				OPERATING IN AUTO RUN MODE)
5	10.	0	0 - 15.	IF PARAMETER=0,DATA PATTERN IS RANDOMLY SELECTED. IF PARAMETER>0,SPECIFIES ONE OF THE 15. PATTERNS. THE SELECTED DATA PATTERN IS POINTED BY THE PARAMETER "PATTERN". (SEE SECTION 8.4)
6	8	000000	0 OR 1	IF PARAMETER = 0, THE WORD COUNT IS RANDOMLY SELECTED BETWEEN 6 AND THE VALUE 'WRDCNT' (MAX WRD CNT). IF PARAMETER = 1, THE WORD COUNT WILL BE THE VALUE 'WRDCNT' (MAX WRD CNT).
7	8	000002	0 - 7	CONTROLS THE APPROXIMATE RATIO OF READ TO WRITE COMMANDS.

VALUE	R/W RATIO
0	15/1
1	7/1
2	6/2
3	5/3
4	4/4
5	3/5
6	2/6
7	1/7

8	8	000001	0 OR 1	IF PARAMETER = 1, END OF PASS DETERMINED BY THE 'WORDS READ' COUNT. IF PARAMETER = 0, END OF PASS IS DETERMINED BY THE NUMBER OF SEEKS.
9	8	000001	0 OR 1	IF EQ 1, DO AN APPROPRIATE WRITE CHECK AFTER EACH WRITE COMMAND. IF EQ 0, SELECT WRITE CHECK COMMAND RANDOMLY.
10	8	000000	0 OR 1	IF PARAMETER=0,RANDOM DATA BLOCK ADDRESS IS USED IN 'T' COMMAND IF PARAMETER=1,SEQUENTIAL DATA BLOCK IS USED IN 'T' COMMAND.

4.1.2 CHANGE DEVICE ADDRESS

THE RP/RH ADDRESS AND VECTOR MAY BE CHANGED WHEN THE PROGRAM IS STARTED AT ADDRESS 204 OR IF THE PROGRAM DOES NOT RECEIVE A RESPONSE WHEN IT ACCESSES THE DEFAULT RP/RH ADDRESS.

(DEFAULT ADDRESS = 176700, VECTOR = 254)

ADDRESS SELECTION EXAMPLES

EXAMPLE 1

```
RPCS1=176700 <CR>        ;NO CHANGE IN ADDRESS
RPVEC=000254 <CR>        ;NO CHANGE IN ADDRESS
```

EXAMPLE 2

```
RPCS1=176700 172400<CR> ;CHANGE BASE ADDRESS TO 172400
RPVEC=000254 224<CR>    ;CHANGE VECTOR ADDRESS TO 224
```

4.2 KEYBOARD COMMANDS

THROUGH THE KEYBOARD COMMANDS, THE OPERATOR MAY ASSIGN DRIVES FOR TEST ('T' COMMAND), WRITE SEQUENTIAL DATA ('W' COMMAND), PERFORM A SEQUENTIAL READ ('R' COMMAND), PERFORM WRITE DATA AND FOLLOWED BY TEST ('WT' COMMAND), REQUEST A DRIVE PERFORMANCE SUMMARY ('S' COMMAND), OR DEASSIGN A DRIVE ('D' COMMAND).

THE 'T', 'W', 'R' AND 'WT' COMMANDS ARE EXCLUSIVE TO ONE ANOTHER ON THE SAME DRIVE UNDER TEST. THE 'D' COMMAND MUST BE ENTERED IN ORDER TO ISSUE A DIFFERENT COMMAND TO THE SAME DRIVE UNDER TEST. EXCEPT FOR THE 'S' COMMAND, WHICH CAN BE ENTERED AT ANY TIME DURING THE TEST.

IF THE PROGRAM WAS STARTED AT ADDRESS 204 OR IF NO DRIVES ARE ASSIGNED FOR TESTING, THE FOLLOWING MESSAGE WILL BE TYPE BEFORE ENTERING THE COMMAND MODE. HOWEVER, IF A 'CONTROL C' IS TYPED WHILE TESTING IS IN PROGRESS, THE FOLLOWING MESSAGE WILL BE OMITTED AND THE PROGRAM WILL ENTER COMMAND MODE.

```
'NO DRIVES ASSIGNED'
```

WHEN THE PROGRAM ENTERS THE COMMAND MODE, THE FOLLOWING PROMPT WILL BE TYPED:

```
'HH:MM:SS
 ENTER COMMANDS:'
```

THE PROGRAM WILL THEN ACCEPT ANY OF THE VALID COMMANDS. AT THE COMPLETION OF A COMMAND, THE PROGRAM WILL EXIT COMMAND MODE AND TRY TO ASSIGN THE DRIVE(S) THAT WERE REQUESTED. IF THE DRIVE(S) CANNOT BE ASSIGNED, ONE OF THE FOLLOWING ERROR MESSAGES WILL BE REPORTED AND THE PROCESS CONTINUES FOR EACH DRIVE.

RESPONSE	COMMAND(S)
?DRIVE N LOAD DEVICE	T, W, R, WT
?DRIVE N OFFLINE	T, W, R, WT
?DRIVE N NOT ASSIGNED	D, S

?DRIVE N ALREADY ASSIGNED	T, W, R, WT
?DRIVE N NOT PRESENT	T, W, R, WT
?DRIVE N UNSAFE	T, W, R, WT
?DRIVE N NOT AN RP07	T, W, R, WT

NEXT, THE PROGRAM WILL PROCESS ALL THE ASSIGNED DRIVES AS FOLLOWS:

WHEN THE PROGRAM IS ASSIGNING THE DRIVES, THE OPERATOR WILL BE ASKED TO CHANGE THE DRIVE PARAMETERS WITH THE FOLLOWING PROMPT:

'CHANGE DRIVE PARAMETERS (L) N ?'

IF THE ENTRY IS A 'N' FOLLOWED BY A CARRIAGE RETURN OR JUST A CARRIAGE RETURN (DEFAULT), THE PROGRAM WILL NOT ALLOW ANY DRIVE PARAMETERS TO BE CHANGED AND WILL PROCEED TO TEST THE DRIVES AS COMMANDED.
IF THE ENTRY IS A 'Y' FOLLOWED BY CARRIAGE RETURN, THE OPERATOR WILL BE ALLOWED TO CHANGE THE DRIVE PARAMETERS AS FOLLOWS.

THE PROGRAM WILL FIRST TELL THE OPERATOR WHICH DRIVE IS BEING REFERENCED FOR CHANGES AND THE HARD WIRED DRV SERIAL NUMBER FORMAT:

'DRIVE # N, PGXXXX, ADDRESS LIMITS:'

WHERE 'XXXX' IS THE HARD WIRED DECIMAL SERIAL NUMBER CONTAINED IN THE RPSN REGISTER OF THE MBA. IF THE DRV SERIAL NUMBER IS NOT JUMPERED IN THE RPSN REGISTER, 'XXXX' WILL APPEAR AS '????'.

THE PROGRAM WILL REQUEST VALUES FOR THE FOLLOWING ADDRESS LIMIT PARAMETERS.

NAME	DEFAULT VALUE	VALUE RANGE	FUNCTION
MIN CYL	♠	♠ - 630.	THE MINIMUM CYLINDER ADDRESS
MAX CYL	630.	♠ - 630.	THE MAXIMUM CYLINDER ADDRESS
MIN TRK	0	0 - 31.	THE MINIMUM TRACK ADDRESS
MAX TRK	31.	0 - 31.	THE MAXIMUM TRACK ADDRESS
MIN SEC	0	0 - 49.	THE MINIMUM SECTOR ADDRESS
MAX SEC	49.	0 - 49.	THE MAXIMUM SECTOR ADDRESS

♠ IF RUNNING THE FIELD VERSION OF THIS PROGRAM AND TESTING OCCURS ONLY ON THE FE CLYINDER, THIS VALUE WILL BE 630. IF RUNNING THE MANUFACTURES VERSION OR THE FIELD VERSION OF THIS PROGRAM AND TESTING IS ANYWHERE ON THE MEDIA, THIS VALUE WILL BE 0.

4.2.1 'T' COMMAND

USED TO ASSIGN A DRIVE(S) FOR A TEST. THIS COMMAND IS REQUIRED TO PERFORM THE TEST OF THE DRIVE(S).

FORMAT: TN<CR>

N = DRIVE NUMBER. MAY BE 0 TO 7 OR 'A'. ENTRY MUST BE TERMINIATED BY A CARRIAGE RETURN <CR>.

EXAMPLE: TO<CR> - ASSIGN DRIVE 0 FOR TEST
TA<CR> - ASSIGN ALL AVAILABLE DRIVES FOR TEST

4.2.2 'D' COMMAND

USED TO DEASSIGN A DRIVE(S) BEING EXERCISED.

FORMAT: DN<CR>

N = DRIVE NUMBER. MAY BE 0 TO 7 OR 'A'. ENTRY MUST BE TERMINIATED BY A CARRIAGE RETURN <CR>.

EXAMPLE: DO<CR> - DEASSIGN DRIVE 0
DA<CR> - DEASSIGN ALL DRIVES BEING TESTED.

4.2.3 'S' COMMAND

USED TO REQUEST A PERFORMANCE SUMMARY TYPEOUT FOR THE REFERENCED DRIVE(S). AFTER THE 'S' COMMAND HAS BEEN PERFORMED, THE PROGRAM WILL AUTOMATICALLY RESUME TESTING THE DRIVE(S) WHICH WERE UNDER TEST.

FORMAT: SN<CR>

N = DRIVE NUMBER. MAY BE 0 TO 7 OR 'A'. ENTRY MUST BE TERMINIATED BY A CARRIAGE RETURN <CR>.

EXAMPLE: SO<CR> - TYPEOUT PERFORMANCE SUMMARY FOR DRIVE 0
SA<CR> - TYPEOUT PERFORMANCE SUMMARY FOR ALL DRIVES BEING TESTED.

4.2.4 'W' COMMAND

USED TO PERFORM A SEQUENTIAL WRITE OF THE DISK, WITH DATA ACCEPTABLE TO THE PERFORMANCE EXERCISER PROGRAM.

FORMAT: WN<CR>

N = DRIVE NUMBER. MAY BE 0 TO 7 OR 'A'. ENTRY MUST BE TERMINATED BY A CARRIAGE RETURN <CR>.

EXAMPLE: WO<CR> - WRITE A DATA PATTERN ON DRIVE 0.
WA<CR> - WRITE A DATA PATTERN ON ALL AVAILABLE DRIVES.

4.2.5 'R' COMMAND

USED TO PERFORM A SEQUENTIAL READ OF THE DISK.

FORMAT: RN<CR>

N = DRIVE NUMBER. MAY BE 0 TO 7 OR 'A'. ENTRY MUST BE TERMINATED BY A CARRIAGE RETURN <CR>.

EXAMPLE: RO<CR> - READ THE DATA ON DRIVE 0.
RA<CR> - READ THE DATA ON ALL AVAILABLE DRIVES.

4.2.6 'WT' COMMAND

USED TO PERFORM A SEQUENTIAL WRITE DATA, FOLLOWED BY A 'T' COMMAND.

FORMAT: WTN<CR>

N = DRIVE NUMBER 0 TO 7 OR "A". ENTRY MUST BE TERMINATED BY A CARRIAGE RETURN <CR>.

EXAMPLE: WT0<CR> - WRITE A DATA PATTERN AND TEST DRIVE 0
WTA<CR> - WRITE A DATA PATTERN AND TEST ALL DRIVES

5. PERFORMANCE SUMMARY TYPEOUT

5.1 THE PROGRAM WILL DISPLAY A PERFORMANCE REPORT FOR THE DRIVES BEING EXERCISED. THIS REPORT WILL BE DISPLAYED AUTOMATICALLY IF THE PARAMETER 'INTRVL' IS NOT ZERO AND SW<02>=0, OR IF THE DRIVE HAS REACHED THE DEFINED NUMBER OF PASSES AND SW<08>=0, OR IF THE OPERATOR REQUESTS TO DO SO BY USE OF THE 'S' COMMAND.

THE REPORT TYPEOUT CONTAINS THE FOLLOWING FIELDS:

'TIME'	ELAPSED TIME OF PROGRAM
'DRIVE'	DRIVE NUMBER - DRIVE TYPE
'DRV S/N'	HARD WIRED MASSBUS ADAPTER SERIAL NUMBER(RMSN)
'PASS'	PRESENT PASS COUNT FOR THE DRIVE
'WRDS WRITN /'	
' PASS'	NUMBER OF WORDS WRITTEN EACH PASS BY THE DRIVE
' TOTAL'	TOTAL NUMBER OF WORDS (X10**6) WRITTEN BY THE DRIVE
'WRDS READ /'	
' PASS'	NUMBER OF WORDS READ EACH PASS BY THE DRIVE
' TOTAL'	TOTAL NUMBER OF WORDS (X10**6) READ BY THE DRIVE
'SEEKS'	
' PASS'	NUMBER OF SEEK OPERATIONS EACH PASS BY THE DRIVE
' TOTAL'	TOTAL NUMBER OF SEEK OPERATIONS BY THE DRIVE
'SOFT'	NUMBER OF SOFT DATA ERRORS
'HARD'	NUMBER OF HARD DATA ERRORS
'SKI'	NUMBER OF 'SKI' ERRORS
'MISP'	NUMBER OF PROGRAM DETECTED POSITIONING ERRORS
'OTHER'	TOTAL ERRORS OF OTHER TYPES

NOTE: ERRORS EM1, EM2, EM3, EM4, EM5, & EM10 ARE NOT INCLUDED IN THE 'OTHER' ERROR TOTAL.

5.2 SOFT/HARD ERROR DEFINITIONS

5.2.1 HARD ERRORS

A. A 'DTE' (DRIVE TIMING ERROR) OR A 'DCK' (DATA CHECK ERROR) WHICH OCCURS DURING A READ DATA OR A READ HEADER & DATA OPERATION AND IS NOT CORRECTABLE OR DOES NOT BECOME CORRECTABLE AFTER THE PROGRAM HAS PERFORMED THE COMPLETE RETRY SEQUENCE ON THE BAD SECTOR.

THE RETRY SEQUENCE IS 16. RE-READS AT TRACK CENTER AND 2 ATTEMPTS

BOTH AT POSITIVE AND NEGATIVE OFFSETS.

5.2.2 SOFT ERRORS

A. ECC CORRECTABLE 'DCK' ERRORS.
B. 'DCK' & 'ECH' ERRORS WHICH BECOME ECC CORRECTABLE DURING RETRY OR WHICH ARE READ CORRECTLY DURING RETRY.
C. HEADER READ ERRORS - READ DATA, READ HEADER & DATA, OR WRITE DATA COMMANDS
D. 'DTE' ERRORS WHICH ARE CORRECTED OR WHICH BECOME ECC CORRECTABLE 'DCK' ERROR DURING THE RETRY SEQUENCE.

6. DATA CHECKING & ERROR RECOVERY

6.1 DATA COMPARISON

DATA COMPARISON OCCURS AFTER EACH 'RDDAT' (READ DATA) OR 'RDHD' (READ HEADER AND DATA) OPERATION UNDER THE FOLLOWING CONDITIONS:

A. THE COMMAND TERMINATED WITH NO ERRORS AND SW<01>=0

B. THE OPERATION TERMINATED WITH 'DCK' SET AND THE ERROR IS ECC CORRECTABLE OR THE SECTOR IN ERROR IS READ CORRECTLY AFTER RETRY ATTEMPTS.

6.2 VERIFICATION OF DATA WRITTEN

DATA VERIFICATION IS DONE EITHER THROUGH READING THE DATA BACK AND MATCHING THE DATA WITH ONE OF THE 15. PATTERNS OR THROUGH ISSUING A WRITE CHECK COMMAND AFTER DOING A WRITE DATA COMMAND.

6.3 BAD ADDRESS FLAGGING

ACCOMPLISHED BY THE RP07 HARDWARE SKIP DEFECT.

7. ERROR MESSAGES

ERRORS ARE REPORTED ON THE TTY CONSOLE. THE PROGRAM CONTAINS NO CODED ERROR HALTS. IF THE PROGRAM HALTS (ASSUMING, OF COURSE, THAT SW<15> IS NOT SET), AN UNRECOVERABLE PROGRAM CONDITION HAS OCCURRED OR A CENTRAL PROCESSOR FAILURE HAS OCCURRED.

ERROR MESSAGES ARE MADE UP OF SEVERAL LINES. EACH TYPE OF ERROR HAS SEVERAL OPTIONAL LINES WHICH MAY APPEAR WITH IT. ALL OF THE POSSIBLE ERROR MESSAGE LINES WHICH MAY APPEAR ARE GIVEN IN THE SECTION DESCRIBING THE PARTICULAR ERROR HEADER.

7.1 ERROR DESCRIPTION LINES

(THE MESSAGE TAGS ARE GIVEN FOR REFERENCE.)

MESSAGE

H2

TAG	TEXT
EM1	RH CONTROLLER INTERRUPT OCCURRED (RMAS=0) THE RH CONTROLLER INTERRUPTED AND THE ATTENTION SUMMARY REGISTER (RMAS) WAS CLEARED.
EM2	UNEXPECTED ATTENTION OCCURRED THE INDICATED DRIVE INTERRUPTED BUT THE DRIVE WAS NOT PERFORMING AN OPERATION.
EM3	MASSBUS PARITY ERROR (MCPE=1) THE RH DETECTED A CONTROL BUS PARITY ERROR WHEN READING THE INDICATED REGISTER FROM THE INDICATED DRIVE.
EM4	MASSBUS PARITY ERROR (PAR=1) THE INDICATED RP DETECTED A CONTROL BUS PARITY ERROR WHEN THE RH LOADED THE SPECIFIED REGISTER.
EM5	ADDRESS PLUG CHANGE BIT SET THE 'OPE' BIT WAS SET WHEN THE INDICATED DRIVE INTERRUPTED.
EM6	RH DIDN'T RESPOND TO ADDRESSING WHEN THE PROGRAM ADDRESSED THE RH, NO RESPONSE WAS RECEIVED FROM THE INDICATED ADDRESS.
EM10	UNCORRECTABLE MASSBUS PARITY ERROR THE PROGRAM HAS TRIED 3 TIMES TO READ OR WRITE THE INDICATED REGISTER.
EM11	FATAL MASSBUS PARITY ERROR A CONTROL BUS PARITY ERROR OCCURRED WHEN THE RH ATTEMPTED TO PROCESS A PREVIOUS, DIFFERENT PARITY ERROR.
EM12	PERSISTENT DEVICE UNSAFE THE DRIVE BECAME UNSAFE; DRIVE CLEAR TO THE DRIVE DID NOT CLEAR THE UNSAFE CONDITION. THE PROGRAM WILL AUTOMATICALLY DEASSIGN THE DRIVE. THE DRIVE CANNOT BE EXERCISED UNTIL THE UNSAFE CONDITION HAS BEEN CLEARED BY MANUAL INTERVENTION.
EM13	OPERATION NOT COMPLETED WITHIN TIME LIMIT THE DRIVE DID NOT COMPLETE THE OPERATION WITHIN 10. SECONDS AFTER THE OPERATION WAS INITIATED.
EM14	UNIT WENT OFFLINE

THE DRIVE WENT OFFLINE DURING THE INDICATED OPERATION. (THE 'MOL' BIT BECAME ZERO.) THE PROGRAM WILL AUTOMATICALLY DEASSIGN THE DRIVE. THE OPERATOR MUST REASSIGN THE DRIVE WITH THE 'T' COMMAND TO RE-INITIATE TESTING.

EM15 NO RESPONSE TO PORT REQUEST

THE PROGRAM IS TESTING A DUAL PORT DRIVE WHICH HAS NOT SWITCHED TO THE REQUESTING PORT WITHIN 15. SECONDS AFTER PORT REQUEST TO THE DRIVE FROM THE REPORTING PORT.

EM20 HEADER CRC ERROR

A HEADER CRC ERROR WAS DETECTED AT THE INDICATED DISK ADDRESS. THE CONTENTS OF THE HEADER ARE DISPLAYED. THE OPERATION WILL BE RETRIED 5 TIMES.

EM21 DATA CHECK ('DCK') ERROR

A DATA CHECK ERROR WAS DETECTED AT THE INDICATED SECTOR. THE FULL RETRY SEQUENCE (INCLUDING OFFSET) WILL BE INITIATED FOR THE SECTOR IN ERROR IF THE ECC HARD ERROR ('ECH) BIT IS SET.

EM22 WRITE CHECK ERROR - DATA CHECK ('DCK') SET

A WRITE CHECK ERROR OCCURRED AND THE DATA CHECK ('DCK') BIT WAS SET. IF 'ECH' IS NOT SET, THE OPERATION WILL BE RETRIED UP TO 5 TIMES; IF THE 'ECH' BIT IS SET, THE OPERATION WILL BE RETRIED UP TO 16. TIMES.

EM23 WRITE CHECK ERROR - DATA CHECK ('DCK') NOT SET

A WRITE CHECK ERROR OCCURRED AND 'DCK' WAS NOT SET. THE WORDS WHICH CAUSED THE ERROR ARE DISPLAYED IN THE ERROR MESSAGE. THE OPERATION WILL BE RETRIED 5 TIMES.

EM24 HEADER READ ERROR - 'FMT' BIT DROPPED

A WRITE DATA, WRITE CHECK DATA, OR A READ DATA WAS BEING PERFORMED AND A 'FMT' ERROR OCCURRED. THE PROGRAM RE-READ THE HEADER OF THE ERROR SECTOR AND THE 'HCRC' BIT WAS SET. THE CONTENTS OF THE HEADER ARE DISPLAYED. THE OPERATION WILL BE RETRIED 5 TIMES.

EM25 HEADER READ ERROR - HEADER COMPARE ('HCE') ERROR

SIMILAR TO EM24, EXCEPT THAT THE 'HCE' ERROR BIT WAS SET INITIALLY. THE OPERATION WILL BE RETRIED 5 TIMES.

EM26 FORMAT ERROR ('FER')

FORMAT ERROR OCCURRED. WHEN THE HEADER WAS RE-READ, THE 'HCRC' BIT WAS NOT SET. THE CONTENTS OF THE HEADER ARE DISPLAYED. THE OPERATION WILL BE RETRIED 5 TIMES.

EM27 HEADER COMPARE ('HCE') ERROR

SIMILAR TO EM26 EXCEPT THAT THE 'HCE' BIT WAS SET INITIALLY. THE OPERATION WILL BE RETRIED 5 TIMES.

EM50 MISCELLANEOUS DRIVE ERROR

THIS MESSAGE IS GIVEN FOR THE FOLLOWING ERROR BITS: 'ADE', 'RMR', 'ILF', OR 'ILR'

EM51 OPERATION INCOMPLETE ('OPI') ERROR

AN OPERATION INCOMPLETE ERROR OCCURRED AT THE INDICATED SECTOR.

EM52 DRIVE TIMING ('DTE') ERROR

DRIVE TIMING ERROR OCCURRED ON THE INDICATED SECTOR. THE OPERATION WILL BE RETRIED 5 TIMES.

EM53 PARITY ('PAR') ERROR AFTER OPERATION STARTED

THE 'PAR' BIT WAS SET WHEN THE OPERATION WAS COMPLETED. THE OPERATION WILL BE RETRIED 5 TIMES.

EM54 WRITE CLOCK FAILURE ('WCF')

A WRITE CLOCK FAILURE OCCURRED DURING THE OPERATION. THE OPERATION WILL BE RETRIED 5 TIMES.

EM55 INVALID ADDRESS ('IAE') ERROR

AN INVALID ADDRESS ERROR OCCURRED DURING THE OPERATION.

EM56 WRITE LOCK ('WLE') ERROR

A WRITE OPERATION WAS ATTEMPTED BUT THE DRIVE WAS WRITE LOCKED.

EM40 RH CONTROLLER OR UNIBUS TRANSFER ERROR

'TRE' IS SET IN THE RH CONTROL REGISTER AND NO DRIVE ERROR HAS OCCURRED. THE OPERATION WILL BE RETRIED 5 TIMES IF THE ERROR WAS CAUSED BY 'DLT', 'UPE', 'NXM', OR 'NDPE'.

EM41 BUS ADDRESS OR WORD COUNT INCORRECT

NO DRIVE ERROR OCCURRED BUT EITHER THE BUS ADDRESS INDICATES THAT AN INCORRECT NUMBER OF WORDS WERE TRANSFERED OR THE WORD COUNT REGISTER IS NOT ZERO.

EM42 DATA COMPARE ERRORS - NO DRIVE ERROR DETECTED

NO SUBSYSTEM ERROR WAS SIGNALED; HOWEVER, THE DATA DOES NOT COMPARE.

EM43 CAN'T MATCH DATA READ WITH A PATTERN

THE DATA IN THE BUFFER DOES NOT MATCH ANY OF THE STANDARD PATTERNS.

EM44 ERROR BIT(S) SET, BUT NO ERROR SIGNALED BY THE RH CONTROLLER

THE OPERATION COMPLETED NORMALLY; HOWEVER, THE PROGRAM FOUND EITHER ERROR BITS IN THE MP SET OR ERROR BITS IN THE RH CONTROLLER SET.

EM45 ECC LOGIC FAILURE

DURING 'DCK' ERROR PROCESSING, THE CONTENTS OF THE ECC POSITION REGISTER (RMEC1) OR THE CONTENTS OF ECC PATTERN REGISTER (RMEC2) WERE NOT VALID. THE POSITION REGISTER WAS EITHER 0 OR GREATER THAN 010040, OR THE PATTERN REGISTER CONTAINED ZEROS.

EM46 BUS ADDRESS OR WORD COUNT NOT CONSISTENT

THE PROGRAM WAS PROCESSING AN ERROR AND FOUND THAT THE NUMBER OF WORDS TRANSFERED AS INDICATED BY THE BUS ADDRESS REGISTER DOES NOT AGREE WITH THE TRANSFER COUNT FROM THE WORD COUNT REGISTER.

EM50 SEEK INCOMPLETE ERROR

THE DRIVE SIGNALED EITHER 'SKI' ERROR.

EM51 NOT USED

EM60 DEVICE UNSAFE

THE INDICATED DRIVE UNSAFE ERROR OCCURRED; THE ERROR WAS CLEARED BY A 'DRIVE CLEAR' INSTRUCTION.

7.2 DETAIL ERROR LINES

THE LINE NUMBERS GIVEN BELOW ARE FOR REFERENCE ONLY.

LINE 1

HH:MM:SS

'HH:MM:SS' IS THE TIME SINCE THE PROGRAM WAS STARTED.
(HOURS, MINUTES, SECONDS)

LINE 2

'PRSNT COMMAND= XXXX PREV COMMAND= YYYY'

MNEMONICS USED FOR THE COMMANDS ARE DEFINED BELOW:

L2


```
SEEK    - SEEK (OCTAL 5)
RECAL   - RECALIBRATE (OCTAL 7)
DRVCLR  - DRIVE CLEAR (OCTAL 11)
RELSE   - RELEASE (OCTAL 13)
OFFSET  - OFFSET (OCTAL 15)
RTC     - RETURN TO CENTERLINE (OCTAL 17)
READIN  - READIN PRESET (OCTAL 21)
PACK    - PACK ACKNOWLEDGE (OCTAL 23)
SEARCH  - SEARCH (OCTAL 31)
•GETREG - GET REGISTERS (OCTAL 41)
•SETFMT - SET FORMAT (ECI OR HCI) (OCTAL 43)
•SELDRV - SELECT DRIVE (OCTAL 45)
WCKD    - WRITE CHECK DATA (OCTAL 51)
WCKHD   - WRITE CHECK HEADER & DATA (OCTAL 53)
WRTDAT  - WRITE DATA (OCTAL 61)
FMTRK   - FORMAT TRACK (WRITE HEADER & DATA) (OCTAL 63)
RDDAT   - READ DATA (OCTAL 71)
RDHD    - READ HEADER & DATA (OCTAL 73)
```

• SPECIAL RP DRIVER COMMAND (NOT A CONTROLLER COMMAND)

(DISPLAY OF THE RH/RP REGISTERS IN TWO GROUPS;
RPCS1, RPCS2, RPDS, RPER1, RPER2, RPEC1 AND RPEC2 FORM THE FIRST
GROUP; ALL THE OTHER REGISTERS ARE IN THE SECOND GROUP.
IF SW<05> IS SET, ONLY THE REGISTERS IN THE FIRST GROUP WILL BE
DISPLAYED.)

THE ABOVE LINE WILL BE TYPED IF THE ERROR OCCURRED DURING
THE NON-DATA TRANSFER PART OF THE OPERATION.

'• ERROR AT BAD TRACK/SECTOR'

THE ABOVE LINE WILL BE PRINTED IF A DATA ERROR OCCURES AT AN ADDRESS
ON THE DISK WHICH THE OPERATOR HAS IDENTIFIED AS BEING BAD. PARAMETER
'NOTPRT' MUST BE 0 FOR THE ERROR TO BE REPORTED.

A WORD CALLED 'STATUS' IS DISPLAYED WITH THE RP REGISTERS. THE
CONTENTS OF THIS WORD IDENTIFY HOW THE ERROR WAS PROCESSED BY THE
RP DRIVE HANDLER ROUTINE. (SEE SECTION 9.7)

LINE 3

ERROR AT CXXX TYY SZZ PREV ADDR= CUUU TVV SWW

THE ACTUAL ADDRESS OF THE ERROR SECTOR AND THE PREVIOUS
DISK ADDRESS ARE GIVEN IN THIS LINE. CYLINDER, TRACK, &
SECTOR ADDRESSES ARE IN DECIMAL.

LINE 4

PRSNT ADDR= CXXX TYY SZZ PREV ADDR= CUUU TVV SWW

THIS LINE IDENTIFIES THE ADDRESS WHEN THE ERROR WAS DETECTED;
THE PREVIOUS ADDRESS IS ALSO GIVEN. CYLINDER, TRACK, & SECTOR

M2

ADDRESSES ARE GIVEN IN DECIMAL.

LINE 5

START CYL= XXX END CYL= YYY

THIS LINE IDENTIFIES THE STARTING CYLINDER OR A SEEK (IMPLIED)
AND THE DESTINATION CYLINDER. CYLINDER ADDRESSES ARE IN
DECIMAL.

LINE 6

START CYL= XXX END CYL= YYY   ACTUAL CYL= ZZZ

THIS LINE IDENTIFIES THE STARTING CYLINDER OF AN IMPLIED SEEK,
THE DESTINATION CYLINDER, AND THE CYLINDER THE DISK ACTUALLY
STOPPED AT. CYLINDER ADDRESSES ARE IN DECIMAL.

LINE 7

RPBA= XXXX RPWC= YYYY

THIS LINE GIVES THE CONTENTS OF THE RH CONTROLLER BUFFER ADDRESS
REGISTER AND THE RH CONTROLLER WORD COUNT REGISTER. THIS LINE IS
NOT PRINTED IF SW<05> IS NOT SET.

LINE 8

START CYL= XXX START TRK= YY START SECTOR= ZZ

THIS LINE IDENTIFIES THE STARTING DISK ADDRESS OF THE PRESENT
OPERATION. CYLINDER, TRACK, AND SECTOR VALUES ARE DECIMAL.

LINE 9

RPDA= XXXX RPCA= YYYY

THIS LINE GIVES THE CONTENTS OF THE RP TRACK AND SECTOR
ADDRESS REGISTER AND THE CONTENTS OF THE DESIRED CYLINDER
ADDRESS REGISTER. THIS LINE IS NOT PRINTED IF SW<05> IS NOT
SET.

LINE 10

BUFFER ADDR= XXXX WRD CNT= YYYY ACTUAL NUMBR WRDS XFRD= ZZZZ

THIS LINE GIVES THE STARTING ADDRESS OF THE BUFFER USED FOR THE
CURRENT DATA TRANSFER OPERATION, ITS SIZE(WORD COUNT), AND THE
ACTUAL NUMBER OF WORD TRANSFERED. THE STARTING ADDRESS OF THE
BUFFER IS IN OCTAL, THE WORD COUNT AND WORDS TRANSFERED VALUE
ARE IN DECIMAL.

N2.

LINE 11

EXPCTD DATA= XXXX RECEVD DATA= YYYY WORD POS= ZZZ

THIS LINE GIVES THE EXPECTED DATA, THE RECIEVED DATA FROM THE DISK, AND THE LOCATION OF THE WORD IN THE SECTOR. THE WORD POSITION IS IN DECIMAL.

LINE 12

HEADER CONTENTS OF ERROR SECTOR= XXXX XXXX XXXX XXXX

THIS LINE GIVES THE CONTENTS OF THE HEADER OF THE SECTOR WHICH GAVE THE ERROR.

LINE 13

RPEC1= XXXX RPEC2= YYYY

THIS LINE WILL BE PRINTED AFTER A SUCESSFUL RETRY OF A SECTOR WHICH BECAME ECC CORRECTABLE DURING RETRY.

LINE 14

ECC CORRECTABLE WITHOUT OFFSET

THE SECTOR IN ERROR IS ECC CORRECTABLE; NO RETRY ATTEMPTS ARE NECESSARY.

LINE 15

READ CORRECTLY AT (NEG OR POS) OFFSET

THE SECTOR IN ERROR WAS READ WITHOUT ERROR AT THE INDICATED OFFSET VALUE.

LINE 16

ECC CORRECTABLE AT (NEG OR POS) OFFSET

THE SECTOR IN ERROR BECAME ECC CORRECTABLE AT THE INDICATED OFFSET.

LINE 17

CORRECTED ON X RETRY

THE OPERATION WAS PERFORMED ERROR FREE ON THE INDICATED RETRY ATTEMPT.

LINE 18

UNCORRECTABLE AFTER X RETRIES

THE OPERATION COULD NOT BE PERFORMED CORRECTLY AFTER THE
INDICATED NUMBER OF RETRY ATTEMPTS.

LINE 19

DIFFERENT ERROR DURING RETRY

WHILE THE PROGRAM WAS RETRYING THE ERROR, A DIFFERENT OCCURRED.
IF THIS LINE IS PRINTED, THE RH/RP REGISTERS WILL ALSO BE
PRINTED (SEE LINE 2).

LINE 20

DATA COMPARISON ERRORS

A PRINTOUT OF THE DATA COMPARISON ERRORS FOLLOW THIS LINE.

LINE 21

TOTAL COMPARE ERRORS= XXXX

THIS LINE GIVES THE TOTAL DATA COMPARISON ERROR COUNT. THE
VALUE GIVEN IS IN DECIMAL.

LINE 22

THE DATA COMPARED OK

THIS LINE INDICATES THE RESULTS OF THE DATA COMPARISON FOLLOWING
ECC CORRECTION.

LINE 23

ECC CORRECTION RESULTS

THE PROGRAM PERFORMED ECC CORRECTION AND THE RESULTS ARE REPORTED.
THE ADDRESS IN MEMORY OF THE WORD(S) IN ERROR ARE GIVEN, THE WORD(S)
BEFORE CORRECTION AND THE WORD(S) AFTER CORRECTION ARE PRINTED.

LINE 24

ERROR BURST BEGINS AT WORD XXX IN DATA FIELD OF ERROR SECTOR

THIS IS AN INFORMATIONAL LINE WHICH WILL BE PRINTED FOR 'DCK' ERRORS
WHICH ARE ECC CORRECTABLE OR WHICH BECOME ECC CORRECTABLE DURING

RETRY. 'XXX' IS THE WORD OFFSET VALUE FROM 'RMFC1' AND IS IN DECIMAL.

LINE 25

ERROR WAS NOT IN THE DATA READ -
ECC CORRECTION CAN'T BE PERFORMED

THE DATA ERROR WAS NOT IN DATA TRANSFERED TO MEMORY.

LINE 26

CONTENTS OF THE ERROR SECTOR (REPORTED ABOVE)

IF SW<03> IS SET, THE SECTOR WHICH GAVE THE 'DCK', 'DTE' OR, 'WCF' ERROR OR 'HARD' DATA CHECK ERROR IS PRINTED. THE CONTENTS OF THE SECTOR FOLLOW THIS LINE.

LINE 27

TOTALS; ERRORS:X WRDS WRITN: YYYY WRDS READ: ZZZZ

THIS IS THE LAST LINE PRINTED FOR ALL NON-POSITIONING TYPE ERRORS.

'ERRORS IS THE TOTAL ERROR COUNT FOR THE DRIVE AND INCLUDES EVERY ERROR DETECTED, REGARDLESS OF TYPE.

'WRDS WRITN' IS THE TOTAL NUMBER OF WORDS WRITTEN THE DRIVE.

'WRDS READ' IS THE TOTAL NUMBER OF WORD READ BY THE DRIVE.

LINE 28

TOTALS; SEEKS: XXX TOTAL POS ERR= YYY TOTAL SKI ERR= Z

THIS IS THE LAST LINE PRINTED FOR ALL POSITIONING TYPE ERRORS.

'TOTAL SEEKS' IS THE TOTAL NUMBER OF SEEK OPERATIONS PERFORMED BY THE DRIVE.

'TOTAL POS ERR' IS THE TOTAL NUMBER OF PROGRAM DETECTED POSITIONING ERROR BY THE DRIVE.

'TOTAL SKI ERR' IS THE TOTAL NUMBER OF 'SKI' ERRORS SIGNALED BY THE DRIVE.

8. PROGRAM DESCRIPTION

8.1 PROGRAM OPERATION

WHEN THE PROGRAM IS STARTED, PROVIDING APT TTY ENABLE BIT IS SET OR DIAGNOSTIC LOADED BY OTHER THAN APT SCRIPT MODE, ALL TABLES AND PARAMETERS ARE CLEARED OR INITIALIZED. THE PARAMETERS WHICH ARE UNDER OPERATOR TTY ENTRY CONTROL ARE CHECKED FOR VALIDITY AND CONSISTENCY. RM CONTROLLER INTERRUPT ENABLE ('IE') IS SET, TTY KEYBOARD INTERRUPT ENABLE IS SET, AND THE KW11-L OR KW11-P CLOCK IS STARTED. COMMAND ENTRIES WILL NOW BE ACCEPTED BY THE PROGRAM.

THE PROGRAM SCANS ITS INTERNAL ASSIGNMENT TABLES, LOOKING FOR:

1) DRIVES TO ASSIGN/DEASSIGN
2) PERFORMANCE REPORT TYPEOUT REQUESTS
3) DRIVES REQUIRING COMMAND INITIATION, BUFFER ASSIGNEMENT, OR PARAMETER SELECTION.
4) DRIVES COMPLETING CURRENT OPERATIONS.

THE PROGRAM CONTINUES SCANNING ITS TABLES UNTIL AN ENTRY IS FOUND. IN THE CASE OF THE PROGRAM AT INITIAL START, THE FIRST ENTRY WILL BE MADE BY THE OPERATOR WHEN A DRIVE IS ASSIGNED ('T' COMMAND).

WHEN A DRIVE IS ASSIGNED, THE KEYBOARD ENTRY ROUTINE VERIFIES THAT THE DRIVE IS PRESENT, IS AN RP07, AND IS ONLINE. THE ASSIGNMENT ROUTINE THEN ISSUES A 'READIN PRESET' INSTRUCTION, SETS 'FMT16', AND ISSUES A 'RECALIBRATE' INSTRUCTION.

PARAMETERS FOR THE OPERATION ARE SELECTED AND A BUFFER IS ASSIGNED. IF THE OPERATION IS A WRITE OR WRITE CHECK COMMAND, THE ASSIGNED BUFFER WILL BE FILLED WITH THE SELECTED PATTERN. (WRITE CHECK COMMANDS ARE ISSUED AFTER EACH WRITE COMMAND. THE WRITE CHECK COMMAND USES THE PARAMETERS SELECTED FOR THE PRECEDING WRITE COMMAND.) CONTROL IS THEN PASSED TO THE COMMAND INITIATION ROUTINE.

THE COMMAND INITIATION ROUTINE FIRST LOOKS AT THE CYLINDER ADDRESS OF THE REQUESTED OPERATION. IF THE DRIVE MUST SEEK TO ANOTHER CYLINDER TO PERFORM THE OPERATION, THE PROGRAM ISSUES A SEARCH INSTRUCTION TO THE DRIVE WITH A 'TARGET' SECTOR WHICH IS 1 SECTOR EARLIER THAN THE 'TRANSFER' SECTOR. (THIS ALLOWS THE PROGRAM TO INITIATE OPERATIONS ON ANOTHER DRIVE WHILE THE PRESENT DRIVE, OR OTHER DRIVES, ARE SEARCHING FOR 'TARGET' SECTORS. ALL SEEKS ISSUED BY THE PROGRAM ARE IMPLIED SEEK SEARCH OPERATIONS.) WHEN A SEARCHING DRIVE FINDS THE 'TARGET' SECTOR AND INTERRUPTS, THE PROGRAM THEN ISSUES THE REQUESTED COMMAND TO THE DRIVE THAT INTERRUPTED.

WHEN THE DATA TRANSFER OPERATION IS COMPLETE, THE DRIVE REGISTERS ARE STORED AND A DATA TRANSFER IS INITIATED FOR A WAITING DRIVE.

IF THE OPERATION HAS BEEN COMPLETED NORMALLY, THE SAVED DRIVE REGISTERS ARE CHECKED TO VERIFY THAT NO ERROR BITS ARE SET; THE RM CONTROLLER BUS ADDRESS AND WORD COUNT ADDRESS REGISTERS ARE CHECKED TO VERIFY THAT THE CORRECT NUMBER OF WORDS HAVE BEEN TRANSFERED AND THAT THE TWO REGISTERS ARE CONSISTENT WITH EACH OTHER; AND IF THE COMMAND WAS A READ COMMAND, THE DATA BUFFER IS COMPARED. WHEN THIS SEQUENCE IS COMPLETED, THE DRIVE IS RETURNED TO THE ASSIGNED, INACTIVE LIST. THE PROGRAM THEN INITIATES A DATA TRANSFER ON A WAITING DRIVE AND RESELECTS AND REINITIATES ANOTHER OPERATION ON THE RELEASED DRIVE.

ERRORS WHICH OCCUR ARE PROCESSED IN THE FOLLOWING ORDER. MULTIPLE

ERRORS WILL BE REPORTED AS THE FIRST ERROR TYPE CHECKED.

A. ERRORS REPORTED FOR OPERATIONS WHICH HAVE NOT COMPLETED NORMALLY.

OPERATION NOT COMPLETED WITHIN TIME LIMIT - EM13
UNIT WENT OFFLINE - EM14

B. ERRORS REPORTED FOR OPERATIONS WHICH COMPLETE NORMALLY.

CORRECTABLE UNSAFE - EM60
DRIVE TIMING ERROR - EM32
DATA CHECK ERROR - EM21
WRITE CHECK WITH DCK SET - EM22
HEADER CRC ERRORS - EM20
FORMAT ERRORS - EM24, EM26
HEADER COMPARE ERRORS - EM25, EM27
PROGRAM DETECTED POSITIONING ERROR - EM51
SEEK INCOMPLETE ERROR - EM50
WRITE CHECK WITHOUT 'DCK' SET - EM23
RM CONTROLLER OR UNIBUS TRANSFER ERROR - EM40
'OPI' ERROR - EM31
'PAR' ERROR - EM33
'WCF' ERROR - EM34
'IAE' ERROR - EM35
'WLE' ERROR - EM36
MISCELLANEOUS DRIVE ERROR - EM30

C. ERRORS NOT FLAGGED BY THE HARDWARE ERROR DETECTION LOGIC.

BUS ADDRESS OR WORD COUNT INCORRECT - EM41
DATA COMPARE ERRORS - NO DRIVE ERROR DETECTED - EM42
CAN'T MATCH DATA READ WITH A PATTERN - EM43
ERROR BIT(S) SET, BUT NO ERROR SIGNALED BY THE RM CONTROLLER - EM44
ECC LOGIC FAILURE - EM45
BUS ADDRESS OR WORD COUNT NOT CONSISTENT - EM46

8.2 DUAL PORT OPERATION

DUAL PORT OPERATION IS NEARLY IDENTICAL TO THE OPERATION DESCRIBED IN SECTION 8.1. THE DIFFERENCES ARE IN COMMAND SEQUENCE INITIATION AND COMMAND TERMINATION.

WHEN THE DUAL PORT HANDLER ROUTINE IN THE EXERCISER PROGRAM RECEIVES A REQUEST FOR A DRIVE, THE PROGRAM VERIFIES THAT THE DRIVE IS ONLINE. THE DRIVE IS SELECTED AND THE RPCS1 REGISTER IS READ TO TEST THE "DVA" BIT. IF THE DRIVE IS IN NEUTRAL, THIS WILL SEIZE THE DRIVE. IF THE DRIVE IS SEIZED BY THE OTHER PORT, A DRIVE CLEAR COMMAND IS ISSUED TO THE DRIVE TO SET 'PORT REQUEST'. THE PROGRAM THEN CHECKS 'DVA' IN 'RPCS1'. IF THE DRIVE IS AVAILABLE AS INDICATED BY THE 'DVA' BIT, THE COMMAND SEQUENCE WILL BE INITIATED IN THE NORMAL MANNER (SEE SECTION 8.1 ABOVE). IF 'DVA' WAS NOT SET, THE PROGRAM MAKES AN ENTRY FOR THE DRIVE IN AN INTERNAL 'PORT REQUEST PENDING' TABLE AND STARTS A 15. SECOND TIMER FOR THE DRIVE. IF THE DRIVE HAS NOT SWITCHED TO THE REQUESTING SYSTEM WITHIN THE 15. SECOND INTERVAL, THE PROGRAM REPORTS A 'NO RESPONSE TO PORT REQUEST' ERROR. NORMALLY THIS ERROR MESSAGE INDICATES A FAILURE IN THE DUAL PORT CONTROL LOGIC IN THE DRIVE BEING TESTED; HOWEVER, UNDER CERTAIN CONDITIONS

(E.G. MASSBUS PARITY ERRORS BEING REPORTED ON THE OTHER SYSTEM ON A TTY), THE OTHER PROCESSOR WAS UNABLE TO PROCESS THE DRIVE AFTER IT HAD REQUESTED THE DRIVE. THE OPERATOR MUST BE AWARE OF WHAT THE OTHER SYSTEM IS DOING AT ALL TIMES TO INTERPRET THE PORT RELATED ERROR MESSAGES PROPERLY.

AFTER A DRIVE HAS COMPLETED AN OPERATION, THE PROGRAM WILL STORE THE REGISTERS AND ISSUE A 'RELEASE' TO THE DRIVE; IF THE OPERATION TERMINATED WITH AN ERROR, THE DRIVE WILL NOT BE RELEASED UNTIL ERROR PROCESSING HAS BEEN COMPLETED.

SINGLE PORT DRIVES, DRIVES WHICH ARE IN NEUTRAL BUT NOT BEING EXERCISED BY THE OPPOSITE PORT ARE STILL TREATED AS DUAL PORT DRIVES IN THAT A RELEASE COMMAND IS ISSUED AT THE END OF NORMAL COMMAND PROCESSING OR AT THE END OF ERROR PROCESSING. A RELEASE COMMAND ISSUED UNDER THESE CONDITIONS HAS NO FUNCTIONAL EFFECT ON THE OPERATION OF THE DRIVE.

8.3 SELECTION OF OPERATION VARIABLES

A. SECTOR ADDRESS SELECTION IS RANDOM BETWEEN THE VALUES IN 'MINSEC' AND 'MAXSEC'. TRACK ADDRESS SELECTION IS RANDOM BETWEEN THE VALUES IN 'MINTRK' AND 'MAXTRK'. CYLINDER ADDRESS SELECTION IS RANDOM BETWEEN 'MINCYL' AND 'MAXCYL'. IF A MINIMUM ADDRESS IS GREATER THAN THE CORRESPONDING MAXIMUM ADDRESS, THE PROGRAM WILL SWAP 'MAX' AND 'MIN' ADDRESSES AND CONTINUE.

B. THE WORD COUNT IS RANDOMLY SELECTED BETWEEN 6 AND THE VALUE 'WRDCNT' (MAX WRD CNT). THIS IS NECESSARY AS THE PROGRAM REQUIRES 4 LOCATIONS IN THE DATA PORTION OF THE SECTOR TO BE ABLE TO MATCH THE DATA TO A PATTERN FOR DATA COMPARISON PURPOSES AND NEEDS 2 MORE LOCATIONS IF A READ HEADER & DATA COMMAND IS ISSUED.

C. THE DATA WRITTEN IS RANDOMLY SELECTED AMONG THE 15. STANDARD PATTERNS. THE PARAMETER 'PATTERN' ENABLES THE RANDOM PATTERN SELECTION, IF THIS PARAMETER IS 0.

D. THE COMMANDS ARE SELECTED RANDOMLY. WRITE CHECK DATA COMMAND IS PERFORMED ONLY IF THE PREVIOUS COMMAND WAS THE APPROPRIATE WRITE DATA COMMAND.

8.4 DATA PATTERNS

THE PROGRAM SELECTS ONE OF THE FOLLOWING DATA PATTERNS TO WRITE WHEN A WRITE COMMAND IS SELECTED. THE ENTIRE BUFFER IS FILLED WITH THE SELECTED PATTERN. WHEN DATA IS READ FROM THE DISK, THE PROGRAM COMPARES DATA ON A SECTOR BASIS. IF THE PARAMETER 'PATTERN' IS 0 THE PROGRAM WILL ATTEMPT TO MATCH THE FIRST 4 DATA WORDS OF EACH SECTOR, TO ONE OF THE FOLLOWING PATTERNS. HOWEVER, IF THE PARAMETER 'PATTERN' IS NOT 0, THE PROGRAM WILL ASSUME THAT THE DESIRED DATA PATTERN IN LOCATION 'PATTERN' IS THE DATA TO LOOK FOR AND WILL NOT TRY TO MATCH ANY PATTERNS. THIS ALLOWS THE OPERATOR TO SCAN THE DISK FOR ANY SPECIFIC PATTERN.

PAT 1 PAT 2 PAT 3 PAT 4 PAT 5 PAT 6 PAT 7 •PAT 8

000001	177776	000000	133331	052525	147556	155555	030221
000003	177774	000000	133331	052525	147556	133333	030221
000007	177770	000000	133331	052525	147556	155555	030221
000017	177760	177777	133331	125252	147556	133333	030221
000037	177740	177777	133331	125252	147556	155555	030221
000077	177700	177777	133331	125252	147556	133333	030221
000177	177600	000000	133331	052525	147556	155555	030221
000377	177400	000000	133331	052525	147556	133333	030221
000777	177000	177777	133331	125252	147556	155555	030221
001777	176000	177777	133331	125252	147556	133333	030221
003777	174000	000000	133331	052525	147556	155555	030221
007777	170000	177777	133331	125252	147556	133333	030221
017777	160000	000000	133331	052525	147556	155555	030221
037777	140000	177777	133331	125252	147556	133333	030221
077777	100000	000000	133331	052525	147556	155555	030221
177777	000000	177777	133331	125252	147556	133333	030221

PAT 9	PAT 10	PAT 11	PAT 12	PAT 13	PAT 14	PAT 15
000001	177776	172646	077777	155555	000000	177777
000002	177775	155555	137777	066667	177777	000000
000004	177773	172646	157777	155555	177777	000000
000010	177767	155555	167777	066667	177777	000000
000020	177757	172646	173777	155555	177777	000000
000040	177737	155555	175777	066667	177777	000000
000100	177677	172646	176777	155555	177777	000000
000200	177577	155555	177377	066667	177777	000000
000400	177377	172646	177577	155555	177777	000000
001000	176777	155555	177677	066667	177777	000000
002000	175777	172646	177737	155555	177777	000000
004000	173777	155555	177757	066667	177777	000000
010000	167777	172646	177767	155555	177777	000000
020000	157777	155555	177773	066667	177777	000000
040000	137777	172646	177775	155555	177777	000000
100000	077777	155555	177776	066667	177777	000000

* WORST CASE PATTERN

9.1 RM/RP DRIVER

THIS DOCUMENT IS THE USER'S GUIDE FOR THE RM/RP DRIVER.

9.2 TO INITIALIZE THE DRIVER:

```
        JSR     PC,RPINIT
        RETURN
```

UPON RETURN YOU MUST EXAMINE THE "DRVSTA" TABLE TO DETERMINE THE DRIVES THAT ARE ONLINE FOR TESTING. THE 'DRVSTA' TABLE IS EIGHT BYTES; ONE BYTE PER DRIVE. THE STATE OF EACH DRIVE WILL BE INDICATED AS FOLLOWS:

DRVSTA	DRIVE STATE

```
                        >0              ONLINE
                        =0              OFFLINE, DRIVE
                                        IS NOT AN RP07, OR
                                        NONEXISTENT DRIVE
                        <0              UNSAFE
```

THE DRIVE TYPE IS DEFINED IN AN 8 BYTE LONG TABLE TAGGED 'DRVTYP'. THE TABLE CONTAINS ONE BYTE FOR EACH DRIVE AND IS INDEXED BY THE DRIVE NUMBER. ENTRIES ARE ENCODED AS FOLLOWS:

DRVTYP	CONDITION
0	NONEXISTENT DRIVE
4	RP07
5	RP07
-1	NOT AN RP07

THE 'RMINIT' ROUTINE WILL DO A READIN PRESET AND WILL SET FMT16.

9.3 AFTER THE DRIVER HAS BEEN INITIALIZED, IT IS CALLED USING THE FOLLOWING SEQUENCE.

CALL:

```
        JSR     R0,RP07         ;MAKE THE CALL
        PNTDPB                  ;ADDRESS OF DPB.
        RETURN1                 ;RETURN IF QUEUE IS FULL
        RETURN2                 ;RETURN IF REQUEST IS IN
                                ;QUEUE OR THERE IS AN
                                ;ERROR CONDITION
```

.DPB (DATA PARAMETER BLOCK)

```
PNTDPB: .BYTE   0               ;(0) DRIVE NUMBER
        .BYTE   0               ;(1) OFFSET VALUE OR FMT16, ECT, AND MCI
        .BYTE   0               ;(2) COMMAND
        .BYTE   0               ;(3) PSEL AND A17 AND A16
        .WORD   0               ;(4) WORD COUNT (MUST BE NEG.)
        .WORD   0               ;(6) BUFFER ADDRESS OR
                                ;REGISTER TABLE POINTER
        .BYTE   0               ;(10) SECTOR ADDRESS OR
                                ;FIRST REG. INDEX
        .BYTE   0               ;(11) TRACK ADDRESS OR
                                ;LAST REG. INDEX
        .WORD   0               ;(12) CYLINDER ADDRESS
        .WORD   0               ;(14) ERROR TABLE POINTER
                                ;POINTS TO THE FIRST OF TWENTY
                                ;LOCATIONS OF WHERE THE DRIVER
                                ;IS TO STORE THE RH/RP
                                ;REGISTERS ON AN ERROR. IF LEFT
                                ;ZERO REGISTERS ARE NOT SAVED.
        .WORD   0               ;(16) STATUS/ERROR INDICATOR
                                ;BIT15=1=ERROR OCCURRED
                                ;BIT07=1=DONE
                                ;BIT14-BIT09 AND BIT06-BIT03
                                ;INDICATE TYPE OF ERROR
```

9.4 THE DRIVER PROVIDES A SOFTWARE TIMEOUT CAPABILITY.
TO UTILIZE THIS CAPABILITY YOU MUST SUPPLY THE "UP TIMER" ROUTINE
WITH THE ELAPSED TIME IN THE FOLLOWING MANNER:

```
        MOV     #16.,-(SP)      ;16. MILLISECONDS BETWEEN
                                ;CLOCK TICKS
        JSR     PC,@#DPTMR      ;CALL THE TIMER ROUTINE
```

IT SHOULD BE NOTED THAT YOU MUST PROVIDE THE CODE TO DRIVE THE
CLOCK AND THE ELAPSED TIME MUST BE IN MILLISECONDS.

9.4.1 EXAMPLE - WRITE 1000. WORDS

```
10:     JSR     R0,@#DP07       ;CALL THE DRIVER
        #WRTDPB                 ;DPB ADDRESS
        BR      10              ;WAIT FOR QUEUE IF FULL
20:     TST     WRTDPB+16       ;WAIT FOR COMMAND TO COMPLETE
        BEQ     20
        BMI     ERROR1          ;ERROR OCCURRED
        .
        .
        .
WRTDPB: .BYTE   5               ;DRIVE #5
        .BYTE   0               ;
        .BYTE   161             ;WRITE COMMAND
        .BYTE   0               ;
        .WORD   -1000.          ;WORD COUNT
        .WORD   WRTBUF          ;BUFFER ADDRESS
        .BYTE   3               ;SECTOR
        .BYTE   5               ;TRACK
        .WORD   400             ;CYLINDER
        .WORD   ERRTBS          ;ERROR TABLE
        .WORD   0               ;STATUS/ERROR INDICATOR
```

ALTERNATE DPB SETUP

```
WRTDPB: .WORD   5               ;THIS SETUP ACHIEVED
        .WORD   WRITE           ;EVERYTHING THE
        .WORD   -1000.          ;ABOVE TABLE DID, BUT
        .WORD   WRTBUF          ;IN A CLEANER FORMAT
        .BYTE   3,5
        .WORD   400,ERRTBS,0
```

9.5 RH/RP REGISTERS

MNEMONIC	INDEX
RPCS1	0
RPWC	2
RPBA	4
RPDA	6
RPCS2	10
RPDS	12
RPER1	14
RPAS	16

[redacted]

- RH70 CONTROLLER REGISTERS

9.6 COMMANDS PERFORMED BY THE DRIVER

COMMAND	CODE	COMMAND TYPE
SEEK	[redacted]	P
RECALIBRATE		P
DRIVE CLEAR		S
RELEASE		S
OFFSET		P
RETURN TO CENTER		P
READIN PRESET		S
PACK ACKNOWLEDGE		S
SEARCH		P
GET REGISTER(S)		S
SET FORMAT		S
SELECT DRIVE		S
WRITE CHECK DATA		D
WRITE CHK HEADER & DATA		D
WRITE DATA		D
WRITE HEADER & DATA		D
READ DATA		D
READ HEADER & DATA		D

N : HOUSEKEEPING
P : POSITIONING
D : DATA TRANSFER
S : SPECIAL PROVIDED BY THE DRIVER

9.7 DPB STATUS/ERROR INDICATOR WORD

THIS INDICATOR WILL INFORM THE USER OF THE RESULTS OF THE REQUEST. THIS IS ACCOMPLISHED BY SETTING VARIES BITS OF THE INDICATOR TO A ONE.

BIT NO.	MEANING IF ON A "1"
15	ERROR OCCURRED

DONE (BIT07-0); BITS 10-0 SPECIFIES TYPE
DONE (BIT07-1); BITS 6-0 SPECIFIES TYPE

10(1)	USER MADE A REQUEST FOR A FUNCTION TO BE PERFORMED ON AN OFFLINE OR UNSAFE DRIVE
15(1)	USER MADE A REQUEST FOR A FUNCTION TO BE PERFORMED ON A DRIVE THAT HAS AN UNLOAD REQUEST IN EFFECT.
12(2)	PERSISTENT UNSAFE CONDITION EXIST.
11(2)	UNCORRECTABLE PARITY ERROR OCCURRED
10(2)(4)	FATAL PARITY ERROR. A MASSBUS CLEAR WAS PERFORMED, ALL QUEUES WERE EMPTIED, AND ALL DRIVES SET TO THE IDLE STATE
9(3)(4)	SOFTWARE TIMEOUT OCCURRED ON THIS DRIVE
8(4)	SOFTWARE TIMEOUT OCCURRED ON ANOTHER DRIVE
7	DONE
6(2)	ERROR OCCURRED DURING AN I/O OPERATION
5(2)	ERROR OCCURRED DURING AN OPERATION OTHER THAN I/O.
4(2)	CORRECTABLE UNSAFE CONDITION OCCURRED
3(2)	DRIVE ERROR OCCURRED THAT CAUSED AN AUTOMATIC "RECALIBRATE" SEQUENCE
2	PORT REQUEST TIMEOUT. THE DRIVER REQUESTED THE DRIVE BUT THE OPPOSITE PORT DID NOT RELEASE THE DRIVE WITHIN 15. SECONDS.
1	NON-EXISTENT DRIVE REQUESTED. USER MADE A REQUEST FOR A NON-EXISTENT DRIVE.

NOTES FOR ABOVE

(1) •	REQUEST WASN'T PUT IN QUEUE. (RH/RP REGISTERS WERE NOT SAVED)
(2) •	REQUEST QUEUE HAS BEEN EMPTIED. THE DRIVER ISSUED A "DRIVE CLEAR" TO THE DRIVE. NOTE: ALL RH/RP REGISTERS ARE SAVED AS PER DP8.14 BEFORE THE "DRIVE CLEAR".
(3) •	REQUEST QUEUE HAS BEEN EMPTIED. THE DRIVER ISSUED A MASSBUS INIT. ALL RH/RP REGISTERS FOR THE DRIVE WERE SAVED AS PER DP8.14 BEFORE THE INIT.

(4) • A "RECALIBRATE" SHOULD BE ISSUED BEFORE ANY OTHER COMMAND.

9.0 ERROR CALLS MADE BY THE DRIVER.

THERE ARE A FEW ERRORS THAT CAN OCCUR THAT CAN NOT BE INDICATED IN A DPB.

WHEN THIS TYPE OF ERROR IS DETECTED BY THE DRIVER IT WILL MAKE AN ERROR CALL OF THE FORM "ERROR N", WHERE "N" IS THE ERROR NUMBER AND THE ERROR WILL BE AN EMT INSTRUCTION.

N	TYPE	DATA AVAILABLE
1	RH/MP INTERRUPT OCCURRED (RHAS=0)	@R0• RPCS1'S ADDRESS
2	UNEXPECTED ATTENTION OCCURRED	R1• DRIVE NUMBER R3• ATA BIT @R0• RPCS1'S ADDRESS R5• (RMAS) RPERRS -RPOS RPERRS+2-RPER1 RPERRS+4-RPER2 RPERRS+6-RPMR2
3	MASSBUS PARITY ERROR (MCPE=1)	RD.ADR• ADDRESS OF REG. READ RD.WRD• WORD READ
4	MASSBUS PARITY ERROR (PAR=1)	WRT.AD• ADDRESS OF REG. WRITTEN WRT.WD• WORD WRITTEN RD.WRD• WORD READ BACK
5	ADDRESS PLUG CHANGE BIT SET ('DPE' ERROR)	R1• DRIVE NUMBER R3• ATA BIT @R4• RPCS1'S ADDRESS R5• (RMAS) RPERRS -RPOS RPERRS+2-RPER1 RPERRS+4-RPER2 RPERRS+6-RPMR2

• THIS IS THE ACTUAL UNIBUS ADDRESS (176700)

```
.REM @

        VERSION (C2RJ0-A-0)

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


        VERSION (C2RJ0-B-0)

            1.  WHEN A BAD SECTOR ERROR (BSE) AND A DATA CHECK (DCK) ARE BOTH
                SET DURING A READ HEADER AND DATA COMMAND, THE PROGRAM REPORTS
                THE DCK ERROR, WHILE IGNORING THE BSE. THE PROGRAM HAS BEEN
                MODIFIED TO LOOK AT THE BSE BIT AFTER THE DCK BIT IS DETECTED,
                SO THE ERROR CAN BE TREATED AS A BAD SECTOR.

@
```

```
                        ;*LAST REVISION 25-MAY-83
                        ;
                        .TITLE  CZRJOBO RP07 PERF EXER
                        ;*COPYRIGHT (C) 1983
                        ;*DIGITAL EQUIPMENT CORPORATION
                        ;*COLORADO SPGS., CO. 80963
                        ;*
                        ;*PROGRAM BY MIKE LEAVITT
                        ;*
                        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        ;*PACKAGE (MAINDEC-11-DZQAC-C5), 18-MAR-81
                        ;*
                        .SBTTL  OPERATIONAL SWITCH SETTINGS
                        ;*
                        ;*      SWITCH                  USE
                        ;*      ------          --------------------
                        ;*        15            HALT ON ERROR
                        ;*        13            INHIBIT ERROR TYPEOUTS
                        ;*        10            BELL ON ERROR
                        ;*         8            INHIBIT END OF PASS MESSAGES
                        ;*         7            DISPLAY ALL DATA COMPARE ERRORS
                        ;*         6            DON'T CHANGE PARAMETERS (LOOP ON PRESENT VALUES)
                        ;*         5            A. PARTIAL REGISTER DISPLAY IF ERROR
                        ;*                      B. NO ECC CORRECTION RESULTS DISPLAYED IF ERROR
                        ;*         4            A. DO NOT CHECK FOR MAXIMUM ERROR COUNTS
                        ;*                      B. DO NOT DROP DRIVE AT END OF TEST
                        ;*         3            A. DISPLAY ERROR SECTOR IF 'DCK', 'DTE', OR 'WCF' ERROR
                        ;*                      B. DISPLAY SECTOR IF 'DCK' ERR UNCORRECTABLE AFTER
                        ;*                         28TH RETRY
                        ;*                      C. IF DATA COMPARE ERROR & SW07 SET, DISPLAY
                        ;*                         REMAINDER OF BUFFER
                        ;*         2            A. DO NOT TYPE DRIVE STATUS AT PROGRAM START
                        ;*                      B. DO NOT TYPE PERFORMANCE REPORT AFTER SPECIFIED TIME
                        ;*         1            INHIBIT DATA COMPARE AFTER READ W/O 'DCK' ERROR
                        ;*         0            READ ONLY MODE
                        ;
                        .SBTTL  BASIC DEFINITIONS

                        ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100                  STACK   = 1100
104000                  ERROR   = EMT           ;;BASIC DEFINITION OF ERROR CALL
000004                  SCOPE   = IOT           ;;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
177776                  PSW=PS
177774                  STKLMT  = 177774        ;;STACK LIMIT REGISTER
177772                  PIRQ    = 177772        ;;PROGRAM INTERRUPT REQUEST REGISTER
177570                  DSWR    = 177570        ;;HARDWARE SWITCH REGISTER
177570                  DDISP   = 177570        ;;HARDWARE DISPLAY REGISTER

                        ;*GENERAL PURPOSE REGISTER DEFINITIONS
000000                  R0      = %0            ;;GENERAL REGISTER
```

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

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

                        ;*"SWITCH REGISTER" SWITCH DEFINITIONS
100000                  SW15    = 100000
040000                  SW14    = 40000
020000                  SW13    = 20000
010000                  SW12    = 10000
004000                  SW11    = 4000
002000                  SW10    = 2000
001000                  SW09    = 1000
000400                  SW08    = 400
000200                  SW07    = 200
000100                  SW06    = 100
000040                  SW05    = 40
000020                  SW04    = 20
000010                  SW03    = 10
000004                  SW02    = 4
000002                  SW01    = 2
000001                  SW00    = 1
001000                  SW9=SW09
000400                  SW8=SW08
000200                  SW7=SW07
000100                  SW6=SW06
000040                  SW5=SW05
000020                  SW4=SW04
000010                  SW3=SW03
000004                  SW2=SW02
000002                  SW1=SW01
000001                  SW0=SW00

                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                  BIT15   = 100000
040000                  BIT14   = 40000
020000                  BIT13   = 20000
010000                  BIT12   = 10000
004000                  BIT11   = 4000
002000                  BIT10   = 2000
001000                  BIT09   = 1000
000400                  BIT08   = 400
```

```
                000200          BIT07   = 200
                000100          BIT06   = 100
                000040          BIT05   = 40
                000020          BIT04   = 20
                000010          BIT03   = 10
                000004          BIT02   = 4
                000002          BIT01   = 2
                000001          BIT00   = 1
                001000          BIT9=BIT09
                000400          BIT8=BIT08
                000200          BIT7=BIT07
                000100          BIT6=BIT06
                000040          BIT5=BIT05
                000020          BIT4=BIT04
                000010          BIT3=BIT03
                000004          BIT2=BIT02
                000002          BIT1=BIT01
                000001          BIT0=BIT00

                                ;*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
105
106                             .SBTTL  RP07 REGISTERS
107
108                             ;CONTROL AND STATUS REGISTER 1 (RPCS1)
109
110             000100          IE      = 100                   ;INTERRUPT ENABLE (BIT #6)
111             000200          RDY     = 200                   ;READY (BIT #7)
112             000400          A16     = 400                   ;HIGH ORDER BUS ADDRESS BIT (BIT #8)
113             001000          A17     = 1000                  ;HIGH ORDER BUS ADDRESS BIT (BIT #9)
114             002000          PSEL    = 2000                  ;PORT SELECT (BIT #10)
115             020000          MCPE    = 20000                 ;MASSBUSS PARITY ERROR (BIT #13)
116             040000          TRE     = 40000                 ;TRANSFER ERROR (BIT #14)
117                             ;SC     = 100000                ;SPECIAL CONDITION (BIT #15)
118
119                             ;WORD COUNT REGISTER (RPWC)
120                             ;(EACH BIT IS CALLED BY BIT NUMBER)
121
122                             ;BUS ADDRESS REGISTER (RPBA)
123                             ;(EACH BIT IS CALLED BY BIT NUMBER)
124
125                             ;CONTROL AND STATUS REGISTER 2 (RPCS2)
126
127             000001          US1     = 1                     ;UNIT SELECT (BIT #0)
128             000002          US2     = 2                     ;UNIT SELECT (BIT #1)
129             000004          US4     = 4                     ;UNIT SELECT (BIT #2)
```

```
000010          BAI     = 10            ;BUS ADDRESS INCREMENT INHIBIT (BIT #3)
000020          PAT     = 20            ;MASSBUS PARITY TEST (BIT #4)
000040          CLR     = 40            ;CLEAR (BIT #5)
000100          IR      = 100           ;INPUT READY (BIT #6)
000200          OR      = 200           ;OUTPUT READY (BIT #7)
000400          MDPE    = 400           ;MASS BUS PARITY ERROR (BIT #8)
001000          MXF     = 1000          ;MISSED TRANSFER ERROR (BIT #9)
002000          PGE     = 2000          ;PROGRAM ERROR (BIT #10)
004000          NEM     = 4000          ;NON EXISTENT MEMORY (BIT #11)
010000          NED     = 10000         ;NON EXISTENT DRIVE (BIT #12)
020000          UPE     = 20000         ;UNIBUS PARITY ERROR (BIT #13)
040000          WCE     = 40000         ;WRITE CHECK ERROR (BIT #14)
100000          DLT     = 100000        ;DATA LATE (BIT #15)

                ;DATA BUFFER REGISTER (RPDB)
                ;(EACH BIT IS CALLED BY BIT NUMBER)

                .SBTTL  RP07 REGISTERS

                ;CONTROL AND STATUS 1 REGISTER. (#00)

000001          GO      = 1             ;GO BIT (BIT #0)
000002          F0      = 2             ;FUNCTION CODE BIT #1
000004          F1      = 4             ;FUNCTION CODE BIT #2
000010          F2      = 10            ;FUNCTION CODE BIT #3
000020          F3      = 20            ;FUNCTION CODE BIT #4
000040          F4      = 40            ;FUNCTION CODE BIT #5
004000          DVA     = 4000          ;DEVICE AVAILABLE (BIT #11)

                ;DRIVE STATUS REGISTER (RPDS1) (#01)

000001          OFFON   = 1             ;OFFSET ON (BIT #0)
000002          EWN     = 2             ;EARLY WARNING (BIT #1)
000004          ILV     = 4             ;INTERLEAVE (BIT #2)
000100          VV      = 100           ;VOLUME VALID (BIT #6)
000200          DRY     = 200           ;DRIVE READY (BIT #7)
000400          DPR     = 400           ;DRIVE PRESENT (BIT #8)
001000          PGM     = 1000          ;PROGRAMABLE (BIT #9)
002000          LBT     = 2000          ;LAST SECTOR TRANSFERRED (BIT #10)
004000          WRL     = 4000          ;WRITE LOCK (BIT #11)
010000          MOL     = 10000         ;MEDIUM ON-LINE (BIT #12)
020000          PIP     = 20000         ;POSITIONING OPERATION IN PROGRESS (BIT #13)
040000          ERR     = 40000         ;COMPOSITE ERROR (BIT #14)
100000          ATA     = 100000        ;ATTENTION ACTIVE (BIT #15)

                ;ERROR REGISTER #01 (RPER1) (#02)

000001          ILF     = 1             ;ILLEGAL FUNCTION (BIT #0)
000002          ILR     = 2             ;ILLEGAL REGISTER (BIT #1)
000004          RMR     = 4             ;REGISTER MODIFICATION REFUSED (BIT #2)
000010          PAR     = 10            ;PARITY ERROR (BIT #3)
000020          FER     = 20            ;FORMAT ERROR (BIT #4)
000040          WCF     = 40            ;WRITE CLOCK FAIL (BIT #5)
000100          ECH     = 100           ;ECC HARD ERROR (BIT #6)
000200          HCE     = 200           ;HEADER COMPARE ERROR (BIT #7)
000400          HCRC    = 400           ;HEADER CRC ERROR (BIT #8)
001000          AOE     = 1000          ;ADDRESS OVERFLOW ERROR (BIT #9)
```

```
                002000          IAE     = 2000          ;INVALID ADDRESS ERROR (BIT #10)
                004000          WLE     = 4000          ;WRITE LOCK ERROR (BIT #11)
                010000          DTE     = 10000         ;DRIVE TIMING ERROR (BIT #12)
                020000          OPI     = 20000         ;OPERATION INCOMPLETE (BIT #13)
                040000          UNS     = 40000         ;DRIVE UNSAFE (BIT #14)
                100000          DCK     = 100000        ;DATA CHECK ERROR (BIT 15)

                                ;MAINTENANCE REGISTER (RPMR1)(#03)

                                ;ATTENTION SUMMARY PSEUDO-REGISTER (RPAS) (#04)

                000001          AT0     = 1             ;DEVICE 0 (BIT #0)
                000002          AT1     = 2             ;DEVICE 1 (BIT #1)
                000004          AT2     = 4             ;DEVICE 2 (BIT #2)
                000010          AT3     = 10            ;DEVICE 3 (BIT #3)
                000020          AT4     = 20            ;DEVICE 4 (BIT #4)
                000040          AT5     = 40            ;DEVICE 5 (BIT #5)
                000100          AT6     = 100           ;DEVICE 6 (BIT #6)
                000200          AT7     = 200           ;DEVICE 7 (BIT #7)

                                ;DESIRED SECTOR/TRACK ADDRESS REGISTER (RPDA) (#05)

                                ;DRIVE TYPE REGISTER (RPDT) (#06)

                000001          DT00    = 1             ;DRIVE TYPE NUMBER BIT 1
                000002          DT01    = 2             ;DRIVE TYPE NUMBER BIT 2
                000004          DT02    = 4             ;DRIVE TYPE NUMBER BIT 3
                000010          DT03    = 10            ;DRIVE TYPE NUMBER BIT 4
                000020          DT04    = 20            ;DRIVE TYPE NUMBER BIT 5
                000040          DT05    = 40            ;DRIVE TYPE NUMBER BIT 6
                000100          DT06    = 100           ;DRIVE TYPE NUMBER BIT 7
                000200          DT07    = 200           ;DRIVE TYPE NUMBER BIT 8
                000400          DT08    = 400           ;DRIVE TYPE NUMBER BIT 9
                004000          DRQ     = 4000          ;DRIVE REQUEST REQUIRED (BIT #11)
                020000          MOH     = 20000         ;MOVING HEAD (BIT #13)
                040000          TAP     = 40000         ;TAPE DRIVE (BIT #14)
                100000          NSA     = 100000        ;NOT SECTOR ADDRESSED (BIT #15)

                                ;LOOK-AHEAD REGISTER (RPLA) (#07)

                000100          SC1     = 100           ;SECTOR COUNT FIELD 0 (BIT #6)
                000200          SC2     = 200           ;SECTOR COUNT FIELD 1 (BIT #7)
                000400          SC04    = 400           ;SECTOR COUNT FIELD 2 (BIT #8)
                001000          SC10    = 1000          ;SECTOR COUNT FIELD 3 (BIT #9)
                002000          SC20    = 2000          ;SECTOR COUNT FIELD 4 (BIT #10)
                004000          SC40    = 4000          ;SECTOR COUNT FIELD 5 (BIT #11)
                010000          SC100   = 10000         ;SECTOR COUNT FIELD 6 (BIT #12)

                                ;SERIAL NUMBER REGISTER (RPSN) (#10)
                                ;(EACH IS CALLED BY BIT NUMBER)

                                ;OFFSET REGISTER (RPOF) (#11)

                000200          OFFDIR  = 200           ;RP07 OFFSET DIRECTION
                002000          HCI     = 2000          ;HEADER COMPARE INHIBIT (BIT #10)
                004000          ECI     = 4000          ;ERROR CORRECTION CODE INHIBIT (BIT #11)
                010000          FMT16   = 10000         ;FORMAT BIT (BIT #12)
```

```
                                ;DESIRED CYLINDER ADDRESS (RPDC) (#12)
                                ;(EACH BIT IS CALLED BY BIT NUMBER)

                                ;CURRENT CYLINDER ADDRESS (RPCC) (#13)
                                ;(EACH BIT IS CALLED BY BIT NUMBER)

                                ;RP07 ERROR REGISTER #2 (RPER2) (#14)

000400                          WRTURNS  = 400          ;WRITE READY UNSAFE (BIT 8)
001000                          WOR      = 1000         ;WRITE OVERRUN (BIT 9)
002000                          RWU1     = 2000         ;READ/WRITE UNSAFE #1 (BIT 10)
004000                          RWU2     = 4000         ;READ/WRITE UNSAFE #2 (BIT 11)
010000                          RWU3     = 10000        ;READ/WRITE UNSAFE #3 (BIT 12)
100000                          PGE      = 100000       ;PROGRAM ERROR (BIT 15)

                                ;RP07 ERROR REGISTER #3 (RPER3) (#15)

000001                          DGE      = 1            ;DIAGNOSTIC ERROR (BIT 0)
000002                          TPE      = 2            ;TEMPERATURE WARNING ERROR(BIT 1)
000004                          AIR      = 4            ;AIR SYSTEM WARNING ERROR (BIT 2)
000010                          DPE      = 10           ;DATA PARITY ERROR (BIT 3)
000020                          BPE      = 20           ;BUFFER PARITY ERROR (BIT 4)
000040                          DCU      = 40           ;DC UNSAFE (BIT 5)
000100                          IXU      = 100          ;INDEX UNSAFE (BIT 6)
000200                          DVC      = 200          ;DEVICE CHECK (BIT 7)
000400                          TCF      = 400          ;TACH CALIBRATION FAILURE (BIT 8)
001000                          LCE      = 1000         ;LOSS OF CYLINDER ERROR (BIT 9)
002000                          LBC      = 2000         ;LOSS OF BIT CLOCK (BIT 10)
040000                          SKI      = 40000        ;SEEK INCOMPLETE (BIT 14)
100000                          BSE      = 100000       ;BAD SECTOR ERROR (BIT 15)

                                ;ECC POSITION REGISTER (RPEC1) (#16)
                                ;(EACH BIT IS CALLED BY BIT NUMBER)

                                ;ECC PATTERN REGISTER (RPEC2) (#17)
                                ;(EACH BIT IS CALLED BY BIT NUMBER)
```

```
                        .SBTTL  RP07 DRIVER COMMANDS

000101          NOOP    = 101           ;NO OPERATION
000105          SEEK    = 105           ;SEEK
000107          RECAL   = 107           ;RECALIBRATE
000111          DRVCLR  = 111           ;DRIVE CLEAR
000113          RELSE   = 113           ;RELEASE
000117          RTC     = 117           ;RETURN TO CENTER LINE
000121          READIN  = 121           ;READ IN PRESET
000131          SEARCH  = 131           ;SEARCH
000151          WCKD    = 151           ;WRITE CHECK DATA
000153          WCKHD   = 153           ;WRITE CHECK HEADER & DATA
000161          WRTDAT  = 161           ;WRITE DATA
000163          FMTRK   = 163           ;FORMAT TRACK
000171          RDDAT   = 171           ;READ DATA
000173          RDHD    = 173           ;READ HEADER & DATA

176700          ABASE   = 176700
000254          AVECT1  = 254
```

```
                                .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  003532          JMP     @#START1               ;;JUMP TO STARTING ADDRESS OF PROGRAM
2
3 000204  000137  003522          JMP     @#START         ;CHANGE THE RHXX/RP07 ADDRESS
7
8                               .SBTTL  ACT11 HOOKS

                                ;;++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ;HOOKS REQUIRED BY ACT11
                        000210          @#VPC=.                 ;SAVE PC
                        000046          .=46
000046  052054                  @#ENDAD                 ;;1)SET LOC.46 TO ADDRESS OF @#ENDAD IN .#EOP
                        000052          .=52
000052  040000                  .WORD   40000           ;;2)SET LOC.52 TO 40000
                        000210          .=@#VPC                 ;; RESTORE PC
9
10                      001100  .=1100
11                              .SBTTL  APT PARAMETER BLOCK

                                ;;++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                ;;++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        001100          .@#=.   ;;SAVE CURRENT LOCATION
                        000024          .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
000024  000200                  200     ;;FOR APT START UP
                        000044          .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
000044  001100                  @#APTHDR ;;POINT TO APT HEADER BLOCK
                        001100          .=.@#   ;;RESET LOCATION COUNTER
                                ;;++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-POP11 DIAGNOSTIC
                                ;INTERFACE SPEC.

001100                          @APTHD:
001100  000000          @HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001102  001206          @MBADR: .WORD   @MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001104  014234          @TSTM:  .WORD   6300.   ;;RUN TIM OF LONGEST TEST
001106  014234          @PASTM: .WORD   6300.   ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001110  014234          @UNITM: .WORD   6300.   ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDED UNIT
001112  000052                  .WORD   @ETEND-@MAIL/2  ;;LENGTH MAILBOX-ETABLE(WORDS)
12              001114  TAB.XV=.        @MTAGSTARING ADDRESS
13
```

```
                        .SBTTL  COMMON TAGS

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

                        .=TAB.XY
001116          001116  $CMTAG:                 ;;START OF COMMON TAGS
001116  000000          $TSTNM: .WORD   0       ;;CONTAINS THE TEST NUMBER
001120      000         $ERFLG: .BYTE   0       ;;CONTAINS ERROR FLAG
001121      000         $ICNT:  .BYTE   0       ;;CONTAINS SUBTEST ITERATION COUNT
001122  000000          $LPADR: .WORD   0       ;;CONTAINS SCOPE LOOP ADDRESS
001124  000000          $LPERR: .WORD   0       ;;CONTAINS SCOPE RETURN FOR ERRORS
001126  000000          $ERTTL: .WORD   0       ;;CONTAINS TOTAL ERRORS DETECTED
001130      000         $ITEMB: .BYTE   0       ;;CONTAINS ITER CONTROL BYTE
001131      001         $ERMAX: .BYTE   1       ;;CONTAINS MAX. ERRORS PER TEST
001132  000000          $ERRPC: .WORD   0       ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001134  000000          $GDADR: .WORD   0       ;;CONTAINS ADDRESS OF 'GOOD' DATA
001136  000000          $BDADR: .WORD   0       ;;CONTAINS ADDRESS OF 'BAD' DATA
001140  000000          $GDDAT: .WORD   0       ;;CONTAINS 'GOOD' DATA
001142  000000          $BDDAT: .WORD   0       ;;CONTAINS 'BAD' DATA
001144  000000                  .WORD   0       ;;RESERVED--NOT TO BE USED
001146  000000                  .WORD   0
001150      000         $AUTOB: .BYTE   0       ;;AUTOMATIC MODE INDICATOR
001151      000         $INTAG: .BYTE   0       ;;INTERRUPT MODE INDICATOR
001152  000000                  .WORD   0
001154  177570          $SW:    .WORD   DSWR    ;;ADDRESS OF SWITCH REGISTER
001156  177570          DISPLAY: .WORD  DISPP   ;;ADDRESS OF DISPLAY REGISTER
001160  177560          $TKS:   177560          ;;TTY KBD STATUS
001162  177562          $TKB:   177562          ;;TTY KBD BUFFER
001164  177564          $TPS:   177564          ;;TTY PRINTER STATUS REG. ADDRESS
001166  177566          $TPB:   177566          ;;TTY PRINTER BUFFER REG. ADDRESS
001170      000         $NULL:  .BYTE   0       ;;CONTAINS NULL CHARACTER FOR FILLS
001171      002         $FILLS: .BYTE   2       ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001172      012         $FILLC: .BYTE   12      ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001173      000         $TPFLG: .BYTE   0       ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001174  000000          $TPPO:  .WORD   0       ;;USER DEFINED
001176      207  377 377 $BELL:  .ASCIZ  <207><377><377>  ;;CODE FOR BELL
001202      077         $QUES:  .ASCII  /?/     ;;QUESTION MARK
001203      015         $CRLF:  .ASCII  <15>    ;;CARRIAGE RETURN
001204      012  000    $LF:    .ASCIZ  <12>    ;;LINE FEED
                        ;;*******************************************************************
                        .SBTTL  APT MAILBOX-ETABLE

                        ;;*******************************************************************
                        .EVEN
001206                  $MAIL:                  ;;APT MAILBOX
001206  000000          $MSGTY: .WORD   AMSGTY  ;;MESSAGE TYPE CODE
001210  000000          $FATAL: .WORD   AFATAL  ;;FATAL ERROR NUMBER
001212  000000          $TESTN: .WORD   ATESTN  ;;TEST NUMBER
001214  000000          $PASS:  .WORD   APASS   ;;PASS COUNT
001216  000000          $DEVCT: .WORD   ADEVCT  ;;DEVICE COUNT
001220  000000          $UNIT:  .WORD   AUNIT   ;;I/O UNIT NUMBER
001222  000000          $MSGAD: .WORD   AMSGAD  ;;MESSAGE ADDRESS
001224  000000          $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
001226                  $ETABLE:                ;;APT ENVIRONMENT TABLE
```

```
C20.4200 EP07 P187 [1400 MACRO V04.00 1-DEC-85 10:32:20 PAGE 0-1                SEQ 0067
EP1 MAILBOX.41/ENLB
```

```
001226  000                 ;DEV_CSR:  .BYTE  DEV     ;DEVICE CSR
001227  000                 ;DEV_VEC:  .BYTE  DEV     ;DEVICE VECTOR BITS
001230  000000              ;SWR:      .WORD  SWR     ;SWITCH REGISTER
001232  000000              ;DEV:      .WORD  DEV     ;DEVICE SWITCHES
                            ;CPUTYP:   .WORD  CPUTYP  ;CPU TYPE OPTIONS
                            ;BITS 15-11:CPU TYPE
                            ;                       11/05=01,11/45=02,11/20=03,11/40=04,11/45=05
                            ;                       11/70=06,J11=07,F-11=10
                            ;BIT 10:M.P.E. TYPE (1:EIS)
                            ;BIT  9:FLOATING POINT PROCESSOR
                            ;BIT  8:MEMORY MANAGEMENT
001236  000                 ;ERRTYP:   .BYTE  ERRTYP  ;ERROR ADDRESS B.15. BYTE
001237  000                 ;UNIT:     .BYTE  UNIT    ;UNIT TYPE BLOCK
                            ;DEV.TYP BYTE   -- (HIGH BYTE)
                            ;                       000 DEC (DRE-11)
                            ;                       100 MSCP (UDA-50)
                            ;                       200 MSCP (KDA-50)
001240  000000              ;ERRADR:   .WORD  ERRADR  ;ERROR ADDRESS B.0-15
                            ;       PER.LAST ADDR.-1 BYTES.THIS WORD AND LOW OF "TYPE" ABOVE
001242  000                 ;ERRTY2:   .BYTE  ERRTY2  ;ERROR ADDRESS B.16. BYTE
001243  000                 ;UNIT2:    .BYTE  UNIT2   ;UNIT TYPE.B.+02
001244  000000              ;ERADR2:   .WORD  ERADR2  ;PER.LAST ADDRESS.B.+00
001246  000                 ;ERTY1:    .BYTE  ERTY1   ;ERROR ADDRESS B.16. BYTE
001247  000                 ;UNIT1:    .BYTE  UNIT1   ;UNIT TYPE.B.+03
001250  000000              ;ERADR1:   .WORD  ERADR1  ;PER.LAST ADDRESS.B.+05
001252  000                 ;ERTY4:    .BYTE  ERTY4   ;ERROR ADDRESS B.16. BYTE
001253  000                 ;UNIT4:    .BYTE  UNIT4   ;UNIT TYPE.B.+06
001254  000000              ;ERADR4:   .WORD  ERADR4  ;PER.LAST ADDRESS.B.+08
001256  000254              ;VECT1:    .WORD  VECT1   ;INTERRUPT VECTOR+01,BUS PRIORITY+01
001260  000000              ;VECT2:    .WORD  VECT2   ;INTERRUPT VECTOR+00,BUS PRIORITY+02
001262  176700              ;BASE:     .WORD  BASE    ;BASE ADDRESS OF EQUIPMENT UNDER TEST
001264  000000              ;DEVMAP:   .WORD  DEVMAP  ;DEVICE MAP
001266  000000              ;CCOM1:    .WORD  CCOM1   ;CONTROLLER DESCRIPTION WORD+1
001270  000000              ;CCOM2:    .WORD  CCOM2   ;CONTROLLER DESCRIPTION WORD+2
001272                      ;DEVEND:
                            .PRINT
```

```
                                .SBTTL  USER DEFINED TAGS

001272  176700          ERFADR: .WORD   176700  ;FIRST ADDRESS OF RH##/RP07 REGISTERS
001274  000254          ERPVEC: .WORD   254     ;RP07 VECTOR ADDRESS
001276  172540          ELRCSR: .WORD   172540  ;ADDR OF RW11-P STATUS REGISTER
001300  172542          ELRCSB: .WORD   172542  ;ADDR OF RW11-P COUNTER BUFFER
001302  000104          ELPVEC: .WORD   104     ;ADDR OF RW11-P VECTOR
001304  177546          ELKS:   .WORD   177546  ;ADDR OF RW11-L STATUS REGISTER
001306  000100          ELLVEC: .WORD   100     ;ADDR OF RW11-L VECTOR
001310  000000          CLKFLG: .WORD   0       ;NO CLOCK= 0, P-CLOCK= 1 OR L-CLOCK= -1
001312  000074          HERTZ:  .WORD   60.     ;60HZ SYSTEM= 60, OR 50HZ SYSTEM= 50.
001314  000000          STATIN: .WORD   0       ;'TYPE STATISTICS' INDICATOR

        001220          DRIVE   =.+UNIT         ;DRIVE # STORAGE: ERRORS 1-5 & 10
                                                ;SAME AS USED IN RPT
001316  000000          ATTN:   .WORD   0       ;ATTN REG STORAGE: ERRORS 1-5 & 10
001320  000000          DRVNO:  .WORD   0       ;DRIVE # STORAGE FOR PRINTOUT
001322  000000          MASK:   .WORD   0       ;ERROR RETRY REGISTER MASK
001324  000     000     RETRY:  .BYTE   0,0     ;ERROR RETRY LIMIT IN THE LOWER BYTE
                                                ;RETRY COUNT IN THE UPPER BYTE
001326  000005          FATIME: .WORD   5       ;FAILURE TIME IN QUEUE VALUE
001330  000000          LSTAD:  .WORD   0       ;STORE LAST MEMORY ADDRESS HERE
001332  000000          CHGADR: .WORD   0       ;CHANGE RH##/RP07 UNIBUS ADDRESS FLAG
001334  000000          CFLAG:  .WORD   0       ;'CONTROL C' FLAG
001336  000000          BADSEC: .WORD   0       ;BAD TRACK/SECTOR FLAG
001340  000000          HOUR:   .WORD   0       ;HOUR COUNT STORED HERE
001342  000000          MINUTE: .WORD   0       ;MINUTE'S COUNT STORED HERE
001344  000000          SECOND: .WORD   0       ;SECOND'S COUNT STORED HERE
001346  000000          ONESEC: .WORD   0       ;TIMER ROUTINE COUNTER (FOR ONE SECOND)
001350  177777          ZROIND: .WORD   -1      ;ZERO INDICATOR FOR THE DATA COMPARE ROUTINE
001352  000             FAILER: .BYTE   0       ;DATA COMPARE ERROR FLAG
                                                ;IF = 0, PROCESSING 'OCHER' OR CAN'T MATCH PATTERN
                                                ;IF # 0, MISCOMPARISON FOUND
001353  000             .BYTE   0               ;MISCOMPARISON OR CAN'T MATCH PATTERN FLAG
                                                ;IF # 0, ERROR IN BUFFER
001354  000000          SAVPOS: .WORD   0       ;SAVE WORD POSITION IN COMPARE ROUTINE
001356  000000          SAVER1: .WORD   0       ;SAVE R1 HERE
001360  000000          SAVER5: .WORD   0       ;SAVE R5 HERE
001362  000000          ERCTR:  .WORD   0       ;NUMBER OF ERRORS
001364  000000          LIMIT:  .WORD   0       ;DISPLAY LIMIT
001366  000000          CMCNT:  .WORD   0       ;WORD COUNT
001370  000000          CMCYL:  .WORD   0       ;CYLINDER ADDRESS
001372  000             CMSEC:  .BYTE   0       ;SECTOR ADDRESS
001373  000             CMTRK:  .BYTE   0       ;TRACK ADDRESS
001374  000000          WRDPOS: .WORD   0       ;WORD POSITION IN COMPARE ROUTINE
001376  000000          ECBIT:  .WORD   0       ;ERROR BURST BIT OFFSET
001400  000000          ECSEC:  .WORD   0       ;ERROR BURST WORD OFFSET (RELATIVE TO SECTOR)
001402  000000          ECMSK0: .WORD   0       ;CORRECTION MASK FOR FIRST ERROR WORD
001404  000000          ECMSK1: .WORD   0       ;CORRECTION MASK FOR SECOND ERROR WORD
001406  000000          ECWRD:  .WORD   0       ;LOCATION OF FIRST ERROR WORD
001410  000000          ECGD:   .WORD   0       ;GOOD (CORRECTED) DATA, FIRST WORD
001412  000000          ECBAD0: .WORD   0       ;BAD (RECEIVED) DATA, FIRST WORD
001414  000000          ECWRD1: .WORD   0       ;LOCATION OF SECOND ERROR WORD
001416  000000          ECGD1:  .WORD   0       ;GOOD (CORRECTED) DATA, SECOND WORD
001420  000000          ECBAD1: .WORD   0       ;BAD (RECEIVED) DATA, SECOND WORD
001422  000000          TSTANY: .WORD   0       ;TEST ON FE CYLINDER ONLY =0, TEST ANYWHERE ON MEDIA =1
001424  000000          RDONLY: .WORD   0       ;READ/WRITE MODE=0, READ MODE ONLY=1
```

```
001426  000000                  DRVPAR: .WORD   0       ;WHEN DRIVES ARE BEING ASSIGNED,
                                                        ;0=CHANGE DRIVE PARAMETERS
                                                        ;1=DO NOT CHANGE DRIVE PARAMETERS
001430  000000                  XXDP:   .WORD   0       ;THE LOW BYTE CONTAINS THE DRIVE NUMBER FROM WHICH
                                                        ;THE PROGRAM WAS LOADED. THE HIGH BYTE CONTAINS THE
                                                        ;'XXDP' DEVICE CODE FOR THE RP07.
                                .LIST   BEX
001432  200                     REV:    .ASCII  <CRLF>
001433  103     132     122             .ASCII  /C2RJD/ ;PROGRAM ID
001436  112     117
001440  055                             .ASCII  /-/
001441  102                             .ASCII  /B/     ;REVISION LEVEL
001442  055                             .ASCII  /-/
001443  060     000                     .ASCII  /0/     ;PATCH LEVEL
                                .NLIST  BEX
                                        .EVEN

                                .SBTTL  COMMON PARAMETERS
                                ;THE FOLLOWING TWO LOCATIONS CONTAIN THE SOFT ERROR RATE WORDS USED TO
                                ;DETERMINE END OF PASS WHEN THE PROGRAM IS DATA BIASED.
                                ;IT WILL TAKE APPROXIMATELY 2.4 PASSES TO REACH THE SOFT ERROR RATE OF
                                ;1 ERROR IN 10**10 BITS (6.25 X 10**8 WORDS) READ OR 10. PASSES TO REACH THE 90%
                                ;CONFIDENCE LEVEL OF 4.128 X 10**10 BITS (2.58 X 10**9 WORDS) READ.
                                ;ENDCON+ LSB AND ENDCON+2+ MSB

001446  142200                  ENDCON: .WORD   142200  ;(2.58 X 10**8 WORDS) OR (4.128 X 10**9 BITS) READ
001450  007540                          .WORD   007540

                                ;THE FOLLOWING TWO LOCATIONS CONTAIN THE SEEK ERROR RATE WORDS USED TO
                                ;DETERMINE END OF PASS WHEN THE PROGRAM IS SEEK BIASED.
                                ;IT WILL TAKE 1 PASS TO REACH A SEEK ERROR RATE OF 1 ERROR IN 10**6 SEEKS OR 3
                                ;PASSES TO REACH A 90% CONFIDENCE LEVEL OF 3 X 10**6 SEEKS.
                                ;ENDSEK+ LSB AND ENDSEK+2+ MSB

001452  041100                  ENDSEK: .WORD   041100  ;(1 X 10**6 SEEKS)
001454  000017                          .WORD   000017

001456  000062                  MAXER:  .WORD   50.      ;MAXIMUM ERRORS ALLOWED PER DRIVE
001460  000004                  CMPLMT: .WORD   4       ;NUMBER OF COMPARE ERRORS TYPED OUT
001462  000017  000017          CMPTIM: .WORD   15.,15. ;FIRST WORD IS THE INTERVAL BETWEEN DATA COMPARES.
                                                        ;(IN MINUTES). SECOND WORD IS THE INTERVAL COUNTER.
                                                        ;IF FIRST WORD IS ZERO, THEN DATA COMPARE IS ALWAYS ON.
                                                        ;THIS TIMER HAS NO AFFECT IF SW01=1.
001466  031000                  WRDCNT: .WORD   12800.  ;MAXIMUM WORD COUNT (6-12800.)
001470  000000  000000          INTRVL: .WORD   0.0     ;FIRST WORD IS THE PERFORMANCE TYPEOUT INTERVAL
                                                        ;(IN MINUTES). SECOND WORD IS THE INTERVAL COUNTER.
                                                        ;IF FIRST WORD IS ZERO, NO REPORT IS TYPED.
001474  000001                  PASSES: .WORD   1       ;NUMBER OF PASSES TO END OF TEST (THIS PARAMETER IS
                                                        ;NOT USED WHEN PROGRAM IS OPERATING IN AUTO RUN(CHAIN)
                                                        ;MODE).
001476  000000                  PATTERN:.WORD   0       ;IF EQ 0,RANDOMLY SELECT DATA PATTERN
                                                        ;IF NOT EQ 0,SELECT ONE SET OF PATTERN
                                                        ;POINTED BY THE "PATTERN".
001500  000000                  RANDWC: .WORD   0       ;IF EQ TO 0, GENERATE A RANDOM WORD COUNT
                                                        ;FOR THE OPERATION.
                                                        ;IF NOT EQ TO 0, USE THE VALUE IN 'WRDCNT' FOR
```

```
                                                ;THE WORD COUNT
001502  000003          RATIO:  .WORD   3      ;READ/WRITE RATIO [RANGE 0 - 7]
                                                ;0 - 15/1       (READ/WRITE)
                                                ;1 -  7/1
                                                ;2 -  6/2
                                                ;3 -  5/3
                                                ;4 -  4/4
                                                ;5 -  3/5
                                                ;6 -  2/6
                                                ;7 -  1/7
001504  000001          ENDING: .WORD   1      ;IF NOT EQ 0, END OF PASS DETERMINED
                                                ;BY THE 'WORDS READ' COUNT. (2.58 X 10**8 WORDS)
                                                ;IF EQ 0, END OF PASS DETERMINED
                                                ;BY THE SEEK COUNT. (1 X 10**6 SEEKS)
001506  000001          WRTCHK: .WORD   1      ;IF NOT EQ 0, DO AN APPROPRIATE WRITE
                                                ;CHECK AFTER EACH WRITE COMMAND.
                                                ;IF EQ 0, SELECT WRITE CHECK COMMANDS
                                                ;RANDOMLY.
001510  000000          RANDOM: .WORD   0      ;IF EQ TO 0, RANDOMLY SELECT DATA BLOCK
                                                ;ADDRESS. IF NOT EQU 0,SEQUENTIALLY
                                                ;SELECT DATA BLOCK ADDRESS

                        .SBTTL  VALUES FOR FIRST OPERATION

001512  000010          BEGPAT: .WORD   8.     ;STARTING PATTERN CODE [RANGE 1 - 15.]
001514  000004          BEGCOD: .WORD   4      ;STARTING COMMAND CODE [RANGE 0 - 5]
                                                ;0 = WRITE CHECK DATA ('WCKD')
                                                ;1 = WRITE CHECK HEADER & DATA ('WCKHD' - NOT USED)
                                                ;2 = WRITE DATA ('WRTDAT')
                                                ;3 = FORMAT TRACK ('FMTRK' - NOT USED)
                                                ;4 = READ DATA ('RDDAT')
                                                ;5 = READ HEADER & DATA ('RDHD')
001516  000400          BEGWC:  .WORD   256.   ;STARTING  WRD CNT [RANGE 6 - WRDCNT]

                        .SBTTL  TABLES, CONSTANTS, AND VARIABLE LOCATIONS

                                                ;LIST OF DRIVES PERFORMING COMMANDS
001520  000000          ORDERQ: .WORD   0
001522  000000                  .WORD   0
001524  000000                  .WORD   0
001526  000000                  .WORD   0
001530  000000                  .WORD   0
001532  000000                  .WORD   0
001534  000000                  .WORD   0
001536  000000                  .WORD   0
001540  000000                  .WORD   0

001542  000000          ASNLST: .WORD   0              ;A BIT SET IS AN ASSIGNED DRIVE

                                                ;ADDRESSES OF DRIVES TO BE DROPPED
001544  000000          DDRVS:  .WORD   0
001546  000000                  .WORD   0
001550  000000                  .WORD   0
001552  000000                  .WORD   0
001554  000000                  .WORD   0
001556  000000                  .WORD   0
001560  000000                  .WORD   0
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001562  000000                          .WORD   0
001564  000000                          .WORD   0

                                ;ADDRESSES OF NEWLY ASSIGNED DRIVES
001566  000000                  NEWUNT: .WORD   0
001570  000000                          .WORD   0
001572  000000                          .WORD   0
001574  000000                          .WORD   0
001576  000000                          .WORD   0
001600  000000                          .WORD   0
001602  000000                          .WORD   0
001604  000000                          .WORD   0
001606  000000                          .WORD   0

                                ;LIST OF DRIVES WAITING FOR BUFFERS/PARAMETERS
001610  000000                  AVAIL:  .WORD   0
001612  000000                          .WORD   0
001614  000000                          .WORD   0
001616  000000                          .WORD   0
001620  000000                          .WORD   0
001622  000000                          .WORD   0
001624  000000                          .WORD   0
001626  000000                          .WORD   0
001630  000000                          .WORD   0

                                ;LIST OF DRIVES WAITING FOR BUFFERS
001632  000000                  WAIT:   .WORD   0
001634  000000                          .WORD   0
001636  000000                          .WORD   0
001640  000000                          .WORD   0
001642  000000                          .WORD   0
001644  000000                          .WORD   0
001646  000000                          .WORD   0
001650  000000                          .WORD   0
001652  000000                          .WORD   0

                                ;BUFFER ALLOCATION TABLE ENTRY COUNT
001654  000000                  BUFTBL: .WORD   0
001656  000000  000000                  .WORD   0.0
001662  000000  000000                  .WORD   0.0
001666  000000  000000                  .WORD   0.0
001672  000000  000000                  .WORD   0.0
001676  000000  000000                  .WORD   0.0
001702  000000  000000                  .WORD   0.0
001706  000000  000000                  .WORD   0.0
001712  000000  000000                  .WORD   0.0
001716  000000  000000                  .WORD   0.0
001722  000000  000000                  .WORD   0.0
001726  000000  000000                  .WORD   0.0
001732  000000  000000                  .WORD   0.0
001736  000000  000000                  .WORD   0.0
001742  000000  000000                  .WORD   0.0
001746  000000  000000                  .WORD   0.0
001752  000000  000000                  .WORD   0.0
001756  000000  000000                  .WORD   0.0
001762  000000  000000                  .WORD   0.0
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001766  000000  000000                  .WORD   0,0
001772  000000  000000                  .WORD   0,0
001776  000000  000000                  .WORD   0,0
002002  000000  000000                  .WORD   0,0
002006  000000  000000                  .WORD   0,0
002012  000000  000000                  .WORD   0,0
002016  000000  000000                  .WORD   0,0
002022  000000  000000                  .WORD   0,0
002026  000000  000000                  .WORD   0,0
002032  000000  000000                  .WORD   0,0
002036  000000  000000                  .WORD   0,0
002042  000000  000000                  .WORD   0,0
002046  000000  000000                  .WORD   0,0
002052  000000  000000                  .WORD   0,0

                                ;DRIVE PARAMETER BLOCK(DPB) POINTER TABLE
002056  046314                  BLKADR: .WORD   DRIVE0  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 0
002060  046556                          .WORD   DRIVE1  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 1
002062  047020                          .WORD   DRIVE2  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 2
002064  047262                          .WORD   DRIVE3  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 3
002066  047524                          .WORD   DRIVE4  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 4
002070  047766                          .WORD   DRIVE5  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 5
002072  050230                          .WORD   DRIVE6  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 6
002074  050472                          .WORD   DRIVE7  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 7

                                ;DRIVER COMMAND CONTROL TABLE (USED IN RP DRIVER)
002076      151                 COMTBL: .BYTE   WCKD    ;WRITE CHECK DATA
002077      377                         .BYTE   -1      ;WRITE CHECK HEADER AND DATA (NOT USED)
002100      161                         .BYTE   WRTDAT  ;WRITE DATA
002101      377                         .BYTE   -1      ;FORMAT TRACK (NOT USED)
002102      171                         .BYTE   RDDAT   ;READ DATA
002103      173                         .BYTE   RDHD    ;READ HEADER AND DATA

                                ;FUNCTION(COMMAND) CODE CONTROL TABLE
002104      004                 OPTBL:  .BYTE   4       ;SEEK
002105      006                         .BYTE   6       ;RECAL
002106      010                         .BYTE   10      ;DRIVE CLEAR
002107      012                         .BYTE   12      ;RELEASE
002110      016                         .BYTE   16      ;RETURN TO CENTERLINE
002111      020                         .BYTE   20      ;READIN PRESET
002112      022                         .BYTE   22      ;PACK ACKNOWLEDGE
002113      030                         .BYTE   30      ;SEARCH
002114      050                         .BYTE   50      ;WRITE CHECK DATA
002115      052                         .BYTE   52      ;WRITE CHECK HEADER AND DATA
002116      060                         .BYTE   60      ;WRITE DATA
002117      062                         .BYTE   62      ;FORMAT TRACK
002120      070                         .BYTE   70      ;READ DATA
002121      072                         .BYTE   72      ;READ HEADER AND DATA
002122      377                         .BYTE   -1      ;TERMINATOR
                                .EVEN

                                ;MESSAGE CONTROL TABLE FOR 'OPTBL' TABLE
002124  123     105     105     MNTBL:  .ASCIZ  /SEEK   /
002134  122     105     103             .ASCIZ  /RECAL  /
002144  104     122     126             .ASCIZ  /DRVCLR /
002154  122     105     114             .ASCIZ  /RELSE  /
002164  122     124     103             .ASCIZ  /RTC    /
```

TABLES, CONSTANTS, AND VARIABLE LOCATIONS

```
002174  122  105  101        .ASCIZ  /READIN /
002204  120  101  103        .ASCIZ  /PACK   /
002214  123  105  101        .ASCIZ  /SEARCH /
002224  127  103  113        .ASCIZ  /WCKD   /
002234  127  103  113        .ASCIZ  /WCKMD  /
002244  127  122  124        .ASCIZ  /WRTDAT /
002254  106  115  124        .ASCIZ  /FMTRK  /
002264  122  104  104        .ASCIZ  /RDDAT  /
002274  122  104  110        .ASCIZ  /RDMD   /
002304  116  117  116        .ASCIZ  /NONE   /
```

```
                                ;STANDARD DATA PATTERN POINTER TABLE

002314  002360          STNDAT: .WORD   DATA0   ;STANDARD DATA PATTERN 0
002316  002420                  .WORD   DATA1   ;STANDARD DATA PATTERN 1
002320  002460                  .WORD   DATA2   ;STANDARD DATA PATTERN 2
002322  002520                  .WORD   DATA3   ;STANDARD DATA PATTERN 3
002324  002560                  .WORD   DATA4   ;STANDARD DATA PATTERN 4
002326  002620                  .WORD   DATA5   ;STANDARD DATA PATTERN 5
002330  002660                  .WORD   DATA6   ;STANDARD DATA PATTERN 6
002332  002720                  .WORD   DATA7   ;STANDARD DATA PATTERN 7
002334  002760                  .WORD   DATA8   ;STANDARD DATA PATTERN 8
002336  003020                  .WORD   DATA9   ;STANDARD DATA PATTERN 9
002340  003060                  .WORD   DATA10  ;STANDARD DATA PATTERN 10
002342  003120                  .WORD   DATA11  ;STANDARD DATA PATTERN 11
002344  003160                  .WORD   DATA12  ;STANDARD DATA PATTERN 12
002346  003220                  .WORD   DATA13  ;STANDARD DATA PATTERN 13
002350  003260                  .WORD   DATA14  ;STANDARD DATA PATTERN 14
002352  003320                  .WORD   DATA15  ;STANDARD DATA PATTERN 15
002354  002360                  .WORD   ZEROS   ;ALL 0'S PATTERN
002356  003262                  .WORD   ONES    ;ALL 1'S PATTERN

002360                  ZEROS:
002360  000000          DATA0:  .WORD   0       ;ALL 0'S DATA PATTERN
002362  000000                  .WORD   0
002364  000000                  .WORD   0
002366  000000                  .WORD   0
002370  000000                  .WORD   0
002372  000000                  .WORD   0
002374  000000                  .WORD   0
002376  000000                  .WORD   0
002400  000000                  .WORD   0
002402  000000                  .WORD   0
002404  000000                  .WORD   0
002406  000000                  .WORD   0
002410  000000                  .WORD   0
002412  000000                  .WORD   0
002414  000000                  .WORD   0
002416  000000                  .WORD   0

002420  000001          DATA1:  .WORD   000001  ;STANDARD PATTERN 1
002422  000003                  .WORD   000003
002424  000007                  .WORD   000007
002426  000017                  .WORD   000017
002430  000037                  .WORD   000037
002432  000077                  .WORD   000077
002434  000177                  .WORD   000177
002436  000377                  .WORD   000377
002440  000777                  .WORD   000777
002442  001777                  .WORD   001777
002444  003777                  .WORD   003777
002446  007777                  .WORD   007777
002450  017777                  .WORD   017777
002452  037777                  .WORD   037777
002454  077777                  .WORD   077777
002456  177777                  .WORD   177777

002460  177776          DATA2:  .WORD   177776  ;STANDARD PATTERN 2
```

E5


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002462  177774                          .WORD   177774
002464  177770                          .WORD   177770
002466  177760                          .WORD   177760
002470  177740                          .WORD   177740
002472  177700                          .WORD   177700
002474  177600                          .WORD   177600
002476  177400                          .WORD   177400
002500  177000                          .WORD   177000
002502  176000                          .WORD   176000
002504  174000                          .WORD   174000
002506  170000                          .WORD   170000
002510  160000                          .WORD   160000
002512  140000                          .WORD   140000
002514  100000                          .WORD   100000
002516  000000                          .WORD   000000

002520  000000                  DATA3:  .WORD   000000  ;STANDARD PATTERN 3
002522  000000                          .WORD   000000
002524  000000                          .WORD   000000
002526  177777                          .WORD   177777
002530  177777                          .WORD   177777
002532  177777                          .WORD   177777
002534  000000                          .WORD   000000
002536  000000                          .WORD   000000
002540  177777                          .WORD   177777
002542  177777                          .WORD   177777
002544  000000                          .WORD   000000
002546  177777                          .WORD   177777
002550  000000                          .WORD   000000
002552  177777                          .WORD   177777
002554  000000                          .WORD   000000
002556  177777                          .WORD   177777

002560  133331                  DATA4:  .WORD   133331  ;STANDARD PATTERN 4
002562  133331                          .WORD   133331
002564  133331                          .WORD   133331
002566  133331                          .WORD   133331
002570  133331                          .WORD   133331
002572  133331                          .WORD   133331
002574  133331                          .WORD   133331
002576  133331                          .WORD   133331
002600  133331                          .WORD   133331
002602  133331                          .WORD   133331
002604  133331                          .WORD   133331
002606  133331                          .WORD   133331
002610  133331                          .WORD   133331
002612  133331                          .WORD   133331
002614  133331                          .WORD   133331
002616  133331                          .WORD   133331

002620  052525                  DATA5:  .WORD   052525  ;STANDARD PATTERN 5
002622  052525                          .WORD   052525
002624  052525                          .WORD   052525
002626  125252                          .WORD   125252
002630  125252                          .WORD   125252
002632  125252                          .WORD   125252
002634  052525                          .WORD   052525
```

F5


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002636  052525                          .WORD   052525
002640  125252                          .WORD   125252
002642  125252                          .WORD   125252
002644  052525                          .WORD   052525
002646  125252                          .WORD   125252
002650  052525                          .WORD   052525
002652  125252                          .WORD   125252
002654  052525                          .WORD   052525
002656  125252                          .WORD   125252

002660  147556                  DATA6:  .WORD   147556   ;STANDARD PATTERN 6 (NOT WORST CASE)
002662  147556                          .WORD   147556
002664  147556                          .WORD   147556
002666  147556                          .WORD   147556
002670  147556                          .WORD   147556
002672  147556                          .WORD   147556
002674  147556                          .WORD   147556
002676  147556                          .WORD   147556
002700  147556                          .WORD   147556
002702  147556                          .WORD   147556
002704  147556                          .WORD   147556
002706  147556                          .WORD   147556
002710  147556                          .WORD   147556
002712  147556                          .WORD   147556
002714  147556                          .WORD   147556
002716  147556                          .WORD   147556

002720  155555                  DATA7:  .WORD   155555   ;STANDARD PATTERN 7
002722  133333                          .WORD   133333
002724  155555                          .WORD   155555
002726  133333                          .WORD   133333
002730  155555                          .WORD   155555
002732  133333                          .WORD   133333
002734  155555                          .WORD   155555
002736  133333                          .WORD   133333
002740  155555                          .WORD   155555
002742  133333                          .WORD   133333
002744  155555                          .WORD   155555
002746  133333                          .WORD   133333
002750  155555                          .WORD   155555
002752  133333                          .WORD   133333
002754  155555                          .WORD   155555
002756  133333                          .WORD   133333

002760  030221                  DATA8:  .WORD   030221   ;STANDARD PATTERN 8 (WORST CASE)
002762  030221                          .WORD   030221
002764  030221                          .WORD   030221
002766  030221                          .WORD   030221
002770  030221                          .WORD   030221
002772  030221                          .WORD   030221
002774  030221                          .WORD   030221
002776  030221                          .WORD   030221
003000  030221                          .WORD   030221
003002  030221                          .WORD   030221
003004  030221                          .WORD   030221
003006  030221                          .WORD   030221
003010  030221                          .WORD   030221
```

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003012  030221                          .WORD   030221
003014  030221                          .WORD   030221
003016  030221                          .WORD   030221

003020  000001          DATA9:  .WORD   000001  ;STANDARD PATTERN 9
003022  000002                  .WORD   000002
003024  000004                  .WORD   000004
003026  000010                  .WORD   000010
003030  000020                  .WORD   000020
003032  000040                  .WORD   000040
003034  000100                  .WORD   000100
003036  000200                  .WORD   000200
003040  000400                  .WORD   000400
003042  001000                  .WORD   001000
003044  002000                  .WORD   002000
003046  004000                  .WORD   004000
003050  010000                  .WORD   010000
003052  020000                  .WORD   020000
003054  040000                  .WORD   040000
003056  100000                  .WORD   100000

003060  177776          DATA10: .WORD   177776  ;STANDARD PATTERN 10
003062  177775                  .WORD   177775
003064  177773                  .WORD   177773
003066  177767                  .WORD   177767
003070  177757                  .WORD   177757
003072  177737                  .WORD   177737
003074  177677                  .WORD   177677
003076  177577                  .WORD   177577
003100  177377                  .WORD   177377
003102  176777                  .WORD   176777
003104  175777                  .WORD   175777
003106  173777                  .WORD   173777
003110  167777                  .WORD   167777
003112  157777                  .WORD   157777
003114  137777                  .WORD   137777
003116  077777                  .WORD   077777

003120  172666          DATA11: .WORD   172666  ;STANDARD PATTERN 11
003122  155555                  .WORD   155555
003124  172666                  .WORD   172666
003126  155555                  .WORD   155555
003130  172666                  .WORD   172666
003132  155555                  .WORD   155555
003134  172666                  .WORD   172666
003136  155555                  .WORD   155555
003140  172666                  .WORD   172666
003142  155555                  .WORD   155555
003144  172666                  .WORD   172666
003146  155555                  .WORD   155555
003150  172666                  .WORD   172666
003152  155555                  .WORD   155555
003154  172666                  .WORD   172666
003156  155555                  .WORD   155555

003160  077777          DATA12: .WORD   077777  ;STANDARD PATTERN 12
003162  137777                  .WORD   137777
```

H5


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003164  157777                          .WORD   157777
003166  167777                          .WORD   167777
003170  173777                          .WORD   173777
003172  175777                          .WORD   175777
003174  176777                          .WORD   176777
003176  177377                          .WORD   177377
003200  177577                          .WORD   177577
003202  177677                          .WORD   177677
003204  177737                          .WORD   177737
003206  177757                          .WORD   177757
003210  177767                          .WORD   177767
003212  177773                          .WORD   177773
003214  177775                          .WORD   177775
003216  177776                          .WORD   177776

003220  155555                  DATA13: .WORD   155555  ;STANDARD PATTERN 13
003222  066667                          .WORD   066667
003224  155555                          .WORD   155555
003226  066667                          .WORD   066667
003230  155555                          .WORD   155555
003232  066667                          .WORD   066667
003234  155555                          .WORD   155555
003236  066667                          .WORD   066667
003240  155555                          .WORD   155555
003242  066667                          .WORD   066667
003244  155555                          .WORD   155555
003246  066667                          .WORD   066667
003250  155555                          .WORD   155555
003252  066667                          .WORD   066667
003254  155555                          .WORD   155555
003256  066667                          .WORD   066667

003260  000000                  DATA14: .WORD   000000  ;STANDARD PATTERN 14
003262  177777                  ONES:   .WORD   177777  ;ALL 1'S DATA PATTERN
003264  177777                          .WORD   177777
003266  177777                          .WORD   177777
003270  177777                          .WORD   177777
003272  177777                          .WORD   177777
003274  177777                          .WORD   177777
003276  177777                          .WORD   177777
003300  177777                          .WORD   177777
003302  177777                          .WORD   177777
003304  177777                          .WORD   177777
003306  177777                          .WORD   177777
003310  177777                          .WORD   177777
003312  177777                          .WORD   177777
003314  177777                          .WORD   177777
003316  177777                          .WORD   177777

003320  177777                  DATA15: .WORD   177777  ;STANDARD PATTERN 15
003322  000000                          .WORD   000000
003324  000000                          .WORD   000000
003326  000000                          .WORD   000000
003330  000000                          .WORD   000000
003332  000000                          .WORD   000000
003334  000000                          .WORD   000000
003336  000000                          .WORD   000000
```

003340	000000	.MDRD	000000
003342	000000	.MDRD	000000
003344	000000	.MDRD	000000
003346	000000	.MDRD	000000
003350	000000	.MDRD	000000
003352	000000	.MDRD	000000
003354	000000	.MDRD	000000
003356	000000	.MDRD	000000

ERROR POINTER TABLE

```
                                .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:

                                ;0      $EM             ;POINTS TO THE ERROR MESSAGE
                                ;2      $DTH            ;POINTS TO THE DATA HEADER
                                ;4      $DT             ;POINTS TO THE DATA
                                ;6      $DF             ;POINTS TO THE DATA FORMAT

  003360                        $ERRTB:

                                ;ERROR 1

  003360  051026                        .WORD   E1$             ;DH CONTROLLER INTERRUPT OCCURRED (RPAS = 0)
  003362  054031                        .WORD   D1$
  003364  054508                        .WORD   T1$
  003366  000000                        .WORD   0

                                ;ERROR 2

  003370  051077                        .WORD   E2$             ;UNEXPECTED ATTENTION OCCURRED
  003372  054036                        .WORD   D2$
  003374  054510                        .WORD   T2$
  003376  000000                        .WORD   0

                                ;ERROR 3

  003400  051135                        .WORD   E3$             ;MASSBUS PARITY ERROR (MCPE=1)
  003402  054113                        .WORD   D3$
  003404  054514                        .WORD   T3$
  003406  000000                        .WORD   0

                                ;ERROR 4

  003410  051175                        .WORD   E4$             ;MASSBUS PARITY ERROR (PAR=1)
  003412  054141                        .WORD   D4$
  003414  054520                        .WORD   T4$
  003416  000000                        .WORD   0

                                ;ERROR 5

  003420  051230                        .WORD   E5$             ;NOT USED
  003422  054036                        .WORD   D2$
  003424  054510                        .WORD   T2$
  003426  000000                        .WORD   0

                                ;ERROR 6

  003430  051264                        .WORD   E6$             ;DHXX DIDN'T RESPOND TO ADDRESSING
  003432  054200                        .WORD   D6$
  003434  054524                        .WORD   T6$
  003436  000000                        .WORD   0
```

ERROR POINTER TABLE

```
                        ;THIS ROUTINE HANDLES UNEXPECTED TIMEOUTS
                        ;
003600  011600          BUSTMO: MOV     (SP),R0         ;SAVE PC WHERE THE TIME OUT OCCURED
003602  005740                  TST     -(R0)           ;ADJUST PC -2
003604  022626                  CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
003606  104401  003656          TYPE    ,65$            ;TYPE ASCIZ STRING
003612  000417                  BR      6$              ;GET OVER THE ASCIZ
                        ;65$:   .ASCIZ  <CRLF><LF><LF>/UNEXPECTED BUS TIMEOUT, PC=/
003712                  6$:
003712  010046                  MOV     R0,-(SP)        ;SETUP FOR TYPING OUT PC
003714  104402                  TYPOC
003716  000240                  NOP                     ;PUT "HALT(0)" INSTRUCTION HERE IF YOU WISH
                                                        ;TO STOP ON UNEXPECTED TIMEOUT.
003720  000406                  BR      START1          ;BRANCH TO START1
                        ;
                        .SBTTL  START OF PROGRAM
                        ;
003722  012737  177777  001552 START:  MOV     #-1,CHGADR      ;ALLOW UNIX/XPDP7 ADDRESS TO BE CHANGED
003730  000407                  BR      START2          ;START THE PROGRAM
                        ;
003732  012737  000400  001552 START1: MOV     #400,CHGADR     ;CLEAR UNIX/XPDP7 ADDRESS CHANGE FLAG
                        ;;=====================================================================
003740  000240          TST1:   NOP
003742  012737  000001  001212          MOV     #1,@#TESTN      ;;SET TEST NUMBER IN APT MAIL BOX
                        ;
003750  005227  000000  START2: INC     #0              ;TTY LOOP, WAIT FOR INCREMENT
003754  001375                  BNE     .-6             ;OF WORD
003756  000005                  RESET                   ;CLEAR THE WORLD
                        ;
                        .SBTTL  INITIALIZE THE COMMON TAGS
                        ;;CLEAR THE COMMON TAGS (SCMTAG) AREA
003760  012706  001116          MOV     #SCMTAG,R0      ;;FIRST LOCATION TO BE CLEARED
003764  005020          CLRLOP: CLR     (R0)+           ;;CLEAR MEMORY LOCATION
003766  022706  001154          CMP     #SUR,R0         ;;DONE?
003772  001374                  BNE     .-6             ;;LOOP BACK IF NO
003774  012706  001100          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                        ;;INITIALIZE A FEW VECTORS
003600  012737  035022  000030          MOV     #ERROR,@#ERRVEC ;;ERR VECTOR FOR ERROR ROUTINE
003606  012737  000340  000032          MOV     #340,@#ERRVEC+2 ;;LEVEL 7
003614  012737  040336  000034          MOV     #TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
003622  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
003630  012737  037720  000024          MOV     #PWRDWN,@#PWRVEC ;;POWER FAILURE VECTOR
003636  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
003644  012737  176543  037504          MOV     #176543,@#MCNUM1 ;;SEED THE RANDOM NUMBER GENERATOR
003652  012737  123456  037506          MOV     #123456,@#LONUM1 ;;BOTH HIGH AND LOW WORDS
                        ;;SIZE FOR A HARDWARE SWITCH REGISTER.  IF NOT FOUND OR IT IS
                        ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
003660  013746  000004          MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
003664  012737  003720  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
003672  012737  177570  001154          MOV     #SWR,SUR        ;;SETUP FOR A HARDWARE SWITCH REGISTER
003700  012737  177570  001156          MOV     #DISP,DISPLAY   ;;AND A HARDWARE DISPLAY REGISTER
003706  022777  177777  175240          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
003714  001012                  BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                        ;;AND THE HARDWARE SWR IS NOT = -1
003716  000403                  BR      65$             ;;BRANCH IF NO TIMEOUT
003720  012716  003726  64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
003724  000002                  RTI
```

```
                        ;INITIALIZE THE COMMON TAGS
 003726 012737 000176 001154 65$:   MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
 003734 012737 000176 001156        MOV     #DISPREG,DISPLAY
 003742 012637 000004               MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

 003746 005037 001214               CLR     @PASS           ;;CLEAR PASS COUNT
 003752 132737 000200 001227        BITB    #APTSIZE,@ENVIR ;;TEST USER SIZE UNDER APT
 003760 001405                      BEQ     67$             ;;YES,USE NON-APT SWITCH
 003762 012737 001230 001154        MOV     #1$WREG,SWR     ;;NO,USE APT SWITCH REGISTER
 003770                         67$:
                        ;SETUP "TIMEOUT" TRAP VECTOR FOR UNEXPECTED BUS TIMEOUTS
 003770 012737 003440 000004        MOV     #BUSTMO,ERRVEC  ;SETUP FOR UNEXPECTED TIMEOUT
 003776 012737 000500 000006        MOV     #PR5,ERRVEC+2   ;LEVEL 6

 004004 104401 001432               TYPE    ,REV            ;TYPE PROGRAM ID, REV LEVEL & PATCH LEVEL
                        .SBTTL  TYPE PROGRAM NAME
                        ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
 004010 005227 177777               INC     #-1             ;;FIRST TIME?
 004014 001022                      BNE     68$             ;;BRANCH IF NO
 004016 104401 004026               TYPE    ,69$            ;;TYPE ASCIZ STRING
 004022 000417                      BR      68$             ;;GET OVER THE ASCIZ
                        ;;69$:  .ASCIZ  <CRLF><BPO7 PERFORMANCE EXERCISER><CRLF>
 004062                         68$:
                        .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
 004062 005737 000042               TST     @42             ;;ARE WE RUNNING UNDER XXDP/ACT?
 004066 001012                      BNE     70$             ;;BRANCH IF YES
 004070 121727 001226 000001        CMPB    @ENV,#1         ;;ARE WE RUNNING UNDER APT?
 004076 001406                      BEQ     70$             ;;BRANCH IF YES
 004100 027727 001154 000176        CMP     @SWR,#SWREG     ;;SOFTWARE SWITCH REG SELECTED?
 004106 001005                      BNE     71$             ;;BRANCH IF NO
 004110 104406                      CTSWR                   ;;GET SOFT-SWR SETTINGS
 004112 000405                      BR      71$
 004114 112737 000001 001150 70$:   MOVB    #1,@AUTOB       ;;SET AUTO-MODE INDICATOR
 004122                         71$:

                        ;THE FOLLOWING FINDS OUT THE PROGRAM CONTROL MODE:
                        ;PAPER TAPE (MANUAL), ACT11, XXDP CHAIN OR DUP

 004122 005037 001430               CLR     XXDP            ;CLEAR 'XXDP' LOAD DEVICE STORAGE
 004126 122737 177777 000041        CMPB    #-1,@41         ;LOADED FROM AN BPO7 ? (UNKNOWN)
 004134 001121                      BNE     5$              ;BR IF NOT
 004136 013737 000040 001430        MOV     @40,XXDP        ;GET DEVICE INDICATOR AND NUMBER
 004144 122737 000007 001430        CMPB    #7,XXDP         ;IS IT A VALID NUMBER ?
 004152 103002                      BHIS    10$             ;YES
 004154 105037 001430               CLRB    XXDP            ;NO, DEFAULT TO DRIVE 0
 004160 005737 000042       10$:    TST     @42             ;CHAIN MODE OR ACT11 AUTO ACCEPT ?
 004164 001425                      BEQ     2$              ;BR IF NEITHER
 004166 104401 004174               TYPE    ,73$            ;;TYPE ASCIZ STRING
 004172 000412                      BR      72$             ;;GET OVER THE ASCIZ
                        ;;73$:  .ASCIZ  <CRLF>/NOT TESTING DRIVE /
 004220                         72$:
 004220 005046                      CLR     -(SP)           ;CLEAR WORD ON STACK
 004222 113716 001430               MOVB    XXDP,(SP)       ;GET DRIVE ADDRESS
 004226 104403                      TYPOS                   ;TYPE THE ADDRESS
 004230     001                     .BYTE   1               ;ONLY 1 CHARACTER
 004231     000                     .BYTE   0               ;SUPRESS LEADING ZEROS
 004232 104401 001203               TYPE    ,$CRLF          ;CR-LF
 004236 000460                      BR      3$              ;GET NUMBER OF DRIVES
```

GET VALUE FOR SOFTWARE SWITCH REGISTER

```
                53
                54 004240  005227  177777          20:     INC     @-1             ;FIRST TIME THRU HERE ?
                55 004244  001055                          BNE     5$              ;NO
                56 004246  104401  004254                   TYPE    ,75$            ;;TYPE ASCIZ STRING
                   004252  000410                          BR      74$             ;;GET OVER THE ASCIZ
                                                  ;;75$:    .ASCIZ  <CRLF>/TO TEST DRIVE /
                   004274                         74$:
                57 004274  005046                          CLR     -(SP)           ;CLEAR WORD ON STACK
                58 004276  113716  001430                   MOVB    RXDP,(SP)       ;GET DRIVE ADDRESS
                59 004302  104403                          TYPOS                   ;TYPE DRIVE ADDRESS
                60 004304     001                          .BYTE   1               ;ONLY 1 CHARACTER
                61 004305     000                          .BYTE   0               ;SUPRESS LEADING ZEROS
                62 004306  104401  004314                   TYPE    ,76$            ;;TYPE ASCIZ STRING
                   004312  000432                          BR      5$              ;;GET OVER THE ASCIZ
                                                  ;;76$:    .ASCIZ  /, HALT PROGRAM, CLEAR LOC. 40 AND RESTART PROGRAM./<CRLF>
                   004400                         5$:
                66 004400  004737  033510                   JSR     PC,@#TKINT      ;TURN ON THE KEYBOARD INTERRUPT
                67 004404  105737  001226                   TSTB    @ENV            ;RUN UNDER APT MODE
                68 004410  001415                          BEQ     5$              ;NO,DO NOT BOTHER
                69 004412  105737  001256                   TSTB    @VECT1          ;NEW VECTOR ?
                70 004416  001405                          BEQ     4$              ;NOT LOAD IF = 0
                71 004420  113737  001256  001274          MOVB    @VECT1,@#PVEC   ;NEW VECTOR
                72 004426  005737  001262           4$:    TST     @BASE           ;NEW BASE ADDRESS ?
                73 004432  001411                          BEQ     6$              ;NO
                74 004434  013737  001262  001272          MOV     @BASE,@#PADR    ;NEW BASE ADDRESS
                75 004442  000405                          BR      6$
                76
                77 004444  105737  001150           5$:    TSTB    @AUTOB          ;RUNNING IN AUTO MODE ?
                78 004450  001002                          BNE     6$              ;YES
                79 004452  004737  062476                   JSR     PC,BUSADR       ;CHECK RHXX/RP07 BUS ADDRESS
                80 004456  013737  001272  040640   6$:    MOV     @#PADR,PADR     ;LOAD ADDRESS INTO DRIVER
                81 004464  013737  001274  040642          MOV     @#PVEC,PVEC     ;LOAD VECTOR INTO DRIVER
                82 004472  005037  001314                   CLR     STATIN          ;CLEAR PERFORMANCE SUMMARY TYPEOUT FLAG
                83 004476  012705  001520                   MOV     @ORDERQ,R5      ;START OF AREA TO CLEAR
                84 004502  005025                   7$:    CLR     (R5)+
                85 004504  022705  002056                   CMP     @BLKADR,R5      ;LOOK FOR END OF CLEAR AREA
                86 004510  001374                          BNE     7$              ;BR IF NOT FINISHED
                87 004512  012706  001100                   MOV     @STACK,SP       ;SETUP THE STACK POINTER
                88 004516  005037  177776                   CLR     PS              ;CLEAR THE PROCESSOR STATUS WORD
                89 004522  013737  001312  001346          MOV     HERTZ,ONESEC    ;RESTORE ONE SECOND COUNTER VALUE
                90 004530  005037  001340                   CLR     HOUR            ;CLEAR THE HOUR'S COUNTER
                91 004534  005037  001342                   CLR     MINUTE          ;CLEAR THE MINUTE'S COUNTER
                92 004540  005037  001344                   CLR     SECOND          ;CLEAR THE SECOND'S COUNTER
                93 004544  005037  001472                   CLR     INTRVL+2        ;CLEAR INTERVAL COUNTER
                94 004550  013737  001462  001464          MOV     CMPTIM,CMPTIM+2 ;INIT COMPARE TIME COUNTER
                95 004556  005037  001334                   CLR     CFLAG           ;CLEAR THE 'CONTROL C' FLAG
                98 004562  005037  046446                   CLR     DRIVE0+@FIRST   ;RESET @FIRST FLAG FOR DRIVE 0
                   004566  005037  046710                   CLR     DRIVE1+@FIRST   ;RESET @FIRST FLAG FOR DRIVE 1
                   004572  005037  047152                   CLR     DRIVE2+@FIRST   ;RESET @FIRST FLAG FOR DRIVE 2
                   004576  005037  047414                   CLR     DRIVE3+@FIRST   ;RESET @FIRST FLAG FOR DRIVE 3
                   004602  005037  047656                   CLR     DRIVE4+@FIRST   ;RESET @FIRST FLAG FOR DRIVE 4
                   004606  005037  050120                   CLR     DRIVE5+@FIRST   ;RESET @FIRST FLAG FOR DRIVE 5
                   004612  005037  050362                   CLR     DRIVE6+@FIRST   ;RESET @FIRST FLAG FOR DRIVE 6
                   004616  005037  050624                   CLR     DRIVE7+@FIRST   ;RESET @FIRST FLAG FOR DRIVE 7
               103 004622  005037  001424                   CLR     RDONLY          ;ASSUME READ/WRITE CONDITION
               104 004626  032777  000001  174320          BIT     @SW0,@SWR       ;IS EXERCISER IN 'READ ONLY' MODE ?
               105 004634  001402                          BEQ     8$              ;BR IF NO
```

GET VALUE FOR SOFTWARE SWITCH REGISTER

```
106 004636  005237  001424                    INC     RDONLY          ;LOCK PROGRAM IN 'READ ONLY' MODE
107 004642                              8$:
109
110                                     ;SEE IF OPERATOR WANTS HELP TEXT PRINTED
111
112 004642  105737  001150                    TSTB    $AUTOB          ;AUTO MODE ?
113 004646  001035                            BNE     13$             ;BR IF YES
114 004650  005227  177777                    INC     #-1             ;FIRST TIME THRU HERE ?
115 004654  001032                            BNE     13$             ;BR IF NO
116
117 004656  104401  064370              9$:   TYPE    ,MSHELP         ;TYPE 'TYPE HELP MESSAGE (L) N ? '
118 004662  104411                            RDLIN                   ;READ THE ENTRY
119 004664  012600                            MOV     (SP)+,R0        ;SAVE ADDRESS OF RESPONSE
120 004666  005737  001334                    TST     CFLAG           ;WAS (↑C) TYPED?
121 004672  001013                            BNE     10$             ;BR IF YES
122 004674  105710                            TSTB    (R0)            ;WAS RESPONSE A CARRIAGE RETURN ?
123 004676  001414                            BEQ     11$             ;BR IF YES (DEFAULT)
124 004700  105760  000001                    TSTB    1(R0)           ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
125 004704  001006                            BNE     10$             ;BR IF NO
126 004706  122710  000131                    CMPB    #'Y,(R0)        ;WAS IT A 'Y' RESPONSE ?
127 004712  001411                            BEQ     12$             ;BR IF YES
128 004714  122710  000116                    CMPB    #'N,(R0)        ;WAS IT A 'N' RESPONSE ?
129 004720  001410                            BEQ     13$             ;BR IF YES
130 004722  104401  060163              10$:  TYPE    ,BADENT         ;TYPE BAD ENTRY MESSAGE
131 004726  000753                            BR      9$              ;TRY AGAIN
132 004730  104401  057077              11$:  TYPE    ,NODFLT         ;TYPE 'NO DEFAULT'
133 004734  000750                            BR      9$              ;TRY AGAIN
134 004736  104401  064500              12$:  TYPE    ,HELPTX         ;TYPE HELP TEXT MESSAGE
135 004742                              13$:
```

```
                                        ;AUTO SIZE FOR RH70 CONTROLLER AND DETERMINE IF IT IS
                                        ;JUMPERED FOR 22 OR 32 REGISTERS

004742  005037  040646          SIZE70: CLR     RHEXT           ;CLEAR RPBAE OFFSET
004746  042737  174000  001234          BIC     #174000,$CPUOP  ;CLEAR CPU TYPE REGISTER
004754  013746  000004                  MOV     ERRVEC,-(SP)    ;SAVE CONTENTS OF ERROR VECTOR
004760  012737  005032  000004          MOV     #2$,ERRVEC      ;SETUP 'TRAP' RETURN ADDRESS
004766  013700  001272                  MOV     $RPADR,R0       ;GET RPCS1 ADDRESS
004772  062700  000050                  ADD     #50,R0          ;GET REGISTER OFFSET FOR RH70
004776  012701  000012                  MOV     #10.,R1         ;GET NUMBER OF REGISTERS TO CHECK
005002  005720                          TST     (R0)+           ;TRAP IF NOT A VALID RPBAE
005004  005720                          TST     (R0)+           ;TRAP IF NOT A VALID RPCS3
005006  012737  000050  040646          MOV     #50,RHEXT       ;LOAD OFFSET FOR RPBAE (22 REGISTER RH)
005014  005720                  1$:     TST     (R0)+           ;TRAP IF NOT A VALID REGISTER
005016  005301                          DEC     R1              ;DONE WITH ALL 32 REGISTERS ?
005020  001375                          BNE     1$              ;BR IF NO
005022  012737  000074  040646          MOV     #74,RHEXT       ;LOAD OFFSET FOR RPBAE (32 REGISTER RH)
005030  000403                          BR      3$
005032  012716  005040          2$:     MOV     #3$,(SP)        ;SETUP RETURN ADDRESS
005036  000002                          RTI

005040  013700  001272          3$:     MOV     $RPADR,R0       ;GET RPCS1 REGISTER
005044  013701  040646                  MOV     RHEXT,R1        ;GET RPBAE REGISTER OFFSET
005050  001416                          BEQ     4$              ;BR IF NONE
005052  060001                          ADD     R0,R1           ;GET RPBAE REGISTER
005054  052710  001400                  BIS     #A17!A16,(R0)   ;SET EXTENDED ADDRESS BITS IN RPCS1
005060  022711  000003                  CMP     #3,(R1)         ;ARE THE EXTENDED BITS SET IN RPBAE ?
005064  001010                          BNE     4$              ;BR IF NO
005066  005011                          CLR     (R1)            ;CLEAR EXTENDED ADDRESS BITS IN RPBAE
005070  011046                          MOV     (R0),-(SP)      ;SAVE RPCS1 REG CONTENTS
005072  042726  176377                  BIC     #^C<A17!A16>,(SP)+      ;ARE THE EXTEND BITS CLEAR IN RPCS1 ?
005076  001003                          BNE     4$              ;BR IF NO
005100  052737  030000  001234          BIS     #BIT13!BIT12,$CPUOP     ;SET THE 11/70 CPU TYPE CODE
005106  012637  000004          4$:     MOV     (SP)+,ERRVEC    ;RESTORE CONTENTS OF ERROR VECTOR
```

```
                                        ;ROUTINE TO DETERMINE BUFFER MAX WORD COUNT
                                        ;
005112  005227  177777        SIZMEM: INC     #-1             ;FIRST TIME THRU HERE ?
005116  001005                        BNE     1$              ;BR IF NO
005120  004737  062344                JSR     PC,$SIZE        ;SEE HOW MUCH MEMORY ON SYSTEM
005124  013737  062474  001330        MOV     $LSTAD,LSTAD    ;SAVE THE LAST ADDRESS
005132  012737  000001  001654  1$:   MOV     #1,BUFTBL       ;LOAD NUMBER OF BUFFERS
005140  012737  064370  001656        MOV     #ENDPGM,BUFTBL+2        ;STARTING ADDRESS OF BUFFER
005146  013737  001330  001660        MOV     LSTAD,BUFTBL+4  ;LAST ADDR TO BUFFER ALLOCATION TABLE
005154  023727  001330  160000        CMP     LSTAD,#160000   ;OVER 28K ?
005162  101403                        BLOS    2$              ;NO
005164  012737  160000  001660        MOV     #160000,BUFTBL+4        ;XXDP MAX MEMORY 28K
005172  162737  064370  001660  2$:   SUB     #ENDPGM,BUFTBL+4        ;SUBTRACT PROGRAM SPACE
005200  000241                        CLC                     ;CLEAR THE 'C' BIT
005202  006037  001660                ROR     BUFTBL+4        ;CONVERT TO WORD COUNT
005206  105737  001150                TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
005212  001403                        BEQ     3$              ;BR IF NO
005214  162737  003000  001660        SUB     #1536.,BUFTBL+4 ;SUBTRACT 'XXDP' LOADER SIZE (1.5K WORDS)
005222  023737  001466  001660  3$:   CMP     WRDCNT,BUFTBL+4 ;IS MAX WORD COUNT TOO LARGE ?
005230  003406                        BLE     4$              ;BR IF NO
005232  013737  001660  001466        MOV     BUFTBL+4,WRDCNT ;USE MAX AVAIL MEMORY AS MAX WRD CNT
005240  013737  001466  060646        MOV     WRDCNT,PARLST+2 ;VALUE FOR THE PARAMETER TABLE
005246                        4$:
```

GET VALUE FOR SOFTWARE SWITCH REGISTER

```
                                ;SEE IF THE OPERATOR WANTS TO CHANGE ANY PARAMETERS
                                ;
005246  005737  040100          LKPAR:  TST     PWRFLG          ;RETURNING FROM POWER FAIL ?
005252  001154                          BNE     SETVEC          ;BRANCH IF YES
005260  105737  001150                  TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
005264  001404                          BEQ     1$              ;BR IF NO
005266  032777  000004  173660          BIT     @SW02,@SWR      ;DOES USER WANT MANUAL INTERVENTION ?
005274  001467                          BEQ     8$              ;BR IF YES
                                ;
005276  005037  001334          1$:     CLR     CFLAG           ;CLEAR CONTROL C FLAG
005302  104401  060306                  TYPE    .MESFE          ;TYPE 'DO YOU WANT TO WRITE ANYWHERE ON MEDIA (L) N ?'
005306  104411                          RDLIN                   ;READ THE ENTRY
005310  012600                          MOV     (SP)+,R0        ;SAVE ADDRESS OF RESPONSE
005312  005737  001334                  TST     CFLAG           ;WAS IT CONTROL C ?
005316  001353                          BNE     LKPAR           ;BR IF YES
005320  105710                          TSTB    (R0)            ;WAS RESPONSE A CARRIAGE RETURN ?
005322  001454                          BEQ     8$              ;BR IF YES
005324  105760  000001                  TSTB    1(R0)           ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
005330  001006                          BNE     2$              ;BR IF NO
005332  122710  000131                  CMPB    #'Y,(R0)        ;WAS IT A 'Y' RESPONSE ?
005336  001406                          BEQ     3$              ;BR IF YES
005340  122710  000116                  CMPB    #'N,(R0)        ;WAS IT A 'N' RESPONSE ?
005344  001443                          BEQ     8$              ;BR IF YES
005346  104401  060163          2$:     TYPE    .BADENT         ;TYPE BAD ENTRY MESSAGE
005352  000735                          BR      LKPAR           ;TRY AGAIN
005354  005737  001424          3$:     TST     RDONLY          ;PROGRAM RUNNING IN READ ONLY MODE ?
005360  001032                          BNE     7$              ;BR IF YES
                                ;
005362  005037  001334          4$:     CLR     CFLAG           ;CLEAR CONTROL C FLAG
005366  104401  060367                  TYPE    .OVRWRT         ;TYPE '   ! CUSTOMER DATA WILL BE OVERWRITTEN !
                                ;                               ;     -----------------------------------
                                ;                               ;CONTINUE (L)  ?'
005372  104411                          RDLIN                   ;READ THE ENTRY
005374  012600                          MOV     (SP)+,R0        ;SAVE ADDRESS OF RESPONSE
005376  005737  001334                  TST     CFLAG           ;WAS IT CONTROL C ?
005402  001321                          BNE     LKPAR           ;BR IF YES
005404  105710                          TSTB    (R0)            ;WAS RESPONSE A CARRIAGE RETURN ?
005406  001414                          BEQ     6$              ;BR IF YES
005410  105760  000001                  TSTB    1(R0)           ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
005414  001006                          BNE     5$              ;BR IF NO
005416  122710  000131                  CMPB    #'Y,(R0)        ;WAS IT A 'Y' RESPONSE ?
005422  001411                          BEQ     7$              ;BR IF YES
005424  122710  000116                  CMPB    #'N,(R0)        ;WAS IT A 'N' RESPONSE ?
005430  001411                          BEQ     8$              ;BR IF YES
005432  104401  060163          5$:     TYPE    .BADENT         ;TYPE BAD ENTRY MESSAGE
005436  000751                          BR      4$              ;TRY AGAIN
005440  104401  057077          6$:     TYPE    .NODFLT         ;TYPE 'NO DEFAULT'
005444  000746                          BR      4$              ;TRY AGAIN
005446  005237  001422          7$:     INC     TSTANY          ;ENABLE TEST ANYWHERE OPTION
005452  000402                          BR      9$
005454  104401  060531          8$:     TYPE    .FEONLY         ;TYPE '* TESTING WILL OCCUR ON FE CYLINDER ONLY *'
                                ;
005460  005737  001424          9$:     TST     RDONLY          ;IS PROGRAM LOCKED IN "READ ONLY" MODE ?
005464  001402                          BEQ     13$             ;BR IF NO
005466  104401  060570                  TYPE    .MREAD          ;TYPE '* PROGRAM IS LOCKED IN 'READ ONLY' MODE *'
                                ;
005472  005037  001334          13$:    CLR     CFLAG           ;CLEAR CONTROL C FLAG
```

```
                                                TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
                                                BNE     SETVEC          ;BR IF YES
                                                TYPE    ,ASKPAR         ;TYPE 'CHANGE PARAMETERS ?'
                                                RDLIN                   ;READ THE ENTRY
                                                MOV     (SP)+,R0        ;SAVE ADDRESS OF RESPONSE
                                                TST     CFLAG           ;WAS (^C) TYPED?
                                                BNE     13$             ;BR IF YES
                                                TSTB    (R0)            ;WAS RESPONSE A CARRIAGE RETURN (DEFAULT 'N')?
                                                BEQ     SETVEC          ;BR IF YES
                                                TSTB    1(R0)           ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
                                                BNE     14$             ;BR IF NO
                                                CMPB    @'Y,(R0)        ;WAS IT A 'Y' RESPONSE ?
                                                BEQ     ENTPR           ;BR IF YES
                                                CMPB    @'N,(R0)        ;WAS IT A 'N' RESPONSE ?
                                                BEQ     SETVEC          ;BR IF YES
                                        14$:    TYPE    ,BADENT         ;TYPE BAD ENTRY MESSAGE
                                                BR      13$             ;TRY AGAIN
                                        15$:
                                        ENTPR:  MOV     @PARLST,R3      ;PARAMETER TABLE ADDRESS
                                                JSR     PC,PARENT       ;GET THE PARAMETER ENTRY
                                                CMP     WRDCNT,@6       ;IS THE 'WRDCNT' VALUE OK ?
                                                BHIS    SETVEC          ;BR IF IT IS
                                                MOV     @6,WRDCNT       ;SET 'WRDCNT' TO THE MINIMUM VALUE
```

F6


```
                                        ;DISPLAY DRIVE STATUS AND SET UP THE OTHER SYSTEM DEVICES THAT
                                        ;THE PROGRAM WILL USE. PROGRAM RETURN HERE ON POWER FAIL
                                        ;
005604  004737  024574          SETVEC: JSR     PC,@#CKCLK      ;START THE CLOCK
005610  004737  040652                  JSR     PC,RPINIT       ;INITIALIZE THE RP07 DRIVER
005614  012737  177777  040602          MOV     #-1,SAVEFG      ;SET THE SAVE REGISTERS FLAG
005622  005227  177777                  INC     #-1             ;FIRST TIME THRU ?
005626  001407                          BEQ     1$              ;BR IF YES
005630  005737  040100                  TST     PWRFLG          ;RETURNING FROM POWER FAIL ?
005634  001004                          BNE     1$              ;BRANCH IF YES
005636  032777  000004  173310          BIT     #SW02,@#SWR     ;TYPEOUT THE DRIVE STATUS TABLE ?
005644  001113                          BNE     12$             ;BR IF NOT
005646  005004                  1$:     CLR     R4              ;DRIVE TABLE POINTER
005650  104401  057113                  TYPE    ,DRSTAT         ;TYPE 'DRIVE STATUS'
005654  104401  001203          2$:     TYPE    ,$CRLF          ;CR-LF
005660  010446                          MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                                ;;TYPE DRIVE NUMBER
005662  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
005664     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
005665     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
005666  104401  056606                  TYPE    ,BLNKS4         ;TYPE 4 BLANKS
005672  105764  040534                  TSTB    DRVSTA(R4)      ;CHECK DRIVE'S STATUS
005676  100416                          BMI     5$              ;BR IF UNSAFE
005700  001020                          BNE     6$              ;BR IF ONLINE
                                        ;
005702  105764  040544                  TSTB    DRVTYP(R4)      ;SEE IF OFFLINE OR NONEXISTENT
005706  001404                          BEQ     3$              ;BR IF NONEXISTENT
005710  100006                          BPL     4$              ;BR IF OFFLINE
005712  104401  056760                  TYPE    ,NOTRP          ;DRIVE NOT AN RP07
005716  000460                          BR      11$             ;CHECK NEXT DRIVE
                                        ;
005720  104401  056775          3$:     TYPE    ,NOTPRS         ;DRIVE NOT PRESENT
005724  000455                          BR      11$             ;CHECK NEXT DRIVE
                                        ;
005726  104401  056667          4$:     TYPE    ,UNTOFF         ;DRIVE OFFLINE
005732  000416                          BR      8$              ;PRINT DRIVE TYPE
                                        ;
005734  104401  057031          5$:     TYPE    ,NOTSAF         ;DRIVE UNSAFE
005740  000413                          BR      8$              ;PRINT DRIVE TYPE
                                        ;
005742  005737  001430          6$:     TST     XXDP            ;LOADED FROM THIS DEVICE ?
005746  001406                          BEQ     7$              ;BR IF NO
005750  123704  001430                  CMPB    XXDP,R4         ;LOADED FROM THIS DRIVE ?
005754  001003                          BNE     7$              ;BR IF NO
005756  104401  057041                  TYPE    ,LODEV          ;TYPE 'LOAD DEVICE'
005762  000436                          BR      11$
005764  104401  056700          7$:     TYPE    ,UNTON          ;DRIVE ONLINE
005770  104401  056610          8$:     TYPE    ,BLNKS2         ;TYPE 2 BLANKS
005774  005000                          CLR     R0
005776  116400  040544                  MOVB    DRVTYP(R4),R0   ;GET DRIVE TYPE
006002  012737  057155  006026          MOV     #$RP07,10$      ;ASSUME ADDRESS OF RP07 MESSAGE
006010  122700  000005                  CMPB    #5,R0           ;IS DEVICE AN RP07 ?
006014  001403                          BEQ     9$              ;TYPE IT IF YES
006016  012737  057162  006026          MOV     #$RP07P,10$     ;ASSUME ADDRESS OF RP07+ MESSAGE
                                        ;
006024  104401                  9$:     TYPE                    ;TYPE THE DRIVE TYPE MESSAGE
006026  000000                  10$:    .WORD   0               ;MESSAGE ADDRESS HERE
```

GET VALUE FOR SOFTWARE SWITCH REGISTER

```
 57
 58 006030  006304                        ASL     R4              ;CHANGE TO WORD INDEX
 59 006032  016402  002056                MOV     BLKADR(R4),R2   ;GET BASE ADDRESS
 60 006036  006204                        ASR     R4              ;CHANGE TO BYTE INDEX
 61 006040  004737  045342                JSR     PC,SVRHXX       ;SAVE ALL REGISTERS
 62 006044  032762  000004  000200        BIT     #ILV,$RPDS(R2)  ;INTERLEAVE SECTOR SET ?
 63 006052  001002                        BNE     11$             ;BR IF YES
 64 006054  104401  057056                TYPE    ,NINLEV         ;TYPE NON-INTERLEAVED MESSAGE
 65
 66 006060  005204                  11$:  INC     R4              ;INCREMENT DRIVE NUMBER/TABLE POINTER
 67 006062  020427  000010                CMP     R4,#8.          ;FINISHED ?
 68 006066  001272                        BNE     2$              ;BR IF NOT
 69 006070  104401  001203                TYPE    ,$CRLF          ;CR-LF
 70 006074                            12$:
```

```
                                        ;INITIALIZE PROGRAM PARAMETERS FOR STARTUP
                                        
006074  004737  033510          STA:    JSR     PC,@TKINT       ;INITIALIZE THE KEYBOARD INTERRUPT HANDLER
006100  012737  142200  001446          MOV     #142200,ENDCON  ;INITIALIZE NORMAL XFER COUNT(LSB)
006106  012737  007540  001450          MOV     #7540,ENDCON+2  ;(MSB)
006114  032777  001000  173032          BIT     #SW9,@SWR       ;DO YOU WANT SHORT RUN TIME (SW9=1) ?
006122  001406                          BEQ     1$              ;BR IF NO
006124  012737  030440  001446          MOV     #030440,ENDCON  ;INITIALIZE (1/4 OF NORMAL) XFER COUNT(LSB)
006132  012737  001730  001450          MOV     #1730,ENDCON+2  ;(MSB)
                                        
006140  105737  001226          1$:     TSTB    @ENV            ;APT SCRIPT MODE ?
006144  001406                          BEQ     2$              ;NO
006146  012737  006110  001446          MOV     #006110,ENDCON  ;INITIALIZE (1/16 OF NORMAL) XFER COUNT(LSB)
006154  012737  000366  001450          MOV     #366,ENDCON+2   ;(MSB)
                                        
006162  105737  001150          2$:     TSTB    @AUTOB          ;RUNNING IN AUTO MODE ?
006166  001003                          BNE     3$              ;BR IF YES
006170  005737  001332                  TST     CHGADR          ;START AT 200 ?
006174  003454                          BLE     8$              ;NO
                                        
006176  005001          3$:     CLR     R1              ;DRIVE 0
006200  005002                  CLR     R2              ;AVAIL TABLE INDEX
006202  005003                  CLR     R3              ;DRIVE0 * 2
006204  005737  001430          4$:     TST     XXDP            ;LOADED FROM THIS DEVICE ?
006210  001405                          BEQ     5$              ;BR IF NO
006212  123701  001430                  CMPB    XXDP,R1         ;LOADED FROM THIS DRIVE ?
006216  001435                          BEQ     7$              ;BR IF YES
006220  105761  040534          5$:     TSTB    DRVSTA(R1)      ;DRIVE ON LINE ?
006224  003430                          BLE     7$              ;NO
006226  016300  002056                  MOV     BLKADR(R3),R0   ;LOAD DPB ADDRESS
006232  004737  030164                  JSR     PC,CLRDPB       ;CLEAR DPB BLOCK
006236  004737  031070                  JSR     PC,GETID        ;GET DRIVE SERIAL NUMBER
006242  032760  000004  000200          BIT     #ILV,@POS(R0)   ;INTERLEAVE SECTOR SET ?
006250  001402                          BEQ     6$              ;BR IF NO
006252  010062  001566                  MOV     R0,NEWUNT(R2)   ;LOAD DPB ADDRESS TO ABAIL QUEUE
006256  004737  030402          6$:     JSR     PC,DRVPRM       ;SETUP DRIVE PARAMETER LIMITS
006262  005737  040100                  TST     PWRFLG          ;RETURNING FROM POWER FAIL ?
006266  001007                          BNE     7$              ;BRANCH IF YES
006270  005060  000132                  CLR     @FIRST(R0)      ;RESET @FIRST FLAG FOR FIRST 204 START
006274  112760  177776  000026          MOVB    #-2,@PACK(R0)   ;SETUP COMMAND 'WT' (WRITE DATA AND TEST)
006302  004737  020330                  JSR     PC,SEQPAR       ;SETUP SEQUENTIAL PARAMETERS FOR WRITE
                                        
006306  022322          7$:     CMP     (R3)+,(R2)+     ;INCREMENT INDEX
006310  005201                  INC     R1              ;NEXT DRIVE
006312  020127  000007                  CMP     R1,#7           ;ALL DRIVES ASSIGNED ?
006316  003752                          BLE     4$              ;NO
006320  005037  001332                  CLR     CHGADR          ;CLEAR START FLAG
006324  000403                          BR      9$
                                        
006326  012737  000001  001334  8$:     MOV     #1,CFLAG        ;DUMMY 'CONTROL C' FLAG
006334  005037  040100          9$:     CLR     PWRFLG          ;CLEAR POWER FAIL FLAG
```

```
                                .SBTTL  MAIN PROGRAM
                        ;
006340  005737  001534  MAIN:   TST     CFLAG           ;WAS (^C) TYPED?
006344  001407          BEQ     5$              ;BR IF NO
006346  005737  001520  10:     TST     ORDERQ          ;ANY DRIVES IN ORDER QUE ?
006352  001402          BEQ     2$              ;BR IF NO, ELSE
006354  000137  007254          JMP     IDLE            ;LET ALL DRIVES FINISH ORDER
006360  004737  026534  20:     JSR     PC,KSR          ;SERVICE THE KEYBOARD
006364                  5$:
                        ;
                        ;CHECK FOR DRIVES TO BE DROPPED
                        ;
006366  012703  000010  MAINDA: MOV     #8.,R3          ;DRIVE COUNTER
006370  012705  001544          MOV     #DRVS,R5        ;ADDRESS OF 'DROPPED DRIVE' TABLE
006374  005715          10:     TST     (R5)            ;SEE IF ENTRY AT PRESENT POSITION
006376  001004          BNE     3$              ;BR IF THERE IS ONE
006400  005725          20:     TST     (R5)+           ;INCREMENT TO NEXT TABLE POSITION
006402  005303          DEC     R3              ;DECREMENT DRIVE COUNTER
006404  001373          BNE     10              ;BR IF MORE TO CHECK
006406  000437          BR      MAIN1           ;GO CHECK FOR NEW ASSIGNED DRIVES
                        ;
006410  012701  001610  3$:     MOV     #AVAIL,R1       ;ADDRESS OF 'AVAILABLE DRIVES' TABLE
006414  005711          40:     TST     (R1)            ;IF AT END OF 'AVAIL' TABLE ?
006416  001406          BEQ     5$              ;BR IF YES
006420  021115          CMP     (R1),(R5)       ;IS DRIVE IN 'AVAIL' THE TABLE ?
006422  001412          BEQ     7$              ;BR IF YES
006424  005721          TST     (R1)+           ;NO, INCREMENT 'AVAIL' TABLE ADDRESS
006426  000772          BR      4$              ;AND CONTINUE LOOKING
                        ;
006430  012701  001632  5$:     MOV     #WAIT,R1        ;ADDRESS OF THE 'WAIT' BUFFER TABLE
006434  005711          6$:     TST     (R1)            ;AT THE END OF 'WAIT' TABLE ?
006436  001760          BEQ     2$              ;BR IF YES
006440  021115          CMP     (R1),(R5)       ;IS DRIVE IN THE 'WAIT' TABLE ?
006442  001402          BEQ     7$              ;BR IF YES
006444  005721          TST     (R1)+           ;NO, INCREMENT 'WAIT' TABLE ADDRESS
006446  000772          BR      6$              ;AND CONTINUE LOOKING
                        ;
006450  011100  7$:     MOV     (R1),R0         ;PUT THE DRIVE'S BLOCK ADDRESS IN R0
006452  104401  001203          TYPE    ,$CRLF          ;CR-LF
006456  004737  026226          JSR     PC,$TIME        ;TYPE ELAPSED TIME
006462  104401  057401          TYPE    ,DASH5          ;TYPE '-----'
006466  104401  057437          TYPE    ,MSGDRP         ;TYPE 'DROPPED, '
006472  004737  025122          JSR     PC,ONESUM       ;TYPE ONE DRIVE SUMMARY
006476  005015          CLR     (R5)            ;CLEAR THE 'DROP DRIVE' TABLE ENTRY
006500  004737  022260          JSR     PC,CMPRES       ;COMPRESS THE RESPECTIVE TABLE
006504  000735          BR      2$              ;SEE IF ANY MORE DRIVES
```

```
                                        ;LOOK FOR DRIVES TO BE ASSIGNED
000506  012705  000010          MAIN1:  MOV     #8.,R5          ;DRIVE COUNT
000512  005001                          CLR     R1              ;ASSIGN LIST INDEX
000514  005002                          CLR     R2              ;AVAIL. INDEX
000516  005003                          CLR     R3              ;NEW DRIVE INDEX
000520  005765  001566          10:     TST     NEWDRV(R5)      ;NEW DRIVE IN THIS POSITION
000524  001005                          BNE     30              ;BR IF THERE IS
000526  005725                  20:     TST     (R5)+           ;INCREMENT R5
000530  005201                          INC     R1              ;INCREMENT ASSIGN INDEX
000532  005305                          DEC     R5              ;DECREMENT DRIVE COUNT
000534  001371                          BNE     10              ;BR IF MORE DRIVES
000536  000442                          BR      MAIN2           ;START OPERATIONS FOR THE AVAILABLE DRIVES

000540  104401  021205          30:     TYPE    ,CRLF           ;CR-LF
000544  104401  020661                  TYPE    ,DRIVE          ;"DRIVE"
000550  010146                          MOV     R1,-(SP)        ;SAVE R1 FOR TYPEOUT
                                        ;TYPE DRIVE NUMBER
                                        ;CR TYPE--OCTAL ASCII
                                        ;TYPE 2 DIGIT(S)
                                        ;SUPPRESS LEADING ZEROS
000552  104003                          TYPOS   #3              ;TYPE "-"
000554  002                             .BYTE   2
000555  000                             .BYTE   0
000556  104401  020653                  TYPE    ,COPYR          ;TYPE "(C)"
000562  104401  020611                  TYPE    ,BLANK          ;TYPE 1 BLANK
000566  016500  001346                  MOV     NEWADR(R5),R0   ;PUT ADDRESS OF DPB IN R0
000572  004737  015050                  JSR     PC,TYPDRV       ;TYPE DRIVE SERIAL NUMBER
000576  104401  021701                  TYPE    ,DIOD           ;"STARTED"
000602  005742  001610          40:     TST     -AVAIL(R2)      ;AT END OF AVAILABLE TABLE
000606  001402                          BEQ     50              ;BR IF YES
000610  005722                          TST     (R2)+           ;INCREMENT AVAILABLE TABLE INDEX
000612  000773                          BR      40              ;CONTINUE LOOKING FOR END OF TABLE
000614  016542  001566  001610  50:     MOV     NEWADR(R5),-AVAIL(R2)   ;MOVE ADDR OF DRIVE INTO AVAIL LST
000622  005065  001566                  CLR     NEWADR(R5)      ;TAKE DRIVE OUT OF NEW DRIVE TABLE
000626  156137  040650  001342          BISB    ATABIT(R1),ASMLST       ;SET DRIVE ASSIGNED INDICATOR
000634  005017  032100                  CLR     @#177560        ;CLEAR AUTO ASSIGN
000640  005722                          TST     (R2)+           ;INCREMENT AVAILABLE TABLE POINTER
000642  000731                          BR      20              ;LOOK FOR MORE DRIVES
```

K6


```
                                        ;GET PARAMETERS, BUFFER SPACE, AND START ORDERS FOR DRIVES IN
                                        ;THE 'AVAILABLE' QUEUE
                                
006666 005002                   MAIN2:  CLR     R2                      ;START FROM THE FIRST LOCATION
006670 105737 001542                    TSTB    @#NLST                  ;ANY DRIVES ACTIVE ?
006674 001010                           BNE     20                      ;GO IF YES
006676 105737 001150                    TSTB    @#AUTOB                 ;RUNNING IN AUTO MODE ?
006702 001025                           BNE     10                      ;GO IF YES
006704 012737 000001 001156             MOV     #1,CTLAC                ;SUPPLY 'CONTROL C' FLAG
006712 013737 001512 001546             MOV     @#TTZ,ONESEC            ;RESTORE ONE SECOND COUNTER VALUE
006720 005037 001540                    CLR     HOUR                    ;CLEAR THE HOUR'S COUNTER
006724 005037 001542                    CLR     MINUTE                  ;CLEAR THE MINUTE'S COUNTER
006730 005037 001544                    CLR     SECOND                  ;CLEAR THE SECOND'S COUNTER
006734 005037 001472                    CLR     INTRVL+2                ;CLEAR INTERVAL COUNTER
006740 013737 001462 001466             MOV     CMPTIM,CMPTIM+2         ;INIT COMPARE TIME COUNTER
006746 104401 000206                    TYPE    ,NODRVS                 ;TYPE "NO DRIVES ASSIGNED"
006750 000137 012024                    JMP     @GET42                  ;GIVE CONTROL TO MONITOR
                                
006754 005762 001652            20:     TST     WAIT(R2)                ;ANY DRIVES WAITING FOR THE BUFFER ?
006760 001433                           BEQ     50                      ;GO IF NO
006762 016200 001652                    MOV     WAIT(R2),R0             ;LOAD R0 WITH THE DPB ADDRESS
006766 005046                           CLR     -(SP)                   ;CLEAR THE STACK FOR BUFFER REQ
006770 004737 017572                    JSR     PC,GETBUF               ;CALL TO GET THE BUFFER AT
006774 012660 000006                    MOV     (SP)+,BUF(R0)           ;IF 0 BUFFER IS STILL NOT AVAILABLE
007000 001425                           BEQ     40                      ;BRANCH IF NO BUFFER AVAILABLE
007002 005060 000130                    CLR     SWCH(R0)                ;CLEAR PARAMETER SELECT FLAG
007006 005060 000116                    CLR     FAIR(R0)                ;CLEAR THE FAIR FLAG
                                
007012 004737 020162                    JSR     PC,FILBUF               ;FILL THE BUFFER
007016 004737 020040                    JSR     PC,QORDIV               ;SET COMMAND AND GO
007022 012705 001520                    MOV     #ORDERQ,R5              ;PUT THE WAIT QUE INTO ORDER QUE
007026 005725                   30:     TST     (R5)+                   ;QUE AVAILABLE ?
007030 001376                           BNE     30                      ;GO IF NO
007032 010045                           MOV     R0,-(R5)                ;LOAD THE DPB ADDRESS INTO THE ORDER QUE
007034 012701 001652                    MOV     #WAIT,R1                ;REMOVE THE DRIVE FROM THE 'WAIT' QUE
007040 060201                           ADD     R2,R1                   ;OFFSET THE QUE POSITION
007042 004737 022260                    JSR     PC,COMPRES              ;COMPRESS THE QUE
007046 000742                           BR      20                      ;BRANCH IF DONE
007050 005722                   40:     TST     (R2)+                   ;CHECK THE NEXT QUE
007052 000740                           BR      20                      ;LOOPING BACK
                                
007054 005737 001520            50:     TST     ORDERQ                  ;ANY OUTSTANDING ORDERS ?
007060 001075                           BNE     IDLE                    ;GO IF YES
                                
007062 005002                           CLR     R2                      ;CLEAR DRIVE TABLE POINTER
007064 005762 001610            60:     TST     AVAIL(R2)               ;ANY DRIVES WAITING FOR PARAMETERS
007070 001002                           BNE     70                      ;BRANCH IF ANY
007072 000137 007256                    JMP     IDLE                    ;BRANCH IF NONE
007076 016200 001610            70:     MOV     AVAIL(R2),R0            ;CONTROL BLOCK ADDR IN R0
007102 005760 000130                    TST     SWCH(R0)                ;PARAMETERS BEEN SELECTED ?
007106 001010                           BNE     90                      ;GO IF THEY HAVE
007110 105760 000026                    TSTB    SPACK(R0)               ;'I' COMMAND FOR THIS DRIVE ?
007114 001403                           BEQ     80                      ;GO IF YES
007116 004737 020330                    JSR     PC,SEQPAR               ;GET SEQUENTIAL PARAMETERS FOR READ OR WRITE
007122 000404                           BR      100                     ;GET THE BUFFER
                                
007124 004737 020672            80:     JSR     PC,GENPAR               ;GO GENERATE THE PARAMETERS
```

L6


```
                        90:     JSR     PC,ADPAR        ;LOAD THE PARAMETERS JUST GENERATED
                        100:    CLR     -(SP)           ;MAKE ROOM ON THE STACK FOR THE BUFFER ADDR
007116  005046                 JSR     PC,GETBUF       ;GET BUFFER
007120  004737  017572          MOV     (SP)+,BUF(R0)   ;MOVE BUFFER ADDR TO DPB
007122  012040  000006          BEQ     120             ;BR IF '0' ADDR (NO BUFFER)
007126  001416                  JSR     PC,FILBUF       ;FILL THE BUFFER
007130  004737  020162          CLR     ONEFIL(R0)      ;CLEAR PARAMETER SELECT FLAG
007134  005060  001130          CLR     FAIR(R0)        ;CLEAR THE 'FAIRNESS' COUNT
007140  005000  000136
007144  004737  020200          JSR     PC,COPDPB       ;PUT CURRENT DPB IN DRIVED
007150  012705  001520          MOV     #DRIVED,R5      ;ADDRESS OF DRIVER OUE IN R5
                        110:    TST     (R5)+           ;END OF QUE ?
007154  005725                  BNE     110             ;BR IF NOT
007156  001376                  MOV     R0,-(R5)        ;PUT BLOCK ADDRESS INTO QUE
007160  010045                  BR      150             ;CONTINUE LOOKING
007162  000416
007164  005260  001116          INC     FAIR(R0)        ;INCREMENT THE FAIR COUNT
007170  027760  000005  000116  CMP     #5,FAIR(R0)     ;THREE TIMES BUFFER IS NOT AVAILABLE?
007176  101005                  BHI     120             ;BRANCH IF NOT OVER THREE TIMES
007200  012705  001632          MOV     #WAIT,R5        ;LOAD INTO THE WAIT QUE
                        120:    TST     (R5)+           ;AN AVAILABLE LOCATION ?
007204  005725                  BNE     120             ;BRANCH IF NOT
007206  001376                  MOV     R0,-(R5)        ;LOAD INTO WAIT QUE
007210  010045                  BR      150             ;REMOVE THE DPB FROM AVAILABLE QUE
007212  000402
                        140:    TST     (R2)+           ;INCREMENT INDEX
007214  005722                  CMP     R2,#AVAIL       ;BRANCH BACK TO FIRE NEXT DRIVE
007216  020012  000712          MOV     #AVAIL,R1       ;'AVAILABLE' TABLE ADDRESS
                        150:    ADD     #2,R1           ;FORM ADDRESS OF LAST ENTRY
007220  012701  001610          JSR     PC,COMPRES      ;COMPRESS THE TABLE
007224  062701  000002          BR      60              ;CONTINUE LOOKING
007226  004737  022260
007232  000704
```

```
                                ;WAIT FOR A COMMAND TO FINISH
                                ;
007250  012701  001520          IDLE:   MOV     @ORDERQ,R1      ;ADDRESS OF THE ORDER QUE IN R1
007252  012100                  10:     MOV     (R1)+,R0        ;PUT BLOCK ADDRESS INTO R0
007254  001467                          BEQ     7$              ;BR IF END OF QUE
007256  005760  000016          20:     TST     $STATUS(R0)     ;SEE IF DRIVE FINISHED
007262  001775                          BEQ     2$              ;BR IF DRIVE NOT FINISHED
007264  005741                          TST     -(R1)           ;BACKUP THE QUE POINTER
007266  010146                          MOV     R1,-(SP)        ;SAVE THE QUE ADDRESS
007270  004737  017270                  JSR     PC,STATIS       ;ACCUMULATE STATISTICS FOR DRIVE IN R0
007274  004737  007472                  JSR     PC,PROCES       ;PROCESS END OF COMMAND
007300  005037  001336                  CLR     @BADSEC         ;CLEAR THE BAD TRK/SEC ERROR INDICATOR
007304  004737  031452                  JSR     PC,ABORPL       ;SEE IF ANY DRIVES HAVE TOO MANY ERRORS
                                                                ;NOW SEE IF WE ARE AT THE END OF A PASS
007310  122760  177777  000026          CMPB    0-1,@PACK(R0)   ;'W' COMMAND FOR THIS DRIVE ?
007316  001434                          BEQ     5$              ;BR IF YES
007320  122760  000001  000026          CMPB    01,@PACK(R0)    ;'R' COMMAND FOR THIS DRIVE ?
007326  001430                          BEQ     5$              ;BR IF YES
007330  005737  001504                  TST     ENDING          ;WILL THE EOP BE DETERMINED BY # OF SEEKS ?
007334  001412                          BEQ     3$              ;BR IF YES
007336  026037  000040  001450          CMP     $ROPAS+2(R0),ENDCON+2   ;IS IT THE EOP BY DATA READ ?
007344  101017                          BHI     4$              ;BR IF YES
007346  103420                          BLO     5$              ;BR IF NO
007350  026037  000036  001446          CMP     $ROPAS(R0),ENDCON       ;IS IT THE EOP BY DATA READ ?
007356  103414                          BLO     5$              ;BR IF NO
007360  000411                          BR      4$              ;THIS IS THE END OF PASS
                                ;
007362  026037  000050  001454  3$:     CMP     $SEEKS+2(R0),ENDSEK+2   ;IS IT THE EOP BY SEEKS ?
007370  101005                          BHI     4$              ;BR IF YES
007372  103406                          BLO     5$              ;BR IF NO
007374  026037  000046  001452          CMP     $SEEKS(R0),ENDSEK       ;IS IT THE EOP BY SEEKS ?
007402  103402                          BLO     5$              ;BR IF NO
007404  004737  031500          4$:     JSR     PC,@EOP         ;THIS IS THE END OF PASS
                                ;
007410  012601                  5$:     MOV     (SP)+,R1        ;RESTORE THE ORDER TABLE INDEX
007412  012705  001610                  MOV     @AVAIL,R5       ;ADDRESS OF THE 'AVAIL' TABLE
007416  005725                  6$:     TST     (R5)+           ;IS IT THE END OF THE 'AVAIL' TABLE ?
007420  001376                          BNE     6$              ;BR IF NO
007422  011145                          MOV     (R1),-(R5)      ;MOVE THE DPB INTO THE 'AVAIL' TABLE
007424  004737  022260                  JSR     PC,CMPRES       ;COMPRESS THE ORDER QUE
007430  004737  017726                  JSR     PC,RELBUF       ;RESTORE BUFFER
                                ;
007434  032777  000004  171524  7$:     BIT     @SW02,@SWR      ;TYPE PERFORMANCE SUMMARY
007442  001016                          BNE     8$              ;BR IF NOT
007444  005737  001314                  TST     STATIN          ;TIME TO TYPE THE PERFORMANCE SUMMARY ?
007450  001413                          BEQ     8$              ;BR IF NOT
007452  005037  001314                  CLR     STATIN          ;CLEAR THE INDICATOR
007456  005737  001542                  TST     ASNLST          ;ANY DRIVES ASSIGNED ?
007462  001406                          BEQ     8$              ;BR IF NO
007464  104401  057167                  TYPE    ,MSGREP         ;TYPE '/\/\/\/\/-PERFORMANCE REPORT-\/\/\/\/\'
007470  004737  025020                  JSR     PC,STATPR       ;TYPE THE SUMMARY
007474  104401  057274                  TYPE    ,TRMREP         ;TYPE '/\/\/\/\/\...ETC'
                                ;
007500  000137  006340          8$:     JMP     MAIN            ;CONTINUE THE LOOP
```

```
                                        ;PROCESS THE COMMAND TERMINATION
                                        ;
007472  111037  001320        PROCES: MOVB    (R0),DRVNO      ;DRIVE NUMBER FOR ANY ERROR MESSAGES
007476  005760  000016                TST     $TATUS(R0)      ;SEE IF DRIVER SIGNALED AN ERROR
007502  100447                        BMI     ERPROC          ;BR IF ERROR
007504  032760  100000  000166        BIT     #BIT15,$RPCS1(R0)       ;SEE IF 'SC' SET
007512  001410                        BEQ     1$              ;BR IF NOT SET
007514  032760  040000  000166        BIT     #BIT14,$RPCS1(R0)       ;SEE IF 'TRE' SET
007522  001037                        BNE     ERPROC          ;BR IF SET
007524  032760  040000  000200        BIT     #BIT14,$RPDS(R0)        ;SEE IF 'ERR' SET
007532  001033                        BNE     ERPROC          ;BR IF SET
                                        ;
                                        ;NO ERRORS DETECTED IN REGISTERS, DO SOME CHECKING ANYWAY
                                        ;
007534  004737  014010        1$:     JSR     PC,CKERR        ;CHECK ERROR BITS
007540  004737  014110                JSR     PC,CKBUS        ;CHECK BUS ADDRESS & WORD COUNT
007544  032777  000002  171402        BIT     #SW01,@SWR      ;INHIBIT DATA COMPARE (SW01=1) ?
007552  001022                        BNE     3$              ;BR IF YES
007554  005737  001462                TST     CMPTIM          ;IS COMPARE DATA ALWAYS ON ?
007560  001415                        BEQ     2$              ;BR IF YES
007562  023737  001464  001462        CMP     CMPTIM+2,CMPTIM ;TIME TO COMPARE DATA ?
007570  002413                        BLT     3$              ;BR IF NO
007572  013746  001462                MOV     CMPTIM,-(SP)    ;GET CURRENT INTERVAL TIME AND
007576  062716  000001                ADD     #1,(SP)         ;ADD ONE MINUTE
007602  023726  001464                CMP     CMPTIM+2,(SP)+  ;STILL COMPARING DATA ?
007606  002402                        BLT     2$              ;BR IF YES
007610  005037  001464                CLR     CMPTIM+2        ;CLEAR INTERVAL TIMER FOR NEXT COMPARE
007614  004737  014174        2$:     JSR     PC,CMPAR        ;NO 'DCK' ERROR, BUT COMPARE DATA ANYWAY
007620  000207                3$:     RTS     PC              ;RETURN
                                        ;
                                        ;COMMAND TERMINATED WITH AN ERROR - PROCESS THE ERROR
                                        ;
007622  032760  000200  000016  ERPROC: BIT     #BIT07,$TATUS(R0)       ;DONE BIT SET ?
007630  001402                        BEQ     ERPRC1          ;BR IF NO, ORDER DIDN'T COMPLETE NORMALLY
007632  000137  010206                JMP     DONE            ;PROCESS ERROR WITH 'DONE' BIT SET
                                        ;
                                        ;PROCESS ORDER COMPLETION WITH 'ERROR' & 'DONE' NOT SET
                                        ;
007636                          ERPRC1:
007636  032760  010000  000016                BIT     #BIT12,$TATUS(R0)       ;SEE IF DRIVE WAS UNSAFE
007644  001025                        BNE     PUNSAF          ;BR IF YES
007646  032760  004000  000016        BIT     #BIT11,$TATUS(R0)       ;PARITY ERROR OCCURRED
007654  001041                        BNE     UCPAR           ;BR IF IT DID
007656  032760  002000  000016        BIT     #BIT10,$TATUS(R0)       ;FATAL PARITY ERROR?
007664  001044                        BNE     FALPAR          ;BR IF THERE IS ONE
007666  032760  001000  000016        BIT     #BIT09,$TATUS(R0)       ;TIMEOUT?
007674  001066                        BNE     SWTIM           ;BR IF YES
007676  032760  040002  000016        BIT     #BIT14!BIT01,$TATUS(R0) ;DRIVE WENT OFFLINE ?
007704  001101                        BNE     OFLIN           ;BR IF IT DID
007706  032760  000004  000016        BIT     #BIT2,$TATUS(R0)        ;PORT REQUEST TIME OUT ?
007714  001115                        BNE     PRTIM           ;BR IF IT DID
007716  000207                        RTS     PC              ;ERROR. RETURN
```

```
                                        ;DRIVE IS PERSISTENTLY UNSAFE
                                        
007720  004737  022274          PUNSAF: JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
007724  104414  051435                  DISPLY  ,EM12           ;PERSISTENT DEVICE UNSAFE MESSAGE
007730  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
007734  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
007740  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF THE ERROR MESSAGE
007744  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
007750  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
007754  000137  031362                  JMP     DROP            ;DROP THE DRIVE
                                        
                                        ;UNCORRECTABLE MASSBUS PARITY ERROR OCCURRED
                                        
007760  104401  001203          UCPAR:  TYPE    ,$CRLF          ;CR-LF
007764  104401  001203                  TYPE    ,$CRLF          ;CR-LF
007770  104401  051337                  TYPE    ,EM10           ;'UNCORRECTABLE PARITY ERROR' MESSAGE
007774  000406                          BR      FALPR1          ;FINISH PROCESSING THE ERROR
                                        
                                        ;'FATAL' MASSBUS PARITY ERROR OCCURRED
                                        
007776  104401  001203          FALPAR: TYPE    ,$CRLF          ;CR-LF
010002  104401  001203                  TYPE    ,$CRLF          ;CR-LF
010006  104401  051402                  TYPE    ,EM11           ;'FATAL PARITY ERROR' MESSAGE
                                        
010012  104401  057676          FALPR1: TYPE    ,MSGON          ;TYPE 'ON'
010016  104401  056661                  TYPE    ,DRVMSG         ;TYPE 'DRIVE'
010022  013746  001320                  MOV     DRVNO,-(SP)     ;;SAVE DRVNO FOR TYPEOUT
                                                                ;;TYPE DRIVE NUMBER
010026  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
010030     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
010031     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
010032  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
010036  032777  100000  171110          BIT     @SW15,@SWR      ;HALT ON ERROR ?
010044  001401                          BEQ     1$              ;BR IF NOT
010046  000000                          HALT                    ;ERROR HALT
010050  000207                  1$:     RTS     PC
                                        
                                        ;SOFTWARE TIMEOUT OCCURRED
                                        
010052  004737  022274          SWTIM:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
010056  104414  051466                  DISPLY  ,EM13           ;PRINT THE TIME OUT MESSAGE
010062  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
010066  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
010072  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
010076  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
010102  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
010106  000207                          RTS     PC              ;RETURN
```

```
                                        ;DRIVE WENT OFFLINE
                                        ;
010110  004737  022274          OFLIN:  JSR     PC,LINE1        ;PRINT LINE 1 OF THE ERROR MESSAGE
010114  104414  051540                  DISPLY  ,EM14           ;PRINT OFFLINE MESSAGE
010120  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF THE ERROR MESSAGE
010124  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF THE ERROR MESSAGE
010130  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF THE ERROR MESSAGE
010134  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
010140  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF THE ERROR MESSAGE
010144  000137  031362                  JMP     DROP            ;DROP THE DRIVE
                                        ;
                                        ;PORT REQUEST TIMEOUT ERROR
                                        ;
010150  004737  022274          PRTIM:  JSR     PC,LINE1        ;TYPE LINE 1 OF THE ERROR MESSAGE
010154  104414  051563                  DISPLY  ,EM15           ;PRINT PORT TIME OUT MESSAGE
010160  004737  022342                  JSR     PC,LINE2        ;TYPE LINE 2 OF THE ERROR MESSAGE
010164  004737  022776                  JSR     PC,LINE3        ;TYPE LINE 3 OF THE ERROR MESSAGE
010170  004737  023446                  JSR     PC,LINE4        ;TYPE LINE 4 OF THE ERROR MESSAGE
010174  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
010200  004737  024136                  JSR     PC,LINE7        ;TYPE LINE 7 OF THE ERROR MESSAGE
010204  000207                          RTS     PC              ;RETURN
                                        ;
                                        ;PROCESS ORDER COMPLETION WITH 'ERROR' & 'DONE' BIT SET
                                        ;
010206  000240                  DONE:   NOP
010210  032760  000030  000016  1$:     BIT     @#BIT04!BIT03,$TATUS(R0) ;UNSAFE OCCURRED
010216  001402                          BEQ     2$              ;BR IF NOT
010220  000137  013402                  JMP     UNSAF           ;REPORT UNSAFE
                                        ;
010224  032760  040000  000202  2$:     BIT     @#BIT14,$RPER1(R0)      ;SEE IF 'UNS' SET
010232  001402                          BEQ     3$              ;BR IF NO
010234  000137  013402                  JMP     UNSAF           ;REPORT UNSAFE
                                        ;
010240  032760  000002  000200  3$:     BIT     @#BIT1,$RPDS(R0) ;SEE IF 'EWN' SET
010246  001402                          BEQ     4$              ;BR IF NOT
010250  000137  013474                  JMP     EWNERR          ;REPORT EARLY WARNING
                                        ;
010254  032760  040000  000176  4$:     BIT     @#BIT14,$RPCS2(R0)      ;IS 'WCE' SET ?
010262  001402                          BEQ     5$              ;BRANCH IF NOT SET
010264  000137  011242                  JMP     WCKER           ;WRITE CHECK ERROR
                                        ;
010270  032760  040000  000166  5$:     BIT     @#BIT14,$RPCS1(R0)      ;CHECK 'TRE'
010276  001002                          BNE     6$              ;BR IF SET
010300  000137  013146                  JMP     TRFER           ;PROCESS 'TRE'
                                        ;
010304  032760  000400  000202  6$:     BIT     @#BIT08,$RPER1(R0)      ;'HCRC' SET?
010312  001402                          BEQ     7$              ;BR IF NOT
010314  000137  011630                  JMP     HCRCER          ;PROCESS 'HCRC'
                                        ;
010320  032760  000020  000202  7$:     BIT     @#BIT04,$RPER1(R0)      ;'FMT' SET?
010326  001402                          BEQ     8$              ;BR IF NOT SET
010330  000137  012022                  JMP     CKFMT           ;CHECK FORMAT ERROR
                                        ;
010334  032760  000200  000202  8$:     BIT     @#BIT07,$RPER1(R0)      ;'HCE' SET?
010342  001402                          BEQ     9$              ;BR IF NOT SET
010344  000137  012212                  JMP     CKHCE           ;CHECK 'HCE' ERROR
```

```
 65 010350  032760  020000  000202  9$:     BIT     @BIT13,$RPER1(R0)       ;'OPI' SET?
 66 010356  001402                          BEQ     10$             ;BR IF NOT SET
 67 010360  000137  012506                  JMP     OPIER           ;REPORT 'OPI'
 68
 69 010364  032760  000010  000202  10$:    BIT     @BIT3,$RPER1(R0)        ;'PAR' SET?
 70 010372  001402                          BEQ     11$             ;BR IF NOT SET
 71 010374  000137  012640                  JMP     PARER           ;REPORT 'PAR'
 72
 73 010400  032760  000040  000202  11$:    BIT     @BIT5,$RPER1(R0)        ;'WCF' SET?
 74 010406  001402                          BEQ     12$             ;BR IF NOT SET
 75 010410  000137  013304                  JMP     WCFER           ;REPORT 'WCF'
 76
 77 010414  032760  002000  000202  12$:    BIT     @BIT10,$RPER1(R0)       ;'IAE' SET?
 78 010422  001402                          BEQ     13$             ;BR IF NOT SET
 79 010424  000137  012732                  JMP     IAEER           ;REPORT 'IAE'
 80
 81 010430  032760  004000  000202  13$:    BIT     @BIT11,$RPER1(R0)       ;'WLE' SET?
 82 010436  001402                          BEQ     14$             ;BR IF NOT SET
 83 010440  000137  012764                  JMP     WLEER           ;REPORT 'WLE'
 84
 85 010444  032760  001000  000202  14$:    BIT     @BIT9,$RPER1(R0)        ;'AOE' SET?
 86 010452  001405                          BEQ     15$             ;BR IF NOT SET
 87 010454  032760  002000  000200          BIT     @BIT10,$RPDS(R0)        ;'LBT' SET?
 88 010462  001401                          BEQ     15$             ;BR IF NOT SET
 89 010464  000207                          RTS     PC              ;'AOE' & 'LBT' SET, EXIT
 90
 91 010466  032760  010000  000202  15$:    BIT     @BIT12,$RPER1(R0)       ;SEE IF 'DTE' SET
 92 010474  001402                          BEQ     16$             ;BR IF NOT
 93 010476  000137  012616                  JMP     DTEER           ;REPORT 'DTE' ERROR
 94
 95 010502  005760  000202          16$:    TST     $RPER1(R0)      ;SEE IF 'DCK' SET
 96 010506  100002                          BPL     17$             ;BR IF NOT
 97 010510  000137  010546                  JMP     DCKER           ;PROCESS 'DCK'
 98
 99 010514  032760  040000  000230  17$:    BIT     @BIT14,$RPER3(R0)       ;'SKI' SET
100 010522  001006                          BNE     18$             ;BRANCH IF SKI, OCYL SET
101 010524  032760  100000  000230          BIT     @BIT15,$RPER3(R0)       ;BAD SPOT ?
102 010532  001004                          BNE     19$             ;BRANCH IF SO
103 010534  000137  011770                  JMP     DRVER           ;REPORT ERROR
104
105 010540  000137  013246          18$:    JMP     SKIER           ;REPORT SKI ERROR
106 010544  000207                  19$:    RTS     PC              ;EXIT FROM ERROR ANALYSIS  ROUT.
```

```
                                        ;PROCESS DATA ('DCK') CHECK ERROR
                                        
010546  004737  016420          DCKER:  JSR     PC,SPOTCK       ;SEE IF ERROR AT A BAD SPOT
010552  000207                          RTS     PC              ;IT IS, DON'T REPORT IT
010554  032760  000100  000202          BIT     #ECM,$RPER1(R0) ;ECM ERROR SET ?
010562  001411                          BEQ     1$              ;BR IF NO
010564  022760  010040  000232          CMP     #10040,$RPEC1(R0)       ;OTHERWISE RPEC1=10040
010572  001024                          BNE     2$              ;REPORT ECC LOGICAL FAILURE
010574  004737  022274                  JSR     PC,LINE1        ;FIRST LINE OF ERROR MESSAGE
010600  104414  053536                  DISPLY  ,EM52           ;ECM ERROR - ECC UNCORRECTABLE
010604  000451                          BR      7$
                                        
010606  026027  000232  010040  1$:     CMP     $RPEC1(R0),#10040       ;IS POSITION COUNT OVER MAXIMUM ?
010614  101013                          BMI     2$              ;BR IF YES
010616  005760  000232                  TST     $RPEC1(R0)      ;POSITION COUNT 0 ?
010622  001410                          BEQ     2$              ;BR IF YES
010624  005760  000234                  TST     $RPEC2(R0)      ;VALUE IN PATTERN REGISTER ?
010630  001033                          BNE     6$              ;BR IF YES
010632  004737  022274                  JSR     PC,LINE1        ;TYPE FIRST LINE OF ERROR MESSAGE
010636  104414  053360                  DISPLY  ,EM47           ;TYPE 'ECC LOGIC ERROR'
010642  000404                          BR      3$
010644  004737  022274          2$:     JSR     PC,LINE1        ;TYPE FIRST LINE OF ERROR MESSAGE
010650  104414  053220                  DISPLY  ,EM45           ;TYPE 'ECC LOGIC ERROR'
010654  004737  022342          3$:     JSR     PC,LINE2        ;TYPE LINE 2 OF ERROR MESSAGE
010660  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
010664  012737  000003  001324          MOV     #3,RETRY        ;RETRY COUNT
010672  004737  017120                  JSR     PC,$RETRY       ;RETRY THE ORDER
010676  000403                          BR      4$              ;RETRY WAS NOT SUCCESSFUL
010700  004737  024076                  JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
010704  000402                          BR      5$              ;FINISH THE ERROR REPORT
                                        
010706  004737  024104          4$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
010712  004737  024136          5$:     JSR     PC,LINE7        ;TYPE LINE 7 OF ERROR MESSAGE
010716  000207                          RTS     PC              ;RETURN
                                        
                                        ;THE VALUES IN THE ECC REGISTERS ARE CORRECT, REPORT 'DCK' ERROR
                                        
010720  004737  022274          6$:     JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
010724  104414  051640                  DISPLY  ,EM21           ;DATA CHECK ERROR
010730                          7$:
```

```
                ;
010730  004737  022342          DCKER1: JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
010734  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
010740  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
010744  004737  016436                  JSR     PC,PRTBAD       ;SEE IF BAD SECTOR TO BE PRINTED
010750  012737  110100  001322          MOV     #BIT15!BIT12!BIT06,MASK ;LOAD ERROR MASK
010756  032760  010000  000202          BIT     #BIT12,$RPER1(R0)       ;IS IT 'DTE' ?
010764  001012                          BNE     2$              ;BR IF YES
010766  032760  000100  000202          BIT     #BIT06,$RPER1(R0)       ;IS IT 'ECM' ?
010774  001403                          BEQ     1$              ;BR IF NO
010776  004737  011202                  JSR     PC,13$          ;COMPARE BAD DATA
011002  000403                          BR      2$
011004  004737  024056          1$:     JSR     PC,LINE6        ;PRINT 'SECTOR IS ECC CORRECTABLE'
011010  000460                          BR      10$             ;FINISH THE ERROR REPORT
011012  012737  000012  001324  2$:     MOV     #10.,RETRY      ;RETRY COUNT
                ;
011020  004737  020240          3$:     JSR     PC,GODRIV       ;RETRY
011024  005760  000016          4$:     TST     $TATUS(R0)      ;TEST FOR DONE
011030  001775                          BEQ     4$              ;BR IF NOT DONE
011032  100057                          BPL     12$             ;BR IF NOT ERROR
011034  032760  000200  000016          BIT     #BIT7,$TATUS(R0)  ;SEE IF ORDER TERMINIATED NORMALLY
011042  001006                          BNE     5$              ;BR IF NOT
011044  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
011050  104414  055650                  DISPLY  ,LIN8M          ;'DIFFERENT ERROR DURING RETRY'
011054  000137  007636                  JMP     ERPRC1          ;SEE WHICH ERROR
                ;
011060  033760  001322  000202  5$:     BIT     MASK,$RPER1(R0) ;LOOK AT CURRENT ERROR
011066  001412                          BEQ     7$              ;BR IF DIFFERENT ERROR
011070  032760  010100  000202          BIT     #BIT12!BIT6,$RPER1(R0)  ;'ECM' OR 'DTE' STILL SET ?
011076  001421                          BEQ     9$              ;BR IF NEITHER SET
011100  105237  001325                  INCB    RETRY+1         ;INCREMENT RETRY COUNT
011104  123737  001324  001325          CMPB    RETRY,RETRY+1   ;DONE ?
011112  001342                          BNE     3$              ;BR IF NOT
011114  004737  024354          7$:     JSR     PC,LINE8        ;PRINT LINE 8 OF ERROR MESSAGE
011120  004737  026106          8$:     JSR     PC,INCHRD       ;INCREMENT 'HARD' ERROR COUNT
011124  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
011130  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
011134  004737  016436                  JSR     PC,PRTBAD       ;PRINT THE BAD SECTOR
011140  000436                          BR      15$             ;CLEAN UP AND RETURN
                ;
011142  004737  024056          9$:     JSR     PC,LINE6        ;PRINT 'SECTOR IS ECC CORRECTABLE'
011146  004737  024014                  JSR     PC,LINE5B       ;PRINT LINE 5B OF THE ERROR MESSAGE
011152  004737  026062          10$:    JSR     PC,INCSOF       ;INCREMENT 'SOFT' ERROR COUNT
011156  004737  015576                  JSR     PC,ECC          ;CORRECT THE ERROR USING ECC AND CHECK IT
011162  000407                          BR      13$             ;COMPARE THE BUFFER
                ;
011164  004737  024104          11$:    JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
011170  000753                          BR      8$              ;INCREMENT ERROR COUNT
                ;
011172  004737  024070          12$:    JSR     PC,LINE6A       ;PRINT 'SECTOR READ CORRECTLY AFTER N RETRY(S)'
011176  004737  026062                  JSR     PC,INCSOF       ;INCREMENT 'SOFT' ERROR COUNT
011202  012737  000001  001352  13$:    MOV     #1,FRSTER       ;SET PROCESSING 'DCKER' INDICATOR
011210  004737  014200                  JSR     PC,CMPARD       ;COMPARE THE BUFFER
011214  105737  001353                  TSTB    FRSTER+1        ;ERROR IN COMPARE ?
011220  100406                          BMI     15$             ;BRANCH IF ERROR
011222  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
011226  104414  056117                  DISPLY  ,LIN9G          ;'DATA COMPARE OK' MESSAGE
```

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71 011232  004737  024136          148:    JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
72 011236  000240                   156:    NOP
73 011240  000207                           RTS     PC              ;RETURN
```

```
                                        ;WRITE CHECK ERROR PROCESSING
                                        ;
011242  005760  000202          WCKER:  TST     @RPER1(R0)      ;SEE IF 'DCK' SET ALSO
011246  100434                          BMI     2$              ;BR IF IT IS
011250  004737  022274                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
011254  104414  051744                  DISPLY  ,EM23           ;PRINT WCE & DCK NOT SET
011260  005037  001322                  CLR     MASK            ;CLEAR ERROR MASK
011264  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
011270  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
011274  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
011300  004737  023536                  JSR     PC,LINE5        ;PRINT LINE 5 OF ERROR MESSAGE
011304  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
011310  012737  000003  001324          MOV     #3,RETRY        ;RETRY LIMIT
011316  004737  017120                  JSR     PC,@RETRY       ;RETRY THE OPERATION
011322  000403                          BR      1$              ;RETRY UNSUCESSFUL
                                        ;
011324  004737  024076                  JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
011330  000532                          BR      15$             ;FINISH PROCESSING THE ERROR
                                        ;
011332  004737  024106          1$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
011336  000527                          BR      15$             ;FINISH PROCESSING THE ERROR
                                        ;
011340  012737  000012  001324  2$:     MOV     #10.,RETRY      ;RETRY LIMIT
011346  004737  022274                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
011352  012737  051671  011500          MOV     #EM22,@#4       ;ASSUME THAT EM22 WILL BE PRINTED
011360  032760  040000  000176          BIT     #BIT14,@#PCS2(R0)  ;DID 'WCK' ALSO SET ?
011366  001003                          BNE     3$              ;BR IF IT DID
011370  012737  052572  011500          MOV     #EM37,@#4       ;MESSAGE FOR 'DCK' AND 'WCK' NOT DURING
                                        ;WRITE CHECK
011376  032760  000100  000202  3$:     BIT     #ECH,@#PER1(R0) ;WRITE CHECK ERROR WITH , ECH SET ?
011404  001410                          BEQ     4$              ;BRANCH IF NOT
011406  012737  053536  011500          MOV     #EM32,@#4       ;REPORT 'ECH' ERROR
011414  022760  010040  000232          CMP     #10040,@#PEC1(R0)       ;OTHERWISE PEC1-10040
011422  001017                          BNE     5$              ;REPORT ECC LOGICAL FAILURE
011424  000424                          BR      7$
                                        ;
011426  026027  000232  010040  4$:     CMP     @#PEC1(R0),#10040       ;IS POSITION COUNT OVER MAXIMUM ?
011434  101012                          BMI     5$              ;BR IF YES
011436  005760  000232                  TST     @#PEC1(R0)      ;POSITION COUNT 0 ?
011442  001407                          BEQ     5$              ;BR IF YES
011444  005760  000234                  TST     @#PEC2(R0)      ;VALUE IN PATTERN REGISTER ?
011450  001007                          BNE     6$              ;BR IF YES
011452  012737  053360  011500          MOV     #EM47,@#4       ;ELSE, REPORT THE ECC LOGIC FAILURE
011460  000403                          BR      6$
011462  012737  053220  011500  5$:     MOV     #EM45,@#4       ;ELSE, REPORT THE ECC LOGIC FAILURE
011470  012737  000003  001324  6$:     MOV     #3,RETRY        ;RETRY LIMIT
                                        ;
011476  104414                  7$:     DISPLY                  ;TYPE THE ERROR MESSAGE
011500  000000                  8$:     .WORD   0               ;MESSAGE ADDRESS GOES HERE
011502  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
011506  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
011512  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
011516  004737  023536                  JSR     PC,LINE5        ;PRINT LINE 5 OF ERROR MESSAGE
                                        ;
011522  004737  020240          9$:     JSR     PC,GODRIV       ;RETRY THE ORDER
011526  005760  000016          10$:    TST     @STATUS(R0)     ;ORDER FINISHED ?
011532  001775                          BEQ     10$             ;BR IF NOT
```

```
 60 011550  100405                      BPT     11$             ;BR IF ERROR ON ORDER
 61 011552  105237  001325              INCB    RETRY+1         ;INCREMENT RETRY COUNT
 62 011556  004737  024076              JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
 63 011562  000416                      BR      13$             ;FINISH ERROR PROCESSING
 64
 65 011564  105237  001325      11$:    INCB    RETRY+1         ;INCREMENT RETRY COUNT
 66 011570  123737  001324  001325      CMPB    RETRY,RETRY+1   ;DONE ?
 67 011576  001463                      BEQ     1$              ;BR IF AT RETRY LIMIT
 68 011600  032760  100000  000202      BIT     #BIT15,@#PER1(R0)  ;'DCK' SET
 69 011606  001401                      BEQ     12$             ;BR IF NOT - DIFFERENT ERROR
 76 011610  000752                      BR      9$              ;CONTINUE RETRY
 77
 78 011612  004737  024354      12$:    JSR     PC,LINE8        ;PRINT LINE 8 - 'DIFFERENT ERROR '
 79 011616  000405                      BR      15$
 80 011620  004737  026062      13$:    JSR     PC,INCSOF       ;COUNT AS A SOFT ERROR
 81 011624  000402                      BR      15$             ;EXIT
 82
 83 011626  004737  026106      14$:    JSR     PC,INCHRD       ;COUNT AS A HARD ERROR
 84 011632  004737  026202      15$:    JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
 85 011636  004737  024136              JSR     PC,LINE7        ;FINISH THE ERROR MESSAGE
 86 011642  000207                      RTS     PC              ;RETURN
```

```
                                ;REPORT "HCRC" ERROR
                        ;
011650  004737  016420  HCRCER: JSR     PC,SPOTCK       ;SEE IF ERROR AT BAD SPOT
011654  000756                  BR      30              ;EXIT IF IT IS
011656  004737  020466          JSR     PC,.READDD      ;READ ERROR SECTOR HEADER
011662  004737  017026          JSR     PC,.READHD      ;GET THE HEAD INFORMATION
011666  004737  022276          JSR     PC,.LINE1       ;PRINT LINE 1 OF ERROR MESSAGE
011672  104414  051617          DISPLY  ,ERHD           ;REPORT "HCRC"
011676  004737  022342          JSR     PC,.LINE2       ;PRINT LINE 2 OF ERROR MESSAGE
011702  004737  022776          JSR     PC,.LINE3       ;PRINT LINE 3 OF ERROR MESSAGE
011706  004737  023446          JSR     PC,.LINE4       ;PRINT LINE 4 OF ERROR MESSAGE
011712  004737  023706          JSR     PC,.LINE5A      ;PRINT THE HEADER INFORMATION
011716  012700  040000  000176  BIT     #BIT14,@#PCS2(R0)       ;"UCE" ERROR ALSO ?
011724  001402                  BEQ     10              ;BR IF NOT
011726  004737  023536          JSR     PC,.LINE5       ;DISPLAY WORDS WHICH CAUSED "UCE"
011732  005267  024042  10:     INC     @#SOFT          ;INCREMENT "SOFT" ERROR COUNT
011736  005267  024202          INC     @#TOT           ;INCREMENT TOTAL ERROR COUNT
011742  012737  000400  001322  MOV     #BIT8,@#MASK    ;SET ERROR MASK
011750  012737  000003  001324  MOV     #3,@#RETRY      ;RETRY LIMIT
011756  004737  017120          JSR     PC,.RETRY       ;RETRY ORDER
011762  000405                  BR      20              ;RETRY NOT SUCESSFUL
011764  004737  020076          JSR     PC,.LINE6C      ;PRINT "CORRECTED ON N RETRY(S)"
011770  004737  024136          JSR     PC,.LINE7       ;PRINT LINE 7 OF ERROR MESSAGE
011774  000408                  BR      30              ;EXIT
011776  004737  020106  20:     JSR     PC,.LINE6D      ;PRINT "UNCORRECTABLE AFTER N RETRY(S)"
012002  004737  024136          JSR     PC,.LINE7       ;PRINT LINE 7 OF ERROR MESSAGE
012006  000207          30:     RTS     PC              ;RETURN
                        ;
                        ;
                                ;REPORT DRIVE ERROR
                        ;
012010  004737  022276  DRVER:  JSR     PC,.LINE1       ;PRINT LINE 1 OF ERROR MESSAGE
012014  104414  051634          DISPLY  ,ERHD           ;REPORT DRIVE ERROR
012020  004737  022342          JSR     PC,.LINE2       ;PRINT LINE 2 OF ERROR MESSAGE
012024  004737  022776          JSR     PC,.LINE3       ;PRINT LINE 3 OF ERROR MESSAGE
012030  004737  024202          JSR     PC,.INCTOT      ;INCREMENT TOTAL ERROR COUNT
012034  004737  024136          JSR     PC,.LINE7       ;PRINT LINE 7 OF ERROR MESSAGE
012040  000207                  RTS     PC              ;RETURN
```

```
                        ;PROCESS FORMAT ('FEP') ERROR
012022 052760 000400 000202 CHFMT:  BIT    #BIT8,@MPUR1(R0) ;"HCRC" SET ON ORIGINAL ERROR ?
012030 001402               BEQ     10$                      ;NO, IF NOT SET
012032 000137 011630        JMP     @#HCRCFD                 ;REPORT "HCRC" ERROR
012036 004767 026466        CALL    RC.RECOD                 ;GET CORRECTED TRACK & SECTOR ADDRESSES
012042 004767 017026        CALL    RC.RECHD                 ;READ HEADER
012046 052767 000400 050770 10$:    BIS     #BIT8,@MPUR1(R0) ;"HCRC" SET WHEN HEADER READ?
012054 001002               BNE     20$                      ;IF "HCRC" SET,
012056 000137 013012        JMP     @#HNED                   ;NO, ERROR IS "FHE" ONLY
012062 004767 016420 20$:   CALL    RC.SPOTCK                ;SEE IF ERROR AT BAD SPOT
012066 000450               BCS     30$                      ;BIT 0 IF IT IS
012070 004767 022270        CALL    RC.LINE1                 ;UPDATE LINE 1 OF ERROR MESSAGE
012074 100416               BMI     30$                      ;PRINT HEAD ERROR - FMT BIT DROPPED UP
012100 004767 022342        CALL    RC.LINE2                 ;UPDATE LINE 2 OF ERROR MESSAGE
012104 004767 022776        CALL    RC.LINE3                 ;UPDATE LINE 3 OF ERROR MESSAGE
012110 004767 023466        CALL    RC.LINE4                 ;UPDATE LINE 4 OF ERROR MESSAGE
012114 052760 000400 000176 30$:    BIS     #BIT8,@MPUR1(R0) ;"HCRC" ERROR ALSO ?
012122 001402               BEQ     40$                      ;NO, IF NOT
012124 004767 007736        CALL    RC.LINE5                 ;DISPLAY ERROR WHICH CAUSED "HCRC"
012130 004767 021746        CALL    RC.LINE6                 ;DISPLAY HEADER
012134 005267 000502        INC     @#HCRCT                  ;INCREMENT "HCRC" ERROR COUNT
012140 005267 000500        INC     @#TOTAL                  ;INCREMENT TOTAL ERROR COUNT
012144 017767 000502 001322 40$:    MOV     @#HCRCT,@#HCRMX  ;"HCRC" ERROR MAXIMUM
012152 017767 000500 001320 50$:    MOV     @#TOTAL,@#TOTMX  ;TOTAL ERROR MAXIMUM
012160 017767 017120        CALL    @#ERRPRT                 ;PRINT ERROR
012164 004767 000000        CALL    RC.LINE7                 ;PRINT "HCRC" ERROR
012170 004767 020076        CALL    RC.LINE8                 ;PRINT "CORRECTED ON N RETRY(S)"
012174 004767 020126        CALL    RC.LINE9                 ;PRINT LINE 9 OF ERROR MESSAGE
012200 000406               BR      60$                      ;EXIT
012202 004767 020106 60$:   CALL    RC.LINEA                 ;PRINT "UNCORRECTABLE AFTER N RETRY(S)"
012206 004767 020136        CALL    RC.LINEB                 ;PRINT LINE B OF ERROR MESSAGE
012212 000207               RTS     PC                       ;RETURN
```

```
                                ;PROCESS HEADER CRC ERROR ('HCE') ERROR
                        ;
012212  052760  000400  000252  CHCE:   BIT     #BIT8,@#PS+1(R0)  ;HCRC SET ON ORIGINAL ERROR ?
012220  001402                  BEQ     10                ;NO IF NOT SET
012222  000137  011650          JMP     HCRCER            ;REPORT HEADER CRC ERROR
012226  004737  024404          JSR     PC,RE.HDSC        ;GET CURRENT SECTOR & TRACK ADDRS
012232  004737  017026          JSR     PC,READHD         ;READ HEADER OF CURRENT SECTOR
012236  052737  000400  050770  10:     BIT     #BIT8,@#RESREG-4(R0) ;'HCRC' SET ?
012246  001017                  BNE     30                ;YES IF SET
012250  013746  001366          MOV     CYLNDR,-(SP)      ;PUSH CYLNDR ON STACK
012254  042737  150000  001366  BIC     #150000,CYLNDR    ;CLEAR FORMAT, IPS AND USER BITS FROM HEADER
012262  026027  000222  001364  CMP     @#DSC(R0),CYLNDR  ;CORRECT CYLINDER ?
012266  001402                  BEQ     20                ;OK IF IT IS
012270  000137  012456          JMP     POSER             ;REPORT POSITIONING ERROR
012274                  20:
012274  012637  001364          MOV     (SP)+,CYLNDR      ;POP STACK INTO CYLNDR
012300  000137  013070          JMP     HCEER             ;REPORT 'HCE' ERROR

012304  004737  016420  30:     JSR     PC,SPOICK         ;SEE IF ERROR AT BAD SPOT
012310  000450                  BVC     40                ;EXIT IF IT IS
012312  004737  022270          JSR     PC,LINE1          ;PRINT LINE 1 OF ERROR MESSAGE
012316  104414  053071          DISPLY  /HPO/             ;HEADER READ ERROR - 'HCE' SET
012322  004737  022342          JSR     PC,LINE2          ;PRINT LINE 2 OF ERROR MESSAGE
012326  004737  022776          JSR     PC,LINE3          ;PRINT LINE 3 OF ERROR MESSAGE
012332  004737  023446          JSR     PC,LINE4          ;PRINT LINE 4 OF ERROR MESSAGE
012336  052760  040000  000176  BIT     #BIT14,@#PS+1(R0) ;'HCE' ERROR ALSO ?
012346  001402                  BEQ     40                ;NO IF NOT
012350  004737  022536          JSR     PC,LINE5          ;DISPLAY WORDS WHICH CAUSED 'HCE'
012354  004737  023746  40:     JSR     PC,LINE5A         ;PRINT LINE 5 OF ERROR MESSAGE
012360  004737  024042          JSR     PC,INCSOF         ;INCREMENT SOFT ERROR COUNT
012364  004737  026202          JSR     PC,INCTOT         ;INCREMENT TOTAL ERROR COUNT
012370  012737  000200  001322  MOV     #BIT7,@#ERR       ;SET ERROR FLAG
012376  012737  000003  001324  MOV     #3,@#RETRY        ;RETRY LIMIT
012404  004737  017120          JSR     PC,.RETRY         ;RETRY THE ERROR
012410  000405                  BR      60                ;RETRY NOT SUCCESSFUL
012412  004737  024076          JSR     PC,LINE6C         ;PRINT 'CORRECTED ON N RETRY(S)'
012416  004737  024136          JSR     PC,LINE7          ;PRINT LINE 7 OF ERROR MESSAGE
012422  000406                  BR      60                ;EXIT
012424  004737  024106  50:     JSR     PC,LINE6D         ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
012430  004737  024136          JSR     PC,LINE7          ;PRINT LINE 7 OF ERROR MESSAGE
012434  000207          60:     RTS     PC                ;RETURN

                        ;REPORT POSSIBLE POSITIONING ERROR

012436  004737  022276  POSER:  JSR     PC,LINE1          ;PRINT LINE 1 OF ERROR MESSAGE
012442  104414  053473          DISPLY  /EPOS/            ;PROGRAM DETECTED POSITIONING ERROR
012446  004737  022342          JSR     PC,LINE2          ;PRINT LINE 2 OF ERROR MESSAGE
012452  004737  023024          JSR     PC,LINE3C         ;PRINT LINE 3C OF ERROR MESSAGE
012456  012637  063364          MOV     (SP)+,CYLNDR      ;;POP STACK INTO CYLNDR
012462  004737  023746          JSR     PC,LINE5A         ;PRINT LINE 5A OF THE ERROR MESSAGE
012466  004737  026156          JSR     PC,INCMIS         ;INCREMENT MISPOSITIONING COUNT
012472  004737  026202          JSR     PC,INCTOT         ;INCREMENT TOTAL ERROR COUNT
012476  004737  024256          JSR     PC,LINE7A         ;PRINT LINE 7A OF ERROR MESSAGE
012502  004737  016710          JSR     PC,RECALT         ;RECALIBRATE
012506  000207                  RTS     PC                ;EXIT

                        ;REPORT 'OPI' ERROR
```

```
                                                
012506  004737  016420          OPIER:  JSR     PC,SPOTCK       ;SEE IF ERROR AT BAD SPOT
012512  000207                          RTS     PC              ;RETURN IF IT IS
012514  004737  022274                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
012520  104414  052266                  DISPLY  ,EM31           ;'OPI' ERROR
012524  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
012530  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
012534  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
012540  004737  026062                  JSR     PC,INCSOF       ;COUNT "OPI" AS A SOFT DATA ERROR
                                                                ;SEPT, 26 ADDED FOR RP07
012544  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
012550  012737  020000  001322          MOV     #BIT13,MASK     ;ERROR MASK
012556  012737  000003  001324  OPIER1: MOV     #3,RETRY        ;RETRY LIMIT
012564  004737  017120                  JSR     PC,.RETRY       ;RETRY THE ORDER
012570  000405                          BR      10              ;RETRY UNSUCESSFUL
012572  004737  024076                  JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
012576  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
012602  000207                          RTS     PC              ;EXIT
012604  004737  024104          10:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
012610  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
012614  000207                          RTS     PC              ;RETURN
                                        
                                        ;REPORT 'DTE' ERROR
                                        
012616  004737  016420          DTEER:  JSR     PC,SPOTCK       ;SEE IF ERROR AT BAD SPOT
012622  000207                          RTS     PC              ;RETURN IF IT IS
012624  004737  022274                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
012630  104414  052331                  DISPLY  ,EM32           ;'DTE' ERROR
012634  000137  010750                  JMP     DCKER1          ;FINISH PROCESSING THE 'DTE' ERROR
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                                        ;REPORT 'PAR' ERROR
                                        
012640  004737  022274          PARER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
012644  104414  052364                  DISPLY  ,EM33           ;REPORT 'PAR'
012650  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
012654  004737  023102                  JSR     PC,LINE3E       ;PRINT LINE 3E OF ERROR MESSAGE
012660  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
012664  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
012670  012737  000010  001322          MOV     #BIT03,MASK     ;ERROR MASK
012676  012737  000003  001324          MOV     #3,RETRY        ;RETRY LIMIT
012704  004737  017120                  JSR     PC,$RETRY       ;RETRY ORDER
012710  000405                          BR      2$              ;RETRY UNSUCESSFUL
012712  004737  024076                  JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
012716  004737  024136          1$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
012722  000207                          RTS     PC              ;EXIT
012724  004737  024104          2$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
012730  000772                          BR      1$              ;FINISH ERROR MESSAGE
                                        
                                        ;REPORT 'IAE' ERROR
                                        
012732  004737  022274          IAEER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
012736  104414  052503                  DISPLY  ,EM35           ;REPORT 'IAE'
012742  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
012746  004737  023170                  JSR     PC,LINE3F       ;PRINT LINE 3F OF ERROR MESSAGE
012752  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
012756  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
012762  000207                          RTS     PC              ;RETURN
                                        
                                        ;REPORT 'WLE' ERROR
                                        
012764  004737  022274          WLEER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
012770  104414  052541                  DISPLY  ,EM36           ;REPORT 'WLE'
012774  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
013000  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
013004  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
013010  000207                          RTS     PC              ;RETURN
                                        
                                        ;REPORT FORMAT ERROR
                                        
013012  004737  022274          FMTER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
013016  104414  052152                  DISPLY  ,EM26           ;FORMAT ERROR
013022  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
013026  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
013032  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
013036  032760  040000  000176          BIT     #BIT14,$RPCS2(R0)  ;'WCE' ERROR ALSO ?
013044  001402                          BEQ     1$              ;BR IF NOT
013046  004737  023536                  JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
013052  004737  023746          1$:     JSR     PC,LINE5A       ;PRINT LINE 5A OF ERROR MESSAGE
013056  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
013062  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
013066  000207                          RTS     PC
```

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                                        ;REPORT HEADER COMPARE ERROR
                                        
013070  004737  022274          HCEER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
013074  104414  052177                  DISPLY  ,EM27           ;HEADER COMPARE ERROR
013100  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
013104  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
013110  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
013114  032760  040000  000176          BIT     #BIT14,$RPCS2(R0)  ;'WCE' ERROR ALSO ?
013122  001402                          BEQ     1$              ;BR IF NOT
013124  004737  023536                  JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
013130  004737  023746          1$:     JSR     PC,LINE5A       ;PRINT LINE 5A OF ERROR MESSAGE
013134  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
013140  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
013144  000207                          RTS     PC              ;RETURN
                                        
                                        ;PROCESS CONTROL/INTERFACE TRANSFER ERROR
                                        
013146  004737  022274          TRFER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
013152  104414  052644                  DISPLY  ,EM40           ;RHXX OR UNIBUS TRANSFER ERROR
013156  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
013162  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
013166  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
013172  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
013176  032760  121400  000176          BIT     #BIT15!BIT13!BIT9!BIT8,$RPCS2(R0)  ;'DLT','UPE','MXF', 'MDPE' SET ?
013204  001415                          BEQ     2$              ;BR IF NONE SET
013206  012737  000003  001324          MOV     #3,RETRY        ;RETRY LIMIT
013214  005037  001322                  CLR     MASK            ;CLEAR ERROR MASK
013220  004737  017120                  JSR     PC,$RETRY       ;RETRY THE OPERATION
013224  000403                          BR      1$              ;RETURN HERE IF RETRY UNSUCESSFUL
013226  004737  024076                  JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
013232  000402                          BR      2$              ;FINISH THE ERROR REPORT
013234  004737  024104          1$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
013240  004737  024136          2$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
013244  000207                          RTS     PC
                                        
                                        ;PROCESS 'SKI' ERRORS
                                        
013246  004737  022274          SKIER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
013252  104414  053435                  DISPLY  ,EM50           ;'SKI' ERROR
013256  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
013262  004737  023012                  JSR     PC,LINE3B       ;PRINT LINE 3B OF ERROR MESSAGE
013266  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
013272  004737  026132                  JSR     PC,INCSKI       ;INCREMENT 'SKI' OR 'OCYL' ERROR COUNT
013276  004737  024256                  JSR     PC,LINE7A       ;PRINT LINE 7A OF ERROR MESSAGE
013302  000207                          RTS     PC
```

```
                                        ;REPORT WRITE CLOCK FAILURE ('WCF')
                                        
013304  004737  022274          WCFER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
013310  104414  052441                  DISPLY  ,EM34           ;REPORT WRITE CLOCK FAILURE
013314  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
013320  004737  023004                  JSR     PC,LINE3A       ;PRINT LINE 3A OF ERROR MESSAGE
013324  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
013330  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
013334  004737  016436                  JSR     PC,PRTBAD       ;SEE IF BAD SECTOR TO BE PRINTED
013340  012737  000003  001324          MOV     #3,RETRY        ;RETRY COUNT
013346  012737  000040  001322          MOV     #BIT05,MASK     ;ERROR MASK
013354  004737  017120                  JSR     PC,$RETRY       ;RETRY THE ORDER
013360  000405                          BR      2$              ;RETURN HERE IF RETRY UNSUCESSFUL
013362  004737  024076                  JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
013366  004737  024136          1$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
013372  000207                          RTS     PC
013374  004737  024104          2$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
013400  000772                          BR      1$
                                        
                                        ;PROCESS DRIVE UNSAFE ERROR
                                        
013402  004737  022274          UNSAF:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
013406  104414  053602                  DISPLY  ,EM60           ;REPORT DRIVE UNSAFE
013412  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
013416  004737  022776                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
013422  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
013426  012737  040000  001322          MOV     #BIT14,MASK     ;RETRY MASK
013434  012737  000003  001324          MOV     #3,RETRY        ;RETRY COUNT
013442  004737  017120                  JSR     PC,$RETRY       ;RETRY THE ORDER
013446  000403                          BR      1$              ;RETRY WAS UNSUCESSFUL
013450  004737  024076                  JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
013454  000404                          BR      2$              ;CONTINUE WITH ERROR REPORT
013456  004737  024104          1$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
013462  000137  031362                  JMP     DROP            ;DROP UNSAFE DRIVE
                                        
013466  004737  024136          2$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
013472  000207                          RTS     PC              ;RETURN
                                        
                                        ;REPORT EARLY WARNING ERROR
                                        
013474  004737  022274          EWNERR: JSR     PC,LINE1        ;SKIP LINES
013500  000240                          NOP
013502  032760  000002  000230          BIT     #BIT1,$RPER3(R0)        ;'TPE' SET?
013510  001403                          BEQ     1$              ;BR IF NO
013512  104414  053625                  DISPLY  ,EM70           ;PRINT TEMPERATURE WARNING ERROR
013516  000411                          BR      3$              ;TYPE REMAINING ERROR MESSAGE
013520  032760  000004  000230  1$:     BIT     #BIT2,$RPER3(R0)        ;'AIR' SET?
013526  001403                          BEQ     2$              ;BR IF NO
013530  104414  053704                  DISPLY  ,EM71           ;'AIR SYSTEM WARNING ERROR'
013534  000402                          BR      3$
013536  104414  053762          2$:     DISPLY  ,EM72           ;'EARLY WARNING ERROR,AIR TPE NOT SET'
013542  004737  022342          3$:     JSR     PC,LINE2        ;ERROR MESSAGE
013546  004737  022776                  JSR     PC,LINE3        ;PRINT OUT
013552  004737  026202                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
013556  012737  000007  001322          MOV     #7,MASK         ;SET UP ERROR MASK
013564  012737  000003  001324          MOV     #3,RETRY        ;RETRY COUNT
013572  004737  017120                  JSR     PC,$RETRY       ;RETRY THE ORDER
```

```
58 013576  000403                    BR      4$              ;RETRY UNSUCESSFUL RETURN
59 013600  004737  024076             JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
60 013604  000207                    RTS     PC              ;RETURN
61 013606  004737  024104  4$:       JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
62 013612  000137  031362             JMP     DROP            ;DROP DRIVE
```

```
                                        ;REPORT AN 'UNKNOWN' DATA PATTERN
                                        ;
                                        ;R1 = POINTER FIRST WORD OF DATA BUFFER
                                        ;
013616  005737  001334          NOMTCH: TST     CFLAG           ;WAS (^C) TYPED?
013622  001060                          BNE     5$              ;BR IF YES
013624  105737  001352          1$:     TSTB    FRSTER          ;FIRST ERROR IN THE SECTOR ?
013630  001013                          BNE     2$              ;BR IF NOT OR IF PROCESSING 'DCKER'
013632  004737  022274                  JSR     PC,LINE1        ;TYPE LINE 1 OF ERROR MESSAGE
013636  104414  053027                  DISPLY  ,EM43           ;'CAN'T MATCH DATA WITH PATTERN'
013642  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
013646  004737  023004                  JSR     PC,LINE3A       ;PRINT LINE 3A OF ERROR MESSAGE
013652  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
013656  000404                          BR      3$              ;CONTINUE PROCESSING ERROR
013660  104414  053027          2$:     DISPLY  ,EM43           ;'CAN'T MATCH DATA WITH PATTERN'
013664  104414  001203                  DISPLY  ,$CRLF          ;CR-LF
013670  104414  056015          3$:     DISPLY  ,LIN9I          ;HEADER FOR DATA PRINTOUT
013674  005737  001334          4$:     TST     CFLAG           ;WAS (^C) TYPED?
013700  001031                          BNE     5$              ;BR IF YES
013702  010146                          MOV     R1,-(SP)        ;ADDRESS OF WORD POSITION
013704  004737  024366                  JSR     PC,LINOCT       ;TYPE WORD NUMBER
013710  005237  001374                  INC     WRDPOS          ;INC WORD POSITION
013714  013746  001374                  MOV     WRDPOS,-(SP)    ;PUT THE WORD POS ON THE STACK
013720  004737  033412                  JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
013724  004537  032742                  JSR     R5,$REPLZ       ;TYPE IT (REPLACE LEADING ZEROS)
013730  000006                          .WORD   6               ;TYPE 6 DIGITS
013732  104414  057771                  DISPLY  ,PERIOD         ;TYPE '.'
013736  104414  056610                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
013742  012146                          MOV     (R1)+,-(SP)     ;ADDRESS OF DATA WORD
013744  004737  024366                  JSR     PC,LINOCT       ;TYPE DATA
013750  104414  001203                  DISPLY  ,$CRLF          ;CR-LF
013754  023727  001374  000003         CMP     WRDPOS,#3       ;DONE ALL WORDS ?
013762  001344                          BNE     4$              ;BR IF NO
013764  062701  000770          5$:     ADD     #<252.*2.>,R1   ;INCREMENT BUFFER POINTER - 4 MATCHING WORDS
013770  005002                          CLR     R2              ;CLEAR 'WORDS TO COMPARE' COUNT IN R2
013772  012737  177777  001352        MOV     #-1,FRSTER      ;SET ERROR FOUND INDICATOR
014000  013737  001460  001364        MOV     CMPLMT,LIMIT    ;RESET THE COMPARE ERROR TYPEOUT LIMIT
014006  000207                        RTS     PC              ;RETURN
```

```
                                        ;CHECK ERROR BITS IN THE RMXX & RP07 REGISTERS
                                        
014010  032760  060000  000166  CKERR:  BIT     #60000,$RPCS1(R0)  ;SEE IF 'TRE' OR 'MCPE' SET
014016  001015                        BNE     1$                 ;BR IT EITHER SET
014020  032760  177400  000176        BIT     #177400,$RPCS2(R0) ;SEE IF ERROR BITS IN CS2 SET
014026  001011                        BNE     1$                 ;BR IF ANY SET
014030  005760  000202                TST     $RPER1(R0)         ;ANY BITS SET IN ER1
014034  001006                        BNE     1$                 ;BR IF ANY SET
014036  005760  000230                TST     $RPER3(R0)         ;ANY BITS SET IN ER3 ?
014042  001003                        BNE     1$                 ;BR IF YES
                                        
014044  005760  000226                TST     $RPER2(R0)         ;ANY BIT SET IN ER2
014050  000416                        BR      2$                 ;BR IF NO
                                        
014052  004737  022274        1$:     JSR     PC,LINE1           ;PRINT LINE 1 OF ERROR MESSAGE
014056  104414  053123                DISPLY  ,EM44              ;ERROR BITS SET, BUT NO ERROR BITS SET
014062  004737  022342                JSR     PC,LINE2           ;PRINT LINE 2 OF ERROR MESSAGE
014066  004737  022776                JSR     PC,LINE3           ;PRINT LINE 3 OF ERROR MESSAGE
014072  004737  023446                JSR     PC,LINE4           ;PRINT LINE 4 OF ERROR MESSAGE
014076  004737  026202                JSR     PC,INCTOT          ;INCREMENT TOTAL ERROR COUNT
014102  004737  024136                JSR     PC,LINE7           ;PRINT LINE 7 OF ERROR MESSAGE
014106  000207          2$:           RTS     PC                 ;RETURN
                                        
                                        ;CHECK BUS ADDRESS REGISTER & WORD COUNT REGISTER
                                        
014110  005760  000170  CKBUS:        TST     $RPWC(R0)          ;CHECK WORD COUNT
014114  001010                        BNE     1$                 ;BR IF NOT ZERO
014116  016046  000020                MOV     $WRDL(R0),-(SP)    ;WORD LENGTH
014122  006316                        ASL     (SP)               ;CHANGE INTO BYTE COUNT
014124  066016  000006                ADD     $BUF(R0),(SP)      ;ADD THE STARTING LOCATION
014130  022660  000172                CMP     (SP)+,$RPBA(R0)    ;BUFFER ADDRESS PROPER ?
014134  001416                        BEQ     2$                 ;BR IF OK
014136  004737  022274          1$:   JSR     PC,LINE1           ;PRINT LINE 1 OF ERROR MESSAGE
014142  104414  052702                DISPLY  ,EM41              ;BUS ADDRESS OR WORD COUNT INCORRECT
014146  004737  022342                JSR     PC,LINE2           ;PRINT LINE 2 OF ERROR MESSAGE
014152  004737  023034                JSR     PC,LINE3D          ;PRINT LINE 3D OF ERROR MESSAGE
014156  004737  023446                JSR     PC,LINE4           ;PRINT LINE 4 OF ERROR MESSAGE
014162  004737  026202                JSR     PC,INCTOT          ;INCREMENT TOTAL ERROR COUNT
014166  004737  024136                JSR     PC,LINE7           ;PRINT LINE 7 OF ERROR MESSAGE
014172  000207          2$:           RTS     PC
```

```
                                        ;COMPARE THE BUFFER
                                        ;
014174  005037  001352          CMPAR:  CLR     FRSTER          ;CLEAR 'FIRST ERROR' AND 'NO DCK' INDICATOR
                                        ;
014200  132760  000004  000024  CMPARD: BITB    #4,$CODE(R0)    ;SEE IF READ COMMAND
014206  001001                          BNE     1$              ;BR IF IT IS
014210  000207                          RTS     PC              ;RETURN
                                        ;
014212  005037  001362          1$:     CLR     ERCTR           ;CLEAR THE ERROR COUNTER
014216  016001  000006                  MOV     $BUF(R0),R1     ;BUFFER ADDRESS
014222  016037  000020  001366          MOV     $WRDL(R0),CMCNT ;WORD COUNT TO WORKING LOCATION
014230  066037  000170  001366          ADD     $RPWC(R0),CMCNT ;CALCULATE WORDS TRANSFERED
014236  001001                          BNE     2$
014240  000207                          RTS     PC              ;EXIT--NO WORDS XFERED
                                        ;
014242  016037  000012  001370  2$:     MOV     $CYL(R0),CMCYL  ;CYLINDER ADDRESS WORKING LOCATION
014250  052737  150000  001370          BIS     #150000,CMCYL   ;SET MFG, USER AND FMT BITS
014256  016037  000010  001372          MOV     $SEC(R0),CMSEC  ;SECTOR & TRACK ADDRESSES TO WORKING LOCNS
014264  013737  001460  001364          MOV     CMPLMT,LIMIT    ;DISPLAY LIMIT
014272  005237  001364                  INC     LIMIT           ;CONVERT PARAMETER INTO LIMIT VALUE
014276  012737  177777  001350  CMSTR:  MOV     #-1,ZROIND      ;CLEAR THE 'ZERO'S' INDICATOR
014304  005037  001356                  CLR     SAVER1          ;CLEAR THE R1 SAVE WORD
014310  005037  001360                  CLR     SAVER5          ;CLEAR THE R5 SAVE WORD
014314  023760  001366  000022          CMP     CMCNT,$SSEC(R0) ;IS BUFFER SIZE GREATER THAN ONE SECTOR ?
014322  101005                          BHI     1$              ;BR IF IT IS
014324  013702  001366                  MOV     CMCNT,R2        ;LESS THAN, USE REMAINING BUFFER
014330  005037  001366                  CLR     CMCNT           ;SET COUNTER TO 0
014334  000405                          BR      2$
014336  016002  000022          1$:     MOV     $SSEC(R0),R2    ;COMPARE SECTOR
014342  166037  000022  001366          SUB     $SSEC(R0),CMCNT ;DECREMENT WORD COUNT
014350  126027  000024  000005  2$:     CMPB    $CODE(R0),#5    ;READ HEADER & DATA?
014356  001034                          BNE     CMDAT           ;BR IF NOT
                                        ;
                                        ;COMPARE HEADER WORDS
                                        ;
014360  012705  001370          CMHED:  MOV     #CMCYL,R5       ;ADDRESS OF COMPARING CYLINDER
014364  052711  150000                  BIS     #150000,(R1)    ;SET BITS INCASE BAD SECTOR ENCOUNTER
014370  022521                          CMP     (R5)+,(R1)+     ;CHECK CYLINDER
014372  001405                          BEQ     1$              ;BR IF COMPARE OK
014374  012737  177777  001374          MOV     #-1,WRDPOS      ;INDICATE WORD POSITION IS HEADER WRD 1
014402  004737  014436                  JSR     PC,CMSTR2       ;REPORT ERROR
014406  022521                  1$:     CMP     (R5)+,(R1)+     ;COMPARE SECTOR/TRACK
014410  001405                          BEQ     2$              ;BR IF EQ
014412  012737  177776  001374          MOV     #-2,WRDPOS      ;INDICATE WORD POSITION IS HEADER WRD 2
014420  004737  014436                  JSR     PC,CMSTR2       ;REPORT ERROR
014424  162702  000002          2$:     SUB     #2,R2           ;SUBTRACT HEADER LENGTH FROM SIZE
014430  003007                          BGT     CMDAT           ;BR IF NOT FINISHED
014432  000137  015052                  JMP     CMPRX           ;COMPARE THE DATA PORTION
                                        ;
014436  005237  001362          CMSTR2: INC     ERCTR           ;INCREMENT THE ERROR COUNT
014442  004737  015060                  JSR     PC,CMPRT        ;REPORT THE COMPARISON ERROR
014446  000207                          RTS     PC              ;CHECK THE REST OF THE HEADER
```

```
                                        ;COMPARE DATA FIELD
                                        ;
014450  012737  177777  001374  CMDAT:  MOV     #-1,WRDPOS      ;INITIALIZE WORD POSITION
014456  004737  015506                  JSR     PC,MATCH        ;FIND THE PATTERN
014462  000403                          BR      1$              ;FOUND A PATTERN
014464  004737  013616                  JSR     PC,NOMTCH       ;RETURN HERE IF NO MATCH WITH PATTERN MADE
014470  000463                          BR      7$              ;BYPASS COMPARE ROUTINE
                                        ;
014472  011405                  1$:     MOV     (R4),R5         ;ADDRESS OF PATTERN ADDRESS IN R4
014474  012703  000020                  MOV     #16.,R3         ;R3 IS PATTERN POS COUNTER
014500  005237  001374          2$:     INC     WRDPOS          ;INCREMENT TO CURRENT WORD POSITION
014504  022125                          CMP     (R1)+,(R5)+     ;COMPARE BUFFER WITH PATTERN
014506  001016                          BNE     4$              ;BR IF NOT EQUAL
014510  005737  001362                  TST     ERCTR           ;ERRORS DETECTED ?
014514  001406                          BEQ     3$              ;BR IF NO ERRORS
014516  032777  000010  164430          BIT     #SW3,@#SWR      ;SWITCH 3 SET ?
014524  001402                          BEQ     3$              ;BR IF NOT SET
014526  004737  015060                  JSR     PC,CMPRT        ;DISPLAY THE WORD
                                        ;
014532  005302                  3$:     DEC     R2              ;DECREMENT SIZE COUNT
014534  003441                          BLE     7$              ;BR WHEN AT END
014536  005303                          DEC     R3              ;DECREMENT PATT POS COUNT
014540  001357                          BNE     2$              ;BR IF NOT AT END OF PATT
014542  000753                          BR      1$              ;RESTART THE PATTERN
                                        ;
014544  005761  177776          4$:     TST     -2(R1)          ;IS MISCOMPARED CHARACTER=0
014550  001410                          BEQ     5$              ;BR IF YES
014552  012737  177777  001350          MOV     #-1,ZROIND      ;SET NON-ZERO MISCOMPARED INDICATOR
014560  005237  001362                  INC     ERCTR           ;INCREMENT THE ERROR COUNTER
014564  004737  015060                  JSR     PC,CMPRT        ;REPORT ERROR
014570  000760                          BR      3$              ;CONTINUE COMPARE
                                        ;
014572  105737  001352          5$:     TSTB    FRSTER          ;FIRST ERROR?
014576  100412                          BMI     6$              ;BR IF NOT
014600  005037  001350                  CLR     ZROIND          ;SET THE ZERO INDICATOR
014604  010137  001356                  MOV     R1,SAVER1       ;SAVE CURRENT R1
014610  010537  001360                  MOV     R5,SAVER5       ;SAVE CURRENT R5
014614  013737  001374  001354          MOV     WRDPOS,SAVPOS   ;SAVE CURRENT WORD POSITION
014622  000743                          BR      3$              ;CONTINUE COMPARE
014624  005737  001350          6$:     TST     ZROIND          ;ANY MISCOMPARIONS NOT ZEROS ?
014630  001740                          BEQ     3$              ;BR IF NONE-ALL ERRORS=ZERO
014632  004737  015060                  JSR     PC,CMPRT        ;REPORT ERROR
014636  000735                          BR      3$              ;CONTINUE COMPARING
                                        ;
014640  126027  000024  000005  7$:     CMPB    $CODE(R0),#5    ;READ HEAD AND DATA ?
014646  001414                          BEQ     9$              ;YES
014650  013702  001366          8$:     MOV     CMCNT,R2        ;SET COUNTER = REMAIN BUFFER LENGTH
014654  020227  000004                  CMP     R2,#4           ;IS THERE AT LEAST 4 WORDS TO MATCH PATTERN ?
014660  002474                          BLT     CMPRX           ;BR IF NO
014662  162737  000400  001366          SUB     #256.,CMCNT     ;GREATER THAN A SECTOR ?
014670  003667                          BLE     CMDAT           ;NO,RETURN TO COMPARE LOOP
014672  012702  000400                  MOV     #256.,R2        ;SET COUNTER =SECTOR SIZE
014676  000664                          BR      CMDAT           ;RETURN TO COMPARE LOOP
                                        ;
014700  023727  001366  000002  9$:     CMP     CMCNT,#2        ;IS THERE AT LEAST 2 WORDS TO COMPARE HEADER ?
014706  002461                          BLT     CMPRX           ;BR IF NO
014710  105237  001372                  INCB    CMSEC           ;INCREMENT COUNTER
```

```
 58 014714  123760  001372  000152          CMPB    CMSEC,SECLMT(R0)        ;MAX SECTOR # ?
 59 014722  101424                          BLOS    10$                     ;NO
 60 014724  105037  001372                  CLRB    CMSEC                   ;RESET SECTOR #
 61 014730  105237  001373                  INCB    CMTRK                   ;INCREMENT TRACK #
 62 014734  123760  001373  000154          CMPB    CMTRK,TRKLMT(R0)        ;MAX TRACK # ?
 63 014742  101414                          BLOS    10$                     ;NO
 64 014744  105037  001373                  CLRB    CMTRK                   ;RESET TRACK #
 65 014750  005237  001370                  INC     CMCYL                   ;INCREMENT CYLINDER NUMBER
 66 014754  013746  001370                  MOV     CMCYL,-(SP)             ;GET COMPARING CYLINDER
 67 014760  042716  150000                  BIC     #150000,(SP)            ;SAVE ONLY THE CYLINDER BITS
 68 014764  022660  000150                  CMP     (SP)+,CYLLMT(R0)        ;LAST CYLINDER ?
 69 014770  101401                          BLOS    10$                     ;NO
 70 014772  000427                          BR      CMPRX                   ;NORMAL RETURN,NOT WRAP AROUND
 71
 72 014774  012705  001370          10$:    MOV     #CMCYL,R5               ;ADDRESS OF COMPARING CYLINDER
 73 015000  052711  150000                  BIS     #150000,(R1)            ;SET BITS INCASE BAD SECTOR ENCOUNTER
 74 015004  022521                          CMP     (R5)+,(R1)+             ;COMPARE 1ST HEADER WORD
 75 015006  001405                          BEQ     11$                     ;MATCH
 76 015010  012737  177777  001374          MOV     #-1,WRDPOS              ;INDICATE WORD POSITION IS HEADER WRD 1
 77 015016  004737  014436                  JSR     PC,CMSTR2               ;NOT MATCH
 78 015022  022521                  11$:    CMP     (R5)+,(R1)+             ;SECOND WORD OF HEADER
 79 015024  001405                          BEQ     12$                     ;MATCH
 80 015026  012737  177776  001374          MOV     #-2,WRDPOS              ;INDICATE WORD POSITION IS HEADER WRD 2
 81 015034  004737  014436                  JSR     PC,CMSTR2               ;NOT MATCH
 82
 83 015040  162737  000002  001366  12$:    SUB     #2,CMCNT                ;ADJUST WORD COUNT
 84 015046  003401                          BLE     CMPRX                   ;COMPARE IS DONE
 85 015050  000677                          BR      8$                      ;RETURN TO COMPARE LOOP
 86
 93 015052  004737  015440          CMPRX:  JSR     PC,ENDCMP               ;PRINT LAST LINE IF ERRORS
 94 015056  000207                          RTS     PC
```

```
                                        ;TYPE DATA COMPARE ERRORS
                                        ;
015060  000240                  CMPRT:  NOP
                                        ;
015062  005737  001356          10:     TST     SAVER1          ;PRINT SAVED VALUES ?
015066  001005                          BNE     20              ;BR IF YES
015070  004737  015166                  JSR     PC,40           ;PRINT INITIAL MESSAGE INFO
015074  004737  015250                  JSR     PC,70           ;PRINT REMAINDER OF MESSAGE
015100  000451                          BR      30              ;EXIT
015102                          20:
015102  010146                          MOV     R1,-(SP)        ;PUSH R1 ON STACK
015104  010546                          MOV     R5,-(SP)        ;PUSH R5 ON STACK
015106  013746  001374                  MOV     WRDPOS,-(SP)    ;PUSH WRDPOS ON STACK
015112  013701  001356                  MOV     SAVER1,R1       ;DISPLAY SAVED R1
015116  013705  001360                  MOV     SAVER5,R5       ;DISPLAY SAVED R5
015122  013767  001354  001374          MOV     SAVPOS,WRDPOS   ;DISPLAY SAVED WORD POSITION
015130  004737  015166                  JSR     PC,40           ;PRINT INITIAL MESSAGE INFO
015134  004737  015250                  JSR     PC,70           ;PRINT SAVED VALUES
015140  005037  001356                  CLR     SAVER1          ;CLEAR SAVED REGISTER INDICATORS
015144  005037  001360                  CLR     SAVER5          ;CLEAR THE OTHER ONE
015150  012637  001374                  MOV     (SP)+,WRDPOS    ;POP STACK INTO WRDPOS
015154  012605                          MOV     (SP)+,R5        ;POP STACK INTO R5
015156  012601                          MOV     (SP)+,R1        ;POP STACK INTO R1
015160  004737  015250                  JSR     PC,70           ;PRINT REMAINDER OF MESSAGE
015164  000207                  30:     RTS     PC              ;RETURN
                                        ;
015166  105737  001352          40:     TSTB    FRSTER          ;FIRST ERROR ?
015172  100443                          BMI     50              ;BR IF NOT
015174  001013                          BNE     56              ;BR IF FIRST ERROR AND PROCESSING 'DCN' ERROR,
                                        ;ELSE, FIRST ERROR AND COMPARE ERROR W/O 'DCN'
015176  004737  022270                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
015202  104414  052746                  DISPLY  .EM42           ;DATA COMPARE ERROR W/O 'DCN' ERROR
015206  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
015212  004737  023004                  JSR     PC,LINE3A       ;PRINT LINE 3A OF ERROR MESSAGE
015216  004737  023446                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
015222  000404                          BR      60              ;GO TO TYPE HEADER
                                        ;
015224  104414  053673          50:     DISPLY  .LIN1B          ;PRINT 'DATA COMPARISON ERRORS'
015230  104414  001203                  DISPLY  .SCRLF          ;CR-LF
015234  104414  055722          60:     DISPLY  .LIN3H          ;PRINT '       WORD  EXPCTD  RECEVD
                                        ;          ADDR   POS   DATA    DATA'
015240  012737  177777  001352          MOV     #-1,FRSTER      ;SET FIRST ERROR FLAG
015246  000207                          RTS     PC              ;RETURN
                                        ;
015250  005737  001334          70:     TST     CFLAG           ;WAS (^C) TYPED?
015254  100412                          BMI     90              ;BR IF YES
015256  005737  001364                  TST     LIMIT           ;TYPEOUT LIMIT REACHED ?
015262  001403                          BEQ     80              ;BR IF IT WAS
015264  005337  001364                  DEC     LIMIT           ;DECREMENT LIMIT COUNTER
015270  001005                          BNE     100             ;BR IF NOT AT LIMIT
015272  032777  000200  163650  80:     BIT     #SW07,@SWR      ;PRINT ALL DATA COMPARE ERRORS ?
015300  001001                          BNE     100             ;BR IF YES
015302  000207                  90:     RTS     PC              ;RETURN
                                        ;
015304  010146                  100:    MOV     R1,-(SP)        ;BUFFER ADDRESS
015306  162716  000002                  SUB     #2,(SP)         ;ADJUST ADDRESS
015312  004737  024366                  JSR     PC,LINOCT       ;TYPE IT
```

```
                                        ;GET WORD POSITION
                                        ;PUT EXPECTED DATA ON THE STACK
                                        ;TYPE IT
                                        ;TYPE 2 BLANKS
                                        ;RECEIVED DATA
                                        ;TYPE IT
                                        ;CR-LF
                                        ;RETURN

                                        ;IS IT HEADER WORD 1 ?
                                        ;NO IF NO
                                        ;TYPE " MAR "
                                        ;IS IT HEADER WORD 2 ?
                                        ;NO IF NO
                                        ;TYPE " MAR "
                                        ;PUT THE WORD POS ON THE STACK
                                        ;CONVERT IT TO DECIMAL
                                        ;TYPE IT (REPLACE LEADING ZEROS)
                                        ;TYPE 6 DIGITS
                                        ;TYPE ":"
                                        ;TYPE 2 BLANKS

;LAST LINE OF COPYRAE ERROR REPORTING

                                        ;ANY COPYRAE ERRORS FOUND ?
                                        ;NO IF NOT
                                        ;SEE HOW MANY ERRORS
                                        ;NO IF ONLY CAN'T MATCH PATTERN
                                        ;"NUMBER OF ERRORS="
                                        ;NUMBER OF ERRORS
                                        ;TYPE IT
                                        ;CR-LF
                                        ;INCREMENT TOTAL ERROR COUNT
                                        ;PRINT LINE 7 OF ERROR MESSAGE
                                        ;RETURN
```

```
                                        ;ROUTINE TO MATCH THE DATA WITH A PATTERN, ONLY WHEN LOCATION 'PATTERN'
                                        ;IS EQUAL TO 0 (RANDOM DATA PATTERN MODE). OTHERWISE, THIS ROUTINE WILL
                                        ;RETURN THE ADDRESS OF THE EXPECTED FIXED DATA PATTERN IN R0.
                                        ;CALL:
                                        ;       MOV     #BUFFER,R1      ;BUFFER ADDRESS
                                        ;       JSR     PC,MATCH
                                        ;       RETURN1                 ;PATTERN ADDRESS IN R0
                                        ;       RETURN2                 ;EQUALS? MATCH PATTERN
                                        ;
015506  010146                  MATCH: MOV     R1,-(SP)        ;SAVE R1 ON THE STACK
015510  013703  000476                 MOV     PATTERN,R0      ;WAS RANDOM PATTERN ENABLED ?
015514  001402                         BEQ     10              ;BR IF YES
015516  062700  000010                 ADD     #8.,R0          ;
015522  000416                         BR      40              ;USE KNOWN PATTERN
015524  012700  000000           10:   MOV     #0$,R0          ;PATTERN TABLE INDEX
015530  011601                 20:   MOV     (SP),R1         ;RELOAD R1
015532  162700  000002                 SUB     #2,R0           ;DECREMENT INDEX
015536  001415                         BEQ     50              ;BR IF PATTERN NOT MATCH
015540  016405  002316                 MOV     $TADAT(R0),R5   ;ADDRESS OF PATTERN ADDRESS
015544  012703  000004                 MOV     #4,R3           ;NUMBER OF LOCATIONS TO CHECK
015550  022125                 30:   CMP     (R1)+,(R5)+     ;COMPARE THE BUFFER AGAINST THE PATTERN
015552  001364                         BNE     20              ;BR IF NOT EQUAL, TRY NEXT PATTERN
015554  005303                         DEC     R3              ;FINISHED CHECKING?
015556  001374                         BNE     30              ;BR IF NOT FINISHED
015560  062700  002316           40:   ADD     #$TADAT,R0      ;MAKE PATTERN ADDRESS ABSOLUTE
015564  000405                         BR      60              ;EXIT
015566  062766  000002  000002   50:   ADD     #2,2(SP)        ;INCREMENT RETURN ADDRESS
015572  012601                 60:   MOV     (SP)+,R1        ;RESTORE R1
015574  000207                         RTS     PC              ;RETURN
```

```
                                        ;USE ECC TO CORRECT THE DATA ERROR
                                        ;
015576  016037  000172  001400  ECC:    MOV     @RPBA(R0),ECSEC ;ADDRESS OF LAST LOCN XFERED
015602  016046  000170                  MOV     @RPWC(R0),-(SP) ;#T WORDS XFERED (2'S COMP)
015610  066016  000020                  ADD     @RPBOL(R0),(SP) ;ADD WORDS REQUESTED
015614  001002                          BNE     10
015616  005726                          TST     (SP)+           ;RESTORE STACK
015620  000207                          RTS     PC              ;EXIT--NO WORDS XFERRED
015622  005046                  10:     CLR     -(SP)           ;CLEAR NEXT STACK LOCN
015624  016046  000022                  MOV     @SSEC(R0),-(SP) ;SECTOR SIZE
015630  004737  032126                  JSR     PC,$DIV         ;DIVIDE WORDS XFERED BY SECTOR SIZE
015634  005716                          TST     (SP)            ;PARTIAL SECTOR XFERED ?
015636  001413                          BEQ     20              ;BR IF NOT
015640  006316                          ASL     (SP)            ;CONVERT INTO NUMBER OF BYTES
015642  161637  001400                  SUB     (SP),ECSEC      ;SUBTRACT SECTOR RESIDUE
015646  122760  000005  000026          CMPB    #5,@CODE(R0)    ;WAS OPERATION, READ HEAD & DATA
015654  001007                          BNE     30              ;BR IF NOT
015656  062737  000004  001400          ADD     #4,ECSEC        ;ADD HEADER SIZE (IN BYTES) BACK IN
015664  000403                          BR      30              ;GO ADJUST THE STACK POINTER
015666  162737  001000  001400  20:     SUB     #256.*2,ECSEC   ;SUBTRACT SECTOR DATA FIELD SIZE (IN BYTES)
015674  062706  000004          30:     ADD     #4,SP           ;ADJUST THE STACK POINTER
015700  016037  000252  001376          MOV     @RPEC1(R0),ECBIT        ;ECC POSITION COUNT
015706  005337  001376                  DEC     ECBIT           ;ADJUST BIT POSITION
015712  013737  001376  001406          MOV     ECBIT,ECWRD     ;LOAD THE WORD COUNT LOCATION
015720  042737  177760  001376          BIC     #^C17,ECBIT     ;SAVE THE BIT OFFSET COUNT
015726  042737  000017  001406          BIC     #17,ECWRD       ;CLEAR THE BIT OFFSET
015734  006237  001406                  ASR     ECWRD           ;CHANGE TO BYTE COUNT(DIVIDE BY 2)
015740  006237  001406                  ASR     ECWRD           ;CHANGE TO BYTE COUNT(DIVIDE BY 4)
015744  006237  001406                  ASR     ECWRD           ;CHANGE TO BYTE COUNT(DIVIDE BY 8.)
015750  104414  056145                  DISPLY  ,LIN10A         ;'ERROR BURST BEGINS AT '
015754  013746  001406                  MOV     ECWRD,-(SP)     ;PUT THE WORD COUNT ON THE STACK
015760  006216                          ASR     (SP)            ;GET STARTING WORD FOR MESSAGE(DIVIDE BY 16.)
015762  011637  001374                  MOV     (SP),WRDPOS     ;GET CURRENT WORD POSITION
015766  004737  033412                  JSR     PC,$B2D         ;CONVERT IT TO DECIMAL
015772  004737  032526                  JSR     PC,$UPRL        ;TYPE IT (LEFT JUSTIFIED)
015776  104414  057771                  DISPLY  .PERIOD         ;TYPE '.'
016002  104414  056201                  DISPLY  ,LIN10B         ;' IN DATA FIELD OF ERROR SECTOR'
016006  063737  001400  001406          ADD     ECSEC,ECWRD     ;FIND THE BEGINNING OF THE ERROR BURST
016014  026037  000172  001406          CMP     @RPBA(R0),ECWRD ;SEE IF BURST WAS IN DATA READ
016022  101002                          BHI     40              ;BR IF IN DATA READ
016024  000137  016406                  JMP     ECC2            ;NOT IN DATA READ - REPORT IT
                                        ;
016030  016037  000234  001402  40:     MOV     @RPEC2(R0),ECMSK0       ;GET THE ERROR BIT MASK
016036  005037  001404                  CLR     ECMSK1          ;CLEAR THE UPPER MASK WORD
016042  005337  001376          50:     DEC     ECBIT           ;DECREMENT THE BIT OFFSET COUNT
016046  002405                          BLT     60              ;BR IF DONE
016050  006337  001402                  ASL     ECMSK0          ;SHIFT THE ERROR MASK
016054  006137  001404                  ROL     ECMSK1          ;SHIFT THE LOWER INTO THE UPPER
016060  000770                          BR      50              ;CONTINUE THE SHIFT
                                        ;
016062  017737  163320  001412  60:     MOV     @ECWRD,ECBADD   ;SAVE THE INCORRECT WORD
016070  013746  001402                  MOV     ECMSK0,-(SP)    ;PUT LOWER MASK ON STACK
016074  047716  163306                  BIC     @ECWRD,(SP)     ;CLEAR ERRONEOUS ONE BITS FROM MASK
016100  043777  001402  163300          BIC     ECMSK0,@ECWRD   ;CLEAR ERRONEOUS ONE BITS FROM BAD WORD
016106  052677  163274                  BIS     (SP)+,@ECWRD    ;SET DROPPED BITS
                                        ;
016112  005737  001404                  TST     ECMSK1          ;DOES ERROR GO INTO NEXT WORD ?
```

```
 58 016116  001415                          BEQ     7$                      ;BR IF NO
 59 016120  013737  001406  001414          MOV     ECWRD,ECWRD1            ;DUPLICATE ADDRESS
 60 016126  062737  000002  001414          ADD     #2,ECWRD1               ;INCREMENT ERROR ADDRESS
 61 016134  026037  000172  001414          CMP     $RPBA(R0),ECWRD1                ;IS NEXT WORD IN THE BUFFER ?
 62 016142  101006                          BMI     8$                      ;BR IF YES, ELSE,
 63 016144  005737  001402                  TST     ECMSK0                  ;WAS ERROR IN FIRST WORD ?
 64 016150  001516                          BEQ     ECC2                    ;BR IF NO
 65 016152  005037  001414          7$:     CLR     ECWRD1                  ;CLEAR 2ND WORD ADDRESS
 66 016156  000414                          BR      ECC1                    ;PRINT WORD CORRECTED
 67
 68 016160  017737  163230  001420  8$:     MOV     @ECWRD1,ECBAD1          ;SAVE THE SECOND BAD WORD
 69 016166  013746  001404                  MOV     ECMSK1,-(SP)            ;PUT THE UPPER MASK ON THE STACK
 70 016172  047716  163216                  BIC     @ECWRD1,(SP)            ;CLEAR ERRONEOUS ONE BITS FROM UPPER MASK
 71 016176  043777  001404  163210          BIC     ECMSK1,@ECWRD1          ;CLEAR ERRONEOUS ONE BITS FROM DATA WORD
 72 016204  052677  163204                  BIS     (SP)+,@ECWRD1           ;SET DROPPED BITS
```

```
 1
 2 016210  104414  056345          ECC1:   DISPLY  .LIN10M         ;HEADER
 6 016214  013746  001406                  MOV     ECWRD,-(SP)     ;PUT ECWRD ON THE STACK
   016220  004737  024366                  JSR     PC,LINOCT       ;TYPE ECWRD
 7 016224  013746  001374                  MOV     WRDPOS,-(SP)    ;PUT THE WORD POS ON THE STACK
 8 016230  004737  033412                  JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
 9 016234  004537  032742                  JSR     R5,$REPLZ       ;TYPE IT (REPLACE LEADING ZEROS)
10 016240  000006                          .WORD   6               ;TYPE 6 DIGITS
11 016242  104414  057771                  DISPLY  .PERIOD         ;TYPE '.'
12 016246  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
17 016252  013746  001412                  MOV     ECBADO,-(SP)    ;PUT ECBADO ON THE STACK
   016256  004737  024366                  JSR     PC,LINOCT       ;TYPE ECBADO
   016262  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
   016266  017746  163114                  MOV     @ECWRD,-(SP)    ;PUT @ECWRD ON THE STACK
   016272  004737  024366                  JSR     PC,LINOCT       ;TYPE @ECWRD
   016276  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
18
19 016302  005737  001414                  TST     ECWRD1          ;PRINT THE NEXT WORD ?
20 016306  001441                          BEQ     ECCX            ;BR IF NOT
21 016310  104414  001203                  DISPLY  .$CRLF          ;CR-LF
25 016314  013746  001414                  MOV     ECWRD1,-(SP)    ;PUT ECWRD1 ON THE STACK
   016320  004737  024366                  JSR     PC,LINOCT       ;TYPE ECWRD1
26 016324  013746  001374                  MOV     WRDPOS,-(SP)    ;PUT THE WORD POS ON THE STACK
27 016330  005216                          INC     (SP)            ;INC TO SECOND WORD OF BURST
28 016332  004737  033412                  JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
29 016336  004537  032742                  JSR     R5,$REPLZ       ;TYPE IT (REPLACE LEADING ZEROS)
30 016342  000006                          .WORD   6               ;TYPE 6 DIGITS
31 016344  104414  057771                  DISPLY  .PERIOD         ;TYPE '.'
32 016350  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
37 016354  013746  001420                  MOV     ECBAD1,-(SP)    ;PUT ECBAD1 ON THE STACK
   016360  004737  024366                  JSR     PC,LINOCT       ;TYPE ECBAD1
   016364  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
   016370  017746  163020                  MOV     @ECWRD1,-(SP)   ;PUT @ECWRD1 ON THE STACK
   016374  004737  024366                  JSR     PC,LINOCT       ;TYPE @ECWRD1
   016400  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
38 016404  000402                          BR      ECCX            ;EXIT
39
40 016406  104414  056241          ECC2:   DISPLY  .LIN10C         ;ERROR BURST WAS NOT TRANSFERED TO MEMORY
41 016412  104414  001203          ECCX:   DISPLY  .$CRLF          ;CR-LF
42 016416  000207                          RTS     PC              ;RETURN
```

```
                                        ;ROUTINE TO CHECK ERROR REGISTER #3 FOR THE BAD SECTOR BIT
                                        ;CALL
                                        ;       JSR     PC,SPOTCK       ;CALL ROUTINE
                                        ;       ------                  ;RETURN HERE IF BAD SPOT IS FOUND, ELSE
                                        ;       ------                  ;RETURN HERE
                                        
016420  032760  100000  000230  SPOTCK: BIT     #BSE,$RPER3(R0) ;SEE IF BSE BIT IS SET,
016426  001002                        BNE     1$              ;BRANCH IF SO, ELSE
016430  062716  000002                ADD     #2,(SP)         ;ADJUST RETURN ADDRESS.
016434  000207                1$:     RTS     PC              ;EXIT
                                        
                                        ;ROUTINE TO DISPLAY THE SECTOR WHICH GAVE THE HARD ERROR
                                        ;CALL
                                        ;       JSR     PC,PRTBAD       ;CALL ROUTINE
                                        
016436  032777  000010  162510  PRTBAD: BIT     #SW3,@SWR       ;PRINT THE BAD SECTOR ?
016444  001520                        BEQ     8$              ;BR IF NOT
016446  016001  000172                MOV     $RPBA(R0),R1    ;PUT THE END ADDRESS INTO R1
016452  016046  000020                MOV     $WRDL(R0),-(SP) ;FIND THE BEGINNING OF THE SECTOR
016456  066016  000170                ADD     $RPWC(R0),(SP)  ;SUBTRACT THE WORDS NOT TRANSFERED
016462  001002                        BNE     1$
016464  005726                        TST     (SP)+           ;RESTORE STACK
016466  000207                        RTS     PC              ;EXIT--NO WORDS XFERRED
016470  005046                1$:     CLR     -(SP)           ;MAKE THE UPPER DIVIDEND 0
016472  016046  000022                MOV     $SSEC(R0),-(SP) ;DIVIDE THE WORDS XFERED BY THE SECTOR SIZE
016476  004737  032126                JSR     PC,$DIV         ;DIVIDE
016502  005716                        TST     (SP)            ;REMANDER = 0 ?
016504  001403                        BEQ     2$              ;BR IF IT IS - COMPLETE SECTOR TRANSFERED
016506  006316                        ASL     (SP)            ;CONVERT THE RESIDUAL SECTOR INTO BYTE COUNT
016510  161601                        SUB     (SP),R1         ;SUBTRACT IT FROM THE END ADDRESS
016512  000410                        BR      3$              ;FINISH THE SIZING
016514  162701  001000        2$:     SUB     #256.*2,R1      ;SUBTRACT FULL SECTOR FROM END ADDR (IN BYTES)
016520  122760  000005  000024        CMPB    #5,$CODE(R0)    ;WAS OPERATION READ HEADER & DATA ?
016525  001002                        BNE     3$              ;BR IF NOT
016530  162701  000004                SUB     #4,R1           ;SUBTRACT HEADER SIZE FROM ADDR
016534  062706  000004        3$:     ADD     #4,SP           ;RESTORE THE STACK POINTER
016540  104414  001203                DISPLY  ,$CRLF          ;CR-LF
016544  104414  056473                DISPLY  ,LIN11H         ;PRINT THE HEADER
016550  122760  000005  000024        CMPB    #5,$CODE(R0)    ;WAS OPERATION READ HEADER & DATA ?
016556  001021                        BNE     4$              ;BR IF NOT
016560  104414  056546                DISPLY  ,LIN11          ;TYPE 'ADDR    HEADER'
016564  010146                        MOV     R1,-(SP)        ;PUT THE ADDRESS ON THE STACK
016566  004737  024366                JSR     PC,LINOCT       ;TYPE THE ADDRESS
016572  104414  056607                DISPLY  ,BLNKS3         ;TYPE 3 BLANKS
016576  012146                        MOV     (R1)+,-(SP)     ;PUT WORD ON STACK
016600  004737  024366                JSR     PC,LINOCT       ;TYPE THE 1ST HEADER WORD
016604  104414  056611                DISPLY  ,BLNKS1         ;TYPE 1 BLANK
016610  012146                        MOV     (R1)+,-(SP)     ;PUT WORD ON STACK
016612  004737  024366                JSR     PC,LINOCT       ;TYPE THE 2ND HEADER WORD
016616  104414  001203                DISPLY  ,$CRLF          ;CR-LF
                                        
016622  104414  056567        4$:     DISPLY  ,LIN11A         ;TYPE 'ADDR    DATA'
016626  012702  000010        5$:     MOV     #8.,R2          ;8. DATA WORDS PER LINE
016632  010146                        MOV     R1,-(SP)        ;PUT THE ADDRESS ON THE STACK
016634  004737  024366                JSR     PC,LINOCT       ;TYPE THE ADDRESS
016640  104414  056610                DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
016644  020160  000172        6$:     CMP     R1,$RPBA(R0)    ;PRINTED ALL THE SECTOR ?
```

```
 58 016650  001412                        BEQ     7$              ;BR IF ALL PRINTED
 59 016652  104414  056611                DISPLY  ,BLNKS1         ;TYPE 1 BLANK
 60 016656  012146                        MOV     (R1)+,-(SP)     ;PUT THE DATA ON THE STACK
 61 016660  004737  024366                JSR     PC,LINOCT       ;TYPE THE DATA
 62 016664  005302                        DEC     R2              ;DECREMENT THE HORIZONTAL COUNT
 63 016666  001366                        BNE     6$              ;BR IF NOT AT THE END OF THE LINE
 64 016670  104414  001203                DISPLY  ,$CRLF          ;CR-LF
 65 016674  000754                        BR      5$              ;RESTORE THE WORDS/LINE COUNT
 66 016676  104414  001203          7$:   DISPLY  ,$CRLF          ;CR-LF
 67 016702  104414  001203                DISPLY  ,$CRLF          ;CR-LF
 68 016706  000207                  8$:   RTS     PC              ;RETURN
```

```
                                        ;ROUTINE TO DO A RECALIBRATE USING ACTIVE DPB
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       JSR     PC,RECALT
                                        ;       RETURN

016710  010037  016734          RECALT: MOV     R0,2$           ;LOAD THE DPB ADDRESS
016714  116060  000166  000027          MOVB    $RPCS1(R0),$PREVO(R0)   ;SAVE THE PREVIOUS COMMAND
016722  112760  000107  000002          MOVB    #RECAL,$COMND(R0)       ;LOAD THE NEW COMMAND
016730  004037  041364          1$:     JSR     R0,RP07         ;START THE RECALIBRATE
016734  000000                  2$:     .WORD   0               ;DPB ADDRESS
016736  000774                          BR      1$              ;DRIVER DIDN'T ACCEPT THE COMMAND

016740  005760  000016          3$:     TST     $TATUS(R0)      ;SEE IF FINISHED
016744  001775                          BEQ     3$              ;IF EQ NO
016746  004737  024444                  JSR     PC,READDR       ;DECREMENT THE ADDRESSES
016752  012660  000034                  MOV     (SP)+,$PREVA+2(R0)      ;MOVE THE CYLINDER ADDRESS
016756  112660  000033                  MOVB    (SP)+,$PREVA+1(R0)      ;MOVE THE TRACK ADDRESS
016762  112660  000032                  MOVB    (SP)+,$PREVA(R0)        ;MOVE THE SECTOR ADDRESS
016766  005060  000012                  CLR     $CYL(R0)        ;CLEAR THE CURRENT CYLINDER ADDRESS
016772  005060  000010                  CLR     $SEC(R0)        ;CLEAR THE CURRENT TRK/SEC ADDRESS
016776  000207                          RTS     PC              ;RETURN

                                        ;ROUTINE TO A RECAL WITH NO DPB ACTIVE
                                        ;CALL:
                                        ;       MOVB    #DRIVE,GENDPB   ;DRIVE ADDRESS
                                        ;       JSR     PC,RECALO
                                        ;       RETURN

017000  112737  000107  050736  RECALO: MOVB    #RECAL,GENDPB+$COMND    ;RELCALIBRATE COMMAND
017006  004037  041364          1$:     JSR     R0,RP07         ;DRIVER ENTRANCE
017012  050734                          GENDPB                  ;DPB ADDRESS FOR COMMAND
017014  000774                          BR      1$              ;DRIVER DIDN'T ACCEPT THE COMMAND
017016  005737  050752          2$:     TST     GENDPB+$TATUS   ;SEE IF FINISHED
017022  001775                          BEQ     2$              ;BR IF NOT FINISHED
017024  000207                          RTS     PC
```

```
                                        ;UTILITY READ HEADER ROUTINE
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       MOV     #SECTOR,-(SP)   ;SECTOR ADDRESS
                                        ;       MOV     #TRACK,-(SP)    ;TRACK ADDRESS
                                        ;       MOV     #CYLINDER,-(SP) ;CYLINDER ADDRESS
                                        ;       JSR     PC,READDR
                                        ;       RETURN

017026  116637  000004  050745 READHD: MOVB    4(SP),GENDPB+$TRK       ;TRACK ADDRESS
017034  116637  000006  050744         MOVB    6(SP),GENDPB+$SEC       ;SECTOR ADDRESS
017042  016637  000002  050746         MOV     2(SP),GENDPB+$CYL       ;CYLINDER ADDRESS
017050  111037  050734                 MOVB    (R0),GENDPB     ;DRIVE NUMBER
017054  112737  000173  050736         MOVB    #RDHD,GENDPB+$COMND     ;COMMAND
017062  012737  177776  050740         MOV     #-2,GENDPB+$WCNT        ;WORD CTR = 2
017070  004037  041364         1$:     JSR     R0,RP07         ;DRIVER ENTRANCE
017074  050734                 GENDPB                          ;DPB ADDRESS FOR COMMAND
017076  000774                 BR      1$                      ;DRIVER DIDN'T ACCEPT COMMAND
017100  005737  050752         2$:     TST     GENDPB+$TATUS   ;FINISHED?
017104  001775                 BEQ     2$                      ;BR IF NOT
017106  011666  000006                 MOV     (SP),6(SP)      ;ADJUST STACK FOR RETURN
017112  062706  000006                 ADD     #6,SP           ;ADJUST RETRUN POINTER
017116  000207                 RTS     PC                      ;RETURN

                                        ;RETRY THE PRESENT OPERATION
                                        ;CALL:
                                        ;       MOV     #COUNT,RETRY    ;RETRY COUNT
                                        ;       JSR     PC,$RETRY
                                        ;       RETURN1                 ;RETRY UNSUCESSFUL
                                        ;       RETURN2                 ;SUCESSFUL RETRY
                                        ;                               ;NOTE: IF A DIFFERENT ERROR OCCURS DURING
                                        ;                               ;RETRY, THE ROUTINE EXITS TO 'ERPRC1'

017120  004737  020240         $RETRY: JSR     PC,GODRIV       ;RE-START ORDER
017124  005760  000016         1$:     TST     $TATUS(R0)      ;ORDER FINISHED?
017130  001775                 BEQ     1$                      ;BR IF NOT
017132  100405                 BMI     2$                      ;BR IF ERROR
017134  105237  001325                 INCB    RETRY+1         ;INCREMENT RETRY COUNT
017140  062716  000002                 ADD     #2,(SP)         ;INCREMENT RETURN
017144  000436                 BR      6$                      ;GO TO EXIT

017146  032760  000200  000016 2$:     BIT     #BIT7,$TATUS(R0)  ;DID ORDER TERMINATE NORMALLY ?
017154  001441                 BEQ     8$                      ;BR IF NOT
017156  005737  001322                 TST     MASK            ;IS ERROR MASK 0 ?
017162  001004                 BNE     3$                      ;BR IF NOT
017164  005760  000202                 TST     $RPER1(R0)      ;MAKE SURE THAT THE DRIVE ERROR REG IS CLEAR
017170  001025                 BNE     7$                      ;BR IF NOT
017172  000415                 BR      5$                      ;CONTINUE RETRY

017174  022737  000007  001322 3$:     CMP     #7,MASK         ;EWN ERROR?
017202  001005                 BNE     4$                      ;BR IF NO
017204  032760  000002  000200         BIT     #BIT1,$RPDS(R0) ;'EWN' STILL SET?
017212  001414                 BEQ     7$                      ;NO, REPORT DIFFERENT ERROR
017214  000404                 BR      5$                      ;SET, RETRY

017216  033760  001322  000202 4$:     BIT     MASK,$RPER1(R0) ;SAME ERROR?
017224  001407                 BEQ     7$                      ;BR IF NOT
```

```
58 017226  105237  001325          56:     INCB    RETRY+1         ;INCREMENT RETRY COUNT
59 017232  123737  001324  001325          CMPB    RETRY,RETRY+1   ;DONE ?
60 017240  001327                          BNE     $RETRY          ;BR IF NOT DONE
61 017242  000207                  68:     RTS     PC              ;RETURN
62
63 017244  004737  024354          78:     JSR     PC,LINE8        ;REPORT DIFFERENT ERROR
64 017250  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7
65 017254  005726                          TST     (SP)+           ;ADJUST STACK POINTER FOR DIRECT RETURN
66 017256  000207                          RTS     PC              ;RETURN
67
68 017260  104414  055650          88:     DISPLY  ,LIN8M          ;'DIFFERENT ERROR DURING RETRY'
69 017264  000137  007636                  JMP     ERPRC1          ;REPORT THE ERROR
```

```
                                ;ROUTINE TO UPDATE THE PERFORMANCE SUMMARY STATISTICS
                                ;CALL:
                                ;       MOV     #DPB,R0         ;DPB ADDRESS
                                ;       JSR     PC,STATIS
                                ;       RETURN
                                
017270  032760  000300  000016  STATIS: BIT     #BIT07!BIT06,STATUS(R0) ;CHECK FOR DATA TERMINATION
017276  001533                          BEQ     7$              ;BR IF NOT DATA TERMINATION
017300  016037  000172  017570          MOV     @RPBA(R0),FACTOR        ;STORE THE FINAL BUFFER ADDRESS
017306  166037  000006  017570          SUB     @BUF(R0),FACTOR ;SUBTRACT THE INITIAL ADDRESS
017314  001524                          BEQ     7$              ;BR IF NO DATA TRANSFER
017316  006237  017570                  ASR     FACTOR          ;CONVERT TO A WORD COUNT
                                
017322  122760  000002  000024          CMPB    #2,@CODE(R0)    ;SEE IF COMMAND WAS A WRITE
017330  001404                          BEQ     1$              ;BRANCH IF YES
017332  122760  000000  000024          CMPB    #0,@CODE(R0)    ;PRESENT OPERATION AN AUTO WRITE CHECK ?
017340  001043                          BNE     4$              ;BR IF NO
017342  063760  017570  000042  1$:     ADD     FACTOR,@WTPAS(R0)       ;ADD WORDS WRITTEN PER PASS
017350  005560  000044                  ADC     @WTPAS+2(R0)    ;ADD ANY CARRY
017354  063760  017570  000062          ADD     FACTOR,@WTOTL+4(R0)     ;ADD WORDS WRITTEN TO REP COUNTER
017362  005560  000064                  ADC     @WTOTL+6(R0)    ;ADD ANY CARRY
017366  016046  000062                  MOV     @WTOTL+4(R0),-(SP)      ;GET LOW DIVIDEND
017372  016046  000064                  MOV     @WTOTL+6(R0),-(SP)      ;GET HIGH DIVIDEND
017376  012746  041100                  MOV     #041100,-(SP)   ;GET LOW DIVISOR
017402  012746  000017                  MOV     #17,-(SP)       ;GET HIGH DIVISOR
017406  004737  032174                  JSR     PC,@#DBDIV      ;DIVIDE BY 1 X10**6
017412  005766  000004                  TST     4(SP)           ;DID REP COUNTER REACH LIMIT YET ?
017416  001412                          BEQ     2$              ;BR IF NO
017420  012660  000064                  MOV     (SP)+,@WTOTL+6(R0)      ;GET HIGH REMAINDER
017424  012660  000062                  MOV     (SP)+,@WTOTL+4(R0)      ;GET LOW REMAINDER
017430  062760  000001  000056          ADD     #1,@WTOTL(R0)   ;UPDATE THE TOTAL WRDS WRITTEN
017436  005560  000060                  ADC     @WTOTL+2(R0)    ;ADD ANY CARRY
017442  000401                          BR      3$
017444  022626                  2$:     CMP     (SP)+,(SP)+     ;GET HIGH & LOW REMAINDER OFF STACK
017446  005726                  3$:     TST     (SP)+           ;GET QUOTIENT OFF STACK
                                
017450  122760  000002  000024  4$:     CMPB    #2,@CODE(R0)    ;SEE IF COMMAND WAS A WRITE
017456  001443                          BEQ     7$              ;BRANCH IF YES
017460  063760  017570  000036          ADD     FACTOR,@RDPAS(R0)       ;ADD WORDS READ PER PASS
017466  005560  000040                  ADC     @RDPAS+2(R0)    ;ADD ANY CARRY
017472  063760  017570  000072          ADD     FACTOR,@RTOTL+4(R0)     ;ADD WORDS READ TO REP COUNTER
017500  005560  000074                  ADC     @RTOTL+6(R0)    ;ADD ANY CARRY
017504  016046  000072                  MOV     @RTOTL+4(R0),-(SP)      ;GET LOW DIVIDEND
017510  016046  000074                  MOV     @RTOTL+6(R0),-(SP)      ;GET HIGH DIVIDEND
017514  012746  041100                  MOV     #041100,-(SP)   ;GET LOW DIVISOR
017520  012746  000017                  MOV     #17,-(SP)       ;GET HIGH DIVISOR
017524  004737  032174                  JSR     PC,@#DBDIV      ;DIVIDE BY 1 X10**6
017530  005766  000004                  TST     4(SP)           ;DID REP COUNTER REACH LIMIT YET ?
017534  001412                          BEQ     5$              ;BR IF NO
017536  012660  000074                  MOV     (SP)+,@RTOTL+6(R0)      ;GET HIGH REMAINDER
017542  012660  000072                  MOV     (SP)+,@RTOTL+4(R0)      ;GET LOW REMAINDER
017546  062760  000001  000066          ADD     #1,@RTOTL(R0)   ;UPDATE THE TOTAL WRDS READ
017554  005560  000070                  ADC     @RTOTL+2(R0)    ;ADD ANY CARRY
017560  000401                          BR      6$
017562  022626                  5$:     CMP     (SP)+,(SP)+     ;GET HIGH & LOW REMAINDER OFF STACK
017564  005726                  6$:     TST     (SP)+           ;GET QUOTIENT OFF STACK
017566  000207                  7$:     RTS     PC
```

```
                58
017570  000000 59                FACTOR: .WORD   0               ;USED FOR WORDS TRANSFERED
```

```
                                        ;ROUTINE TO GET A BUFFER
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       CLR     -(SP)           ;CLEAR THE STACK
                                        ;       JSR     PC,GETBUF
                                        ;       RETURN                  ;BUFFER ADDRESS WILL BE ON THE STACK
                                        ;                               ;STACK WILL BE ZERO IF NO BUFFER AVAILABLE

017572 010146                   GETBUF: MOV     R1,-(SP)        ;SAVE R1
017574 010246                           MOV     R2,-(SP)        ;SAVE R2
017576 010346                           MOV     R3,-(SP)        ;SAVE R3
017600 013702 001654                    MOV     BUFTBL,R2       ;NUMBER OF SEPARATE BUFFERS
017604 001444                           BEQ     5$              ;BR IF NONE AVAILABLE
017606 012701 001656                    MOV     #BUFTBL+2,R1    ;FIRST ADDRESS OF ALLOCATION TABLE
017612 026061 000020 000002     10:     CMP     @UROL(R0),2(R1) ;SEE IF THERE IS A BLOCK LARGE ENOUGH
017620 101405                           BLOS    2$              ;BRANCH IF IT IS
017622 005302                           DEC     R2              ;DECREMENT TABLE COUNT
017624 001434                           BEQ     5$              ;BR IF THROUGH TABLE
017626 062701 000004                    ADD     #4,R1           ;INCREMENT TABLE POINTER
017632 000767                           BR      1$              ;CONTINUE LOOKING
017634 011166 000010            20:     MOV     (R1),10(SP)     ;BUFFER ADDRESS TO STACK
017640 166061 000020 000002             SUB     @UROL(R0),2(R1) ;ADJUST BUFFER URO CNT
017646 001407                           BEQ     3$              ;BR IF DIFFERENCE IS ZERO
017650 006360 000020                    ASL     @UROL(R0)       ;CONVERT # WORDS TO BYTES
017654 066011 000020                    ADD     @UROL(R0),(R1)  ;MAKE NEW STARTING ADDRESS
017660 006260 000020                    ASR     @UROL(R0)       ;RETURN # BYTES TO WORDS
017664 000414                           BR      5$              ;RETURN
017666 005337 001654            30:     DEC     BUFTBL          ;DECREMENT ENTRY COUNT
017672 001411                           BEQ     5$              ;BR IF ALLOCATION TABLE EMPTY
017674 005302                           DEC     R2              ;DECREMENT TABLE COUNT
017676 001407                           BEQ     5$              ;BR IF ITEM WERE LAST ENTRY
017700 010103                           MOV     R1,R3           ;MOVE TABLE POINTER
017702 062703 000004                    ADD     #4,R3           ;POINT TO NEXT ENTRY
017706 012321                   40:     MOV     (R3)+,(R1)+     ;MOVE ITEMS
017710 012321                           MOV     (R3)+,(R1)+
017712 005302                           DEC     R2              ;DECREMENT TABLE COUNT
017714 001374                           BNE     4$              ;CONTINUE IF NOT AT END OF TABLE
017716 012603                   50:     MOV     (SP)+,R3        ;RESTORE R3
017720 012602                           MOV     (SP)+,R2        ;RESTORE R2
017722 012601                           MOV     (SP)+,R1        ;RESTORE R1
017724 000207                           RTS     PC              ;RETURN
```

```
                                        ;ROUTINE TO PUT BUFFER B(    )N TABLE
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       JSR     PC,RELBUF
                                        ;       RETURN
                                        ;
017726  010146                  RELBUF: MOV     R1,-(SP)        ;SAVE R1
017730  010246                          MOV     R2,-(SP)        ;SAVE R2
017732  010346                          MOV     R3,-(SP)        ;SAVE R3
017734  010446                          MOV     R4,-(SP)        ;SAVE R4
017736  010546                          MOV     R5,-(SP)        ;SAVE R5
017740  012701  001656                  MOV     #BUFTBL-2,R1    ;BEGINNING OF TABLE
017744  013702  001654                  MOV     @#BUFTBL,R2     ;ENTRY COUNT
017750  001426                          BEQ     20              ;BR IF EMPTY TABLE
017752  016001  000120                  MOV     #BLOKC(R0),R5   ;TRIAL ADDRESS
017756  006305                          ASL     R5              ;CHANGE TO BYTE COUNT
017760  066005  000006                  ADD     @#BUF(R0),R5    ;ADDRESS OF HIGHER ADJACENT BLOCK
017764  021105                  10:     CMP     (R1),R5         ;UPPER ADJACENT BLOCK
017766  001420                          BEQ     30              ;BR IF YES
017770  062701  000004                  ADD     #4,R1           ;INCREMENT POINTER
017774  005302                          DEC     R2              ;DECREMENT ENTRY COUNT
017776  001372                          BNE     10              ;CONTINUE SEARCHING
020000  016011  000006                  MOV     @#BUF(R0),(R1)  ;PUT THE BUFFER BLOCK INTO THE TABLE
020004  016061  000120  000002          MOV     #BLOKC(R0),2(R1)        ;BLOCK NMB CNT
020012  005237  001654                  INC     @#BUFTBL        ;INCREMENT ENTRY COUNT
020016  005202                          INC     R2              ;INCREMENT R2 FOR USE LATER
020020  000414                          BR      40              ;SEE IF A LOWER ADJACENT BLOCK IS IN THE TABLE
020022  016021  000006          20:     MOV     @#BUF(R0),(R1)+ ;BLOCK ADDRESS TO TABLE
020026  016021  000120                  MOV     #BLOKC(R0),(R1)+        ;NMB CNT TO TABLE
020032  005237  001654                  INC     @#BUFTBL        ;INCREMENT ENTRY COUNT
020036  000448                          BR      60              ;EXIT
020040  016011  000006          30:     MOV     @#BUF(R0),(R1)  ;RELEASED BUFFER IS LOWER ADJACENT
020044  066061  000120  000002          ADD     #BLOKC(R0),2(R1)        ;INCREMENTED NMB CNT
020052  010246                  40:     MOV     R2,-(SP)        ;SAVE R2
020054  013702  001654                  MOV     @#BUFTBL,R2     ;ENTRY COUNT
020060  012705  001656                  MOV     #@#BUFTBL-2,R5  ;BEGINNING OF TABLE
020064  016504  000002          50:     MOV     2(R5),R4        ;BLOCK SIZE (IN WORDS)
020070  006304                          ASL     R4              ;CHANGE TO BYTE COUNT
020072  061504                          ADD     (R5),R4         ;ADD BLOCK BEGINNING ADDRESS
020074  020411                          CMP     R4,(R1)         ;R1 STILL POINTS TO INSERTED ENTRY
020076  001406                          BEQ     60              ;LOWER ADJACENT IN TABLE
020100  062705  000004                  ADD     #4,R5           ;INCREMENT POINTER
020104  005302                          DEC     R2              ;DECREMENT ENTRY COUNT
020106  001366                          BNE     50              ;CONTINUE LOOKING
020110  005726                          TST     (SP)+           ;RESTORE STACK POINTER
020112  000415                          BR      80              ;END
020114  012602                  60:     MOV     (SP)+,R2        ;RESTORE R2
020116  066165  000002  000002          ADD     2(R1),2(R5)     ;INCREMENT LOWER BLOCK LENGTH
020124  005537  001654                  DEC     @#BUFTBL        ;DECREMENT ENTRY COUNT
020130  010105                          MOV     R1,R5           ;GET READY TO COMPRESS
020132  062705  000004                  ADD     #4,R5           ;INCREMENT TO NEXT ENTRY
020136  012521                  70:     MOV     (R5)+,(R1)+     ;COMPRESS TABLE
020140  012521                          MOV     (R5)+,(R1)+     ;MOVE SIZE FIELD DOWN
020142  005302                          DEC     R2              ;DECREMENT ENTRY COUNT
020144  001374                          BNE     70              ;BR IF NOT FINISHED
020146  012605                  80:     MOV     (SP)+,R5        ;RESTORE R5
020150  012604                          MOV     (SP)+,R4        ;RESTORE R4
```

L9

```
                                ;FILL THE ASSIGNED BUFFER (IF WRITE OR WRITE CHECK COMMAND)
                                ;CALL:
                                ;       MOV     #DPB,R0         ;DPB ADDRESS
                                ;       MOV     #BUF,BUF(R0)    ;LOAD BUFFER ADDRESS INTO THE DPB
                                ;       MOVB    #PATTERN,PATC(R0)       ;PATTERN CODE
                                ;       JSR     PC,FILBUF
                                ;       RETURN
                                ;
                                ;
                                FILBUF: SAVREG                  ;SAVE THE REGISTERS
020162  104412                          BITB    #8.OCODE(R0)    ;SEE IF READ COMMAND
020164  132760  000004  000024          BNE     4$              ;BR IF READ
020172  001020                          MOV     BUF(R0),R1      ;BUFFER ADDRESS
020174  016001  000006          10$:    MOV     NWRD(R0),R2     ;POSITIVE WORD COUNT
020200  016002  000020                  MOVB    PATC(R0),R0     ;RELATIVE PATTERN ADDRESS
020204  116000  000010                  ADD     STRBAT(R0),R5   ;PATTERN ADDRESS
020210  016405  002314                  MOV     016.,R3         ;PATTERN COUNT
020214  012703  000020          20$:    MOV     (R5)+,(R1)+     ;MOVE THE PATTERN INTO THE BUFFER
020220  012521                  30$:    DEC     R2              ;DECREMENT THE WORD COUNT
020222  005302                          BLE     40$             ;BR IF DONE (WORD COUNT = 0)
020224  001403                          DEC     R3              ;DECREMENT THE PATTERN COUNT
020226  005303                          BNE     30$             ;BR IF MORE PATTERN
020230  001373                          BR      20$             ;CONTINUE DISTRIBUTING THE PATTERN
020232  000766                  40$:    RESREG                  ;RESTORE THE REGISTERS
020234  104413                          RTS     PC              ;RETURN
020236  000207
```

```
                                        ;START THE COMMAND FOR THE DPB IN R0
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       JSR     PC,GODRIV
                                        ;       RETURN

020240  010046                  GODRIV: MOV     R0,-(SP)        ;SAVE R0
020242  010037  020252                  MOV     R0,2$           ;CURRENT DPB ADDRESS
020246  004037  041364          1$:     JSR     R0,RP07         ;CALL THE DRIVE HANDLER
020252  000000                  2$:     .WORD   0               ;DRIVE BLOCK ADDRESS GOES HERE
020254  000000                          HALT                    ;DRIVER REJECTED REQUEST
020256  012600                          MOV     (SP)+,R0        ;RESTORE R0
020260  062760  000001  000052          ADD     #1,$OPERC(R0)   ;INCREMENT THE OPERATION COUNT
020266  005560  000054                  ADC     $OPERC+2(R0)
020272  026060  000034  000012          CMP     $PREVA+2(R0),$CYL(R0)   ;DID COMMAND REQUIRE A CYLINDER CHANGE ?
020300  001412                          BEQ     3$              ;BR IF NO
020302  062760  000001  000046          ADD     #1,$SEEKS(R0)   ;INCREMENT SEEK COUNT PER PASS
020310  005560  000050                  ADC     $SEEKS+2(R0)    ;ADD ANY CARRY
020314  062760  000001  000076          ADD     #1,$STOTL(R0)   ;INCREMENT SEEK COUNT TOTAL
020322  005560  000100                  ADC     $STOTL+2(R0)    ;ADD ANY CARRY
020326  000207                  3$:     RTS     PC
```

```
                                        ;ROUTINE TO SETUP PARAMETERS FOR A SEQUENTIAL READ OR WRITE OF THE DISK
                                        ;CALL
                                        ;       MOV     @DPB,R0         ;DPB ADDRESS
                                        ;       MOV     @NN,$PACK(R0)   ;GET COMMAND NUMBER
                                        ;       JSR     PC,SEQPAR       ;CALL ROUTINE
                                        ;       RETURN
                                        ;
                                        ;WHERE 'NN' CAN BE ONE OF THE FOLLOW NUMBERS;
                                        ;       'WT' COMMAND= -2
                                        ;       'W'  COMMAND= -1
                                        ;       'T'  COMMAND=  0        (NOT USED IN ROUTINE)
                                        ;       'R'  COMMAND=  1
020330  005760  000054          SEQPAR: TST     $OPERC+2(R0)    ;IS THIS THE FIRST OPERATION ?
020334  001010                          BNE     1$              ;BR IF NO
020336  005760  000052                  TST     $OPERC(R0)      ;IS THIS THE FIRST OPERATION ?
020342  001005                          BNE     1$              ;BR IF NO
020344  012704  000010                  MOV     @$SEC,R4        ;GET INDEX TO SECTOR ADDR STORAGE IN DPB
020350  004737  021412                  JSR     PC,CKLMTS       ;GO CHECK DISK ADDRESS LIMITS
020354  000453                          BR      3$              ;BR IF NOT AT END OF SEQUENTIAL ADDRESSING

020356  116060  000166  000027  1$:     MOVB    $RPCS1(R0),$PREV0(R0)   ;SAVE CURRENT PARAMETERS
020364  016060  000010  000032          MOV     $SEC(R0),$PREVA(R0)     ;SAVE PREVIOUS TRACK/SECTOR ADDRESS
020372  016060  000012  000034          MOV     $CYL(R0),$PREVA+2(R0)   ;SAVE PREVIOUS CYLINDER ADDRESS
020400  016060  000174  000010          MOV     $RPDA(R0),$SEC(R0)      ;CURRENT SECTOR & TRACK ADDRESS
020406  016060  000222  000012          MOV     $RPDC(R0),$CYL(R0)      ;CURRENT CYLINDER ADDRESS

020414  012704  000010          2$:     MOV     @$SEC,R4        ;GET INDEX TO SECTOR ADDR STORAGE IN DPB
020420  004737  021412                  JSR     PC,CKLMTS       ;GO CHECK DISK ADDRESS LIMITS
020424  000427                          BR      3$              ;BR IF NOT AT END OF SEQUENTIAL ADDRESSING

020426  116060  000146  000010          MOVB    MINSEC(R0),$SEC(R0)     ;RESET SECTOR ADDRESS
020434  116060  000142  000011          MOVB    MINTRK(R0),$TRK(R0)     ;RESET TRACK ADDRESS
020442  016060  000136  000012          MOV     MINCYL(R0),$CYL(R0)     ;RESET CYLINDER ADDRESS
020450  112760  000004  000024          MOVB    @4,$CODE(R0)    ;SET CODE TO READ DATA
020456  122760  177776  000026          CMPB    @-2,$PACK(R0)   ;WAS WRITE DATA IN PROGESS ?
020464  001473                          BEQ     8$              ;BR IF YES (START TESTING, 'T' COMMAND)
020466  004737  031500                  JSR     PC,$EOP         ;THIS IS THE END OF PASS
020472  032777  000020  160454          BIT     @SW04,@SWR      ;DO NOT DROP DRIVE AT EOT (SW04=1) ?
020500  001467                          BEQ     9$              ;BR IF NO
020502  000744                          BR      2$              ;MUST SURE ADDRESS IS NOT 'BSF' TRACK

020504  012704  000010          3$:     MOV     @$SEC,R4        ;GET INDEX TO SECTOR STORAGE
020510  013705  001466                  MOV     WRDCNT,R5       ;WORD COUNT IS MAXIMUM
020514  004737  021572                  JSR     PC,CHKWC        ;CHECK WORD COUNT FOR MAXCYL/MAXTRK
020520  010560  000020                  MOV     R5,$WRDL(R0)    ;GET WORD COUNT
020524  042760  000377  000020          BIC     @377,$WRDL(R0)  ;IS IT LESS THAN ONE SECTOR WORD COUNT ?
020532  001002                          BNE     4$              ;BR IF NO
020534  105260  000021                  INCB    $WRDL+1(R0)     ;SET TO ONE SECTOR
020540  016060  000020  000004  4$:     MOV     $WRDL(R0),$WCNT(R0)     ;STORE FOR 2'S COMPLEMENT WORD
020546  016060  000020  000120          MOV     $WRDL(R0),$HLDWC(R0)    ;HOLD WORD FOR 'RELBUF' ROUTINE
020554  005460  000004                  NEG     $WCNT(R0)       ;CHANGE WORD COUNT TO 2'S COMPLEMENT
020560  012760  000400  000022          MOV     @256.,$SSEC(R0) ;SECTOR SIZE FOR READ OR WRITE

020566  105760  000026                  TSTB    $PACK(R0)       ;'R' OR 'W' COMMAND FOR THIS DRIVE ?
020572  100407                          BMI     6$              ;BR IF WRITE
020574  112760  000004  000024  5$:     MOVB    @4,$CODE(R0)    ;CODE FOR READ DATA
```

```
                                                                    ;DRIVE CODE FOR OPERATION
                                                                    ;SET UP FOR EXIT
                                                                    ;LOCKED IN "READ ONLY" MODE ?
                                                                    ;BR IF YES
                                                                    ;CODE FOR WRTDAT
                                                                    ;OP CODE
                                                                    ;GET PATTERN CODE
                                                                    ;PATTERN CODE
                                                                    ;SET PARAMETERS SELECTED INDICATOR
                                                                    ;RETURN

                                                                    ;SET 'T' COMMAND FLAG IN DPB TABLE
                                                                    ;CLEAR 'PARAMETER SELECTED' INDICATOR
                                                                    ;CLEAR STACK LEVEL
                                                                    ;JUMP TO MAIN BACKGROUND LOOP
```

58	020602	112760	000171	000002		MOVB	@RDDAT,$COMND(R0)	
59	020610	000415				BR	7$	
61	020612	005737	001424		6$:	TST	RDONLY	
62	020616	001366				BNE	5$	
63	020620	112760	000002	000024		MOVB	@2,$CODE(R0)	
67	020626	112760	000161	000002		MOVB	@WRTDAT,$COMND(R0)	
68	020634	004737	021352			JSR	PC,GETPAT	
69	020640	110560	000030			MOVB	R5,$PATTC(R0)	
70	020644	012760	177777	000130	7$:	MOV	@-1,$NEXT(R0)	
71	020652	000207				RTS	PC	
72								
73	020654	105060	000026		8$:	CLRB	$PACK(R0)	
74	020660	005060	000130		9$:	CLR	$NEXT(R0)	
75	020664	005726				TST	(SP)+	
76	020666	000137	006340			JMP	MAIN	

```
                                        ;GENERATE PARAMETERS FOR THE OPERATION
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       JSR     PC,GENPAR
                                        ;       RETURN

020672  004737  037206         GENPAR: JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
020676  005737  001424                 TST     RDONLY          ;LOCKED IN "READ ONLY" MODE ?
020702  001016                         BNE     1$              ;BR IF YES
020704  032777  000001  160242         BIT     #SWO,@SWR       ;SEE IF SWO SET
020712  001012                         BNE     1$              ;BR IF SET - READ ONLY
020714  012705  000010                 MOV     #8.,R5          ;READ/WRITE SELECTION DIVISOR
020720  004737  032102                 JSR     PC,GETREM       ;GET SELECTION VALUE
020724  020537  001502                 CMP     R5,RATIO        ;DETERMINE IF READ OR WRITE
020730  103003                         BHIS    1$              ;BR IF READ
020732  012705  000002                 MOV     #2,R5           ;SELECT WRITE DATA COMMAND
020736  000407                         BR      2$              ;SELECT ADDRESS

020740  013705  037306         1$:     MOV     $LONUM,R5       ;SELECT READ OPERATION CODE
020744  000305                         SWAB    R5              ;SWAP BYTES IN R5
020746  042705  177776                 BIC     #^C1,R5         ;MASK OUT ALL BUT BIT 0
020752  062705  000004                 ADD     #4,R5           ;TABLE OFFSET FOR READ CODE
020756  110560  000122         2$:     MOVB    R5,$NCODE(R0)   ;COMMAND SELECTION CODE TO CONTROL BLOCK
020762  016060  000174  000124         MOV     $RPDA(R0),$NSEC(R0)     ;SECTOR AND TRACK
020770  016060  000222  000126         MOV     $RPDC(R0),$NCYL(R0)     ;CYLINDER NUMBER

020776  005737  001510         THEAD:  TST     RANDOM          ;ENABLE RANDOM ADDRESS SELECT ?
021002  001427                         BEQ     RANCYL          ;YES
021004  005760  000054                 TST     $OPERC+2(R0)    ;IS THIS THE FIRST OPERATION ?
021010  001003                         BNE     1$              ;BR IF NO
021012  005760  000052                 TST     $OPERC(R0)      ;IS THIS THE FIRST OPERATION ?
021016  001405                         BEQ     2$              ;BR IF YES

021020  012704  000124         1$:     MOV     #$NSEC,R4       ;GET INDEX TO SECTOR ADDR STORAGE IN DPB
021024  004737  021412                 JSR     PC,CKLMTS       ;GO CHECK DISK ADDRESS LIMITS
021030  000412                         BR      3$              ;BR IF NOT AT END OF SEQUENTIAL ADDRESSING
021032  116060  000146  000124 2$:     MOVB    MINSEC(R0),$NSEC(R0)    ;RESET SECTOR ADDRESS
021040  116060  000142  000125         MOVB    MINTRK(R0),$NTRK(R0)    ;RESET TRACK ADDRESS
021046  016060  000136  000126         MOV     MINCYL(R0),$NCYL(R0)    ;RESET CYLINDER ADDRESS
021054  000761                         BR      1$              ;RE-CHECK FOR 'BSF' TRACK
021056  000137  021230         3$:     JMP     RANSIZ          ;GO CHECK FOR RANDOM WORD SIZE
```

```
                                        ;GENERATE A RANDOM CYLINDER ADDRESS BETWEEN VALUES 'MINCYL' & 'MAXCYL'

                                        
021062  016005  000134      RANCYL: MOV     MAXCYL(R0),R5   ;GET MAXIMUM CYLINDER ADDRESS
021066  026005  000136              CMP     MINCYL(R0),R5   ;'MINCYL' AND 'MAXCYL' THE SAME ?
021072  001407                  BEQ     1$              ;BR IF THEY ARE
021074  166005  000136          SUB     MINCYL(R0),R5   ;GET NUMBER OF ALLOWABLE CYLINDERS
021100  005205                  INC     R5              ;INCREMENT DIFFERENCE TO USE AS DIVISOR
021102  004737  032102          JSR     PC,GETREM       ;GET THE RANDOM AUGMENT
021106  066005  000136          ADD     MINCYL(R0),R5   ;NEW CYLINDER ADDRESS
021112  010560  000126      1$:     MOV     R5,$NCYL(R0)    ;STORE CYLINDER ADDRESS IN DPB

                                        ;GENERATE A RANDOM TRACK ADDRESS BETWEEN VALUES 'MINTRK' & 'MAXTRK'

021116  016005  000140      RANTRK: MOV     MAXTRK(R0),R5   ;GET MAXIMUM TRACK ADDRESS
021122  026005  000142              CMP     MINTRK(R0),R5   ;'MINTRK' AND 'MAXTRK' THE SAME ?
021126  001407                  BEQ     1$              ;BR IF THEY ARE
021130  166005  000142          SUB     MINTRK(R0),R5   ;GET NUMBER OF ALLOWABLE TRACKS
021134  005205                  INC     R5              ;INCREMENT DIFFERENCE TO USE AS DIVISOR
021136  004737  032102          JSR     PC,GETREM       ;GET THE RANDOM AUGMENT
021142  066005  000142          ADD     MINTRK(R0),R5   ;NEW TRACK ADDRESS
021146  110560  000125      1$:     MOVB    R5,$NTRK(R0)    ;STORE TRACK ADDRESS IN DPB

                                        ;GENERATE A RANDOM SECTOR ADDRESS BETWEEN VALUES 'MINSEC' & 'MAXSEC'

021152  016005  000144      RANSEC: MOV     MAXSEC(R0),R5   ;GET MAXIMUM SECTOR ADDRESS
021156  026005  000146              CMP     MINSEC(R0),R5   ;'MINSEC' AND 'MAXSEC' THE SAME ?
021162  001407                  BEQ     1$              ;BR IF THEY ARE
021164  166005  000146          SUB     MINSEC(R0),R5   ;GET NUMBER OF ALLOWABLE SECTORS
021170  005205                  INC     R5              ;INCREMENT DIFFERENCE TO USE AS DIVISOR
021172  004737  032102          JSR     PC,GETREM       ;GET THE RANDOM AUGMENT
021176  066005  000146          ADD     MINSEC(R0),R5   ;NEW SECTOR ADDRESS
021202  110560  000124      1$:     MOVB    R5,$NSEC(R0)    ;STORE SECTOR ADDRESS IN DPB

                                        ;MAKE SURE ADDRESS JUST GENERATED IS NOT 'BAD SECTOR FILE'

                                        
021206  012704  000124              MOV     #$NSEC,R4       ;GET INDEX TO SECTOR ADDR STORAGE IN DPB
021212  004737  021412              JSR     PC,CKLMTS       ;GO CHECK DISK ADDRESS LIMITS
021216  000404                  BR      2$              ;BR IF NOT AT END OF SEQUENTIAL ADDRESSING
021220  004737  037206          JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
021224  000137  021062          JMP     RANCYL          ;GO GENERATE NEW ADDRESS
021230                          2$:
```

```
                                        ;GENERATE A RANDOM BUFFER LENGTH BETWEEN 6 & THE VALUE IN 'WRDCNT'
                                        
021230  013705  001466          RANSIZ: MOV     WRDCNT,R5       ;GET MAX WORD COUNT
021234  005737  001500                  TST     RANDWC          ;SELECT A RANDOM WORD COUNT ?
021240  001011                          BNE     2$              ;BR IF NOT
021242  005205                          INC     R5              ;INCREMENT THE MAXIMUM WRD CNT
021244  004737  032102                  JSR     PC,GETREM       ;DIVIDE BY MAX VALUE
021250  020527  000006                  CMP     R5,#6           ;WORD COUNT LESS THAN 6 ?
021254  002003                          BGE     2$              ;BR IF NO
021256  004737  037206          1$:     JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
021262  000762                          BR      RANSIZ
                                        
021264  012704  000124          2$:     MOV     #$NSEC,R4       ;GET INDEX TO SECTOR STORAGE
021270  004737  021572                  JSR     PC,CHKWC        ;SEE IF WORD COUNT IS TOO LARGE TO FIT
                                                                ;IN REMAINDER OF TRACK. IF SO, THEN ADJUST
                                                                ;WORD COUNT TO FIT ON TRACK.
021274  122760  000002  000122  3$:     CMPB    #2,$NCODE(R0)   ;WRITE OPERATION ?
021302  001005                          BNE     4$              ;BR IF NO
021304  042705  000377                  BIC     #377,R5         ;WRITTING PARTIAL SECTOR ?
021310  001002                          BNE     4$              ;BR IF NO, ELSE,
021312  012705  000400                  MOV     #256.,R5        ;WRITE AT LEAST ONE SECTOR
021316  010560  000020          4$:     MOV     R5,$WRDL(R0)    ;WORD COUNT
                                        
                                        ;GET A RANDOM PATTERN NUMBER
                                        
021322  122760  000002  000122  RANPAT: CMPB    #2,$NCODE(R0)   ;WRITE OPERATION ?
021330  001004                          BNE     RANXIT          ;BR IF NO
021332  004737  021352                  JSR     PC,GETPAT       ;GET PATTERN CODE
021336  110560  000123                  MOVB    R5,$NPATC(R0)   ;MOVE PATTERN CODE TO CONTROL BLOCK
021342  012760  177777  000130  RANXIT: MOV     #-1,$NEXT(R0)   ;SET PARAMETERS SELECTED INDICATOR
021350  000207                          RTS     PC              ;RETURN
                                        
                                        ;ROUTINE TO SELECT A PATTERN
                                        
021352  012705  000020          GETPAT: MOV     #16.,R5         ;SELECT PATTERN
021356  005737  001476                  TST     PATTERN         ;ENABLE RANDOM PATTERN SELECTION ?
021362  001403                          BEQ     1$              ;YES
021364  013705  001476                  MOV     PATTERN,R5      ;USE INDEXED PATTERN
021370  000406                          BR      2$              ;NO
021372  004737  037206          1$:     JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
021376  004737  032102                  JSR     PC,GETREM       ;GET CODE
021402  005705                          TST     R5              ;WAS PATTERN ZERO SELECTED ?
021404  001762                          BEQ     GETPAT          ;BR IF YES
021406  006305                  2$:     ASL     R5              ;MAKE CODE INTO TABLE INDEX
021410  000207                          RTS     PC
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                                        ;THIS ROUTINE IS USED TO CHECK ADDRESS LIMITS BEFORE THE NEXT COMMAND
                                        ;IS PERFORMED. ALSO, IT WILL CHECK FOR MAXIMUM ADDRESS LIMITS TO LOOK
                                        ;FOR AN END TO THE SEQUENTIAL ADDRESSING AND WILL MAKE SURE THE CURRENT
                                        ;ADDRESS IS NOT THE 'BAD SECTOR FILE'
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       MOV     #POINTER,R4     ;POINTER TO SECTOR STORAGE (#SEC OR #NSEC) IN DPB
                                        ;       JSR     PC,CKLMTS       ;CALL ADDRESS LIMITS ROUTINE
                                        ;       BR      ???             ;RETURN HERE IF NOT END OF SEQUENTIAL ADDRESSING
                                        ;       ------                  ;ELSE, RETURN HERE TO RESET DISK ADDRESS
                                        ;
                                        ;R0 = DPB ADDRESS BEFORE CALLING THE ROUTINE
                                        ;R4 = POINTER TO SECTOR STORAGE BEFORE CALLING THE ROUTINE

021412  060004                 CKLMTS: ADD     R0,R4           ;POINT TO SECTOR STORAGE POINT IN DPB
021414  026460  000002  000136          CMP     2(R4),MINCYL(R0)        ;IS CYLINDER ADDRESS BELOW MIN. ?
021422  002003                          BGE     1$              ;BR IF NO
021424  016064  000136  000002          MOV     MINCYL(R0),2(R4)        ;RESET CYLINDER TO MIN.
021432  126460  000001  000142  1$:     CMPB    1(R4),MINTRK(R0)        ;IS TRACK ADDRESS BELOW MIN. ?
021440  002003                          BGE     2$              ;BR IF NO
021442  116064  000142  000001          MOVB    MINTRK(R0),1(R4)        ;RESET TRACK TO MIN.
021450  121460  000146          2$:     CMPB    (R4),MINSEC(R0) ;IS SECTOR ADDRESS BELOW MIN. ?
021454  002002                          BGE     3$              ;BR IF NO
021456  116014  000146                  MOVB    MINSEC(R0),(R4) ;RESET SECTOR TO MIN.

                                        ;LOOK FOR MAXIMUM LIMITS, FOR END OF SEQUENTIAL ADDRESSING AND
                                        ;ALSO CHECK THAT ADDRESS IS NOT 'BAD SECTOR FILE'

021462  121460  000144          3$:     CMPB    (R4),MAXSEC(R0) ;IS SECTOR ADDRESS AT MAXIMUM ?
021466  003404                          BLE     5$              ;BR IF NO
021470  116014  000146                  MOVB    MINSEC(R0),(R4) ;RESET SECTOR ADDRESS
021474  105264  000001          4$:     INCB    1(R4)           ;INCREMENT TO NEXT TRACK ADDRESS
021500  126460  000001  000140  5$:     CMPB    1(R4),MAXTRK(R0)        ;IS TRACK ADDRESS OVER MAXIMUM ?
021506  003407                          BLE     6$              ;BR IF NO
021510  116014  000146                  MOVB    MINSEC(R0),(R4) ;RESET SECTOR ADDRESS
021514  116064  000142  000001          MOVB    MINTRK(R0),1(R4)        ;RESET TRACK ADDRESS
021522  005264  000002                  INC     2(R4)           ;INCREMENT TO NEXT CYLINDER ADDRESS
021526  026460  000002  000134  6$:     CMP     2(R4),MAXCYL(R0)        ;IS CYLINDER ADDRESS OVER MAXIMUM ?
021534  003403                          BLE     7$              ;BR IF NO
021536  062716  000002                  ADD     #2,(SP)         ;ADJUST RETURN TO RESET DISK ADDRESS PARAMETERS
021542  000412                          BR      8$

                                        ;CHECK NOT TO READ OR WRITE BAD SECTOR TRACK
021544  016046  000156          7$:     MOV     FE1(R0),-(SP)   ;GET 1ST FE CYLINDER (LAST CYL+1)
021550  005316                          DEC     (SP)            ;LOOK AT LAST USER CYLINDER
021552  026426  000002                  CMP     2(R4),(SP)+     ;ARE WE ON LAST USER CYLINDER ?
021556  001004                          BNE     8$              ;BR IF NO
021560  126460  000001  000154          CMPB    1(R4),TRKLMT(R0)        ;IS THIS THE BAD SECTOR TRACK ?
021566  001742                          BEQ     4$              ;BR IF YES
021570  000207                  8$:     RTS     PC              ;RETURN
```

```
                                        ;THIS ROUTINE IS USED TO CALCULATE AND CHECK THE WORD COUNT FOR THE
                                        ;DRIVE THAT IS TO DO A DATA TRANSFER ON THE MAXIMUM TRACK OF THE MAXIMUM
                                        ;CYLINDER. IF THE CALCULATED MAXIMUM WORD COUNT, EXCEEDS THE DESIRED WORD
                                        ;COUNT (CONTENTS OF R5), THEN THE DESIRED WORD COUNT IS CHANGED, SO THAT
                                        ;THE WORD COUNT WILL NOT CAUSE A TRACK OVERFLOW DURING THE TRANSFER.
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       MOV     #POINTER,R4     ;POINTER TO SECTOR STORAGE (#SEC OR #NSEC) IN DPB
                                        ;       JSR     PC,CHKWC        ;CALL CHECK WORD COUNT ROUTINE
                                        ;       RETURN                  ;RETURN WITH R5 CONTAINING THE DESIRED WORD COUNT
                                        ;
                                        ;R0 = DPB ADDRESS BEFORE CALLING THE ROUTINE
                                        ;R4 = POINTER TO SECTOR STORAGE BEFORE CALLING THE ROUTINE
                                        ;R5 = DESIRED WORD COUNT BEFORE CALLING THE ROUTINE

021572  060004                 CHKWC: ADD     R0,R4           ;POINT TO SECTOR STORAGE POINT IN DPB
021574  105760  000146                TSTB    MINSEC(R0)      ;ALLOW SPIRAL RD/WRT ?
021600  001023                        BNE     2$              ;BR IF NO
021602  126060  000144  000152        CMPB    MAXSEC(R0),SECLMT(R0)   ;ALLOW SPIRAL RD/WRT ?
021610  001017                        BNE     2$              ;BR IF NO
021612  105760  000142                TSTB    MINTRK(R0)      ;ALLOW SPIRAL RD/WRT ?
021616  001010                        BNE     1$              ;BR IF NO
021620  126060  000140  000154        CMPB    MAXTRK(R0),TRKLMT(R0)   ;ALLOW SPIRAL RD/WRT ?
021626  001004                        BNE     1$              ;BR IF NO
                                        ;WHEN SPIRAL RD/WRT IS ALLOWED, THEN CHECK
                                        ;TO MAKE SURE YOU DO NOT SPIRAL OVER MAXIMUM
                                        ;TRACK ON MAXIMUM CYLINDER
021630  026064  000134  000002        CMP     MAXCYL(R0),2(R4)        ;ON MAXIMUM CYLINDER ?
021636  001022                        BNE     4$              ;BR IF NO
021640  126064  000140  000001  1$:   CMPB    MAXTRK(R0),1(R4)        ;ON MAXIMUM TRACK ?
021646  001016                        BNE     4$              ;BR IF NO
                                        ;ADJUST WORD COUNT TO FIT ON REMAINDER OF TRACK
021650  111404                 2$:    MOVB    (R4),R4         ;GET STARTING SECTOR (#SEC OR #NSEC) ADDRESS
021652  016046  000144                MOV     MAXSEC(R0),-(SP)        ;GET MAXIMUM SECTOR
021656  160416                        SUB     R4,(SP)         ;GET NUMBER SECTORS TO BE XFERD
021660  005004                        CLR     R4              ;CLEAR R4
021662  062704  000400          3$:   ADD     #256.,R4        ;ADD 1 SECTOR OF WORDS TO R4
021666  005316                        DEC     (SP)            ;DONE ALL SECTORS YET ?
021670  002374                        BGE     3$              ;BR IF NO
021672  005726                        TST     (SP)+           ;RESTORE STACK
021674  020504                        CMP     R5,R4           ;TOO MANY WORDS FOR TRACK ?
021676  003420                        BLE     5$              ;BR IF NO
021700  010405                        MOV     R4,R5           ;YES, CHANGE WORD COUNT
021702  000416                        BR      5$

021704  016046  000156          4$:   MOV     FE1(R0),-(SP)   ;GET 1ST FE CYLINDER (LAST CYL+1)
021710  005316                        DEC     (SP)            ;LOOK AT LAST USER CYLINDER
021712  026426  000002                CMP     2(R4),(SP)+     ;ARE WE ON LAST USER CYLINDER ?
021716  001010                        BNE     5$              ;BR IF NO
021720  016046  000154                MOV     TRKLMT(R0),-(SP)        ;GET LAST TRACK
021724  005316                        DEC     (SP)            ;LOOK AT NEXT TO LAST TRACK
021726  005046                        CLR     -(SP)           ;PUSH STACK
021730  116416  000001                MOVB    1(R4),(SP)      ;GET CURRENT TRACK
021734  022626                        CMP     (SP)+,(SP)+     ;IS IT TRACK BEFORE BAD SECTOR TRACK ?
021736  001744                        BEQ     2$              ;BR IF YES (DON'T ALLOW SPIRAL TO BAD SEC TRK)
021740  000207                 5$:    RTS     PC
```

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                                        ;ROUTINE TO GET THE PREVIOUSLY SELECTED PARAMETER VALUES
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       JSR     PC,GENPAR       ;GENERATE THE PARAMETERS
                                        ;       JSR     PC,LOOPAR       ;LOAD THE PARAMETERS JUST GENERATED
                                        ;       RETURN

021742  010546                  LOOPAR: MOV     R5,-(SP)        ;SAVE R5
021744  105760  000026                  TSTB    $PACK(R0)       ;'T' COMMAND FOR THIS DRIVE ?
021750  001127                          BNE     6$              ;BR IF NO
021752  116060  000166  000027          MOVB    $RPCS1(R0),$PREVO(R0)   ;SAVE CURRENT PARAMETERS
021760  142760  177701  000027          BICB    #^C76,$PREVO(R0)        ;STRIP GO,AND IE BITS
021766  132760  000006  000122          BITB    #6,$NCODE(R0)   ;SEE IF NEXT OPERATION IS READ OR WRITE
021774  001007                          BNE     1$              ;BR IF EITHER
021776  016060  000012  000034          MOV     $CYL(R0),$PREVA+2(R0)   ;SAVE STARTING CYLINDER
022004  016060  000010  000032          MOV     $SEC(R0),$PREVA(R0)     ;SAVE STARTING SECTOR AND TRACK
022012  000410                          BR      2$
022014  004737  024444          1$:     JSR     PC,READDA       ;GET THE DECREMENTED SECTOR AND TRACK ADDRESSES
022020  012660  000034                  MOV     (SP)+,$PREVA+2(R0)      ;CYLINDER ADDRESS
022024  112660  000033                  MOVB    (SP)+,$PREVA+1(R0)      ;TRACK ADDRESS
022030  112660  000032                  MOVB    (SP)+,$PREVA(R0)        ;SECTOR ADDRESS

022034  005337  022256          2$:     DEC     ITCNT+2         ;REPEAT THIS COMMAND AGAIN ?
022040  002007                          BGE     3$              ;BR IF YES
022042  013737  022254  022256          MOV     ITCNT,ITCNT+2   ;RESTORE ITERATION COUNT
022050  032777  000100  157076          BIT     #SW06,@SWR      ;LOOP ON PREVIOUS VALUES (SW6=1) ?
022056  001413                          BEQ     4$              ;BR IF NO
022060  122760  000151  000002  3$:     CMPB    #WCKD,$COMND(R0)        ;IS COMMAND A WRITE CHECK DATA ?
022066  001060                          BNE     6$              ;BR IF NO
022070  112760  000002  000024          MOVB    #2,$CODE(R0)    ;CODE FOR WRTDAT
022076  112760  000161  000002          MOVB    #WRTDAT,$COMND(R0)      ;PUT WRITE DATA COMMAND BACK FOR LOOP
022104  000451                          BR      6$

022106  116060  000122  000024  4$:     MOVB    $NCODE(R0),$CODE(R0)    ;LOGICAL CODE FOR OPERATION
022114  116005  000122                  MOVB    $NCODE(R0),R5   ;LOAD R5 FOR USE AS TABLE INDEX
022120  116560  002076  000002          MOVB    COMTBL(R5),$COMND(R0)   ;COMMAND CODE
022126  122760  000151  000002          CMPB    #WCKD,$COMND(R0)        ;IS NEW COMMAND A WRITE CHECK DATA ?
022134  001012                          BNE     5$              ;BR IF NO
022136  122760  000060  000027          CMPB    #60,$PREVO(R0)  ;WAS PREVIOUS COMMAND A WRITE DATA ?
022144  001431                          BEQ     6$              ;BR IF YES
022146  112760  000171  000002          MOVB    #RDDAT,$COMND(R0)       ;CHANGE WRITE CHECK TO READ DATA COMMAND
022154  112760  000004  000024          MOVB    #4,$CODE(R0)    ;CODE NUMBER CHANGED TO READ DATA

022162  116060  000123  000030  5$:     MOVB    $NPATC(R0),$PATTC(R0)   ;PATTERN CODE
022170  016060  000124  000010          MOV     $NSEC(R0),$SEC(R0)      ;TRACK AND SECTOR ADDRESSES
022176  016060  000126  000012          MOV     $NCYL(R0),$CYL(R0)      ;CYLINDER ADDRESS
022204  012760  000400  000022          MOV     #256.,$SSEC(R0) ;INITIAL VALUE OF SECTOR SIZE
022212  132760  000001  000024          BITB    #1,$CODE(R0)    ;HEADER OPERATION ?
022220  001403                          BEQ     6$              ;BR IF NOT
022222  062760  000002  000022          ADD     #2,$SSEC(R0)    ;ADD HEADER SIZE
022230  016060  000020  000004  6$:     MOV     $WRDL(R0),$WCNT(R0)     ;GET WORD COUNT AND
022236  016060  000020  000120          MOV     $WRDL(R0),$HLDWC(R0)    ;HOLD WORD FOR 'RELBUF' ROUTINE
022244  005460  000004                  NEG     $WCNT(R0)       ;MAKE IT 2'S COMPLEMENT
022250  012605                          MOV     (SP)+,R5        ;RESTORE R5
022252  000207                          RTS     PC              ;RETURN

022254  000000  000000          ITCNT:  .WORD   0,0             ;'ITCNT' CONTAINS THE NUMBER OF TIMES TO
```

```
                                                                ;REPEAT THE COMMAND
                                                                ;"ITCNT+2" IS THE COUNTER
                                ;ROUTINE TO COMPRESS A LIST
                                ;CALL:
                                ;       MOV     #ADDRS,R1       ;COMPRESS LIST STARTING AT THIS ADDRESS
                                ;       JSR     PC,CMPRES
                                ;       RETURN

022260  016111  000002          CMPRES: MOV     2(R1),(R1)      ;COMPRESS THE TABLE IN R1
022264  001402                          BEQ     10              ;BR WHEN ZERO FOUND
022266  005721                          TST     (R1)+           ;INCREMENT R1
022270  000775                          BR      CMPRES          ;CONTINUE COMPRESSING TABLE
022272  000207                  10:     RTS     PC              ;RETURN
```

```
                                        .SBTTL  ERROR MESSAGE GENERATION ROUTINES
                                        ;
                                        ;PRINT LINE 1 OF ERROR MESSAGE:
                                        ;'MM:PM:SS'
                                        ;
022274  032777  002000  156652  LINE1:  BIT     @SW10,@SWR      ;SWITCH 10 SET ?
022302  001402                          BEQ     10              ;BR IF NOT
022304  104401  001176                  TYPE    ,$BELL          ;RING THE BELL
022310  032777  020000  156636  10:     BIT     @SW13,@SWR      ;INHIBIT TYPEOUT (SW13=1) ?
022316  001010                          BNE     20              ;BR IF YES
022320  104401  001205                  TYPE    ,$CRLF          ;CR-LF
022324  104401  001205                  TYPE    ,$CRLF          ;CR-LF
022330  004737  026226                  JSR     PC,@TIME        ;TYPE ELAPSED TIME
022334  104401  056611                  TYPE    ,$LMSG1         ;TYPE 1 BLANK
022340  000207                  20:     RTS     PC              ;RETURN & TYPE DESCRIPTION
                                        ;
                                        ;PRINT LINE 2 OF ERROR MESSAGE
                                        ;'PRESENT ORDER = XXXX  PREVIOUS ORDER = XXXX'
                                        ;'= ERROR AT BAD TRACK/SECTOR'
                                        ;'DRIVE   RPCS1   RPCS2   RPDS1   RPER1   RPER2   RPER3   RPEC1'
                                        ;'RPEC2   RPWC    RPBA    RPDA    RPAS    RPLA    RPDB    RPMR1'
                                        ;'RPDT    RPOP    RPMP    RPDC    RPCC    STATUS'
                                        ;'RPBAE   RPCS3'  (RH70 ONLY)
                                        ;'BUS ADDRESS OR WORD COUNT NOT CONSISTENT'
                                        ;'RPBA = XXXXXX   RPWC = XXXXXX'
                                        ;'BUFFER ADR = XXXXXX   WRD CNT = XXXX   RPER WRDS XFRD = XXX'
                                        ;
022542                          LINE2:
022542  010346                          MOV     R3,-(SP)        ;PUSH R3 ON STACK
022544  010446                          MOV     R4,-(SP)        ;PUSH R4 ON STACK
022546  010546                          MOV     R5,-(SP)        ;PUSH R5 ON STACK
022550  104414  001205          DISPLY: .$CRLF                  ;CR-LF
022554  005037  022502                  CLR     @$             ;CLEAR MESSAGE ADDRESS STORAGE
022560  005004                          CLR     R4              ;WORKING REGISTER
022562  012737  054616  022502          MOV     @LINOC,@$      ;ADDRESS OF 'PRESENT ORDER = ' MSG
022570  116004  000166          MOVB    @RPCS1(R0),R4           ;GET THE OPCODE
022574  042704  177701                  BIC     #^C76,R4        ;SAVE ONLY SIGNIFICANT BITS
022600  004737  022436                  JSR     PC,10           ;TYPE THE FIRST MNEMONIC
022604  005737  022506                  TST     $0              ;SEE IF MNEMONIC ENTRY FOUND
022610  001440                          BEQ     LINE2A          ;BR IF NOT
022612  012737  054636  022502          MOV     @LINOP,@$      ;ADDRESS OF 'PREVIOUS ORDER = ' MSG
022620  116004  000027          MOVB    @PREVO(R0),R4           ;PREVIOUS OPERATION CODE
022624  042704  177701                  BIC     #^C76,R4        ;SAVE ONLY SIGNIFICANT BITS
022630  004737  022436                  JSR     PC,10           ;TYPE THE PREVIOUS MNEMONIC
022634  000426                          BR      LINE2A          ;CONTINUE
022636  005005                  10:     CLR     R5              ;CLEAR THE TABLE INDEX
022640  126504  002104          20:     CMPB    @OPTBL(R5),R4   ;LOOK FOR THE OPCODE
022644  001405                          BEQ     30              ;BR WHEN OPCODE COUNT = OPCODE
022646  105765  002104                  TSTB    @OPTBL(R5)      ;LOOK FOR END OF TABLE
022652  100402                          BPL     30              ;BR IF END
022654  005205                          INC     R5              ;INCREMENT THE POINTER
022656  000770                          BR      20              ;CONTINUE - NOT END OF TABLE
022660  006305                  30:     ASL     R5              ;SHIFT INDEX
022662  006305                          ASL     R5              ;SHIFT THE INDEX
022664  006305                          ASL     R5              ;SHIFT THE INDEX
022666  012737  002124  022506          MOV     @OPNTBL,@$     ;ADDRESS OF ASCII TEXT TABLE
022674  060537  022506                  ADD     R5,@$          ;ADD THE INDEX
```

```
                                        ;TYPE IT
                        40:     .WORD   0               ;ADDRESS OF "PRESENT" OR "PREVIOUS" MESSAGE
                                DISPLY                  ;TYPE THE OPERATION PREFORMED
                        50:     .WORD   0               ;ADDRESS OF MESSAGE
                                RTS     PC              ;RETURN TO MAIN ROUTINE

                        LINE2A: TST     @#DSEC          ;PRINT THE BAD SECTOR LINE ?
                                BEQ     LINE2B          ;BR IF NOT
                                DISPLY  .CRLF           ;CR-LF
                                DISPLY  #LIN25          ;ERROR ADDRESS DEFINED AS BAD AREA
                                DISPLY  .CRLF           ;CR-LF
                        LINE2B: DISPLY  .DM16           ;STANDARD DP07 REGISTER HEADER
                                MOV     @#R0,-(SP)      ;PUT THE DRIVE NUMBER ON THE STACK
                                JSR     PC,LINOCT       ;TYPE IT
                                DISPLY  .R/W52          ;TYPE 'R/W='
                                MOV     @DT10,R5        ;REGISTER INDEXES
                                JSR     PC,30           ;PRINT THE REGISTERS

                                BIT     @#DM05,@#DM0    ;PRINT THE OPTIONAL REGISTERS ?
                                BNE     10              ;BR IF NOT
                                DISPLY  .DM15           ;STANDARD DP07 REGISTER HEADER
                                MOV     @DT15,R5        ;SECOND DATA LINE
                                JSR     PC,30           ;PRINT THEM

                                DISPLY  .DM16           ;STANDARD DP07 REGISTER HEADER
                                MOV     @DT16,R5        ;THIRD DATA LINE
                                JSR     PC,30           ;PRINT THE REGISTERS

                                MOV     @CPUSP,-(SP)    ;CHECK THE CPU (RH) TYPE
                                BIC     #^C1700000,(SP) ;CLEAR THE CPU BITS
                                CMP     #300000,(SP)+   ;SEE IF RH70
                                BNE     10              ;BR IF NO
                                DISPLY  .DM17           ;STANDARD DP07 REGISTER HEADER
                                MOV     @DT17,R5        ;OPTIONAL FOURTH DATA LINE
                                JSR     PC,30           ;PRINT THE REGISTERS
                                BIT     #BIT6,STATUS(R0)        ;DATA ERROR ?
                                BEQ     20              ;BR IF NOT
                                MOV     WORDS(R0),-(SP) ;TRANSFER SIZE
                                ADD     @#MPC(R0),(SP)  ;ADD REMAINING WORD COUNT
                                ASL     (SP)            ;CONVERT TO AN BYTE INCREMENT
                                ADD     @BUF(R0),(SP)   ;BUFFER STARTING ADDRESS
                                CMP     (SP)+,@#MBA(R0) ;CORRECT BUFFER ADDRESS ?
                                BEQ     20              ;BR IF YES
                                DISPLY  .DM46           ;"BUS ADDRESS AND WORD COUNT ARE NOT CONSISTENT"
                                DISPLY  .CRLF           ;CR-LF
                                JSR     PC,LINE3D       ;PRINT LINE 3D OF ERROR MESSAGE
                                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
                        20:
                                MOV     (SP)+,R5        ;POP STACK INTO R5
                                MOV     (SP)+,R4        ;POP STACK INTO R4
                                MOV     (SP)+,R3        ;POP STACK INTO R3
                                RTS     PC              ;RETURN TO ERROR PROCESSING ROUTINE

                        30:     MOV     (R5)+,-(SP)     ;PUT THE REGISTER INDEX ON THE STACK
                                ADD     R0,(SP)         ;ADD DRIVE'S TABLE ADDRESS
                                MOV     @(SP),-(SP)     ;VALUE
                                JSR     PC,LINOCT       ;TYPE IT
```

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                        005726                  TST     (SP)+           ;CORRECT THE STACK POINTER
                        104414  056610          DISPLY  .BLNKS2         ;TYPE 2 BLANKS
                        005715                  TST     (R5)            ;AT END OF LINE ?
                        001365                  BNE     3$              ;BR IF NOT
                        104414  001205  40:     DISPLY  .$CRLF          ;CR-LF
                        000207                  RTS     PC              ;RETURN

                                        ;PRINT LINE 3 OF ERROR MESSAGE
                                        ;'ERROR AT CCC TT SS   PREVIOUS ADR = CCC TT SS'

                        104414  054715  LINE3:  DISPLY  .LIN#3          ;LINE 3 ENTRANCE
                        000517                  BR      LIN3.1          ;FINISH PRINTOUT

                                        ;PRINT LINE 3A OF ERROR MESSAGE
                                        ;'START CYL= CCC  END CYL= CCC'

                        104414  054731  LINE3A: DISPLY  .LIN#3          ;LINE 3A ENTRANCE
                        000514                  BR      LIN3.1          ;FINISH ERROR LINE

                                        ;PRINT LINE 3B OF ERROR MESSAGE
                                        ;'START CYL= CCC  END CYL= CCC  ACTUAL CYL= CCC'

                        004737  023350  LINE3B: JSR     PC,LIN3.3       ;LINE 3B ENTRANCE
                        104414  001205          DISPLY  .$CRLF
                        000207                  RTS     PC

                                        ;PRINT LINE 3C OF ERROR MESSAGE
                                        ;'START CYL= CCC  END CYL= CCC  ACTUAL CYL= CCC  TRK= TT'

                        004737  023350  LINE3C: JSR     PC,LIN3.3       ;LINE 3C ENTRANCE
                        000137  023402          JMP     LIN3.4          ;FINISH MESSAGE

                                        ;PRINT LINE 3D OF ERROR MESSAGE
                                        ;'RPBA = XXXXXX   RPWC = XXXXXX'

        032777  000040  156112  LINE3D: BIT     @SW05,@SWR      ;SWITCH 5 SET ?
                        001416          BEQ     1$              ;BR IF IT IS
                        104414  055070  DISPLY  .LIN#3          ;'RPBA = '
                        016046  000172  MOV     @RPBA(R0),-(SP) ;BUFFER ADDR REG CONTENTS
                        004737  024366  JSR     PC,LINOCT       ;CONVERT TO OCTAL AND TYPE IT
                        104414  055077  DISPLY  .LIN#3          ;'  RPWC = '
                        016046  000170  MOV     @RPWC(R0),-(SP) ;WORD COUNT REGISTER CONTENTS
                        004737  024366  JSR     PC,LINOCT       ;CONVERT TO OCTAL AND TYPE IT
                        104414  001205  DISPLY  .$CRLF
                        000207  1$:     RTS     PC

                                        ;PRINT LINE 3E OF ERROR MESSAGE
                                        ;'START CYL = CCC   START TRK = TT   START SEC = SS'

                        104414  054772  LINE3E: DISPLY  .LIN#3          ;'START CYL = '
                        016046  000012          MOV     @CYL(R0),-(SP)  ;MOVE CYL TO STACK
                        004737  024420          JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
                        104414  056610          DISPLY  .BLNKS2         ;TYPE 2 BLANKS
                        104414  055110          DISPLY  .LIN#3          ;'START TRK = '
                        005046                  CLR     -(SP)           ;CLEAR STACK
                        116016  000011          MOVB    @TRK(R0),(SP)   ;TRACK TO STACK
                        004737  024420          JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
```

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                                        DISPLY  .BLNKS2         ;TYPE 2 BLANKS
                                        DISPLY  .LINSS3         ;'START SEC = '
                                        CLR     -(SP)           ;CLEAR STACK
                                        MOVB    $SEC(R0),(SP)   ;SECTOR ADDR TO STACK
                                        JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
                                        DISPLY  ,$CRLF
                                        RTS     PC

                                ;PRINT LINE 3F OF ERROR MESSAGE
                                ;'RPDA = XXXXXX   RPCA = XXXXXX'

                        155756  LINE3F: BIT     @SW5,@SWR       ;SWITCH 5 SET ?
                                        BEQ     1$              ;BR IF NOT
                                        DISPLY  .LINDA3         ;'RPDA = '
                                        MOV     $RPDA(R0),-(SP) ;PUT SECTOR/TRACK ADDRESS ON THE STACK
                                        JSR     PC,LINOCT       ;TYPE IT
                                        DISPLY  .BLNKS2         ;TYPE 2 BLANKS
                                        DISPLY  .LINCA3         ;' RPDC = '
                                        MOV     $RPDC(R0),-(SP) ;PUT DESIRED CYLINDER ADDRESS ON THE STACK
                                        JSR     PC,LINOCT       ;TYPE IT
                                        DISPLY  ,$CRLF
                                1$:     RTS     PC

                                ;'CCC TT SS   PREV ADR = CCC TT SS'

                                LIN3.1: JSR     PC,READDR       ;DECREMENT TRACK AND SECTOR ADDRESS
                                        JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
                                        DISPLY  ,T              ;PRINT 'T'
                                        JSR     PC,LINDEC       ;TYPE TRACK IN DECIMAL
                                        DISPLY  ,S              ;PRINT 'S'
                                        JSR     PC,LINDEC       ;TYPE SECTOR ADDRESS
                                        DISPLY  ,LINP3          ;PRINT 'PREV ADDR'
                                        MOV     $PREVA+2(R0),-(SP) ;PREVIOUS CYLINDER
                                        JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
                                        DISPLY  ,T              ;PRINT 'T'
                                        CLR     -(SP)           ;MAKE ROOM ON THE STACK
                                        MOVB    $PREVA+1(R0),(SP)  ;PREVIOUS TRACK ADDRESS
                                        JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
                                        DISPLY  ,S              ;PRINT 'S'
                                        CLR     -(SP)           ;MAKE ROOM ON THE STACK
                                        MOVB    $PREVA(R0),(SP)  ;PREVIOUS SECTOR DDRESS
                                        JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
                                        DISPLY  ,$CRLF
                                        RTS     PC

                                ;'START CYL= CCC  END CYL= CCC'

                                LIN3.3: DISPLY  .LINS3          ;LINE '3B & 3C' ENTRANCE
                                        MOV     $PREVA+2(R0),-(SP) ;PREVIOUS CYLINDER
                                        JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
                                        DISPLY  .LINEN3         ;PRINT ' END CYL'
                                        MOV     $RPDC(R0),-(SP) ;PRESENT CYLINDER
                                        JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
                                        RTS     PC

                                ;'ACTUAL CYL= CCC  TRK= TT'
```

ERROR MESSAGE GENERATION ROUTINES

```
023402  104414  055022          LIN3.4: DISPLY  ,LINA3           ;PRINT 'ACTUAL CYL= '
023406  013746  063364                  MOV     CYLNDR,-(SP)     ;ACTUAL CYLINDER
023412  042716  010000                  BIC     #BIT12,(SP)      ;CLEAR THE FORMAT BIT
023416  004737  024420                  JSR     PC,LINDEC        ;TYPE IT IN DECIMAL
023422  104414  055041                  DISPLY  ,LINT3           ;PRINT 'TRK= '
023426  005046                          CLR     -(SP)            ;CLEAR STACK WORD
023430  116016  000175                  MOVB    $RPDA+1(R0),(SP) ;PUT TRACK ON STACK
023434  004737  024420                  JSR     PC,LINDEC        ;TYPE IT IN DECIMAL
023440  104414  001203                  DISPLY  ,$CRLF
023444  000207                          RTS     PC

                                ;PRINT LINE 4 OF ERROR MESSAGE
                                ;'BUFFER ADR= XXXXXX  WRD CNT= XXXX  NMBR WRDS XFRD= XXX'

023446  032760  000100  000016  LINE4:  BIT     #BIT06,$TATUS(R0)  ;DATA ERROR ?
023454  001427                          BEQ     1$               ;BR IF NOT
023456  104414  055140                  DISPLY  ,LINM4           ;PRINT 'BUFFER ADR= '
023462  016046  000006                  MOV     $BUF(R0),-(SP)   ;BUFFER ADDR ON STACK
023466  004737  024366                  JSR     PC,LINOCT        ;CONVERT TO OCTAL & PRINT
023472  104414  055156                  DISPLY  ,LINS4           ;PRINT 'WRD CNT= '
023476  016046  000020                  MOV     $WRDL(R0),-(SP)  ;BUFFER SIZE
023502  004737  024420                  JSR     PC,LINDEC        ;TYPE IT IN DECIMAL
023506  104414  055172                  DISPLY  ,LINX4           ;'  NMBR WRDS XFRD = '
023512  016046  000172                  MOV     $RPBA(R0),-(SP)  ;VALUE IN BUFFER ADDR REGISTER
023516  166016  000006                  SUB     $BUF(R0),(SP)    ;SUBTRACT STARTING ADDRESS
023522  006216                          ASR     (SP)             ;CONVERT INTO A WORD COUNT
023524  004737  024420                  JSR     PC,LINDEC        ;TYPE IT IN DECIMAL
023530  104414  001203                  DISPLY  ,$CRLF           ;CR-LF
023534  000207                  1$:     RTS     PC               ;RETURN

                                ;PRINT LINE 5 OF ERROR MESSAGE
                                ;'EXPCTD DATA= XXXXXX  RECEVD DATA= XXXXXX  WORD POS= XXX'

023536  104414  055215          LINE5:  DISPLY  ,LIND5           ;PRINT 'EXPCTD DATA'
023542  162760  000002  000172          SUB     #2,$RPBA(R0)     ;BACK THE ADDRESS UP
023550  013746  001234                  MOV     $CPUOP,-(SP)     ;CHECK THE CPU (RH) TYPE
023554  042716  003777                  BIC     #^C174000,(SP)   ;LEAVE THE CPU BITS
023560  022726  030000                  CMP     #30000,(SP)+     ;SEE IF RH70
023564  001012                          BNE     1$               ;BR IF NO
023566  162760  000004  000172          SUB     #4,$RPBA(R0)     ;BACKUP THE BUFFER POINTER
023574  032760  004000  000240          BIT     #BIT11,$RPCS3(R0)       ;SEE WHICH WORD HALF DIDN'T COMPARE
023602  001403                          BEQ     1$               ;IF EQ, EVEN HALF DIDN'T COMPARE
023604  162760  000002  000172          SUB     #2,$RPBA(R0)     ;BACKUP THE BUFFER POINTER AGAIN
023612  017046  000172          1$:     MOV     @$RPBA(R0),-(SP)        ;'EXPCTD' DATA - AT THE BUFFER LOCATION
023616  004737  024366                  JSR     PC,LINOCT        ;TYPE IT
023622  104414  055233                  DISPLY  ,LIN85           ;PRINT 'RECEVD DATA'
023626  016046  000210                  MOV     $RPDB(R0),-(SP)  ;RECEVD DATA FROM BUFFER
023632  004737  024366                  JSR     PC,LINOCT        ;TYPE IT
023636  016046  000170                  MOV     $RPWC(R0),-(SP)  ;WORD LENGTH ON STACK
023642  066016  000020                  ADD     $WRDL(R0),(SP)   ;MAKE INTO A POSITIVE NUMBER
023646  005046                          CLR     -(SP)            ;UPPER DIVIDEND TO ZERO
023650  016046  000022                  MOV     $SSEC(R0),-(SP)  ;SECTOR SIZE ON THE STACK
023654  004737  032126                  JSR     PC,$DIV          ;DIVIDE WORDS XFERED BY SECTOR SIZE
023660  012616                          MOV     (SP)+,(SP)       ;MOVE REMAINDER UP THE STACK
023662  005316                          DEC     (SP)             ;DECREMENT WORD POSITION BY 1
023664  032760  040000  000176          BIT     #BIT14,$RPCS2(R0)       ;IS 'WCE' SET ?
023672  001416                          BEQ     2$               ;BR IF NO
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                                        MOV     $CPUOP,-(SP)    ;CHECK THE CPU (RH) TYPE
                                        BIC     #^C174000,(SP)  ;LEAVE THE CPU BITS
                                        CMP     #30000,(SP)+    ;SEE IF RM70
                                        BNE     2$              ;BR IF NO
                                        SUB     #2,(SP)         ;SUBTRACT 2 FOR A DOUBLE WORD
                                        BIT     #BIT11,$RPCS3(R0)       ;SEE WHICH WORD HALF DIDN'T COMPARE
                                        BEQ     2$              ;IF EQ, EVEN HALF DIDN'T COMPARE
                                        DEC     (SP)            ;SUBTRACT 1 FOR AN ODD WORD
                                2$:     DISPLY  ,LINP5          ;PRINT 'WORD POS'
                                        JSR     PC,LINDEC       ;TYPE THE POSITION
                                        DISPLY  ,$CRLF
                                        RTS     PC

                                ;PRINT LINE 5A OF THE ERROR MESSAGE
                                ;'HEADER FROM ERROR SECTOR  XXXXXX  XXXXXX  XXXXXX  XXXXXX'

                                LINE5A:
                                        DISPLY  ,LIN55          ;'HEADER CONTENTS OF ERROR SECTOR'
                                        MOV     CYLNDR,-(SP)    ;HEADER POSITION
                                        JSR     PC,LINOCT       ;TYPE IT
                                        DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
                                        MOV     CYLNDR+2,-(SP)  ;HEADER POSITION +2
                                        JSR     PC,LINOCT       ;TYPE IT
                                        DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
                                        DISPLY  ,LINX5
                                        DISPLY  ,$CRLF
                                        RTS     PC

                                ;PRINT LINE 5B OF ERROR MESSAGE
                                ;'RPEC1 = XXXXXX   RPEC2 = XXXXXX'

                                LINE5B: DISPLY  ,LINEP5         ;'RPEC1 = '
                                        MOV     $RPEC1(R0),-(SP)  ;PUT REGISTER CONTENTS ON THE STACK
                                        JSR     PC,LINOCT       ;TYPE IT
                                        DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
                                        DISPLY  ,LINE05         ;' RPEC2 = '
                                        MOV     $RPEC2(R0),-(SP)  ;PUT REGISTER CONTENTS ON THE STACK
                                        JSR     PC,LINOCT       ;TYPE IT
                                        DISPLY  ,$CRLF
                                        RTS     PC              ;RETURN

                                ;PRINT LINE 6 OF ERROR MESSAGE
                                ;'SECTOR IS ECC CORRECTABLE'

                                LINE6:  DISPLY  ,LIN86          ;PRINT 'SECTOR IS ECC CORRECTABLE '
                                        DISPLY  ,$CRLF
                                        RTS     PC

                                ;PRINT LINE 6A OF THE ERROR MESSAGE
                                ;'SECTOR READ CORRECTLY AFTER N RETRY(S)'

                                LINE6A: DISPLY  ,LINC6          ;PRINT 'SECTOR READ CORRECTLY AFTER N RETRY(S)'
                                        BR      LIN6.2          ;TYPE THE REST OF THE LINE

                                ;PRINT LINE 6C OF THE ERROR MESSAGE
                                ;'CORRECTED ON N RETRY(S)'
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                                ;PRINT LINE 6C OF THE ERROR MESSAGE
                                ;'CORRECTED ON N RETRY(S)'
                                ;PRINT LINE 6D OF THE ERROR MESSAGE
                                ;'UNCORRECTABLE AFTER N RETRY(S)'
                                ;RETRY COUNT TYPEOUT
                                ;PRINT LINE 7 OF THE ERROR MESSAGE
                                ;'TOTALS; ERRORS:XXX  WRDS WRITN:XXXXX X10↑6 WRDS READ:XXXXX X10↑6'
                                ;PRINT LINE 7A OF ERROR MESSAGE
                                ;'TOTALS; SEEKS= XXXXX  MIS POS ERRORS= XXX  SKI ERRORS= XXX'
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000336 024076  104414  055435  LINE6C: DISPLY  ,LING6          ;'CORRECTED ON N RETRY(S)'
000337 024102  000403                  BR      LIN6.2          ;TYPE THE REST OF THE LINE
000338
000339
000340
000341
000342 024104  104414  055465  LINE6D: DISPLY  ,LINU06         ;'UNCORRECTABLE AFTER N RETRY(S)'
000343 024110  000400                  BR      LIN6.2          ;FINISH
000355
000356
000357
000358 024112  005046          LIN6.2: CLR     -(SP)           ;CLEAR STACK
000359 024114  113716  001325          MOVB    RETRY+1,(SP)    ;RETRY COUNT
000360 024120  004737  024420          JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
000361 024124  104414  055453          DISPLY  ,LINR6          ;' RETRY(S)'
000362 024130  104414  001203          DISPLY  ,$CRLF
000363 024134  000207                  RTS     PC
000364
000365
000366
000367
000377 024136  104414  055574  LINE7:  DISPLY  ,LIN7T          ;TOTALS; ERRORS
000378 024142  016046  000102          MOV     $TOTAL(R0),-(SP)        ;TO STACK
000379 024146  004737  024420          JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
000380 024152  104414  055615          DISPLY  ,LIN7X          ;PRINT ' WRDS WRITN'
000381 024156  012746  000056          MOV     #$WTOTL,-(SP)   ;ADDRESS OF LOW WORD ON STACK
000382 024162  060016                  ADD     R0,(SP)
000383 024164  004737  037404          JSR     PC,$DB2D        ;CONVERT
000384 024170  004737  032526          JSR     PC,$SUPRL       ;PRINT
000385 024174  104414  057771          DISPLY  ,PERIOD         ;TYPE '.'
000386 024200  104414  057632          DISPLY  ,MSGX10         ;TYPE ' X10↑6'
000387 024204  104414  055633          DISPLY  ,LIN7R          ;PRINT ' WRDS READ'
000388 024210  012746  000066          MOV     #$RTOTL,-(SP)   ;LOW WORD ADDRESS
000389 024214  060016                  ADD     R0,(SP)
000390 024216  004737  037404          JSR     PC,$DB2D        ;CONVERT
000391 024222  004737  032526          JSR     PC,$SUPRL       ;PRINT IT
000392 024226  104414  057771          DISPLY  ,PERIOD         ;TYPE '.'
000393 024232  104414  057632          DISPLY  ,MSGX10         ;TYPE ' X10↑6'
000394 024236  104414  001203          DISPLY  ,$CRLF          ;CR-LF
000395 024242  032777  100000  154704  BIT     #SW15,@SWR      ;SEE IF 'HALT ON ERROR' - SWITCH 15
000396 024250  001401                  BEQ     1$              ;BR IF NOT
000397 024252  000000                  HALT                    ;SWITCH 15 HALT
000398 024254  000207          1$:     RTS     PC
000399
000400
000401
000402
000412 024256  104414  055535  LINE7A: DISPLY  ,LIN7P          ;'TOTALS; SEEKS= '
000413 024262  012746  000076          MOV     #$STOTL,-(SP)   ;TOTAL SEEKS
000414 024266  060016                  ADD     R0,(SP)         ;DEVICE TABLE ADDRESS
000415 024270  004737  037404          JSR     PC,$DB2D        ;CONVERT THE SEEK COUNT
000416 024274  004737  032526          JSR     PC,$SUPRL       ;PRINT IT
000417 024300  104414  057771          DISPLY  ,PERIOD         ;TYPE '.'
000418 024304  104414  055512          DISPLY  ,LIN7M          ;'  MIS POS ERRORS= '
000419 024310  016046  000112          MOV     $MISPO(R0),-(SP)        ;TOTAL ERRORS
000420 024314  004737  024420          JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
000421 024320  104414  055555          DISPLY  ,LIN7S          ;'  SKI ERRORS= '
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                                        MOV     $SKI(R0),-(SP)  ;CONVERT & PRINT IT
                                        JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
                                        DISPLY  ,$CRLF          ;CR-LF
                                        BIT     @SW15,@SWR      ;SEE IF HALT ON ERROR - SWITCH 15 SET
                                        BEQ     1$              ;BR IF NOT
                                        HALT                    ;SWITCH 15 HALT
                                1$:     RTS     PC

                                ;PRINT LINE 8 OF THE ERROR MESSAGE
                                ;'DIFFERENT ERROR DURING RETRY'

                                LINE8:  DISPLY  ,LIN8M
                                        JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                        RTS     PC

                                ;OCTAL TYPEOUT ROUTINE
                                ;CALL:
                                ;       MOV     NUM,-(SP)       ;PUT THE NUMBER ON THE STACK
                                ;       JSR     PC,LINOCT
                                ;       RETURN

                                LINOCT: MOV     2(SP),-(SP)     ;PUT NUMBER IN PROPER LOCATION ON STACK
                                        JSR     PC,$SB2O        ;CONVERT THE NUMBER TO OCTAL
                                        MOV     (SP)+,1$        ;GET THE ADDRESS OF THE ASCII STRING
                                        ADD     #5.,1$          ;ADDRESS THE LAST 6 ASCII DIGITS
                                        DISPLY                  ;TYPE IT
                                1$:     .WORD   0               ;ADDRESS
                                        MOV     (SP)+,(SP)      ;CORRECT THE STACK
                                        RTS     PC              ;RETURN

                                ;ROUTINE TO CONVERT THE INPUT NUMBER TO DECIMAL AND TYPE IT
                                ;LEFT JUSTIFIED
                                ;CALL:
                                ;       MOV     NUM,-(SP)       ;PUT THE NUMBER ON THE STACK
                                ;       JSR     PC,LINDEC
                                ;       RETURN

                                LINDEC: MOV     2(SP),-(SP)     ;SET UP STACK FOR CONVERT
                                        JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
                                        JSR     PC,$SUPRL       ;TYPE IT (LEFT JUSTIFIED)
                                        DISPLY  ,PERIOD         ;TYPE '.'
                                        MOV     (SP)+,(SP)      ;RESTORE STACK POINTER
                                        RTS     PC

                                .SBTTL  GENERAL SUPPORT SUBROUTINES

                                ;DECREMENT THE SECTOR-TRACK ADDRESS
                                ;CALL:
                                ;       MOV     @DPB,R0         ;DPB ADDRESS
                                ;       JSR     PC,READDR
                                ;       RETURN
                                ;
                                ;ON RETURN THE STACK CONTAINS THE FOLLOWING:
                                ;       4(SP) = SECTOR ADDRESS
                                ;       2(SP) = TRACK ADDRESS
                                ;        (SP) = CYLINDER ADDRESS
                                ;
```

```
 479 024444  162706  000006          READDR: SUB     #6,SP                   ;DECREMENT THE STACK POINTER
 480 024450  016616  000006                  MOV     6(SP),(SP)              ;MOVE THE RETURN ADDR DOWN THE STACK
 481 024454  005066  000006                  CLR     6(SP)                   ;CLEAR STACK FOR SECTOR
 482 024460  005066  000004                  CLR     4(SP)                   ;CLEAR STACK FOR TRACK
 483 024464  116066  000174  000006          MOVB    $RPDA(R0),6(SP)         ;SECTOR ON STACK
 484 024472  116066  000175  000004          MOVB    $RPDA+1(R0),4(SP)               ;TRACK ADDRESS
 485 024500  016066  000222  000002          MOV     $RPDC(R0),2(SP)         ;CYLINDER ADDRESS
 486 024506  005766  000006          1$:     TST     6(SP)                   ;SECTOR 0 ?
 487 024512  001403                          BEQ     2$                      ;BRANCH IF SO
 488 024514  105366  000006                  DECB    6(SP)                   ;DECREMENT ONE SECTOR
 489 024520  000424                          BR      4$                      ;BRANCH TO EXIT
 490 024522  005766  000004          2$:     TST     4(SP)                   ;ALSO ON TRACK 0 ?
 491 024526  001406                          BEQ     3$                      ;BRANCH IF SO
 492 024530  116066  000152  000006          MOVB    SECLMT(R0),6(SP)                ;LAST SECTOR
 493 024536  105366  000004                  DECB    4(SP)                   ;DECREMENT ONE TRACK
 494 024542  000413                          BR      4$                      ;EXIT
 495 024544  005766  000002          3$:     TST     2(SP)                   ;ALSO ON CYLINDER 0 ?
 496 024550  001410                          BEQ     4$                      ;BRANCH IF SO
 497 024552  116066  000152  000006          MOVB    SECLMT(R0),6(SP)                ;LAST SECTOR
 498 024560  116066  000154  000004          MOVB    TRKLMT(R0),4(SP)                ;GET LAST TRACK
 499 024566  005366  000002                  DEC     2(SP)                   ;DECREMENT ONE CYLINDER COUNT
 500 024572  000207                  4$:     RTS     PC                      ;RETURN
```

```
                                .SBTTL  KW11 CLOCK CHECK ROUTINE
                                ;
                                ;ROUTINE TO CHECK FOR KW11-L OR KW11-P CLOCKS
                                ;
024574  005037  001310        CKCLK:  CLR     CLKFLG          ;ASSUME "NO CLOCK" AVAILABLE
024600  013746  000004                MOV     ERRVEC,-(SP)    ;;PUSH ERRVEC ON STACK
024604  012737  024656  000004        MOV     #CKCLK1,ERRVEC  ;SETUP ERROR TRAP VECTOR FOR P-CLOCK CHECK
024612  005777  154460                TST     @#LKCSR         ;CHECK FOR KW11-P
024616  012737  000001  001310        MOV     #1,CLKFLG       ;SET P-CLOCK FLAG
024624  013701  001302                MOV     $LPVEC,R1       ;KW11-P VECTOR ADDRESS
024630  012721  026352                MOV     #KWSVR,(R1)+    ;SETUP KW11-P VECTOR
024634  012711  000300                MOV     #PR6,(R1)       ;SET INTERRUPT PRIORITY TO 6
024640  012777  174575  154432        MOV     #-1667.,@#LKCSB ;LOAD COUNTER BUFFER WITH 16.67
024646  012777  000131  154422        MOV     #131,@#LKCSR    ;SET KW11-P INTERRUPT, CNT UP, 10US, REPEAT MODE
024654  000442                      BR      CKCLK3
                                ;
024656  012716  024664        CKCLK1: MOV     #1$,(SP)        ;SETUP RETURN ADDRESS
024662  000002                      RTI
024664  012737  024730  000004  1$:     MOV     #CKCLK2,ERRVEC  ;SET UP ERROR TRAP VECTOR FOR L-CLOCK CHECK
024672  005777  154406                TST     @#LKS           ;CHECK FOR KW11-L
024676  012737  177777  001310        MOV     #-1,CLKFLG      ;SET L-CLOCK FLAG
024704  013701  001306                MOV     $LVEC,R1        ;KW11-L VECTOR ADDRESS
024710  012721  026352                MOV     #KWSVR,(R1)+    ;SETUP KW11-L VECTOR
024714  012711  000300                MOV     #PR6,(R1)       ;SET INTERRUPT PRIORITY TO 6
024720  012777  000100  154356        MOV     #100,@#LKS      ;SET KW11-L INTERRUPT
024726  000415                      BR      CKCLK3
                                ;
024730  012716  024736        CKCLK2: MOV     #1$,(SP)        ;SETUP RETURN ADDRESS
024734  000002                      RTI
024736  104401  057714        1$:     TYPE    ,NEDCLK         ;'P OR L CLOCK MUST BE ON SYSTEM'
024742  105737  001150                TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
024746  001402                      BEQ     2$              ;BR IF NOT
024750  000137  032024                JMP     $GET42          ;ABORT PROGRAM
024754  000000                2$:     HALT                    ;HALT
024756  000137  003522                JMP     START           ;TRY AGAIN
                                ;
024762  012637  000004        CKCLK3: MOV     (SP)+,ERRVEC    ;RESTORE THE ERROR VECTOR
024766  000207                      RTS     PC
                                ;
                                ;THIS ROUTINE IS USED TO SHUT OFF INTERRUPT TO THE SYSTEM CLOCK
                                ;CALL
                                ;       JSR     PC,CLKOFF       ;CALL ROUTINE
                                ;
024770  005737  001310        CLKOFF: TST     CLKFLG          ;IS CLOCK AVAILABLE ?
024774  001410                      BEQ     2$              ;BR IF NO
024776  100404                      BMI     1$              ;BR IF L-CLOCK
025000  042777  000101  154270        BIC     #101,@#LKCSR    ;SHUT OFF KW11-P INTERRUPT
025006  000403                      BR      2$
025010  042777  000100  154266  1$:     BIC     #100,@#LKS      ;SHUT OFF KW11-L INTERRUPT
025016  000207                2$:     RTS     PC              ;EXIT
```

```
                                        ;ROUTINE TO DISPLAY STATISTICS FOR ASSIGNED DRIVES
                                        ;CALL:
                                        ;       JSR     PC,STATPR
                                        ;       RETURN

025020                                  STATPR:
025020  010046                                 MOV     R0,-(SP)        ;;PUSH R0 ON STACK
025022  010446                                 MOV     R4,-(SP)        ;;PUSH R4 ON STACK
025024  005737  001542                         TST     ASNLST          ;ANY DRIVES ASSIGNED ?
025030  001431                                 BEQ     5$              ;BR IF NOT
025032  005004                          2$:    CLR     R4              ;CLEAR THE DRIVE INDEX
025034  104401  001203                         TYPE    ,$CRLF          ;CR-LF
025040  006304                          3$:    ASL     R4              ;CHANGE TO INDEX WORDS
025042  016400  002056                         MOV     BLKADR(R4),R0   ;GET THE DRIVE'S BLOCK ADDRESS
025046  006204                                 ASR     R4              ;RESTORE R4
025050  136437  040630  001542                 BITB    ATABIT(R4),ASNLST       ;IS THIS DRIVE ASSIGNED ?
025056  001412                                 BEQ     4$              ;BR IF NOT
025060  104401  001203                         TYPE    ,$CRLF          ;CR-LF
025064  004737  026226                         JSR     PC,$TIME        ;TYPE ELAPSED TIME
025070  104401  057401                         TYPE    ,DASH5          ;TYPE '-----'
025074  104401  057425                         TYPE    ,MSGSUM         ;TYPE 'SUMMARY, '
025100  004737  025150                         JSR     PC,TYPSUM       ;TYPE THE SUMMARY
025104  005204                          4$:    INC     R4              ;INCREMENT THE INDEX
025106  020427  000010                         CMP     R4,#8.          ;FINISHED ?
025112  001352                                 BNE     3$              ;BR IF NO
025114                                  5$:
025114  012604                                 MOV     (SP)+,R4        ;;POP STACK INTO R4
025116  012600                                 MOV     (SP)+,R0        ;;POP STACK INTO R0
025120  000207                                 RTS     PC              ;RETURN

                                        ;ROUTINE TO TYPE THE SUMMARY FOR ONLY ONE DRIVE
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       JSR     PC,ONESUM
                                        ;       RETURN

025122  010046                  ONESUM: MOV     R0,-(SP)        ;SAVE R0
025124  010446                          MOV     R4,-(SP)        ;SAVE R4
025126  005004                          CLR     R4              ;CLEAR R4 FOR DRIVE NUMBER
025130  111004                          MOVB    (R0),R4         ;DRIVE NUMBER
025132  004737  025150                  JSR     PC,TYPSUM       ;TYPE THE SUMMARY
025136  104401  057407                  TYPE    ,DASH13         ;TYPE '------------'
025142  012604                          MOV     (SP)+,R4        ;RESTORE R4
025144  012600                          MOV     (SP)+,R0        ;RESTORE R0
025146  000207                          RTS     PC              ;RETURN

                                        ;TYPE THE SUMMARY
                                        ;CALL:
                                        ;       MOV     #DRIVE,R4       ;DRIVE NUMBER
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       RETURN

025150  000240                  TYPSUM: NOP

                                        ;TYPE REST OF SUMMARY LINE 1
025152  104401  056661                  TYPE    ,DRVMSG         ;TYPE 'DRIVE'
```

```
                                        MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                                ;;TYPE DRIVE NUMBER
 025160  104403                         TYPOS                   ;;GO TYPE--OCTAL ASCII
 025162     002                         .BYTE   2               ;;TYPE 2 DIGIT(S)
 025163     000                         .BYTE   0               ;;SUPPRESS LEADING ZEROS
 025164  104401  056611                 TYPE    .BLNKS1         ;TYPE 1 BLANK
 025170  104401  056655                 TYPE    .DASH           ;TYPE '-'
 025174  104401  056611                 TYPE    .BLNKS1         ;TYPE 1 BLANK
 025200  012737  057155  025226         MOV     @#RP07,28       ;ADDRESS OF RP07 MESSAGE
 025206  122764  000005  040544         CMPB    05,DRVTYP(R4)   ;IS DEVICE AN RP07 ?
 025214  001403                         BEQ     1$              ;BR IF YES
 025216  012737  057162  025226         MOV     @#RP07P,28      ;ADDRESS OF RP07+ MESSAGE
 025224  104401                 1$:     TYPE                    ;TYPE THE DRIVE TYPE MESSAGE
 025226  000000                 2$:     .WORD   0               ;MESSAGE ADDRESS HERE
 025230  104401  056653                 TYPE    .COMMA          ;TYPE ','
 025234  104401  056611                 TYPE    .BLNKS1         ;TYPE 1 BLANK
 025240  004737  033044                 JSR     PC,TYDRV        ;TYPE DRIVE SERIAL NUMBER
 025244  104401  025252                 TYPE    ,65$            ;;TYPE ASCIZ STRING
 025250  000404                         BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  /, PASS /
 025262                         64$:
 025262  016046  000114                 MOV     @PASSC(R0),-(SP)        ;PUT THE PASS COUNT ON THE STACK
 025266  004737  033412                 JSR     PC,$B2D         ;CONVERT IT
 025272  004537  032632                 JSR     R5,REPLZ        ;TYPE IT
 025276  000003                         .WORD   3               ;TYPE 3 DIGITS
 025300  104401  057771                 TYPE    .PERIOD         ;TYPE '.'

                                ;TYPE LINE 2 OF SUMMARY
                                ;;;     TYPE    .$CRLF          ;CR-LF

                                ;TYPE LINE 3 OF SUMMARY
 025304  104401  025312                 TYPE    ,67$            ;;TYPE ASCIZ STRING
 025310  000407                         BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  <CRLF>/WRDS WRITN /
 025330                         66$:
 025330  104401  057612                 TYPE    ,MSPASS         ;TYPE '/ PASS '
 025334  010046                         MOV     R0,-(SP)        ;GET ADDRESS OF DPB
 025336  062716  000042                 ADD     @#WTPAS,(SP)    ;POINT TO LOW NUMBER OF WRDS WRITTEN PER PASS
 025342  004737  037404                 JSR     PC,@#D82D       ;CONVERT DECIMAL NUMBER
 025346  004737  032442                 JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
 025352  104401  057771                 TYPE    ,PERIOD         ;TYPE '.'
 025356  104401  057622                 TYPE    ,MSTOTL         ;TYPE '  TOTAL '
 025362  010046                         MOV     R0,-(SP)        ;GET ADDRESS OF DPB
 025364  062716  000056                 ADD     @#WTOTL,(SP)    ;POINT TO LOW NUMBER OF WRDS WRITTEN
 025370  004737  037404                 JSR     PC,@#D82D       ;CONVERT DECIMAL NUMBER
 025374  004737  032442                 JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
 025400  104401  057771                 TYPE    ,PERIOD         ;TYPE '.'
 025404  104401  057632                 TYPE    ,MSGX10         ;TYPE ' X10+6'

                                ;TYPE LINE 4 OF SUMMARY
 025410  104401  025416                 TYPE    ,69$            ;;TYPE ASCIZ STRING
 025414  000407                         BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$:  .ASCIZ  <CRLF>/WRDS READ  /
 025434                         68$:
 025434  104401  057612                 TYPE    ,MSPASS         ;TYPE '/ PASS '
 025440  010046                         MOV     R0,-(SP)        ;GET ADDRESS OF DPB
 025442  062716  000036                 ADD     @#RDPAS,(SP)    ;POINT TO LOW NUMBER OF WRDS READ PER PASS
```

```
                025446  004737  037404          JSR     PC,@DB2D        ;CONVERT DECIMAL NUMBER
                025452  004737  032442          JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
                025456  104401  057771          TYPE    ,PERIOD         ;TYPE '.'
                025462  104401  057622          TYPE    ,MSTOTL         ;TYPE ' TOTAL '
                025466  010046                  MOV     R0,-(SP)        ;GET ADDRESS OF DPB
                025470  062716  000066          ADD     #RTOTL,(SP)     ;POINT TO LOW NUMBER OF WRDS READ
                025474  004737  037404          JSR     PC,@DB2D        ;CONVERT DECIMAL NUMBER
                025500  004737  032442          JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
                025504  104401  057771          TYPE    ,PERIOD         ;TYPE '.'
                025510  104401  057632          TYPE    ,MSGX10         ;TYPE ' X10+6'

                                        ;TYPE LINE 5 OF SUMMARY
                025514  104401  025522          TYPE    ,718            ;;TYPE ASCIZ STRING
                025520  000407                  BR      70$             ;;GET OVER THE ASCIZ
                                        ;;718:  .ASCIZ  <CRLF>/SEEKS    /
                025540
                025540  104401  057612  70$:    TYPE    ,MSPASS         ;TYPE '/ PASS '
                025544  010046                  MOV     R0,-(SP)        ;PUT @STOTL ON THE STACK
                025546  062716  000046          ADD     #SEEKS,(SP)     ;POINT TO LOW NUMBER OF SEEK COUNT
                025552  004737  037404          JSR     PC,@DB2D        ;CONVERT DECIMAL NUMBER
                025556  004737  032442          JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
                025562  104401  057771          TYPE    ,PERIOD         ;TYPE '.'
                025566  104401  057622          TYPE    ,MSTOTL         ;TYPE ' TOTAL '
                025572  010046                  MOV     R0,-(SP)        ;PUT @STOTL ON THE STACK
                025574  062716  000076          ADD     #STOTL,(SP)     ;POINT TO LOW NUMBER OF SEEK COUNT
                025600  004737  037404          JSR     PC,@DB2D        ;CONVERT DECIMAL NUMBER
                025604  004737  032442          JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
                025610  104401  057771          TYPE    ,PERIOD         ;TYPE '.'

                                        ;TYPE LINES 6 AND 7 OF SUMMARY
                025614  104401  025622          TYPE    ,73$            ;;TYPE ASCIZ STRING
                025620  000412                  BR      72$             ;;GET OVER THE ASCIZ
                                        ;;73$:  .ASCIZ  <CRLF>/CUMULATIVE ERRORS:/
                025646
                025646  104401  025654  72$:    TYPE    ,75$            ;;TYPE ASCIZ STRING
                025652  000404                  BR      74$             ;;GET OVER THE ASCIZ
                                        ;;75$:  .ASCIZ  <CRLF>/SOFT /
                025664
                025664  016046  000104  74$:    MOV     @SOFT(R0),-(SP) ;;SAVE @SOFT(R0) FOR TYPEOUT
                025670  104405                  TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                025672  104401  057771          TYPE    ,PERIOD         ;TYPE '.'
                025676  104401  025704          TYPE    ,77$            ;;TYPE ASCIZ STRING
                025702  000404                  BR      76$             ;;GET OVER THE ASCIZ
                                        ;;77$:  .ASCIZ  / HARD /
                025714
                025714  016046  000106  76$:    MOV     @HARD(R0),-(SP) ;;SAVE @HARD(R0) FOR TYPEOUT
                025720  104405                  TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                025722  104401  057771          TYPE    ,PERIOD         ;TYPE '.'
                025726  104401  025734          TYPE    ,79$            ;;TYPE ASCIZ STRING
                025732  000405                  BR      78$             ;;GET OVER THE ASCIZ
                                        ;;79$:  .ASCIZ  / SKI /
                025742
                025742  016046  000110  78$:    MOV     @SKI(R0),-(SP)  ;;SAVE @SKI(R0) FOR TYPEOUT
                025746  104405                  TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                025750  104401  057771          TYPE    ,PERIOD         ;TYPE '.'
                025754  104401  025762          TYPE    ,81$            ;;TYPE ASCIZ STRING
                025760  000404                  BR      80$             ;;GET OVER THE ASCIZ
```

```
                                                ;;010:  .ASCIZ  / MISP /
                    025772
159 025772  016086  000112                      800:    MOV     $MISPO(R0),-(SP)        ;;SAVE $MISPO(R0) FOR TYPEOUT
            025776  104405                              TYPOS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
160 026000  104401  057771                              TYPE    .PERIOD         ;TYPE '.'
161 026004  104401  026012                              TYPE    .030            ;;TYPE ASCIZ STRING
            026010  000004                              BR      820             ;;GET OVER THE ASCIZ
                                                ;;030:  .ASCIZ  / OTHER /
                    026022                      820:
162 026022  016086  000102                              MOV     $TOTAL(R0),-(SP)        ;CALCULATE NUMBER OF OTHER ERRORS
165 026026  166016  000104                              SUB     $SOFT(R0),(SP)  ;SUBTRACT $SOFT FROM $TOTAL
            026032  166016  000106                      SUB     $HARD(R0),(SP)  ;SUBTRACT $HARD FROM $TOTAL
            026036  166016  000110                      SUB     $SKI(R0),(SP)   ;SUBTRACT $SKI FROM $TOTAL
            026042  166016  000112                      SUB     $MISPO(R0),(SP) ;SUBTRACT $MISPO FROM $TOTAL
166 026046  104405                                      TYPOS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
167 026050  104401  057771                              TYPE    .PERIOD         ;TYPE '.'
168 026054  104401  001203                              TYPE    .CRLF           ;CR-LF
169 026060  000207                                      RTS     PC
```

```
                        ;ROUTINE TO INCREMENT $SOFT
                        ;
                        ;NOTE:  $SOFT WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

026052  005737  001336  INCSOF: TST     @#BADSEC        ;SEE IF BAD TRK/SEC INDICATOR SET
026056  001006          BNE     10$                     ;BR IF IT'S SET, DON'T INCREMENT COUNT
026060  026027  000106  077777  CMP     $SOFT(R0),#77777        ;IS $SOFT ALREADY AT MAXIMUM ?
026066  103002          BHIS    10$                     ;BR IF IT IS
026070  005260  000106          INC     $SOFT(R0)               ;INCREMENT $SOFT
026074  000207          10$:    RTS     PC              ;RETURN

                        ;ROUTINE TO INCREMENT $HARD
                        ;
                        ;NOTE:  $HARD WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

026076  005737  001336  INCHRD: TST     @#BADSEC        ;SEE IF BAD TRK/SEC INDICATOR SET
026102  001006          BNE     10$                     ;BR IF IT'S SET, DON'T INCREMENT COUNT
026104  026027  000126  077777  CMP     $HARD(R0),#77777        ;IS $HARD ALREADY AT MAXIMUM ?
026112  103002          BHIS    10$                     ;BR IF IT IS
026114  005260  000126          INC     $HARD(R0)               ;INCREMENT $HARD
026120  000207          10$:    RTS     PC              ;RETURN

                        ;ROUTINE TO INCREMENT $SKI
                        ;
                        ;NOTE:  $SKI WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

026122  005737  001336  INCSKI: TST     @#BADSEC        ;SEE IF BAD TRK/SEC INDICATOR SET
026126  001006          BNE     10$                     ;BR IF IT'S SET, DON'T INCREMENT COUNT
026130  026027  000110  077777  CMP     $SKI(R0),#77777 ;IS $SKI ALREADY AT MAXIMUM ?
026136  103002          BHIS    10$                     ;BR IF IT IS
026140  005260  000110          INC     $SKI(R0)                ;INCREMENT $SKI
026144  000207          10$:    RTS     PC              ;RETURN

                        ;ROUTINE TO INCREMENT $HISPO
                        ;
                        ;NOTE:  $HISPO WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

026146  005737  001336  INCHIS: TST     @#BADSEC        ;SEE IF BAD TRK/SEC INDICATOR SET
026152  001006          BNE     10$                     ;BR IF IT'S SET, DON'T INCREMENT COUNT
026154  026027  000112  077777  CMP     $HISPO(R0),#77777       ;IS $HISPO ALREADY AT MAXIMUM ?
026162  103002          BHIS    10$                     ;BR IF IT IS
026164  005260  000112          INC     $HISPO(R0)              ;INCREMENT $HISPO
026170  000207          10$:    RTS     PC              ;RETURN

                        ;ROUTINE TO INCREMENT $TOTAL
                        ;
                        ;NOTE:  $TOTAL WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

026172  005737  001336  INCTOT: TST     @#BADSEC        ;SEE IF BAD TRK/SEC INDICATOR SET
026176  001006          BNE     10$                     ;BR IF IT'S SET, DON'T INCREMENT COUNT
026200  026027  000102  077777  CMP     $TOTAL(R0),#77777       ;IS $TOTAL ALREADY AT MAXIMUM ?
026206  103002          BHIS    10$                     ;BR IF IT IS
026210  005260  000102          INC     $TOTAL(R0)              ;INCREMENT $TOTAL
026214  000207          10$:    RTS     PC              ;RETURN
```

```
                                ;ROUTINE TO TYPE THE ELAPSED CPU RUN TIME
                                ;
026226  005737  001310          $TIME:  TST     CLKFLG          ;IS CLOCK AVAILABLE ?
026232  001446                          BEQ     3$              ;BR IF NO
026234  012737  000002  026502          MOV     #2,2$           ;ASSUME 2 DIGITS TO TYPE
026242  013746  001340                  MOV     HOUR,-(SP)      ;PUT 'HOURS' ON THE STACK
026246  021627  000144                  CMP     (SP),#100.      ;100. HOURS OR MORE ?
026252  002407                          BLT     1$              ;BR IF NO
026254  005237  026502                  INC     2$              ;TYPE 3 DIGITS
026260  021627  001750                  CMP     (SP),#1000.     ;1000. HOURS OR MORE ?
026264  002402                          BLT     1$              ;BR IF NO
026266  005237  026502                  INC     2$              ;TYPE 4 DIGITS
026272  004737  033412          1$:     JSR     PC,$B2D         ;CONVERT TO DECIMAL
026276  004537  032626                  JSR     R5,FILL2        ;TYPE IT
026302  000000          2$:     .WORD   0                       ;NUMBER OF HOUR DIGITS TO TYPE
026304  104401  060156                  TYPE    ,COLON          ;':'
026310  013746  001342                  MOV     MINUTE,-(SP)    ;PUT 'MINUTES' ON THE STACK
026314  004737  033412                  JSR     PC,$B2D         ;CONVERT TO DECIMAL
026320  004537  032626                  JSR     R5,FILL2        ;TYPE IT
026324  000002                          .WORD   2               ;TYPE 2 DIGITS
026326  104401  060156                  TYPE    ,COLON          ;':'
026332  013746  001344                  MOV     SECOND,-(SP)    ;PUT SECONDS ON THE STACK
026336  004737  033412                  JSR     PC,$B2D         ;CONVERT TO DECIMAL
026342  004537  032626                  JSR     R5,FILL2        ;TYPE IT
026346  000002                          .WORD   2               ;TYPE 2 DIGITS
026350  000207          3$:     RTS     PC
                                ;
                                ;KW11 CLOCK INTERRUPT SERVICE ROUTINE
                                ;
026352  005337  001346          KWSVR:  DEC     ONESEC          ;INCREMENT THE 1/60 SECOND COUNTER
026356  001037                          BNE     1$              ;BR IF A SECOND NOT COUNTED
026360  013737  001312  001346          MOV     HERTZ,ONESEC    ;RESTORE THE VALUE
026366  005237  001344                  INC     SECOND          ;COUNT THE SECOND
026372  023727  001344  000074          CMP     SECOND,#60.     ;AT MAXIMUM ?
026400  103426                          BLO     1$              ;BR IF NOT
026402  005037  001344                  CLR     SECOND          ;CLEAR THE SECOND'S COUNTER
026406  005237  001472                  INC     INTRVL+2        ;COUNT SUMMARY INTERVAL COUNTER
026412  005237  001464                  INC     CMPTIM+2        ;COUNT COMPARE TIME INTERVAL COUNTER
026416  005237  001342                  INC     MINUTE          ;COUNT THE MINUTE
026422  023727  001342  000074          CMP     MINUTE,#60.     ;AT MAXIMUM ?
026430  103412                          BLO     1$              ;BR IF NOT
026432  005037  001342                  CLR     MINUTE          ;CLEAR THE MINUTE'S COUNTER
026436  005237  001340                  INC     HOUR            ;COUNT THE HOURS
026442  023727  001340  023417          CMP     HOUR,#9999.     ;AT MAXIMUM
026450  101402                          BLOS    1$              ;BR IF NOT
026452  005037  001340                  CLR     HOUR            ;CLEAR THE HOURS
026456  012746  000024          1$:     MOV     #20.,-(SP)      ;20MS ON THE STACK @ 50HZ
026462  023727  001312  000062          CMP     HERTZ,#50.      ;CPU RUNNING @ 50HZ ?
026470  001402                          BEQ     2$              ;BR IF YES
026472  012716  000020                  MOV     #16.,(SP)       ;16MS ON THE STACK @ 60HZ
026476  004737  044402          2$:     JSR     PC,RPTMR        ;DRIVER TIMER ROUTINE
026502  005737  001470                  TST     INTRVL          ;DISPLAY THE PERFORMANCE SUMMARY ?
026506  001411                          BEQ     3$              ;BR IF NOT
026510  023737  001472  001470          CMP     INTRVL+2,INTRVL ;DISPLAY INTERVAL FINISHED ?
026516  002405                          BLT     3$              ;BR IF NO
026520  012737  177777  001314          MOV     #-1,STATIN      ;SET PERFORMANCE SUMMARY DISPLAY FLAG
```

KW11 CLOCK CHECK ROUTINE

```
 58 026526  005037  001472                CLR     INTRVL+2        ;CLEAR THE PERFORMANCE INTERVAL COUNTER
 59 026532  000002                  38:    RTI
```

```
                                        ;COMMAND DECODE ROUTINE
                                        ;CALL:
                                        ;       MOV     #1,CFLAG        ;'CFLAG' IS NORMALLY SET BY THE TTY SERVICE
                                        ;                               ;ROUTINE IN INTERRUPT MODE
                                        ;       JSR     PC,KSR
                                        ;       RETURN1                 ;SYSTEM BUSY RETURN
                                        ;       RETURN2                 ;RETURN AFTER KEYBOARD SERVICED

026534  005737  040626          KSR:  TST     DTUW            ;ANY DATA TRANSFERS UNDER WAY ?
026540  100375                  KSR1: BPL     KSR             ;BR IF YES
026542  104412                        SAVREG                  ;SAVE THE REGISTERS
026544  012737  000200  177776        MOV     #PR4,PS         ;SET PRIORITY TO 4
026552  013704  040640          1$:   MOV     RPADR,R4        ;GET RP/RH BASE ADDRESS
026556  012764  000040  000010        MOV     #CLR,RPCS2(R4)  ;CLEAR MASSBUS CONTROLLER
026564  005037  001334                CLR     CFLAG           ;CLEAR THE 'CONTROL C' FLAG
026570  104401  001203                TYPE    .$CRLF          ;CR-LF
026574  004737  026226                JSR     PC,$TIME        ;TYPE ELAPSED TIME
026600  104401  056653                TYPE    .COMMA          ;TYPE ','
026604  104401  056611                TYPE    .BLNKS1         ;TYPE 1 BLANK
026610  104401  034736                TYPE    .$MSWR+2        ;TYPE 'SWR = '
026614  017746  152334                MOV     @SWR,-(SP)      ;;SAVE @SWR FOR TYPEOUT
                                                              ;;CONTENTS OF SWITCH REGISTER
026620  104402                        TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
026622  004737  033510                JSR     PC,$TKINT       ;INITIALIZE TTY KEYBOARD
026626  004737  024770                JSR     PC,CLKOFF       ;SHUT OFF CLOCK INTERRUPT WHILE WAITING
026632  104401  060061                TYPE    .ENTCOM         ;'ENTER COMMAND'

026636  104411                        RDLIN                   ;READ THE KEYBOARD
026640  012605                        MOV     (SP)+,R5        ;GET ADDRESS OF INPUT STRING
026642  005737  001334                TST     CFLAG           ;WAS (^C) TYPED?
026646  001405                        BEQ     2$              ;BR IF NO
026650  005737  001542                TST     ASNLST          ;ANY DRIVES ASSIGNED ?
026654  001141                        BNE     13$             ;BR IF YES
026656  000137  003522                JMP     START           ;JUMP TO START

026662  004737  024574          2$:   JSR     PC,CKCLK        ;START SYSTEM CLOCK
026666  005205                        INC     R5              ;POINT TO SECOND CHARACTER
026670  122715  000124                CMPB    #'T,(R5)        ;EQ TO A 'T' ?
026674  001465                        BEQ     9$              ;YES
026676  122715  000101                CMPB    #'A,(R5)        ;EQ TO AN 'A'
026702  001410                        BEQ     3$              ;BR IF IT IS
026704  121527  000067                CMPB    (R5),#'7        ;DRIVE NUMBER GREATER THAN AN ASCII 7 ?
026710  101117                        BHI     12$             ;BR IF IT IS
026712  121527  000060                CMPB    (R5),#'0        ;DRIVE NUMBER LESS THAN AN ASCII 0 ?
026716  103514                        BLO     12$             ;BR IF IT IS
026720  142715  177770                BICB    #^C7,(R5)       ;LEAVE ONLY LOWER 3 BITS IF CHAR NOT 'A'
026724  122765  000124  177777  3$:   CMPB    #'T,-1(R5)      ;EQ TO 'T'
026732  001003                        BNE     4$              ;BR IF NOT EQ
026734  004737  030110                JSR     PC,NEWASN       ;ASSIGN DRIVE FOR TEST
026740  000507                        BR      13$             ;EXIT
026742  122765  000104  177777  4$:   CMPB    #'D,-1(R5)      ;EQ TO 'D' ?
026750  001003                        BNE     5$              ;BR IF NOT EQ
026752  004737  027700                JSR     PC,DROPD        ;DROP DRIVE
026756  000500                        BR      13$             ;EXIT
026760  122765  000123  177777  5$:   CMPB    #'S,-1(R5)      ;EQ TO 'S'
026766  001003                        BNE     6$              ;BR IF NOT EQ
```

```
 59 026770  004737  030006                    JSR     PC,SCMND        ;TYPE STATISTICS
 60 026774  000471                            BR      13$             ;EXIT
 61 026776  122765  000127  177777  6$:       CMPB    #'W,-1(R5)      ;EQ TO 'W'
 62 027004  001012                            BNE     8$              ;BR IF NOT EQ
 64 027006  005737  001424                    TST     RDONLY          ;LOCKED IN "READ ONLY" MODE ?
 65 027012  001053                            BNE     11$             ;BR IF YES
 67 027014  032777  000001  152132            BIT     #SW0,@SWR       ;IS SWITCH 0 SET ?
 68 027022  001047                            BNE     11$             ;BR IF SET, CAN'T DO 'W' COMMAND
 69 027024  004737  030132          7$:       JSR     PC,DATAPK       ;WRITE DATA
 70 027030  000453                            BR      13$             ;EXIT
 71 027032  122765  000122  177777  8$:       CMPB    #'R,-1(R5)      ;EQ TO 'R' ?
 72 027040  001043                            BNE     12$             ;BR IF NOT EQ
 73 027042  004737  030120                    JSR     PC,REDAPK       ;READ DATA
 74 027046  000444                            BR      13$             ;EXIT
 75 027050  122765  000127  177777  9$:       CMPB    #'W,-1(R5)      ;WT COMMAND ?
 76 027056  001034                            BNE     12$             ;NO
 78 027060  005737  001424                    TST     RDONLY          ;LOCKED IN "READ ONLY" MODE ?
 79 027064  001026                            BNE     11$             ;BR IF YES
 81 027066  032777  000001  152060            BIT     #SW0,@SWR       ;IS SWITCH 0 SET ?
 82 027074  001022                            BNE     11$             ;BR IF SET, CAN'T DO 'W' COMMAND
 83 027076  122765  000101  000001            CMPB    #'A,1(R5)       ;ALL DRIVES ?
 84 027104  001413                            BEQ     10$             ;YES
 85 027106  126527  000001  000067            CMPB    1(R5),#'7       ;GREAT THAN 7
 86 027114  101015                            BHI     12$             ;YES
 87 027116  126527  000001  000060            CMPB    1(R5),#'0       ;LESS THAN 0
 88 027124  103411                            BLO     12$             ;YES
 89 027126  142765  177770  000001            BICB    #^C7,1(R5)      ;CHOP OFF THE HIGHER BITS
 90 027134  004737  030144          10$:      JSR     PC,WATPAK       ;ASSIGN DRIVES WITH WT COMMAND
 91 027140  000407                            BR      13$
 92 027142  104401  057773          11$:      TYPE    ,MSWRO          ;TYPE 'CAN'T WRITE IN READ ONLY MODE'
 93 027146  000601                            BR      1$              ;TRY AGAIN
 94 027150  104401  060036          12$:      TYPE    ,INVLD          ;TYPE 'INVALID COMMAND' MESSAGE
 95 027154  000137  026552                    JMP     1$              ;TRY AGAIN
 96 027160  104413                  13$:      RESREG                  ;RESTORE R0 - R5
 97 027162  005777  151774                    TST     @$TKB           ;CLEAR THE TTY BUFFER
 98 027166  052777  000100  151764            BIS     #BIT06,@$TKS    ;SET TTY INTERRUPT ENABLE
 99 027174  005037  177776                    CLR     PS              ;SET PRIORITY BACK TO ZERO
100 027200  000207                            RTS     PC              ;RETURN
```

```
                                        ;ROUTINE TO PROCESS THE ASSIGN REQUEST ('T', 'R', OR 'W' COMMANDS)
                                        ;
027202  111504                  ASSIGN: MOVB    (R5),R4         ;PUT DRIVE # IN R4
027204  005037  001334          1$:     CLR     CFLAG           ;CLEAR CONTROL C FLAG
027210  005037  001426                  CLR     DRVPAR          ;ASSUME CHANGING DRIVE PARAMETERS
027214  104401  060244                  TYPE    .MSPRM          ;TYPE 'CHANGE DRIVE PARAMETERS ?'
027220  104411                          RDLIN                   ;READ THE ENTRY
027222  012600                          MOV     (SP)+,R0        ;SAVE ADDRESS OF RESPONSE
027224  005737  001334                  TST     CFLAG           ;WAS (↑C) TYPED?
027230  001365                          BNE     1$              ;BR IF YES
027232  105710                          TSTB    (R0)            ;WAS RESPONSE A CARRIAGE RETURN (DEFAULT 'N')?
027234  001414                          BEQ     3$              ;BR IF YES
027236  105760  000001                  TSTB    1(R0)           ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
027242  001006                          BNE     2$              ;BR IF NO
027244  122710  000131                  CMPB    #'Y,(R0)        ;WAS IT A 'Y' RESPONSE ?
027250  001410                          BEQ     4$              ;BR IF YES
027252  122710  000116                  CMPB    #'N,(R0)        ;WAS IT A 'N' RESPONSE ?
027256  001403                          BEQ     3$              ;BR IF YES
027260  104401  060163          2$:     TYPE    .BADENT         ;TYPE BAD ENTRY MESSAGE
027264  000747                          BR      1$              ;TRY AGAIN
027266  005237  001426          3$:     INC     DRVPAR          ;DO NOT CHANGE DRIVE PARAMETERS
027272  122704  000101          4$:     CMPB    #'A,R4          ;ASSIGN ALL DRIVES ?
027276  001426                          BEQ     ASGN2           ;BR IF YES
                                        ;
027300  012737  056732  031356  ASGN1:  MOV     #UNTASN,ASNMSG  ;ERROR MESSAGE
027306  005737  001430                  TST     XXDP            ;LOADED FROM THIS DEVICE ?
027312  001407                          BEQ     1$              ;BR IF NO
027314  123704  001430                  CMPB    XXDP,R4         ;LOADED FROM THIS DRIVE ?
027320  001004                          BNE     1$              ;BR IF NO
027322  012737  057041  031356          MOV     #LODEV,ASNMSG   ;'LOAD DEVICE' MESSAGE ADDRESS
027330  000407                          BR      2$
027332  136437  040630  001542  1$:     BITB    ATABIT(R4),ASNLST       ;DRIVE ALREADY ASSIGNED ?
027340  001003                          BNE     2$              ;BR IF IT IS
027342  004737  027444                  JSR     PC,ASGN3        ;SEE IF DRIVE ON THE SYSTEM
027346  000207                          RTS     PC              ;RETURN
027350  000137  031332          2$:     JMP     ASNERR          ;EXIT ERROR
                                        ;
027354  005004                  ASGN2:  CLR     R4              ;START WITH DRIVE 0
027356  012737  056732  031356  1$:     MOV     #UNTASN,ASNMSG  ;ERROR MESSAGE
027364  005737  001430                  TST     XXDP            ;LOADED FROM THIS DEVICE ?
027370  001407                          BEQ     2$              ;BR IF NO
027372  123704  001430                  CMPB    XXDP,R4         ;LOADED FROM THIS DRIVE ?
027376  001004                          BNE     2$              ;BR IF NO
027400  012737  057041  031356          MOV     #LODEV,ASNMSG   ;'LOAD DEVICE' MESSAGE ADDRESS
027406  000413                          BR      4$
027410  136437  040630  001542  2$:     BITB    ATABIT(R4),ASNLST       ;ALREADY ASSIGNED ?
027416  001007                          BNE     4$              ;YES
027420  004737  027444                  JSR     PC,ASGN3        ;ASSIGN THE DRIVE
027424  005204                  3$:     INC     R4              ;INCREMENT DRIVE #
027426  020427  000007                  CMP     R4,#7           ;ALL DRIVE CHECKED ?
027432  003751                          BLE     1$              ;NO
027434  000207                          RTS     PC              ;YES
027436  004737  031332          4$:     JSR     PC,ASNERR       ;ERROR MESSAGE
027442  000770                          BR      3$              ;TO LOOP
                                        ;
027444  136437  040630  001542  ASGN3:  BITB    ATABIT(R4),ASNLST       ;DRIVE ALREADY ASSIGNED ?
027452  001056                          BNE     ASGN4           ;BR IF IT IS
```

```
                                                MOVB    R4,GENDPB       ;GET DRIVE NUMBER
                                                ASL     R4              ;MAKE R4 WORD INDEX
                                                MOV     BLKADR(R4),R0   ;PUT BLOCK'S ADDR INTO R0
                                                JSR     PC,RECALO       ;RECALIBRATE DRIVE
                                                ASR     R4              ;MAKE R4 BYTE INDEX
                                                TSTB    DRVSTA(R4)      ;DRIVE AVAILABLE?
                                                BEQ     ASGN7           ;BR IF DRIVE OFFLINE OR NONEXISTENT
                                                BMI     ASGN6           ;BR IF DRIVE UNSAFE
                                                JSR     PC,CLRDPB       ;CLEAR BLOCK FOR DRIVE JUST ASSIGNED
                                                JSR     PC,GETID        ;GET DRIVE SERIAL NUMBER
                                                BIT     #ILV,$RPDS(R0)  ;INTERLEAVE SECTOR SET ?
                                                BEQ     ASGN8           ;BR IF NO
                                                TST     DRVPAR          ;CHANGE DRIVE PARAMETERS ?
                                                BNE     1$              ;BR IF NO
                                                TYPE    .$CRLF          ;CR-LF
                                                TYPE    .DRVMSG         ;TYPE 'DRIVE'
                                                MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                                        ;;TYPE DRIVE NUMBER
                                                TYPOS                   ;;GO TYPE--OCTAL ASCII
                                                .BYTE   2               ;;TYPE 2 DIGIT(S)
                                                .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                TYPE    .COMMA          ;TYPE ','
                                                TYPE    .BLNKS1         ;TYPE 1 BLANK
                                                JSR     PC,TYPDRV       ;TYPE DRIVE SERIAL NUMBER
                                        1$:     ASL     R4              ;MAKE R4 WORD INDEX
                                                JSR     PC,DRVPRM       ;GET THE DRIVE'S ADDRESS LIMITS
                                                MOV     BLKADR(R4),NEWUNT(R4)   ;DPB ADDRESS
                                                MOVB    PACK,$PACK(R0)  ;SET COMMAND INDICATOR
                                                ASR     R4              ;MAKE R4 BYTE INDEX
                                        ASGN4:  RTS     PC              ;RETURN

                                        ASGN6:  MOV     #NOTSAF,ASNMSG  ;'UNSAFE' MESSAGE ADDRESS
                                                JMP     ASNERR          ;TO ERROR ROUTINE

                                        ASGN7:  TSTB    DRVTYP(R4)      ;DRIVE PRESENT?
                                                BEQ     1$              ;BR IF NOT
                                                BPL     2$              ;BR IF DRIVE OFFLINE
                                                MOV     #NOTRP,ASNMSG   ;ADDRESS OF 'NOT RP07' MSG
                                                BR      3$              ;EXIT
                                        1$:     MOV     #NOTPRS,ASNMSG  ;ADDRESS OF 'NOT PRESENT' MSG
                                                BR      3$              ;EXIT
                                        2$:     MOV     #UNTOFF,ASNMSG  ;ADDRESS OF 'DRIVE OFFLINE' MESSAGE
                                        3$:     JMP     ASNERR          ;TO ERROR ROUTINE

                                        ASGN8:  MOV     #NINLEV,ASNMSG  ;ADDRESS OF 'NON-INTERLEAVED' MESSAGE
                                                JMP     ASNERR          ;TO ERROR ROUTINE
```

```
                                        ;'D' COMMAND (ROUTINE TO DROP A DRIVE)
                                        ;
027700  005004                DROPD:  CLR     R4              ;START WITH DRIVE 0
027702  012703  000010                MOV     #8.,R3          ;COUNTER
027706  122715  000101                CMPB    #'A,(R5)        ;DROP ALL DRIVES ?
027712  001403                        BEQ     1$              ;BR IF YES
027714  111504                        MOVB    (R5),R4         ;GET DRIVE NUMBER
027716  012703  000001                MOV     #1,R3           ;SET R3 FOR ONE DRIVE
027722  136437  040630  001542  1$:   BITB    ATABIT(R4),ASNLST       ;DRIVE ASSIGNED ?
027730  001417                        BEQ     3$              ;BR IF NOT
027732  146437  040630  001542        BICB    ATABIT(R4),ASNLST       ;DELETE THE DRIVE FROM THE ASSIGNED LIST
027740  146437  040630  032100        BICB    ATABIT(R4),AUTLST       ;DELETE DRIVE FROM AUTO ASSIGN LIST
027746  006304                        ASL     R4              ;MAKE ADDR INTO A WORD INDEX
027750  016464  002056  001544        MOV     BLKADR(R4),DDRVS(R4)    ;PUT ADDRESS IN DROP LIST
027756  006204                        ASR     R4
027760  005303                2$:     DEC     R3              ;ANY MORE DRIVES ?
027762  001410                        BEQ     4$              ;BR IF NOT
027764  005204                        INC     R4
027766  000755                        BR      1$
027770  012737  056710  031356  3$:   MOV     #UNTNOT,ASNMSG  ;ADDR OF 'NOT ASSIGNED' MESSAGE
027776  004737  031332                JSR     PC,ASNERR       ;REPORT IT
030002  000766                        BR      2$
030004  000207                4$:     RTS     PC
                                        ;'S' COMMAND (ROUTINE TO TYPE DRIVE PERFORMANCE SUMMARY)
                                        ;
030006                          SCMND:
030006  013746  001542                MOV     ASNLST,-(SP)    ;;PUSH ASNLST ON STACK
030012  122715  000101                CMPB    #'A,(R5)        ;ALL STATISTICS ?
030016  001416                        BEQ     2$              ;BR IF YES
030020  111504                        MOVB    (R5),R4         ;GET DRIVE NUMBER
030022  136416  040630                BITB    ATABIT(R4),(SP) ;IS THIS DRIVE ASSIGNED ?
030026  001404                        BEQ     1$              ;BR IF NO
030030  116437  040630  001542        MOVB    ATABIT(R4),ASNLST       ;GET DRIVE ASSIGN BIT
030036  000411                        BR      3$
                                        ;
030040  012737  056710  031356  1$:   MOV     #UNTNOT,ASNMSG  ;ADDR OF 'NOT ASSIGNED' MSG
030046  004737  031332                JSR     PC,ASNERR       ;TYPE ERROR MESSAGE
030052  000413                        BR      4$              ;EXIT
030054  105737  001542        2$:     TSTB    ASNLST          ;ANY DRIVE ASSIGNED ?
030060  001410                        BEQ     4$              ;BR IF NO
030062  004737  025020        3$:     JSR     PC,STATPR       ;TYPE ALL STATISTICS
030066  104401  057407                TYPE    ,DASH13         ;TYPE '-------------'
030072  104401  001203                TYPE    ,$CRLF          ;CR-LF
030076  104401  057573                TYPE    ,MSGCON         ;TYPE 'CONTINUING...'
                                        ;
030102                          4$:
030102  012637  001542                MOV     (SP)+,ASNLST    ;;POP STACK INTO ASNLST
030106  000207                        RTS     PC
```

```
                                        ;'T' COMMAND (ROUTINE TO TEST A DRIVE)
                                        ;
030110  005037  030162                  NEWASN: CLR     PACK            ;SET 'T' COMMAND INDICATOR
030114  000137  027202                          JMP     ASSIGN          ;GO TO THE ASSIGN ROUTINE
                                        ;
                                        ;'R' COMMAND (ROUTINE TO DO SEQUENTIAL READ DATA)
                                        ;
030120  012737  000001  030162          REDAPK: MOV     #1,PACK         ;SET 'R' COMMAND INDICATOR
030126  000137  027202                          JMP     ASSIGN          ;ASSIGN THE REQUESTED DRIVE
                                        ;
                                        ;'W' COMMAND (ROUTINE TO DO SEQUENTIAL WRITE DATA)
                                        ;
030132  012737  177777  030162          DATAPK: MOV     #-1,PACK        ;SET 'W' COMMAND INDICATOR
030140  000137  027202                          JMP     ASSIGN          ;ASSIGN REQUESTED DRIVE
                                        ;
                                        ;'WT' COMMAND (ROUTINE TO DO WRITE DATA AND TEST A DRIVE)
                                        ;
030144  116515  000001                  WATPAK: MOVB    1(R5),(R5)      ;ADJUST DRIVE NUMBER ADDRESS
030150  012737  177776  030162                  MOV     #-2,PACK        ;SET 'WT' COMMAND INDICATOR
030156  000137  027202                          JMP     ASSIGN          ;JUMP TO ASSIGN ROUTINE
                                        ;
030162  000000                          PACK:   .WORD   0               ;TEMPORARY STORAGE FOR COMMAND INDICATOR
```

```
                                ;ROUTINE TO CLEAR THE DPB FOR THE ASSIGNED DRIVE
                                ;CALL:
                                ;       MOV     #DPB,R0         ;DPB ADDRESS
                                ;       JSR     PC,CLRDPB
                                ;       RETURN
                                ;
                                ;R0 = DPB ADDRESS BEFORE CALLING THE ROUTINE

 030164                         CLRDPB:
 030164  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 030166  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 030170  010446                         MOV     R4,-(SP)        ;;PUSH R4 ON STACK
 030172  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
 030174  005737  040100                 TST     PWRFLG          ;RETURNING FROM POWER FAIL ?
 030200  001073                         BNE     4$              ;BRANCH IF YES
 030202  010004                         MOV     R0,R4           ;GET THE DPB ADDRESS
 030204  062704  000002                 ADD     #2,R4           ;ADDRESS OF FIRST LOCN TO BE CLEARED
 030210  012703  000012                 MOV     #<$CYL-$COMND>+2,R3      ;NUMBER OF LOCNS TO BE CLEARED
 030214  005024                 1$:     CLR     (R4)+           ;CLEAR LOCATIONS '$COMND' - '$CYL' IN DPB
 030216  162703  000002                 SUB     #2,R3           ;DONE CLEARING YET ?
 030222  001374                         BNE     1$              ;BR IF NO

 030224  062704  000002                 ADD     #2,R4           ;SKIP OVER THE '$REG' LOCATION
 030230  012703  000114                 MOV     #<$NEXT-$TATUS>+2,R3     ;NUMBER OF LOCNS TO BE CLEARED
 030234  005024                 2$:     CLR     (R4)+           ;CLEAR LOCATIONS '$TATUS' - '$NEXT' IN DPB
 030236  162703  000002                 SUB     #2,R3           ;DONE CLEARING YET ?
 030242  001374                         BNE     2$              ;BR IF NO

 030244  062704  000026                 ADD     #<$DRVSN-$FIRST>,R4      ;SKIP OVER '$FIRST', MIN/MAX ADRS
                                                                 ;LIMITS AND 'CYL, TRK, SEC, FE1' LIMITS
 030250  012703  000062                 MOV     #<$RPCS3-$DRVSN>+2,R3    ;NUMBER OF LOCNS TO BE CLEARED
 030254  005024                 3$:     CLR     (R4)+           ;CLEAR LOCATIONS '$DRVSN' - '$RPCS3' IN DPB
 030256  162703  000002                 SUB     #2,R3           ;DONE CLEARING YET ?
 030262  001374                         BNE     3$              ;BR IF NO

                                                                 ;INITIALIZE SOME OTHER LOCATIONS
 030264  113760  001514  000024         MOVB    BEGCOD,$CODE(R0)        ;INITIAL COMMAND CODE
 030272  013701  001514                 MOV     BEGCOD,R1       ;GET THE ACTUAL OP CODE
 030276  116160  002076  000002         MOVB    COMTBL(R1),$COMND(R0)   ;OPERATION CODE
 030304  113760  001512  000030         MOVB    BEGPAT,$PATTC(R0)       ;PATTERN CODE
 030312  106360  000030                 ASLB    $PATTC(R0)      ;CONVERT CODE TO A TABLE INDEX
 030316  013760  001516  000020         MOV     BEGWC,$WRDL(R0) ;BEGINNING WORD COUNT
 030324  013760  001516  000004         MOV     BEGWC,$WCNT(R0) ;VALUE FOR DATA TRANSFER
 030332  005460  000004                 NEG     $WCNT(R0)       ;MAKE IT INTO 2'S COMPLEMENT
 030336  012760  000400  000022         MOV     #256.,$SSEC(R0) ;INITIAL VALUE OF SECTOR SIZE
 030344  012760  000001  000114         MOV     #1,$PASSC(R0)   ;PRESET PASS COUNT TO 1
 030352  132760  000001  000024         BITB    #1,$CODE(R0)    ;HEADER COMMAND ?
 030360  001403                         BEQ     4$              ;BR IF NOT
 030362  062760  000002  000022         ADD     #2,$SSEC(R0)    ;ADD HEADER SIZE TO SECTOR SIZE
 030370                         4$:
 030370  012605                         MOV     (SP)+,R5        ;;POP STACK INTO R5
 030372  012604                         MOV     (SP)+,R4        ;;POP STACK INTO R4
 030374  012603                         MOV     (SP)+,R3        ;;POP STACK INTO R3
 030376  012601                         MOV     (SP)+,R1        ;;POP STACK INTO R1
 030400  000207                         RTS     PC              ;RETURN
```

```
                                        ;ROUTINE TO GET ADDRESS LIMITS FROM THE OPERATOR
                                        ;CALL:
                                        ;       MOV     @DPB,R0         ;DPB ADDRESS
                                        ;       JSR     PC,DRVPRM       ;CALL ROUTINE
                                        ;
                                        ;R0 = DPB ADDRESS BEFORE CALLING THE ROUTINE

030402  010346                 DRVPRM: MOV     R3,-(SP)        ;SAVE R3
030404  010446                         MOV     R4,-(SP)        ;SAVE R4
030406  004737  030766          10$:    JSR     PC,GETLMT       ;GET ADDRESS LIMITS
030412  062760  177777  000132         ADD     #-1,#FIRST(R0)  ;SEE IF FIRST TIME STARTED
030420  103426                         BCS     4$              ;BR IF NOT
030422  016060  000150  000134         MOV     CYLLMT(R0),MAXCYL(R0)   ;LOAD MAXIMUM CYLINDER
030430  016060  000154  000140         MOV     TRKLMT(R0),MAXTRK(R0)   ;LOAD MAXIMUM TRACK
030436  016060  000152  000144         MOV     SECLMT(R0),MAXSEC(R0)   ;LOAD MAXIMUM SECTOR
030444  005737  001422                 TST     TSTANY          ;ARE YOU TESTING ANYWHERE ON MEDIA ?
030450  001004                         BNE     2$              ;BR IF YES
030452  016060  000156  000136         MOV     FE1(R0),MINCYL(R0)      ;RESET MINIMUM CYLINDER ADDRESS
030460  000402                         BR      3$
030462  005060  000136         2$:     CLR     MINCYL(R0)      ;CLEAR MINIMUM CYLINDER
030466  005060  000142         3$:     CLR     MINTRK(R0)      ;CLEAR MINIMUM TRACK
030472  005060  000146                 CLR     MINSEC(R0)      ;CLEAR MINIMUM SECTOR

030476  105737  001150         4$:     TSTB    @AUTOB          ;RUNNING IN AUTO MODE ?
030502  001074                         BNE     7$              ;BR IF YES
030504  005737  001332                 TST     CHGADR          ;PROGRAM STARTED AT 200 ?
030510  003071                         BGT     7$              ;BR IF YES
030512  005737  001426                 TST     DRVPAR          ;CHANGE DRIVE PARAMETERS ?
030516  001066                         BNE     7$              ;BR IF NO
030520  016403  061644                 MOV     TABLE(R4),R3    ;PARAMETER TABLE ADDRESS
030524  016063  000150  000002         MOV     CYLLMT(R0),2(R3)        ;LOAD CYLINDER LIMIT FOR MINCYL
030532  016063  000150  000010         MOV     CYLLMT(R0),10(R3)       ;LOAD CYLINDER LIMIT FOR MAXCYL
030540  016063  000154  000016         MOV     TRKLMT(R0),16(R3)       ;LOAD TRACK LIMIT FOR MINTRK
030546  016063  000154  000024         MOV     TRKLMT(R0),24(R3)       ;LOAD TRACK LIMIT FOR MAXTRK
030554  016063  000152  000032         MOV     SECLMT(R0),32(R3)       ;LOAD SECTOR LIMIT FOR MINSEC
030562  016063  000152  000040         MOV     SECLMT(R0),40(R3)       ;LOAD SECTOR LIMIT FOR MAXSEC
030570  104401  060102                 TYPE    ,ENTLMT         ;' ADDRESS LIMITS;'
030574  004737  031170                 JSR     PC,PARENT       ;GET THE DRIVE'S PARAMETERS

030600  016003  000136                 MOV     MINCYL(R0),R3   ;STORE MINCYL VALUE
030604  016004  000134                 MOV     MAXCYL(R0),R4   ;STORE MAXCYL VALUE
030610  020304                         CMP     R3,R4           ;IS MIN. LESS THAN OR EQUAL TO MAX. ?
030612  003404                         BLE     5$              ;BR IF YES
030614  010360  000134                 MOV     R3,MAXCYL(R0)   ;SWAP MIN. TO MAX.
030620  010460  000136                 MOV     R4,MINCYL(R0)   ;SWAP MAX. TO MIN.
030624  016003  000142         5$:     MOV     MINTRK(R0),R3   ;STORE MINTRK VALUE
030630  016004  000140                 MOV     MAXTRK(R0),R4   ;STORE MAXTRK VALUE
030634  020304                         CMP     R3,R4           ;IS MIN. LESS THAN OR EQUAL TO MAX. ?
030636  003404                         BLE     6$              ;BR IF YES
030640  010360  000140                 MOV     R3,MAXTRK(R0)   ;SWAP MIN. TO MAX.
030644  010460  000142                 MOV     R4,MINTRK(R0)   ;SWAP MAX. TO MIN.
030650  016003  000146         6$:     MOV     MINSEC(R0),R3   ;STORE MINSEC VALUE
030654  016004  000144                 MOV     MAXSEC(R0),R4   ;STORE MAXSEC VALUE
030660  020304                         CMP     R3,R4           ;IS MIN. LESS THAN OR EQUAL TO MAX. ?
030662  003404                         BLE     7$              ;BR IF YES
030664  010360  000144                 MOV     R3,MAXSEC(R0)   ;SWAP MIN. TO MAX.
030670  010460  000146                 MOV     R4,MINSEC(R0)   ;SWAP MAX. TO MIN.
```

KW11 CLOCK CHECK ROUTINE

```
64
65 030674  005737  001422          76:   TST     TSTANY          ;ARE YOU TESTING ANYWHERE ON MEDIA ?
67 030700  001016                        BNE     90              ;BR IF YES
68 030702  026060  000136  000156        CMP     MINCYL(R0),FE1(R0)      ;IS MIN. CYLINDER < 1ST FE CYLINDER ?
69 030710  103003                        BHIS    80              ;BR IF NO
70 030712  016060  000156  000136        MOV     FE1(R0),MINCYL(R0)      ;RESET MINIMUM CYLINDER ADDRESS
71 030720  026060  000134  000156  80:   CMP     MAXCYL(R0),FE1(R0)      ;IS MAX. CYLINDER < 1ST FE CYLINDER ?
72 030726  103003                        BHIS    90              ;BR IF NO
73 030730  016060  000150  000134        MOV     CYLLMT(R0),MAXCYL(R0)   ;RESET MAXIMUM CYLINDER ADDRESS
74
75 030736  016060  000136  000012  90:   MOV     MINCYL(R0),$CYL(R0)     ;INITIAL CYLINDER VALUE
79 030744  116060  000142  000011        MOVB    MINTRK(R0),$TRK(R0)     ;INITIAL TRACK VALUE
80 030752  116060  000146  000010        MOVB    MINSEC(R0),$SEC(R0)     ;INITIAL SECTOR VALUE
81 030760  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
   030762  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
82 030764  000207                        RTS     PC              ;RETURN
```

```
                                ;ROUTINE TO GET THE ADDRESS LIMITS FOR THE CURRENT DRIVE TYPE
                                ;CALL:
                                ;       JSR     PC,GETLMT       ;CALL ROUTINE
                                ;
                                ;R0 = DPB ADDRESS BEFORE CALLING THE ROUTINE

 050766                         GETLMT:
 050766  010146                         MOV     R1,-(SP)        ;PUSH R1 ON STACK
 050770  005001                         CLR     R1              ;START FRESH
 050772  012760  001057  000156         MOV     #559.,FE1(R0)   ;GET ADDRESS OF 1ST FE CYLINDER
 051000  012760  001060  000150         MOV     #560.,CYLLMT(R0)        ;ASSUME CYLINDER LIMIT FOR RP07
 051006  012760  000035  000154         MOV     #29.,TRKLMT(R0) ;ASSUME TRACK LIMIT     "
 051014  012760  000041  000152         MOV     #33.,SECLMT(R0) ;ASSUME SECTOR LIMIT    "
 051022  111001                         MOVB    (R0),R1         ;GET DRIVE NUMBER
 051024  122761  000005  040544         CMPB    #5,DRVTYP(R1)   ;IS DRIVE AN RP07 ?
 051032  001414                         BEQ     10              ;BR IF YES
 051034  012760  001166  000156         MOV     #630.,FE1(R0)   ;GET ADDRESS OF 1ST FE CYLINDER
 051042  012760  001166  000150         MOV     #630.,CYLLMT(R0)        ;GET CYLINDER LIMIT FOR RP07.
 051050  012760  000037  000154         MOV     #31.,TRKLMT(R0) ;GET TRACK LIMIT        "
 051056  012760  000061  000152         MOV     #49.,SECLMT(R0) ;GET SECTOR LIMIT.      "
 051064                         10:
 051064  012601                         MOV     (SP)+,R1        ;POP STACK INTO R1
 051066  000207                         RTS     PC              ;RETURN
```

```
                        ;ROUTINE TO GET THE DRIVE SERIAL NUMBER FROM OPSN REGISTER
                        ;THIS NUMBER IS CONTAINED IN THE REGISTER ARE ONLY THE 4 LSD'S OF THE
                        ;SERIAL NUMBER.
                        ;CALL:
                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                        ;       JSR     PC,GETID        ;CALL ROUTINE
                        ;
                        ;R0 = DPB ADDRESS BEFORE CALLING THE ROUTINE

011070                  GETID:
011070  010046                 MOV     R0,-(SP)        ;PUSH R0 ON STACK
011072  010146                 MOV     R1,-(SP)        ;PUSH R1 ON STACK
011074  010246                 MOV     R2,-(SP)        ;PUSH R2 ON STACK
011076  010546                 MOV     R5,-(SP)        ;PUSH R5 ON STACK
011100  010002                 MOV     R0,R2           ;GET INDEX TO DPB
011102  004737  005342         JSR     PC,SVRMSE       ;SAVE ALL REGISTERS
011106  012702  000004         MOV     #4,R2           ;FOUR DIGITS TO STORE
011112  016001  000216         MOV     @DPSN(R0),R1    ;SERIAL NUMBER
011116  005005          10:    CLR     R5              ;ZERO
011120  006101                 ROL     R1              ;PUT THE NEXT DIGIT
011122  006105                 ROL     R5              ;INTO R5
011124  006101                 ROL     R1
011126  006105                 ROL     R5
011130  006101                 ROL     R1
011132  006105                 ROL     R5
011134  006101                 ROL     R1
011136  006105                 ROL     R5
011140  062705  000060         ADD     #'0,R5          ;MAKE IT ASCII
011144  110560  000160         MOVB    R5,@DRVSN(R0)   ;SAVE DRIVE SERIAL NUMBER DIGIT
011150  005200                 INC     R0              ;GET NEXT INDEX FOR DRIVE SERIAL NUMBER
011152  005302                 DEC     R2              ;ALL DIGITS TYPED?
011154  003360                 BGT     10              ;NO -- BRANCH
011156  012605                 MOV     (SP)+,R5        ;POP STACK INTO R5
011160  012602                 MOV     (SP)+,R2        ;POP STACK INTO R2
011162  012601                 MOV     (SP)+,R1        ;POP STACK INTO R1
011164  012600                 MOV     (SP)+,R0        ;POP STACK INTO R0
011166  000207                 RTS     PC              ;RETURN
```

```
                                        .SBTTL  PARAMETER ENTRY ROUTINE
                                        ;
                                        ;PARAMETER ENTRY ROUTINE
                                        ;CALL:
                                        ;       MOV     #ADR,R3         ;PARAMETER TABLE ADDRESS
                                        ;       JSR     PC,PARENT       ;GET THE PARAMETERS
                                        ;
031170  010346                  PARENT: MOV     R3,-(SP)        ;SAVE THE PARAMETER TABLE ADDRESS
031172  005037  001334                  CLR     CFLAG           ;CLEAR THE 'CONTROL C' FLAG
031176  012337  031206          10:     MOV     (R3)+,2$        ;ADDRESS OF PARAMETER NAME
031202  001451                          BEQ     7$              ;BR IF AT END OF TABLE
031204  104401                          TYPE                    ;TYPE THE PARAMETER NAME
031206  000000                  20:     .WORD   0               ;ADDRESS OF PARAMETER NAME TEXT
031210  012302                          MOV     (R3)+,R2        ;MAXIMUM PARAMETER VALUE
031212  012305                          MOV     (R3)+,R5        ;ADDRESS OF PARAMETER
031214  011546                          MOV     (R5),-(SP)      ;CURRENT VALUE OF PARAMETER
031216  004737  033412                  JSR     PC,$B2D         ;CONVERT IT TO DECIMAL
031222  004737  032426                  JSR     PC,SUPRSL       ;TYPE IT (LEFT JUSTIFIED)
                                        ;                       ;TYPE THE CURRENT VALUE OF THE PARAMETER
031226  104401  056611                  TYPE    .BLNKS1         ;TYPE 1 BLANK
031232  104401  056647                  TYPE    .QUES           ;'?'
031236  104401  056611                  TYPE    .BLNKS1         ;TYPE 1 BLANK
031242  104411                          RDLIN                   ;READ THE KEYBOARD
031244  012601                          MOV     (SP)+,R1        ;INPUT ASCII STRING ADDRESS
031246  005737  001334                  TST     CFLAG           ;WAS (^C) TYPED?
031252  001021                          BNE     6$              ;BR IF IT WAS
031254  004537  033254                  JSR     R5,CK.DIG       ;CHECK THE DIGIT(S)
031260  031176                          1$                      ;CARRIAGE RETURN ONLY ENTERED
031262  031326                          7$                      ;PERIOD ONLY ENTERED
031264  031300                          4$                      ;ILLEGAL INPUT
031266  031274                          3$                      ;TERMINATED WITH A CARRIAGE RETURN
031270  031300                          4$                      ;TERMINATED WITH A ","
031272  031312                          5$                      ;TERMINATED WITH A "."
031274  010215                  3$:     MOV     R2,(R5)         ;MOVE NEW VALUE TO PARAMETER LOCATION
031276  000737                          BR      1$              ;GET MORE PARAMETERS
031300  104401  060163          4$:     TYPE    ,BADENT         ;'BAD ENTRY'
031304  162703  000006                  SUB     #6,R3           ;DECREMENT THE TABLE POINTER
031310  000732                          BR      1$              ;TRY AGAIN
031312  010215                  5$:     MOV     R2,(R5)         ;NEW VALUE
031314  000404                          BR      7$              ;EXIT
031316  005037  001334          6$:     CLR     CFLAG           ;CLEAR THE 'CONTROL C' FLAG
031322  011603                          MOV     (SP),R3         ;RELOAD THE PARAMETER TABLE ADDRESS
031324  000724                          BR      1$              ;TRY AGAIN
031326  005726                  7$:     TST     (SP)+           ;CORRECT THE STACK POINTER
031330  000207                          RTS     PC              ;RETURN
```

```
                                        ;TYPEOUT ASSIGN/DROP ERROR MESSAGE
                                        ;CALL:
                                        ;       MOV     @#ESADR,ASNMSG  ;ERROR MESSAGE ADDRESS
                                        ;       JSR     PC,ASNERR
                                        ;       RETURN

031332  104401  001203          ASNERR: TYPE    .$CRLF          ;CR-LF
031336  104401  056647                  TYPE    .QUES           ;'?'
031342  104401  056661                  TYPE    .DRVMSG         ;TYPE 'DRIVE'
031346  010446                          MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                                ;;TYPE DRIVE NUMBER
031350  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
031352     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
031353     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
031354  104401                          TYPE                    ;TYPE SPECIFIC MESSAGE
031356  000000                  ASNMSG: .WORD   0               ;MESSAGE ADDRESS
031360  000207                          RTS     PC

                                        ;DROP DRIVE IF A FATAL ERROR OCCURS
                                        ;CALL:
                                        ;       JSR     PC,DROP
                                        ;       RETURN

031362  005037  043626          DROP:   CLR     PERM            ;CLR PERMENANT ERROR FLAG
031366  005004                          CLR     R4              ;CLEAR R4 FOR DRIVE NUMBER
031370  111004                          MOVB    (R0),R4         ;MOVE DRIVE NUMBER TO R4
031372  146437  040630  001542          BICB    ATABIT(R4),ASNLST       ;REMOVE DRIVE FROM ASSIGNED LIST
031400  146437  040630  032100          BICB    ATABIT(R4),AUTLST       ;DELETE DRIVE FROM AUTO ASSIGN LIST
031406  006304                          ASL     R4              ;MAKE DRIVE NUMBER INTO A TABLE INDEX
031410  010064  001544                  MOV     R0,DDRVS(R4)    ;PUT DRIVE IN DROP LIST
031414  104401  001203                  TYPE    .$CRLF
031420  104401  057641                  TYPE    .DROPNG         ;TYPE '?FATAL OR EXCESSIVE ERRORS'
031424  104401  057676                  TYPE    .MSGON          ;TYPE 'ON'
031430  104401  056661                  TYPE    .DRVMSG         ;TYPE 'DRIVE'
031434  006204                          ASR     R4              ;DRIVE NUMBER
031436  010446                          MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                                ;;TYPE DRIVE NUMBER
031440  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
031442     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
031443     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
031444  104401  001203                  TYPE    .$CRLF          ;CR-LF
031450  000207                  1$:     RTS     PC

                                        ;ROUTINE TO DROP DRIVE IF ERRORS BECOMES EXCESSIVE

031452  032777  000020  147474  ABNRML: BIT     @#SW04,@#SWR    ;SEE IF SWITCH 4 SET
031460  001006                          BNE     1$              ;BR IF IT'S SET
031462  023760  001456  000102          CMP     MAXER,$TOTAL(R0)        ;CHECK TOTAL ERROR VALUE
031470  101002                          BHI     1$              ;BR IF ERRORS DO NOT EXCEED MAX
031472  000137  031362                  JMP     DROP            ;DROP THE DRIVE
031476  000207                  1$:     RTS     PC              ;RETURN
```

```
                        ;ROUTINE TO CHECK FOR END OF PASS AND END OF TEST
```

END OF PASS ROUTINE

```
1                                       .SBTTL  END OF PASS ROUTINE

                                        ;;**********************************************************************
                                        ;*INCREMENT THE PASS NUMBER ($PASS)
                                        ;*IF THERES A MONITOR GO TO IT
                                        ;*IF THERE ISN'T JUMP TO RTURN

031500                                  $EOP:
031500  010446                                  MOV     R4,-(SP)        ;SAVE R4
031502  111004                          1$:     MOVB    (R0),R4         ;MOVE DRIVE NUMBER

031504  105737  001150                          TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
031510  001410                                  BEQ     2$              ;BR IF NO
031512  136437  040630  032100                  BITB    ATABIT(R4),AUTLST       ;IS DRIVE ALREADY ASSIGNED TO AUTO LIST ?
031520  001110                                  BNE     6$              ;BR IF YES
031522  156437  040630  032100                  BISB    ATABIT(R4),AUTLST       ;ADD DRIVE TO AUTO ASSIGN LIST
031530  000441                                  BR      3$

031532  026037  000114  001474  2$:     CMP     $PASSC(R0),PASSES       ;SEE IF AT END OF TEST
031540  103435                                  BLO     3$              ;BR IF NOT
031542  032777  000020  147404                  BIT     @SW04,@SWR      ;TYPE END OF TEST MESSAGE (SW04=1) ?
031550  001031                                  BNE     3$              ;BR IF NO
031552  104401  001203                          TYPE    .$CRLF          ;CR-LF
031556  104401  001203                          TYPE    .$CRLF          ;CR-LF
031562  104401  057407                          TYPE    .DASH13         ;TYPE '-------------'
031566  104401  057477                          TYPE    .MSGEOT         ;TYPE 'END OF TEST-----------------EOT'
031572  146437  040630  001542                  BICB    ATABIT(R4),ASNLST       ;DELETE DRIVE FROM ASSIGNED LIST
031600  006304                                  ASL     R4              ;MAKE DRIVE NUMBER INTO TABLE INDEX
031602  010064  001544                          MOV     R0,DDRVS(R4)    ;PUT BLOCK ADDRESS INTO DROP LIST
031606  105737  001542                          TSTB    ASNLST          ;ALL DRIVES ARE DROPPED ?
031612  001062                                  BNE     7$              ;BR IF NO
031614  005237  001216                          INC     $DEVCT          ;INCREMENT DEVICE COUNT
031620  005237  001214                          INC     $PASS           ;INCREMENT THE PASS COUNT
031624  042737  100000  001214                  BIC     @100000,$PASS   ;AVOID NEGATIVE NUMBER
031632  000452                                  BR      7$

031634  032777  000400  147312  3$:     BIT     @SW08,@SWR      ;INHIBIT END OF PASS TYPEOUT (SW08=1) ?
031642  001022                                  BNE     4$              ;BR IF YES
031644  104401  001203                          TYPE    .$CRLF          ;CR-LF
031650  104401  001203                          TYPE    .$CRLF          ;CR-LF
031654  104401  057407                          TYPE    .DASH13         ;TYPE '-------------'
031660  104401  057451                          TYPE    .MSGEOP         ;TYPE 'END OF PASS'
031664  104401  001203                          TYPE    .$CRLF          ;CR-LF
031670  004737  026226                          JSR     PC,$TIME        ;TYPE ELAPSED TIME
031674  104401  057401                          TYPE    .DASH5          ;TYPE '-----'
031700  104401  057425                          TYPE    .MSGSUM         ;TYPE 'SUMMARY'
031704  004737  025122                          JSR     PC,ONESUM       ;TYPE ONE DRIVE SUMMARY

031710  010346                          4$:     MOV     R3,-(SP)        ;SAVE R3
031712  010004                                  MOV     R0,R4           ;DRIVE'S BLOCK ADDRESS
031714  062704  000036                          ADD     #$RDPAS,R4      ;ADD THE STARTING ADDR OF SECTIONS TO CLEAR
031720  012703  000016                          MOV     #<$OPERC-$RDPAS>/2,R3   ;NUMBER OF LOCNS TO BE CLEARED
031724  005024                          5$:     CLR     (R4)+           ;CLEAR LOCATIONS '$RDPAS' - '$OPERC' IN DPB
031726  162703  000002                          SUB     #2,R3           ;DONE CLEARING YET ?
031732  001374                                  BNE     5$              ;BR IF NO
031734  012603                                  MOV     (SP)+,R3        ;RESTORE R3
031736  005260  000114                          INC     $PASSC(R0)      ;INCREMENT THE PASS COUNT
```

```
031742  105737  001150          6$:     TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
031746  001404                          BEQ     7$              ;BR IF NO
031750  023737  001542  032100          CMP     ASNLST,AUTLST   ;HAVE ALL DRIVES COMPLETED PASS IN AUTO MODE ?
031756  001402                          BEQ     8$              ;BR IF YES
031760  012604                  7$:     MOV     (SP)+,R4        ;RESTORE R4
031762  000207                          RTS     PC              ;RETURN

031764  005237  032100          8$:     INC     AUTLST          ;CLEAR AUTO ASSIGN LIST FOR NEXT PASS AND
031770  001375                          BNE     8$              ;WAIT FOR TTY
031772  005237  001216                  INC     $DEVCT          ;INCREMENT DEVICE COUNT
031776  005237  001214                  INC     $PASS           ;;INCREMENT THE PASS NUMBER
032002  042737  100000  001214          BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
032010  005327                          DEC     (PC)+           ;;LOOP?
032012  000001          $EOPCT: .WORD   1
032014  003013                          BGT     $DOAGN          ;;YES
032016  012737                          MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
032020  000001          $ENDCT: .WORD   1
032022  032012                          $EOPCT
032024  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
032030  001405                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
032032  000005                          RESET                   ;;CLEAR THE WORLD
032034  004710          $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
032036  000240                          NOP                     ;;SAVE ROOM
032040  000240                          NOP                     ;;FOR
032042  000240                          NOP                     ;;ACT11
032044                  $DOAGN:
032044  000137                          JMP     @(PC)+          ;;RETURN
032046  032050          $RTNAD: .WORD   RTURN

032050  005037  177776  RTURN:  CLR     PS              ;SET PRIORITY TO 0
032054  012706  001100          MOV     #STACK,SP       ;RESTORE STACK
032060  005237  001212          INC     $TESTN          ;INCREMENT THE TEST NUMBER IN THE MAIL BOX
032064  004737  033510          JSR     PC,$TKINT       ;MAKE SURE KEYBOARD INTERRUPT AND
032070  004737  024574          JSR     PC,CKCLK        ;SYSTEM CLOCK ARE STILL ON.
032074  000137  006340          JMP     MAIN            ;RETURN TO LOOP

032100  000000  AUTLST: .WORD   0               ;AUTO ASSIGN LIST (USED IN AUTO RUN MODE)
```

END OF PASS ROUTINE

```
                                ;ROUTINE TO GET THE REMAINDER OF THE RANDOM NUMBER
                                ;CALL:
                                ;       MOV     NUMBER,R5       ;DIVISOR INTO R5
                                ;       JSR     PC,GETREM
                                ;       RETURN                  ;REMAINDER IS IN R5

032102  013746  037306          GETREM: MOV     $LONUM,-(SP)    ;STORE RANDOM NUMBER ON THE STACK FOR DIVIDE
032106  013746  037304                  MOV     $HINUM,-(SP)    ;UPPER PART
032112  010546                         MOV     R5,-(SP)        ;PUT THE DIVISOR ONTO THE STACK
032114  004737  032126                 JSR     PC,$DIV         ;DIVIDE THE RANDOM NUMBERS
032120  012605                         MOV     (SP)+,R5        ;PUT THE REMAINDER INTO R5
032122  005726                         TST     (SP)+           ;ADJUST THE STACK POINTER
032124  000207                         RTS     PC

                                .SBTTL  INTEGER DIVIDE ROUTINE

                                ;;*****************************************************************
                                ;*THIS ROUTINE WILL DIVIDE A 32-BIT TWO'S COMPLEMENT INTEGER
                                ;*DIVIDEND BY A 16-BIT TWO'S COMPLEMENT INTEGER DIVISOR GIVING
                                ;*A 16-BIT TWO'S COMPLEMENT INTEGER QUOTIENT AND A 16-BIT REMAINDER.
                                ;*DIVISION WILL BE PERFORMED SO THAT THE REMAINDER IS OF THE
                                ;*SAME SIGN AS THE DIVIDEND.
                                ;*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
                                ;*
                                ;*      STACK   NO ERROR        OVERFLOW        DIVIDE BY ZERO
                                ;*      -----   --------        --------        --------------
                                ;*      TOP     REMAINDER       ALL ZEROS       ALL ONES
                                ;*      +2      QUOTIENT        ALL ZEROS       ALL ONES
                                ;*
                                ;*
                                ;*NOTE: THIS ROUTINE WILL LINK TO THE DIVISION SUBROUTINE ('M.DPID').

032126  104412                  $DIV:   SAVREG                  ;STORE R0 - R5
032130  016605  000026                  MOV     26(SP),R5       ;DIVISOR
032134  005004                         CLR     R4              ;OTHER DIVISOR WORD
032136  016602  000030                 MOV     30(SP),R2       ;UPPER DIVIDEND WORD
032142  016603  000032                 MOV     32(SP),R3       ;LOWER DIVIDEND WORD
032146  005000                         CLR     R0              ;CLEAR OTHER DIVIDEND REGISTERS
032150  005001                         CLR     R1
032152  004737  032250                 JSR     PC,M.DPID       ;GO TO THE DIVIDE ROUTINE
032156  010166  000030                 MOV     R1,30(SP)       ;REMAINDER ON THE STACK
032162  010366  000032                 MOV     R3,32(SP)       ;QUOTIENT ON THE STACK
032166  104413                         RESREG                  ;RESTORE R0 - R5
032170  012616                         MOV     (SP)+,(SP)      ;MOVE RETURN UP THE STACK
032172  000207                         RTS     PC
```

```
                                .SBTTL  DOUBLE DIVIDE ROUTINE

                                ;;*****************************************************************
                                ;*THIS ROUTINE WILL DIVIDE A 32-BIT TWO'S COMPLEMENT INTEGER
                                ;*DIVIDEND BY A 32-BIT TWO'S COMPLEMENT INTEGER DIVISOR GIVING
                                ;*A 16-BIT TWO'S COMPLEMENT INTEGER QUOTIENT AND A 32-BIT REMAINDER.
                                ;*DIVISION WILL BE PERFORMED SO THAT THE REMAINDER IS OF THE
                                ;*SAME SIGN AS THE DIVIDEND.
                                ;*CALL:
                                ;*      MOV     LOW DIVIDEND,-(SP)      ;;THE HIGH DIVIDEND MUST BE < 1/2
                                ;*      MOV     HIGH DIVIDEND,-(SP)     ;;AS LARGE AS THE DIVISOR
                                ;*      MOV     LOW DIVISOR,-(SP)
                                ;*      MOV     HIGH DIVISOR,-(SP)
                                ;*      JSR     PC,$DBDIV
                                ;*      RETURN                          ;;QUOTIENT & REMAINDER ARE ON THE STACK
                                ;*
                                ;*      STACK   NO ERROR        OVERFLOW        DIVIDE BY ZERO
                                ;*      -----   --------        --------        --------------
                                ;*      TOP     REMAINDER       ALL ZEROS       ALL ONES (MSD)
                                ;*      +2      REMAINDER       ALL ZEROS       ALL ONES (LSD)
                                ;*      +4      QUOTIENT        ALL ZEROS       ALL ONES
                                ;*
                                ;*
                                ;*NOTE: THIS ROUTINE WILL LINK TO THE DIVISION SUBROUTINE ('M.DPID').

032174  104412                  $DBDIV: SAVREG                  ;STORE R0 - R5
032176  016604  000026                  MOV     26(SP),R4       ;HIGH DIVISOR WORD
032202  016605  000030                  MOV     30(SP),R5       ;LOW DIVISOR WORD
032206  016602  000032                  MOV     32(SP),R2       ;UPPER DIVIDEND WORD
032212  016603  000034                  MOV     34(SP),R3       ;LOWER DIVIDEND WORD
032216  005000                          CLR     R0              ;CLEAR OTHER DIVIDEND REGISTERS
032220  005001                          CLR     R1
032222  004737  032250                  JSR     PC,M.DPID       ;GO TO THE DIVIDE ROUTINE
032226  010066  000030                  MOV     R0,30(SP)       ;REMAINDER ON THE STACK (MSD)
032232  010166  000032                  MOV     R1,32(SP)       ;REMAINDER ON THE STACK (LSD)
032236  010366  000034                  MOV     R3,34(SP)       ;QUOTIENT ON THE STACK
032242  104413                          RESREG                  ;RESTORE R0 - R5
032244  012616                          MOV     (SP)+,(SP)      ;MOVE RETURN UP THE STACK
032246  000207                          RTS     PC
```

```
                                .SBTTL  DOUBLE PRECISION DIVISION SUBROUTINE
                                ;
                                ;CALL:
                                ;       JSR     PC,M.DPID
                                ;
                                ;       DIVIDEND = R0-R1-R2-R3 (R0=MSD)
                                ;       DIVISOR = R4-R5 (R4=MSD)
                                ;
                                ;RETURN
                                ;
                                ;       REMAINDER AFTER DIVISION = R0-R1 (R0=MSD)
                                ;       QUOTIENT AFTER DIVISION = R2-R3 (R2=MSD)
                                ;
032250  012746  000040  M.DPID: MOV     #40,-(SP)       ;COUNTER FOR DIVISION CYCLES
032254  010446                  MOV     R4,-(SP)        ;HIGH ORDER
032256  010546                  MOV     R5,-(SP)        ;LOW ORDER DIVISOR TO THE STACK
032260  005466  000002          NEG     2(SP)           ;FORM NEGATIVE
032264  005416                  NEG     @SP             ;VERSION OF THE DIVISOR
032266  005666  000002          SBC     2(SP)
032272  061601                  ADD     @SP,R1
032274  005500                  ADC     R0              ;PERFORM THE INITIAL SUBTRACTION
032276  066600  000002          ADD     2(SP),R0
032302  103445                  BCS     M.DP50          ;IF CARRY THEN OVERFLOW HAS OCCURRED
032304  005046                  CLR     -(SP)           ;THIS IS A LONGER LASTING CARRY BIT
032306  006103          M.DP40: ROL     R3
032310  006102                  ROL     R2
032312  006101                  ROL     R1
032314  006100                  ROL     R0
032316  005716                  TST     @SP             ;TEST "CARRY" INDICATOR
032320  001410                  BEQ     M.DP41          ;IF NO "CARRY" THEN ADD ELSE SUBTRACT
032322  005016                  CLR     @SP             ;CLEAR UP FOR NEXT TIME
032324  066601  000002          ADD     2(SP),R1
032330  005500                  ADC     R0              ;ADD -(DIVISOR)
032332  005516                  ADC     @SP     ;  I    ;SET "CARRY"
032334  066600  000004          ADD     4(SP),R0;<-
032340  000404                  BR      M.DP42
032342  060501          M.DP41: ADD     R5,R1
032344  005500                  ADC     R0              ;ADD +(DIVISOR)
032346  005516                  ADC     @SP     ;  I    ;SET "CARRY"
032350  060400                  ADD     R4,R0   ;<-
032352  005516          M.DP42: ADC     @SP             ;SET "CARRY"
032354  005716                  TST     @SP             ;TEST THE UPDATE INDICATOR
032356  001401                  BEQ     .+4     ;->     ;IF ZERO FORGET IT
032360  005203                  INC     R3      ;  I    ;NO CARRY POSSIBLE HERE
032362  005366  000006          DEC     6(SP)   ;<-     ;DECREMENT COUNTER
032366  003347                  BGT     M.DP40          ;BRANCH IF MORE TO DO
032370  006003                  ROR     R3
032372  103404                  BCS     M.DP44
032374  060501                  ADD     R5,R1
032376  005500                  ADC     R0
032400  060400                  ADD     R4,R0
032402  000241                  CLC
032404  006103          M.DP44: ROL     R3
032406  062706  000010          ADD     #10,SP          ;ADJUST STACK BY 4 WORDS
032412  000242                  CLV
032414  000207                  RTS     PC
032416  062706  000006  M.DP50: ADD     #6,SP
```

```
     58 032422  000262                          SEV
     59 032424  000207                          RTS     PC
```

```
                                .SBTTL  SUPRS - TYPE ASCIZ, REPLACE LEADING 0'S WITH BLANKS
                                .SBTTL  SUPRSL -TYPE ASCIZ, LEFT JUSTIFY
                                
                                ;;*****************************************************************
                                ;CALL:
                                ;       MOV     @NUMADR,-(SP)   ;FIRST ADDRESS OF ASCIZ STRING
                                ;       JSR     PC,SUPRS
                                ;  OR
                                ;       MOV     @NUMADR,-(SP)   ;FIRST ADDRESS OF ASCIZ STRING
                                ;       JSR     PC,SUPRSL
                                
032426  010046                  SUPRSL: MOV     R0,-(SP)        ;SAVE R0
032430  016600  000004                  MOV     4(SP),R0        ;GET POINTER TO MESSAGE
032434  005037  032516                  CLR     SUPR2
032440  000405                          BR      SUPR1
                                
032442  010046                  SUPRS:  MOV     R0,-(SP)        ;SAVE R0
032444  016600  000004                  MOV     4(SP),R0        ;GET POINTER TO MESSAGE
032450  010037  032516                  MOV     R0,SUPR2        ;GET POINTER FOR TYPING
032454                          SUPR1:
032454  105710                  1$:     TSTB    (R0)            ;TEST FOR TERMINATOR
032456  001406                          BEQ     2$              ;YES
032460  122710  000060                  CMPB    #'0,(R0)        ;IS THIS A "0" ?
032464  001006                          BNE     3$              ;NO
032466  112720  000040                  MOVB    #40,(R0)+       ;REPLACE IT WITH A "BLANK"
032472  000770                          BR      1$              ;NEXT CHAR.
032474  005300                  2$:     DEC     R0              ;BACKUP 1
032476  112710  000060                  MOVB    #'0,(R0)        ;MAKE IT "0"
032502  005737  032516          3$:     TST     SUPR2           ;LEFT JUSTIFY ?
032506  001002                          BNE     4$              ;NO
032510  010037  032516                  MOV     R0,SUPR2        ;YES
032514  104401                  4$:     TYPE
032516  000000                  SUPR2:  .WORD   0
032520  012600                          MOV     (SP)+,R0        ;RESTORE R0
032522  012616                          MOV     (SP)+,(SP)      ;RESTORE STACK
032524  000207                          RTS     PC
```

```
- TYPE ASCIZ, REPLACE LEADING 0'S WITH BLANKS

                                .SBTTL   - TYPE ASCIZ, REPLACE LEADING 0'S WITH BLANKS
                                .SBTTL  $SUPRL - TYPE ASCIZ, LEFT JUSTIFY
                                
                                ;;******************************************************************
                                ;
                                ;THIS ROUTINE IS SAME AS '$SUPRSL' AND '$SUPRS', EXCEPT THAT IT
                                ;WILL SUPPRESS THE ERROR TYPEOUT IF SW13=1. THIS IS ACCOMPLISHED BY
                                ;USING THE TRAP CALL 'DISPLY', INSTEAD OF 'TYPE'.
                                ;CALL:
                                ;       MOV     @#UPVADR,-(SP)  ;FIRST ADDRESS OF ASCIZ STRING
                                ;       JSR     PC,$SUPRS
                                ;  OR
                                ;       MOV     @#UPVADR,-(SP)  ;FIRST ADDRESS OF ASCIZ STRING
                                ;       JSR     PC,$SUPRL
                                
016046 032526 010046            $SUPRL: MOV     R0,-(SP)        ;SAVE R0
016600 032530 016600 000004             MOV     4(SP),R0        ;GET POINTER TO MESSAGE
005037 032534 005037 032616             CLR     $SUPR2
000405 032540 000405                    BR      $SUPR1
                                
010046 032542 010046            $SUPRS: MOV     R0,-(SP)        ;SAVE R0
016600 032544 016600 000004             MOV     4(SP),R0        ;GET POINTER TO MESSAGE
010037 032550 010037 032616             MOV     R0,$SUPR2       ;GET POINTER FOR TYPING
                                $SUPR1:
105710 032554 105710            1$:     TSTB    (R0)            ;TEST FOR TERMINATOR
001406 032556 001406                    BEQ     2$              ;YES
122710 032560 122710 000060             CMPB    #'0,(R0)        ;IS THIS A "0" ?
001006 032564 001006                    BNE     3$              ;NO
112720 032566 112720 000040             MOVB    #40,(R0)+       ;REPLACE IT WITH A "BLANK"
000770 032572 000770                    BR      1$              ;NEXT CHAR.
005300 032574 005300            2$:     DEC     R0              ;BACKUP 1
112710 032576 112710 000060             MOVB    #'0,(R0)        ;MAKE IT "0"
005737 032602 005737 032616     3$:     TST     $SUPR2          ;LEFT JUSTIFY ?
001002 032606 001002                    BNE     4$              ;NO
010037 032610 010037 032616             MOV     R0,$SUPR2       ;YES
104414 032614 104414            4$:     DISPLY                  ;TYPE, UNLESS SW13=1
000000 032616 000000            $SUPR2: .WORD   0
012600 032620 012600                    MOV     (SP)+,R0        ;RESTORE R0
012616 032622 012616                    MOV     (SP)+,(SP)      ;RESTORE STACK
000207 032624 000207                    RTS     PC
```

```
                                        ;ROUTINE TO REPLACE LEADING ZEROS IN A NUMERIC STRING WITH SPACES
                                        ;CALL:
                                        ;       MOV     @ADDR,-(SP)     ;ADDRESS OF NUMBER (IN ASCII)
                                        ;       JSR     R5,REPLZ        ;REPLACE PRECEDING ZEROS WITH BLANKS
                                        ;       .WORD   N               ;'N' IS NUMBER OF DIGITS TO BE TYPED
                                        ;  OR
                                        ;       MOV     @ADDR,-(SP)     ;ADDRESS OF NUMBER (IN ASCII)
                                        ;       JSR     R5,FILLZ        ;TYPE PRECEDING ZEROS
                                        ;       .WORD   N               ;'N' IS NUMBER OF DIGITS TO BE TYPED

032626  005237  032734      FILLZ:  INC     FILLO           ;LEAVE ZERO'S

032632  010046              REPLZ:  MOV     R0,-(SP)        ;SAVE R0
032634  016600  000004              MOV     4(SP),R0        ;ADDRESS OF NUMBER TO R0
032640  005737  032734              TST     FILLO           ;LEAVE PRECEDING ZEROS ?
032644  001014                      BNE     3$              ;BR IF YES
032646  122710  000060      1$:     CMPB    #'0,(R0)        ;BYTE EQUAL TO ASCII '0' ?
032652  001004                      BNE     2$              ;BR IF NOT
032654  112710  000040              MOVB    #40,(R0)        ;REPLACE THE ZERO WITH A SPACE
032660  005200                      INC     R0              ;INCREMENT THE BYTE ADDRESS
032662  000771                      BR      1$              ;GO BACK AND LOOK FOR MORE LEADING ZEROS
032664  105710              2$:     TSTB    (R0)            ;SEE IF ZERO BYTE TERMINATOR
032666  001003                      BNE     3$              ;BR IF NOT
032670  005300                      DEC     R0              ;BACKUP STRING POINTER
032672  112710  000060              MOVB    #'0,(R0)        ;PUT A ZERO BACK IN
032676  016600  000004      3$:     MOV     4(SP),R0        ;PUT ADDRESS OF FIRST CHARACTER ON STACK
032702  105720              4$:     TSTB    (R0)+           ;SEE IF ZERO BYTE TERMINATOR
032704  001376                      BNE     4$              ;BR IF NOT
032706  005300                      DEC     R0              ;BACKUP STRING POINTER
032710  162500                      SUB     (R5)+,R0        ;ADJUST ADDRESS
032712  010037  032720              MOV     R0,5$           ;GET ADDRESS FOR TYPEOUT
032716  104401                      TYPE                    ;TYPE THE NUMBER
032720  000000              5$:     .WORD   0               ;ADDRESS OF NUMBER
032722  012600                      MOV     (SP)+,R0        ;;POP STACK INTO R0
032724  012616                      MOV     (SP)+,(SP)      ;RESTORE STACK
032726  005037  032734              CLR     FILLO           ;RESET FILL FLAG
032732  000205                      RTS     R5              ;RETURN

032734  000000      FILLO:  .WORD   0               ;IF SET, LEAVE PRECEDING ZEROS FOR TYPE
```

```
                                        ;THIS ROUTINE IS SAME AS 'REPLZ' AND 'FILLZ', EXCEPT THAT IT
                                        ;WILL SUPPRESS THE ERROR TYPEOUT IF SW13=1. THIS ACCOMPLISHED BY
                                        ;USED TRAP CALL 'DISPLY', INSTEAD OF 'TYPE'.
                                        ;CALL:
                                        ;       MOV     @#DR,-(SP)      ;ADDRESS OF NUMBER (IN ASCII)
                                        ;       JSR     R5,@#REPLZ      ;REPLACE PRECEDING ZEROS WITH BLANKS
                                        ;       .WORD   N               ;'N' IS NUMBER OF DIGITS TO BE TYPED
                                        ;  OR
                                        ;       MOV     @#DR,-(SP)      ;ADDRESS OF NUMBER (IN ASCII)
                                        ;       JSR     R5,@#FILLZ      ;TYPE PRECEDING ZEROS
                                        ;       .WORD   N               ;'N' IS NUMBER OF DIGITS TO BE TYPED

032736  005237  032736          FILLZ:: INC     FILLO           ;LEAVE ZERO'S

032742  010046                  REPLZ:: MOV     R0,-(SP)        ;SAVE R0
032744  016600  000004                  MOV     4(SP),R0        ;ADDRESS OF NUMBER TO R0
032750  005737  032734                  TST     FILLO           ;LEAVE PRECEDING ZEROS ?
032754  001014                          BNE     3$              ;BR IF YES
032756  122710  000060          1$:     CMPB    @#'0,(R0)       ;BYTE EQUAL TO ASCII '0' ?
032762  001004                          BNE     2$              ;BR IF NOT
032764  112710  000040                  MOVB    @#40,(R0)       ;REPLACE THE ZERO WITH A SPACE
032770  005200                          INC     R0              ;INCREMENT THE BYTE ADDRESS
032772  000771                          BR      1$              ;GO BACK AND LOOK FOR MORE LEADING ZEROS
032774  105710          2$:     TSTB    (R0)            ;SEE IF ZERO BYTE TERMINATOR
032776  001003                          BNE     3$              ;BR IF NOT
033000  005300                          DEC     R0              ;BACKUP STRING POINTER
033002  112710  000060                  MOVB    @#'0,(R0)       ;PUT A ZERO BACK IN
033006  016600  000004          3$:     MOV     4(SP),R0        ;PUT ADDRESS OF FIRST CHARACTER ON STACK
033012  105720          4$:     TSTB    (R0)+           ;SEE IF ZERO BYTE TERMINATOR
033014  001376                          BNE     4$              ;BR IF NOT
033016  005300                          DEC     R0              ;BACKUP STRING POINTER
033020  162500                          SUB     (R5)+,R0        ;ADJUST ADDRESS
033022  010037  033030                  MOV     R0,5$           ;GET ADDRESS FOR TYPEOUT
033026  104414                          DISPLY                  ;TYPE, UNLESS SW13=1
033030  000000          5$:     .WORD   0               ;ADDRESS OF NUMBER
033032  012600                  MOV     (SP)+,R0        ;POP STACK INTO R0
033034  012616                  MOV     (SP)+,(SP)      ;RESTORE STACK
033036  005037  032734                  CLR     FILLO           ;RESET FILL FLAG
033042  000205                          RTS     R5              ;RETURN
```

```
                                        ;ROUTINE TO TYPE THE DRIVE SERIAL NUMBER IN DECIMAL
                                        ;CALL:
                                        ;       MOV     @DPB,R0         ;ADDRESS OF DRIVE PARAMETER BLOCK
                                        ;       JSR     PC,TYDRV        ;CALL ROUTINE
                                        ;   OR
                                        ;       MOV     @DPB,R0         ;ADDRESS OF DRIVE PARAMETER BLOCK
                                        ;       JSR     PC,TYPDRV       ;CALL ROUTINE(WITH NO HEADER MESSAGE)
                                        ;
                                        ;R0 = DPB ADDRESS BEFORE CALLING THE ROUTINE

033044  104401  060232          TYDRV:  TYPE    .DRVSN          ;TYPE 'DRV S/N: '
033050  104401  057132          TYPDRV: TYPE    .MSGPG          ;TYPE 'PG'
033054  010037  033070                  MOV     R0,1$           ;ADDRESS OF DPB
033060  062737  000160  033070          ADD     @#DRVSN,1$      ;INDEX TO DRIVE SERIAL NUMBER
033066  104401                          TYPE                    ;TYPE THE DRIVE SERIAL NUMBER
033070  000000                  1$:     .WORD   0               ;ADDRESS OF DRIVE SERIAL NUMBER FIELD
033072  104401  057771                  TYPE    .PERIOD         ;TYPE '.'
033076  000207                          RTS     PC              ;RETURN

                                        ;ROUTINE TO TYPE ERRORS
                                        ;CALL
                                        ;       DISPLY                  ;MUST DEFINED IN 'TRAP' TABLE
                                        ;       MESADR                  ;ADDRESS OF MESSAGE
                                        ;       RETURN

033100  032777  020000  146046  @DSPLY: BIT     @#BIT13,@#SWR   ;INHIBIT ERROR TYPEOUT ?
033106  001004                          BNE     1$              ;BR IF YES
033110  005037  177776                  CLR     @#PS            ;SET PRIORITY TO ZERO
033114  000137  035732                  JMP     @#TYPE          ;TYPE THE MESSAGE
033120  062716  000002          1$:     ADD     #2,(SP)         ;INCREMENT THE RETURN
033124  000002                          RTI                     ;RETURN

                                        ;THIS ROUTINE IS USED TO CHECK IF AN
                                        ;ASCII CHARACTER IS A DIGIT BETWEEN 0 AND 7.
                                        ;CALL
                                        ;       MOV     @ADR,R1         ;ADDRESS OF ASCII CHARACTER
                                        ;       JSR     R5,CK.OCT       ;CHECK THE CHARACTER
                                        ;       RETURN1                 ;CHARACTER IS NOT BETWEEN 0-7
                                        ;       RETURN2                 ;CHARACTER IS IN R2 AS A
                                        ;                               ;OCTAL DIGIT

033126  121127  000060          CK.OCT: CMPB    (R1),#'0        ;LESS THAN ZERO?
033132  103407                          BLO     1$              ;YES -- BRANCH
033134  121127  000067                  CMPB    (R1),#'7        ;GREATER THAN SEVEN?
033140  101004                          BHI     1$              ;YES -- BRANCH
033142  111102                          MOVB    (R1),R2         ;GET THE CHARACTER
033144  042702  177770                  BIC     #^C7,R2         ;STRIP AWAY THE ASCII
033150  005725                          TST     (R5)+           ;ADJUST FOR RETURN
033152  000205                  1$:     RTS     R5              ;RETURN
```

```
                                        ;THIS ROUTINE IS USED TO CHECK AN ASCII CHARACTER
                                        ;AND DETERMINE IF IT IS A DIGIT BETWEEN 0 AND 9.
                                        ;CALL
                                        ;       MOV     #ADR,R1         ;ADDRESS OF ASCII CHARACTER
                                        ;       JSR     R5,CK.DEC       ;CHECK THE CHARACTER
                                        ;       RETURN1                 ;NOT BETWEEN 0 AND 9
                                        ;       RETURN2                 ;BETWEEN 0 AND 9
                                        ;                               ;R2 = DIGIT

033154  121127  000060          CK.DEC: CMPB    (R1),#'0        ;LESS THAN ZERO?
033160  103407                  1$      BLO     1$              ;YES -- BRANCH
033162  121127  000071                  CMPB    (R1),#'9        ;GREATER THAN NINE?
033166  101004                          BHI     1$              ;YES -- BRANCH
033170  111102                          MOVB    (R1),R2         ;GET THE CHARACTER
033172  042702  000060                  BIC     #'0,R2          ;STRIP AWAY THE ASCII
033176  005725                          TST     (R5)+           ;ADJUST FOR RETURN
033200  000205                  1$:     RTS     R5              ;RETURN

                                        ;THIS ROUTINE WILL CHECK AN ASCII CHARACTER TO
                                        ;DETERMINE WHAT IT IS.
                                        ;CALL
                                        ;       MOV     #ADR,R1         ;ADDRESS OF ASCII CHARACTER
                                        ;       JSR     R5,CK.CHR       ;CHECK CHARACTER
                                        ;       RETURN  ADR1            ;UNKNOWN CHARACTER
                                        ;       RETURN  ADR2            ;CARRIAGE RETURN * (R1)=ADR+1
                                        ;       RETURN  ADR3            ;COMMA * (R1)=ADR+1
                                        ;       RETURN  ADR4            ;PERIOD * (R1)=ADR+1
                                        ;       RETURN  ADR5            ;DIGIT BETWEEN 0 AND 7.
                                        ;       RETURN  ADR6            ;DIGIT BETWEEN 8 AND 9.
                                        ;                               ;R2 = DIGIT * (R1)=ADR+1

033202  105711                  CK.CHR: TSTB    (R1)            ;"CARRIAGE RETURN"?
033204  001417                          BEQ     3$              ;YES -- BRANCH
033206  121127  000054                  CMPB    (R1),#',        ;"COMMA"?
033212  001413                          BEQ     2$              ;YES -- BRANCH
033214  121127  000056                  CMPB    (R1),#'.        ;"PERIOD"?
033220  001407                          BEQ     1$              ;YES -- BRANCH
033222  004537  033154                  JSR     R5,CK.DEC       ;"DIGIT"?
033226  000410                          BR      4$              ;NO -- BRANCH
033230  004537  033126                  JSR     R5,CK.OCT       ;OCTAL ?
033234  005725                          TST     (R5)+           ;DIGIT BETWEEN 8-9
033236  005725                          TST     (R5)+           ;DIGIT BETWEEN 0-7
033240  005725                  1$:     TST     (R5)+           ;PERIOD
033242  005725                  2$:     TST     (R5)+           ;COMMA
033244  005725                  3$:     TST     (R5)+           ;CARRIAGE RETURN
033246  005201                          INC     R1              ;MOVE POINTER TO NEXT CHARACTER
033250  011505                  4$:     MOV     (R5),R5         ;UNKNOWN CHARACTER
033252  000205                          RTS     R5              ;RETURN
```

```
                                        ;THIS ROUTINE CHECKS AN ASCII STRING FOR LEGAL
                                        ;CHARACTERS AND FORMS A DECIMAL VALUE BINARY NUMBER IN R2.
                                        ;CALL
                                        ;       MOV     @ADR,R1         ;ADDRESS OF ASCIZ STRING
                                        ;       MOV     @NUM,R2         ;MAX. MAGNITUDE OF INPUT NUMBER
                                        ;       JSR     R5,CK.DIG       ;CHECK DIGITS
                                        ;       RETURN  ADR1            ;"CR" ONLY ENTERED -- R2=0
                                        ;       RETURN  ADR2            ;"PERIOD" ONLY ENTERED -- R2=0
                                        ;       RETURN  ADR3            ;ILLEGAL CHARACTER OR INPUT TOO LARGE -- R2=?
                                        ;       RETURN  ADR4            ;"CR" -- R2 = NUMBER
                                        ;       RETURN  ADR5            ;"COMMA" -- R2 = NUMBER
                                        ;       RETURN  ADR6            ;"PERIOD" -- R2 = NUMBER

033254  010446                  CK.DIG: MOV     R4,-(SP)        ;SAVE R4
033256  010346                          MOV     R3,-(SP)        ;SAVE R3
033260  010246                          MOV     R2,-(SP)        ;SAVE THE MAX. SIZE ON THE STACK
033262  005002                          CLR     R2              ;START WITH 0
033264  005003                          CLR     R3
033266  005004                          CLR     R4
033270  004537  033202                  JSR     R5,CK.CHR       ;CHECK ONE CHARACTER
033274  033370                          6$                      ;ILLEGAL CHARACTER
033276  033376                          9$                      ;CARRIAGE RETURN
033300  033370                          6$                      ;"."
033302  033372                          7$                      ;"."
033304  033310                          1$                      ;DIGIT 0-7
033306  033310                          1$                      ;DIGIT 8-9
033310  062705  000004          1$:     ADD     @4,R5           ;STEP RETURN POINTER PAST "CR" & "PERIOD" RETURNS
033314  006303                  2$:     ASL     R3              ;INPUT NUMBER *2
033316  010346                          MOV     R3,-(SP)        ;SAVE *2
033320  006303                          ASL     R3              ;*4
033322  006303                          ASL     R3              ;*8
033324  062603                          ADD     (SP)+,R3        ;(*2)+(*8) = *10
033326  060203                          ADD     R2,R3           ;UPDATE THE INPUT NUMBER
033330  004537  033202                  JSR     R5,CK.CHR       ;CHECK ONE CHARACTER
033334  033374                          8$                      ;ILLEGAL CHARACTER
033336  033360                          5$                      ;CARRIAGE RETURN
033340  033356                          4$                      ;"."
033342  033350                          3$                      ;"."
033344  033314                          2$                      ;DIGIT 0-7
033346  033314                          2$                      ;DIGIT 8-9
033350  105711                  3$:     TSTB    (R1)            ;DOES A "CR" FOLLOW THE "PERIOD"
033352  001010                          BNE     8$              ;BR IF NOT
033354  005724                          TST     (R4)+           ;INCREMENT THE RETURN
033356  005724                  4$:     TST     (R4)+           ;INCREMENT THE RETURN
033360  005724                  5$:     TST     (R4)+           ;INCREMENT THE RETURN
033362  020316                          CMP     R3,(SP)         ;CHECK THE MAGNITUDE OF THE NUMBER
033364  101004                          BHI     9$              ;BR IF ENTERED NUMBER TOO LARGE
033366  000402                          BR      8$              ;BYPASS INCREMENT
033370  005725                  6$:     TST     (R5)+           ;INCREMENT RETURN PAST INVALID RETURN
033372  005725                  7$:     TST     (R5)+           ;INCREMENT RETURN
033374  060405                  8$:     ADD     R4,R5           ;SETUP RETURN POINTER
033376  010302                  9$:     MOV     R3,R2           ;ENTERED VALUE
033400  005726                          TST     (SP)+           ;CLEAN MAX. SIZE OFF OF STACK
033402  012603                          MOV     (SP)+,R3        ;RESTORE R3
033404  012604                          MOV     (SP)+,R4        ;RESTORE R4
033406  011505                          MOV     (R5),R5         ;GET RETURN ADDRESS
033410  000205                          RTS     R5              ;RETURN
```

```
                                ;THIS ROUTINE WILL CONVERT A 16-BIT UNSIGNED BINARY NUMBER TO AN
                                ;UNSIGNED DECIMAL ASCIZ NUMBER.
                                ;CALL
                                ;       MOV     NUMBER,-(SP)    ;PUT THE NUMBER ON THE STACK
                                ;       JSR     PC,$SB2D        ;CALL
                                ;       RETURN                  ;ADDRESS OF THE 1ST ASCIZ CHAR IS ON THE STACK
                                ;
                                ;NOTE:  THE PROGRAM REQUIRES THIS FORM OF '$SB2D', NOT THE VERSION ON
                                ;       THE SYSMAC LIBRARY, REV C AND LATER

033412  016637  000002  033436  $SB2D:  MOV     2(SP),1$        ;SAVE THE BINARY NUMBER
033420  012746  033436          MOV     #1$,-(SP)       ;SET THE POINTER
033424  004737  037404          JSR     PC,$DB2D        ;CALL THE DOUBLE LENGTH CONVERT
033430  012666  000002          MOV     (SP)+,2(SP)     ;PICKUP THE POINTER
033434  000207                  RTS     PC              ;RETURN
033436  000000  000000  1$:     .WORD   0,0

                                ;THIS ROUTINE WILL CONVERT A 16-BIT UNSIGNED BINARY NUMBER TO AN
                                ;UNSIGNED OCTAL ASCIZ NUMBER.
                                ;CALL
                                ;       MOV     NUMBER,-(SP)    ;PUT THE NUMBER ON THE STACK
                                ;       JSR     PC,$SB2O        ;CALL
                                ;       RETURN                  ;ADDRESS OF THE 1ST ASCIZ CHAR IS ON THE STACK
                                ;
                                ;NOTE:  THE PROGRAM REQUIRES THIS FORM OF '$SB2O', NOT THE VERSION ON
                                ;       THE SYSMAC LIBRARY, REV C AND LATER

033442  016637  000002  033466  $SB2O:  MOV     2(SP),1$        ;SAVE THE BINARY NUMBER
033450  012746  033466          MOV     #1$,-(SP)       ;SET THE POINTER
033454  004737  037600          JSR     PC,$DB2O        ;CALL THE DOUBLE LENGTH CONVERT
033460  012666  000002          MOV     (SP)+,2(SP)     ;PICKUP THE POINTER
033464  000207                  RTS     PC              ;RETURN
033466  000000  000000  1$:     .WORD   0,0
```

```
  1                                     .SBTTL  TTY INPUT ROUTINE

                                        ;;**********************************************************************
                                        .ENABL  LSB
033472  000000                          $TKCNT: .WORD   0               ;;NUMBER OF ITEMS IN QUEUE
033474  000000                          $TKQIN: .WORD   0               ;;INPUT POINTER
033476  000000                          $TKQOUT: .WORD  0               ;;OUTPUT POINTER
033500                                  $TKQSRT: .BLKB  7               ;;TTY KEYBOARD QUEUE
        033507                          $TKQEND=.
                                        .EVEN

                                        ;*TK INITIALIZE ROUTINE
                                        ;*THIS ROUTINE WILL INITIALIZE THE TTY KEYBOARD INPUT QUEUE
                                        ;*SETUP THE INTERRUPT VECTOR AND TURN ON THE KEYBOARD INTERRUPT
                                        ;
                                        ;*CALL:
                                        ;*      JSR     PC,$TKINT
                                        ;*      RETURN
                                        ;
033510  005037  033472                  $TKINT: CLR     $TKCNT          ;;CLEAR COUNT OF ITEMS IN QUEUE
033514  012737  033500  033474                  MOV     #$TKQSRT,$TKQIN ;;MOVE THE STARTING ADDRESS OF THE
033522  013737  033474  033476                  MOV     $TKQIN,$TKQOUT  ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
033530  012737  033560  000060                  MOV     #$TKSRV,@#TKVEC ;;INITIALIZE THE KEYBOARD VECTOR
033536  012737  000200  000062                  MOV     #200,@#TKVEC+2  ;;"BR" LEVEL 4
033544  005777  145412                        TST     @$TKB           ;;CLEAR DONE FLAG
033550  012777  000100  145402                MOV     #100,@$TKS      ;;ENABLE TTY KEYBOARD INTERRUPT
033556  000207                          RTS     PC              ;;RETURN TO CALLER

                                        ;*TK SERVICE ROUTINE
                                        ;*THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT
                                        ;*BY READING THE CHARACTER FROM THE INPUT BUFFER AND PUTTING
                                        ;*IT IN THE QUEUE.
                                        ;*IF THE CHARACTER IS A "CONTROL-C" (↑C) $TKINT IS CALLED AND
                                        ;*UPON RETURN EXIT IS MADE TO THE "CONTROL-C" RESTART ADDRESS (CTRAP)
                                        ;
033560  117746  145376                  $TKSRV: MOVB    @$TKB,-(SP)     ;;PICKUP THE CHARACTER
033564  042716  177600                          BIC     #↑C177,(SP)     ;;STRIP THE JUNK
033570  021627  000021                          CMP     (SP),#$XON      ;;IS IT A RANDOM XON?
033574  001002                                  BNE     30$             ;;BRANCH IF NO
033576  005726                                  TST     (SP)+           ;;CLEAN RANDOM XON OFF STACK
033600  000002                                  RTI                     ;;RETURN
033602                                  30$:
033602  021627  000003                          CMP     (SP),#3         ;;IS IT A CONTROL C?
033606  001007                                  BNE     1$              ;;BRANCH IF NO
033610  104401  034715                          TYPE    ,$CNTLC         ;;TYPE A CONTROL-C (↑C)
033614  004737  033510                          JSR     PC,$TKINT       ;;INIT THE KEYBOARD
033620  005726                                  TST     (SP)+           ;;CLEAN UP STACK
033622  000137  034756                          JMP     CTRAP           ;;CONTROL C RESTART
033626  021627  000007                  1$:     CMP     (SP),#7         ;;IS IT A CONTROL G?
033632  001004                                  BNE     2$              ;;BRANCH IF NO
033634  022737  000176  001154                  CMP     #SWREG,SWR      ;;IS SOFT-SWR SELECTED?
033642  001500                                  BEQ     6$              ;;GO TO SWR CHANGE

033644                                  2$:
033644  022737  000007  033472                  CMP     #7,$TKCNT       ;;IS THE QUEUE FULL?
033652  001004                                  BNE     3$              ;;BRANCH IF NO
033654  104401  001176                          TYPE    ,$BELL          ;;RING THE TTY BELL
```

```
033660  005726                          TST     (SP)+           ;;CLEAN CHARACTER OFF OF STACK
033662  000451                          BR      5$              ;;EXIT
033664  021627  000023          3$:     CMP     (SP),#23        ;;IS IT A CONTROL-S?
033670  001021                          BNE     32$             ;;BRANCH IF NO
033672  005077  145262                  CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
033676  005726                          TST     (SP)+           ;;CLEAN CHAR OFF STACK
033700  105777  145254          31$:    TSTB    @$TKS           ;;WAIT FOR A CHAR
033704  100375                          BPL     31$             ;;LOOP UNTIL ITS THERE
033706  117746  145250                  MOVB    @$TKB,-(SP)     ;;GET THE CHARACTER
033712  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
033716  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
033722  001366                          BNE     31$             ;;BRANCH IF NO
033724  012777  000100  145226          MOV     #100,@$TKS      ;;REENABLE TTY KEYBOARD INTERRUPTS
033732  000002                          RTI                     ;;RETURN
033734  005237  033472          32$:    INC     $TKCNT          ;;COUNT THIS CHARACTER
033740  021627  000140                  CMP     (SP),#140       ;;IS IT UPPER CASE?
033744  002405                          BLT     4$              ;;BRANCH IF YES
033746  021627  000175                  CMP     (SP),#175       ;;IS IT A SPECIAL CHAR?
033752  003002                          BGT     4$              ;;BRANCH IF YES
033754  042716  000040                  BIC     #40,(SP)        ;;MAKE IT UPPER CASE
033760  112677  177510          4$:     MOVB    (SP)+,@$TKQIN   ;;AND PUT IT IN QUEUE
033764  005237  033474                  INC     $TKQIN          ;;UPDATE THE POINTER
033770  023727  033474  033507          CMP     $TKQIN,#$TKQEND ;;GO OFF THE END?
033776  001003                          BNE     5$              ;;BRANCH IF NO
034000  012737  033500  033474          MOV     #$TKQSRT,$TKQIN ;;RESET THE POINTER
034006  000002                  5$:     RTI                     ;;RETURN

                        ;;**************************************************************************
                        ;*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 INTERRUPT MODE.
034010  022737  000176  001154  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED
034016  001124                          BNE     15$             ;;EXIT IF NOT
034020  105777  145134                  TSTB    @$TKS           ;;IS A CHAR WAITING?
034024  100121                          BPL     15$             ;;IF NOT, EXIT
034026  117746  145130                  MOVB    @$TKB,-(SP)     ;;YES
034032  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT  7-BIT ASCII
034036  021627  000007                  CMP     (SP),#7         ;;IS IT A CONTROL-G?
034042  001300                          BNE     2$              ;;IF NOT, PUT IT IN THE TTY QUEUE
                                                                ;;AND EXIT

                        ;;**************************************************************************
                        ;*CONTROL IS PASSED TO THIS POINT FROM EITHER THE TTY INTERRUPT SERVICE
                        ;*ROUTINE OR FROM THE SOFTWARE SWITCH REGISTER TRAP CALL, AS A RESULT OF A
                        ;*CONTROL-G BEING TYPED, AND THE SOFTWARE SWITCH REGISTER BEING SELECTED.
034044  123727  001150  000001  6$:     CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
034052  001674                          BEQ     2$              ;;BRANCH IF YES
034054  005726                          TST     (SP)+           ;;CLEAR CONTROL-G OFF STACK
034056  004737  033510                  JSR     PC,$TKINT       ;;FLUSH THE TTY INPUT QUEUE
034062  005077  145072                  CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
034066  112737  000001  001151          MOVB    #1,$INTAG       ;;SET INTERRUPT MODE INDICATOR

034074  104401  034727                  TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
034100  104401  034734  $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
034104  013746  000176                  MOV     SWREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
034110  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
```

```
034112  104401  034745                  TYPE    .$MNEW          ;;PROMPT FOR NEW SWR
034116  005046                  19$:    CLR     -(SP)           ;;CLEAR COUNTER
034120  005046                          CLR     -(SP)           ;;THE NEW SWR
034122  105777  145032          7$:     TSTB    @$TKS           ;;CHAR THERE?
034126  100375                          BPL     7$              ;;IF NOT TRY AGAIN

034130  117746  145026                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
034134  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII

034140  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL-C?
034144  001015                          BNE     9$              ;;BRANCH IF NOT
034146  104401  034715                  TYPE    .$CNTLC         ;;YES, ECHO CONTROL-C (^C)
034152  062706  000006                  ADD     #6,SP           ;;CLEAN UP STACK
034156  123727  001151  000001          CMPB    $INTAG,#1       ;;REENABLE TTY KEYBOARD INTERRUPTS?
034164  001003                          BNE     8$              ;;BRANCH IF NO
034166  012777  000100  144764          MOV     #100,@$TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
034174  000137  034756          8$:     JMP     CTRAP           ;;CONTROL-C RESTART

034200  021627  000025          9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
034204  001005                          BNE     10$             ;;BRANCH IF NOT
034206  104401  034722                  TYPE    .$CNTLU         ;;YES, ECHO CONTROL-U (^U)
034212  062706  000006          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
034216  000737                          BR      19$             ;;LET'S TRY IT AGAIN

034220  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
034224  001022                          BNE     16$             ;;BRANCH IF NO
034226  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
034232  001403                          BEQ     11$             ;;BRANCH IF YES
034234  016677  000002  144712          MOV     2(SP),@SWR      ;;SAVE NEW SWR
034242  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
034246  104401  001203          14$:    TYPE    .$CRLF          ;;ECHO <CR> AND <LF>
034252  123727  001151  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
034260  001003                          BNE     15$             ;;BRANCH IF NOT
034262  012777  000100  144670          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
034270  000002          15$:    RTI                             ;;RETURN
034272  004737  036144          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
034276  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
034302  002420                          BLT     18$             ;;BRANCH IF YES
034304  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
034310  003015                          BGT     18$             ;;BRANCH IF YES
034312  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
034316  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
034322  001003                          BEQ     17$             ;;BRANCH IF YES
034324  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
034326  006316                          ASL     (SP)            ;;   CHAR OVER TO MAKE
034330  006316                          ASL     (SP)            ;;   ROOM FOR NEW ONE.
034332  005266  000002          17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
034336  056616  177776                  BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
034342  000667                          BR      7$              ;;GET THE NEXT ONE
034344  104401  001202          18$:    TYPE    .$QUES          ;;TYPE ?<CR><LF>
034350  000720                          BR      20$             ;;SIMULATE CONTROL-U
                        .DSABL  LSB

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

```
                                ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                ;*CALL:
                                ;*      RDCHR                   ;;GET A CHARACTER FROM THE QUEUE
                                ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
                                ;*                              ;;WITH PARITY BIT STRIPPED OFF
                                ;
034352  011646                 $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC AND
034354  016666  000004  000002          MOV     4(SP),2(SP)     ;;THE PS
034362  005066  000004                  CLR     4(SP)           ;;GET READY FOR A CHARACTER
034366  005046                          CLR     -(SP)           ;;PUT NEW PS ON STACK
034370  012746  034376                  MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
034374  000002                          RTI                     ;;POP NEW PC AND PS
034376                          64$:
034376  005737  033472          1$:     TST     $TKCNT          ;;WAIT ON A CHARACTER
034402  001775                          BEQ     1$
034404  005337  033472                  DEC     $TKCNT          ;;DECREMENT THE COUNTER
034410  117766  177062  000004          MOVB    @$TKQOUT,4(SP)  ;;GET ONE CHARACTER
034416  005237  033476                  INC     $TKQOUT         ;;UPDATE THE POINTER
034422  023727  033476  033507          CMP     $TKQOUT,#$TKQEND ;;DID IT GO OFF OF THE END?
034430  001003                          BNE     2$              ;;BRANCH IF NO
034432  012737  033500  033476          MOV     #$TKQSRT,$TKQOUT ;;RESET THE POINTER
034440  000002                  2$:     RTI                     ;;RETURN
                                ;;**********************************************************************
                                ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                                ;*CALL:
                                ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
                                ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                                ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S

034442  010346                 $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
034444  005046                          CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
034446  012703  034676          1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
034452  022703  034715          2$:     CMP     #$TTYIN+15.,R3  ;;BUFFER FULL?
034456  101456                          BLOS    4$              ;;BR IF YES
034460  104410                          RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
034462  112613                          MOVB    (SP)+,(R3)      ;;GET CHARACTER
034464  122713  000177          10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
034470  001022                          BNE     5$              ;;BR IF NO
034472  005716                          TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
034474  001007                          BNE     6$              ;;BR IF NO
034476  112737  000134  034674          MOVB    #'\,9$          ;;TYPE A BACK SLASH
034504  104401  034674                  TYPE    ,9$
034510  012716  177777                  MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
034514  005303                  6$:     DEC     R3              ;;BACKUP BY ONE
034516  020327  034676                  CMP     R3,#$TTYIN      ;;STACK EMPTY?
034522  103434                          BLO     4$              ;;BR IF YES
034524  111337  034674                  MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
034530  104401  034674                  TYPE    ,9$             ;;GO TYPE
034534  000746                          BR      2$              ;;GO READ ANOTHER CHAR.
034536  005716                  5$:     TST     (SP)            ;;RUBOUT KEY SET?
034540  001406                          BEQ     7$              ;;BR IF NO
034542  112737  000134  034674          MOVB    #'\,9$          ;;TYPE A BACK SLASH
034550  104401  034674                  TYPE    ,9$
034554  005016                          CLR     (SP)            ;;CLEAR THE RUBOUT KEY
034556  122713  000025          7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
034562  001003                          BNE     8$              ;;BR IF NO
```

```
034564  104401  034722                  TYPE    ,$CNTLU         ;;TYPE A CONTROL "U"
034570  000726                          BR      1$              ;;GO START OVER
034572  122713  000022          8$:     CMPB    #22,(R3)        ;;IS CHARACTER A "^R"?
034576  001011                          BNE     3$              ;;BRANCH IF NO
034600  105013                          CLRB    (R3)            ;;CLEAR THE CHARACTER
034602  104401  001203                  TYPE    ,$CRLF          ;;TYPE A "CR" & "LF"
034606  104401  034676                  TYPE    ,$TTYIN         ;;TYPE THE INPUT STRING
034612  000717                          BR      2$              ;;GO PICKUP ANOTHER CHACTER
034614  104401  001202          4$:     TYPE    ,$QUES          ;;TYPE A '?'
034620  000712                          BR      1$              ;;CLEAR THE BUFFER AND LOOP
034622  111337  034674          3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
034626  104401  034674                  TYPE    ,9$
034632  122723  000015                  CMPB    #15,(R3)+       ;;CHECK FOR RETURN
034636  001305                          BNE     2$              ;;LOOP IF NOT RETURN
034640  105063  177777                  CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
034644  104401  001204                  TYPE    ,$LF            ;;TYPE A LINE FEED
034650  005726                          TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
034652  012603                          MOV     (SP)+,R3        ;;RESTORE R3
034654  011646                          MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
034656  016666  000004  000002          MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
034664  012766  034676  000004          MOV     #$TTYIN,4(SP)
034672  000002                          RTI                     ;;RETURN
034674     000          9$:     .BYTE   0                       ;;STORAGE FOR ASCII CHAR. TO TYPE
034675     000                  .BYTE   0                       ;;TERMINATOR
034676                  $TTYIN: .BLKB   15.                     ;;RESERVE 15. BYTES FOR TTY INPUT
034715     136     103     015  $CNTLC: .ASCIZ  /^C/<15><12>    ;;CONTROL "C"
034722     136     125     015  $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL "U"
034727     136     107     015  $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL "G"
034734     015     012     123  $MSWR:  .ASCIZ  <15><12>/SWR = /
034745     040     040     116  $MNEW:  .ASCIZ  /  NEW = /

                                ;THIS ROUTINE WILL PROCESS THE (^C) CHARACTER

034756  012737  000001  001334  CTRAP:  MOV     #1,CFLAG        ;SET THE 'CONTROL C' FLAG
034764  005237  033472                  INC     $TKCNT          ;COUNT THIS CHARACTER
034770  112777  000015  176476          MOVB    #15,@$TKQIN     ;PUT 'RETURN' CHARACTER IN QUEUE
034776  005237  033474                  INC     $TKQIN          ;UPDATE THE POINTER
035002  023727  033474  033507          CMP     $TKQIN,#$TKQEND ;GO OFF THE END ?
035010  001003                          BNE     1$              ;BR IF YES
035012  012737  033500  033474          MOV     #$TKQSRT,$TKQIN ;RESET THE POINTER
035020  000002                  1$:     RTI                     ;RETURN
```

```
1                                       .SBTTL  ERROR HANDLER ROUTINE

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

035022  105037  035410          @ERROR: CLRB    IBSAVE          ;;CLEAR THE ITEM BYTE SAVE LOCATION
035026  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
035030  010337  001316                  MOV     R5,ATTN         ;SAVE THE ATTENTION REGISTER CONTENTS
035034  010137  001320                  MOV     R1,DRVNO        ;DRIVE NUMBER
035040  032777  020000  144106          BIT     @SW13,@SWR      ;INHIBIT PRINTOUTS ?
035046  001004                          BNE     .+12            ;BR IF YES
035050  104401  001203                  TYPE    .@CRLF          ;CR-LF
035054  104401  001203                  TYPE    ,@CRLF          ;CR-LF
035060  004737  026226                  JSR     PC,@TIME        ;TYPE ELAPSED TIME
035064  105237  001117          7$:     INCB    @ERFLG          ;;SET THE ERROR FLAG
035070  001775                          BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
035072  013777  001116  144056          MOV     @TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
035100  032777  002000  144046          BIT     @BIT10,@SWR     ;;BELL ON ERROR?
035106  001402                          BEQ     1$              ;;NO - SKIP
035110  104401  001176                  TYPE    .@BELL          ;;RING BELL
035114  005237  001126          1$:     INC     @ERTTL          ;;COUNT THE NUMBER OF ERRORS
035120  011637  001132                  MOV     (SP),@ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
035124  162737  000002  001132          SUB     #2,@ERRPC
035132  117737  143774  001131          MOVB    @#ERRPC,@ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
035140  032777  001000  144006          BIT     @BIT09,@SWR     ;;SEE IF LOOP ON ERROR IS SET
035146  001060                          BNE     10004$          ;;BRANCH AROUND ROUTINE IF SO
035150  122737  000177  001130          CMPB    #177,@ITEMB     ;;SEE IF THIS IS THE POWER FAIL CALL
035156  001454                          BEQ     10004$          ;;BRANCH AROUND ROUTINE IF IT IS
035160  105737  035410                  TSTB    IBSAVE          ;;SEE IF THIS IS THE 2ND ERROR CALL IN THIS ROUTINE
035164  001047                          BNE     10003$          ;;BRANCH IF SO
035166  022737  177777  035406          CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
035174  001445                          BEQ     10004$          ;;BRANCH IF SO
035176  013746  000004                  MOV     @ERRVEC,-(SP)   ;;SAVE CONTENTS OF ERROR VECTOR
035202  012737  035220  000004          MOV     #10000$,@ERRVEC ;;SETUP 'TRAP' RETURN ADDRESS
035210  013737  177766  035406          MOV     @#177766,CPSAVE ;;MOVE CPU ERROR REGISTER TO CPSAVE FOR TEST
035216  000406                          BR      10001$
035220  012737  177777  035406  10000$: MOV     #-1,CPSAVE      ;;SET CPU ERROR REGISTER TIMEOUT INDICATOR
035226  012716  035234                  MOV     #10001$,(SP)    ;;SETUP RETURN ADDRESS
035232  000002                          RTI
035234  012637  000004          10001$: MOV     (SP)+,@ERRVEC   ;;RESTORE CONTENTS OF ERROR VECTOR

035240  022737  177777  035406  10002$: CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
035246  001420                          BEQ     10004$          ;;BRANCH IF SO
035250  032737  000001  035406          BIT     #BIT00,CPSAVE   ;;SEE IF POWER MONITOR BIT IS SET IN CPU ERR REG
035256  001414                          BEQ     10004$          ;;BRANCH IF OK
035260  042737  000001  177766          BIC     #BIT00,@#177766 ;;CLEAR THE BIT FOUND SET
035266  113737  001130  035410          MOVB    @ITEMB,IBSAVE   ;;MAKE IBSAVE NON-ZERO FOR DUAL ERROR CALL
035274  112737  000177  001130          MOVB    #177,@ITEMB     ;;SET @ITEMB TO SPECIAL POWER FAIL POINTER
035302  000402                          BR      10004$          ;;BRANCH OVER IBSAVE CLEARING
```

ERROR HANDLER ROUTINE

```
035304  105037  035410          10038:  CLRB    IBSAVE          ;;CLEAR IBSAVE SO 2ND TIME THROUGH EXITS
035310                          10048:
035310  032777  020000  143636          BIT     @#IT13,@SWR     ;;SKIP TYPEOUT IF SET
035316  001004                        BNE     20$             ;;SKIP TYPEOUTS
035320  004737  035412                JSR     PC,@ERRTYP      ;;GO TO USER ERROR ROUTINE
035324  104401  001205                TYPE    .$CRLF
035330                          20$:
035330  122737  000001  001226        CMPB    @#PTENV,@ENV    ;;RUNNING IN APT MODE
035336  001007                        BNE     21$             ;;NO,SKIP APT ERROR REPORT
035340  113737  001130  035352        MOVB    @ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
035346  004737  036756                JSR     PC,@ATY4        ;;REPORT FATAL ERROR TO APT
035352     000                  21$:   .BYTE   0
035353     000                          .BYTE   0
035354  000777                  22$:    BR      22$             ;;APT ERROR LOOP
035356  105737  035410          2$:     TSTB    IBSAVE          ;;SEE IF IBSAVE IS LOADED
035362  001005                        BNE     3$              ;;BRANCH IF NOT - NO HALT ON PWR MON BIT ERROR
035364  005777  143564                TST     @SWR            ;;HALT ON ERROR
035370  100002                        BPL     3$              ;;SKIP IF CONTINUE
035372  000000                        HALT                    ;;HALT ON ERROR!
035374  104407                        CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
035376                          3$:
035376  105737  035410                TSTB    IBSAVE          ;;SEE IF ITEM BYTE SAVE LOCATION HAS AN ERROR CALL
035402  001230                        BNE     7$              ;;BRANCH BACK TO CALL ORIGINAL ERROR
035404  000002                        RTI                     ;;RETURN
035406  000000          CPSAVE: .WORD   0               ;;LOCATION TO SAVE CPU ERROR REG CONTENTS
035410  000000          IBSAVE: .WORD   0               ;;LOCATION TO SAVE ITEM BYTE
```

```
                                .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.

035412                          @ERRTYP:
035412  104401  001203                  TYPE    ,@CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
035416  010046                  MOV     R0,-(SP)        ;;SAVE R0
035420  005000                  CLR     R0              ;;PICKUP THE ITEM INDEX
035422  153700  001130          BISB    @@#ITEMB,R0
035426  001004                  BNE     1@              ;;IF ITEM NUMBER IS ZERO, JUST
                                                        ;;TYPE THE PC OF THE ERROR
035430  013746  001132          MOV     @#ERRPC,-(SP)   ;;SAVE @#ERRPC FOR TYPEOUT
                                                        ;;ERROR ADDRESS
035434  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
035436  000457                  BR      6@              ;;GET OUT
035440  122700  000177          1@:     CMPB    @#177,R0        ;;SEE IF THIS ERROR CALL IS SPECIAL POWER FAIL CALL
035444  001006                  BNE     10000@          ;;BRANCH IF NOT
035446  013737  001212  035730          MOV     @#TESTN,PFTSTN  ;;GET TEST NUMBER
035454  012700  035570          MOV     @PFECH,R0       ;;MOVE POWER FAIL ERROR CALL TABLE TO R0
035460  000406                  BR      10010@          ;;BRANCH TO CALL ERROR
035462  005300                  10000@: DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
035464  006300                  ASL     R0              ;;       WORK FOR THE ERROR TABLE
035466  006300                  ASL     R0
035470  006300                  ASL     R0              ;
035472  062700  003360          ADD     @#ERRTB,R0      ;;FORM TABLE POINTER
035476  012037  035506          10010@: MOV     (R0)+,2@        ;;PICKUP "ERROR MESSAGE" POINTER
035502  001404                  BEQ     3@              ;;SKIP TYPEOUT IF NO POINTER
035504  104401                  TYPE                    ;;TYPE THE "ERROR MESSAGE"
035506  000000                  2@:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
035510  104401  001203          TYPE    ,@CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
035514  012037  035524          3@:     MOV     (R0)+,4@        ;;PICKUP "DATA HEADER" POINTER
035520  001404                  BEQ     5@              ;;SKIP TYPEOUT IF 0
035522  104401                  TYPE                    ;;TYPE THE "DATA HEADER"
035524  000000                  4@:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
035526  104401  001203          TYPE    ,@CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
035532  011000                  5@:     MOV     (R0),R0         ;;PICKUP "DATA TABLE" POINTER
035534  001004                  BNE     7@              ;;GO TYPE THE DATA
035536  012600                  6@:     MOV     (SP)+,R0        ;;RESTORE R0
035540  104401  001203          TYPE    ,@CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
035544  000207                  RTS     PC              ;;RETURN
035546                          7@:
035546  013046                  MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
035550  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
035552  005710                  TST     (R0)            ;;IS THERE ANOTHER NUMBER?
035554  001770                  BEQ     6@              ;;BR IF NO
035556  104401  035564          TYPE    ,8@             ;;TYPE TWO(2) SPACES
035562  000771                  BR      7@              ;;LOOP
035564    040     040     000   8@:     .ASCIZ  /  /            ;;TWO(2) SPACES
                                .EVEN
035570  035600  035662  035714  PFECH:  PFECH1,PFECH2,PFECH3,PFECH4 ;;WORDS DEFINING TABLES BELOW
035600    120     117     127   PFECH1: .ASCIZ  ?POWER MONITOR BIT IN CPU ERROR REGISTER FOUND SET?
035662    124     105     123   PFECH2: .ASCIZ  ?TESTNO  ERR PC  CPUERREG?
                                .EVEN
035714  035730  001132  035406  PFECH3: .WORD   PFTSTN,@#ERRPC,CPSAVE,0
```

```
035720  000     000     000  PFECHO: .BYTE   0,0,0,0
035750  000000               PFTSTN: .WORD   0          ;;CONTAINS TEST NUMBER FOR PF BIT ERROR
```

```
                                .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
                                ;*

035732  105737  001173          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
035736  100002                          BPL     1$              ;;BR IF YES
035740  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
035742  000430                          BR      3$              ;;LEAVE
035744  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
035746  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
035752  122737  000001  001226          CMPB    @APTENV,$ENV    ;;RUNNING IN APT MODE
035760  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
035762  132737  000100  001227          BITB    @APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
035770  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
035772  010037  036002                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
035776  004737  036746                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
036002  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
036004  132737  000040  001227  62$:    BITB    @APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
036012  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
036014  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
036016  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
036020  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
036022  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
036024  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
036030  000002                          RTI                     ;;RETURN
036032  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
036036  001430                          BEQ     8$
036040  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
036044  001006                          BNE     5$
036046  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
036050  104401                          TYPE                    ;;TYPE A CR AND LF
036052  001203                          $CRLF
036054  105037  036262                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
036060  000755                          BR      2$              ;;GET NEXT CHARACTER
036062  004737  036144          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
036066  123726  001172          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
036072  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
036074  013746  001170                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
036100  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
036104  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
036106  004737  036144                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
036112  105337  036262                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
036116  000770                          BR      7$              ;;LOOP
```

```
                                ;HORIZONTAL TAB PROCESSOR

036120  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
036124  004737  036144          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
036130  132737  000007  036262          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
036136  001372                          BNE     9$              ;;TAB STOP
036140  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
036142  000724                          BR      2$              ;;GET NEXT CHARACTER
036144                          $TYPEC: .
036144  105777  143010                  TSTB    @$TKS           ;;CHAR IN KYBD BUFFER?
036150  100022                          BPL     10$             ;;BR IF NOT
036152  017746  143004                  MOV     @$TKB,-(SP)     ;;GET CHAR
036156  042716  177600                  BIC     #177600,(SP)    ;;STRIP EXTRANEOUS BITS
036162  122716  000023                  CMPB    #$XOFF,(SP)     ;;WAS CHAR XOFF
036166  001012                          BNE     102$            ;;BR IF NOT
036170                          101$:
036170  105777  142764                  TSTB    @$TKS           ;;WAIT FOR CHAR
036174  100375                          BPL     101$
036176  117716  142760                  MOVB    @$TKB,(SP)      ;;GET CHAR
036202  042716  177600                  BIC     #177600,(SP)    ;;STRIP IT
036206  122716  000021                  CMPB    #$XON,(SP)      ;;WAS IT XON?
036212  001366                          BNE     101$            ;;BR IF NOT
036214                          102$:
036214  005726                          TST     (SP)+           ;;FIX STACK
036216                          10$:
036216  105777  142742                  TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
036222  100375                          BPL     10$
036224  116677  000002  142734          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
036232  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
036240  001003                          BNE     1$              ;;BRANCH IF NO
036242  105037  036262                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
036246  000406                          BR      $TYPEX          ;;EXIT
036250  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
036256  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
036260  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
036262  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
036264  000207          $TYPEX: RTS     PC
```

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

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

036266  017646  000000        $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
036272  116637  000001 036511          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
036300  112637  036513                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
036304  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
036310  000406                          BR      $TYPON
036312  112737  000001 036511 $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
036320  112737  000006 036513          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
036326  112737  000005 036510 $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
036334  010346                          MOV     R3,-(SP)        ;;SAVE R3
036336  010446                          MOV     R4,-(SP)        ;;SAVE R4
036340  010546                          MOV     R5,-(SP)        ;;SAVE R5
036342  113704  036513                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
036346  005404                          NEG     R4
036350  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
036354  110437  036512                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
036360  113704  036511                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
036364  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
036370  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
036372  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
036374  000404                          BR      3$              ;;GO DO MSB
036376  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
036400  006105                          ROL     R5
036402  006105                          ROL     R5
036404  010503                          MOV     R5,R3
036406  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
036410  105337  036512                  DECB    $OMODE          ;;TYPE THIS DIGIT?
036414  100016                          BPL     7$              ;;BR IF NO
036416  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
036422  001002                          BNE     4$              ;;TEST FOR 0
036424  005704                          TST     R4              ;;SUPPRESS THIS 0?
036426  001403                          BEQ     5$              ;;BR IF YES
036430  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
```

```
036432  052703  000060            BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
036436  052703  000040     5$:    BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
036442  110337  036506            MOVB    R3,8$           ;;SAVE FOR TYPING
036446  104401  036506            TYPE    ,8$             ;;GO TYPE THIS DIGIT
036452  105337  036510     7$:    DECB    $OCNT           ;;COUNT BY 1
036456  003347                    BGT     2$              ;;BR IF MORE TO DO
036460  002402                    BLT     6$              ;;BR IF DONE
036462  005204                    INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
036464  000744                    BR      2$              ;;GO DO THE LAST DIGIT
036466  012605     6$:            MOV     (SP)+,R5        ;;RESTORE R5
036470  012604                    MOV     (SP)+,R4        ;;RESTORE R4
036472  012603                    MOV     (SP)+,R3        ;;RESTORE R3
036474  016666  000002  000004    MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
036502  012616                    MOV     (SP)+,(SP)
036504  000002                    RTI                     ;;RETURN
036506     000     8$:            .BYTE   0               ;;STORAGE FOR ASCII DIGIT
036507     000                    .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
036510     000     $OCNT:         .BYTE   0               ;;OCTAL DIGIT COUNTER
036511     000     $OFILL:        .BYTE   0               ;;ZERO FILL SWITCH
036512  000000     $OMODE:        .WORD   0               ;;NUMBER OF DIGITS TO TYPE
```

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

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

036514                          $TYPDS:
036514  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
036516  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
036520  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
036522  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
036524  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
036526  012746  020200                 MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
036532  016605  000020                 MOV     20(SP),R5       ;;GET THE INPUT NUMBER
036536  100004                         BPL     1$              ;;BR IF INPUT IS POS.
036540  005405                         NEG     R5              ;;MAKE THE BINARY NUMBER POS.
036542  112766  000055  000001         MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
036550  005000                 1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
036552  012703  036730                 MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
036556  112723  000040                 MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
036562  005002                 2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
036564  016001  036720                 MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
036570  160105                 3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
036572  002402                         BLT     4$              ;;BR IF DONE
036574  005202                         INC     R2              ;;INCREASE THE BCD DIGIT BY 1
036576  000774                         BR      3$
036600  060105                 4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
036602  005702                         TST     R2              ;;CHECK IF BCD DIGIT=0
036604  001002                         BNE     5$              ;;FALL THROUGH IF 0
036606  105716                         TSTB    (SP)            ;;STILL DOING LEADING 0'S?
036610  100407                         BMI     7$              ;;BR IF YES
036612  106316                 5$:     ASLB    (SP)            ;;MSD?
036614  103003                         BCC     6$              ;;BR IF NO
036616  116663  000001  177777         MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
036624  052702  000060         6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
036630  052702  000040         7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
036634  110223                         MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
036636  005720                         TST     (R0)+           ;;JUST INCREMENTING
036640  020027  000010                 CMP     R0,#10          ;;CHECK THE TABLE INDEX
036644  002746                         BLT     2$              ;;GO DO THE NEXT DIGIT
036646  003002                         BGT     8$              ;;GO TO EXIT
036650  010502                         MOV     R5,R2           ;;GET THE LSD
036652  000764                         BR      6$              ;;GO CHANGE TO ASCII
036654  105726                 8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
036656  100003                         BPL     9$              ;;BR IF NO
036660  116663  177777  177776         MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
036666  105013                 9$:     CLRB    (R3)            ;;SET THE TERMINATOR
036670  012605                         MOV     (SP)+,R5        ;;POP STACK INTO R5
036672  012603                         MOV     (SP)+,R3        ;;POP STACK INTO R3
036674  012602                         MOV     (SP)+,R2        ;;POP STACK INTO R2
036676  012601                         MOV     (SP)+,R1        ;;POP STACK INTO R1
```

CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

```
036700  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
036702  104401  036730                  TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
036706  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
036714  012616                          MOV     (SP)+,(SP)
036716  000002                          RTI                     ;;RETURN TO USER
036720  023420                  $DTBL:  10000.
036722  001750                          1000.
036724  000144                          100.
036726  000012                          10.
036730                          $DBLK:  .BLKW   4
```

```
                                .SBTTL  APT COMMUNICATIONS ROUTINE

                                ;;*****************************************************************
036740  112737  000001  037204  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
036746  112737  000001  037202  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
036754  000403                        BR      $ATYC
036756  112737  000001  037204  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
036764                          $ATYC:
036764  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
036766  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
036770  105737  037202                TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
036774  001450                        BEQ     5$              ;;IF NOT:  BR
036776  122737  000001  001226        CMPB    @APTENV,$ENV    ;;OPERATING UNDER APT?
037004  001031                        BNE     3$              ;;IF NOT:  BR
037006  132737  000100  001227        BITB    @APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
037014  001425                        BEQ     3$              ;;IF NOT:  BR
037016  017600  000004                MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
037022  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
037030  005737  001206          1$:   TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
037034  001375                        BNE     1$              ;;IF NOT:  WAIT
037036  010037  001222                MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
037042  105720                  2$:   TSTB    (R0)+           ;;FIND END OF MESSAGE
037044  001376                        BNE     2$
037046  163700  001222                SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
037052  006200                        ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
037054  010037  001224                MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
037060  012737  000004  001206        MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
037066  000413                        BR      5$
037070  017637  000004  037114  3$:   MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
037076  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
037104  013746  177776                MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
037110  004737  035732                JSR     PC,$TYPE        ;;CALL TYPE MACRO
037114  000000                  4$:   .WORD   0
037116                          5$:
037116  105737  037204          10$:  TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
037122  001416                        BEQ     12$             ;;IF NOT:  BR
037124  005737  001226                TST     $ENV            ;;RUNNING UNDER APT?
037130  001413                        BEQ     12$             ;;IF NOT:  BR
037132  005737  001206          11$:  TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
037136  001375                        BNE     11$             ;;IF NOT:  WAIT
037140  017637  000004  001210        MOV     @4(SP),$FATAL   ;;GET ERROR #
037146  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
037154  005237  001206                INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
037160  105037  037204          12$:  CLRB    $FFLG           ;;CLEAR FATAL FLAG
037164  105037  037203                CLRB    $LFLG           ;;CLEAR LOG FLAG
037170  105037  037202                CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
037174  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
037176  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
037200  000207                        RTS     PC              ;;RETURN
037202     000          $MFLG:  .BYTE   0               ;;MESSG. FLAG
037203     000          $LFLG:  .BYTE   0               ;;LOG FLAG
037204     000          $FFLG:  .BYTE   0               ;;FATAL FLAG
                                .EVEN
            000200      APTSIZE = 200
            000001      APTENV  = 001
            000100      APTSPOOL= 100
            000040      APTCSUP = 040
```

```
                                .SBTTL  RANDOM NUMBER GENERATOR ROUTINE

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

037206                          $RAND:
037206  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
037210  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
037212  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
037214  013700  037306                 MOV     $LONUM,R0       ;;SET R0 WITH LOW
037220  013701  037304                 MOV     $MINUM,R1       ;;SET R1 WITH HIGH
037224  012702  177771                 MOV     #-7,R2          ;;SET SHIFT COUNT
037230  006300                  1$:    ASL     R0              ;;SHIFT R0 LEFT AND
037232  006101                         ROL     R1              ;;ROTATE CARRY INTO R1 AND
037234  005202                         INC     R2              ;;CHECK FOR DONE
037236  001374                         BNE     1$              ;;CONTINUE SHIFT LOOP
037240  063700  037306                 ADD     $LONUM,R0       ;;ADD NUMBER TO MAKE X 129
037244  005501                         ADC     R1              ;;PROPOGATE CARRY
037246  063701  037304                 ADD     $MINUM,R1       ;;ADD NUMBER TO MAKE X 129
037252  062700  001057                 ADD     #1057,R0        ;;ADD LOW CONSTANT
037256  005501                         ADC     R1              ;;PROPOGATE CARRY
037260  062701  047401                 ADD     #47401,R1       ;;ADD HIGH CONSTANT
037264  010037  037306                 MOV     R0,$LONUM       ;;SAVE R0
037270  010137  037304                 MOV     R1,$MINUM       ;;SAVE R1
037274  012602                         MOV     (SP)+,R2        ;;POP STACK INTO R2
037276  012601                         MOV     (SP)+,R1        ;;POP STACK INTO R1
037300  012600                         MOV     (SP)+,R0        ;;POP STACK INTO R0
037302  000207                         RTS     PC              ;;RETURN
037304  176543                 $MINUM: .WORD   176543
037306  123456                 $LONUM: .WORD   123456
```

```
                                .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

037310                          $SAVREG:
037310  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
037312  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
037314  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
037316  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
037320  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
037322  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
037324  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
037330  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
037334  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
037340  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
037344  000002                          RTI

                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      RESREG

037346                          $RESREG:
037346  012666  000022                  MOV     (SP)*,22(SP)    ;;RESTORE PC OF CALL
037352  012666  000022                  MOV     (SP)*,22(SP)    ;;RESTORE PS OF CALL
037356  012666  000022                  MOV     (SP)*,22(SP)    ;;RESTORE PC OF MAIN FLOW
037362  012666  000022                  MOV     (SP)*,22(SP)    ;;RESTORE PS OF MAIN FLOW
037366  012605                          MOV     (SP)*,R5        ;;POP STACK INTO R5
037370  012604                          MOV     (SP)*,R4        ;;POP STACK INTO R4
037372  012603                          MOV     (SP)*,R3        ;;POP STACK INTO R3
037374  012602                          MOV     (SP)*,R2        ;;POP STACK INTO R2
037376  012601                          MOV     (SP)*,R1        ;;POP STACK INTO R1
037400  012600                          MOV     (SP)*,R0        ;;POP STACK INTO R0
037402  000002                          RTI
```

```
                                .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

037404  104412                  #DB2D:  SAVREG                  ;;SAVE REGISTERS
037406  016602  000002                  MOV     2(SP),R2        ;;PICKUP THE DATA POINTER
037412  012700  037564                  MOV     #DECVL,R0       ;;GET ADDRESS OF "#DECVL" STRING
037416  010066  000002                  MOV     R0,2(SP)        ;;PUT ADDRESS OF ASCIZ STRING ON STACK
037422  012201                          MOV     (R2)+,R1        ;;PICKUP THE BINARY NUMBER
037424  012202                          MOV     (R2)+,R2
037426  012737  000012  037502          MOV     #10.,4#         ;;SET UP TO DO 10 CONVERSIONS
037434  012704  037514                  MOV     #TNPWR,R4       ;;ADDRESS OF TEN POWER
037440  012705  037516                  MOV     #TNPWR+2,R5
037444  005003                  1#:     CLR     R3              ;;CLEAR PARTIAL
037446  161401                  2#:     SUB     (R4),R1         ;;SUBTRACT TEN POWER
037450  005602                          SBC     R2
037452  161502                          SUB     (R5),R2
037454  002402                          BLT     3#              ;;BR IF TEN POWER TO LARGE
037456  005203                          INC     R3              ;;ADD 1 TO PARTIAL
037460  000772                          BR      2#              ;;LOOP
037462  062401                  3#:     ADD     (R4)+,R1        ;;RESTORE SUBTRACTED VALUE
037464  005502                          ADC     R2
037466  062402                          ADD     (R4)+,R2
037470  022525                          CMP     (R5)+,(R5)+     ;;MOVE TO NEXT TEN POWER
037472  052703  000060                  BIS     #'0,R3          ;;CHANGE PARTIAL TO ASCII
037476  110320                          MOVB    R3,(R0)+        ;;SAVE IT
037500  005327                          DEC     (PC)+           ;;DONE?
037502  000000                  4#:     .WORD   0
037504  001357                          BNE     1#              ;;BR IF NO
037506  105020                          CLRB    (R0)+           ;;TERMINATOR
037510  104413                          RESREG                  ;;RESTORE REGISTERS
037512  000207                          RTS     PC              ;;RETURN
037514  145000                  #TNPWR: 145000                  ;;1.0E09
037516  035632                          35632
037520  160400                          160400                  ;;1.0E08
037522  002765                          2765
037524  113200                          113200                  ;;1.0E07
037526  000230                          230
037530  041100                          041100                  ;;1.0E06
037532  000017                          17
037534  103240                          103240                  ;;1.0E05
037536  000001                          1
037540  023420                          23420                   ;;1.0E04
037542  000000                          0
037544  001750                          1750                    ;;1.0E03
037546  000000                          0
037550  000144                          144                     ;;1.0E02
037552  000000                          0
```

```
037554  000012                          12                      ;;1.0E01
037556  000000                          0
037560  000001                          1                       ;;1.0E00
037562  000000                          0
037564                          $DECVL: .BLKB   12.             ;;RESERVE STORAGE FOR ASCIZ STRING
```

```
                        .SBTTL  DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT ROUTINE

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

037600  104412          @#DB2O: SAVREG                  ;;SAVE ALL REGISTERS
037602  016601  000002          MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
037606  012705  037717          MOV     #OCTVL+13.,R5   ;;POINTER TO DATA TABLE
037612  012704  000014          MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
037616  012703  177770          MOV     #^C7,R3         ;;MASK
037622  012100                  MOV     (R1)+,R0        ;;LOWER WORD
037624  012101                  MOV     (R1)+,R1        ;;HIGH WORD
037626  005002                  CLR     R2              ;;TERMINATOR
037630  110245          1$:     MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
037632  010002                  MOV     R0,R2           ;;GET THIS DIGIT
037634  005304                  DEC     R4              ;;COUNT THIS CHARACTER
037636  003007                  BGT     3$              ;;BR IF NOT THE LAST DIGIT
037640  001405                  BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
037642  005205                  INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
037644  010566  000002          MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
037650  104413                  RESREG                  ;;RESTORE ALL REGISTERS
037652  000207                  RTS     PC              ;;RETURN TO USER
037654  006203          2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
037656  006001          3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
037660  006000                  ROR     R0              ;;      THE NEXT OCTAL DIGIT
037662  006001                  ROR     R1
037664  006000                  ROR     R0
037666  006001                  ROR     R1
037670  006000                  ROR     R0
037672  040302                  BIC     R3,R2           ;;MASK OUT ALL JUNK
037674  062702  000060          ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
037700  000755                  BR      1$              ;;GO PUT IT IN THE DATA TABLE
037702                  @OCTVL: .BLKB   14.             ;;RESERVE DATA TABLE
```

```
                                .SBTTL  POWER DOWN AND UP ROUTINES

                                ;;******************************************************************
                                ;POWER DOWN ROUTINE
037720  012737  040072  000024  $PWRDN: MOV     @#ILLUP,@#PWRVEC ;;SET FOR FAST UP
037726  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
037734  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
037736  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
037740  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
037742  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
037744  010446                        MOV     R4,-(SP)        ;;PUSH R4 ON STACK
037746  010546                        MOV     R5,-(SP)        ;;PUSH R5 ON STACK
037750  017746  141200                MOV     @SWR,-(SP)      ;;PUSH @SWR ON STACK
037754  010637  040076                MOV     SP,$SAVR6       ;;SAVE SP
037760  012737  037772  000024        MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
037766  000000                        HALT
037770  000776                        BR      .-2             ;;HANG UP

                                ;;******************************************************************
                                ;POWER UP ROUTINE
037772  012737  040072  000024  $PWRUP: MOV     @#ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
040000  013706  040076                MOV     $SAVR6,SP       ;;GET SP
040004  005037  040076                CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
040010  005237  040076        1$:     INC     $SAVR6          ;;WAIT FOR THE INC
040014  001375                        BNE     1$              ;;OF  WORD
040016  005337  040100        2$:     DEC     PWRFLG          ;TTY WAIT LOOP & SET POWER FAIL FLAG
040022  003775                        BLE     2$              ;WAIT FOR FLAG= 1
040024  012677  141124                MOV     (SP)+,@SWR      ;;POP STACK INTO @SWR
040030  012605                        MOV     (SP)+,R5        ;;POP STACK INTO R5
040032  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
040034  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
040036  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
040040  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
040042  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
040044  012737  037720  000024        MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
040052  012737  000340  000026        MOV     #340,@#PWRVEC+2 ;;PRIO:7
040060  104401                        TYPE                    ;;REPORT THE POWER FAILURE
040062  040102                $PWRMG: .WORD   MSGPWR          ;;POWER FAIL MESSAGE POINTER
040064  012716                        MOV     (PC)+,(SP)      ;;RESTART AT PWRUP
040066  040124                $PWRAD: .WORD   PWRUP           ;;RESTART ADDRESS
040070  000002                        RTI
040072  000000                $ILLUP: HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
040074  000776                        BR      .-2             ;; BEFORE THE POWER DOWN WAS COMPLETE
040076  000000                $SAVR6: 0                       ;;PUT THE SP HERE
 2
 3  040100  000000                PWRFLG: .WORD   0               ;POWER FAIL FLAG GOES HERE; FAILED= 1
 4
 5  040102      200     012     042 MSGPWR: .ASCIZ  <CRLF><LF>/"POWER UP" AT /
 6                                  .EVEN
 7
 8                                  ;THIS ROUTINE HANDLES THE RETURN ON POWER UP. WAIT THREE (3) MINUTES AND
 9                                  ;DO AN AUTO RE-START TO 'SIZMEM'.
10
11  040124  005227  000000        PWRUP:  INC     #0              ;TTY LOOP, WAIT FOR INCREMENT
12  040130  001375                        BNE     .-4             ;OF WORD
13  040132  000005                        RESET                   ;CLEAR THE WORLD
14  040134  005037  177776                CLR     PS              ;CLEAR PSW
```

POWER DOWN AND UP ROUTINES

```
040140  012706  001100                MOV     #STACK,SP       ;SETUP STACK POINTER
040144  005037  001344                CLR     SECOND          ;RESET SECOND COUNT
040150  005037  001472                CLR     INTRVL+2        ;RESET THE INTERVAL COUNT
040154  004737  033510                JSR     PC,$TKINT       ;MAKE SURE KEYBOARD INTERRUPT AND
040160  004737  024574                JSR     PC,CKCLK        ;SYSTEM CLOCK ARE STILL ON.
040164  004737  026226                JSR     PC,$TIME        ;TYPE ELAPSED TIME
040170  104401  001203                TYPE    ,$CRLF          ;CR-LF
040174  005037  001334                CLR     CFLAG           ;CLEAR (^C) FLAG
040200  105737  001542                TSTB    ASNLST          ;ANY DRIVES ASSIGNED ?
040204  001414                        BEQ     2$              ;BR IF NO
040206  104401  040256                TYPE    ,MSWAIT         ;TYPE 'WAITING 3 MINUTES...TO START'
040212  005737  001334        1$:     TST     CFLAG           ;WAS (^C) TYPED?
040216  001007                        BNE     2$              ;BR IF YES
040220  023727  001472  000003        CMP     INTRVL+2,#3     ;THREE MINUTES YET ?
040226  002771                        BLT     1$              ;WAIT IF NOT
040230  012737  000400  001332        MOV     #400,CHGADR     ;FUDGE 200 START
040236  012705  001520        2$:     MOV     #ORDERQ,R5      ;CLEAR UP THE QUE AND BUFFER
040242  005025                3$:     CLR     (R5)+
040244  022705  002056                CMP     #BLKADR,R5      ;ALL DONE ?
040250  001374                        BNE     3$              ;BRANCH IF NOT .
040252  000137  005112                JMP     SIZMEM          ;LOOP BACK

040256      200     124     131 MSWAIT: .ASCII  <CRLF>/TYPE ^C TO ABORT/
040277      200     127     101         .ASCIZ  <CRLF>/WAITING 3 MINUTES...TO START/<CRLF>
                                .EVEN
```

```
                        .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.

040336  010046                 $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
040340  016600  000002                 MOV     2(SP),R0        ;;GET TRAP ADDRESS
040344  005740                         TST     -(R0)           ;;BACKUP BY 2
040346  111000                         MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
040350  006300                         ASL     R0              ;;POSITION FOR INDEXING
040352  016000  040372                 MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
040356  000200                         RTS     R0              ;;GO TO ROUTINE

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

040360  011646                 $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
040362  016666  000004  000002         MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
040370  000002                         RTI                     ;;RESTORE THE PSW

                        .SBTTL  TRAP TABLE

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

                        ;       ROUTINE
                        ;       -------
040372  040360          $TRPAD: .WORD   $TRAP2
040374  035732                  $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
040376  036312                  $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
040400  036266                  $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
040402  036326                  $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
040404  036514                  $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)

040406  034100                  $GTSWR  ;;CALL=GTSWR    TRAP+6(104406)  GET SOFT-SWR SETTING

040410  034010                  $CKSWR  ;;CALL=CKSWR    TRAP+7(104407)  TEST FOR CHANGE IN SOFT-SWR
040412  034352                  $RDCHR  ;;CALL=RDCHR    TRAP+10(104410) TTY TYPEIN CHARACTER ROUTINE
040414  034442                  $RDLIN  ;;CALL=RDLIN    TRAP+11(104411) TTY TYPEIN STRING ROUTINE
040416  037310                  $SAVREG ;;CALL=SAVREG   TRAP+12(104412) SAVE R0-R5 ROUTINE
040420  037346                  $RESREG ;;CALL=RESREG   TRAP+13(104413) RESTORE R0-R5 ROUTINE
2 040422  033100                $DSPLY  ;;CALL=DISPLY   TRAP+14(104414) ROUTINE TO TYPE ERROR MESSAGES
3         000032        $TERM=.-$TRPAD
```

```
                                .SBTTL  RPO7 DRIVER

                                ;STORAGE FOR RPDS, RPER1, RPER2, AND RPER3

040424  000000  000000  000000  RPSTU0: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 0
040434  000000  000000  000000  RPSTU1: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 1
040444  000000  000000  000000  RPSTU2: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 2
040454  000000  000000  000000  RPSTU3: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 3
040464  000000  000000  000000  RPSTU4: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 4
040474  000000  000000  000000  RPSTU5: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 5
040504  000000  000000  000000  RPSTU6: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 6
040514  000000  000000  000000  RPSTU7: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 7

                                ;TABLE OF DRIVE ACTIVE INDICATORS (DRVACT=8 BYTES)
                                        ;DRVACT=0 IF DRIVE IS IDLE
                                        ;DRVACT>0 IF DRIVE IS ACTIVE WITH A COMMAND
                                        ;DRVACT<0 IF DRIVE IS ACTIVE WITH AN ERROR RECOVERY OPERATION

040524      000                 DRVACT: .BYTE   0               ;DRIVE 0
040525      000                         .BYTE   0               ;DRIVE 1
040526      000                         .BYTE   0               ;DRIVE 2
040527      000                         .BYTE   0               ;DRIVE 3
040530      000                         .BYTE   0               ;DRIVE 4
040531      000                         .BYTE   0               ;DRIVE 5
040532      000                         .BYTE   0               ;DRIVE 6
040533      000                         .BYTE   0               ;DRIVE 7

                                ;TABLE OF DRIVE STATUS INDICATORS (DRVSTA=8 BYTES)
                                        ;DRVSTA=0 IF DRIVE IS OFFLINE OR NONEXSITENT
                                        ;DRVSTA>0 IF DRIVE IS ONLINE
                                        ;DRVSTA<0 IF DRIVE IS UNSAFE

040534      000                 DRVSTA: .BYTE   0               ;DRIVE 0
040535      000                         .BYTE   0               ;DRIVE 1
040536      000                         .BYTE   0               ;DRIVE 2
040537      000                         .BYTE   0               ;DRIVE 3
040540      000                         .BYTE   0               ;DRIVE 4
040541      000                         .BYTE   0               ;DRIVE 5
040542      000                         .BYTE   0               ;DRIVE 6
040543      000                         .BYTE   0               ;DRIVE 7

                                ;TABLE OF DRIVE TYPES (DRVTYP=8 BYTES)
                                        ;DRVTYP= 0 IF DRIVE IS NONEXISTENT (DRVSTA=0, ALSO)
                                        ;DRVTYP= 4 IF DRIVE IS RPO7+
                                        ;DRVTYP= 5 IF DRIVE IS RPO7  MOVING HEAD OPTION
                                        ;DRVTYP=-1 IF NOT RPO7

040544      000                 DRVTYP: .BYTE   0               ;DRIVE 0
040545      000                         .BYTE   0               ;DRIVE 1
040546      000                         .BYTE   0               ;DRIVE 2
040547      000                         .BYTE   0               ;DRIVE 3
040550      000                         .BYTE   0               ;DRIVE 4
040551      000                         .BYTE   0               ;DRIVE 5
040552      000                         .BYTE   0               ;DRIVE 6
040553      000                         .BYTE   0               ;DRIVE 7
```

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                                ;TABLE OF DUAL PORT INITIALIZATION INDICATORS
                                        ;DPINT=0 IF INITIALIZATION IS NOT ACTIVE ON THE DRIVE
                                        ;DPINT<0 IF INITIALIZATION IS IN PROGRESS

040554  000             DPINT:  .BYTE   0               ;DRIVE 0
040555  000                     .BYTE   0               ;DRIVE 1
040556  000                     .BYTE   0               ;DRIVE 2
040557  000                     .BYTE   0               ;DRIVE 3
040560  000                     .BYTE   0               ;DRIVE 4
040561  000                     .BYTE   0               ;DRIVE 5
040562  000                     .BYTE   0               ;DRIVE 6
040563  000                     .BYTE   0               ;DRIVE 7

                                ;TABLE OF PENDING DUAL PORT REQUESTS
                                        ;DPRQS=0 IF THAT A DUAL PORT REQUEST IS NOT PENDING FOR THAT DRIVE
                                        ;DPRQS<0 IF THAT A DUAL PORT REQUEST IS PENDING FOR THAT DRIVE

040564  000             DPRQS:  .BYTE   0               ;DRIVE 0
040565  000                     .BYTE   0               ;DRIVE 1
040566  000                     .BYTE   0               ;DRIVE 2
040567  000                     .BYTE   0               ;DRIVE 3
040570  000                     .BYTE   0               ;DRIVE 4
040571  000                     .BYTE   0               ;DRIVE 5
040572  000                     .BYTE   0               ;DRIVE 6
040573  000                     .BYTE   0               ;DRIVE 7

                                ;TRANSFER WAIT FLAG (TRNSWT=1 WORD)
                                        ;THIS IS A ONE WORD QUEUE. IT WILL CONTAIN THE ADDRESS OF
                                        ;"DPB" OF THE I/O OPERATION.

040574  000000          TRNSWT: .WORD   0

                                ;SEARCH WAIT KEYS (SRCHWT=1 WORD)
                                        ;THIS IS A ONE WORD QUEUE THAT WILL CONTAIN A KEY FOR EACH OF
                                        ;THE DRIVES THAT ARE PERFORMING A SEARCH COMMAND FOR THE I/O
                                        ;REQUEST THAT IS AT THE TOP OF THEIR REQUEST QUEUE.
                                        ;EACH DRIVE IS ASSIGNED ONE BIT, STARTING AT BIT00 FOR DRIVE 0.

040576  000000          SRCHWT: .WORD   0

                                ;RPO7 DRIVER ACTIVE FLAG (ACTDRV=1 BYTE)
                                        ;ACTDRV=0 IF DRIVER IS INACTIVE
                                        ;ACTDRV>0 IF DRIVER IS ACTIVE

040600  000             ACTDRV: .BYTE   0

                                ;SOFTWARE TIMER ROUTINE ACTIVE FLAG (ACTSTR=1 BYTE)
                                        ;ACTSTR=0 IF SOFTWARE TIMER ROUTINE IS INACTIVE
                                        ;ACTSTR>0 IF SOFTWARE TIMER ROUTINE IS ACTIVE

040601  000             ACTSTR: .BYTE   0
```

```
                                ;SAVE REGISTERS FLAG (SAVEFG=1 WORD)
                                        ;SAVEFG <0 IF SAVE THE RHXX/RP07 REGISTERS WHEN THE
                                        ;OPERATION IS COMPLETED AS PER (DPB+14).
                                        ;SAVEFG=0 IF SAVE THE RHXX/RP07 REGISTERS, AS PER
                                        ;(DPB+14), AFTER AN ERROR.

040602  000000                  SAVEFG: .WORD   0

                                ;SEEK FLAG (SEEKFG=1 WORD)
                                        ;SEEKFG=0 IF WHEN THE DISK ADDRESS ISN'T IN THE WINDOW
                                        ;FOR A DATA TRANSFER START A SEARCH COMMAND
                                        ;SEEKFG<0 IF DATA TRANSFER WILL DO IMPLIED SEEKS,
                                        ;DISREGARD THE WINDOW

040604  177777                  SEEKFG: .WORD   -1

                                ;TIMEOUT TABLE (TIMER=8 WORDS)
                                        ;THIS TABLE CONTAINS THE TIME ALLOWED FOR AN OPERATION

040606  177777                  TIMER:  .WORD   -1       ;DRIVE 0
040610  177777                          .WORD   -1       ;DRIVE 1
040612  177777                          .WORD   -1       ;DRIVE 2
040614  177777                          .WORD   -1       ;DRIVE 3
040616  177777                          .WORD   -1       ;DRIVE 4
040620  177777                          .WORD   -1       ;DRIVE 5
040622  177777                          .WORD   -1       ;DRIVE 6
040624  177777                          .WORD   -1       ;DRIVE 7

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

040626  177777                  DTUW:   .WORD   -1

                                ;ATTENTION BITS TABLE (ATABIT=8 BYTES)
                                        ;THIS TABLE CONTAINS THE CORRESPONDING BIT TO EACH DRIVES
                                        ;ATTENTION BIT

040630      001                 ATABIT: .BYTE   1        ;DRIVE 0
040631      002                         .BYTE   2        ;DRIVE 1
040632      004                         .BYTE   4        ;DRIVE 2
040633      010                         .BYTE   10       ;DRIVE 3
040634      020                         .BYTE   20       ;DRIVE 4
040635      040                         .BYTE   40       ;DRIVE 5
040636      100                         .BYTE   100      ;DRIVE 6
040637      200                         .BYTE   200      ;DRIVE 7
```

```
                                ;STORAGE FOR RPADR (THE FIRST ADDRESS (776700) OF THE RHXX/RP07),
                                ;RPVEC (THE VECTOR ADDRESS (254)), AND RPVEC+2 (THE BR LEVEL (5)).
                                
040640  176700                  RPADR:  .WORD   176700          ;RHXX/RP07 CONTROL STATUS REGISTER
040642  000254  000240          RPVEC:  .WORD   254,5*32.       ;VECTOR ADDRESS & BR LEVEL 5
040646  000050                  RHEXT:  .WORD   50              ;OFFSET TO RPBAE
                                
                                ;SEARCH DIFFERENCE IS 1 SECTOR
                                
040650  000001                  MXWNDW: .WORD   1
                                
                                ;DEFINITIONS OF THE RHXX/RP07 ADDRESS INDEXES
                                
        000000                  RPCS1   = 0                     ;CONTROL AND STATUS REGISTER #1 (DRIVE REG. 00)
        000002                  RPWC    = 2                     ;WORD COUNT REGISTER (NOT A DRIVE REG)
        000004                  RPBA    = 4                     ;UNIBUS ADDRESS REGISTER (NOT A DRIVE REG)
        000006                  RPDA    = 6                     ;DESIRED SECTOR/TRACK ADDRESS REGISTER (DRIVE REG. 05)
        000010                  RPCS2   = 10                    ;CONTROL AND STATUS REGISTER #2 (NOT A DRIVE REG)
        000012                  RPDS    = 12                    ;DRIVE STATUS REGISTER (DRIVE REG 01)
        000014                  RPER1   = 14                    ;ERROR REGISTER #1 (DRIVE REG. 02)
        000016                  RPAS    = 16                    ;ATTENTION SUMMARY PSEUDO REGISTER (DRIVE REG. 04)
        000020                  RPLA    = 20                    ;LOOK AHEAD REGISTER (DRIVE REG. 07)
        000022                  RPDB    = 22                    ;DATA BUFFER REGISTER (NOT A DRIVE REG.)
        000024                  RPMR1   = 24                    ;MAINTAINABILITY REGISTER (DRIVE REG. 03)
        000026                  RPDT    = 26                    ;DRIVE TYPE REGISTER (DRIVE REG. 06)
        000030                  RPSN    = 30                    ;SERIAL NUMBER REGISTER (DRIVE REG. 10)
        000032                  RPOF    = 32                    ;OFFSET REGISTER (DRIVE REG. 11)
        000034                  RPDC    = 34                    ;DESIRED CYLINDER ADDRESS REGISTER (DRIVE REG. 12)
        000036                  RPCC    = 36                    ;DUMMY  ADDRESS REGISTER (DRIVE REG. 13)
        000040                  RPER2   = 40                    ;ERROR REGISTER #2
        000042                  RPER3   = 42                    ;ERROR REGISTER #2 (DRIVE REG. 15)
        000044                  RPEC1   = 44                    ;ECC POSITION REGISTER (DRIVE REG. 16)
        000046                  RPEC2   = 46                    ;ECC PATTERN REGISTER (DRIVE REG.  17)
        000050                  RPBAE   = 50                    ;BUS ADDRESS EXTENTION REGISTER
        000052                  RPCS3   = 52                    ;CONTROL AND STATUS REGISTER #3
```

```
                                ;RHXX/RP07 DRIVER INITIALIZATION CODE
                                        ;THIS ROUTINE WILL DETERMINE WHICH RP07 DRIVES ARE
                                        ;AVAILABLE FOR TESTING AND SET THE DRVSTA INDICATOR
                                        ;TO THE PROPER STATE FOR EACH DRIVE.
                                        ;NOTE: THIS ROUTINE CALLS DRVINT
                                ;
                                ;CALL
                                ;
                                ;       JSR     PC,RPINIT
                                ;       RETURN
                                ;
                                ;NOTE: THE 'P' OR 'L' CLOCK MUST BE STARTED
                                ;
040652  104412                  RPINIT: SAVREG                  ;SAVE R0 - R5
040654  013746  177776                  MOV     @#PS,-(SP)      ;SAVE THE PRESENT PROCESSOR STATUS
040660  012737  000240  177776          MOV     #<5*32.>,@#PS   ;CHANGE THE PRIORITY TO 5
040666  004737  046052                  JSR     PC,CLRQUE       ;CLEAR ALL REQUEST QUEUES
040672  012701  040424                  MOV     #RPSTUO,R1      ;FIRST ADDRESS TO BE CLEARED
040676  012702  040604                  MOV     #SEEKFG,R2      ;LAST ADDRESS TO BE CLEARED
040702  005021                  1$:     CLR     (R1)+           ;CLEAR
040704  020102                          CMP     R1,R2           ;ARE WE DONE?
040706  103775                          BLO     1$              ;BRANCH IF NO

040710  012702  040626                  MOV     #DTUW,R2        ;LAST ADDRESS
040714  012721  177777          2$:     MOV     #-1,(R1)+       ;INITIALIZE
040720  020102                          CMP     R1,R2           ;DONE?
040722  101774                          BLOS    2$              ;LOOP IF NO

040724  005037  040534                  CLR     DRVSTA          ;SET ALL DRIVES TO OFFLINE
040730  005037  040536                  CLR     DRVSTA+2
040734  005037  040540                  CLR     DRVSTA+4
040740  005037  040542                  CLR     DRVSTA+6
040744  013703  040642                  MOV     RPVEC,R3        ;SETUP THE RHXX/RP07 VECTOR
040750  012723  043254                  MOV     #ISR,(R3)+
040754  013713  040644                  MOV     RPVEC+2,(R3)
040760  013704  040640                  MOV     RPADR,R4        ;FIRST ADDRESS OF RHXX/RP07
040764  012764  000040  000010          MOV     #BIT05,RPCS2(R4)  ;MASSBUS INIT
040772  005001                          CLR     R1              ;START WITH DRIVE 0
040774  004037  041030          3$:     JSR     R0,DRVINT       ;INIT THE DRIVE
041000  000401                          BR      4$              ;'DVA' NOT SET OR PARITY ERROR
041002  000402                          BR      5$              ;NORMAL RETURN

041004  105061  040534          4$:     CLRB    DRVSTA(R1)      ;SET DRIVE STATUS TO OFFLINE
041010  005201                  5$:     INC     R1              ;GO TO NEXT DRIVE
041012  042701  177770                  BIC     #^C7,R1         ;MASK OUT UNUSED BITS
041016  001366                          BNE     3$              ;BR IF MORE DRIVES TO GO
041020  012637  177776                  MOV     (SP)+,@#PS      ;RESTORE THE PROCESSOR STATUS
041024  104413                          RESREG                  ;RESTORE R0 - R5
041026  000207                          RTS     PC              ;BYE-BYE
```

```
                                        ;DRIVE INITILIZATION ROUTINE
                                        ;THIS ROUTINE DETERMINES IF A DRIVE EXIST AND IF IT IS
                                        ;AN RP07. IF IT IS, A "READ-IN PRESET" IS ISSUED AND FMT22
                                        ;IS SET TO A "1". THEN MOL, DPR, DRY, AND VV ARE CHECKED TO
                                        ;INSURE THEY ARE ALL ON A "1". AND DEPENDING ON THEIR STATE,
                                        ;DRVSTA IS SET TO THE PROPER CONDITION.
                                        ;CALL
                                        ;       MOV     RPADR,R4        ;UNIBUS ADDRESS OF RHXX/RP07 (RPCS1)
                                        ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     R0,DRVINT       ;CALLED BY A JSR
                                        ;       RETURN1                 ;ERROR OCCURRED (PARITY)
                                        ;       RETURN2                 ;NORPAL RETURN
                                        ;
041030  010546                  DRVINT: MOV     R5,-(SP)        ;SAVE R5
041032  112761  177777  040554          MOVB    #-1,DPINT(R1)   ;SET THE DUAL PORT INITIALIZE FLAG
041040  006301                          ASL     R1
041042  012761  023420  040606          MOV     #10000.,TIMER(R1)       ;START 10. SECOND TIMER
041050  006201                          ASR     R1              ;DRIVE ADDRESS

041052  105061  040534          1$:     CLRB    DRVSTA(R1)      ;START DRIVE STATUS AS OFFLINE
041056  105061  040544                  CLRB    DRVTYP(R1)      ;CLEAR THE DRIVE TYPE INDICATOR
041062  010164  000010                  MOV     R1,RPCS2(R4)    ;SELECT A DRIVE
041066  112764  000111  000000          MOVB    #111,RPCS1(R4)  ;DO A DRIVE CLEAR COMMAND (& SEIZE DRIVE)
041074  032764  010000  000010          BIT     #BIT12,RPCS2(R4) ;NONEXISTENT DRIVE?
041102  001403                          BEQ     2$              ;NO---BRANCH
041104  004737  045506                  JSR     PC,SET.IE       ;GO SET "IE" WITHOUT A "TRE"
041110  000513                          BR      6$              ;LEAVE THIS ROUTINE

041112  105061  040534          2$:     CLRB    DRVSTA(R1)      ;SET DRIVE STATUS TO OFFLINE
041116  032764  004000  000000          BIT     #BIT11,RPCS1(R4)  ;SEE IF DRIVE AVAILABLE
041124  001004                          BNE     3$              ;BRANCH IF DVA SET
041126  105761  040554                  TSTB    DPINT(R1)       ;SOFTWARE TIMEOUT ON DUAL PORT INITIALIZE ?
041132  001347                          BNE     1$              ;BRANCH IF NOT
041134  000501                          BR      6$              ;OTHERWISE EXIT

041136  004037  045116          3$:     JSR     R0,RD.RP        ;READ THE DRIVE TYPE REG.
041142  000026                          RPDT
041144  041342                          8$                      ;ERROR RETURN ADDRESS
041146  012605                          MOV     (SP)+,R5        ;PUT DRIVE TYPE IN R5
041150  112761  000005  040544          MOVB    #5,DRVTYP(R1)   ;SET RP07 INDICATOR
041156  022705  020040                  CMP     #20040,R5       ;SINGLE PORT RP07
041162  001420                          BEQ     4$              ;BR IF YES
041164  022705  024040                  CMP     #24040,R5       ;DUAL PORT RP07
041170  001415                          BEQ     4$              ;BR IF YES
041172  112761  000004  040544          MOVB    #4,DRVTYP(R1)   ;SET RP07+ INDICATOR
041200  022705  020042                  CMP     #20042,R5       ;SINGLE PORT RP07+
041204  001407                          BEQ     4$              ;BRANCH IF SO
041206  022705  024042                  CMP     #24042,R5       ;DUAL PORT RP07+
041212  001404                          BEQ     4$              ;BRANCH IF SO
041214  112761  177777  040544          MOVB    #-1,DRVTYP(R1)  ;SET INDICATOR TO 'OTHER'
041222  000446                          BR      6$              ;EXIT

041224  012746  000121          4$:     MOV     #121,-(SP)      ;DO A "READ-IN PRESET"
041230  004037  045210                  JSR     R0,WRT.RP
041234  000000                          RPCS1
041236  041342                          8$
```

```
                                                MOV     #BIT12,-(SP)    ;SET FMT16=1
                                                JSR     R0,WRT.RP
                                                RPOF
                                                8$
                                                JSR     R0,RD.RP        ;READ RPDS
                                                RPDS
                                                8$
                                                MOV     (SP)+,R5        ;AND SAVE IT IN R5
                                                BPL     5$              ;BRANCH IF ATA=0
                                                MOVB    ATABIT(R1),RPAS(R4) ;CLEAR ATTENTION BIT
                                                JSR     R0,RD.RP        ;FIND OUT WHY ATA=1
                                                RPER1
                                                8$
                                                ROL     (SP)+           ;IS IT UNSAFE?
                                                BPL     5$              ;BR IF NOT
                                                MOVB    #-1,DRVSTA(R1)  ;SET UNSAFE INDICATOR
                                                BR      6$              ;EXIT

                                        5$:     COM     R5              ;CHECK MOL, DPR, DRY, AND VV
                                                BIC     #^C<BIT12!BIT08!BIT07!BIT06>,R5
                                                BNE     6$              ;BRANCH IF MOL, DPR, DRY, OR VV IS CLEAR
                                                MOVB    #1,DRVSTA(R1)   ;SET DRIVE STATUS TO ONLINE
                                        6$:     TST     (R0)+           ;STEP OVER THE ERROR RETURN
                                        7$:
                                        8$:     ASL     R1              ;WORD INDEX
                                                MOV     #-1,TIMER(R1)   ;STOP THE CLOCK
                                                ASR     R1              ;DRIVE ADDRESS
                                                CLRB    DPINT(R1)
                                                MOV     (SP)+,R5        ;RESTORE R5
                                                RTS     R0              ;EXIT
```

```
                                        ;REQUEST PRE-PROCESSOR-HANDLES SUBSYSTEM REQUEST
                                        ;
                                        ;CALL
                                        ;
                                        ;       JSR     R0,RP07         ;CALL THE RP07 DRIVER
                                        ;       PNTADR                  ;ADDRESS OF POINTER OF DRIVES PARAMETER BLOCK
                                        ;       RETURN1                 ;RETURN HERE IF QUEUE IS FULL
                                        ;       RETURN2                 ;RETURN HERE IF REQUEST IS IN QUEUE OR THERE
                                                                        ;IS AN ERROR CONDITION

041364  013746  177776        RP07:   MOV     @#PS,-(SP)      ;SAVE THE CALLING STATUS
041370  013737  040644  177776        MOV     RPVEC+2,@#PS    ;DON'T ALLOW ANY RP07 INTERRUPTS
041376  112737  000001  040600        MOVB    #1,ACTDRV       ;SET "ACTIVE DRIVER" FLAG
041404  104412                        SAVREG                  ;SAVE R0 - R5
041406  011002                        MOV     (R0),R2         ;PICKUP THE DRIVE PARAMETER BLOCK POINTER
041410  005062  000016                CLR     16(R2)          ;CLEAR THE STATUS/ERROR INDICATOR
041414  111201                        MOVB    (R2),R1         ;PICKUP THE DRIVE NUMBER
041416  013704  040640                MOV     RPADR,R4        ;UNIBUS ADDRESS OF RPCS1
041422  105761  040534                TSTB    DRVSTA(R1)      ;CHECK DRIVES STATUS
041426  003006                        BGT     1$              ;BRANCH IF ONLINE
041430  004037  041030                JSR     R0,DRVINT       ;GO INIT. THE DRIVE
041434  000421                        BR      3$              ;ERROR RETURN

041436  105761  040534                TSTB    DRVSTA(R1)      ;IS DRIVE STATUS ONLINE?
041442  003435                        BLE     5$              ;BR IF NOT
041444  105761  040564        1$:     TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
041450  001016                        BNE     4$              ;BR IF YES
041452  010164  000010                MOV     R1,RPCS2(R4)    ;SELECT THE DRIVE
041456  004037  046150                JSR     R0,DRVQUE       ;PUT THIS REQUEST IN QUEUE
041462  000450                        BR      8$              ;QUEUE IS FULL

041464  105761  040524        2$:     TSTB    DRVACT(R1)      ;IS THIS DRIVE ACTIVE?
041470  001042                        BNE     7$              ;BR IF YES
041472  004737  041622                JSR     PC,OPT          ;CALL THE OPTIMIZER
041476  000437                        BR      7$

041500  004737  042750        3$:     JSR     PC,CI7          ;GO HANDLE THE PARITY ERROR
041504  000434                        BR      7$

041506  004037  046150        4$:     JSR     R0,DRVQUE       ;PUT REQUEST IN QUEUE
041512  000434                        BR      8$              ;QUEUE IS FULL

041514  012764  000000  000036        MOV     #0,RPCC(R4)     ;WRITE THE CURRENT CYL REG
041522  032714  000100                BIT     #BIT06,(R4)     ;IE BIT SET ?
041526  001023                        BNE     7$              ;YES
041530  004737  045506                JSR     PC,SET.IE       ;SET THE INTERRUPT
041534  000420                        BR      7$              ;RETURN

041536  105761  040534        5$:     TSTB    DRVSTA(R1)      ;SEE IF DRIVE OFFLINE OR UNSAFE
041542  002412                        BLT     6$              ;BR IF UNSAFE
041544  012762  140000  000016        MOV     #BIT15!BIT14,16(R2)  ;SET OFFLINE ERROR INDICATOR
041552  105761  040544                TSTB    DRVTYP(R1)      ;SEE IF OFFLINE OR NONEXISTENT
041556  001007                        BNE     7$              ;BR IF OFFLINE
041560  012762  100002  000016        MOV     #BIT15!BIT01,16(R2)  ;REPORT DRIVE NONEXISTENT
041566  000403                        BR      7$              ;GO TO EXIT

041570  012762  110000  000016  6$:   MOV     #BIT15!BIT12,16(R2)  ;DRIVE IS UNSAFE
```

J16


```
     61 041576  104413                 7$:     RESREG                  ;RESTORE R0 - R5
     62 041600  005720                         TST     (R0)+           ;SETUP FOR NORMAL RETURN
     63 041602  000401                         BR      9$              ;FINISH UP, THEN EXIT
     64
     65 041604  104413                 8$:     RESREG                  ;RESTORE R0 - R5
     66 041606  005720                 9$:     TST     (R0)+           ;CORRECT THE RETURN ADDRESS
     67 041610  105037  040600                 CLRB    ACTDRV          ;CLEAR "ACTIVE DRIVER" FLAG
     68 041614  012637  177776                 MOV     (SP)+,@#PS      ;RETURN "PS" TO USER LEVEL
     69 041620  000200                         RTS     R0              ;RETURN TO CALLER
```

```
                                        ;OPTIMIZER-CALLED FOR A PARTICULAR DRIVE
                                        ;
                                        ;CALL
                                        ;       MOV     #DPB,R2         ;ADDRESS OF DRIVE PARAMETER BLOCK
                                        ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     PC,OPT          ;SETUP A COMMAND
                                        ;
041622  104412                  OPT:    SAVREG                          ;SAVE R0 - R5
041624  013746  177776                  MOV     @#PS,-(SP)              ;SAVE PROC. STATUS
041630  146137  040630  040576          BICB    ATABIT(R1),SRCHWT       ;CLEAR SEARCH FLAG
041636  105061  040564                  CLRB    DPRQS(R1)               ;RESET THE PORT REQ FLAG
041642  004737  046224                  JSR     PC,GETREQ               ;GET "DPB" POINTER OF REQUEST
041646  005702                          TST     R2                      ;IS THERE A REQUEST IN QUEUE?
041650  001475                          BEQ     8$                      ;NO--BRANCH TO EXIT
041652  010164  000010                  MOV     R1,RPCS2(R4)            ;LOAD THE DRIVE ADDRESS
041656  012764  000111  000000          MOV     #111,RPCS1(R4)          ;CLEAR THE DRIVE
041664  032764  004000  000000          BIT     #BIT11,RPCS1(R4)                ;DVA SET ?
041672  001446                          BEQ     6$                      ;TO PROT REQUEST ,IF NOT
041674  105761  040534          1$:     TSTB    DRVSTA(R1)              ;IS DRIVE ONLINE?
041700  003014                          BGT     2$                      ;YES--BRANCH
041702  004737  046246                  JSR     PC,POPQUE               ;NO--REMOVE REQUEST FROM QUEUE
041706  012762  140000  000016          MOV     #BIT15!BIT14,16(R2)  ;SET OFFLINE STATUS/ERROR INDICATOR
041714  105761  040534                  TSTB    DRVSTA(R1)              ;IS DRIVE UNSAFE ?
041720  100056                          BPL     9$                      ;BR TO EXIT IF NOT
041722  012762  110000  000016          MOV     #BIT15!BIT12,16(R2)  ;SET UNSAFE STATUS/ERROR INDICATOR
041730  000452                          BR      9$                      ;BRANCH TO EXIT
                                        
041732  122762  000150  000002  2$:     CMPB    #150,2(R2)              ;IS THE REQUEST FOR I/O?
041740  002407                          BLT     3$                      ;YES--BRANCH
041742  122762  000135  000002          CMPB    #135,2(R2)              ;IS IT A DIAGNOSTIC COMMAND ?
041750  001403                          BEQ     3$                      ;BRANCH IF SO
041752  004737  042372                  JSR     PC,CI4                  ;CALL THE COMMAND INITIATOR
041756  000437                          BR      9$                      ;BRANCH TO EXIT
                                        
041760  005737  040626          3$:     TST     DTUW                    ;DATA TRANSFER UNDERWAY?
041764  002006                          BGE     5$                      ;BR IF YES
041766  005737  040604                  TST     SEEKFG                  ;DO IMPLIED SEEKS ?
041772  100003                          BPL     5$                      ;NO, DO SEARCH
041774  004737  042066          4$:     JSR     PC,CI1                  ;START A DATA TRANSFER
042000  000426                          BR      9$
                                        
042002  004737  042260          5$:     JSR     PC,CI3                  ;START A SEARCH ON TARGET SECTOR -1
042006  000423                          BR      9$                      ;GO TO THE EXIT
                                        
042010  112761  177777  040564  6$:     MOVB    #-1,DPRQS(R1)           ;SET PORT REQUEST INDICATOR
042016  010103                          MOV     R1,R3                   ;SET UP TO ADDRESS WORDS
042020  006303                          ASL     R3                      ;CONVERT TO WORD INDEX
042022  012763  035230  040606          MOV     #15000.,TIMER(R3)  ;START 15. SECOND TIMER
042030  012764  000000  000036          MOV     #0,RPCC(R4)             ;SET PORT REQUEST
042036  000402                          BR      8$                      ;EXIT
                                        
042040  004737  042750          7$:     JSR     PC,CI7                  ;PROCESS THE PARITY ERROR
042044  032714  000100          8$:     BIT     #BIT06,(R4)             ;SEE IF 'IE' ALREADY SET
042050  001002                          BNE     9$                      ;BR IF SET
042052  004737  045506                  JSR     PC,SET.IE               ;SET "IE" WITHOUT A "TRE"
042056  012637  177776          9$:     MOV     (SP)+,@#PS              ;RESTORE PROC. STATUS
042062  104413                          RESREG                          ;RESTORE R0 - R5
```

```
     58 042064  000207                          RTS     PC
```

```
                                        ;COMMAND INITIATOR
                                        ;
                                        ;CALL
                                        ;       MOV     #DPB,R2         ;ADDRESS OF DRIVE PARAMETER BLOCK
                                        ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     PC,CI????       ;CI???? = CI1, CI3, OR CI4
                                        ;                               ;WHERE:
                                        ;                               ; CI1 = DATA TRANSFER
                                        ;                               ; CI3 = SEARCH REQUESTED BY DATA XFER
                                        ;                               ; CI4 = NO DATA TRANSFER

042066  004737  046246          CI1:    JSR     PC,POPQUE       ;REMOVE REQUEST FROM "DRIVES WAIT" QUEUE
042072  010237  040574                  MOV     R2,TRNSWT       ;PUT REQ. IN TRANSFER WAIT QUEUE
042076  010203                          MOV     R2,R3           ;DPB ADDRESS TO R3
042100  013704  040640                  MOV     RPADR,R4        ;RPCS1 ADDRESS
042104  010164  000010                  MOV     R1,RPCS2(R4)    ;SELECT DRIVE
042110  122762  000135  000002          CMPB    #135,2(R2)      ;IS IT A DIAGNOSTIC COMMAND ?
042116  001011                          BNE     1$              ;BRANCH IF NOT
042120  016246  000004                  MOV     4(R2),-(SP)     ;GET THE ROUTINE NUMBER, PARAMETERS
042124  052716  100000                  BIS     #BIT15,(SP)     ;SET THE DIAGNOSTIC MODE BIT
042130  004037  045210                  JSR     R0,WRT.RP       ;WRITE THE RPMR1 REG
042134  000024                          RPMR1
042136  042750                          CI7
042140  000422                          BR      2$              ;LOAD THE COMMAND AND EXIT

042142  062703  000004          1$:     ADD     #4,R3           ;DESIRED WORD COUNT
042146  062704  000002                  ADD     #2,R4           ;RPWC ADDRESS
042152  012324                          MOV     (R3)+,(R4)+     ;LOAD WORD COUNT
042154  012324                          MOV     (R3)+,(R4)+     ;LOAD BUFFER ADDRESS
042156  012346                          MOV     (R3)+,-(SP)     ;LOAD SECTOR AND TRACK
042160  004037  045210                  JSR     R0,WRT.RP       ;CALL THE LOAD(WRITE) ROUTINE
042164  000006                          RPDA                    ;INDEX OF REGISTER TO LOAD
042166  042750                          CI7                     ;ERROR RETURN ADDRESS
042170  012346                          MOV     (R3)+,-(SP)     ;LOAD CYLINDER ADDRESS
042172  004037  045210                  JSR     R0,WRT.RP
042176  000034                          RPDC
042200  042750                          CI7
042202  004737  042232                  JSR     PC,CI2          ;SEE IF BIT15 SHOULD BE SET IN RPMR1

042206  016246  000002          2$:     MOV     2(R2),-(SP)     ;LOAD "COMMAND+GO", "A17&A16", AND "PSEL"
042212  004037  045210                  JSR     R0,WRT.RP
042216  000000                          RPCS1
042220  042750                          CI7
042222  010137  040626                  MOV     R1,DTUW         ;SET "DATA TRANSFER UNDERWAY"
042226  000137  042712                  JMP     CI5

042232  026262  000012  000156  CI2:    CMP     12(R2),FE1(R2)  ;DATA XFER TO FE CYLINDERS ?
042240  002406                          BLT     1$              ;BR IF NO
042242  012746  100000                  MOV     #BIT15,-(SP)    ;SET THE DIAGNOSTIC MODE BIT
042246  004037  045210                  JSR     R0,WRT.RP       ;WRITE THE RPMR1 REG
042252  000024                          RPMR1
042254  042750                          CI7
042256  000207                  1$:     RTS     PC

042260  013704  040640          CI3:    MOV     RPADR,R4        ;RPCS1 ADDRESS
042264  010164  000010                  MOV     R1,RPCS2(R4)    ;SELECT DRIVE
042270  016246  000012                  MOV     12(R2),-(SP)    ;DESIRED CYLINDER ADDRESS
```

```
                                                JSR     R0,WRT.RP
                                                RPDC
                                                CI7
                                                JSR     PC,CI2          ;SEE IF BIT15 SHOULD BE SET IN RPMR1
                                                MOVB    10(R2),R3       ;PICKUP SECTOR ADDRESS
                                                SUB     MXWNDW,R3       ;BACKUP BY MAX. SEARCH FOR I/O WINDOW
                                                BGE     1$              ;BR IF >= 0
                                                ADD     #30.,R3         ;ADD MAXIMUM SECTOR COUNT BACK
                                1$:             MOV     R3,-(SP)        ;COMBINE THE ADJUSTED SECTOR WITH
                                                MOVB    11(R2),1(SP)    ;THE DESIRED TRACK
                                                JSR     R0,WRT.RP       ;LOAD DESIRED TRACK & SECTOR
                                                RPDA
                                                CI7

                                                MOV     #131,-(SP)      ;START A SEARCH
                                                JSR     R0,WRT.RP
                                                RPCS1
                                                CI7
                                                BISB    ATABIT(R1),SRCHWT       ;SET "SEARCH WAIT" KEY
                                                BR      CI5

                                CI4:            MOV     RPADR,R4        ;RPCS1 ADDRESS
                                                MOV     R1,RPCS2(R4)    ;SELECT DRIVE
                                                MOVB    2(R2),R3        ;PICKUP THE REQUESTED COMMAND
                                                CMPB    #131,R3         ;IS IT A SEARCH COMMAND?
                                                BNE     1$              ;BRANCH IF NO
                                                MOV     10(R2),-(SP)    ;LOAD DESIRED TRACK & SECTOR
                                                JSR     R0,WRT.RP
                                                RPDA
                                                CI7
                                                BR      2$              ;GO LOAD CYLINDER

                                1$:             CMPB    #105,R3         ;IS IT A SEEK COMMAND
                                                BNE     3$              ;BRANCH IF NO
                                2$:             MOV     12(R2),-(SP)    ;LOAD DESIRED CYLINDER
                                                JSR     R0,WRT.RP
                                                RPDC
                                                CI7
                                                JSR     PC,CI2          ;SEE IF BIT15 SHOULD BE SET IN RPMR1
                                                BR      CI6

                                3$:             CMPB    #115,R3         ;IS IT AN "OFFSET" COMMAND ?
                                                BNE     4$              ;BR IF NO
                                                JSR     R0,RD.RP        ;MERGE THE OFFSET VALUE INTO RPOF
                                                RPOF                    ;BUT DON'T CHANGE THE UPPER
                                                CI7
                                                MOVB    1(R2),(SP)      ;BYTE WHEN LOADING THE
                                                JSR     R0,WRT.RP       ;REGISTER (RPOF)
                                                RPOF
                                                CI7
                                                BR      CI6             ;GO START THE COMMAND

                                4$:             CMPB    #107,R3         ;IS IT A "RECALIBRATE" COMMAND?
                                                BEQ     CI6             ;BRANCH IF YES
                                                CMPB    #117,R3         ;IS IT A RETURN TO CENTER?
                                                BEQ     CI6             ;BRANCH IF YES
```

```
121 042532  122703  000143          5$:     CMPB    #143,R3         ;IS IT A "SET FORMAT" COMMAND?
122 042536  001014                          BNE     6$              ;BRANCH IF NO
123 042540  004037  045116                  JSR     R0,RD.RP        ;READ THE OFFSET REGISTER
124 042544  000032                          RPOF
125 042546  042750                          CI7
126 042550  116266  000001  000001          MOVB    1(R2),1(SP)     ;COMBINE "FMT16","ECI", AND "HCI"
127 042556  004037  045210                  JSR     R0,WRT.RP
128 042562  000032                          RPOF
129 042564  042750                          CI7
130 042566  000436                          BR      12$
131
132 042570  122703  000141          6$:     CMPB    #141,R3         ;IS IT A "GET REGISTER" COMMAND?
133 042574  001023                          BNE     10$             ;BRANCH IF NO
134 042576  016203  000006          7$:     MOV     6(R2),R3        ;POINTS TO 1ST ADDRESS OF WHERE
135                                                                 ;TO PUT THE REGISTER(S)
136 042602  116237  000010  042620          MOVB    10(R2),9$       ;INIT. THE INDEX FOR THE FIRST REG.
137 042610  116205  000011                  MOVB    11(R2),R5       ;INDEX OF LAST REG. TO MOVE
138 042614  004037  045116          8$:     JSR     R0,RD.RP        ;READ RHXX/RP07 REGISTER
139 042620  000000          9$:     RPCS1                           ;INDEX OF REG. TO READ
140 042622  042750                          CI7
141 042624  012623                          MOV     (SP)+,(R3)+     ;GET THE CONTENTS OF RHXX//RP07 REG.
142 042626  023705  042620                  CMP     9$,R5           ;LAST REG. BEEN READ?
143 042632  001414                          BEQ     12$             ;GET OUT IF YES
144 042634  062737  000002  042620          ADD     #2,9$           ;INCREASE THE INDEX BY 2
145 042642  000764                          BR      8$              ;LOOP--MORE TO READ
146
147 042644  122703  000145          10$:    CMPB    #145,R3         ;IS IT A "SELECT DRIVE" COMMAND?
148 042650  001405                          BEQ     12$             ;BRANCH IF YES
149 042652  010346                  11$:    MOV     R3,-(SP)        ;LOAD THE COMMAND
150 042654  004037  045210                  JSR     R0,WRT.RP
151 042660  000000                          RPCS1
152 042662  042750                          CI7
153 042664  004737  046246          12$:    JSR     PC,POPQUE       ;REMOVE REQ. FROM QUEUE
154 042670  052762  000200  000016          BIS     #BIT07,16(R2)   ;SET THE "DONE" BIT
155 042676  005737  040602                  TST     SAVEFG          ;SAVE RHXX/RP07 REGISTERS ?
156 042702  100002                          BPL     13$             ;BR IF NO
157 042704  004737  045342                  JSR     PC,SVRHXX       ;YES--GO SAVE THE REGISTERS
158 042710  000207                  13$:    RTS     PC              ;RETURN TO USER
159
160 042712  006301                  CI5:    ASL     R1
161 042714  012761  023420  040606          MOV     #10000.,TIMER(R1)       ;START 10. SECOND TIMER
162 042722  006201                          ASR     R1
163 042724  112761  000001  040524          MOVB    #1,DRVACT(R1)   ;SET THE DRIVE ACTIVE
164 042732  000207                          RTS     PC              ;RETURN TO THE USER
165
166 042734  010346                  CI6:    MOV     R3,-(SP)        ;LOAD THE COMMAND
167 042736  004037  045210                  JSR     R0,WRT.RP
168 042742  000000                          RPCS1
169 042744  042750                          CI7
170 042746  000761                          BR      CI5
171
172 042750  005702                  CI7:    TST     R2              ;ANYTHING IN QUEUE ?
173 042752  001001                          BNE     1$              ;BRANCH IF QUEUE IS THERE
174 042754  000207                          RTS     PC              ;OTHERWISE EXIT
175 042756  012762  104000  000016  1$:     MOV     #BIT15!BIT11,16(R2)     ;SET "PARITY" ERROR INDICATOR
176
177 042764  012746  000111          CI7B:   MOV     #111,-(SP)      ;DO A "DRIVE CLEAR"
```

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178 042770  004037  045210                    JSR     R0,WRT.RP
179 042774  000000                            RPCS1
180 042776  043036                            CI8
181 043000  004737  046130                    JSR     PC,EMPTYQ       ;EMPTY THE QUEUE
182 043004  105061  040564                    CLRB    DPRQS(R1)       ;CLEAR THE PORT REQUEST FLAG
183 043010  105061  040524                    CLRB    DRVACT(R1)      ;DRIVE IS IDLE
184 043014  020237  040574                    CMP     R2,TRNSWT       ;IF THIS DRIVE HAD AN I/O REQUEST
185 043020  001005                            BNE     1$              ;IN PROGRESS CLEAR ALL OF THE FLAGS
186 043022  005037  040574                    CLR     TRNSWT
187 043026  012737  177777  040626            MOV     #-1,DTUW
188 043034  000207                    1$:     RTS     PC
189
190 043036  104412                    CI8:    SAVREG                  ;SAVE R0 - R5
191 043040  005001                            CLR     R1
192 043042  005003                            CLR     R3
193 043044  105761  040524            1$:     TSTB    DRVACT(R1)      ;DRIVE ACTIVE?
194 043050  001003                            BNE     2$              ;BRANCH IF IN ACTIVE
195 043052  105761  040564                    TSTB    DPRQS(R1)       ;PORT REQUEST
196 043056  001443                            BEQ     6$              ;BRANCH IF NOT
197 043060  013702  040574            2$:     MOV     TRNSWT,R2       ;GET "DPB" FROM THE "TRANSFER WAIT" QUEUE
198 043064  020137  040626                    CMP     R1,DTUW         ;DID THIS DRIVE HAVE AN I/O IN PROGRESS?
199 043070  001402                            BEQ     3$              ;BRANCH IF YES
200 043072  004737  046224                    JSR     PC,GETREQ       ;GET THE DPB POINTER
201 043076  005702                    3$:     TST     R2              ;QUEUE ENTRY FOR DRIVE ?
202 043100  001413                            BEQ     5$              ;BR IF NOT
203 043102  032764  010000  000010            BIT     #BIT12,RPCS2(R4)  ;'NED' SET ?
204 043110  001404                            BEQ     4$              ;BR IF NOT
205 043112  012762  100002  000016            MOV     #BIT15!BIT01,16(R2)  ;SET 'DRIVE NON-EXISTENT' INDICATOR
206 043120  000403                            BR      5$              ;CONTINUE
207
208 043122  012762  102000  000016    4$:     MOV     #BIT15!BIT10,16(R2) ;SET "NON-CLEARABLE PARITY" ERROR INDICATOR
209 043130  012763  177777  040606    5$:     MOV     #-1,TIMER(R3)   ;STOP THE TIMER
210
214 043136  105061  040524                    CLRB    DRVACT(R1)      ;SET "DRIVE ACTIVE" TO IDLE
215 043142  105061  040564                    CLRB    DPRQS(R1)       ;CLEAR PORT REQUEST FLAG
216 043146  020137  040626                    CMP     R1,DTUW         ;IS THIS DRIVE SETUP FOR A TRANSFER
217 043152  001005                            BNE     6$              ;BR IF NOT
218 043154  012737  177777  040626            MOV     #-1,DTUW        ;RESET THE INDICATOR
219 043162  005037  040574                    CLR     TRNSWT          ;CLEAR THE TRANSFER QUEUE
220 043166  005201                    6$:     INC     R1              ;MOVE TO THE NEXT DRIVE
221 043170  062703  000002                    ADD     #2,R3
222 043174  042701  177770                    BIC     #^C7,R1
223 043200  001321                            BNE     1$              ;BRANCH IF MORE DRIVES
224 043202  012737  177777  040626            MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
225 043210  005037  040574                    CLR     TRNSWT          ;CLEAR THE 'TRANSFER WAIT' QUEUE
226 043214  004737  046052                    JSR     PC,CLRQUE       ;CLEAR ALL OF THE REQUEST QUEUES
227 043220  012764  000040  000010            MOV     #BIT05,RPCS2(R4) ;DO A MASSBUS INIT.
228 043226  000406                            BR      8$              ;CONTINUE
229
230 043230  004737  046130            7$:     JSR     PC,EMPTYQ       ;CLEAR THE DRIVE'S QUEUE
231 043234  105061  040534                    CLRB    DRVSTA(R1)      ;SET DRIVE TO OFFLINE
232 043240  105061  040544                    CLRB    DRVTYP(R1)      ;CLEAR THE DRIVE TYPE INDICATOR
233 043244  004737  045506            8$:     JSR     PC,SET.IE       ;SET "IE" WITHOUT "TRE"
234 043250  104413                            RESREG                  ;RESTORE R0 - R5
235 043252  000207                            RTS     PC              ;RETURN
```

```
                                        ;INTERRUPT SERVICE ROUTINE
                                        ;
043254  112737  000001  040600  ISR:    MOVB    #1,ACTDRV       ;SET "ACTIVE DRIVER" FLAG
043262  104412                          SAVREG                  ;SAVE R0 - R5
043264  013704  040640                  MOV     RPADR,R4        ;ADDRESS OF RPCS1
043270  013701  040626                  MOV     DTUW,R1         ;GET "DATA TRANSFER UNDERWAY" INDICATOR
043274  002402                          BLT     1$              ;BRANCH IF NO DATA TRANSFER UNDERWAY
043276  004737  043404                  JSR     PC,TD           ;CALL TRANSFER DONE
043302  004737  043630          1$:     JSR     PC,SC           ;CALL SPECIAL CONDITIONS
043306  104413                          RESREG                  ;RESTORE R0 - R5
043310  105037  040600                  CLRB    ACTDRV          ;CLEAR "ACTIVE DRIVER" FLAG
043314  000002                          RTI                     ;RETURN
                                        ;
                                        ;FORCE WRITE CHECK ROUTINE
                                        ;
043316  005737  001506          WC.HK:  TST     WRTCHK          ;DO WRITE CHECK ?
043322  001427                          BEQ     1$              ;BR IF NO
043324  122762  000161  000002          CMPB    #WRTDAT,$COMND(R2)      ;LAST COMMAND A WRITE COMMAND ?
043332  001023                          BNE     1$              ;BRANCH IF NOT
043334  004037  046150                  JSR     R0,DRVQUE       ;PUT INTO THE QUEUE
043340  000420                          BR      1$              ;BRANCH IF QUEUE IS FULL
                                        ;
043342  005062  000016                  CLR     $TATUS(R2)      ;CLEAR 'DONE' BIT IN DPB
043346  116262  000166  000027          MOVB    $RPCS1(R2),$PREVO(R2)   ;PREVIOUS COMMAND
043354  016262  000012  000034          MOV     $CYL(R2),$PREVA+2(R2)   ;PREVIOUS CYLINDER ADDRESS
043362  016262  000010  000032          MOV     $SEC(R2),$PREVA(R2)     ;PREVIOUS SEC , TRK ADDRESSES
043370  105062  000024                  CLRB    $CODE(R2)       ;CHANGE WRITE DATA TO WRITE CHECK DATA
043374  112762  000151  000002          MOVB    #WCKD,$COMND(R2)        ;CHANGE FUNCTION CODE TO WRITE CHECK
043402  000207                  1$:     RTS     PC              ;EXIT
```

```
                                        ;TRANSFER DONE ROUTINE
                                        
043404  005037  043626          TD:     CLR     PERM            ;CLR PERMENANT ERROR FLAG
                                        
043410  105061  040524                  CLRB    DRVACT(R1)      ;SET DRIVE ACTIVE INDICATOR TO IDLE
043414  012737  177777  040626          MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
043422  006301                          ASL     R1
043424  012761  177777  040606          MOV     #-1,TIMER(R1)   ;CANCEL TIMEOUT
043432  006201                          ASR     R1
043434  013702  040574                  MOV     TRNSWT,R2       ;GET "DPB" FROM THE "TRANSFER WAIT" QUEUE
043440  005037  040574                  CLR     TRNSWT          ;TRANSFER WAIT QUEUE--CLEAR QUEUE
043444  052762  000200  000016          BIS     #BIT07,16(R2)   ;SET DONE
043452  010164  000010                  MOV     R1,RPCS2(R4)    ;SELECT THE DRIVE
043456  004037  045116                  JSR     R0,RD.RP        ;TRANSFER ERROR(TRE=1)?
043462  000000                          RPCS1
043464  042750                          CI7
043466  006126                          ROL     (SP)+
043470  100430                          BMI     4$              ;BR IF YES
043472  005737  040602                  TST     SAVEFG          ;SAVE RHXX/RP07 REGISTERS ?
043476  100002                          BPL     1$              ;BR IF NO
043500  004737  045342                  JSR     PC,SVRHXX       ;YES--SAVE THE REGISTERS
043504  122762  000135  000002  1$:     CMPB    #135,2(R2)      ;IE FROM DIAGNOSTIC COMMAND ?
043512  001003                          BNE     2$              ;BRANCH IF NOT
043514  116164  040630  000016          MOVB    ATABIT(R1),RPAS(R4)     ;RESET THE ATA BIT
                                        
043522  004737  043316          2$:     JSR     PC,WC.MK        ;SEE IF WRITE CHECK TO BE PUT IN QUEUE
043526  004737  046224                  JSR     PC,GETREQ       ;GET DPB POINTER
043532  005702                          TST     R2              ;ENTRY FOR DRIVE ?
043534  001403                          BEQ     3$              ;BR IF NOT
043536  004737  041622                  JSR     PC,OPT          ;CALL OPTIMIZER
043542  000207                          RTS     PC              ;RETURN
043544  012714  000113          3$:     MOV     #113,(R4)       ;RELEASE THE DRIVE
043550  000207                          RTS     PC              ;RETURN
                                        
043552  052762  100100  000016  4$:     BIS     #BIT15!BIT06,16(R2) ;SET DATA ERROR FLAG
043560  004737  046130                  JSR     PC,EMPTYQ       ;EMPTY THE "DRIVE'S WAIT" QUEUE
043564  004737  045342                  JSR     PC,SVRHXX       ;SAVE THE RHXX/RP07 REGISTERS
043570  012714  040111                  MOV     #40111,(R4)     ;ISSUE A "DRIVE CLEAR"
                                        
043574  032764  040000  000012          BIT     #BIT14,RPDS(R4) ;DID ERROR BIT CLEAR?
043602  001406                          BEQ     5$              ;BR IF YES
043604  005237  043626                  INC     PERM            ;SET PERM ERROR FLAG
043610  116164  040630  000016          MOVB    ATABIT(R1),RPAS(R4)     ;CLR ATA BIT
043616  000207                          RTS     PC              ;RETURN
                                        
043620  012714  000113          5$:     MOV     #113,(R4)       ;ISSUE A RELEASE TO THE DRIVE
043624  000207                          RTS     PC              ;RETURN
                                        
043626  000000                  PERM:   .WORD   0               ;PERMENANT ERROR FLAG
```

```
                                ;SPECIAL CONDITION ROUTINE
                                
043630  116403  000016  SC:     MOVB    RPAS(R4),R3     ;READ "RPAS" REGISTER
043634  001013                  BNE     2$              ;BRANCH IF ANY 'ATA' BITS SET
043636  004037  045116          JSR     R0,RD.RP        ;READ CONTROL AND STATUS REGISTER
043642  000000                  RPCS1
043644  043036                  CI8
043646  106126                  ROLB    (SP)+           ;IS "IE"=1?
043650  100404                  BMI     1$              ;YES, NO DRIVES TO CHECK
043652  000401                  BR      1$-4            ;BRANCH OVER ERROR, REPLACE BRANCH WITH 'NOP'
                                                        ;IF ERROR REPORT IS DESIRED
043654  104001                  EMT     1               ;REPORT ILLEGAL INTERRUPT
043656  004737  045506          JSR     PC,SET.IE       ;SET INTERRUPT ENABLE
043662  000207          1$:     RTS     PC              ;RETURN
                                
043664  005046          2$:     CLR     -(SP)           ;PROCESS ALL DRIVES THAT HAVE
043666  110316                  MOVB    R3,(SP)         ;STORE ATA BITS ON STACK
043670  005001                  CLR     R1              ;SETUP R1 & R3 TO CHECK DRIVE 0
043672  012703  000001          MOV     #1,R3
043676  030316          SC3:    BIT     R3,(SP)         ;IS THIS ATA BIT SET ?
043700  001005                  BNE     SC5             ;BR IF YES
043702  005201          SC4:    INC     R1              ;MOVE TO THE NEXT DRIVE
043704  106303                  ASLB    R3              ;ANY MORE DRIVES TO CHECK ?
043706  001373                  BNE     SC3             ;BR IF YES
043710  005726                  TST     (SP)+           ;CLEAN OFF THE STACK
043712  000207                  RTS     PC
                                
043714  105761  040564  SC5:    TSTB    DPRQS(R1)       ;IS THERE PORT REQUEST OUTSTANDING ?
043720  001402                  BEQ     1$              ;BR IF NO
043722  000137  044264          JMP     SC13            ;START THE OUTSTANDING COMMAND
                                
043726  105761  040534  1$:     TSTB    DRVSTA(R1)      ;IS THIS DRIVE ON-LINE ?
043732  003011                  BGT     2$              ;BR IF YES
043734  004737  046224          JSR     PC,GETREQ       ;GET DPB POINTER
043740  004737  045342          JSR     PC,SVRHXX       ;SAVE THE RHXX/RP07 REGISTERS
043744  004737  044200          JSR     PC,SC12         ;SAVE RPDS, RPER1, RPER2 AND RPER3
                                                        ;ALSO DO A DRIVE INIT (DRVINT)
043750  105761  040534          TSTB    DRVSTA(R1)      ;DID DRIVE COME ON-LINE ?
043754  003405                  BLE     3$              ;BR IF NO
043756  105761  040524  2$:     TSTB    DRVACT(R1)      ;DRIVE ACTIVE WITH COMMAND OR ERROR RECOVERY ?
043762  001020                  BNE     SC6             ;BR IF EITHER
043764  004737  044200          JSR     PC,SC12         ;SAVE RPDS, RPER1, RPER2 AND RPER3
                                                        ;ALSO DO A DRIVE INIT (DRVINT)
043770  105761  040534  3$:     TSTB    DRVSTA(R1)      ;CHECK ON DRIVE'S STATUS
043774  100412                  BMI     4$              ;BR IF UNSAFE
043776  012746  000111          MOV     #111,-(SP)      ;DRIVE CLEAR
044002  004037  045210          JSR     R0,WRT.RP       ;WRITE THE COMMAND INTO RPCS1
044006  000000                  RPCS1                   ;REGISTER INDEX
044010  044052                  SC8                     ;PARITY EXIT ADDRESS
044012  116164  040630  000016  MOVB    ATABIT(R1),RPAS(R4)     ;CLR ATTN BIT
044020  000240                  NOP
044022  000727          4$:     BR      SC4             ;CHECK FOR MORE DRIVES
                                
044024  006301          SC6:    ASL     R1              ;SETUP TO ADDRESS WORDS
044026  012761  177777  040606  MOV     #-1,TIMER(R1)   ;STOP THE TIMER
044034  006201                  ASR     R1              ;RESTORE THE DRIVE ADDRESS
044036  004737  046224          JSR     PC,GETREQ       ;GET THE DPB POINTER FROM THE QUEUE
```

```
                                        MOV     R1,RPCS2(R4)    ;SELECT DRIVE
                                        JMP     SC11            ;PROCESS THE SEARCH

                        SC8:            TSTB    DRVACT(R1)      ;IS DRIVE IDLE?
                                        BEQ     1$              ;YES--BRANCH
                                        JSR     PC,GETREQ       ;GET DPB POINTER
                                        JSR     PC,CI7          ;PROCESS THE PARITY ERROR
                                        BR      2$              ;CONTINUE

                        1$:             JSR     PC,CI7B         ;PROCESS THE UNCORRECTABLE PARITY ERROR
                        2$:             JMP     SC4             ;CHECK MORE DRIVES

                        SC11:           CLRB    DRVACT(R1)      ;SET DRIVE IDLE
                                        BITB    ATABIT(R1),SRCHWT  ;DOING A SEARCH OPERATION FOR
                                                                   ;AN I/O COMMAND?
                                        BNE     1$              ;BRANCH IF YES
                                        JSR     PC,POPQUE       ;REMOVE REQUEST FROM QUEUE
                                        BIS     #BIT07,16(R2)   ;SET "DONE" BIT
                                        TST     SAVEFG          ;SAVE THE REGISTERS?
                                        BPL     1$              ;BR IF NO
                                        JSR     PC,SVRHXX       ;YES--SAVE ALL OF THE RHXX/RP07 REG'S
                        1$:             MOVB    ATABIT(R1),RPAS(R4)  ;CLEAR ATTENTION BIT
                                        BICB    ATABIT(R1),SRCHWT       ;CLEAR IMPLIED SEEK SET
                                        ASL     R1              ;WORD INDEX
                                        MOV     #-1,TIMER(R1)   ;STOP CLOCK
                                        ASR     R1              ;RESTORE R1
                                        JSR     PC,OPT          ;START A REQUEST
                                        JMP     SC4             ;CHECK FOR MORE DRIVES

                        SC12:           MOV     R1,RPCS2(R4)    ;SELECT DRIVE
                                        ASL     R1
                                        ASL     R1
                                        ASL     R1
                                        MOV     RPDS(R4),RPSTU0(R1)     ;STORE DRIVE STATUS
                                        MOV     RPER1(R4),RPSTU0+2(R1)  ;STORE ERROR REG #1
                                        MOV     RPER2(R4),RPSTU0+4(R1)  ;STORE ERROR REG #2
                                        MOV     RPER3(R4),RPSTU0+6(R1)  ;STORE ERROR REG #3
                                        ASR     R1
                                        ASR     R1
                                        ASR     R1
                                        JSR     R0,DRVINT       ;INIT. THE STATE OF THE DRIVE
                                        BR      1$              ;TAKE ERROR EXIT
                                        RTS     PC              ;RETURN
                        1$:             TST     (SP)+           ;CLEAR THE STACK
                                        BR      SC8             ;PROCESS THE PARITY ERROR

                        SC13:           MOV     R1,RPCS2(R4)    ;SELECT THE DRIVE
                                        MOVB    ATABIT(R1),RPAS(R4)  ;CLEAR THE ATTENTION BIT
                        1$:             TSTB    DPINT(R1)       ;INITIALIZING THE DRIVE ?
                                        BEQ     2$              ;BR IF NOT
                                        CLRB    DPINT(R1)       ;CLEAR THE INIT INDICATOR
                                        JSR     R0,DRVINT       ;GO INIT THE DRIVE
                                        NOP                     ;DUMMY PARITY ERROR RETURN
                                        TSTB    DRVSTA(R1)      ;DRIVE ONLINE ?
                                        BGT     2$              ;BR IF YES -- START ORDER
                                        TST     R2              ;QUEUE ENTRY FOR THE DRIVE
                                        BEQ     4$              ;BR IF NOT
```

```
123 044330  004737  046224                  JSR     PC,GETREQ           ;GET DPB ADDRESS
124 044334  052762  140000  000016          BIS     #BIT15!BIT14,16(R2)  ;INFORM USER THAT DRIVE OFFLINE
125 044342  004737  045342                  JSR     PC,SVRHXX           ;SAVE THE REGISTERS
126 044346  004737  046246                  JSR     PC,POPQUE           ;REMOVE THE QUEUE
127 044352  000411                          BR      4$
128
129 044354  032764  004000  000000  2$:     BIT     #BIT11,RPCS1(R4)            ;DVA SET ?
130 044362  001003                          BNE     3$                  ;SET THEN CALL OPT
136 044364  004737  045506                  JSR     PC,SET.IE
137 044370  000402                          BR      4$
138
139 044372  004737  041622          3$:     JSR     PC,OPT              ;START THE REQUEST
140 044376  000137  043702          4$:     JMP     SC4                 ;PROCESS OTHER DRIVES
```

```
                                        ;RP07 TIMER ROUTINE
                                        ;CALL
                                        ;       MOV     #TIME,-(SP)     ;ELASPED TIME IN MILLISECONDS ON THE STACK
                                        ;       JSR     PC,RPTMR        ;CALL RP07 TIME ROUTINE
                                        RPTMR:  TST     ACTDRV          ;CHECK "ACTDRV & ACTSTR"
044406  001027                                BNE     4$              ;IF NON ZERO EXIT
044410  112737  000001  040601                MOVB    #1,ACTSTR       ;SET "ACTSTR"
044416  104412                                SAVREG                  ;SAVE R0 - R5
044420  005001                                CLR     R1              ;START WITH DRIVE 0
044422  005003                                CLR     R3
044424  005763  040606                1$:     TST     TIMER(R3)       ;IS THE TIMER RUNNING?
044430  002406                                BLT     2$              ;BRANCH IF NO
044432  166663  000002  040606                SUB     2(SP),TIMER(R3) ;COUNT THE INTERVAL
044440  003002                                BGT     2$              ;BR IF NO SOFTWARE TIMEOUT
044442  004737  044472                        JSR     PC,STO          ;CALL SOFTWARE TIMEOUT ROUTINE
044446  005201                        2$:     INC     R1              ;MOVE TO NEXT DRIVE
044450  005723                                TST     (R3)+
044452  022701  000010                        CMP     #8.,R1          ;OUT OF DRIVES?
044456  003362                                BGT     1$              ;BRANCH IF NO
044460  104413                        3$:     RESREG                  ;RESTORE R0 - R5
044462  105037  040601                        CLRB    ACTSTR          ;ZERO ACTIVE SOFTWARE TIMEOUT ROUTINE FLAG
044466  012616                        4$:     MOV     (SP)+,(SP)      ;ADJUST THE STACK
044470  000207                                RTS     PC              ;RETURN
```

```
                                        ;SOFTWARE TIMEOUT ROUTINE
                                        ;
                                        ;NOTE: THIS ROUTINE MUST BE ENTERED AT PRIORITY 6
                                        ;       OR GREATER
                                        ;
                                        ;CALL
                                        ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     PC,STO          ;SOFTWARE TIME ROUTINE
                                        ;       RETURN
 044472  010146                 STO:    MOV     R1,-(SP)        ;SAVE R1
 044474  010346                         MOV     R3,-(SP)        ;SAVE R3
 044476  013704  040640                 MOV     RPADR,R4        ;GET ADDRESS OF "RPCS1"
 044502  010164  000010                 MOV     R1,RPCS2(R4)    ;SELECT THE DRIVE
 044506  004037  045116                 JSR     R0,RD.RP        ;READ THE DRIVE STATUS REGISTER
 044512  000012                         RPDS
 044514  045004                         9$
 044516  105726                         TSTB    (SP)+           ;IS "DRY"=1?
 044520  100473                         BMI     6$              ;BR IF YES
 044522  105761  040554         1$:     TSTB    DPINT(R1)       ;TRYING TO INTIALIZE THE DRIVE ?
 044526  001070                         BNE     6$              ;BR IF YES
 044530  105761  040564                 TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
 044534  001065                         BNE     6$              ;BR IF YES
 044536  013702  040574                 MOV     TRNSWT,R2       ;GET "DPB" FROM THE "TRANSFER WAIT" QUEUE
 044542  020137  040626                 CMP     R1,DTUW         ;TRANSFER UNDERWAY ON THIS DRIVE?
 044546  001402                         BEQ     2$              ;BRANCH IF YES
 044550  004737  046224                 JSR     PC,GETREQ       ;GET DPB ADDRESS
 044554  052762  101000  000016 2$:     BIS     #BIT15!BIT09,16(R2)     ;SET THE ERROR FLAGS
 044562  004737  045342                 JSR     PC,SVRHXX       ;SAVE RHXX/RP07 REGISTERS
 044566  012764  000040  000010         MOV     #BIT05,RPCS2(R4)        ;"INIT" THE MASS BUS
 044574  105061  040524                 CLRB    DRVACT(R1)      ;DRIVE IS IDLE
 044600  005001                         CLR     R1              ;START WITH DRIVE 0
 044602  005003                         CLR     R3
 044604  004037  041030         3$:     JSR     R0,DRVINT       ;INIT. THIS DRIVE
 044610  000475                         BR      9$              ;PARITY ERROR RETURN

 044612  105761  040524                 TSTB    DRVACT(R1)      ;DRIVE IDLE BEFORE THE INIT.?
 044616  001414                         BEQ     5$              ;YES--BRANCH
 044620  013702  040574                 MOV     TRNSWT,R2       ;GET "DPB" FROM THE "TRANSFER WAIT" QUEUE
 044624  023701  040626                 CMP     DTUW,R1         ;WAS A DATA TRANSFER UNDERWAY ON THIS DRIVE?
 044630  001402                         BEQ     4$              ;YES--BRANCH
 044632  004737  046224                 JSR     PC,GETREQ       ;GET THE DPB POINTER FROM QUEUE
 044636  052762  100400  000016 4$:     BIS     #BIT15!BIT08,16(R2)     ;INFORM USER OF INIT.
 044644  105061  040524                 CLRB    DRVACT(R1)      ;SET DRIVE ACTIVE TO IDLE
 044650  012763  177777  040606 5$:     MOV     #-1,TIMER(R3)   ;STOP THE TIMER
 044656  005723                         TST     (R3)+           ;UPDATE THE INDEX
 044660  005201                         INC     R1              ;INCREMENT THE DRIVE NUMBER
 044662  022701  000010                 CMP     #8.,R1          ;LAST DRIVE BEEN CHECKED?
 044666  003346                         BGT     3$              ;NO--LOOP
 044670  012737  177777  040626         MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
 044676  005037  040574                 CLR     TRNSWT          ;CLEAR TRANSFER WAIT QUEUE
 044702  004737  046052                 JSR     PC,CLRQUE       ;CLEAR ALL REQUEST QUEUES
 044706  000500                         BR      13$             ;EXIT

 044710  116405  000016         6$:     MOVB    RPAS(R4),R5     ;READ ATTENTION REG
 044714  136105  040630                 BITB    ATABIT(R1),R5   ;IS ATTENTION FOR THIS DRIVE UP ?
 044720  001017                         BNE     7$              ;YES--BRANCH
```

```
                                                TSTB    DPINT(R1)       ;TRYING TO INTIALIZE THE DRIVE ?
                                                BNE     10$             ;BR IF YES - DRIVE NOT ONLINE
                                                TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
                                                BNE     11$             ;BR IF YES - NO RESPONSE TO REQUEST
                                                CMP     R1,DTUW         ;DATA TRANSFER UNDERWAY FOR THIS DRIVE
                                                BNE     1$              ;BR IF NO
                                                JSR     R0,RD.RP        ;READ CONTROL AND STATUS REGISTER
                                                RPCS1
                                                9$
                                                TSTB    (SP)+           ;CHECK 'RDY'
                                                BPL     1$              ;BR IF "RDY"=0
                                        7$:     TSTB    DPINT(R1)       ;INITIALIZING THE DRIVE ?
                                                BNE     8$              ;BR IF INIT PENDING
                                                TSTB    DPRQS(R1)       ;PORT REQUEST PENDING ?
                                                BEQ     13$             ;BR IF NOT
                                        8$:     MOV     #-1,TIMER(R3)   ;STOP THE TIMER
                                                BR      13$             ;EXIT

                                        9$:     JSR     PC,CI8          ;GO HANDLE THE 'NED'
                                                BR      13$

                                        10$:    CLRB    DPINT(R1)       ;CLEAR THE INITIALIZE INDICATOR
                                                CLRB    DRVSTA(R1)      ;SET DRIVE OFFLINE
                                                MOV     #-1,TIMER(R3)   ;STOP THE TIMER
                                                JSR     PC,GETREQ       ;GET THE DPB ADDRESS
                                                TST     R2              ;REQUEST IN QUEUE ?
                                                BEQ     13$             ;BR IF NOT
                                                BIS     #BIT15!BIT14,16(R2)     ;INFORM THE USER DRIVE NOT AVAILABLE
                                                BR      12$             ;FINISH

                                        11$:    MOV     #-1,TIMER(R3)   ;STOP THE TIMER
                                                CLRB    DPRQS(R1)       ;CLEAR PORT REQUEST INDICATOR
                                                JSR     PC,GETREQ       ;GET DPB ADDRESS
                                                TST     R2              ;QUEUE ENTRY FOR DRIVE ?
                                                BEQ     13$             ;BR IF NONE
                                                MOV     #BIT15!BIT2,16(R2)      ;INFORM USER OF PORT REQUEST ERROR
                                        12$:    JSR     PC,EMPTYQ       ;CLEAR THE QUEUE FOR THE DRIVE
                                                JSR     PC,SVRHXX       ;SAVE RHXX/RP07 REGISTERS
                                        13$:    MOV     (SP)+,R3        ;RESTORE R3
                                                MOV     (SP)+,R1        ;RESTORE R1
                                                RTS     PC              ;RETURN
```

```
                                        ;ROUTINE TO READ A RHXX/RP07 REGISTER
                                        ;
                                        ;CALL
                                        ;       JSR     R0,RD.RP        ;GO READ A REGISTER
                                        ;       INDEX                   ;REG. INDEX FROM BASE
                                        ;       ERRADR                  ;ERROR ADDRESS--PROCESS ERROR STARTING
                                        ;                               ;AT THIS ADDRESS
                                        ;       RETURN                  ;CONTENTS OF REG. IS ON THE STACK

045116  011646                  RD.RP:  MOV     (SP),-(SP)      ;SAVE R0
045120  013746  040640                  MOV     RPADR,-(SP)     ;ADDRESS OF THE
045124  062016                          ADD     (R0)+,(SP)      ;REG
045126  017666  000000  000004          MOV     @(SP),4(SP)     ;READ THE CONTENTS OF THE REG
045134  013716  040640                  MOV     RPADR,(SP)      ;CHECK IF NON-EXIST DRIVE
045140  062716  000010                  ADD     #RPCS2,(SP)     ;
045144  032776  010000  000000          BIT     #BIT12,@(SP)    ;NED BIT SET ?
045152  001004                          BNE     1$              ;ERROR EXIT
045154  032777  020000  173456          BIT     #BIT13,@RPADR   ;MCPE SET ?
045162  001406                          BEQ     2$              ;EXIT
045164  016666  000002  000004  1$:     MOV     2(SP),4(SP)     ;MOVE THE R0 TO TOP OF STACK
045172  022626                          CMP     (SP)+,(SP)+     ;CLEAR OFF THE STACK
045174  011000                          MOV     (R0),R0         ;ERROR EXIT ADDRESS
045176  000403                          BR      3$              ;EXIT

045200  062700  000002          2$:     ADD     #2,R0           ;NORMAL EXIT
045204  005726                          TST     (SP)+           ;CLEAR OFF STACK
045206  000200                  3$:     RTS     R0              ;EXIT
```

```
                                        ;ROUTINE TO WRITE A REGISTER
                                        ;
                                        ;CALL
                                        ;       MOV     DATA,-(SP)      ;DATA TO BE LOADED ON THE STACK
                                        ;       JSR     R0,WRT.RP       ;CALL THE ROUTINE TO LOAD(WRITE) THE REG.
                                        ;       INDEX                   ;INDEX OF THE REGISTER TO BE LOADED
                                        ;       ERRADR                  ;ADDRESS TO RETURN TO ON AN ERROR
                                        ;       RETURN                  ;ERROR FREE RETURN

045210                                  WRT.RP:
045210  012046                                  MOV     (R0)+,-(SP)     ;FORMING THE REG ADDRESS
045212  001017                                  BNE     2$              ;BRANCH IF NOT RPCS1
045214  122766  000150  000004                  CMPB    #150,4(SP)      ;DATA XTRNS COMMAND ?
045222  002413                                  BLT     2$              ;BRANCH IF NOT
045224  105777  173410                1$:       TSTB    @RPADR          ;SEE IF CONTROLLER READY
045230  100375                                  BPL     1$
045232  017746  173402                        MOV     @RPADR,-(SP)    ;READ RPCS1
045236  000316                                  SWAB    (SP)            ;MERG THE A17,A18,PSEL BITS
045240  042716  177770                        BIC     #^C7,(SP)       ;CHOP OFF THE REST BITS FROM RPCS1
045244  111666  000007                        MOVB    (SP),7(SP)      ;ATTACH A17,A18,PSEL TO COMMAND
045250  005726                                  TST     (SP)+           ;RESTORE STACK LEVEL
045252  063716  040640                2$:       ADD     RPADR,(SP)      ;THE DEST REG ADDRESS
045256  016676  000004  000000                  MOV     4(SP),@(SP)     ;WRITE THE REGISTER
045264  013716  040640                        MOV     RPADR,(SP)      ;CHECK NED,PAR BITS
045270  062716  000010                        ADD     #RPCS2,(SP)     ;
045274  032776  010000  000000                BIT     #BIT12,@(SP)    ;NONE EXIST DRIVE ?
045302  001013                                  BNE     3$              ;BRANCH IF IT IS
045304  013716  040640                        MOV     RPADR,(SP)      ;ADDRESS RPER1
045310  062716  000014                        ADD     #RPER1,(SP)     ;
045314  032776  000010  000000                BIT     #BIT3,@(SP)     ;PAR SET ?
045322  001003                                  BNE     3$              ;BRANCH IF SO
045324  062700  000002                        ADD     #2,R0           ;NORMAL RETURN
045330  000401                                  BR      4$              ;EXIT

045332  011000                        3$:       MOV     (R0),R0         ;ERROR EXIT
045334  005726                        4$:       TST     (SP)+           ;CLEAR OFF THE STACK
045336  012616                                  MOV     (SP)+,(SP)      ;MOVE R0 TO TOP OF STACK
045340  000200                                  RTS     R0              ;EXIT
```

```
                                        ;ROUTINE TO SAVE THE RHXX/RP07 REGISTERS AS PER DPB+14
                                        ;
                                        ;CALL
                                        ;       MOV     @DPB,R2         ;ADDRESS OF DRIVE PARAMETER BLOCK
                                        ;       JSR     PC,SVRHXX       ;SAVE THE DRIVES REG'S
                                        ;
045342  104412                  SVRHXX: SAVREG                          ;SAVE R0 - R5
045344  005702                          TST     R2                      ;QUEUE ENTRY FOR THE DRIVE ?
045346  001455                          BEQ     7$                      ;BR IF NONE
045350  013704  040640                  MOV     RPADR,R4
045354  111264  000010                  MOVB    (R2),RPCS2(R4)          ;SELECT DRIVE
045360  016203  000014                  MOV     14(R2),R3               ;GET THE ERROR TABLE POINTER
045364  001446                          BEQ     7$                      ;EXIT IF NO ADDRESS
045366  005037  045422                  CLR     3$                      ;COUNTER & POINTER
045372  023727  045422  000020  1$:     CMP     3$,@RPDB                ;REACHED THE BUFFER REGISTER ?
045400  001006                          BNE     2$                      ;BR IF NOT
045402  032764  000200  000010          BIT     @CSTO7,RPCS2(R4)                ;'OR' SET ?
045410  001002                          BNE     2$                      ;BR IF SET
045412  005023                          CLR     (R3)+                   ;STORE RPDB AS ZEROES
045414  000405                          BR      4$                      ;CONTINUE
                                        ;
045416  004037  045116          2$:     JSR     R0,RD.RP                ;READ THE SELECTED REGISTER
045422  000000                  3$:     .WORD   0                       ;REGISTER INDEX
045424  045450                          5$                              ;ERROR RETURN ADDRESS
045426  012623                          MOV     (SP)+,(R3)+             ;STORE THE REGISTER CONTENTS
045430  023727  045422  000046  4$:     CMP     3$,@RPEC2               ;REACHED THE END ?
045436  001406                          BEQ     6$                      ;BR IF YES
045440  062737  000002  045422          ADD     #2,3$                   ;INCREMENT THE REGISTER INDEX
045446  000751                          BR      1$                      ;CONTINUE READING THE REGISTERS
                                        ;
045450  004737  042750          5$:     JSR     PC,CI7                  ;PROCESS THE UNCORRECTABLE PARITY ERROR
045454  013746  001234          6$:     MOV     $CPUOP,-(SP)            ;CHECK THE CPU (RH) TYPE
045460  042716  003777                  BIC     #^C174000,(SP)          ;LEAVE THE CPU TYPE BITS
045464  022726  030000                  CMP     #30000,(SP)+            ;SEE IF RH70
045470  001004                          BNE     7$                      ;IF NE, NO
045472  063704  040646                  ADD     RHEXT,R4                ;POINT TO RPBAE
045476  012423                          MOV     (R4)+,(R3)+             ;STORE THE CONTENTS
045500  011413                          MOV     (R4),(R3)               ;GET RPCS3
045502  104413                  7$:     RESREG                          ;RESTORE R0 - R5
045504  000207                          RTS     PC                      ;RETURN
```

```
                                        ;ROUTINE TO SET THE INTERRUPT ENABLE (IE) BIT IN RPCS1 WITHOUT GETTING A
                                        ;TRANSFER ERROR (TRE).
                                        ;CALL
                                        ;       MOV     @DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     PC,SET.IE       ;SET INTERRUPT ENABLE ROUTINE
                                        ;       RETURN
045506  010446                 SET.IE: MOV     R4,-(SP)        ;SAVE R4
045510  013704  040640                 MOV     RPADR,R4        ;PICKUP ADDRESS OF RPCS1
045514  010164  000010                 MOV     R1,RPCS2(R4)    ;SELECT DRIVE
045520  011446                         MOV     (R4),-(SP)      ;READ RPCS1
045522  052716  040000                 BIS     @BIT14,(SP)     ;SET THE "TRE" BIT OF THE WORD READ
045526  000316                         SWAB    (SP)            ;ADJUST FOR DATO
045530  112714  000100                 MOVB    @BIT06,(R4)     ;SET "IE"
045534  032764  010000  000010         BIT     @BIT12,RPCS2(R4) ;IS "NED"=1?
045542  001002                         BNE     1$              ;YES--CLEAR "TRE"
045544  005726                         TST     (SP)+           ;CLEAN OFF THE STACK
045546  000402                         BR      2$

045550  112664  000001         1$:     MOVB    (SP)+,1(R4)     ;CLEAR "TRE"
045554  012604                 2$:     MOV     (SP)+,R4        ;RESTORE R4
045556  000207                         RTS     PC              ;RETURN TO CALLER

                                        ;QUEUE COUNT
045560      000                 QCNT:   .BYTE   0               ;DRIVE 0
045561      000                         .BYTE   0               ;DRIVE 1
045562      000                         .BYTE   0               ;DRIVE 2
045563      000                         .BYTE   0               ;DRIVE 3
045564      000                         .BYTE   0               ;DRIVE 4
045565      000                         .BYTE   0               ;DRIVE 5
045566      000                         .BYTE   0               ;DRIVE 6
045567      000                         .BYTE   0               ;DRIVE 7
```

```
                                ;QUEUE INPUT POINTERS
                                
045570  045652                  QINPT:  .WORD   QDRV0            ;DRIVE 0
045572  045672                          .WORD   QDRV1            ;DRIVE 1
045574  045712                          .WORD   QDRV2            ;DRIVE 2
045576  045732                          .WORD   QDRV3            ;DRIVE 3
045600  045752                          .WORD   QDRV4            ;DRIVE 4
045602  045772                          .WORD   QDRV5            ;DRIVE 5
045604  046012                          .WORD   QDRV6            ;DRIVE 6
045606  046032                          .WORD   QDRV7            ;DRIVE 7

                                ;QUEUE OUTPUT POINTERS

045610  045652                  QOUTPT: .WORD   QDRV0            ;DRIVE 0
045612  045672                          .WORD   QDRV1            ;DRIVE 1
045614  045712                          .WORD   QDRV2            ;DRIVE 2
045616  045732                          .WORD   QDRV3            ;DRIVE 3
045620  045752                          .WORD   QDRV4            ;DRIVE 4
045622  045772                          .WORD   QDRV5            ;DRIVE 5
045624  046012                          .WORD   QDRV6            ;DRIVE 6
045626  046032                          .WORD   QDRV7            ;DRIVE 7

045630  045652                  QSTART: .WORD   QDRV0            ;DRIVE 0 START ADDRESS
045632  045672                  QSTOP:  .WORD   QDRV1            ;DRIVE 0 STOP ADDRESS & DRIVE 1 START ADDRESS
045634  045712                          .WORD   QDRV2            ;STOP DRIVE 1--START DRIVE 2
045636  045732                          .WORD   QDRV3            ;STOP DRIVE 2--START DRIVE 3
045640  045752                          .WORD   QDRV4            ;STOP DRIVE 3--START DRIVE 4
045642  045772                          .WORD   QDRV5            ;STOP DRIVE 4--START DRIVE 5
045644  046012                          .WORD   QDRV6            ;STOP DRIVE 5--START DRIVE 6
045646  046032                          .WORD   QDRV7            ;STOP DRIVE 6--START DRIVE 7
045650  046052                          .WORD   QTERP            ;STOP DRIVE 7
```

```
                                ;DRIVE REQUEST QUEUES
                                ;
045652                          QDRV0:  .BLKW   10
045672                          QDRV1:  .BLKW   10
045712                          QDRV2:  .BLKW   10
045732                          QDRV3:  .BLKW   10
045752                          QDRV4:  .BLKW   10
045772                          QDRV5:  .BLKW   10
046012                          QDRV6:  .BLKW   10
046032                          QDRV7:  .BLKW   10
        046052                  QTERP=.
                                ;
                                ;ROUTINE TO CLEAR ALL OF THE REQUEST QUEUES
                                ;
                                ;CALL
                                ;       JSR     PC,CLRQUE
                                ;
046052  104412                  CLRQUE: SAVREG                  ;SAVE R0 - R5
046054  012702  045560                  MOV     #QCNT,R2        ;ZERO THE QUEUE COUNTS
046060  005022                          CLR     (R2)+           ;DRIVES 0 & 1
046062  005022                          CLR     (R2)+           ;DRIVES 2 & 3
046064  005022                          CLR     (R2)+           ;DRIVES 4 & 5
046066  005022                          CLR     (R2)+           ;DRIVES 6 & 7
046070  012703  000010                  MOV     #8.,R3          ;MOVE THE STARTING
046074  012701  045630                  MOV     #QSTART,R1      ;ADDRESS OF THE QUEUE INTO
046100  012122                  1$:     MOV     (R1)+,(R2)+     ;THE QUEUE INPUT POINTER
046102  005303                          DEC     R3
046104  001375                          BNE     1$
046106  012703  000010                  MOV     #8.,R3          ;MOVE THE STARTING ADDRESS
046112  012701  045630                  MOV     #QSTART,R1      ;OF THE QUEUE INTO THE
046116  012122                  2$:     MOV     (R1)+,(R2)+     ;QUEUE OUTPUT POINTER
046120  005303                          DEC     R3
046122  001375                          BNE     2$
046124  104413                          RESREG                  ;RESTORE R0 - R5
046126  000207                          RTS     PC
```

F2


```
                                        ;EMPTY THE QUEUE SPECIFIED BY R1
                                        ;
                                        ;CALL
                                        ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     PC,EMPTYQ
                                        ;
046130  105061  045560          EMPTYQ: CLRB    QCNT(R1)        ;CLEAR NUMBER OF ITEMS IN QUEUE
046134  006301                          ASL     R1
046136  016161  045570  045610        MOV     QINPT(R1),QOUTPT(R1) ;SET OUTPUT QUEUE POINTER=INPUT POINTER
046144  006201                          ASR     R1
046146  000207                          RTS     PC
                                        ;ROUTINE TO PUT A REQUEST IN QUEUE
                                        ;
                                        ;CALL
                                        ;       MOV     #DPB,R2         ;ADDRESS OF DRIVE PARAMETER BLOCK
                                        ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     R0,DRVQUE       ;GO PUT REQUEST IN QUEUE
                                        ;       ------                  ;RETURN HERE IF QUEUE IS FULL
                                        ;       ------                  ;RETURN HERE IF REQUEST IS IN QUEUE
046150  122761  000010  045560  DRVQUE: CMPB    #10,QCNT(R1)    ;IS QUEUE FULL?
046156  001421                          BEQ     2$              ;BR IF YES-TAKE RETURN1
046160  105261  045560                  INCB    QCNT(R1)        ;INCREMENT QUEUE COUNT
046164  006301                          ASL     R1
046166  010271  045570                  MOV     R2,@QINPT(R1)   ;PUT THIS REQUEST IN QUEUE
046172  062761  000002  045570          ADD     #2,QINPT(R1)    ;UPDATE THE QUEUE POINTER
046200  026161  045570  045632          CMP     QINPT(R1),QSTOP(R1) ;TIME TO RESET THE POINTER
046206  001003                          BNE     1$              ;BRANCH IF NO
046210  016161  045630  045570          MOV     QSTART(R1),QINPT(R1) ;YES--RESET POINTER
046216  006201                  1$:     ASR     R1
046220  005720                          TST     (R0)+           ;TAKE RETURN 2
046222  000200                  2$:     RTS     R0              ;RETURN TO USER
```

```
                                        ;ROUTINE TO GET THE "DPB" ADDRESS OF NEXT REQUEST IN QUEUE
                                        ;
                                        ;ON RETURN, R2 WILL CONTAIN POINTER ADDRESS OF "DPB" REQUESTED OR
                                        ;ZERO IF NO REQUEST IN QUEUE.
                                        ;
                                        ;CALL
                                        ;       MOV     @DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     PC,GETREQ       ;GO GET THE REQUEST
046224  005002                  GETREQ: CLR     R2
046226  105761  045560                  TSTB    QCNT(R1)        ;IS THERE ANY REQUEST IN QUEUE?
046232  001404                          BEQ     2$              ;NO---BRANCH
046234  006301                  1$:     ASL     R1
046236  017102  045610                  MOV     @QOUTPT(R1),R2  ;PICKUP "DPB" POINTER FOR THIS DRIVE
046242  006201                          ASR     R1
046244  000207                  2$:     RTS     PC              ;RETURN TO USER

                                        ;ROUTINE TO "POP" THE REQUEST FROM QUEUE
                                        ;
                                        ;ON RETURN, R2 WILL CONTAIN POINTER ADDRESS OF "DPB" REMOVED
                                        ;
                                        ;CALL
                                        ;       MOV     @DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     PC,POPQUE       ;CALL TO REMOVE REQUEST

046246  105361  045560          POPQUE: DECB    QCNT(R1)        ;DECREMENT QUEUE COUNT
046252  006301                          ASL     R1
046254  017102  045610                  MOV     @QOUTPT(R1),R2  ;GET THE "DPB" POINTER
046260  005071  045610                  CLR     @QOUTPT(R1)     ;REMOVE DPB ADDRESS FROM THE QUEUE
046264  062761  000002  045610          ADD     #2,QOUTPT(R1)   ;UPDATE THE QUEUE POINTER
046272  026161  045610  045632          CMP     QOUTPT(R1),QSTOP(R1) ;TIME TO RESET THE POINTER?
046300  001003                          BNE     1$              ;NO--BRANCH TO EXIT
046302  016161  045630  045610          MOV     QSTART(R1),QOUTPT(R1) ;YES--RESET THE POINTER
046310  006201                  1$:     ASR     R1
046312  000207                          RTS     PC              ;RETURN TO USER
```

H2


```
                        .SBTTL  DEVICE PARAMETER BLOCKS
                        ;
                        ;BLOCK LOCATION EQUATE STATEMENTS
                        ;
                        ;       = 0             ;DRIVE NUMBER (BYTE)
000001                  $FMT    = 1             ;FMT,MCI,ECI OR OFFSET CODE (BYTE)
000002                  $COMND  = $FMT+1        ;OPERATION CODE (BYTE)
000003                  $PSEL   = $FMT+2        ;PORT SELECT & BITS A16, A17 (BYTE)
000004                  $WCNT   = $FMT+3        ;WORD COUNT (2'S COMP)
000006                  $BUF    = $FMT+5        ;BUFFER ADDR OR REGISTER TABLE POINTER
000010                  $SEC    = $FMT+7        ;SECTOR ADDRESS OR 1ST REG ADDR
000011                  $TRK    = $FMT+10       ;TRACK ADDRESS OF LAST REG ADDR
000012                  $CYL    = $FMT+11       ;CYLINDER ADDR
000014                  $REG    = $FMT+13       ;REGISTER STORAGE (IF ERROR)
000016                  $TATUS  = $FMT+15       ;STATUS WORD (SET BY DRIVER)
                        ;
                        ;DRIVE'S HISTORY AND CURRENT INDICATOR STORAGE EQUATES
                        ;
000020                  $WRDL   = $FMT+17       ;WORD COUNT (NOT 2'S COMP)
000022                  $SSEC   = $WRDL+2       ;SECTOR SIZE FOR CURRENT OPERATION (256. OR 258.)
000024                  $CODE   = $WRDL+4       ;PRESENT COMMAND SELECTION CODE
000026                  $PACK   = $WRDL+6       ;READ/WRITE COMMAND INDICATOR (BYTE)
000027                  $PREVO  = $WRDL+7       ;PREVIOUS COMMAND SELECTION CODE (BYTE)
000030                  $PATTC  = $WRDL+10      ;PATTERN CODE
000032                  $PREVA  = $WRDL+12      ;PREVIOUS ADDRESS- TRK, SEC, CYL (DOUBLE WORD)
000036                  $RDPAS  = $WRDL+16      ;WORDS READ PER PASS (DOUBLE WORD)
000042                  $WTPAS  = $WRDL+22      ;WORDS WRITTEN PER PASS (DOUBLE WORD)
000046                  $SEEKS  = $WRDL+26      ;NUMBER OF SEEKS PER PASS (DOUBLE WORD)
000052                  $OPERC  = $WRDL+32      ;OPERATION COUNT (DOUBLE WORD)
000056                  $WTOTL  = $WRDL+36      ;TOTAL WORDS WRITTEN X10*6 (DOUBLE WORD) &
                                                ;1 X10*6 REPETITION COUNTER (DOUBLE WORD)
000066                  $RTOTL  = $WRDL+46      ;TOTAL WORDS READ X10*6 (DOUBLE WORD) &
                                                ;1 X10*6 REPETITION COUNTER (DOUBLE WORD)
000076                  $STOTL  = $WRDL+56      ;TOTAL SEEK COUNT (DOUBLE WORD)
000102                  $TOTAL  = $WRDL+62      ;TOTAL ERRORS COUNT (ALL TYPES)
000104                  $SOFT   = $WRDL+64      ;'SOFT' ERROR COUNT
000106                  $HARD   = $WRDL+66      ;'HARD' ERROR COUNT
000110                  $SKI    = $WRDL+70      ;'SKI' ERROR COUNT
000112                  $MISPO  = $WRDL+72      ;PROG DETECTED MIS-POSITIONING ERROR COUNT
000114                  $PASSC  = $WRDL+74      ;PASS COUNTER
000116                  $FAIR   = $WRDL+76      ;OPERATION QUEUE 'FAIRNESS' COUNT
000120                  $HLDWC  = $WRDL+100     ;HOLD WORD FOR 'RELBUF' ROUTINE
                        ;
                        ;INDEX EQUATES TO THE NEXT OPERATION PARAMETERS
                        ;
000122                  $NCODE  = $WRDL+102     ;NEXT OPERATION CODE
000123                  $NPATC  = $NCODE+1      ;NEXT PATTERN
000124                  $NSEC   = $NCODE+2      ;NEXT SECTOR
000125                  $NTRK   = $NCODE+3      ;NEXT TRACK
000126                  $NCYL   = $NCODE+4      ;NEXT CYLINDER
000130                  $NEXT   = $NCODE+6      ;PARAMETER SELECTION INDICATOR
000132                  $FIRST  = $NCODE+10     ;FIRST OPERATION INDICATOR
```

```
                                ;INDEX EQUATES FOR MAXIMUM/MINIMUM ADDRESSES
                        
000134                  MAXCYL  = $NCODE+12             ;MAXIMUM CYLINDER ADDRESS
000136                  MINCYL  = MAXCYL+2              ;MINIMUM CYLINDER ADDRESS
000140                  MAXTRK  = MAXCYL+4              ;MAXIMUM TRACK ADDRESS
000142                  MINTRK  = MAXCYL+6              ;MINIMUM TRACK ADDRESS
000144                  MAXSEC  = MAXCYL+10             ;MAXIMUM SECTOR ADDRESS
000146                  MINSEC  = MAXCYL+12             ;MINIMUM SECTOR ADDRESS
                        
                                ;INDEX EQUATES FOR CYLLMT, TRKLMT, SECLMT ADDRESSES LIMITS AND 1ST FE CYLINDER
                        
000150                  CYLLMT  = MAXCYL+14             ;CYLINDER ADDRESS LIMIT
000152                  SECLMT  = CYLLMT+2              ;SECTOR ADDRESS LIMIT
000154                  TRKLMT  = CYLLMT+4              ;TRACK ADDRESS LIMIT
000156                  FE1     = CYLLMT+6              ;1ST FE CYLINDER
                        
                                ;DRIVE SERIAL NUMBER AREA INDEX EQUATE
                        
000160                  $DRVSN  = CYLLMT+10             ;DRIVE SERIAL NUMBER (6 BYTES)
                        
                                ;RP/RM REGISTER EQUATES
                        
000166                  $RPCS1  = $DRVSN+6              ;RP REGISTER STORAGE
000170                  $RPWC   = $RPCS1+2
000172                  $RPBA   = $RPCS1+4
000174                  $RPDA   = $RPCS1+6
000176                  $RPCS2  = $RPCS1+10
000200                  $RPDS   = $RPCS1+12
000202                  $RPER1  = $RPCS1+14
000204                  $RPAS   = $RPCS1+16
000206                  $RPLA   = $RPCS1+20
000210                  $RPDB   = $RPCS1+22
000212                  $RPMR1  = $RPCS1+24
000214                  $RPDT   = $RPCS1+26
000216                  $RPSN   = $RPCS1+30
000220                  $RPOF   = $RPCS1+32
000222                  $RPDC   = $RPCS1+34
000224                  $RPCC   = $RPCS1+36
000226                  $RPER2  = $RPCS1+40
000230                  $RPER3  = $RPCS1+42
000232                  $RPEC1  = $RPCS1+44
000234                  $RPEC2  = $RPCS1+46
000236                  $RPBAE  = $RPCS1+50
000240                  $RPCS3  = $RPCS1+52
```

J2

DEVICE PARAMETER BLOCKS

```
8
046314     000     000          ;DPB FOR DRIVE 0
046316                  DRIVE0: .BYTE   0,0             ;DRIVE NUMBER 0
046330  046502                  .BLKW   5
046332                          .WORD   .+$RPCS1-$REG
                                .BLKB   $RPCS3-$REG

                        ;DPB FOR DRIVE 1
046556     001     000  DRIVE1: .BYTE   1,0             ;DRIVE NUMBER 1
046560                          .BLKW   5
046572  046744                  .WORD   .+$RPCS1-$REG
046574                          .BLKB   $RPCS3-$REG

                        ;DPB FOR DRIVE 2
047020     002     000  DRIVE2: .BYTE   2,0             ;DRIVE NUMBER 2
047022                          .BLKW   5
047034  047206                  .WORD   .+$RPCS1-$REG
047036                          .BLKB   $RPCS3-$REG

                        ;DPB FOR DRIVE 3
047262     003     000  DRIVE3: .BYTE   3,0             ;DRIVE NUMBER 3
047264                          .BLKW   5
047276  047450                  .WORD   .+$RPCS1-$REG
047300                          .BLKB   $RPCS3-$REG

                        ;DPB FOR DRIVE 4
047524     004     000  DRIVE4: .BYTE   4,0             ;DRIVE NUMBER 4
047526                          .BLKW   5
047540  047712                  .WORD   .+$RPCS1-$REG
047542                          .BLKB   $RPCS3-$REG

                        ;DPB FOR DRIVE 5
047766     005     000  DRIVE5: .BYTE   5,0             ;DRIVE NUMBER 5
047770                          .BLKW   5
050002  050154                  .WORD   .+$RPCS1-$REG
050004                          .BLKB   $RPCS3-$REG

                        ;DPB FOR DRIVE 6
050230     006     000  DRIVE6: .BYTE   6,0             ;DRIVE NUMBER 6
050232                          .BLKW   5
050244  050416                  .WORD   .+$RPCS1-$REG
050246                          .BLKB   $RPCS3-$REG

                        ;DPB FOR DRIVE 7
050472     007     000  DRIVE7: .BYTE   7,0             ;DRIVE NUMBER 7
050474                          .BLKW   5
050506  050660                  .WORD   .+$RPCS1-$REG
050510                          .BLKB   $RPCS3-$REG
```

K2

DEVICE PARAMETER BLOCKS

```
                                        ;GENERAL PURPOSE DEVICE PARAMETER BLOCK
                                        
050734      000         GENDPB: .BYTE   0           ;DRIVER PARAMETER BLOCK, DRIVE #
050735      000                 .BYTE   0           ;OFFSET VALUE OR FMT16, MCI OR ECI
050736      000                 .BYTE   0           ;COMMAND CODE
050737      000                 .BYTE   0           ;PSEL, A16 AND A17
050740   177776                 .WORD   -2          ;WORD COUNT (NEG)
050742   063364                 .WORD   CYLNDR      ;BUFFER ADDRESS
050744      000                 .BYTE   0           ;SECTOR ADDRESS
050745      000                 .BYTE   0           ;TRACK ADDRESS
050746   000000                 .WORD   0           ;CYLINDER ADDRESS
050750   050754                 .WORD   GENREG      ;ADDRESS TO SAVE ALL RMXX/RP07 REG'S
050752   000000                 .WORD   0           ;STATUS WORD
                                        
050754              GENREG: .BLKW   24          ;REGISTER STORAGE
```

L2


```
                                .SBTTL  ERROR MESSAGES

051024  122  110  040  EM1:    .ASCIZ  /RM CONTROLLER INTERRUPT OCCURRED (RPAS= 0)/
051077  125  116  105  EM2:    .ASCIZ  /UNEXPECTED ATTENTION OCCURRED/
051135  115  101  123  EM3:    .ASCIZ  /MASSBUS PARITY ERROR (MCPE=1)/
051173  115  101  123  EM4:    .ASCIZ  /MASSBUS PARITY ERROR (PAR=1)/
051230  101  104  104  EM5:    .ASCIZ  /ADDRESS PLUG CHANGE BIT SET/
051264  122  110  040  EM6:    .ASCIZ  /RM CONTROLLER DIDN'T RESPOND TO ADDRESSING/
051337  125  116  103  EM10:   .ASCIZ  /UNCORRECTABLE MASSBUS PARITY ERROR/
051402  106  101  124  EM11:   .ASCIZ  /FATAL MASSBUS PARITY ERROR/
051435  120  105  122  EM12:   .ASCIZ  /PERSISTENT DEVICE UNSAFE/
051466  117  120  105  EM13:   .ASCIZ  /OPERATION NOT COMPLETED WITHIN TIME LIMIT/
051540  104  122  111  EM14:   .ASCIZ  /DRIVE WENT OFFLINE/
051563  116  117  040  EM15:   .ASCIZ  /NO RESPONSE TO PORT REQUEST/
051617  110  105  101  EM20:   .ASCIZ  /HEADER CRC ERROR/
051640  104  101  124  EM21:   .ASCIZ  /DATA CHECK ('DCK') ERROR/
051671  127  122  111  EM22:   .ASCIZ  /WRITE CHECK ERROR - DATA CHECK ('DCK') SET/
051744  127  122  111  EM23:   .ASCIZ  /WRITE CHECK ERROR - DATA CHECK ('DCK') NOT SET/
052023  110  105  101  EM24:   .ASCIZ  /HEADER READ ERROR - 'FMT' BIT DROPPED/
052071  110  105  101  EM25:   .ASCIZ  /HEADER READ ERROR - HEADER COMPARE ('HCE') ERROR/
052152  106  117  122  EM26:   .ASCIZ  /FORMAT ERROR ('FER')/
052177  110  105  101  EM27:   .ASCIZ  /HEADER COMPARE ('HCE') ERROR/
052234  115  111  123  EM30:   .ASCIZ  /MISCELLANEOUS DRIVE ERROR/
052266  117  120  105  EM31:   .ASCIZ  /OPERATION INCOMPLETE ('OPI') ERROR/
052331  104  122  111  EM32:   .ASCIZ  /DRIVE TIMING ('DTE') ERROR/
052364  120  101  122  EM33:   .ASCIZ  /PARITY ('PAR') ERROR AFTER OPERATION STARTED/
052441  127  122  111  EM34:   .ASCIZ  /WRITE CLOCK FAILURE ('WCF') ERROR/
052503  111  116  126  EM35:   .ASCIZ  /INVALID ADDRESS ('IAE') ERROR/
052541  127  122  111  EM36:   .ASCIZ  /WRITE LOCK ('WLE') ERROR/
052572  104  101  124  EM37:   .ASCIZ  /DATA CHECK ('DCK') SET DURING WRITE CHECK/
052644  122  110  130  EM40:   .ASCIZ  /RMXX OR UNIBUS TRANSFER ERROR/
052702  102  125  123  EM41:   .ASCIZ  /BUS ADDRESS OR WORD COUNT INCORRECT/
052746  104  101  124  EM42:   .ASCIZ  /DATA COMPARE ERRORS - NO OTHER ERROR(S) DETECTED/
053027  103  101  116  EM43:   .ASCIZ  /CAN'T MATCH DATA READ WITH A PATTERN - UNKNOWN DATA PATTERN/
053123  105  122  122  EM44:   .ASCIZ  /ERROR BIT(S) SET, BUT NO ERROR SIGNALED BY THE RM CONTROLLER/
053220  105  103  103  EM45:   .ASCIZ  /ECC LOGIC FAILURE - POSITION REGISTER VALUE NOT VALID/
053306  102  125  123  EM46:   .ASCIZ  /BUS ADDRESS AND WORD COUNT NOT CONSISTENT/
053360  105  103  103  EM47:   .ASCIZ  /ECC LOGIC FAILURE - PATTERN REGISTER IS ZERO/
053435  123  105  105  EM50:   .ASCIZ  /SEEK INCOMPLETE ('SKI') ERROR/
053473  120  122  117  EM51:   .ASCIZ  /PROGRAM DETECTED POSITIONING ERROR/
053536  105  103  110  EM52:   .ASCIZ  /ECH ERROR - UNCORRECTABLE ECC ERROR/
053602  104  122  111  EM60:   .ASCIZ  /DRIVE UNSAFE ERROR/
053625  105  101  122  EM70:   .ASCIZ  /EARLY WARNING, TEMPERATURE WARNING (TPE) ERROR/
053704  105  101  122  EM71:   .ASCIZ  /EARLY WARNING, AIR SYSTEM WARNING (AIR) ERROR/
053762  105  101  122  EM72:   .ASCIZ  /EARLY WARNING ERROR, AIR, TPE, NOT SET/
```

M2

ERROR MESSAGES

```
 1 054031      122      120      101  DM1:    .ASCIZ  /RPAS/
 2 054036      104      122      111  DM2:    .ASCIZ  /DRIVE   RPDS    RPER1   RPER3   RPER2   RPAS/
 3 054113      104      122      111  DM3:    .ASCIZ  /DRIVE   REG ADR  DATA/
 4 054141      104      122      111  DM4:    .ASCIZ  /DRIVE   REG ADR    GOOD    BAD/
 5 054200      122      120      101  DM6:    .ASCIZ  /RPADR/
 6 054206      104      122      111  DM14:   .ASCIZ  /DRIVE   RPCS1   RPCS2   RPDS    RPER1   RPER2   RPER3   RPEC1/<CRLF>
 7 054305      122      120      105  DM15:   .ASCIZ  /RPEC2   RPWC    RPBA    RPDA    RPAS    RPLA    RPDB    RPMR1/<CRLF>
 8 054404      122      120      104  DM16:   .ASCIZ  /RPDT    RPSN    RPOF    RPDC    RPCC    STATUS/<CRLF>
 9 054464      122      120      102  DM17:   .ASCIZ  /RPBAE   RPCS3/<CRLF>
10                                    .EVEN
```

ERROR MESSAGES

```
      1 054504  001316  000000          DT1:    .WORD   ATTN,0
      2 054510  001220  000000          DT2:    .WORD   DRIVE,0
      3 054514  001220  000000          DT3:    .WORD   DRIVE,0
      4 054520  001220  000000          DT4:    .WORD   DRIVE,0
      5 054524  001272  000000          DT6:    .WORD   $RPADR,0
      6
      7 054530  000166  000176  000200 DT14:    .WORD   $RPCS1,$RPCS2,$RPDS,$RPER1,$RPER2,$RPER3,$RPEC1,0
      8 054550  000234  000170  000172 DT15:    .WORD   $RPEC2,$RPWC,$RPBA,$RPDA,$RPAS,$RPLA,$RPDB,$RPMR1,0
      9 054572  000214  000216  000220 DT16:    .WORD   $RPDT,$RPSN,$RPOF,$RPDC,$RPCC,$TATUS,0
     10 054610  000236  000240  000000 DT17:    .WORD   $RPBAE,$RPCS3,0
```

```
                                .SBTTL  ASCII MESSAGES

054616  120  122  123  LIN2C:  .ASCIZ  /PRSNT COMMAND= /
054636  040  040  120  LIN2P:  .ASCIZ  /  PREVS COMAND= /
054657  052  040  105  LIN2S:  .ASCIZ  /* ERROR AT BAD TRACK/SECTOR/
054713  105  122  122  LINM3:  .ASCIZ  /ERROR AT C/
054726  040  124  000  T:      .ASCIZ  / T/
054731  120  122  123  LINN3:  .ASCIZ  /PRSNT ADDR= C/
054747  040  123  000  S:      .ASCIZ  / S/
054752  040  040  120  LINP3:  .ASCIZ  /  PREVS ADDR= C/
054772  123  124  101  LINS3:  .ASCIZ  /START CYL= /
055006  040  040  105  LINEN3: .ASCIZ  /  END CYL= /
055022  040  040  101  LINA3:  .ASCIZ  /  ACTUAL CYL= /
055041  040  040  124  LINT3:  .ASCIZ  /  TRK= /
055051  040  122  120  LINCA3: .ASCIZ  / RPDC= /
055061  122  120  104  LINDA3: .ASCIZ  /RPDA= /
055070  122  120  102  LINB3:  .ASCIZ  /RPBA= /
055077  040  040  122  LINW3:  .ASCIZ  /  RPWC= /
055110  123  124  101  LINST3: .ASCIZ  /START TRK= /
055124  123  124  101  LINSS3: .ASCIZ  /START SEC= /
055140  102  125  106  LINM4:  .ASCIZ  /BUFFER ADDR= /
055156  040  040  127  LINS4:  .ASCIZ  /  WRD CNT= /
055172  040  040  116  LINX4:  .ASCIZ  /  NMBR WRDS XFRD= /
055215  105  130  120  LIND5:  .ASCIZ  /EXPCTD DATA= /
055233  040  040  122  LINB5:  .ASCIZ  /  RECEVD DATA= /
055253  040  040  127  LINP5:  .ASCIZ  /  WORD POS= /
055270  110  105  101  LINS5:  .ASCIZ  /HEADER FROM ERROR SECTOR= /
055323  122  120  105  LINEP5: .ASCIZ  /RPEC1= /
055333  040  040  122  LINE05: .ASCIZ  /  RPEC2= /
055345  123  105  103  LINB6:  .ASCIZ  /SECTOR IS ECC CORRECTABLE /
055400  123  105  103  LINC6:  .ASCIZ  /SECTOR READ CORRECTLY AFTER /
055435  103  117  122  LING6:  .ASCIZ  /CORRECTED ON /
055453  040  122  105  LINR6:  .ASCIZ  / RETRY(S)/
055465  125  116  103  LINUO6: .ASCIZ  /UNCORRECTABLE AFTER /
055512  040  040  115  LIN7M:  .ASCIZ  /  MIS POS ERRORS= /
055535  124  117  124  LIN7P:  .ASCIZ  /TOTALS; SEEKS= /
055555  040  040  123  LIN7S:  .ASCIZ  /  SKI ERRORS= /
055574  124  117  124  LIN7T:  .ASCIZ  /TOTALS; ERRORS= /
055615  040  127  122  LIN7X:  .ASCIZ  / WRDS WRITN= /
055633  040  127  122  LIN7R:  .ASCIZ  / WRDS READ= /

055650  105  122  122  LIN8M:  .ASCIZ  /ERROR DURING RETRY/
055673  104  101  124  LIN9B:  .ASCIZ  /DATA COMPARISON ERRORS/
055722  040  040  040  LIN9H:  .ASCII  /          WORD  EXPCTD  RECEVD/<CRLF>
055760  101  104  104          .ASCIZ  /ADDR     POS   DATA    DATA/<CRLF>
056015  040  040  040  LIN9I:  .ASCII  /          WORD  RECEVD/<CRLF>
056043  101  104  104          .ASCIZ  /ADDR     POS   DATA/<CRLF>
056070  124  117  124  LIN9E:  .ASCIZ  /TOTAL COMPARE ERRORS= /
056117  124  110  105  LIN9G:  .ASCIZ  /THE DATA COMPARED OK/<CRLF>
056145  105  122  122  LIN10A: .ASCIZ  /ERROR BURST BEGINS AT WORD /
056201  040  111  116  LIN10B: .ASCIZ  / IN DATA FIELD OF ERROR SECTOR/<CRLF>
056241  105  122  122  LIN10C: .ASCII  /ERROR WAS NOT IN THE DATA READ - /<CRLF>
056303  105  103  103          .ASCIZ  /ECC CORRECTION CAN'T BE PERFORMED/
056345  105  103  103  LIN10H: .ASCII  /ECC CORRECTION RESULTS/<CRLF>
056374  040  040  040          .ASCII  /          WORD  BAD     CORRECTED /<CRLF>
056436  101  104  104          .ASCIZ  /ADDR     POS   DATA    DATA/<CRLF>
056473  103  117  116  LIN11H: .ASCIZ  /CONTENTS OF ERROR SECTOR (REPORTED ABOVE)/<CRLF>
```

```
     62 056546      101      104      104  LIN11:  .ASCIZ  /ADDR     HEADER/<CRLF>
     63 056567      101      104      104  LIN11A: .ASCIZ  /ADDR     DATA/<CRLF>
     64 056606      040                   BLNKS4: .ASCII  / /
     65 056607      040                   BLNKS3: .ASCII  / /
     66 056610      040                   BLNKS2: .ASCII  / /
     67 056611      040      000          BLNKS1: .ASCIZ  / /
     68 056613      122      105      124  LINX5:.ASCIZ    /RETRIEVED BY A RDHD COMMAND/
```

```
                                        .SBTTL  TELETYPE MESSAGES

  056647    077     000                 QUES:   .ASCIZ  /?/
  056651    075     000                 EQUAL:  .ASCIZ  /=/
  056653    054     000                 COMMA:  .ASCIZ  /,/
  056655    055     000                 DASM:   .ASCIZ  /-/
  056657    011     000                 TAB:    .ASCIZ  <11>
  056661    104     122     111         DRVMSG: .ASCIZ  /DRIVE/
  056667    040     117     106         UNTOFF: .ASCIZ  / OFFLINE/
  056700    040     117     116         UNTON:  .ASCIZ  / ONLINE/
  056710    040     116     117         UNTNOT: .ASCIZ  / NOT BEING TESTED/
  056732    040     101     114         UNTASN: .ASCIZ  / ALREADY BEING TESTED/
  056760    040     116     117         NOTRP:  .ASCIZ  / NOT AN RP07/
  056775    040     116     117         NOTPRS: .ASCIZ  / NOT PRESENT/
  057012    040     116     117         NOTAVL: .ASCIZ  / NOT AVAILABLE/
  057031    040     125     116         NOTSAF: .ASCIZ  / UNSAFE/
  057041    040     114     117         LODEV:  .ASCIZ  / LOAD DEVICE/
  057056    040     116     117         NINLEV: .ASCIZ  / NON-INTERLEAVED/
  057077    200     116     117         NODFLT: .ASCIZ  <CRLF>/NO DEFAULT/
  057113    200     104     122         DRSTAT: .ASCIZ  <CRLF>/DRIVE STATUS:/
  057132    120     107     000         MSGPG:  .ASCIZ  /PG/
  057135    040     040     040         MSHW1:  .ASCIZ  /   HW1 /
  057145    040     040     040         MSHW2:  .ASCIZ  /   HW2 /
  057155    122     120     060         $RP07:  .ASCIZ  /RP07/
  057162    122     120     060         $RP07P: .ASCIZ  /RP07/
  057167    200     012                 MSGREP: .ASCII  <CRLF><LF>
  057171    057     134     057                 .ASCIZ  @/\/\/\/\/\/\/\/\/\/\/\/-PERFORMANCE REPORT-\/\/\/\/\/\/\/\/\/\/\/\@
  057274    200                         TRMREP: .ASCII  <CRLF>
  057275    134     057     134                 .ASCII  @\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/@
  057377    200     000                         .ASCIZ  <CRLF>
  057401    055     055     055         DASH5:  .ASCIZ  /-----/
  057407    055     055     055         DASH13: .ASCIZ  /-------------/
  057425    123     125     115         MSGSUM: .ASCIZ  /SUMMARY, /
  057437    104     122     117         MSGDRP: .ASCIZ  /DROPPED, /
  057451    105     040     116         MSGEOP: .ASCIZ  /E N D   O F   P A S S/
  057477    105     040     116         MSGEOT: .ASCIZ  /E N D   O F   T E S T-----------------------------------EOT/
  057573    200     103     117         MSGCON: .ASCIZ  <CRLF>/CONTINUING.../
  057612    057     040     120         MSPASS: .ASCIZ  @/ PASS @
  057622    040     124     117         MSTOTL: .ASCIZ  / TOTAL /
  057632    040     130     061         MSGX10: .ASCIZ  / X10↑6/
  057641    007     200     077         DROPNG: .ASCIZ  <BELL><CRLF>/?FATAL OR EXCESSIVE ERRORS/
  057676    040     117     116         MSGON:  .ASCIZ  / ON /
  057703    040     123     124         ASGND:  .ASCIZ  / STARTED/
  057714    200     007     077         NEDCLK: .ASCIZ  <CRLF><BELL>/? 'L' OR 'P' CLOCK REQUIRED ON SYSTEM/<CRLF>
  057765    116     000                 N:      .ASCIZ  /N/
  057767    131     000                 Y:      .ASCIZ  /Y/
  057771    056     000                 PERIOD: .ASCIZ  /./
  057773    040     077     103         MSWRO:  .ASCIZ  / ?CAN'T WRITE IN 'READ ONLY' MODE/<CRLF>
  060036    040     077     111         INVLD:  .ASCIZ  / ?INVALID COMMAND/<CRLF>
  060061    200     105     116         ENTCOM: .ASCIZ  <CRLF>/ENTER COMMAND: /
  060102    040     101     104         ENTLMT: .ASCIZ  / ADDRESS LIMITS;/<CRLF>
  060124    200     105     116         ENTADR: .ASCIZ  <CRLF>/ENTER BAD SECTR ADRS:/<CRLF>
  060154    072     000                 COLON:  .ASCIZ  /:/
  060156    116     117     116         NONE:   .ASCIZ  /NONE/
  060163    040     077     111         BADENT: .ASCIZ  / ?INVALID ENTRY/<CRLF>
  060204    200     012     116         NODRVS: .ASCIZ  <CRLF><LF>/NO DRIVES ASSIGNED/<CRLF>
  060232    104     122     126         DRVSN:  .ASCIZ  @DRV S/N: @
```

TELETYPE MESSAGES

```
     62 060244      200      103      110  MSPRM:   .ASCIZ  <CRLF>/CHANGE DRIVE PARAMETERS (L) N ? /
     83 060306      200      104      117  MESFE:   .ASCIZ  <CRLF>/DO YOU WANT TO WRITE ANYWHERE ON MEDIA (L) N ? /
     84 060367      200               OVRWRT:  .ASCII  <CRLF>
     85 060370      007      011      041       .ASCII  <BELL>/ ! CUSTOMER DATA WILL BE OVERWRITTEN !/<CRLF>
     86 060440      007      011      055       .ASCII  <BELL>/ ---------------------------------------/<CRLF>
     87 060510      103      117      116       .ASCIZ  /CONTINUE (L)  ? /
     88 060531      200      052      040  FEONLY:  .ASCIZ  <CRLF>/* TESTING FE CYLINDER ONLY */<CRLF>
     89 060570      200      052      040  MREAD:   .ASCIZ  <CRLF>/* PROGRAM IS LOCKED IN 'READ ONLY' MODE */<CRLF>
     91                                    .EVEN
```

F3

PARAMETER ENTRY TABLE

```
                                .SBTTL  PARAMETER ENTRY TABLE

060644  061002  031000  001466  PARLST: .WORD   PAR1.12800..WRDCNT
060652  061041  077777  001470          .WORD   PAR2.32767..INTRVL
060660  061331  077777  001462          .WORD   PAR12.32767..CMPTIM
060666  061555  077777  001474          .WORD   PAR19.32767..PASSES
060674  061121  000017  001476          .WORD   PAR3.15..PATTERN
060702  061264  000001  001500          .WORD   PAR11.1.RANDWC
060710  061414  000007  001502          .WORD   PAR14.7.RATIO
060716  061511  000001  001504          .WORD   PAR16.1.ENDING
060724  061447  000001  001506          .WORD   PAR15.1.WRTCHK
060732  061577  000001  001510          .WORD   PAR21.1.RANDOM
060740  000000                          .WORD   0               ;TABLE TERMINATOR

060742      040     057     040  SLASH:  .ASCIZ  / / /
060746      200     103     110  ASKPAR: .ASCIZ  <CRLF>/CHANGE PARAMETERS (L) N ? /
061002      115     101     130  PAR1:   .ASCIZ  /MAXIMUM WORD COUNT (6-12800.) /
061041      124     111     115  PAR2:   .ASCIZ  /TIME BETWEEN REPORTS (IN MINUTES, 0=NO REPORT) /
061121      104     101     124  PAR3:   .ASCIZ  /DATA PATTERN NUMBER (0=RANDOM, 1-15.=FIXED) /
061176      115     101     130  PAR4:   .ASCIZ  /MAX CYL /
061207      115     111     116  PAR5:   .ASCIZ  /MIN CYL /
061220      115     101     130  PAR6:   .ASCIZ  /MAX TRK /
061231      115     111     116  PAR7:   .ASCIZ  /MIN TRK /
061242      115     101     130  PAR8:   .ASCIZ  /MAX SEC /
061253      115     111     116  PAR9:   .ASCIZ  /MIN SEC /
061264      127     117     122  PAR11:  .ASCIZ  /WORD COUNT MODE (0=RANDOM, 1=FIXED) /
061331      124     111     115  PAR12:  .ASCIZ  /TIME BETWEEN DATA COMPARES (IN MINUTES, 0=ALWAYS) /
061414      122     105     101  PAR14:  .ASCIZ  /READ TO WRITE RATIO (0-7) /
061447      105     116     101  PAR15:  .ASCIZ  /ENABLE WRITE CHECK (0=NO, 1=YES) /
061511      105     116     104  PAR16:  .ASCIZ  /END OF PASS MODE (0=SEEKS, 1=DATA) /
061555      116     125     115  PAR19:  .ASCIZ  /NUMBER OF PASSES /
061577      123     105     105  PAR21:  .ASCIZ  /SEEK MODE (0=RANDOM, 1=SEQUENTIAL) /

                                .EVEN
```

DRIVE PARAMETER TABLES (DPB)

```
                                        .SBTTL  DRIVE PARAMETER TABLES (DPB)

                                        ;PARAMETER TABLE POINTERS FOR ADDRESS LIMITS

061644  061664                          TABLE:  .WORD   TABLE0          ;PARAMETER TABLE FOR DRIVE 0
061646  061732                                  .WORD   TABLE1          ;PARAMETER TABLE FOR DRIVE 1
061650  062000                                  .WORD   TABLE2          ;PARAMETER TABLE FOR DRIVE 2
061652  062046                                  .WORD   TABLE3          ;PARAMETER TABLE FOR DRIVE 3
061654  062114                                  .WORD   TABLE4          ;PARAMETER TABLE FOR DRIVE 4
061656  062162                                  .WORD   TABLE5          ;PARAMETER TABLE FOR DRIVE 5
061660  062230                                  .WORD   TABLE6          ;PARAMETER TABLE FOR DRIVE 6
061662  062276                                  .WORD   TABLE7          ;PARAMETER TABLE FOR DRIVE 7

                                        ;PARAMETER TABLE FOR ADDRESS LIMITS

061664  061207  000000  046452          TABLE0: .WORD   PAR5.0,MINCYL+DRIVE0
061672  061176  001166  046450                  .WORD   PAR4.630.,MAXCYL+DRIVE0
061700  061231  000035  046456                  .WORD   PAR7.29.,MINTRK+DRIVE0
061706  061220  000035  046454                  .WORD   PAR6.29.,MAXTRK+DRIVE0
061714  061253  000041  046462                  .WORD   PAR9.33.,MINSEC+DRIVE0
061722  061242  000041  046460                  .WORD   PAR8.33.,MAXSEC+DRIVE0.0

061732  061207  000000  046714          TABLE1: .WORD   PAR5.0,MINCYL+DRIVE1
061740  061176  001166  046712                  .WORD   PAR4.630.,MAXCYL+DRIVE1
061746  061231  000035  046720                  .WORD   PAR7.29.,MINTRK+DRIVE1
061754  061220  000035  046716                  .WORD   PAR6.29.,MAXTRK+DRIVE1
061762  061253  000041  046724                  .WORD   PAR9.33.,MINSEC+DRIVE1
061770  061242  000041  046722                  .WORD   PAR8.33.,MAXSEC+DRIVE1.0

062000  061207  000000  047156          TABLE2: .WORD   PAR5.0,MINCYL+DRIVE2
062006  061176  001166  047154                  .WORD   PAR4.630.,MAXCYL+DRIVE2
062014  061231  000035  047162                  .WORD   PAR7.29.,MINTRK+DRIVE2
062022  061220  000035  047160                  .WORD   PAR6.29.,MAXTRK+DRIVE2
062030  061253  000041  047166                  .WORD   PAR9.33.,MINSEC+DRIVE2
062036  061242  000041  047164                  .WORD   PAR8.33.,MAXSEC+DRIVE2.0

062046  061207  000000  047420          TABLE3: .WORD   PAR5.0,MINCYL+DRIVE3
062054  061176  001166  047416                  .WORD   PAR4.630.,MAXCYL+DRIVE3
062062  061231  000035  047424                  .WORD   PAR7.29.,MINTRK+DRIVE3
062070  061220  000035  047422                  .WORD   PAR6.29.,MAXTRK+DRIVE3
062076  061253  000041  047430                  .WORD   PAR9.33.,MINSEC+DRIVE3
062104  061242  000041  047426                  .WORD   PAR8.33.,MAXSEC+DRIVE3.0

062114  061207  000000  047662          TABLE4: .WORD   PAR5.0,MINCYL+DRIVE4
062122  061176  001166  047660                  .WORD   PAR4.630.,MAXCYL+DRIVE4
062130  061231  000035  047666                  .WORD   PAR7.29.,MINTRK+DRIVE4
062136  061220  000035  047664                  .WORD   PAR6.29.,MAXTRK+DRIVE4
062144  061253  000041  047672                  .WORD   PAR9.33.,MINSEC+DRIVE4
062152  061242  000041  047670                  .WORD   PAR8.33.,MAXSEC+DRIVE4.0

062162  061207  000000  050124          TABLE5: .WORD   PAR5.0,MINCYL+DRIVE5
062170  061176  001166  050122                  .WORD   PAR4.630.,MAXCYL+DRIVE5
062176  061231  000035  050130                  .WORD   PAR7.29.,MINTRK+DRIVE5
062204  061220  000035  050126                  .WORD   PAR6.29.,MAXTRK+DRIVE5
062212  061253  000041  050134                  .WORD   PAR9.33.,MINSEC+DRIVE5
062220  061242  000041  050132                  .WORD   PAR8.33.,MAXSEC+DRIVE5.0
```

DRIVE PARAMETER TABLES (DPB)

```
062230  061207  000000  050366  TABLE6: .WORD   PAR5.0,MINCYL-DRIVE6
062236  061176  001166  050364          .WORD   PAR4.650.,MAXCYL-DRIVE6
062244  061231  000035  050372          .WORD   PAR7.29.,MINTRK-DRIVE6
062252  061220  000035  050370          .WORD   PAR6.29.,MAXTRK-DRIVE6
062260  061253  000041  050376          .WORD   PAR9.33.,MINSEC-DRIVE6
062266  061242  000041  050374          .WORD   PAR8.33.,MAXSEC-DRIVE6,0

062276  061207  000000  050630  TABLE7: .WORD   PAR5.0,MINCYL-DRIVE7
062304  061176  001166  050626          .WORD   PAR4.650.,MAXCYL-DRIVE7
062312  061231  000035  050634          .WORD   PAR7.29.,MINTRK-DRIVE7
062320  061220  000035  050632          .WORD   PAR6.29.,MAXTRK-DRIVE7
062326  061253  000041  050640          .WORD   PAR9.33.,MINSEC-DRIVE7
062334  061242  000041  050636          .WORD   PAR8.33.,MAXSEC-DRIVE7,0
```

```
  1                                     .SBTTL  ROUTINE TO SIZE MEMORY

                                        ;;*****************************************************************
                                        ;*CALL:
                                        ;*      JSR     PC,@SIZE
                                        ;*      RETURN
                                        ;*@LSTAD WILL CONTAIN THE LAST AVAILABLE MEMORY LOCATION

 062344  010046                        @SIZE:  MOV     R0,-(SP)        ;;SAVE R0 ON THE STACK
 062346  010146                                MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
 062350  013746  000114                        MOV     @#114,-(SP)     ;;SAVE MEMORY ERROR VECTOR PS & PC
 062354  013746  000116                        MOV     @#116,-(SP)
 062360  012737  000116  000114                MOV     #116,@#114      ;;IGNORE PARITY ERRORS WHILE SIZING
 062366  012737  000002  000116                MOV     #RTI,@#116
 062374  013746  000004                        MOV     @#ERRVEC,-(SP)  ;;SAVE PRESENT ERROR VECTOR PS & PC
 062400  013746  000006                        MOV     @#ERRVEC+2,-(SP)
 062404  010600                                MOV     SP,R0           ;;SAVE THE STACK POINTER
                                        ;;SET THE ERRVEC PS TO THE PRESENT PS
                                                TRAP                    ;;PUSH OLD PSW AND PC ON STACK
 062406  104400                                MOV     (SP)+,@#ERRVEC+2        ;;SAVE THE PSW IN @#ERRVEC+2
 062410  012637  000006                        MOV     #20,@#ERRVEC    ;;SET FOR TIMEOUT
 062414  012737  062434  000004                MOV     #20000,R1       ;;FIRST ADDRESS
 062422  012701  020000                1$:     TST     (R1)            ;;TEST THIS ADDRESS
 062426  005711                                TST     (R1)+           ;;STEP TO NEXT ADDRESS
 062430  005721                                BR      1$              ;;TRY ANOTHER
 062432  000775                        2$:     SUB     #2,R1           ;;DROP BACK
 062434  162701  000002                        MOV     R0,SP           ;;RESTORE THE STACK
 062440  010006                                MOV     (SP)+,@#ERRVEC+2 ;;RESTORE ERROR VECTOR
 062442  012637  000006                        MOV     (SP)+,@#ERRVEC
 062446  012637  000004                        MOV     (SP)+,@#116     ;;RESTORE MEMORY ERROR VECTOR
 062452  012637  000116                        MOV     (SP)+,@#114
 062456  012637  000114                        MOV     R1,@LSTAD       ;;LAST ADDRESS
 062462  010137  062474                        MOV     (SP)+,R1        ;;RESTORE R1
 062466  012601                                MOV     (SP)+,R0        ;;RESTORE R0
 062470  012600                                RTS     PC
 062472  000207                        @LSTAD: .WORD   0               ;;CONTAINS THE LAST ADDRESS
 062474  000000
```

```
                        .SBTTL  BUSADR - GET BUS ADDRESS AND VECTOR ADDRESS
                ;
                ;THIS ROUTINE IS USED TO INSURE THE BUS ADDRESS OF THE BHXX/8P07
                ;IS SETUP FOR THE PROPER ADDRESS. IT WILL ALSO READ THE ADDRESS
                ;FROM THE TTY IF REQUIRED.
                ;
                ;NOTE: THIS ROUTINE DESTROYS R0-R4
                ;CALL:
                ;
                ;       JSR     PC,BUSADR
                ;       RETURN
                ;
 062476 005737  001332  BUSADR: TST     CHGADR          ;INPUT FROM TTY REQUESTED?
 062502 002046                  BGE     30              ;NO--BRANCH
 062504 005037  001332          CLR     CHGADR          ;YES--CLEAR THE REQUEST FLAG
 062510 104401  001203          TYPE    ,$CRLF          ;CR-LF
 062514 005037  001334  10:     CLR     CFLAG           ;CLEAR CONTROL C FLAG
 062520 012700  001272          MOV     #IRPADR,R0      ;FIRST ADDRESS
 062524 104401  062636          TYPE    ,MRPCS1         ;"RPCS1="
 062530 011046                  MOV     (R0),-(SP)      ;PRESENT RPCS1 ADDRESS
 062532 104402                  TYPOC                   ;TYPE IT
 062534 104401  056610          TYPE    ,BLNKS2         ;TYPE 2 BLANKS
 062540 104411                  RDLIN                   ;GET THE ENTRY
 062542 012601                  MOV     (SP)+,R1        ;ADDRESS OF ASCII TEXT
 062544 005737  001334          TST     CFLAG           ;WAS (^C) TYPED?
 062550 001361                  BNE     10              ;BR IF YES
 062552 004537  062654          JSR     R5,CK.NUM       ;ENTER AND STORE THE NEW ADDRESS
 062556 000756                  BR      10              ;ERROR EXIT
                ;
 062560 012700  001274  20:     MOV     #IRPVEC,R0      ;VECTOR ADDRESS
 062564 104401  062645          TYPE    ,MRPVEC         ;"RPVEC="
 062570 011046                  MOV     (R0),-(SP)      ;PRESENT BHXX/8P07 VECTOR ADDRESS ON THE STACK
 062572 104402                  TYPOC                   ;TYPE IT
 062574 104401  056610          TYPE    ,BLNKS2         ;TYPE 2 BLANKS
 062600 104411                  RDLIN                   ;READ THE ENTRY
 062602 012601                  MOV     (SP)+,R1        ;ASCII TEXT ADDRESS
 062604 005737  001334          TST     CFLAG           ;WAS (^C) TYPED?
 062610 001341                  BNE     10              ;BR IF YES
 062612 004537  062654          JSR     R5,CK.NUM       ;ENTER AND STORE NEW ADDRESS
 062616 000760                  BR      20              ;ERROR EXIT
                ;
 062620 012700  001272  30:     MOV     #IRPADR,R0      ;FIRST ADDRESS OF NEW PARAMETERS
 062624 012701  040640          MOV     #RPADR,R1       ;FIRST ADDRESS OF WHERE TO PUT THEM
 062630 012021                  MOV     (R0)+,(R1)+     ;BUS ADDRESS
 062632 012021                  MOV     (R0)+,(R1)+     ;VECTOR ADDRESS
 062634 000207                  RTS     PC              ;RETURN
                ;
 062636   122   120   103  MRPCS1: .ASCIZ  @RPCS1=@
 062645   122   120   126  MRPVEC: .ASCIZ  @RPVEC=@
```

```
                                        .SBTTL  CX.NUM - CHECK NUMBER (OCTAL)
                                        ;THIS ROUTINE CHECKS AN ASCIZ STRING FOR LEGAL CHARACTERS
                                        ;AND FORMS AN OCTAL NUMBER IN R2
                                        ;CALL:
                                        ;       MOV     @ADR,R1         ;ADRS OF ASCIZ STRING
                                        ;       JSR     R5,CX.NUM       ;R5 CHANGED
                                        ;       RET                     ;ERROR EXIT
                                        ;       RET                     ;NORMAL EXIT

062654  010246                  CX.NUM: MOV     R2,-(SP)        ;SAVE R2
062656  010346                          MOV     R3,-(SP)        ;SAVE R3
062660  010446                          MOV     R4,-(SP)        ;SAVE R4
062662  012703  000006                  MOV     #6,R3           ;MAX OCTAL DIGITS IN THE NUMBER
062666  005002                          CLR     R2              ;FINAL OCTAL VALUE
062670  112104                  1$:     MOVB    (R1)+,R4        ;GET CURRENT POINTED BYTE
062672  001424                          BEQ     3$              ;BRANCH,IF TERMINATOR DETECTED
062674  120427  000060                  CMPB    R4,#'0          ;SMALLER THAN ASCII-0
062700  103425                          BLO     5$              ;YES,ERROR EXIT
062702  120427  000067                  CMPB    R4,#'7          ;LARGER THAN ASCII-7 ?
062706  101022                          BHI     5$              ;YES,ERROR EXIT
062710  006302                          ASL     R2              ;SHIFT LEFT
062712  103420                          BCS     5$              ;
062714  006302                          ASL     R2              ;ONE
062716  103416                          BCS     5$              ;
062720  006302                          ASL     R2              ;OCTAL DIGIT
062722  103414                          BCS     5$              ;ERROR IF CARRY BIT SET
062724  042704  177770                  BIC     #177770,R4      ;CHOP OFF HIGHER BITS
062730  060402                          ADD     R4,R2           ;APPENDING CURRENT DIGIT TO NUMBER
062732  005303                          DEC     R3              ;DECREMENT BYTE COUNT
062734  001401                          BEQ     2$              ;BRANCH,IF LAST BYTE
062736  000754                          BR      1$              ;LOOPING BACK

062740  112104                  2$:     MOVB    (R1)+,R4        ;CHECK TERMINATOR
062742  001004                          BNE     5$              ;ERROR EXIT
062744  005702                  3$:     TST     R2              ;FINAL VALUE= 0
062746  001401                          BEQ     4$              ;YES,THEN NOT REPLACE THE ORIGINAL VALUE
062750  010210                          MOV     R2,(R0)         ;REPLACE THE ORIGINAL VALUE
062752  005725                  4$:     TST     (R5)+           ;ADJUST FOR NORMAL RETURN
062754  012604                  5$:     MOV     (SP)+,R4        ;RESTORE R4
062756  012603                          MOV     (SP)+,R3        ;RESTORE R3
062760  012602                          MOV     (SP)+,R2        ;RESTORE R2
062762  000205                          RTS     R5              ;EXIT
                                        .EVEN
062764  000000                  PATCH:  .WORD   0               ;ALLOCATE 200 OCTAL LOCATIONS FOR PATCHING

063364                          CYLNDR: .BLKW   256.            ;ONE SECTOR OF WORDS
064370                          ENDPGM=.
```

L3


```
                                .SBTTL  HELP TEXT MESSAGE
                        ;
064370  200             MSHELP: .ASCII  <CRLF>
064371  007 124 110             .ASCII  <BELL>/THE HELP MESSAGE CAN ONLY BE TYPED ONCE./
064442  007                     .ASCII  <BELL>
064443  200 104 117             .ASCIZ  <CRLF>/DO YOU WANT IT TYPED (L) ? /
064500  200             HELPTX: .ASCII  <CRLF>
064501  200 104 122             .ASCII  <CRLF>/DRIVE PARAMETERS:/
064523  200 115 101             .ASCII  <CRLF>/MAXCYL   :max cylinder adrs/
064557  200 115 111             .ASCII  <CRLF>/MINCYL   :min cylinder adrs/
064613  200 115 101             .ASCII  <CRLF>/MAXTRK   :max track adrs/
064644  200 115 111             .ASCII  <CRLF>/MINTRK   :min track adrs/
064675  200 115 101             .ASCII  <CRLF>/MAXSEC   :max sector adrs/
064727  200 115 111             .ASCII  <CRLF>/MINSEC   :min sector adrs/
064761  200                     .ASCII  <CRLF>
064762  200 124 110             .ASCII  <CRLF>/THE FOLLOWING ARE VALID COMMANDS:/
065024  200 040 127             .ASCII  <CRLF>/ W0<CR> assign drive and do SEQUENTIAL WRITE data/
065106  200 040 122             .ASCII  <CRLF>/ R0<CR> assign drive and do SEQUENTIAL READ data/
065167  200 040 124             .ASCII  <CRLF>/ T0<CR> assign drive  to do (random or sequential) TEST/
065257  200 127 124             .ASCII  <CRLF>/WT0<CR> assign drive, to do SEQUENTIAL WRITE data and/
065345  200 040 040             .ASCII  <CRLF>/         to do (random or sequential) TEST/
065417  200 040 104             .ASCII  <CRLF>/ D0<CR> DROP a drive from test/
065456  200 040 123             .ASCII  <CRLF>/ S0<CR> type the performance SUMMARY report/
065532  200                     .ASCII  <CRLF>
065533  200 040 040             .ASCII  <CRLF>/  0 is the drive number (0-7 or 'A' for all drives)/
065617  200                     .ASCII  <CRLF>
065620  200 123 127             .ASCII  <CRLF>/SWITCH REGISTER SETTINGS:/
065652  200 123 127             .ASCII  <CRLF>/SW15= (100000)  halt on error/
065710  200 123 127             .ASCII  <CRLF>/SW14= (040000)  /
065731  200 123 127             .ASCII  <CRLF>/SW13= (020000)  inhibit error typeout/
065777  200 123 127             .ASCII  <CRLF>/SW12= (010000)  /
066020  200 123 127             .ASCII  <CRLF>/SW11= (004000)  /
066041  200 123 127             .ASCII  <CRLF>/SW10= (002000)  ring tty bell on error/
066110  200 123 127             .ASCII  <CRLF>@SW09= (001000)  change end of pass to 1/4 of normal@
066174  200 123 127             .ASCII  <CRLF>/SW08= (000400)  inhibit end of pass messages/
066251  200 123 127             .ASCII  <CRLF>/SW07= (000200)  display all data compare errors/
066331  200 123 127             .ASCII  <CRLF>/SW06= (000100)  don't change parameters (loop on present values)/
066432  200 123 127             .ASCII  <CRLF>/SW05= (000040)  A. partial register display if error/
066517  200 040 040             .ASCII  <CRLF>/                B. no ECC correction results displayed if error/
066617  200 123 127             .ASCII  <CRLF>/SW04= (000020)  A. do not check for maximum error count/
066707  200 040 040             .ASCII  <CRLF>/                B. do not drop drive at end of test/
066773  200 123 127             .ASCII  <CRLF>/SW03= (000010)  A. display error sector if DCK, DTE or WCF error/
067074  200 040 040             .ASCII  <CRLF>/                B. display sector if DCK uncorrectable after 28th ret
ry/
067204  200 040 040             .ASCII  <CRLF>/                C. if data compare error & SW07 set, display remainde
r of bu
067325  200 123 127             .ASCII  <CRLF>/SW02= (000004)  A. do not type drive status at program start/
067422  200 040 040             .ASCII  <CRLF>/                B. do not type performance report after specified tim
e/
067531  200 040 040             .ASCII  <CRLF>/                C. prompt 'write anywhere' question during auto test
mode/
067643  200 123 127             .ASCII  <CRLF>@SW01= (000002)  inhibit data compare after read without DCK error@
067745  200 123 127             .ASCII  <CRLF>/SW00= (000001)  read only mode/
```

```
    1 070004      200                       .ASCII  <CRLF>
    2 070005      200      116      117     .ASCII  <CRLF>/NOTE: If a DCK error occurs,  the program  will execute/
    3 070075      200      040      040     .ASCII  <CRLF>/       a data compare on the data in memory, regardless/
    4 070165      200      040      040     .ASCII  <CRLF>/       of the setting in SW01./
    5 070223      200                       .ASCII  <CRLF>
    6 070224      200      124      171     .ASCII  <CRLF>/Type control-c (^C) to HALT the program/
    7 070274      200                       .ASCII  <CRLF>
    8 070275      200      124      157     .ASCII  <CRLF>/To change RHXX adresses,  start program at address 204/
    9 070364      200                       .ASCII  <CRLF>
   10 070365      200      056      105     .ASCII  <CRLF>/.END OF HELP/
   11 070402      200                       .ASCII  <CRLF>
   12 070403      200      000              .ASCIZ  <CRLF>
   13
   15           000200                .END    200
```

SYMBOL TABLE

```
ABASE = 176700
ABNRML  031452
ACDW1 = 000000
ACDW2 = 000000
ACPUOP= 000000
ACTDRV  040600
ACTSTR  040601
ADDW0 = 000000
ADDW1 = 000000
ADDW10= 000000
ADDW11= 000000
ADDW12= 000000
ADDW13= 000000
ADDW14= 000000
ADDW15= 000000
ADDW2 = 000000
ADDW3 = 000000
ADDW4 = 000000
ADDW5 = 000000
ADDW6 = 000000
ADDW7 = 000000
ADDW8 = 000000
ADDW9 = 000000
ADEVCT= 000000
ADEVM = 000000
AENV  = 000000
AENVM = 000000
AFATAL= 000000
AIR   = 000004
AMADR1= 000000
AMADR2= 000000
AMADR3= 00000C
AMADR4= 000000
AMAMS1= 000000
AMAMS2= 000000
AMAMS3= 000000
AMAMS4= 000000
AMSGAD= 000000
AMSGLG= 000000
AMSGTY= 000000
AMTYP1= 000000
AMTYP2= 000000
AMTYP3= 000000
AMTYP4= 000000
AOE   = 001000
APASS = 000000
APRIOR= 000000
APTCSU= 000040
APTENV= 000001
APTSIZ= 000200
APTSPO= 000100
ASGND   057703
ASGN1   027300
ASGN2   027354
ASGN3   027444
ASGN4   027610
ASGN6   027612
ASGN7   027624
ASGN8   027666
ASKPAR  060746
ASNERR  031332
ASNLST  001542
ASNMSG  031356
ASSIGN  027202
ASWREG= 000000
ATA   = 100000
ATABIT  040630
ATESTN= 000000
ATTN    001316
ATO   = 000001
AT1   = 000002
AT2   = 000004
AT3   = 000010
AT4   = 000020
AT5   = 000040
AT6   = 000100
AT7   = 000200
AUNIT = 000000
AUSWR = 000000
AUTLST  032100
AVAIL   001610
AVECT1= 000254
AVECT2= 000000
A16   = 000400
A17   = 001000
BADENT  060163
BADSEC  001336
BADTMO  003440
BAI   = 000010
BEGCOD  001514
BEGPAT  001512
BEGWC   001516
BELL  = 000007
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
BLKADR  002056
BLNKS1  056611
BLNKS2  056610
BLNKS3  056607
BLNKS4  056606
BPE   = 000020
BPTVEC= 000014
BSE   = 100000
BUFTBL  001654
BUSADR  062476
CFLAG   001334
CHGADR  001332
CHKWC   021572
CI1     042066
CI2     042232
CI3     042260
CI4     042372
CI5     042712
CI6     042734
CI7     042750
CI7B    042764
CI8     043036
CKBUS   014110
CKCLK   024574
CKCLK1  024656
CKCLK2  024730
CKCLK3  024762
CKERR   014010
CKFMT   012022
CKHCE   012212
CKLMTS  021412
CKSWR = 104407
CK.CHR  033202
CK.DEC  033154
CK.DIG  033254
CK.NUM  062654
CK.OCT  033126
CLKFLG  001310
CLKOFF  024770
CLR   = 000040
CLRDPB  030164
CLRQUE  046052
CMCNT   001366
CMCYL   001370
CMDAT   014450
CMHED   014360
CMPAR   014174
CMPARD  014200
CMPLMT  001460
CMPRES  022260
CMPRT   015060
CMPRX   015052
CMPTIM  001462
CMSEC   001372
CMSTR   014276
CMSTR2  014436
CMTRK   001373
COLON   060154
COMMA   056653
COMTBL  002076
CPSAVE  035406
CR    = 000015
CRLF  = 000200
CTRAP   034756
CYLLMT= 000150
CYLNDR  063364
DASH    056655
DASH13  057407
DASH5   057401
DATAPK  030132
DATA0   002360
DATA1   002420
DATA10  003060
DATA11  003120
DATA12  003160
DATA13  003220
DATA14  003260
DATA15  003320
DATA2   002460
DATA3   002520
DATA4   002560
DATA5   002620
DATA6   002660
DATA7   002720
DATA8   002760
DATA9   003020
DCK   = 100000
DCKER   010546
DCKER1  010730
DCU   = 000040
DDISP = 177570
DDRVS   001544
DGE   = 000001
DH1     054031
DH14    054206
DH15    054305
DH16    054404
DH17    054464
DH2     054036
DH3     054113
DH4     054141
DH6     054200
DISPLA  001156
DISPLY= 104414
DISPRE  000174
DLT   = 100000
DONE    010206
DPE   = 000010
DPINT   040554
DPR   = 000400
DPRQS   040564
DRIVE = 001220
DRIVE0  046314
DRIVE1  046556
DRIVE2  047020
DRIVE3  047262
DRIVE4  047524
DRIVE5  047766
DRIVE6  050230
DRIVE7  050472
DROP    031362
DROPD   027700
DROPNG  057641
DRQ   = 004000
DRSTAT  057113
DRVACT  040524
DRVCLR= 000111
DRVER   011770
DRVINT  041030
DRVMSG  056661
DRVNO   001320
DRVPAR  001426
DRVPRM  030402
DRVQUE  046150
DRVSN   060232
DRVSTA  040534
DRVTYP  040544
DRY   = 000200
DSWR  = 177570
DTE   = 010000
DTEER   012616
DTUW    040626
DT00  = 000001
DT01  = 000002
DT02  = 000004
DT03  = 000010
DT04  = 000020
DT05  = 000040
DT06  = 000100
DT07  = 000200
DT08  = 000400
DT1     054504
DT14    054530
DT15    054550
DT16    054572
DT17    054610
DT2     054510
DT3     054514
DT4     054520
DT6     054524
DVA   = 004000
DVC   = 000200
ECBAD0  001412
ECBAD1  001420
ECBIT   001376
ECC     015576
```

SYMBOL TABLE

```
ECCX    016412  ENDCMP  015440  HOUR    001340  LINE6   024056  MAIN1   006506
ECC1    016210  ENDCON  001446  HT    = 000011  LINE6A  024070  MAIN2   006644
ECC2    016406  ENDING  001504  IAE   = 002000  LINE6C  024076  MASK    001322
ECGD    001410  ENDPGM= 064370  IAEER   012732  LINE6D  024104  MATCH   015506
ECGD1   001416  ENDSEK  001452  IBSAVE  035410  LINE7   024136  MAXCYL= 000134
ECH   = 000100  ENTADR  060124  IDLE    007234  LINE7A  024256  MAXER   001456
ECI   = 004000  ENTCOM  060061  IE    = 000100  LINE8   024354  MAXSEC= 000144
ECMSK0  001402  ENTLMT  060102  ILF   = 000001  LING6   055435  MAXTRK= 000140
ECMSK1  001404  ENTPR   005556  ILR   = 000002  LINM3   054713  MCPE  = 020000
ECSEC   001400  EQUAL   056651  ILV   = 000004  LINM4   055140  MDPE  = 000400
ECWRD   001406  ERCTR   001362  INCMRD  026106  LINN3   054731  MESFE   060306
ECWRD1  001414  ERPRC1  007636  INCMIS  026156  LINOCT  024366  MINCYL= 000136
EMPTYQ  046130  ERPROC  007622  INCSKI  026132  LINP3   054752  MINSEC= 000146
EMTVEC= 000030  ERR   = 040000  INCSOF  026062  LINP5   055253  MINTRK= 000142
EM1     051024  ERROR = 104000  INCTOT  026202  LINR6   055453  MINUTE  001342
EM10    051337  ERRVEC= 000004  INTRVL  001470  LINSS3  055124  MNTBL   002124
EM11    051402  EWN   = 000002  INVLD   060036  LINST3  055110  MOH   = 020000
EM12    051435  EWNERR  013474  IOTVEC= 000020  LINS3   054772  MOL   = 010000
EM13    051466  FACTOR  017570  IR    = 000100  LINS4   055156  MREAD   060570
EM14    051540  FAIRNS  001326  ISR     043254  LINS5   055270  MRPCS1  062636
EM15    051563  FALPAR  007776  ITCNT   022254  LINT3   055041  MRPVEC  062645
EM2     051077  FALPR1  010012  IXU   = 000100  LINU06  055465  MSGCON  057573
EM20    051617  FEONLY  060531  KSR     026534  LINW3   055077  MSGDRP  057437
EM21    051640  FER   = 000020  KSR1    026542  LINX4   055172  MSGEOP  057451
EM22    051671  FE1   = 000156  KWSVR   026352  LINX5   056613  MSGEOT  057477
EM23    051744  FILBUF  020162  LBC   = 002000  LIN10A  056145  MSGON   057676
EM24    052023  FILLZ   032626  LBT   = 002000  LIN10B  056201  MSGPG   057132
EM25    052071  FILLO   032734  LCE   = 001000  LIN10C  056241  MSGPWR  040102
EM26    052152  FMTER   013012  LF    = 000012  LIN10H  056345  MSGREP  057167
EM27    052177  FMTRK = 000163  LIMIT   001364  LIN11   056546  MSGSUM  057425
EM3     051135  FMT16 = 010000  LINA3   055022  LIN11A  056567  MSGX10  057632
EM30    052234  FRSTER  001352  LINB3   055070  LIN11H  056473  MSHELP  064370
EM31    052266  F0    = 000002  LINB5   055233  LIN2C   054616  MSHW1   057135
EM32    052331  F1    = 000004  LINB6   055345  LIN2P   054636  MSHW2   057145
EM33    052364  F2    = 000010  LINCA3  055051  LIN2S   054657  MSPASS  057612
EM34    052441  F3    = 000020  LINC6   055400  LIN3.1  023242  MSPRM   060244
EM35    052503  F4    = 000040  LINDA3  055061  LIN3.3  023350  MSTOTL  057622
EM36    052541  GENDPB  050734  LINDEC  024420  LIN3.4  023402  MSWAIT  040256
EM37    052572  GENPAR  020672  LIND5   055215  LIN6.2  024112  MSWR0   057773
EM4     051173  GENREG  050754  LINEN3  055006  LIN7M   055512  MXF   = 001000
EM40    052644  GETBUF  017572  LINE05  055333  LIN7P   055535  MXWNDW  040650
EM41    052702  GETID   031070  LINEP5  055323  LIN7R   055633  M.DPID  032250
EM42    052746  GETLMT  030766  LINE1   022274  LIN7S   055555  M.DP40  032306
EM43    053027  GETPAT  021352  LINE2   022342  LIN7T   055574  M.DP41  032342
EM44    053123  GETREG= 000141  LINE2A  022512  LIN7X   055615  M.DP42  032352
EM45    053220  GETREM  032102  LINE2B  022530  LIN8M   055650  M.DP44  032404
EM46    053306  GETREQ  046224  LINE3   022776  LIN9B   055673  M.DP50  032416
EM47    053360  GO    = 000001  LINE3A  023004  LIN9E   056070  N       057765
EM5     051230  GODRIV  020240  LINE3B  023012  LIN9G   056117  NED   = 010000
EM50    053435  GTSWR = 104406  LINE3C  023024  LIN9H   055722  NEDCLK  057714
EM51    053473  HCE   = 000200  LINE3D  023034  LIN9I   056015  NEM   = 004000
EM52    053536  HCEER   013070  LINE3E  023102  LKPAR   005246  NEWASN  030110
EM6     051264  HCI   = 002000  LINE3F  023170  LODEV   057041  NEWUNT  001566
EM60    053602  HCRC  = 000400  LINE4   023446  LODPAR  021742  NINLEV  057056
EM70    053625  HCRCER  011630  LINE5   023536  LSTAD   001330  NODFLT  057077
EM71    053704  HELPTX  064500  LINE5A  023746  MAIN    006340  NODRVS  060204
EM72    053762  HERTZ   001312  LINE5B  024014  MAINDA  006364  NOMTCH  013616
```

SYMBOL TABLE

```
NONE    060156
NOOP  = 000101
NOTAVL  057012
NOTPRS  056775
NOTRP   056760
NOTSAF  057031
NSA   = 100000
OFFDIR= 000200
OFFON = 000001
OFLIN   010110
ONES    003262
ONESEC  001346
ONESUM  025122
OPI   = 020000
OPIER   012506
OPIER1  012556
OPT     041622
OPTBL   002104
OR    = 000200
ORDERQ  001520
OVRWRT  060367
PACK    030162
PAR   = 000010
PARENT  031170
PARER   012640
PARLST  060644
PAR1    061002
PAR11   061264
PAR12   061331
PAR14   061414
PAR15   061447
PAR16   061511
PAR19   061555
PAR2    061041
PAR21   061577
PAR3    061121
PAR4    061176
PAR5    061207
PAR6    061220
PAR7    061231
PAR8    061242
PAR9    061253
PASSES  001474
PAT   = 000020
PATCH   062764
PATTER  001476
PERIOD  057771
PERM    043626
PFECH   035570
PFECH1  035600
PFECH2  035662
PFECH3  035714
PFECH4  035724
PFTSTN  035730
PGE   = 100000
PGM   = 001000
PIP   = 020000
PIRQ  = 177772
PIRQVE= 000240
POPQUE  046246
POSER   012434
PROCES  007472
PRTBAD  016436
PRTIM   010150
PR0   = 000000
PR1   = 000040
PR2   = 000100
PR3   = 000140
PR4   = 000200
PR5   = 000240
PR6   = 000300
PR7   = 000340
PS    = 177776
PSEL  = 002000
PSW   = 177776
PUNSAF  007720
PWRFLG  040100
PWRUP   040124
PWRVEC= 000024
QCNT    045560
QDRV0   045652
QDRV1   045672
QDRV2   045712
QDRV3   045732
QDRV4   045752
QDRV5   045772
QDRV6   046012
QDRV7   046032
QINPT   045570
QOUTPT  045610
QSTART  045630
QSTOP   045632
QTERP = 046052
QUES    056647
RANCYL  021062
RANDOM  001510
RANDWC  001500
RANPAT  021322
RANSEC  021152
RANSIZ  021230
RANTRK  021116
RANXIT  021342
RATIO   001502
RDCHR = 104410
RDDAT = 000171
RDHD  = 000173
RDLIN = 104411
RDONLY  001424
RDY   = 000200
RD.RP   045116
READDR  024444
READHD  017026
READIN= 000121
RECAL = 000107
RECALT  016710
RECALO  017000
REDAPK  030120
RELBUF  017726
RELSE = 000113
REPLZ   032632
RESREG= 104413
RESVEC= 000010
RETRY   001324
REV     001432
RMEXT   040646
RMR   = 000004
RPADR   040640
RPAS  = 000016
RPBA  = 000004
RPBAE = 000050
RPCC  = 000036
RPCS1 = 000000
RPCS2 = 000010
RPCS3 = 000052
RPDA  = 000006
RPDB  = 000022
RPDC  = 000034
RPDS  = 000012
RPDT  = 000026
RPEC1 = 000044
RPEC2 = 000046
RPER1 = 000014
RPER2 = 000040
RPER3 = 000042
RPINIT  040652
RPLA  = 000020
RPMR1 = 000024
RPOF  = 000032
RPSN  = 000030
RPSTU0  040424
RPSTU1  040434
RPSTU2  040444
RPSTU3  040454
RPSTU4  040464
RPSTU5  040474
RPSTU6  040504
RPSTU7  040514
RPTMR   044402
RPVEC   040642
RPWC  = 000002
RP07    041364
RTC   = 000117
RTURN   032050
RWU1  = 002000
RWU2  = 004000
RWU3  = 010000
R6    =%000006
R7    =%000007
S       054747
SAVEFG  040602
SAVER1  001356
SAVER5  001360
SAVPOS  001354
SAVREG= 104412
SC      043630
SCMND   030006
SCOPE = 000004
SC04  = 000400
SC1   = 000100
SC10  = 001000
SC100 = 010000
SC11    044102
SC12    044200
SC13    044264
SC2   = 000200
SC20  = 002000
SC3     043676
SC4     043702
SC40  = 004000
SC5     043714
SC6     044024
SC8     044052
SEARCH= 000131
SECLMT= 000152
SECOND  001344
SEEK  = 000105
SEEKFG  040604
SELDRV= 000145
SEQPAR  020330
SETFMT= 000143
SETVEC  005604
SET.IE  045506
SIZE70  004742
SIZMEM  005112
SKI   = 040000
SKIER   013246
SLASH   060742
SPOTCK  016420
SRCHWT  040576
STA     006074
STACK = 001100
START   003522
START1  003532
START2  003550
STATIN  001314
STATIS  017270
STATPR  025020
STKLMT= 177774
STNDAT  002314
STO     044472
SUPRS   032442
SUPRSL  032426
SUPR1   032454
SUPR2   032516
SVRHXX  045342
SWR     001154
SWREG   000176
SWTIM   010052
SW0   = 000001
SW00  = 000001
SW01  = 000002
SW02  = 000004
SW03  = 000010
SW04  = 000020
SW05  = 000040
SW06  = 000100
SW07  = 000200
SW08  = 000400
SW09  = 001000
SW1   = 000002
SW10  = 002000
SW11  = 004000
SW12  = 010000
SW13  = 020000
SW14  = 040000
SW15  = 100000
SW2   = 000004
SW3   = 000010
SW4   = 000020
SW5   = 000040
SW6   = 000100
SW7   = 000200
SW8   = 000400
SW9   = 001000
T       054726
TAB     056657
TABLE   061644
TABLE0  061664
TABLE1  061732
TABLE2  062000
TABLE3  062046
TABLE4  062114
TABLE5  062162
TABLE6  062230
TABLE7  062276
TAB.XY= 001114
TAP   = 040000
TBITVE= 000014
TCF   = 000400
TD      043404
THEAD   020776
TIMER   040606
TKVEC = 000060
TPE   = 000002
TPVEC = 000064
TRAPVE= 000034
TRE   = 040000
TRFER   013146
TRKLMT= 000154
TRMREP  057274
TRNSWT  040574
TRTVEC= 000014
TSTANY  001422
TST1    003540
TYDRV   033044
```

SYMBOL TABLE

```
TYPDRV  033050
TYPDS = 104405
TYPE  = 104401
TYPOC = 104402
TYPON = 104404
TYPOS = 104403
TYPSUM  025150
UCPAR   007760
UNS   = 040000
UNSAF   013402
UNTASN  056732
UNTNOT  056710
UNTOFF  056667
UNTON   056700
UPE   = 020000
US1   = 000001
US2   = 000002
US4   = 000004
VV    = 000100
WAIT    001632
WATPAK  030144
WCE   = 040000
WCF   = 000040
WCFER   013304
WCHKX = 040424
WCKD  = 000151
WCKER   011242
WCKHD = 000153
WC.HK   043316
WLE   = 004000
WLEER   012764
WOR   = 001000
WRDCNT  001466
WRDPOS  001374
WRL   = 004000
WRTCHK  001506
WRTDAT= 000161
WRT.RP  045210
WRYUNS= 000400
XXDP    001430
Y       057767
ZEROS   002360
ZROIND  001350
$APTHD  001100
$ATYC   036764
$ATY1   036740
$ATY3   036746
$ATY4   036756
$AUTOB  001150
$BASE   001262
$BDADR  001136
$BDDAT  001142
$BELL   001176
$BUF  = 000006
$CDW1   001266
$CDW2   001270
$CHARC  036262
$CKSWR  034010
$CMTAG  001114
$CM3  = 000000
$CM4  = 000001
$CNTLC  034715
$CNTLG  034727
$CNTLU  034722
$CODE = 000024
$COMND= 000002
$CPUOP  001234
$CRLF   001203
$CYL  = 000012
$DBDIV  032174
$DBLK   036730
$DB2D   037404
$DB2O   037600
$DECVL  037564
$DEVCT  001216
$DEVM   001264
$DIV    032126
$DOAGN  032044
$DRVSN= 000160
$DSPLY  033100
$DTBL   036720
$ENDAD  032034
$ENDCT  032020
$ENV    001226
$ENVM   001227
$EOP    031500
$EOPCT  032012
$ERFLG  001117
$ERMAX  001131
$ERROR  035022
$ERRPC  001132
$ERRTB  003360
$ERRTY  035412
$ERTTL  001126
$ETABL  001226
$ETEND  001272
$FAIR = 000116
$FATAL  001210
$FFLG   037204
$FILLC  001172
$FILLS  001171
$FILLZ  032736
$FIRST= 000132
$FMT  = 000001
$GDADR  001134
$GDDAT  001140
$GET42  032024
$GTSWR  034100
$HARD = 000106
$HD   = 000000
$HIBTS  001100
$HINUM  037304
$HLDWC= 000120
$ICNT   001120
$ILLUP  040072
$INTAG  001151
$ITEMB  001130
$LF     001204
$LFLG   037203
$LKCSB  001300
$LKCSR  001276
$LKS    001304
$LLVEC  001306
$LONUM  037306
$LPADR  001122
$LPERR  001124
$LPVEC  001302
$LSTAD  062474
$MADR1  001240
$MADR2  001244
$MADR3  001250
$MADR4  001254
$MAIL   001206
$MAMS1  001236
$MAMS2  001242
$MAMS3  001246
$MAMS4  001252
$MBADR  001102
$MFLG   037202
$MISPO= 000112
$MNEW   034745
$MSGAD  001222
$MSGLG  001224
$MSGTY  001206
$MSWR   034734
$MTYP1  001237
$MTYP2  001243
$MTYP3  001247
$MTYP4  001253
$NCODE= 000122
$NCYL = 000126
$NEXT = 000130
$NPATC= 000123
$NSEC = 000124
$NTRK = 000125
$NULL   001170
$NWTST= 000000
$OCNT   036510
$OCTVL  037702
$OMODE  036512
$OPERC= 000052
$PACK = 000026
$PASS   001214
$PASSC= 000114
$PASTM  001106
$PATTC= 000030
$PREVA= 000032
$PREVO= 000027
$PSEL = 000003
$PWRAD  040066
$PWRDN  037720
$PWRMG  040062
$PWRUP  037772
$QUES   001202
$RAND   037206
$RDCHR  034352
$RDLIN  034442
$RDPAS= 000036
$RDSZ = 000017
$REG  = 000014
$REPLZ  032742
$RESRE  037346
$RETRY  017120
$RPADR  001272
$RPAS = 000204
$RPBA = 000172
$RPBAE= 000236
$RPCC = 000224
$RPCS1= 000166
$RPCS2= 000176
$RPCS3= 000240
$RPDA = 000174
$RPDB = 000210
$RPDC = 000222
$RPDS = 000200
$RPDT = 000214
$RPEC1= 000232
$RPEC2= 000234
$RPER1= 000202
$RPER2= 000226
$RPER3= 000230
$RPLA = 000206
$RPMR1= 000212
$RPOF = 000220
$RPSN = 000216
$RPVEC  001274
$RPWC = 000170
$RP07   057155
$RP07P  057162
$RTNAD  032046
$RTOTL= 000066
$SAVRE  037310
$SAVR6  040076
$SB2D   033412
$SB2O   033442
$SEC  = 000010
$SEEKS= 000046
$SETUP= 000156
$SIZE   062344
$SKI  = 000110
$SOFT = 000104
$SSEC = 000022
$STOTL= 000076
$STUP = 177777
$SUPRL  032526
$SUPRS  032542
$SUPR1  032554
$SUPR2  032616
$SVPC = 000210
$SWR  = 122000
$SWREG  001230
$TATUS= 000016
$TERM = 000032
$TESTN  001212
$TIME   026226
$TKB    001162
$TKCNT  033472
$TKINT  033510
$TKQEN= 033507
$TKQIN  033474
$TKQOU  033476
$TKQSR  033500
$TKS    001160
$TKSRV  033560
$TMPO   001174
$TN   = 000002
$TNPWR  037514
$TOTAL= 000102
$TPB    001166
$TPFLG  001173
$TPS    001164
$TRAP   040336
$TRAP2  040360
$TRK  = 000011
$TRP  = 000015
$TRPAD  040372
$TSTM   001104
$TSTNM  001116
$TTYIN  034676
$TYPDS  036514
$TYPE   035732
$TYPEC  036144
$TYPEX  036264
$TYPOC  036312
$TYPON  036326
$TYPOS  036266
$UNIT   001220
$UNITM  001110
$USWR   001232
$VECT1  001256
$VECT2  001260
$WCNT = 000004
$WRDL = 000020
$WTOTL= 000056
$WTPAS= 000042
$XOFF = 000023
$XON  = 000021
$$GET4= 000000
$OFILL  036511
.$X   = 001100
```

```
CZRJOBO RP07 PERF EXER MACRO V04.00 1-DEC-83 10:32:28 PAGE 155-5                SEQ 0249
SYMBOL TABLE


. ABS.  070405     000
        000000     001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  62464 WORDS  ( 244 PAGES)
DYNAMIC MEMORY AVAILABLE FOR  71 PAGES
.CZRJOB/C=[20,12]CZRJOB.DOC,CZRJOB.MIS,CZRJOB,[20,0]SYSMAC/M
```

F4

CROSS REFERENCE TABLE (CREF V04.00)

```
$$$EOP   73-1
$$$EOT   73-1
$$$IT    129-16   129-48
$$$MFG     1-3      1-11     4-3      5-53     5-82     9-0      9-0      12-99    15-5     15-87    16-6     21-45    22-4     22-37
          24-25    34-7     35-41    37-87    38-3     41-43    50-60    51-8     58-51    59-61    62-16    62-63    62-77    67-16
          67-65    128-80   133-43   134-50   135-14   135-15
$$$ODT     7-4
$$GET4    73-1     73-10
$OFILL    89-1     89-10    89-1*    89-1*
$40CAT    86-1
$APTMD     7-11     7-11#
$ASTAT    91-1     91-1
$ATY1     91-1#
$ATY3     88-1     91-1#
$ATY4     86-1     91-1#
$ATYC     91-1     91-1#
$AUTOB     8-0#    12-51*   12-77    12-112   14-16    15-10    15-88    17-16    20-7     58-31    67-30    73-1     73-1     85-1
          85-1     85-1
$BASE      8-0#    12-72    12-74
$BDADR     8-0#
$BDDAT     8-0#
$BELL      8-0#    57-8     85-1     85-1     85-1     86-1     86-1     86-1
$BUF      20-24*   20-62*   35-30    36-10    45-10    47-17    47-23    47-28    47-32    48-12    57-95    57-240   57-247   101-41
         120-10#
$CDW1      8-0#
$CDW2      8-0#
$CHARC    88-1     88-1#    88-1*    88-1*    88-1*
$CKSWR    85-1#    97-1     97-1
$CM3       8-0      8-0#
$CM4       8-0      8-0      8-0#     8-0#
$CMTAG     8-0#     12-25    12-25    12-25
$CNTLC    85-1     85-1     85-1     85-1     85-1#
$CNTLG    85-1     85-1#
$CNTLU    85-1     85-1     85-1#
$CODE     36-5     36-31    37-45    40-16    42-33    42-39    45-14    45-16    45-37    48-10    50-35*   50-57*   50-63*   56-30*
          56-34*   56-42*   56-48    66-33*   66-43    107-27*  120-21#
$COMND    43-9*    43-30*   44-14*   50-58*   50-67*   56-28    56-31*   56-36*   56-37    56-41*   66-14    66-35*   101-38   107-18
         107-28*  120-7#
$CPUOP     8-0#    13-5*    13-33*   57-83    57-258   57-280   114-32
$CRLF      8-0#    12-51    16-18    16-69    18-39    19-15    23-14    23-15    23-21    23-22    34-22    34-37    38-40    38-65
          38-93    41-21    41-41    42-37    42-50    42-64    42-66    42-67    57-11    57-12    57-29    57-63    57-65    57-99
          57-113   57-132   57-152   57-171   57-186   57-208   57-231   57-250   57-290   57-304   57-317   57-324   57-362   57-394
          57-424   59-22    59-28    59-168   62-20    63-72    64-44    71-7     71-30    71-36    73-1     73-1     73-1     73-1
          73-1     85-1     85-1     85-1     85-1     86-1     86-1     86-1     86-1     86-1     87-1     87-1     87-1     87-1
          88-1     88-1     88-1     96-21    132-21
$CYL      36-16    43-20*   44-12*   49-15    50-24    50-26*   50-34*   56-15    56-46*   57-159   66-14    67-75*   101-44   107-25
         120-13#
$DB2D     57-383   57-390   57-415   59-97    59-103   59-113   59-119   59-129   59-135   84-13    94-1#
$DB2O     84-30    95-1#
$DBDIV    45-26    45-47    75-26#
$DBLK     90-1     90-1     90-1#
$DECVL    94-1     94-1#
$DEVCT     8-0#    73-1*    73-1*
$DEVM      8-0#
$DIV      40-11    42-26    57-275   74-10    74-38#
$DOAGN    73-1     73-1     73-1#
```

```
$DRVSN   66-25    66-27    69-25*   81-14    121-19#  121-23
$DSPLY   81-26#   97-2
$DTBL    90-1     90-1#
$ENDAD    7-8     73-1#
$ENDCT   73-1#
$ENV      8-0#    12-31    12-67    17-11    86-1     88-1     91-1     91-1
$ENVM     8-0#    12-25    88-1     88-1     91-1
$EOP     21-33    50-38    73-1#
$EOPCT   73-1     73-1#
$ERFLG    8-0#    86-1     86-1     86-1*
$ERMAX    8-0#
$ERROR   12-25    86-1#
$ERRPC    8-0#    86-1     86-1     86-1     86-1*    86-1*    87-1     87-1
$ERRTB   11-0#    87-1
$ERRTY   86-1     87-1#
$ERTTL    8-0#    86-1     86-1     86-1*
$ETABL    8-0#
$ETEND    7-11     8-0#
$FAIR    20-27*   20-66*   20-75*   20-76    120-41#
$FATAL    8-0#    91-1*
$FFLG    91-1     91-1#    91-1*    91-1*    91-1*
$FILLC    8-0#    88-1     88-1     88-1
$FILLS    8-0#    88-1     88-1
$FILLZ   80-13#
$FIRST   12-98*   12-98*   12-98*   12-98*   12-98*   12-98*   12-98*   12-98*   17-39*   66-25    67-11*   120-52#
$FMT    101-37   120-6#   120-7    120-8    120-9    120-10   120-11   120-12   120-13   120-14   120-15   120-19
$GDADR    8-0#
$GDDAT    8-0#
$GET42   20-17    58-33    73-1#
$GTSWR   85-1#    97-1     97-1
$HARD    59-153   59-165   60-17    60-17*   120-37#
$HD       5-85     5-85     5-85
$HIBTS    7-11#
$HINUM   12-25*   74-8     92-1     92-1     92-1#    92-1*
$HLDWC   47-15    47-24    47-29    47-33    50-51*   56-52*   120-42#
$ICNT     8-0#
$ILLUP   96-1     96-1     96-1#
$INTAG    8-0#    85-1     85-1     85-1     85-1     85-1*
$ITEMB    8-0#    86-1     86-1     86-1     86-1     86-1     86-1*    86-1*    87-1
$LF       8-0#    85-1     85-1     85-1     86-1     86-1     88-1     88-1
$LFLG    91-1#    91-1*
$LKCSB    9-0#    58-13*
$LKCSR    9-0#    58-8     58-14*   58-47*
$LKS      9-0#    58-20    58-25*   58-49*
$LLVEC    9-0#    58-22
$LONUM   12-25*   51-21    74-7     92-1     92-1     92-1#    92-1*
$LPADR    8-0#
$LPERR    8-0#
$LPVEC    9-0#    58-10
$LSTAD   14-6     131-1#   131-1*
$MADR1    8-0#
$MADR2    8-0#
$MADR3    8-0#
$MADR4    8-0#
$MAIL     7-11     7-11     8-0#     12-19    12-25    12-31    86-1     88-1
$MAMS1    8-0#
```

```
$MAMS2   8-00
$MAMS3   8-00
$MAMS4   8-00
$MBADR   7-110
$MFLG   91-1     91-10    91-1*    91-1*
$MISPO  57-419   59-159   59-165   60-19    60-19*   120-390
$MNEW   85-1     85-10
$MSGAD   8-00    91-1     91-1*
$MSGLG   8-00    91-1*
$MSGTY   8-00    91-1     91-1     91-1*    91-1*
$MSWR   62-24    85-1     85-10
$MTYP1   8-00
$MTYP2   8-00
$MTYP3   8-00
$MTYP4   8-00
$NCODE  51-25*   53-17    53-26    56-13    56-34    56-35    120-460  120-47   120-48   120-49   120-50   120-51   120-52   121-3
$NCYL   51-27*   51-41*   52-10*   56-46    120-500
$NEXT   20-26*   20-50    20-65*   50-70*   50-74*   53-30*   66-20    120-510
$NPATC  53-29*   56-44    120-470
$NSEC   51-26*   51-36    51-39*   52-32*   52-36    53-13    56-45    120-480
$NTRK   51-40*   52-21*   120-490
$NULL    8-00    88-1     88-1     88-1
$NWTST  12-190
$OCNT   89-10    89-1*    89-1*
$OCTVL  95-1     95-10
$OMODE  89-1     89-10    89-1*    89-1*    89-1*    89-1*
$OPERC  49-13*   49-14*   50-14    50-16    51-31    51-33    73-1     120-290
$PACK   17-40*   20-52    21-15    21-17    50-36    50-55    50-73*   56-9     63-81*   120-220
$PASS    8-00    12-25*   73-1     73-1     73-1*    73-1*    73-1*    73-1*
$PASSC  59-83    66-42*   73-1     73-1*    120-400
$PASTM   7-110
$PATTC  48-14    50-69*   56-44*   66-36*   66-37*   120-240
$PREVA  43-17*   43-18*   43-19*   49-15    50-23*   50-24*   56-15*   56-16*   56-19*   56-20*   56-21*   57-198   57-202   57-206
        57-214   107-25*  107-26*  120-250
$PREVO  43-8*    50-22*   56-11*   56-12*   56-39    57-39    107-24*  120-230
$PSEL   101-39   120-80
$PWRAD  96-10
$PWRDN  12-25    96-1     96-10
$PWRMG  96-10
$PWRUP  96-1     96-10
$QUES    8-00    85-1     85-1     85-1     85-1     86-1     86-1     88-1     88-1
$R2A    97-1
$RAND   51-7     52-39    53-10    53-40    92-10
$RDCHR  85-10    97-1     97-1
$RDDEC  97-1
$RDLIN  85-10    97-1     97-1
$RDOCT  97-1
$RDPAS  21-21    21-24    45-39*   45-40*   59-112   73-1     73-1     120-260
$RDSZ   85-1     85-10
$REG    101-45   120-140  122-8    122-8    122-8    122-8    122-8    122-8    122-8    122-8    122-8    122-8    122-8    122-8
        122-8    122-8    122-8    122-8
$REPLZ  34-31    38-78    41-9     41-29    80-150
$RESRE  93-10    97-1
$RETRY  25-27    27-13    28-20    29-27    30-33    30-70    31-11    32-28    33-12    33-29    33-57    44-340   44-60
$RP07   16-50    59-73    128-240
$RP07P  16-53    59-76    128-250
```

CROSS REFERENCE TABLE (CREF V04.00)

```
$TATUS  21-6    22-7    22-36   22-51   22-53   22-55   22-57   22-59   22-61   24-33   26-21   26-24   27-58   43-14
        43-34   44-19   44-35   44-42   45-7    57-90   57-237  66-20   101-46  107-23* 120-15* 126-9
$TERM   97-30
$TESTN   8-00   12-19*  78-5*   87-1    87-1
$TIME   18-40   57-13   59-29   61-40   62-21   73-1    86-1    96-20
$TKB     8-00   62-97   85-1    85-1    85-1    85-1    85-1    85-1    85-1    88-1    88-1
$TKCNT  85-1    85-1    85-10   85-1*   85-1*   85-1*   85-6*
$TKINT  12-66   17-3    62-26   73-6    85-1    85-1    85-10   96-18
$TKQEN  85-1    85-1    85-10   85-9
$TKQIN  85-1    85-1    85-10   85-1*   85-1*   85-1*   85-1*   85-7*   85-8*   85-9    85-11*
$TKQOU  85-1    85-1    85-10   85-1*   85-1*   85-1*
$TKQSR  85-1    85-1    85-1    85-10   85-11
$TKS     8-00   62-98*  85-1    85-1    85-1    85-1    85-1    85-1*   85-1*   85-1*   85-1*   85-1*   85-1*   88-1
        88-1
$TKSRV  85-1    85-10
$TMPO    8-00
$TN      5-74*   5-85   12-19   12-19   12-19   12-190
$TNPUR  94-1    94-1    94-10
$TOTAL  57-378  59-162   60-20   60-20*  71-45   120-350
$TPB     8-00   88-1    88-1    88-1*
$TPFLG   8-00   88-1    88-1    88-1
$TPS     8-00   88-1    88-1    88-1
$TRAP   12-25   97-10
$TRAP2  97-1    97-10
$TRK    44-10*  50-33*  57-164  67-79*  101-45  120-120
$TRP    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1
        97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1
        97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1    97-1
        97-1    97-1    97-10   97-10   97-10   97-10   97-10   97-10   97-10   97-10   97-10   97-10   97-10   97-10
        97-2    97-2    97-2    97-2    97-20
$TRPAD  97-1    97-10   97-3
$TSTN    7-11*
$TSTNM   8-00   86-1    86-1    86-1
$TTYIN  85-1    85-1    85-1    85-1    85-1    85-10
$TYPBN  97-1
$TYPDS  90-10   97-1    97-1
$TYPE   81-29   88-10   91-1    97-1    97-1
$TYPEC  85-1    88-1    88-1    88-1    88-10
$TYPEX  88-1    88-1    88-10
$TYPOC  89-10   97-1    97-1
$TYPON  89-1    89-10   97-1
$TYPOS  89-10   97-1
$UNIT    8-00    9-0
$UNITM   7-11*
$USWR    8-00
$VECT1   8-00   12-69   12-71
$VECT2   8-00
$WCNT   44-15*  50-50*  50-52*  56-51*  56-53*  66-39*  66-40*  101-40  120-90
$WRDL   35-28   36-11   40-5    42-19   46-15   46-22   46-24*  46-25   46-26*  48-13   50-46*  50-47*  50-49*  50-50
        50-51   53-22*  56-51   56-52   57-92   57-243  57-272  66-38*  120-19* 120-20  120-21  120-22  120-23  120-24
       120-25  120-26  120-27  120-28  120-29  120-30  120-32  120-34  120-35  120-36  120-37  120-38  120-39  120-40
       120-41  120-42  120-46
$WTOTL  45-20*  45-21*  45-22   45-23   45-29*  45-30*  45-31*  45-32*  57-381  59-102  120-30*
$WTPAS  45-18*  45-19*  59-96   120-27*
$XOFF   88-1    88-1
$XON    85-1    88-1    88-1
```

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.$ASTA  91-1    91-1
.$X      7-11    7-110
A16      5-1120  13-26   13-31
A17      5-1130  13-26   13-31
ABASE    6-260   8-0      8-0
ABNRPL  21-13   71-410
ACDW1    8-0     8-0
ACDW2    8-0     8-0
ACPUDP   8-0     8-0
ACTDRV  99-450  104-18*  104-67*  107-5*   107-11*  110-6
ACTSTR  99-510  110-8*   110-22*
ADDW0    8-0
ADDW1    8-0
ADDW10   8-0
ADDW11   8-0
ADDW12   8-0
ADDW13   8-0
ADDW14   8-0
ADDW15   8-0
ADDW2    8-0
ADDW3    8-0
ADDW4    8-0
ADDW5    8-0
ADDW6    8-0
ADDW7    8-0
ADDW8    8-0
ADDW9    8-0
ADEVCT   8-0     8-0
ADEVM    8-0     8-0
AENV     8-0     8-0
AENVM    8-0     8-0
AFATAL   8-0     8-0
AIR      5-2640
AMADR1   8-0     8-0
AMADR2   8-0     8-0
AMADR3   8-0     8-0
AMADR4   8-0     8-0
AMAMS1   8-0     8-0
AMAMS2   8-0     8-0
AMAMS3   8-0     8-0
AMAMS4   8-0     8-0
AMSGAD   8-0     8-0
AMSGLG   8-0     8-0
AMSGTY   8-0     8-0
AMTYP1   8-0     8-0
AMTYP2   8-0     8-0
AMTYP3   8-0     8-0
AMTYP4   8-0     8-0
AOE      5-1860
APASS    8-0     8-0
APRIOR   8-0
APTCSU  88-1    91-10
APTENV  86-1    88-1    91-1    91-10
APTSIZ  12-25   91-10
APTSPO  88-1    91-1    91-10
ASGN1   63-250
```

L4

CROSS REFERENCE TABLE (CREF V04.00)

```
ASGN2    63-23   63-300
ASGN3    63-34   63-48   63-560
ASGN4    63-57   63-830
ASGN6    63-65   63-850
ASGN7    63-64   63-880
ASGN8    63-69   63-900
ASGND    19-22  128-470
ASKPAR   15-91  129-250
ASMBLY    9-0
ASNERR   63-36   63-55   63-86   63-96   63-99   64-22   64-38   71-70
ASNLST    9-00   19-29•  20-5    21-52   59-8    59-26   62-34   63-32   63-46   63-56   64-10   64-12•  64-28   64-34•
          64-40   64-47•  71-26•  73-1    73-1    73-1•   96-23
ASNMSG   63-25•  63-30•  63-39•  63-44•  63-85•  63-91•  63-93•  63-95•  63-98•  64-21•  64-37•  71-120
ASSIGN   63-30   65-4    65-9    65-14   65-20
ASWREG    8-0     8-0
AT0       5-1980
AT1       5-1990
AT2       5-2000
AT3       5-2010
AT4       5-2020
AT5       5-2030
AT6       5-2040
AT7       5-2050
ATA       5-1730
ATABIT   19-29   59-26   63-32   63-46   63-56   64-10   64-12   64-15   64-32   64-34   71-26   71-27   73-1    73-1
          73-1   100-390  103-67  105-10  106-83  108-24  108-47  109-50  109-74  109-82  109-83  109-113 111-56
ATESTN    8-0     8-0
ATTN      9-00    86-1•   126-1
AUNIT     8-0     8-0
AUSWR     8-0     8-0
AUTLST   19-30•  64-13•  71-27•  73-1    73-1    73-1•   73-1•   73-10•
AVAIL     9-00   18-22   19-23   19-27•  20-46   20-49   20-86   21-36
AVECT1    6-27•   8-0     8-0
AVECT2    8-0     8-0
BADENT   12-130  15-32   15-53   15-104  63-19   70-30  128-59•
BADSEC    9-00   21-12•  57-61   60-16   60-17   60-18   60-19   60-20
BADTMD   12-30   12-27
BAI       5-1300
BEGCOD    9-00   66-33   66-34
BEGPAT    9-00   66-36
BEGWC     9-00   66-38   66-39
BELL    127-3   128-41  128-48  128-85  128-86  134-7   134-8
BIT0      5-1040
BIT00     5-104   5-1040  86-1    86-1
BIT01     5-104   5-1040  22-59  104-57  106-205
BIT02     5-104   5-1040
BIT03     5-104   5-1040  24-33   31-9
BIT04     5-104   5-1040  24-33   24-57
BIT05     5-104   5-1040  33-11  102-37  106-227  111-30
BIT06     5-104   5-1040  26-6    26-9    45-7    57-237   62-98  103-77  104-44  105-53  108-39  115-14
BIT07     5-104   5-1040  22-36   24-61   45-7    103-77  106-154  108-12  109-78  114-17
BIT08     5-104   5-1040  24-53  103-77  111-43
BIT09     5-104   5-1040  22-57   86-1    111-28
BIT1      5-1040  24-41   33-43   44-52
BIT10     5-1040  22-55   24-77   24-87   86-1    106-208
BIT11     5-1040  22-53   24-81   57-263  57-285  103-31   105-17  106-175  109-129
```

CROSS REFERENCE TABLE (CREF V04.00)

```
BIT12    5-1040  13-33   22-51   24-91   26-6    26-7    26-32   57-225  103-25  103-58  103-77  104-60  105-25  106-203
        112-16  113-26  115-15
BIT13    5-1040  13-33   24-65   30-68   32-24   81-26   86-1    112-18
BIT14    5-1040  22-11   22-13   22-59   24-37   24-45   24-49   24-99   27-25   28-13   29-19   30-25   31-45   32-8
        33-27   57-278  104-51  105-22  108-44  109-124 111-85  115-12
BIT15    5-1040  22-9    24-101  26-6    27-68   32-24   104-51  104-57  104-60  105-22  105-25  106-20  106-55  106-175
       106-205 106-208  108-39  109-124 111-28  111-43  111-85  111-93
BIT2     5-1040  22-61   33-47   111-93
BIT3     5-1040  24-69   113-30
BIT4     5-1040  29-25
BIT5     5-1040  24-73
BIT6     5-1040  26-32   57-90
BIT7     5-1040  26-24   30-31   44-42
BIT8     5-1040  28-18   29-3    29-8    30-3    30-8    32-24
BIT9     5-1040  24-85   32-24
BLKADR   9-0#    12-85   16-59   17-30   59-24   63-60   63-80   64-15   96-33
BLNKS1  19-19    42-47   42-59   57-14   59-70   59-72   59-80   62-23   63-76   70-20   70-22  127-67#
BLNKS2  16-47    34-34   38-62   38-81   41-12   41-17   41-17   41-32   41-37   41-37   42-56   57-69   57-110  57-161
        57-166   57-182  57-302  57-302  57-313 127-66#  132-27  132-39
BLNKS3  42-44   127-65#
BLNKS4  16-20   127-64#
BPE      5-266#
BPTVEC   5-104#
BSE      5-274#  42-7
BUFTBL   9-0#    14-7*   14-8*   14-9*   14-12*  14-13*  14-15*  14-18*  14-19   14-21   46-12   46-14   46-28*  47-12
        47-13   47-25*  47-30*  47-35   47-36   47-49*
BUSADR  12-79   132-13#
CFLAG    9-0#    12-95*  12-120  15-18*  15-22   15-37*  15-43   15-86*  15-94   17-50*  18-3    20-9*   34-5    34-24
        38-46   62-19*  62-32   63-4*   63-9    70-9*   70-25   70-35*  85-5*   96-22*  96-26  132-22*  132-30  132-42
CMGADR   9-0#    12-15*  12-18*  17-18   17-47*  67-32   96-30*  132-13  132-15*
CMKWC   50-45   53-14   55-16#
CI1    105-39  106-12#
CI2    106-44  106-53#  106-67  106-103
CI3    105-42  106-61#
CI4    105-32  106-86#
CI5    106-51  106-84   106-160# 106-170
CI6    106-104 106-115  106-118  106-120 106-166#
CI7    104-37  105-52   106-23   106-33  106-37  106-49  106-58  106-66  106-77  106-82  106-94  106-102 106-110 106-114
       106-125 106-129  106-140  106-152 106-169 106-172# 108-16 109-67  114-31
CI7B   106-177# 109-70
CI8    106-180 106-190# 109-7    111-76
CK.CHR  82-32#  83-20   83-28
CK.DEC  82-10#  82-38
CK.DIG  70-27   83-14#
CK.NUM 132-32   132-44  133-10#
CK.OCT  81-42#  82-40
CKBUS   22-19   35-26#
CKCLK   16-4    58-5#   62-38   73-7    96-19
CKCLK1  58-7    58-17#
CKCLK2  58-19   58-28#
CKCLK3  58-15   58-26   58-37#
CKERR   22-18   35-3#
CKFMT   24-59   29-3#
CKHCE   24-63   30-3#
CKLMTS  50-19   50-29   51-37   52-37   54-15#
CKSWR   86-1    86-1    97-1#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
CLKFLG    9-0#    58-5*    58-9*    58-21*   58-44    61-4
CLKOFF   58-44#   62-27
CLR       5-132#  62-15
CLRDPB   17-31    63-66    66-9#
CLRQUE  102-17   106-226  111-52   117-18#
CMCNT     9-0#    36-11*   36-12*   36-24    36-26    36-27*   36-30*   37-47    37-50*   37-55    37-83*
CMCYL     9-0#    36-16*   36-17*   36-36    37-65*   37-66    37-72
CMDAT    36-32    36-47    37-3#    37-51    37-53
CMMED    36-36#
CMPAR    22-31    36-3#
CMPARD   26-66    36-5#
CMPLMT    9-0#    34-43    36-19
CMPRES   18-45    20-37    20-88    21-40    56-67#   56-70
CMPRT    36-51    37-18    37-30    37-42    38-8#
CMPRX    36-48    37-49    37-56    37-70    37-84    37-93#
CMPTIM    9-0#    12-94    12-94*   20-15    20-15*   22-22    22-24    22-24    22-26    22-28    22-30*   61-39*   129-5
CMSEC     9-0#    36-18*   37-57*   37-58    37-60*
CMSTR    36-21#
CMSTR2   36-41    36-45    36-50#   37-77    37-81
CMTRK     9-0#    37-61*   37-62    37-64*
COLON    61-17    61-22   128-57#
COMMA    19-18    59-79    62-22    63-75   128-5#
COMTBL    9-0#    56-36    66-35
CPSAVE   86-1     86-1     86-1     86-1     86-1     86-1#    86-1*    86-1*    87-1
CR        5-104#  88-1     88-1
CRLF      5-104#   9-0     12-6     12-31    12-31    12-45    12-56    12-62    59-93    59-109   59-125   59-148   59-149   88-1
          88-1    96-5     96-37    96-38    96-38   125-6    125-7    125-8    125-9    127-48   127-49   127-50   127-51   127-53
         127-55  127-56   127-58   127-59   127-60   127-61   127-62   127-63   128-19   128-20   128-26   128-28   128-30   128-37
         128-41  128-48   128-48   128-52   128-53   128-54   128-55   128-56   128-56   128-59   128-60   128-60   128-62   128-83
         128-84  128-85   128-86   128-88   128-88   128-89   128-89   129-25   134-6    134-9    134-10   134-11   134-12   134-13
         134-14  134-15   134-16   134-17   134-18   134-19   134-20   134-21   134-22   134-23   134-24   134-25   134-26   134-27
         134-28  134-29   134-30   134-31   134-32   134-33   134-34   134-35   134-36   134-37   134-38   134-39   134-40   134-41
         134-42  134-43   134-44   134-45   134-46   134-47   134-48   134-49   134-51   134-53   134-54   135-1    135-2    135-3
         135-4   135-5    135-6    135-7    135-8    135-9    135-10   135-11   135-12
CTRAP     85-1    85-1     85-5#
CYLLMT   37-68    67-13    67-37    67-38    67-73    68-10*   68-17*   121-12#  121-13   121-14   121-15   121-19
CYLNDR   30-10    30-11*   30-12    30-15*   30-48*   57-224   57-302    57-302   123-8    133-79#
DASH     59-71   128-6#
DASH13   59-50    64-43    73-1     73-1    128-32#
DASH5    18-41    59-30    73-1    128-31#
DATA0    10-0     10-0#
DATA1    10-0     10-0#
DATA10   10-0     10-0#
DATA11   10-0     10-0#
DATA12   10-0     10-0#
DATA13   10-0     10-0#
DATA14   10-0     10-0#
DATA15   10-0     10-0#
DATA2    10-0     10-0#
DATA3    10-0     10-0#
DATA4    10-0     10-0#
DATA5    10-0     10-0#
DATA6    10-0     10-0#
DATA7    10-0     10-0#
DATA8    10-0     10-0#
DATA9    10-0     10-0#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
DATAFK  62-69    65-133
DCK      5-192#
DCKER   24-97    25-3#
DCKER1  26-2#    30-85
DCU      5-267#
DDISP    5-104#   8-0     12-25
DDRVS    9-0#    18-14    64-15*   71-29*   73-1*
DEVOFF  71-21
DGE      5-262#
DH1     11-5     125-1#
DH14    57-66    125-6#
DH15    57-75    125-7#
DH16    57-79    125-8#
DH17    57-87    125-9#
DH2     11-12     11-33   125-2#
DH3     11-19    125-3#
DH4     11-26    125-4#
DH6     11-40    125-5#
DISPLA   8-0#    12-25*   12-25*   86-1*
DISPLY  23-4     23-37    24-4     24-15    25-10    25-20    25-23    25-39    26-27    26-70    27-6     27-47    28-8     28-32
        29-15    30-21    30-45    30-61    30-84    31-4     31-22    31-32    31-41    32-4     32-19    32-39    33-4     33-23
        33-45    33-49    33-51    34-16    34-21    34-22    34-23    34-33    34-34    34-37    35-16    35-34    38-33    38-39
        38-40    38-41    38-62    38-65    38-70    38-74    38-80    38-81    38-90    38-93    40-30    40-36    40-37    41-2
        41-11    41-12    41-17    41-17    41-21    41-31    41-32    41-37    41-37    41-40    41-41    42-37    42-38    42-41
        42-44    42-47    42-50    42-52    42-56    42-59    42-64    42-66    42-67    44-68    57-29    57-55    57-57    57-63
        57-64    57-65    57-66    57-69    57-75    57-79    57-87    57-98    57-99    57-110   57-113   57-119   57-125   57-132
        57-146   57-149   57-152   57-158   57-161   57-162   57-166   57-167   57-171   57-179   57-182   57-183   57-186   57-193
        57-195   57-197   57-200   57-204   57-208   57-213   57-216   57-223   57-227   57-231   57-239   57-242   57-245   57-250
        57-256   57-268   57-288   57-290   57-297   57-302   57-302   57-303   57-304   57-310   57-313   57-314   57-317   57-323
        57-324   57-330   57-336   57-342   57-361   57-362   57-377   57-380   57-385   57-386   57-387   57-392   57-393   57-394
        57-412   57-417   57-418   57-421   57-424   57-433   57-447   57-462   78-36    80-34    97-2#
DISPRE   7-1#     12-25
DLT      5-142#
DONE    22-45     24-31#
DPE      5-265#
DPINT   99-5#    103-16*  103-33   103-85*  109-114  109-116* 111-20   111-58   111-69   111-79*
DPR      5-166#
DPRQS   99-18#   104-26   105-11*  105-45*  106-182* 106-195  106-215* 109-28   111-22   111-60   111-71   111-89*
DRIVE    9-0#    126-2    126-3    126-4
DRIVE0   9-0      12-98*   122-8#   130-20   130-20   130-20   130-20   130-20   130-20
DRIVE1   9-0      12-98*   122-8#   130-20   130-20   130-20   130-20   130-20   130-20
DRIVE2   9-0      12-98*   122-8#   130-20   130-20   130-20   130-20   130-20   130-20
DRIVE3   9-0      12-98*   122-8#   130-20   130-20   130-20   130-20   130-20   130-20
DRIVE4   9-0      12-98*   122-8#   130-20   130-20   130-20   130-20   130-20   130-20
DRIVE5   9-0      12-98*   122-8#   130-20   130-20   130-20   130-20   130-20   130-20
DRIVE6   9-0      12-98*   122-8#   130-20   130-20   130-20   130-20   130-20   130-20
DRIVE7   9-0      12-98*   122-8#   130-20   130-20   130-20   130-20   130-20   130-20
DROP    23-10     24-10    33-34    33-62    71-20#   71-52
DROPD   62-55     64-4#
DROPNG  71-31    128-41#
DRQ      5-220#
DRSTAT  16-17    128-20#
DRVACT  98-23#   104-32   106-163* 106-183* 106-193  106-214* 108-5*   109-40   109-64   109-73*  111-31*  111-37   111-44*
DRVCLR   6-6#
DRVER   24-103    28-31#
DRVINT 102-39    103-15#  104-21   109-101  109-117  111-34
```

CROSS REFERENCE TABLE (CREF V04.00)

```
DRVMSG  19-16    23-26    59-68    63-73    71-9     71-33    128-8#
DRVNO    9-0#    22-3*    23-27    57-67    86-1*
DRVPAR   9-0#    63-5*    63-21*   63-70    67-34
DRVPRM  17-36    63-79    67-8#
DRVQUE 104-29   104-40   107-20   118-22#
DRVSN   81-11   128-61#
DRVSTA  16-21    17-28    63-63    98-37#   102-29*  102-30*  102-31*  102-32*  102-43*  103-21*  103-30*  103-73*  103-79*  104-19
       104-24   104-49   105-19   105-23   106-231* 109-32   109-38   109-44   109-119  111-80*
DRVTYP  16-25    16-49    59-74    63-88    68-14    98-52#   103-22*  103-41*  103-46*  103-51*  104-55   106-232*
DRY      5-165#
DSWR     5-104#   8-0      12-25
DT00     5-211#
DT01     5-212#
DT02     5-213#
DT03     5-214#
DT04     5-215#
DT05     5-216#
DT06     5-217#
DT07     5-218#
DT08     5-219#
DT1      11-6     126-1#
DT14     57-70    126-7#
DT15     57-76    126-8#
DT16     57-80    126-9#
DT17     57-88    126-10#
DT2      11-13    11-34    126-2#
DT3      11-20    126-3#
DT4      11-27    126-4#
DT6      11-41    126-5#
DTE      5-189#
DTEER    24-93    30-81#
DTUW     62-10    100-33#  102-24   105-35   106-50*  106-187* 106-198  106-216  106-218* 106-224* 107-6    108-6*   111-25   111-40
        111-50*  111-62
DVA      5-157#
DVC      5-269#
ECBAD0   9-0#    40-51*   41-17
ECBAD1   9-0#    40-68*   41-37
ECBIT    9-0#    40-22*   40-23*   40-24    40-25*   40-45*
ECC     26-57    40-3#
ECC1    40-66    41-2#
ECC2    40-41    40-64    41-40#
ECCX    41-20    41-38    41-41#
ECGD     9-0#
ECGD1    9-0#
ECH      5-183#   25-5     27-29
ECI      5-242#
ECMSK0   9-0#    40-43*   40-47*   40-52    40-54    40-63
ECMSK1   9-0#    40-44*   40-48*   40-57    40-69    40-71
ECSEC    9-0#    40-3*    40-15*   40-18*   40-20*   40-38
ECWRD    9-0#    40-24*   40-26*   40-27*   40-28*   40-29*   40-31    40-38*   40-39    40-51    40-53    40-54*   40-55*   40-59
        41-6     41-17
ECWRD1   9-0#    40-59*   40-60*   40-61    40-65*   40-68    40-70    40-71*   40-72*   41-19    41-25    41-37
EM1     11-4     124-3#
EM10    23-16    124-9#
EM11    23-23    124-10#
EM12    23-4     124-11#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
EM13     23-37   124-120
EM14     24-4    124-130
EM15     24-15   124-140
EM2      11-11   124-40
EM20     28-8    124-150
EM21     25-39   124-160
EM22     27-24   124-170
EM23     27-6    124-180
EM24     29-15   124-190
EM25     30-21   124-200
EM26     31-41   124-210
EM27     32-4    124-220
EM3      11-18   124-50
EM30     28-32   124-230
EM31     30-61   124-240
EM32     30-84   124-250
EM33     31-4    124-260
EM34     33-4    124-270
EM35     31-22   124-280
EM36     31-32   124-290
EM37     27-27   124-300
EM4      11-25   124-60
EM40     32-19   124-310
EM41     35-34   124-320
EM42     38-33   124-330
EM43     34-16    34-21   124-340
EM44     35-16   124-350
EM45     25-23    27-44   124-360
EM46     57-98   124-370
EM47     25-20    27-42   124-380
EM5      11-32   124-70
EM50     32-39   124-390
EM51     30-45   124-400
EM52     25-10    27-31   124-410
EM6      11-39   124-80
EM60     33-23   124-420
EM70     33-45   124-430
EM71     33-49   124-440
EM72     33-51   124-450
EMPTYQ  106-181  106-230  108-40   111-94   118-70
EMTVEC    5-1040  12-25*   12-25*
ENDCMP   37-93    38-860
ENDCON    9-00    17-4*    17-5*    17-8*    17-9*    17-13*   17-14*   21-21    21-24
ENDING    9-00    21-19   129-10
ENDPGM   14-8     14-13   133-800
ENDSEK    9-00    21-28    21-31
ENTADR  128-560
ENTCOM   62-28   128-540
ENTLMT   67-43   128-550
ENTPR    15-101   15-1080
EQUAL    128-40
ERCTR     9-00    36-9*    36-50*   37-14    37-29*   38-88    38-91
ERPRC1   22-44   22-500    26-28    44-69
ERPROC   22-8    22-12    22-14    22-360
ERR       5-1720
ERROR     5-1040
```

```
ERRVEC    5-104#  12-25    12-25*   12-25*   12-27*   12-28*   13-6     13-7*    13-34*   58-6     58-7*    58-19*   58-37*   86-1
          86-1*   86-1*    131-1    131-1    131-1*   131-1*   131-1*   131-1*
EWN       5-162#
EWNERR    24-43   33-41#
F0        5-152#
F1        5-153#
F2        5-154#
F3        5-155#
F4        5-156#
FACTOR    45-9*   45-10*   45-12*   45-18    45-20    45-39    45-41    45-59#
FAIRNS    9-0#
FALPAR    22-56   23-21#
FALPR1    23-17   23-25#
FE1       54-43   55-46    67-19    67-68    67-70    67-71    68-9*    68-16*   106-53   121-15#
FEONLY    15-59   128-88#
FER       5-181#
FILBUF    20-29   20-64    48-9#
FILLO     79-11*  79-15    79-36*   79-39#   80-13*   80-17    80-38*
FILLZ     61-15   61-20    61-25    79-11#
FMT16     5-243#
FMTER     29-10   31-40#
FMTRK     6-22#
FRSTER    9-0#    26-65*   26-67    34-13    34-42*   36-3*    37-33    38-28    38-43*   38-86
GENDPB    43-30*  43-32    43-34    44-10*   44-11*   44-12*   44-13*   44-14*   44-15*   44-17    44-19    63-58*   123-3#
GENPAR    20-57   51-7#
GENREG    29-8    30-8     123-12   123-15#
GETBUF    20-23   20-61    46-9#
GETID     17-32   63-67    69-10#
GETLMT    67-10   68-7#
GETPAT    50-68   53-28    53-35#   53-43
GETREG    6-15#
GETREM    51-15   52-8     52-19    52-30    53-7     53-41    74-7#
GETREQ    105-12  106-200  108-28   109-34   109-60   109-66   109-123  111-27   111-42   111-82   111-90   119-10#
GNS       7-1     7-1      12-6     12-31    12-45    12-56    12-62    59-82    59-93    59-109   59-125   59-148   59-149   59-152
          59-155  59-158   59-161   97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1
          97-1    97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-2     97-2
GO        5-151#
GODRIV    20-30   20-68    26-20    27-57    44-34    49-7#
GTSWR     12-31   97-1#
HCE       5-184#
HCEER     30-16   32-3#
HCI       5-241#
HCRC      5-185#
HCRCER    24-55   28-3#    29-5     30-5
HELPTX    12-134  134-10#
HERTZ     9-0#    12-89    20-10    61-33    61-49
HOUR      9-0#    12-90*   20-11*   61-7     61-44*   61-45    61-47*
HT        5-104#  88-1     88-1
IAE       5-187#
IAEER     24-79   31-21#
IBSAVE    86-1    86-1     86-1     86-1     86-1     86-1#    86-1*    86-1*    86-1*
IDLE      18-7    20-43    20-48    21-3#
IE        5-110#
ILF       5-177#
ILR       5-178#
ILV       5-163#  16-62    17-33    63-68
```

CROSS REFERENCE TABLE (CREF V04.00)

```
INCMRD   26-48    27-83    60-17#
INCMIS   30-50    60-19#
INCSKI   32-43    60-18#
INCSOF   26-56    26-64    27-80    28-16    29-23    30-29    30-65    60-16#
INCTOT   23-8     23-28    23-41    24-8     24-19    25-25    26-26    26-49    26-69    27-11    27-84    28-17    28-35    29-24
         30-30    30-51    30-67    31-8     31-25    31-34    31-49    32-12    32-23    32-42    33-8     33-26    33-54    35-20
         35-38    38-94    60-20#
INTRVL    9-0#    12-93*   20-14*   61-38*   61-53    61-55    61-55    61-58*   96-17*   96-28    129-4
INVLD    62-94   128-53#
IOTVEC    5-104#
IR        5-133#
ISR     102-34   107-3#
ITCNT    56-23*   56-25    56-25*   56-57#
IXU       5-268#
KIPARO  131-1
KSR      18-8     62-10#   62-11
KSR1     62-12#
KWSVR    58-11    58-23    61-31#
LBC       5-272#
LBT       5-168#
LCE       5-271#
LF        5-104#   12-6     88-1     88-1     96-5    128-26   128-60
LIMIT     9-0#    34-43*   36-19*   36-20*   38-48    38-50*
LIN10A   40-30   127-54#
LIN10B   40-37   127-55#
LIN10C   41-40   127-56#
LIN10H   41-2    127-58#
LIN11    42-41   127-62#
LIN11A   42-52   127-63#
LIN11H   42-38   127-61#
LIN2C    57-32   127-4#
LIN2P    57-38   127-5#
LIN2S    57-64   127-6#
LIN3.1   57-120   57-126   57-191#
LIN3.3   57-131   57-138   57-213#
LIN3.4   57-139   57-223#
LIN6.2   57-331   57-337   57-343   57-358#
LIN7M    57-418  127-36#
LIN7P    57-412  127-40#
LIN7R    57-387  127-44#
LIN7S    57-421  127-41#
LIN7T    57-377  127-42#
LIN7X    57-380  127-43#
LIN8M    26-27    44-68    57-433  127-46#
LIN9B    38-39   127-47#
LIN9E    38-90   127-52#
LIN9G    26-70   127-53#
LIN9H    38-41   127-48#
LIN9I    34-23   127-50#
LINA3    57-223  127-14#
LINB3    57-146  127-18#
LINB5    57-268  127-26#
LINB6    57-323  127-31#
LINC6    57-330  127-32#
LINCA3   57-183  127-16#
LIND5    57-256  127-25#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
LINDAS  57-179  127-17#
LINDEC  38-92   57-160  57-165  57-170  57-192  57-194  57-196  57-199  57-203  57-207  57-215  57-218  57-226  57-230
        57-244  57-249  57-289  57-360  57-379  57-420  57-423  57-459#
LINE1   23-3    23-36   24-3    24-14   25-9    25-19   25-22   25-38   27-5    27-23   28-7    28-31   29-14   30-20
        30-44   30-60   30-83   31-3    31-21   31-31   31-40   32-3    32-18   32-38   33-3    33-22   33-41   34-15
        35-15   35-33   38-32   57-6#
LINE2   23-5    23-38   24-5    24-18   25-24   26-2    27-10   27-51   28-9    28-33   29-16   30-22   30-46   30-62
        31-5    31-23   31-33   31-42   32-5    32-20   32-40   33-5    33-24   33-52   34-17   35-17   35-35   38-34
        57-28#  57-434
LINE2A  57-37   57-42   57-61#
LINE2B  57-62   57-65#
LINE3   23-6    23-39   24-6    24-18   26-3    27-10   27-51   28-10   28-34   29-17   30-23   30-63   31-43   32-6
        32-21   33-25   33-53   35-18   57-119#
LINE3A  33-6    34-18   38-35   57-125#
LINE3B  32-41   57-131#
LINE3C  30-47   57-138#
LINE3D  35-36   57-100   57-144#
LINE3E  31-6    57-158#
LINE3F  31-24   57-177#
LINE4   23-7    23-40   24-7    24-18   26-4    27-10   27-51   28-11   29-18   30-24   30-64   31-7    31-44   32-7
        32-22   33-7    34-19   35-19   35-37   38-36   57-101  57-237#
LINE5   27-10   27-51   28-15   29-21   30-27   31-47   32-10   57-256#
LINE5A  28-12   29-22   30-28   30-49   31-48   32-11   57-296#
LINE5B  26-55   57-310#
LINE6   26-13   26-54   57-323#
LINE6A  26-63   57-330#
LINE6C  25-29   27-16   27-62   28-22   29-29   30-35   30-72   31-13   32-30   33-14   33-31   33-59   57-336#
LINE6D  25-32   26-60   27-19   28-25   29-32   30-38   30-75   31-16   32-32   33-17   33-33   33-61   57-342#
LINE7   23-9    23-42   24-9    24-20   25-33   26-50   26-71   27-85   28-23   28-26   28-36   29-30   29-33   30-36
        30-39   30-73   30-76   31-14   31-26   31-35   31-50   32-13   32-33   33-15   33-36   35-21   35-39   38-95
        44-64   57-377#
LINE7A  30-52   32-44   57-412#
LINE8   26-47   27-78   44-63   57-433#
LINEN3  57-216  127-13#
LINEO5  57-314  127-30#
LINEP5  57-310  127-29#
LING6   57-336  127-33#
LINM3   57-119  127-7#
LINM4   57-239  127-22#
LINN3   57-125  127-9#
LINOCT  34-27   34-36   38-58   38-61   38-64   41-6    41-17   41-17   41-25   41-37   41-37   42-43   42-46   42-49
        42-55   42-61   57-68   57-108  57-148  57-151  57-181  57-185  57-241  57-267  57-270  57-302  57-302  57-312
        57-316  57-443#
LINP3   57-197  127-11#
LINP5   57-288  127-27#
LINR6   57-361  127-34#
LINS3   57-158  57-213  127-12#
LINS4   57-242  127-23#
LINS5   57-297  127-28#
LINSS3  57-167  127-21#
LINST3  57-162  127-20#
LINT3   57-227  127-15#
LINU06  57-342  127-35#
LINW3   57-149  127-19#
LINX4   57-245  127-24#
LINX5   57-303  127-68#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
LKPAR    15-30     15-23     15-33     15-44
LODEV    16-44     63-30     63-44    128-170
LODPAR   20-58     56-80
LSTAD     9-00     14-6*     14-9      14-10
M.DP40   76-250    76-46
M.DP41   76-30     76-370
M.DP42   76-36     76-410
M.DP44   76-48     76-530
M.DP50   76-23     76-570
M.DPID   74-45     75-33     76-140
MAIN     18-30     21-58     50-76     73-8
MAIN1    18-20     19-30
MAIN2    19-13     20-40
MAINDA   18-130
MASK      9-00     26-6*     26-30     27-7*     28-18*    29-25*    30-31*    30-68*    31-9*     32-27*    33-11*    33-27*    33-55*    44-44
         44-50     44-56
MATCH    37-4      39-160
MAXCYL   52-3      54-38     55-28     67-13*    67-47     67-50*    67-71     67-73*    121-30    121-4     121-5     121-6     121-7     121-8
        121-12    130-20    130-20    130-20    130-20    130-20    130-20    130-20    130-20
MAXER     9-00     71-43
MAXSEC   52-25     54-29     55-19     55-34     67-15*    67-59     67-62*    121-70    130-20    130-20    130-20    130-20    130-20    130-20
        130-20    130-20
MAXTRK   52-14     54-33     55-23     55-30     67-14*    67-53     67-56*    121-50    130-20    130-20    130-20    130-20    130-20    130-20
        130-20    130-20
MCPE      5-1150
MDPE      5-1350
MESFE    15-19    128-830
MINCYL   50-34     51-41     52-4      52-6      52-9      54-16     54-18     67-19*    67-21*    67-46     67-51*    67-68     67-70*    67-75
        121-40    130-20    130-20    130-20    130-20    130-20    130-20    130-20    130-20
MINSEC   50-32     51-39     52-26     52-28     52-31     54-22     54-24     54-31     54-35     55-17     67-23*    67-58     67-63*    67-80
        121-80    130-20    130-20    130-20    130-20    130-20    130-20    130-20    130-20
MINTRK   50-33     51-40     52-15     52-17     52-20     54-19     54-21     54-36     55-21     67-22*    67-52     67-57*    67-79    121-60
        130-20    130-20    130-20    130-20    130-20    130-20    130-20    130-20
MINUTE    9-00     12-91*    20-12*    61-18     61-40*    61-41     61-43*
MNTBL     9-00     57-53
MOM       5-2210
MOL       5-1700
MREAD    15-63    128-890
MRPCS1  132-24    132-530
MRPVEC  132-36    132-540
MSGCON   64-45    128-370
MSGDRP   18-42    128-340
MSGEOP   73-1     128-350
MSGEOT   73-1     128-360
MSGON    23-25     71-32    128-420
MSGPG    81-12    128-210
MSGPWR   96-1      96-50
MSGREP   21-54    128-260
MSGSUM   59-31     73-1     128-330
MSGX10   57-386    57-393    59-106    59-122    128-400
MSHELP   12-117    134-60
MSHW1    38-70    128-220
MSHW2    38-74    128-230
MSPASS   59-94     59-110    59-126    128-380
MSPRM    63-6     128-620
MSTOTL   59-100    59-116    59-132    128-390
```

CROSS REFERENCE TABLE (CREF V04.00)

```
MSWAIT   96-25    96-370
MSWRO    62-92   128-520
MXF       5-1360
MXWNDW  101-100  106-70
N       128-490
NED       5-1390
NEDCLK   58-30   128-480
NEM       5-1380
NEWASN   62-51    65-30
NEWUNT    9-00    17-35*   19-7     19-20    19-27    19-28*   63-80*
NINLEV   16-64    63-98   128-180
NODFLT   12-132   15-55   128-190
NODRVS   20-16   128-600
NOMTCH   34-50    37-6
NONE    128-580
NOOP      6-30
NOTAVL  128-150
NOTPRS   16-31    63-93   128-140
NOTRP    16-28    63-91   128-130
NOTSAF   16-37    63-85   128-160
NSA       5-2230
OFFDIR    5-2400
OFFON     5-1610
OFFSET    9-0      9-0      9-0     26-16    26-37    43-37    57-344
OFLIN    22-60    24-30
ONES     10-0     10-00
ONESEC    9-00    12-89*   20-10*   61-31*   61-33*
ONESUM   18-43    59-450   73-1
OPI       5-1900
OPIER    24-67    30-580
OPIER1   30-690
OPT     104-34   105-80   108-34   109-87   109-139
OPTBL     9-00    57-44    57-46
OR        5-1340
ORDERQ    9-00    12-83    18-5     20-31    20-42    20-69    21-3     96-31
OVRWRT   15-38   128-840
PACK     63-81    65-3*    65-8*    65-13*   65-19*   65-22*
PAR       5-1800
PAR1     129-3   129-260
PAR11    129-8   129-380
PAR12    129-5   129-390
PAR14    129-9   129-400
PAR15    129-11  129-410
PAR16    129-10  129-420
PAR19    129-6   129-430
PAR2     129-4   129-270
PAR21    129-15  129-470
PAR3     129-7   129-280
PAR4     129-290 130-20   130-20   130-20   130-20   130-20   130-20   130-20   130-20
PAR5     129-300 130-20   130-20   130-20   130-20   130-20   130-20   130-20   130-20
PAR6     129-310 130-20   130-20   130-20   130-20   130-20   130-20   130-20   130-20
PAR7     129-320 130-20   130-20   130-20   130-20   130-20   130-20   130-20   130-20
PAR8     129-330 130-20   130-20   130-20   130-20   130-20   130-20   130-20   130-20
PAR9     129-340 130-20   130-20   130-20   130-20   130-20   130-20   130-20   130-20
PARENT   15-109   67-44    70-80
PARER    24-71    31-30
```

CROSS REFERENCE TABLE (CREF V04.00)

```
PARLST  14-22*   15-108  129-30
PASPAR   9-0     71-45
PASSES   9-00    73-1    129-6
PAT      5-1310
PATCH  133-720
PATTER   9-00    39-21   53-36   53-38   129-7
PERIOD  34-33    38-80   40-36   41-11   41-31   57-385  57-392  57-417  57-462  59-87   59-99   59-105  59-115  59-121
        59-131   59-137  59-151  59-156  59-157  59-160  59-167  81-17   120-510
PERM    71-20*  108-3*  108-46*  108-530
PFECH    87-1    87-10
PFECH1   87-1    87-10
PFECH2   87-1    87-10
PFECH3   87-1    87-10
PFECHA   87-1    87-10
PFTSTN   87-1    87-10   87-1*
PGE      5-1370   5-2580
PGM      5-1670
PIP      5-1710
PIRQ     5-1040
PIRQVE   5-1040
POPQUE  105-21   106-12  106-153  109-77   109-126  119-260
POSER    30-14    30-440
PR0      5-1040
PR1      5-1040
PR2      5-1040
PR3      5-1040
PR4      5-1040   62-13
PR5      5-1040
PR6      5-1040   12-28   58-12   58-24
PR7      5-1040
PROCES   21-11    22-30
PRTBAD   26-5     26-51   33-9    42-160
PRTIM    22-62    24-140
PS        5-104    5-1040  12-88*  62-13*  62-99*  73-3*   81-28*  96-14*  102-15  102-16*  102-47*  104-11  104-12*  104-68*
        105-9    105-56*
PSEL     5-1140
PSW      5-1040
PUNSAF   22-52    23-30
PWRFLG   15-3     16-12   17-37   17-51*  66-10   96-1*   96-30
PWRUP    96-1     96-110
PWRVEC    5-1040  12-25*  12-25*  96-1*   96-1*   96-1*   96-1*   96-1*   96-1*
QCNT    115-250  117-19  118-7*  118-22  118-24*  119-11  119-26*
QDRV0   116-3    116-14  116-23  117-30
QDRV1   116-4    116-15  116-24  117-40
QDRV2   116-5    116-16  116-25  117-50
QDRV3   116-6    116-17  116-26  117-60
QDRV4   116-7    116-18  116-27  117-70
QDRV5   116-8    116-19  116-28  117-80
QDRV6   116-9    116-20  116-29  117-90
QDRV7   116-10   116-21  116-30  117-100
QINPT   116-30   118-9   118-26*  118-27*  118-28  118-30*
QOUTPT  116-140  118-9*  119-14   119-28   119-29*  119-30*  119-31  119-33*
QSTART  116-230  117-25  117-30   118-30   119-33
QSTOP   116-240  118-28  119-31
QTERP   116-31   117-110
QUES     70-21    71-8    128-30
```

```
R6          5-1040  12-25   12-25*  12-25*
R7          5-1040
RANCYL     51-30    52-30   52-40
RANDOM      9-00    51-29   129-15
RANDMC      9-00    53-4    129-8
RANPAT     53-260
RANSEC     52-250
RANSIZ     51-45    53-30   53-11
RANTRK     52-140
RANXIT     53-27    53-300
RATIO       9-00    51-16   129-9
RD,RP     103-37   103-62  103-68  106-108  106-125  106-138  108-14  109-5  111-15  111-64  112-100  114-22
RDCHR      85-1     97-10
RDDAT       6-230    9-0    50-58   56-41
RDHD        6-240    9-0    44-14
RDLIN      12-118   15-20   15-41   15-92    62-30    65-7    70-25   97-10  132-28  132-40
RDONLY      9-00    12-103* 12-106* 15-34    15-61    50-61   51-9    62-64   62-78
RDY         5-1110
READDR     28-5     29-6    30-6    43-16    56-18    57-191  57-4790
READHD     28-6     29-7    30-7    44-100
READIN      6-120
RECAL       6-50    43-9    43-30
RECALO     43-300   63-61
RECALT     30-55    43-70
REDAPK     62-75    65-80
RELBUF     21-41    47-70
RELSE       6-70
REPLZ      59-85    79-130
RESREG     48-23    62-96   74-48   75-37    94-1     95-1    97-10   102-48  104-61  104-65  105-57  106-234  107-10  110-21
          114-39   117-34
RESVEC      5-1040
RETRY       9-00    25-26*  26-15*  26-34*   26-35    26-35   27-12*  27-22*  27-45*  27-61*  27-65*  27-66    27-66   28-19*
           29-26*   30-32*  30-69*  31-10*   32-26*   33-10*  33-28*  33-56*  44-38*  44-58*  44-59   44-59    57-359
REV         9-00    12-30
RHEXT      13-4*    13-13*  13-17*  13-23    101-60   114-36
RMR         5-1790
RP07       43-10    43-31   44-16   49-9     104-110
RPADR      12-80*   62-14   101-40  102-36   104-18   106-15  106-61  106-86  107-5   111-13  112-11   112-14   112-18  113-15
          113-17   113-22  113-24  113-28   114-10   115-9   132-48
RPAS      101-210  103-67*  108-24* 108-47*  109-3    109-50* 109-82* 109-113* 111-55
RPBA      101-160
RPBAE     101-340
RPCC      101-290  104-43*  105-49*
RPCS1     101-140  103-24*  103-31  103-56   105-16*  105-17  106-48  106-81  106-139  106-151  106-168  106-179  108-15  109-6
          109-48   109-129  111-65
RPCS2      62-15*  101-180  102-37*  103-23*  103-25   104-28* 105-15* 106-16* 106-62*  106-87*  106-203  106-227* 108-13* 109-61*
          109-90*  109-112* 111-14*  111-30*  112-15   113-25  114-11* 114-17  115-10*  115-15
RPCS3     101-350
RPDA      101-170  106-32   106-76   106-93
RPDB      101-230  114-15
RPDC      101-280  106-36   106-65   106-101
RPDS      101-190  103-63   108-44   109-94   111-16
RPDT      101-250  103-38
RPEC1     101-320
RPEC2     101-330  114-26
RPER1      29-8     30-8    101-20*  103-69   109-95   113-29
```

CROSS REFERENCE TABLE (CREF V04.00)

```
RPER2   101-300  109-96
RPER3   101-310  109-97
RPINIT   16-5    102-140
RPLA    101-220
RPMR1   101-240  106-22   106-57
RPOF    101-270  103-60   106-109  106-113  106-124  106-128
RPSN    101-260
RPSTU0   98-160  102-18   109-94*  109-95*  109-96*  109-97*
RPSTU1   98-160
RPSTU2   98-160
RPSTU3   98-160
RPSTU4   98-160
RPSTU5   98-160
RPSTU6   98-160
RPSTU7   98-160
RPTMR    61-52   110-60
RPVEC    12-81*  101-50   102-33   102-35   104-12
RPWC    101-150
RTC       6-110
RTURN    73-1    73-30
RMU1      5-2550
RMU2      5-2560
RMU3      5-2570
S        57-195   57-204   127-100
SAVEFG   16-9*   100-70   106-155  108-19   109-79
SAVER1    9-00    36-22*   37-36*   38-11    38-17    38-22*
SAVER5    9-00    36-23*   37-37*   38-18    38-23*
SAVPOS    9-00    37-38*   38-19
SAVREG   48-9     62-12    74-38    75-26    94-1     95-1     97-10    102-14   104-14   105-8    106-190  107-4    110-9    114-7
        117-18
SC      107-9    109-30
SC04      5-2290
SC1       5-2270
SC10      5-2300
SC100     5-2330
SC11    109-62   109-730
SC12    109-36   109-42   109-900
SC13    109-30   109-1120
SC2       5-2280
SC20      5-2310
SC3     109-20   109-24
SC4     109-22   109-55   109-71   109-88   109-140
SC40      5-2320
SC5     109-21   109-280
SC6     109-41   109-570
SC8     109-49   109-640  109-105
SCMND    62-59    64-280
SCOPE     5-1040
SEARCH    6-130
SECLMT   37-58    55-19    57-492   57-497   67-15    67-41    67-42    68-12*   68-19*   121-130
SECOND    9-00    12-92*   20-13*   61-23    61-34*   61-35    61-37*   96-16*
SEEK      6-40
SEEKFG  100-150  102-19   105-37
SELDRV    6-170
SEQPAR   17-41    20-54    50-140
SET.IE  103-27   104-46   105-55   106-233  109-13   109-136  115-80
```

CROSS REFERENCE TABLE (CREF V04.00)

```
SETFMT    6-160
SETVEC   15-4      15-89     15-97     15-103    15-111    16-40
SIZE70   13-40
SIZMEM   14-30     96-35
SKI       5-2730
SKIER    24-105    32-380
SLASH   129-240
SPOTCK   25-3      28-3      29-12     30-18     30-58     30-81     42-70
SRCMMT   99-390   105-10*   106-83*   109-74    109-83*
STA      17-30
STACK     5-1040   12-25     12-87     73-4      96-15
START     7-3      12-150    58-35     62-36
START1    7-1      12-11     12-180
START2   12-16     12-210
STATIN    9-00     12-82*    21-49     21-51*    61-57*
STATIS   21-10     45-70
STATPR   21-55     59-70     64-42
STKLMT    5-1040
STNDAT   10-00     39-29     39-35     48-15
STO     110-16    111-110
SUPR1    77-15     77-200
SUPR2    77-14*    77-19*    77-29     77-31*    77-330
SUPRS    59-98     59-104    59-114    59-120    59-130    59-136    77-170
SUPRSL   70-18     77-120
SVRMXX   16-61     69-12     106-157   108-21    108-41    109-35    109-81    109-125   111-29    111-95    114-70
SW0       5-1040   12-104    51-12     62-67     62-81
SW00      5-104     5-1040
SW01      5-104     5-1040   22-20
SW02      5-104     5-1040   15-15     16-14     21-43
SW03      5-104     5-1040
SW04      5-104     5-1040   50-39     71-41     73-1
SW05      5-104     5-1040   57-73     57-144
SW06      5-104     5-1040   56-26
SW07      5-104     5-1040   38-52
SW08      5-104     5-1040   73-1
SW09      5-104     5-1040
SW1       5-1040
SW10      5-1040   57-6
SW11      5-1040
SW12      5-1040
SW13      5-1040   57-9      86-1
SW14      5-1040
SW15      5-1040   23-29     57-395    57-425
SW2       5-1040
SW3       5-1040   37-16     42-16
SW4       5-1040
SW5       5-1040   57-177
SW6       5-1040
SW7       5-1040
SW8       5-1040
SW9       5-1040   17-6
SWR       8-00     12-25     12-25     12-25*    12-25*    12-25*    12-31     12-104    15-15     16-14     17-6      21-43     22-20     23-29
         37-16     38-52     42-16     50-39     51-12     56-26     57-6      57-9      57-73     57-144    57-177    57-395    57-425    62-25
         62-67     62-81     71-41     73-1      73-1      81-26     85-1      85-1      85-1*     86-1      86-1      86-1      86-1      86-1
         96-1      96-1*
SWREG     7-1#     12-25     12-31     85-1      85-1      85-1
```

CROSS REFERENCE TABLE (CREF V04.00)

```
SWTIM    22-58    23-36#
T        57-193   57-200  127-8#
TAB     128-7#
TAB.XY    7-12#     8-0
TABLE    67-36   130-5#
TABLE0  130-5    130-20#
TABLE1  130-8    130-20#
TABLE2  130-8    130-20#
TABLE3  130-8    130-20#
TABLE4  130-8    130-20#
TABLE5  130-8    130-20#
TABLE6  130-8    130-20#
TABLE7  130-8    130-20#
TAP       5-222#
TBITVE    5-104#
TCF       5-270#
TD      107-8    108-3#
THEAD    51-29#
TIMER   100-20#  103-18*  103-83*  105-48*  106-161* 106-209* 108-8*   109-58*  109-85*  110-12   110-14*  111-45*  111-73*  111-81*
        111-88*
TKVEC     5-104#  85-1*    85-1*
TPE       5-263#
TPVEC     5-104#
TRAPVE    5-104#  12-25*   12-25*
TRE       5-116#
TRFER    24-51    32-18#
TRKLMT   37-62    54-47    55-23    55-50    57-498   67-14    67-39    67-40    68-11*   68-18*   121-14#
TRMREP   21-56   128-28#
TRNSWT   99-31#  106-13*  106-184  106-186* 106-197  106-219* 106-225* 108-10   108-11*  111-24   111-39   111-51*
TRTVEC    5-104#
TST1     12-19#
TSTANY    9-0#    15-7*    15-57*   67-17    67-66
TYDRV    59-81    81-11#
TYPDRV   19-21    63-77    81-12#
TYPDS    59-150   59-153   59-156   59-159   59-166   97-1#
TYPE     12-6     12-30    12-31    12-45    12-51    12-56    12-62    12-117   12-130   12-132   12-134   15-19    15-32    15-38
         15-53    15-55    15-59    15-63    15-91    15-104   16-17    16-18    16-20    16-28    16-31    16-34    16-37    16-44
         16-46    16-47    16-55    16-64    16-69    18-39    18-41    18-42    19-15    19-16    19-18    19-19    19-22    20-16
         21-54    21-56    23-14    23-15    23-16    23-21    23-22    23-23    23-25    23-26    57-8     57-11    57-12    57-14
         58-30    59-22    59-28    59-30    59-31    59-50    59-68    59-70    59-71    59-72    59-77    59-79    59-80    59-82
         59-87    59-93    59-94    59-99    59-100   59-105   59-106   59-109   59-110   59-115   59-116   59-121   59-122   59-125
         59-126   59-131   59-132   59-137   59-148   59-149   59-151   59-152   59-154   59-155   59-157   59-158   59-160   59-161
         59-167   59-168   61-17    61-22    62-20    62-22    62-23    62-24    62-28    62-92    62-94    63-6     63-19    63-72
         63-73    63-75    63-76    64-43    64-44    64-45    67-43    70-12    70-20    70-21    70-22    70-30    71-7     71-8
         71-9     71-11    71-30    71-31    71-32    71-33    71-36    73-1     73-1     73-1     73-1     73-1     73-1     73-1
         73-1     73-1     73-1     73-1     77-32    79-32    81-11    81-12    81-15    81-17    85-1     85-1     85-1     85-1
         85-1     85-1     85-1     85-1     85-1     85-1     85-1     85-1     85-1     85-1     85-1     85-1     85-1     85-1
         86-1     86-1     86-1     86-1     87-1     87-1     87-1     87-1     87-1     87-1     87-1     88-1     89-1     90-1
         96-1     96-21    96-25    97-1#    132-21   132-24   132-27   132-36   132-39
TYPOC    12-8     62-25    85-1     87-1     87-1     97-1#    132-26   132-38
TYPON    97-1#
TYPOS    12-48    12-59    16-19    19-17    23-27    59-69    63-74    71-10    71-35    97-1#
TYPRI4   80-41
TYPSUM   59-32    59-49    59-64#
UCPAR    22-54    23-14#
UNS       5-191#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
UNSAF    24-35    24-39    33-22#
UNTASN   63-25    63-39   128-12#
UNTNOT   64-21    64-37   128-11#
UNTOFF   16-34    63-95   128-9#
UNTON    16-46   128-10#
UPE       5-140#
US1       5-127#
US2       5-128#
US4       5-129#
VV        5-164#
WAIT      9-0#    18-30    20-19    20-21    20-35    20-78
WATPAK   62-90    65-18#
WC.HK   107-16#  108-27
WCE       5-141#
WCF       5-182#
WCFER    24-75    33-3#
WCHKX    98-2#   108-26
WCKD      6-19#    9-0     56-28    56-37   107-28
WCKER    24-47    27-3#
WCKHD     6-20#
WLE       5-188#
WLEER    24-83    31-31#
WOR       5-254#
WRDCNT    9-0#    14-19    14-21*   14-22    15-110   15-112*  50-44    53-3     129-3
WRDPOS    9-0#    34-28*   34-29    34-38    36-40*   36-44*   37-3*    37-11*   37-38    37-76*   37-80*   38-16    38-19*   38-24*
          38-68    38-72    38-76    40-33*   41-7     41-26
WRL       5-169#
WRT.RP  103-55   103-59   106-21   106-31   106-35   106-47   106-56   106-64   106-75   106-80   106-92   106-100  106-112  106-127
        106-150  106-167  106-178  109-47   113-10#
WRTCHK    9-0#   107-16   129-11
WRTDAT    6-21#    9-0     50-67    56-31   107-18
WRYUNS    5-253#
XXDP      9-0#    12-36*   12-39*   12-40    12-42*   12-47    12-58    16-40    16-42    17-24    17-26    63-26    63-28    63-40
          63-42
Y       128-50#
ZEROS     10-0    10-0#
ZROIND    9-0#    36-21*   37-28*   37-35*   37-40
```

```
$$CMRE    7-600#
$$CMTM    7-600#   8-0
$$ESCA    5-104#
$$NEWT    5-104#   12-19
$$SET    97-1      97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-10#   97-2
$$SETM   12-25     12-25#
$$SKIP    5-104#
.$ACT1    5-76#     7-8
.$APTB    5-79#     8-0      8-0#
.$APTH    5-79#     7-11
.$APTY    5-79#    91-1
.$CATC    5-77#     7-1
.$CMTA    5-77#     7-600
.$DB2D    5-78#    94-1
.$DB2O    5-78#    95-1
.$EOP     5-79#    73-1
.$ERRO    5-77#    86-1
.$ERRT    5-77#    87-1
.$POWE    5-79#    96-1
.$RAND    5-78#    92-1
.$READ    5-76#    85-1
.$SAVE    5-78#    93-1
.$SIZE    5-78#   131-1
.$TRAP    5-78#    97-1
.$TYPD    5-77#    90-1
.$TYPE    5-76#    88-1
.$TYPO    5-77#    89-1
.EQUAT    5-76#     5-104
.HEADE    5-76#     5-85
.SETUP    5-76#     6-29
.SWRHI    5-76#     5-87
.SWRLO    5-76#     5-87#    5-88     5-89     5-90     5-92     5-94     5-99     5-101    5-102
A        60-2#     60-16    60-17    60-18    60-19    60-20
CKCHR     5-17#    83-20    83-28
CKDIG     5-27#    70-27
CKNUM     5-40#
COMMEN    5-104#
ENDCOM    5-104#
ERENTR   85-13#    86-1
ERROR     5-104#  109-12
ESCAPE    5-104#
GETPRI    5-104#  131-1
GETSWR    5-104#   12-31    12-31#
MORETA    7-14#     8-0
MULT      5-104#
NEWTST    5-104#   12-19
POP       5-104#   30-15    30-48    38-24    57-102   59-36    64-47    66-46    67-81    68-20    69-29    79-34    80-36    90-1
         91-1      91-1     92-1     93-1     96-1     96-1
PUSH      5-104#   30-10    38-16    57-28    58-6     59-7     64-28    66-9     68-7     69-10    90-1     91-1     91-1     91-1
         92-1      93-1     96-1     96-1
REPORT    5-104#
SETPRI    5-104#   85-1
SETTRA   97-1      97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-1     97-10#   97-2
SETUP     5-104#   12-25
SKIP      5-104#
SLASH     5-104#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
STARS    5-104#   7-8      7-11     7-11     7-11     8-0      8-0      8-0      12-19    73-1     77-4     78-4     85-1     85-1
         85-1     85-1     85-1     86-1     87-1     88-1     89-1     90-1     91-1     92-1     93-1     94-1     95-1     96-1
         96-1     97-1     131-1
SWRSU    5-104#   12-25    12-25#
TRMTRP   97-1#    97-3
TYPBIN   5-104#
TYPDEC   5-104#   59-150   59-153   59-156   59-159
TYPNAM   5-104#   12-31
TYPNUM   5-104#
TYPOCS   5-104#   16-19    19-17    23-27    59-69    63-74    71-10    71-35
TYPOCT   5-104#   62-25    85-1     87-1     87-1
TYPTXT   5-104#   12-6     12-45    12-56    12-62    59-82    59-93    59-109   59-125   59-148   59-149   59-152   59-155   59-158
         59-161
UPCODE   95-2#    96-1
XXEP     72-11#   73-1
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