RP07

RP07 PERF EXER
CZRJOB0

AH-F965B-MC
FICHE 1 OF 2

APR 1984
digital
Made In USA

RP07

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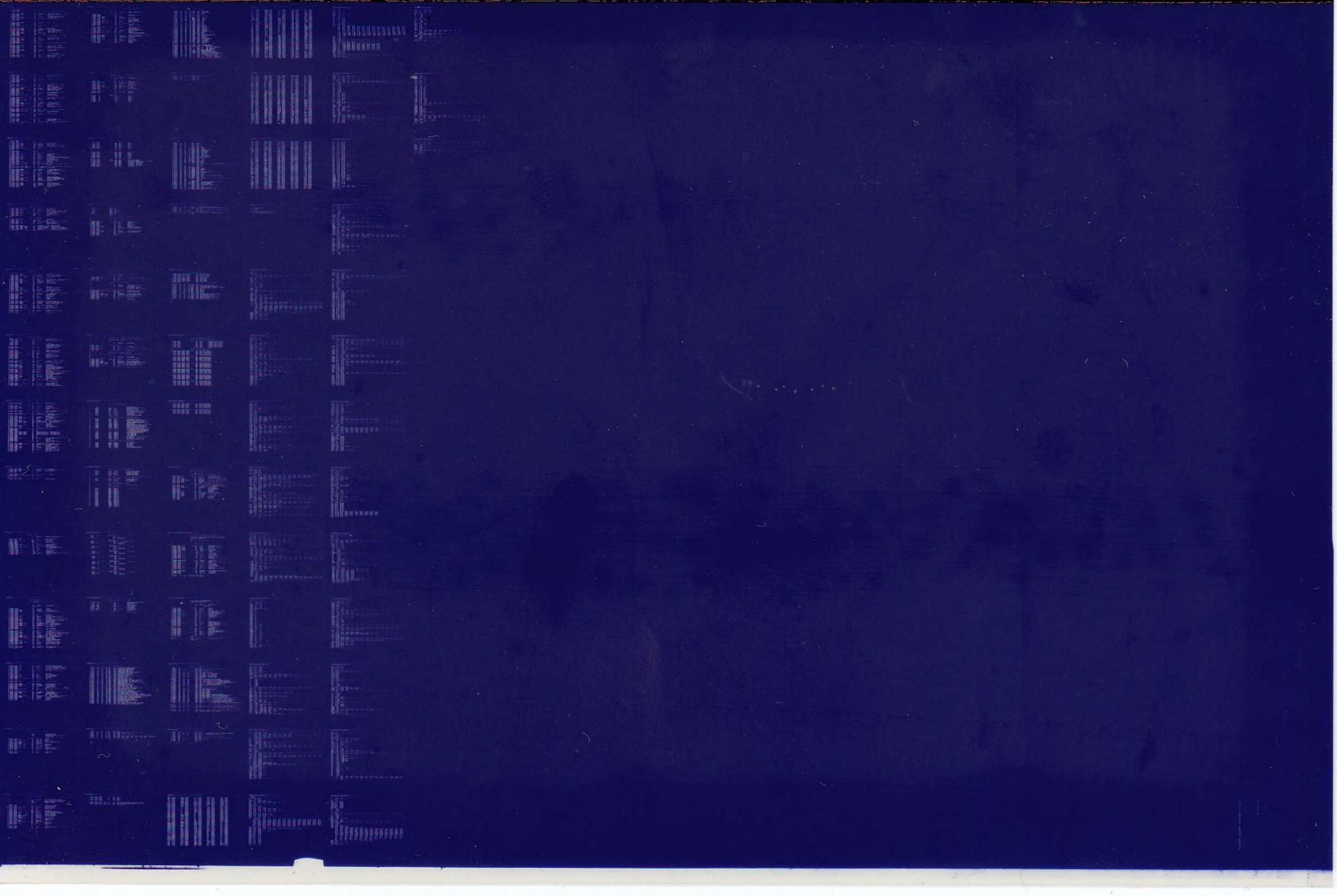

USER DOCUMENTATION

.REM @

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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.REM @

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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":

K L

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 BF 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                          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
```

EASILY. THE USER CAN SCAN SCAN DOWN A COL'PN, 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 (SWO=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 PARAME'ER 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 :	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 RPO7	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<CP> 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 RE'URN <CR>.

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

4.2.3 'S' CUMMAND

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 'RODAT' (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

TAG	TEXT
EM1	RH CONTROLLER INTERRUPT OCCURRED (ERRS=0) THE RH CONTROLLER INTERRUPTED AND THE ATTENTION SUMMARY REGISTER (RPAS) 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 'RDY' BIT BECAME ZERO). THE PROGRAM WILL AUTOMATICALLY
DEASSIGN THE DRIVE. THE OPERATOR MUST REASSIGN THE DRIVE
WITH THE 'I' 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

[illegible] AS TO ERCA EXCEPT THAT THE 'ACE' 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, DRE, IAE, OR BLE

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 'NXDPE'.

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 'BCE' ERROR PROCESSING, THE CONTENTS OF THE ECC POSITION REGISTER (SPEC1) OR THE CONTENTS OF ECC PATTERN REGISTER (SPEC2) 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 TRANSFERRED 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:

```
SEEK    - SEEK (OCTAL 9)
RECAL   - RECALIBRATE (OCTAL 7)
DRVCLR  - DRIVE CLEAR (OCTAL 11)
RELEASE - 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)
•GETSTS - GET REGISTERS (OCTAL 41)
•SETFMT - SET FORMAT (ECI OR NCI) (OCTAL 43)
•SELDRV - SELECT DRIVE (OCTAL 45)
WCHKD   - WRITE CHECK DATA (OCTAL 51)
WCHKHD  - 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 RM CONTROLLER BUFFER ADDRESS
REGISTER AND THE RM 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.

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 COUNT 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 OFERATIONS.) 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
RH 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 RH 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	111111	052525	147756	155555	030221
000003	177774	000000	111111	052525	147756	111111	030221
000007	177770	000000	111111	052525	147756	155555	030221
000017	177760	177777	111111	125252	147756	111111	030221
000037	177740	177777	111111	125252	147756	155555	030221
000077	177700	177777	111111	125252	147756	111111	030221
000177	177600	000000	111111	052525	147756	155555	030221
000377	177400	000000	111111	052525	147756	111111	030221
000777	177000	177777	111111	125252	147756	155555	030221
001777	176000	177777	111111	125252	147756	111111	030221
003777	174000	000000	111111	052525	147756	155555	030221
007777	170000	177777	111111	125252	147756	111111	030221
017777	160000	000000	111111	052525	147756	155555	030221
037777	140000	177777	111111	125252	147756	111111	030221
077777	100000	000000	111111	052525	147756	155555	030221
177777	000000	177777	111111	125252	147756	111111	030221

PAT 9	PAT 10	PAT 11	PAT 12	PAT 13	PAT 14	PAT 15
000001	177776	172666	077777	155555	000000	177777
000002	177775	155555	137777	066667	177777	000000
000004	177773	172666	157777	155555	177777	000000
000010	177767	155555	167777	066667	177777	000000
000020	177757	172666	173777	155555	177777	000000
000040	177737	155555	175777	066667	177777	000000
000100	177677	172666	176777	155555	177777	000000
000200	177577	155555	177577	066667	177777	000000
000400	177377	172666	177577	155555	177777	000000
001000	176777	155555	177677	066667	177777	000000
002000	175777	172666	177737	155555	177777	000000
004000	173777	155555	177757	066667	177777	000000
010000	167777	172666	177767	155555	177777	000000
020000	157777	155555	177773	066667	177777	000000
040000	137777	172666	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 PACKED .BYTE'S.
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	RM03
5	RM05
-1	NOT AN RP07

THE 'DRVRST' ROUTINE WILL DO A RECOVERY PRESET AND WILL SET DVFLG.

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

CALL:

```
        JSR     R0,@DPB         ;MAKE THE CALL
        .WORD                   ;ADDRESS OF DPB=
        RETURN1                 ;RETURN IF DRIVE IS FULL
        RETURN2                 ;RETURN IF REQUEST IS IN
                                ;OK & 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 RP/RM
                                ;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 "RP TIMER" ROUTINE WITH THE ELAPSED TIME IN THE FOLLOWING MANNER:

```
        MOV     #50.,-(SP)      ;50. MILLISECONDS BETWEEN
                                ;CLOCK TICKS
        JSR     PC,RPTMR        ;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$:    JSR     R0,RP07         ;CALL THE DRIVER
        WRTDPB                  ;DPB ADDRESS
        BR      10$             ;WAIT FOR QUEUE IF FULL
20$:    TST     WRTDPB+16       ;WAIT FOR COMMAND TO COMPLETE
        BEQ     20$
        BMI     ERROR           ;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 RM/RP REGISTERS

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

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

* [illegible] CONTROLLER REGISTERS

9.6 COMMANDS PERFORMED BY THE DRIVER

COMMAND	CODE	COMMAND TYPE
SEEK	105	P
RECALIBRATE	107	P
DRIVE CLEAR	111	H
RELEASE	113	H
OFFSET	115	P
RETURN TO CENTER	117	P
READIN PRESET	121	H
PACK ACKNOWLEDGE	123	H
SEARCH	131	P
GET REGISTER(S)	141	S
SET FORMAT	143	S
SELECT DRIVE	145	S
WRITE CHECK DATA	151	D
WRITE CHK HEADER & DATA	153	D
WRITE DATA	161	D
WRITE HEADER & DATA	163	D
READ DATA	171	D
READ HEADER & DATA	173	D

H = HOUSEKEEPING
P = POSITIONING
D = DATA TRANSFER
S = SPECIAL PROVIDED BY THE DRIVER

9.7 RPO STATUS/ERROR INDICATOR WORD

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

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

[illegible]

14(1)	USER MADE A REQUEST FOR A FUNCTION TO BE PERFORMED ON AN OFFLINE OR UNSAFE DRIVE
13(1)	USER MADE A REQUEST FOR A FUNCTION TO BE PERFORMED ON A DRIVE THAT HAS AN UNLOAD REQUEST IN QUEUE
12(2)	PERSISTENT UNSAFE CONDITION EXIST
11(2)	UNCORRECTABLE PARITY ERROR OCCURRED
10(2)(4)	FATAL PARITY ERROR. A [illegible] 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. (DRIVE REGISTERS WERE NOT SAVED)

(2) - REQUEST QUEUE HAS BEEN EMPTIED. THE DRIVER ISSUED A "DRIVE CLEAR" TO THE DRIVE. NOTE: ALL DRIVE REGISTERS ARE SAVED AS PER BBC-14 BEFORE THE "DRIVE CLEAR".

(3) - REQUEST QUEUE HAS BEEN EMPTIED. THE DRIVER ISSUED A MASSBUS INIT. ALL DRIVE REGISTERS FOR THE DRIVE WERE SAVED AS PER BBC-14 BEFORE THE INIT.

(4) • [illegible]

9.0 [illegible]

[illegible]

[illegible]

#	TYPE	DATA AVAILABLE
1	[illegible]	•R0• UNIBUS ADDRESS
2	[illegible]	R1• DRIVE NUMBER R3• ATA BIT •R4• UNIBUS ADDRESS R5• (RMAS) [illegible]
3	[illegible]	R0 •R0• ADDRESS OF REG. READ R0 •R0• WORD READ
4	[illegible]	WRT R0• ADDRESS OF REG. WRITTEN WRT R0• [illegible] WRITTEN RD •R0• WORD READ BACK
5	ADDRESS PLUG CHANGE BIT SET ('DPE' ERROR)	R1• DRIVE NUMBER R3• ATA BIT •R4• UNIBUS ADDRESS R5• (RMAS) [illegible]

• THIS IS THE ACTUAL UNIBUS ADDRESS (176700)

.REM @

VERSION (C2RJ0-A 01)

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 #4)
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  RPO7 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)
```

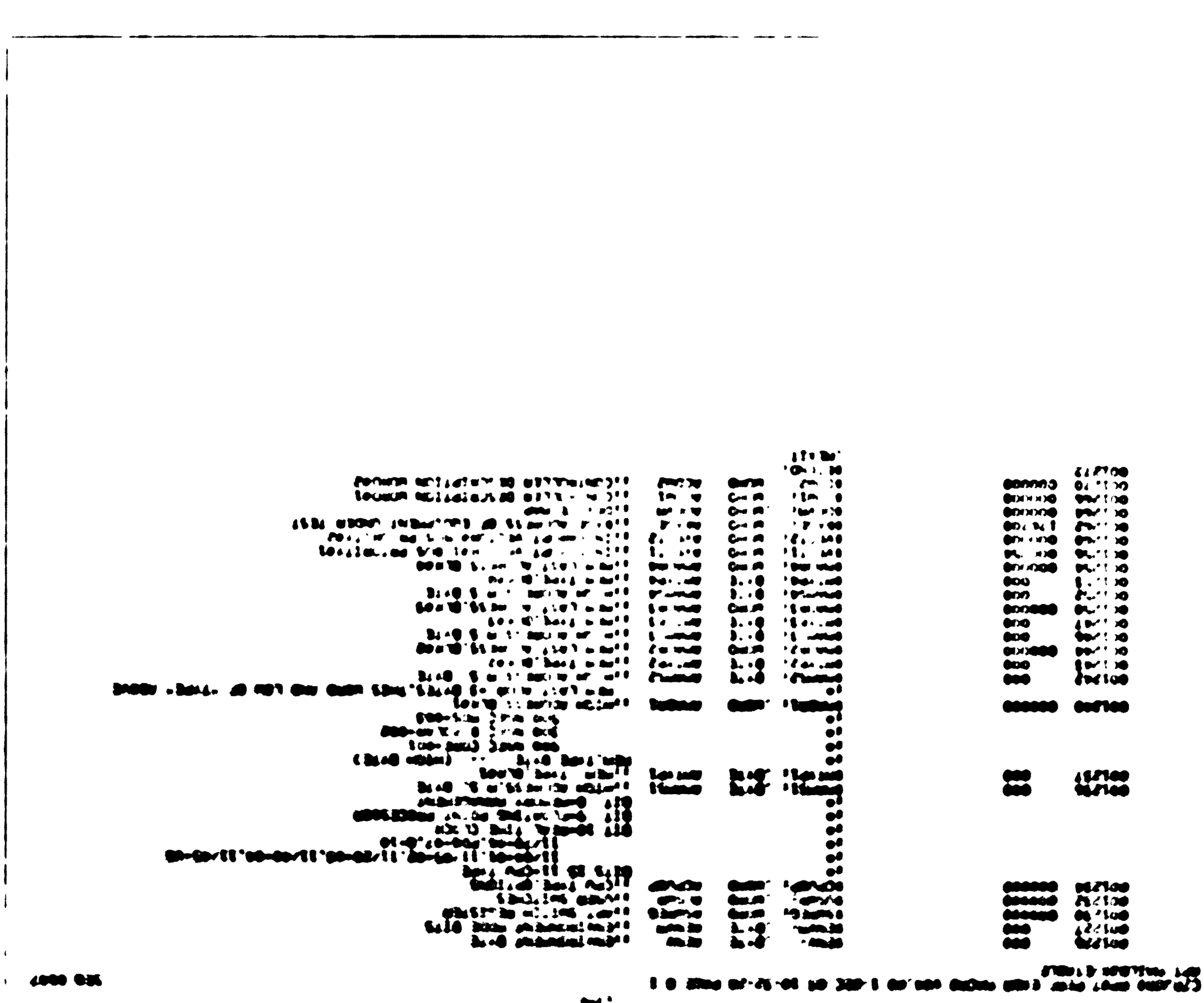
```
187          002000                  IAE     = 2000                  ;INVALID ADDRESS ERROR (BIT #10)
188          004000                  WLE     = 4000                  ;WRITE LOCK ERROR (BIT #11)
189          010000                  DTE     = 10000                 ;DRIVE TIMING ERROR (BIT #12)
190          020000                  OPI     = 20000                 ;OPERATION INCOMPLETE (BIT #13)
191          040000                  UNS     = 40000                 ;DRIVE UNSAFE (BIT #14)
192          100000                  DCK     = 100000                ;DATA CHECK ERROR (BIT 15)
193
194                                  ;MAINTENANCE REGISTER (RPMR1)(#03)
195
196                                  ;ATTENTION SUMMARY PSEUDO REGISTER (RPAS) (#04)
197
198          000001                  ATO     = 1                     ;DEVICE 0 (BIT #0)
199          000002                  AT1     = 2                     ;DEVICE 1 (BIT #1)
200          000004                  AT2     = 4                     ;DEVICE 2 (BIT #2)
201          000010                  AT3     = 10                    ;DEVICE 3 (BIT #3)
202          000020                  AT4     = 20                    ;DEVICE 4 (BIT #4)
203          000040                  AT5     = 40                    ;DEVICE 5 (BIT #5)
204          000100                  AT6     = 100                   ;DEVICE 6 (BIT #6)
205          000200                  AT7     = 200                   ;DEVICE 7 (BIT #7)
206
207                                  ;DESIRED SECTOR/TRACK ADDRESS REGISTER (RPDA) (#05)
208
209                                  ;DRIVE TYPE REGISTER (RPDT) (#06)
210
211          000001                  DT00    = 1                     ;DRIVE TYPE NUMBER BIT 1
212          000002                  DT01    = 2                     ;DRIVE TYPE NUMBER BIT 2
213          000004                  DT02    = 4                     ;DRIVE TYPE NUMBER BIT 3
214          000010                  DT03    = 10                    ;DRIVE TYPE NUMBER BIT 4
215          000020                  DT04    = 20                    ;DRIVE TYPE NUMBER BIT 5
216          000040                  DT05    = 40                    ;DRIVE TYPE NUMBER BIT 6
217          000100                  DT06    = 100                   ;DRIVE TYPE NUMBER BIT 7
218          000200                  DT07    = 200                   ;DRIVE TYPE NUMBER BIT 8
219          000400                  DT08    = 400                   ;DRIVE TYPE NUMBER BIT 9
220          004000                  DRQ     = 4000                  ;DRIVE REQUEST REQUIRED (BIT #11)
221          020000                  MOH     = 20000                 ;MOVING HEAD (BIT #13)
222          040000                  TAP     = 40000                 ;TAPE DRIVE (BIT #14)
223          100000                  NSA     = 100000                ;NOT SECTOR ADDRESSED (BIT #15)
224
225                                  ;LOOK-AHEAD REGISTER (RPLA) (#07)
226
227          000100                  SC1     = 100                   ;SECTOR COUNT FIELD 0 (BIT #6)
228          000200                  SC2     = 200                   ;SECTOR COUNT FIELD 1 (BIT #7)
229          000400                  SC04    = 400                   ;SECTOR COUNT FIELD 2 (BIT #8)
230          001000                  SC10    = 1000                  ;SECTOR COUNT FIELD 3 (BIT #9)
231          002000                  SC20    = 2000                  ;SECTOR COUNT FIELD 4 (BIT #10)
232          004000                  SC40    = 4000                  ;SECTOR COUNT FIELD 5 (BIT #11)
233          010000                  SC100   = 10000                 ;SECTOR COUNT FIELD 6 (BIT #12)
234
235                                  ;SERIAL NUMBER REGISTER (RPSN) (#10)
236                                  ;(EACH IS CALLED BY BIT NUMBER)
237
238                                  ;OFFSET REGISTER (RPOF) (#11)
239
240          000200                  OFFDIR  = 200                   ;RP07 OFFSET DIRECTION
241          002000                  HCI     = 2000                  ;HEADER COMPARE INHIBIT (BIT #10)
242          004000                  ECI     = 4000                  ;ERROR CORRECTION CODE INHIBIT (BIT #11)
243          010000                  FMT16   = 10000                 ;FORMAT BIT (BIT #12)
```

```
244
245                             ;DESIRED CYLINDER ADDRESS (RPDC) (012)
246                             ;(EACH BIT IS CALLED BY BIT NUMBER)
247
248                             ;CURRENT CYLINDER ADDRESS (RPCC) (013)
249                             ;(EACH BIT IS CALLED BY BIT NUMBER)
250
251                             ;RP07 ERROR REGISTER 02 (RPER2) (014)
252
253     000400                  WRTURS  = 400                   ;WRITE READY UNSAFE (BIT 8)
254     001000                  WOR     = 1000                  ;WRITE OVERRUN (BIT 9)
255     002000                  RWU1    = 2000                  ;READ/WRITE UNSAFE 01 (BIT 10)
256     004000                  RWU2    = 4000                  ;READ/WRITE UNSAFE 02 (BIT 11)
257     010000                  RWU3    = 10000                 ;READ/WRITE UNSAFE 03 (BIT 12)
258     100000                  PGE     = 100000                ;PROGRAM ERROR (BIT 15)
259
260                             ;RP07 ERROR REGISTER 03 (RPER3) (015)
261
262     000001                  DGE     = 1                     ;DIAGNOSTIC ERROR (BIT 0)
263     000002                  TPE     = 2                     ;TEMPERATURE WARNING ERROR(BIT 1)
264     000004                  AIR     = 4                     ;AIR SYSTEM WARNING ERROR (BIT 2)
265     000010                  DPE     = 10                    ;DATA PARITY ERROR (BIT 3)
266     000020                  BPE     = 20                    ;BUFFER PARITY ERROR (BIT 4)
267     000040                  DCU     = 40                    ;DC UNSAFE (BIT 5)
268     000100                  IXU     = 100                   ;INDEX UNSAFE (BIT 6)
269     000200                  DVC     = 200                   ;DEVICE CHECK (BIT 7)
270     000400                  TCF     = 400                   ;TACH CALIBRATION FAILURE (BIT 8)
271     001000                  LCE     = 1000                  ;LOSS OF CYLINDER ERROR (BIT 9)
272     002000                  LBC     = 2000                  ;LOSS OF BIT CLOCK (BIT 10)
273     040000                  SKI     = 40000                 ;SEEK INCOMPLETE (BIT 14)
274     100000                  BSE     = 100000                ;BAD SECTOR ERROR (BIT 15)
275
276                             ;ECC POSITION REGISTER (RPEC1) (016)
277                             ;(EACH BIT IS CALLED BY BIT NUMBER)
278
279                             ;ECC PATTERN REGISTER (RPEC2) (017)
280                             ;(EACH BIT IS CALLED BY BIT NUMBER)
```

```
                        .TITLE  RMP07 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          WCHKD   = 151           ;WRITE CHECK DATA
000153          WCHKHD  = 153           ;WRITE CHECK HEADER & DATA
000161          WRTDAT  = 161           ;WRITE DATA
000163          FMTTRK  = 163           ;FORMAT TRACK
000171          RDDAT   = 171           ;READ DATA
000173          RDHD    = 173           ;READ HEADER & DATA
                ;
176700          RBASE   = 176700
000254          NVECTI  = 254
                ;
```

```
                        ;                       .SBTTL  TRAP CATCHER
                                                        ;0
                 000000                         ;ALL UNUSED LOCATIONS FROM 0 - 776 CONTAIN A "JSR R5,@#2.+2"
                                                ;SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                                ;LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
                 000176                                 .=176
000176 000000                                   DISPREG:: .WORD   0             ;;SOFTWARE DISPLAY REGISTER
000200 000000                                   SWREG::   .WORD   0             ;;SOFTWARE SWITCH REGISTER
                                                .SBTTL  STARTING ADDRESS(ES)
000700 000137 009532                                    JMP     @#STRTA1                ;;JUMP TO STARTING ADDRESS OF PROGRAM
                                                ;
000704 000137 009522                                    JMP     @#STRT01        ;CHANGE THE RUN/REPOT ADDRESS
                                                ;
                                                .SBTTL  ACT11 HOOKS
                                                ;;*************************************************************
                                                ;HOOKS REQUIRED BY ACT11
                 000710                                 $SVPC=.                 ;SAVE PC
                 000046                                 .=46
000046 015056                                           @#RUNMOD                ;;RESET LOC.46 TO ADDRESS OF RUNMOD IN .REOP
                 000052                                 .=52
000052 040000                                           .WORD   40000           ;;RESET LOC.52 TO 40000
                 000710                                 .=$SVPC                 ;; RESTORE PC
                                                ;
                 001100                         .=1100
                                                .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                                 .=.&1C  ;;RESET LOCATION COUNTER
                                                ;;*************************************************************
                                                ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                                ;INTERFACE SPEC.

001100                                          $APTHD::
001100 000000                                   $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001102 001106                                   $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0 15)
001104 014256                                   $ITSTM: .WORD   6500.   ;;RUN TIM OF LONGEST TEST
001106 014256                                   $PASTM: .WORD   6500.   ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001110 014256                                   $UNITM: .WORD   6500.   ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDED UNIT
001112 000052                                           .WORD   $ETEND-$MAIL/2  ;;LENGTH MAILBOX-ETABLE(WORDS)
                 001114                         TAB.EV=.                ;ENTAGSTARING ADDRESS
```

```
                                        .SBTTL  COMMON TAGS

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

        001114                                  .=1114
001114                                  $CMTAG:                         ;;START OF COMMON TAGS
001114  000000                                  .WORD   0
001116     000                          $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
001117     000                          $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
001120  000000                          $ICNT:  .WORD   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 ITEM 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                          SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
001156  177570                          DISPLAY: .WORD  DDISP           ;;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                          $TIMES: .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
```



```
[redacted]
```

```
001426 000000            [illegible]: .WORD  0     ;[illegible] BYTES ARE [illegible] ASSIGNED.
                                                   ;[illegible] BYTE PARAMETERS
                                                   ;[illegible] CHANGE BYTE PARAMETERS
001430 000000            [illegible]: .WORD  0     ;THE LOW BYTE CONTAINS THE DRIVE NUMBER FROM WHICH
                                                   ;THE PROGRAM WAS LOADED. THE [illegible] BYTE CONTAINS THE
                                                   ;[illegible] DEVICE CODE FOR THE [illegible].
                          .LIST  [illegible]
001432    [illegible]     [illegible]: .ASCII [illegible]
001433    [illegible]  [illegible]  [illegible]  .ASCII [illegible]   ;PROGRAM ID
001436    [illegible]  [illegible]
001440    [illegible]          .ASCII [illegible]
001441    [illegible]          .ASCII [illegible]   ;REVISION LEVEL
001442    [illegible]          .ASCII [illegible]
001443    [illegible]  [illegible]  .ASCII [illegible]   ;PATCH LEVEL
                          .NLIST [illegible]

                                 .EVEN

                          ;[illegible] CONTROL PARAMETERS
                          ;THE FOLLOWING TWO LOCATIONS CONTAIN THE SOFT ERROR RATE WORDS USED TO
                          ;DETERMINE END OF PASS WHEN THE PROGRAM IS DATA [illegible]
                          ;IT [illegible] APPROXIMATELY [illegible] PASSES TO REACH THE SOFT ERROR RATE OF
                          ;1 [illegible] IN 10^10 [illegible] (6.25 X 10^8 WORDS) READ OR 10 PASSES TO REACH THE 90%
                          ;CONFIDENCE LEVEL OF 4.120 X 10^10 BITS (2.50 X 10^9 WORDS) READ.
                          ;[illegible] LSB AND ENDCON+2= MSB

001446 14[illegible]00    ENDCON: .WORD  14[illegible]0  ;(2.50 X 10^9 WORDS) OR (4.120 X 10^9 BITS) READ
001450 007540                    .WORD  00[illegible]40

                          ;THE FOLLOWING TWO LOCATIONS CONTAIN THE SEEK ERROR RATE WORDS USED TO
                          ;DETERMINE END OF PASS WHEN THE PROGRAM IS SEEK BIASED
                          ;IT [illegible] 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.
                          ;[illegible] LSB AND [illegible]+2= MSB

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

001456 0000[illegible]2   MAXER:  .WORD  50.     ;MAXIMUM ERRORS ALLOWED PER DRIVE
001460 [illegible]4       [illegible]: .WORD 4   ;NUMBER OF COMPARE [illegible] 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 [illegible]
001466 03[illegible]000   WRDCNT: .WORD  12000.  ;MAXIMUM WORD COUNT (6-12000.)
001470 000000 000000      [illegible]: .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
```

```
001502  000008                  RATIO:  .WORD   8               ;THE WORD COUNT
                                        ;READ/WRITE RATIO (RANGE 0   7)
                                        ;0   15/1       (READ/WRITE)
                                        ;1 -  7/1
                                        ;2 -  4/2
                                        ;3 -  2/3
                                        ;4 -  1/4
                                        ;5 -  1/5
                                        ;6 -  1/6
                                        ;7 -  1/7
001504  000001                  ENDING: .WORD   1               ;IF NOT EQ 0, END OF PASS DETERMINED
                                        ;BY THE 'WORDS READ' COUNT. (2 50 X 10**6 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 ('WCHKD')
                                        ;1 = WRITE CHECK HEADER & DATA ('WCHKHD' - 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
```

```
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
```

```
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    /
```

```
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  115          .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
```

```
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
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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
```

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005166  157777                          .WORD   157777
005166  167777                          .WORD   167777
005170  173777                          .WORD   173777
005172  175777                          .WORD   175777
005174  176777                          .WORD   176777
005176  177377                          .WORD   177377
005200  177577                          .WORD   177577
005202  177677                          .WORD   177677
005204  177737                          .WORD   177737
005206  177757                          .WORD   177757
005210  177767                          .WORD   177767
005212  177773                          .WORD   177773
005214  177775                          .WORD   177775
005216  177776                          .WORD   177776

005220  125525                  DATA13: .WORD   125525  ;STANDARD PATTERN 13
005222  052447                          .WORD   052447
005224  125525                          .WORD   125525
005226  052447                          .WORD   052447
005230  125525                          .WORD   125525
005232  052447                          .WORD   052447
005234  125525                          .WORD   125525
005236  052447                          .WORD   052447
005240  125525                          .WORD   125525
005242  052447                          .WORD   052447
005244  125525                          .WORD   125525
005246  052447                          .WORD   052447
005250  125525                          .WORD   125525
005252  052447                          .WORD   052447
005254  125525                          .WORD   125525
005256  052447                          .WORD   052447

005260  000000                  DATA14: .WORD   000000  ;STANDARD PATTERN 14
005262  177777                  ONES:   .WORD   177777  ;ALL 1 S DATA PATTERN
005264  177777                          .WORD   177777
005266  177777                          .WORD   177777
005270  177777                          .WORD   177777
005272  177777                          .WORD   177777
005274  177777                          .WORD   177777
005276  177777                          .WORD   177777
005300  177777                          .WORD   177777
005302  177777                          .WORD   177777
005304  177777                          .WORD   177777
005306  177777                          .WORD   177777
005310  177777                          .WORD   177777
005312  177777                          .WORD   177777
005314  177777                          .WORD   177777
005316  177777                          .WORD   177777

005320  177777                  DATA15: .WORD   177777  ;STANDARD PATTERN 15
005322  000000                          .WORD   000000
005324  000000                          .WORD   000000
005326  000000                          .WORD   000000
005330  000000                          .WORD   000000
005332  000000                          .WORD   000000
005334  000000                          .WORD   000000
005336  000000                          .WORD   000000
```

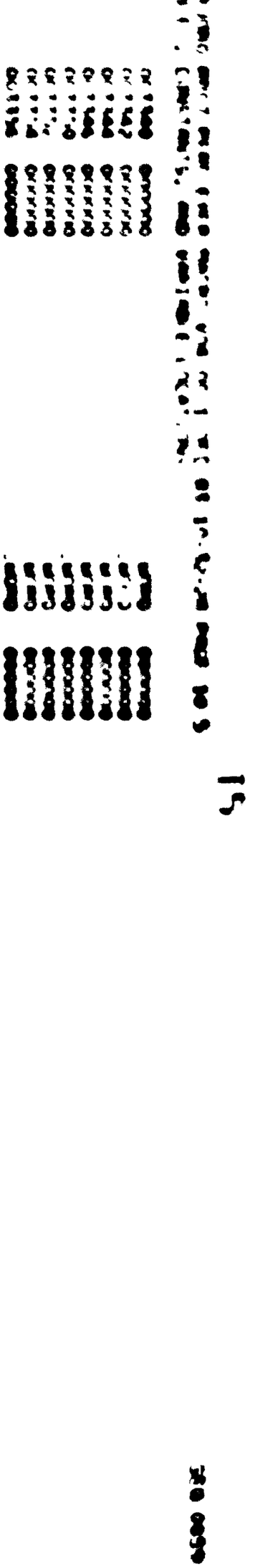

```
                        ;+
                        ; SCB - SYSTEM CONTROL BLOCK
                        ;
                        ; THIS TABLE CONTAINS THE INTERRUPT AND EXCEPTION VECTORS FOR EACH EXCEPTION THAT CAN OCCUR.
                        ; THE VECTOR IS THE ADDRESS OF THE FIRST INSTRUCTION OF THE ROUTINE TO BE EXECUTED.
                        ; THE LOW TWO BITS OF THE VECTOR ARE USED TO INDICATE WHICH STACK TO USE FOR THE EXCEPTION.
                        ; (SEE SCBDEF)
                        ;
                        ;       EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:
                        ;
                        ;  00      FIELD           ;POINTER TO THE KERNEL ROUTINE
                        ;  01      FIELD           ;POINTER TO THE EXEC ROUTINE
                        ;  02      FIELD           ;POINTER TO THE SUPER ROUTINE
                        ;  03      FIELD           ;POINTER TO THE USER ROUTINE
                        ;-

                        SCBTAB:                 ;
                        ;
                        ; 00 - CONTROLLER INTERRUPT OCCURRED (IPR#0 = 0)
                        ;
00000000 00000000       .LONG   0               ;
00000004 00000000       .LONG   0               ;
00000008 00000000       .LONG   0               ;
0000000C 00000000       .LONG   0               ;
                        ;
                        ; 04 - UNEXPECTED INTERRUPT OCCURRED
                        ;
00000010 00000000       .LONG   0               ;UNEXPECTED INTERRUPT OCCURRED
00000014 00000000       .LONG   0               ;
00000018 00000000       .LONG   0               ;
0000001C 00000000       .LONG   0               ;
                        ;
                        ; 08 - MACHINE CHECK
                        ;
00000020 00000000       .LONG   0               ;MACHINE CHECK (VECTOR=1)
00000024 00000000       .LONG   0               ;
00000028 00000000       .LONG   0               ;
0000002C 00000000       .LONG   0               ;
                        ;
                        ; 0C - KERNEL STACK NOT VALID
                        ;
00000030 00000000       .LONG   0               ;KERNEL STACK NOT VALID (PSL=1)
00000034 00000000       .LONG   0               ;
00000038 00000000       .LONG   0               ;
0000003C 00000000       .LONG   0               ;
                        ;
                        ; 10 - POWER FAIL
                        ;
00000040 00000000       .LONG   0               ;NOT USED
00000044 00000000       .LONG   0               ;
00000048 00000000       .LONG   0               ;
0000004C 00000000       .LONG   0               ;
                        ;
                        ; 14 - RESERVED INSTRUCTION FAULT
                        ;
00000050 00000000       .LONG   0               ;RESERVED INSTRUCTION TO ADDRESSING
00000054 00000000       .LONG   0               ;
00000058 00000000       .LONG   0               ;
0000005C 00000000       .LONG   0               ;
```

KS


```
                                        ;THIS ROUTINE HANDLES UNEXPECTED TIMEOUTS
[illegible]   [illegible]                 [illegible]  MOV   [illegible]       ;SAVE PC WHERE THE TIME OUT OCCURED
[illegible]   [illegible]                              [illegible]             [illegible]
[illegible]   [illegible]                              CMP   [illegible]       [illegible]
[illegible]   [illegible]  [illegible]                 [illegible]             [illegible]
[illegible]   [illegible]                              BR    [illegible]       [illegible]
                                        [illegible]
[illegible]
[illegible]
[illegible]   [illegible]                              MOV   [illegible]       ;SETUP FOR TYPING OUT PC
[illegible]   [illegible]                              [illegible]
[illegible]   [illegible]                              [illegible]             [illegible] INSTRUCTION HERE IF YOU WISH
                                                                              ;TO STOP ON UNEXPECTED TIMEOUT.
[illegible]   000000                                   BR    START1            ;BRANCH TO START1

                                        .SBTTL START OF PROGRAM

[illegible]   012737  177777  001532  START:  MOV   #-1,[illegible]    ;ALLOW [illegible] ADDRESS TO BE CHANGED
[illegible]   000407                                   BR    START2            ;START THE PROGRAM

[illegible]   012737  000000  001532  START1: MOV   #0,[illegible]     ;CLEAR [illegible] ADDRESS CHANGE FLAG
                                        ;*****************************************************************
[illegible]   [illegible]                     [illegible]:   [illegible]
[illegible]   012737  [illegible]  [illegible]         MOV   [illegible]       ;;SET TEST NUMBER IN APT MAIL BOX

[illegible]   [illegible]  000000                  START2: [illegible] [illegible] ;TTY LOOP, WAIT FOR [illegible]
[illegible]   [illegible]                              [illegible] [illegible] ;OF WORD
[illegible]   000005                                   RESET                   ;CLEAR THE WORLD

                                        .SBTTL INITIALIZE THE COMMON TAGS
                                        ;;CLEAR THE COMMON TAGS ([illegible]) AREA
[illegible]   012706  001134                           MOV   [illegible]       ;;FIRST LOCATION TO BE CLEARED
[illegible]   [illegible]                              CLR   (R6)+             ;;CLEAR MEMORY LOCATION
[illegible]   [illegible]  001134                      CMP   [illegible]       ;;DONE?
[illegible]   [illegible]                              BNE   .-6               ;;LOOP BACK IF NO
003570        012706  001100                           MOV   [illegible]       ;;SETUP THE STACK POINTER
                                        ;;INITIALIZE A FEW [illegible]
[illegible]   012737  [illegible]  [illegible]         MOV   [illegible]       ;;EMT VECTOR FOR ERROR ROUTINE
[illegible]   012737  [illegible]  [illegible]         MOV   #340,[illegible]  ;;LEVEL 7
[illegible]   012737  [illegible]  [illegible]         MOV   [illegible]       ;;TRAP VECTOR FOR TRAP CALLS
[illegible]   012737  [illegible]  [illegible]         MOV   #340,[illegible]  ;;LEVEL 7
[illegible]   012737  [illegible]  [illegible]         MOV   [illegible]       ;;POWER FAILURE VECTOR
[illegible]   012737  [illegible]  [illegible]         MOV   #340,[illegible]  ;;LEVEL 7
[illegible]   012737  [illegible]  [illegible]         MOV   [illegible]       ;;[illegible] THE RANDOM NUMBER GENERATOR
003652        012737  123456  [illegible]              MOV   [illegible]       ;;[illegible] HIGH AND LOW [illegible]
                                        ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                        ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
003660        013706  000004                           MOV   [illegible],-(SP) ;;SAVE ERROR VECTOR
[illegible]   012737  [illegible]  000004              MOV   [illegible]       ;;SET UP ERROR VECTOR
[illegible]   012737  177570  001156                   MOV   [illegible],SWR   ;;SETUP FOR A HARDWARE SWITCH REGISTER
003700        012737  177570  001156                   MOV   [illegible] DISPLAY ;;AND A HARDWARE DISPLAY REGISTER
003706        022777  177777  175240                   CMP   #-1,[illegible]   ;;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
```

```
[illegible]
        000010  [illegible]  177777                    TST     @ 1              ;[illegible]
        000014  [illegible]                            BNE     60$              ;BRANCH IF NO
        000016  104401  000020                         TYPE    ,65$             ;;TYPE ASCIZ STRING
        000022  000417                                 BR      60$              ;;GET OVER THE ASCIZ
                                       ;;65$:  .ASCIZ  <CRLF>[illegible]<CRLF>
        000062                          60$:
                                        .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
        000062  005737  000042                         TST     @#42             ;;ARE WE RUNNING UNDER XXDP/ACT?
        000066  001012                                 BNE     70$              ;;BRANCH IF YES
        000070  [illegible]  001226  000001            CMPB    #APTENV,#1       ;;ARE WE RUNNING UNDER APT?
        000076  001405                                 BEQ     70$              ;;BRANCH IF YES
        000100  [illegible]  001154  000176            CMP     SWR,#SWREG       ;;SOFTWARE SWITCH REG SELECTED?
        000106  001005                                 BNE     71$              ;;BRANCH IF NO
        000110  104406                                 GTSWR                    ;;GET SOFT-SWR SETTINGS
        000112  000403                                 BR      71$
        000114  112737  000001  001150  70$:           MOVB    #1,$AUTOB        ;;SET AUTO-MODE INDICATOR
        000122                          71$:

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

        000122  005037  001430                         CLR     XXDP             ;CLEAR 'XXDP' LOAD DEVICE STORAGE
        000126  [illegible]  177777  000001            CMPB    @#-1,#1          ;LOADED FROM AN APT ? (UNKNOWN)
        000134  001121                                 BNE     30$              ;BR IF NOT
        000136  013737  000040  001430                 MOV     @#40,XXDP        ;GET DEVICE INDICATOR AND NUMBER
        000144  [illegible]  000007  001430            CMPB    #7,XXDP          ;IS IT A VALID NUMBER ?
        000152  [illegible]                            BHIS    10$              ;YES
        000154  [illegible]  001430                    CLRB    XXDP             ;NO, DEFAULT TO DRIVE 0
        000160  005737  000042          10$:           TST     @#42             ;CHAIN MODE OR ACT11 AUTO ACCEPT ?
        000164  001425                                 BEQ     20$              ;BR IF NEITHER
        000166  104401  000176                         TYPE    ,73$             ;;TYPE ASCIZ STRING
        000172  000412                                 BR      72$              ;;GET OVER THE ASCIZ
                                       ;;73$:  .ASCIZ  <CRLF>/NOT TESTING DRIVE /
        000220                          72$:
        000220  005046                                 CLR     -(SP)            ;CLEAR WORD ON STACK
        000222  113716  001430                         MOVB    XXDP,(SP)        ;GET DRIVE ADDRESS
        000226  104405                                 TYPOS                    ;TYPE THE ADDRESS
        000230     001                                 .BYTE   1                ;ONLY 1 CHARACTER
        000231     000                                 .BYTE   0                ;SUPRESS LEADING ZEROS
        000232  104401  001203                         TYPE    ,$CRLF           ;CR-LF
        000236  000460                                 BR      30$              ;GET NUMBER OF DRIVES
```

```
                        ;
004700  000227  177777          20$:    JMP     @-1             ;DIDN'T TYPE ANOTHER ?
004704  001005                          BNE     30$             ;NO
004706  104401  004750                  TYPE    ,75$            ;TYPE ASCII STRING
004712  000410                          BR      30$             ;GET OVER THE ASCII
                        ;
004714                  75$:    .ASCIZ  <CRLF>/?? TEST DRIVE /
004770                  30$:
004770  005046                          CLR     -(SP)           ;CLEAR WORD ON STACK
004772  113716  001430                  MOVB    @#DDP,(SP)      ;GET DRIVE ADDRESS
004776  104403                          TYPOS                   ;TYPE DRIVE ADDRESS
005000      001                         .BYTE   1               ;ONLY 1 CHARACTER
005001      000                         .BYTE   0               ;SUPPRESS LEADING ZEROS
005002  104401  005016                  TYPE    ,76$            ;TYPE ASCII STRING
005006  000412                          BR      30$             ;GET OVER THE ASCII
                        ;
005010                  76$:    .ASCIZ  /, HALT PROGRAM, CLEAR LOC. 00 AND RESTART PROGRAM./<CRLF>
005050                  30$:
005050  004737  033510          66:     JSR     PC,@#KBINT      ;TURN ON THE KEYBOARD INTERRUPT
005054  105737  001226                  TSTB    @#ERW           ;RUN UNDER APT MODE
005060  001415                          BEQ     5$              ;NO.DO NOT BOTHER
005062  105737  001256                  TSTB    @#VECT1         ;NEW VECTOR ?
005066  001403                          BEQ     4$              ;NOT LOAD IF = 0
005070  113737  001256  001274          MOVB    @#VECT1,@#PVEC  ;NEW VECTOR
005076  005737  001262          46:     TST     @#BASE          ;NEW BASE ADDRESS ?
005102  001411                          BEQ     6$              ;NO
005104  013737  001262  001272          MOV     @#BASE,@#PADR   ;NEW BASE ADDRESS
005112  000405                          BR      6$
                        ;
005114  105737  001150          5$:     TSTB    @#AUTOB         ;RUNNING IN AUTO MODE ?
005120  001002                          BNE     6$              ;YES
005122  004737  062476                  JSR     PC,BUSADR       ;CHECK RHXX/RP07 BUS ADDRESS
005126  013737  001272  040640  6$:     MOV     @#PADR,@#PADR   ;LOAD ADDRESS INTO DRIVER
005134  013737  001274  040642          MOV     @#PVEC,@#PVEC   ;LOAD VECTOR INTO DRIVER
005142  005037  001314                  CLR     STATIN          ;CLEAR PERFORMANCE SUMMARY TYPEOUT FLAG
005146  012705  001520                  MOV     @#ORDER0,R5     ;START OF AREA TO CLEAR
005152  005025          7$:     CLR     (R5)+
005154  022705  002056                  CMP     @#LKADR,R5      ;LOOK FOR END OF CLEAR AREA
005160  001374                          BNE     7$              ;BR IF NOT FINISHED
005162  012706  001100                  MOV     @#STACK,SP      ;SETUP THE STACK POINTER
005166  005037  177776                  CLR     @#PS            ;CLEAR THE PROCESSOR STATUS WORD
005172  013737  001312  001346          MOV     @#HERTZ,@#ONESEC ;RESTORE ONE SECOND COUNTER VALUE
005200  005037  001340                  CLR     @#HOUR          ;CLEAR THE HOUR'S COUNTER
005204  005037  001342                  CLR     @#MINUTE        ;CLEAR THE MINUTE'S COUNTER
005210  005037  001344                  CLR     @#SECOND        ;CLEAR THE SECOND'S COUNTER
005214  005037  001472                  CLR     @#INTRVL+2      ;CLEAR INTERVAL COUNTER
005220  013737  001462  001464          MOV     @#CMPTIM,@#CMPTIM+2 ;INIT COMPARE TIME COUNTER
005226  005037  001334                  CLR     @#CFLAG         ;CLEAR THE 'CONTROL C' FLAG
005232  005037  046446                  CLR     @#DRIVE0+8$FIRST ;RESET $FIRST FLAG FOR DRIVE 0
005236  005037  046710                  CLR     @#DRIVE1+8$FIRST ;RESET $FIRST FLAG FOR DRIVE 1
005242  005037  047152                  CLR     @#DRIVE2+8$FIRST ;RESET $FIRST FLAG FOR DRIVE 2
005246  005037  047414                  CLR     @#DRIVE3+8$FIRST ;RESET $FIRST FLAG FOR DRIVE 3
005252  005037  047656                  CLR     @#DRIVE4+8$FIRST ;RESET $FIRST FLAG FOR DRIVE 4
005256  005037  050120                  CLR     @#DRIVE5+8$FIRST ;RESET $FIRST FLAG FOR DRIVE 5
005262  005037  050362                  CLR     @#DRIVE6+8$FIRST ;RESET $FIRST FLAG FOR DRIVE 6
005266  005037  050624                  CLR     @#DRIVE7+8$FIRST ;RESET $FIRST FLAG FOR DRIVE 7
005272  005037  001424                  CLR     @#RDONLY        ;ASSUME READ/WRITE CONDITION
005276  032777  000001  174320          BIT     @#SW0,@#SWR     ;IS EXERCISER IN 'READ ONLY' MODE ?
005304  001402                          BEQ     8$              ;BR IF NO
```

GET VALUE FOR SOFTWARE SWITCH REGISTER

```
106 004636  005237  001424                    INC     RDONLY          ;LOCK PROGRAM IN 'READ ONLY' MODE
107 004642                              8$:
108
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     $RPADR,R0       ;GET RPCS1 ADDRESS
004772  062700  000050                  ADD     #50,R0          ;GET REGISTER OFFSET FOR RH70
004776  012701  000012                  MOV     #10.,R1         ;GET NUMBER OF REGISTERS TO CHECK
005002  005720                  1$:     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                          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,$SIZE        ;SEE HOW MUCH MEMORY ON SYSTEM
 005124  013737  062474  001330  1$:     MOV     $LSTAD,LSTAD    ;SAVE THE LAST ADDRESS
 005132  012737  000001  001654          MOV     #1,BUFTBL       ;LOAD NUMBER OF BUFFERS
 005140  012737  064370  001656          MOV     #ENDPGM,BUFTBL+2        ;STARTING ADDRESS OF BUFFER
 005146  013737  001330  001660          MOV     LSTAD,BUFTBL+4  ;LAST ADDR TO BUFFER ALLOCATION TABLE
 005154  023727  001330  160000          CMP     LSTAD,#160000   ;OVER 28K ?
 005162  101403                  BLOS    2$              ;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$:
```

```
                                        ;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
```

GET VALUE FOR SOFTWARE SWITCH REGISTER

```
 88 005476  105737  001150                TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
 89 005502  001040                      BNE     SETVEC          ;BR IF YES
 91 005504  104401  060746                TYPE    ,ASKPAR         ;TYPE 'CHANGE PARAMETERS ?
 92 005510  104411                      RDLIN                   ;READ THE ENTRY
 93 005512  012600                      MOV     (SP)+,R0        ;SAVE ADDRESS OF RESPONSE
 94 005514  005737  001334                TST     CFLAG           ;WAS (^C) TYPED?
 95 005520  001364                      BNE     13$             ;BR IF YES
 96 005522  105710                      TSTB    (R0)            ;WAS RESPONSE A CARRIAGE RETURN (DEFAULT 'N')?
 97 005524  001427                      BEQ     SETVEC          ;BR IF YES
 98 005526  105760  000001              TSTB    1(R0)           ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
 99 005532  001006                      BNE     14$             ;BR IF NO
100 005534  122710  000131              CMPB    #'Y,(R0)        ;WAS IT A 'Y' RESPONSE ?
101 005540  001406                      BEQ     ENTPR           ;BR IF YES
102 005542  122710  000116              CMPB    #'N,(R0)        ;WAS IT A 'N' RESPONSE ?
103 005546  001416                      BEQ     SETVEC          ;BR IF YES
104 005550  104401  060163      14$:    TYPE    ,BADENT         ;TYPE BAD ENTRY MESSAGE
105 005554  000746                      BR      13$             ;TRY AGAIN
106 005556                      15$:
107
108 005556  012703  060644      ENTPR:  MOV     #PARLST,R3      ;PARAMETER TABLE ADDRESS
109 005562  004737  031170              JSR     PC,PARENT       ;GET THE PARAMETER ENTRY
110 005566  023727  001466  000006      CMP     WRDCNT,#6       ;IS THE 'WRDCNT' VALUE OK ?
111 005574  103003                      BHIS    SETVEC          ;BR IF IT IS
112 005576  012737  000006  001466      MOV     #6,WRDCNT       ;SET 'WRDCNT' TO THE MINIMUM VALUE
```

```
                                        ;DISPLAY DRIVE STATUS AND SET UP THE OTHER SYSTEM DEVICES THAT
                                        ;THE PROGRAM WILL USE. PROGRAM RETURN HERE ON POWER FAIL
                                        ;
 4 005604  004737  024574       SETVEC: JSR     PC,CKCLK        ;START THE CLOCK
 5 005610  004737  040652               JSR     PC,RPINIT       ;INITIALIZE THE RP07 DRIVER
 9 005614  012737  177777  040602       MOV     #-1,SAVEFG      ;SET THE SAVE REGISTERS FLAG
10 005622  005227  177777               INC     #-1             ;FIRST TIME THRU ?
11 005626  001407                       BEQ     1$              ;BR IF YES
12 005630  005737  040100               TST     PWRFLG          ;RETURNING FROM POWER FAIL ?
13 005634  001004                       BNE     1$              ;BRANCH IF YES
14 005636  032777  000004  173310       BIT     #SW02,@SWR      ;TYPEOUT THE DRIVE STATUS TABLE ?
15 005644  001113                       BNE     12$             ;BR IF NOT
16 005646  005004               1$:     CLR     R4              ;DRIVE TABLE POINTER
17 005650  104401  057113               TYPE    ,DRSTAT         ;TYPE 'DRIVE STATUS'
18 005654  104401  001203       2$:     TYPE    ,$CRLF          ;CR-LF
19 005660  010446                       MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                                 ;;TYPE DRIVE NUMBER
   005662  104403                       TYPOS                   ;;GO TYPE--OCTAL ASCII
   005664     002                       .BYTE   2               ;;TYPE 2 DIGIT(S)
   005665     000                       .BYTE   0               ;;SUPPRESS LEADING ZEROS
20 005666  104401  056606               TYPE    ,BLNKS4         ;TYPE 4 BLANKS
21 005672  105764  040534               TSTB    DRVSTA(R4)      ;CHECK DRIVE'S STATUS
22 005676  100416                       BMI     5$              ;BR IF UNSAFE
23 005700  001020                       BNE     6$              ;BR IF ONLINE
24
25 005702  105764  040544               TSTB    DRVTYP(R4)      ;SEE IF OFFLINE OR NONEXISTENT
26 005706  001404                       BEQ     3$              ;BR IF NONEXISTENT
27 005710  100006                       BPL     4$              ;BR IF OFFLINE
28 005712  104401  056760               TYPE    ,NOTRP          ;DRIVE NOT AN RP07
29 005716  000460                       BR      11$             ;CHECK NEXT DRIVE
30
31 005720  104401  056775       3$:     TYPE    ,NOTPRS         ;DRIVE NOT PRESENT
32 005724  000455                       BR      11$             ;CHECK NEXT DRIVE
33
34 005726  104401  056667       4$:     TYPE    ,UNTOFF         ;DRIVE OFFLINE
35 005732  000416                       BR      8$              ;PRINT DRIVE TYPE
36
37 005734  104401  057031       5$:     TYPE    ,NOTSAF         ;DRIVE UNSAFE
38 005740  000413                       BR      8$              ;PRINT DRIVE TYPE
39
40 005742  005737  001430       6$:     TST     XXDP            ;LOADED FROM THIS DEVICE ?
41 005746  001406                       BEQ     7$              ;BR IF NO
42 005750  123704  001430               CMPB    XXDP,R4         ;LOADED FROM THIS DRIVE ?
43 005754  001003                       BNE     7$              ;BR IF NO
44 005756  104401  057041               TYPE    ,LODEV          ;TYPE 'LOAD DEVICE'
45 005762  000436                       BR      11$
46 005764  104401  056700       7$:     TYPE    ,UNTON          ;DRIVE ONLINE
47 005770  104401  056610       8$:     TYPE    ,BLNKS2         ;TYPE 2 BLANKS
48 005774  005000                       CLR     R0
49 005776  116400  040544               MOVB    DRVTYP(R4),R0   ;GET DRIVE TYPE
50 006002  012737  057155  006026       MOV     #9$,RP07,10$    ;ASSUME ADDRESS OF RP07 MESSAGE
51 006010  122700  000005               CMPB    #5,R0           ;IS DEVICE AN RP07 ?
52 006014  001403                       BEQ     9$              ;TYPE IT IF YES
53 006016  012737  057162  006026       MOV     #9$,RP07P,10$   ;ASSUME ADDRESS OF RP07+ MESSAGE
54
55 006024  104401               9$:     TYPE                    ;TYPE THE DRIVE TYPE MESSAGE
56 006026  000000               10$:    .WORD   0               ;MESSAGE ADDRESS HERE
```

```
;GET VALUE FOR SOFTWARE SWITCH REGISTER

;7
;8 006030  006304                  ASL   R4                  ;CHANGE TO WORD INDEX
;9 006032  016402  002056          MOV   BLKADR(R4),R2       ;GET BASE ADDRESS
;0 006036  006204                  ASR   R4                  ;CHANGE TO BYTE INDEX
;1 006040  004737  005342          JSR   PC,SVREGS           ;SAVE ALL REGISTERS
;2 006044  032762  000004  000200  BIT   #ILV,HRPOS(R2)      ;INTERLEAVE SECTOR SET ?
;3 006052  001002                  BNE   11$                 ;BR IF YES
;4 006054  104401  057056          TYPE  ,NINLEV             ;TYPE NON-INTERLEAVED MESSAGE
;5
;6 006060  005204            11$:  INC   R4                  ;INCREMENT DRIVE NUMBER/TABLE POINTER
;7 006062  020427  000010          CMP   R4,#8.              ;FINISHED ?
;8 006066  001272                  BNE   2$                  ;BR IF NOT
;9 006070  104401  001203          TYPE  ,$CRLF              ;CR-LF
;0 006074                    12$:
```

```
                                        ;INITIALIZE PROGRAM PARAMETERS FOR STARTUP
                                        ;
006070  004737  035510          STA:    JSR     PC,$TWINT       ;INITIALIZE THE KEYBOARD INTERRUPT HANDLER
006100  012737  142200  001446          MOV     #142200,ENDCDN  ;INITIALIZE NORMAL XFER COUNT(LSB)
006106  012737  007540  001450          MOV     #7540,ENDCDN+2  ;(MSB)
006114  032777  001000  175652          BIT     #SWR9,@SWR      ;DO YOU WANT SHORT RUN TIME (SW9=1) ?
006122  001406                          BEQ     1$              ;BR IF NO
006124  012737  030640  001446          MOV     #030640,ENDCDN  ;INITIALIZE (1/4 OF NORMAL) XFER COUNT(LSB)
006132  012737  001730  001450          MOV     #1730,ENDCDN+2  ;(MSB)
                                        ;
006140  105737  001226          1$:     TSTB    @#PSW           ;APT SCRIPT MODE ?
006144  001406                          BEQ     2$              ;NO
006146  012737  006110  001446          MOV     #006110,ENDCDN  ;INITIALIZE (1/16 OF NORMAL) XFER COUNT(LSB)
006154  012737  000366  001450          MOV     #366,ENDCDN+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  003456                          BLE     8$              ;NO
                                        ;
006176  005001          3$:     CLR     R1                      ;DRIVE 0
006200  005002                  CLR     R2                      ;AVAIL TABLE INDEX
006202  005003                  CLR     R3                      ;DRIVE# * 2
006204  005737  001430          4$:     TST     XXDP            ;LOADED FROM THIS DEVICE ?
006210  001405                          BEQ     5$              ;BR IF NO
006212  123701  001430                  CMPB    XXDP,R1         ;LOADED FROM THIS DRIVE ?
006216  001433                          BEQ     7$              ;BR IF YES
006220  105761  040534          5$:     TSTB    DRVSTA(R1)      ;DRIVE ON LINE ?
006224  003430                          BLE     7$              ;NO
006226  016500  002056                  MOV     @LXADR(R5),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,XMPOS(R0)  ;INTERLEAVE SECTOR SET ?
006250  001402                          BEQ     6$              ;BR IF NO
006252  010062  001566                  MOV     R0,NEWUNT(R2)   ;LOAD DPB ADDRESS TO AVAIL 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,XPACK(R0)   ;SETUP COMMAND 'WT' (WRITE DATA AND TEST)
006302  004737  020350                  JSR     PC,SEQPAR       ;SETUP SEQUENTIAL PARAMETERS FOR WRITE
                                        ;
006306  022522          7$:     CMP     (R5)+,(R2)+     ;INCREMENT INDEX
006310  005201                  INC     R1              ;NEXT DRIVE
006312  020127  000007                  CMP     R1,#7           ;ALL DRIVES ASSIGNED ?
006316  003752                          BLE     4$              ;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
                                ;
                                ;
000500  005737  001530  MAIN:  TST     @FLAG           ;HAS (^C) TYPED?
000504  001407                 BEQ     30              ;BR IF NO
000506  005737  001520  10:    TST     @NDRIVE         ;ANY DRIVES IN ORDER QUE ?
000512  001402                 BEQ     20              ;BR IF NO, EXIT
000514  000137  007256         JMP     IDLE            ;LET ALL DRIVES FINISH ORDER
000520  004737  026536  20:    JSR     PC,$KB          ;SERVICE THE KEYBOARD
000524                 30:
                                ;
                                ;CHECK FOR DRIVES TO BE DROPPED
                                ;
000524  012701  000010  MAINDA: MOV     #8.,R1          ;DRIVE COUNTER
000530  012705  001540          MOV     #DDRVS,R5       ;ADDRESS OF  DROPPED DRIVE  TABLE
000534  005715          10:    TST     (R5)            ;SEE IF ENTRY AT PRESENT POSITION
000536  001406                 BEQ     30              ;BR IF THERE IS ONE
000540  005725          20:    TST     (R5)+           ;INCREMENT TO NEXT TABLE POSITION
000542  005301                 DEC     R1              ;DECREMENT DRIVE COUNTER
000544  001373                 BNE     10              ;BR IF MORE TO CHECK
000546  000437                 BR      MAIN1           ;GO CHECK FOR NEW ASSIGNED DRIVES
                                ;
000550  012701  001610  30:    MOV     #AVAIL,R1       ;ADDRESS OF 'AVAILABLE DRIVES' TABLE
000554  005711          40:    TST     (R1)            ;IF AT END OF 'AVAIL' TABLE ?
000556  001406                 BEQ     50              ;BR IF YES
000560  021115                 CMP     (R1),(R5)       ;IS DRIVE IN 'AVAIL' THE TABLE ?
000562  001412                 BEQ     70              ;BR IF YES
000564  005721                 TST     (R1)+           ;NO, INCREMENT 'AVAIL' TABLE ADDRESS
000566  000772                 BR      40              ;AND CONTINUE LOOKING
                                ;
000570  012701  001632  50:    MOV     #WAIT,R1        ;ADDRESS OF THE 'WAIT' BUFFER TABLE
000574  005711          60:    TST     (R1)            ;AT THE END OF 'WAIT' TABLE ?
000576  001760                 BEQ     20              ;BR IF YES
000600  021115                 CMP     (R1),(R5)       ;IS DRIVE IN THE 'WAIT' TABLE ?
000602  001402                 BEQ     70              ;BR IF YES
000604  005721                 TST     (R1)+           ;NO, INCREMENT 'WAIT' TABLE ADDRESS
000606  000772                 BR      60              ;AND CONTINUE LOOKING
                                ;
000610  011100          70:    MOV     (R1),R0         ;PUT THE DRIVE'S BLOCK ADDRESS IN R0
000612  104401  001703         TYPE    ,SCRLF          ;CR LF
000616  004737  026426         JSR     PC,$TIME        ;TYPE ELAPSED TIME
000622  104401  057401         TYPE    ,DASHS          ;TYPE ' - - - - - '
000626  104401  057437         TYPE    ,MSGDRP         ;TYPE 'DROPPED, '
000632  004737  025122         JSR     PC,ONESUP       ;TYPE ONE DRIVE SUPPORT
000636  005015                 CLR     (R5)            ;CLEAR THE 'DROP DRIVE' TABLE ENTRY
000640  004737  022260         JSR     PC,COMPRES      ;COMPRESS THE RESPECTIVE TABLE
000644  000735                 BR      20              ;SEE IF ANY MORE DRIVES
```

```
                                        ;ARRAY FOR ENTRIES TO BE ASSIGNED
                                        [illegible]: BLKW  ^D256*2      ;ENTIRE COUNT
                                                     BLKW  1           ;FREE LIST INDEX
                                                     BLKW  1           ;FREE INDEX
                                                     BLKW  1           ;END OF FREE INDEX
                                        10$:         BLKW  ^D256-10    ;MOVE ALOOR OF ENTIRE INTO THIS POSITION
                                                     BLKW  10          ;END OF FREE IS
                                        20$:         BLKW  ^D256       ;ENTIRE COUNT IS
                                                     BLKW  1           ;ENTIRE COUNT EXISTED INDEX
                                                     BLKW  1           ;ENTIRE COUNT
                                                     BLKW  1           ;END OF FREE ENTIRE
                                                     BLKW  ^D256       ;START LOCATIONS FOR THE AVAILABLE ENTRIES
                                        30$:         MOV   #[illegible],R0
                                                     MOV   #[illegible],R1
                                                     MOV   #1,(R0)+    ;MOVE IN FIRST FREE NUMBER
                                                     INC   R1          ;NEXT ENTIRE NUMBER
                                                     CMP   R1,#^D256   ;END OF ENTIRE ARRAY?
                                                     BLO   40$         ;IF LO NO
                                                     CLR   (R0)        ;YES, MARK END OF FREE LIST
                                                     MOV   #[illegible],R0
                                                     MOV   #[illegible],R1
                                                     MOV   #^D256,(R0)+ ;MOVE IN FIRST FREE ENTIRE NUMBER
                                                     DEC   R1          ;NEXT ENTIRE NUMBER
                                                     CMP   R1,#^D256-10 ;END OF FREE ENTIRE?
                                                     BLO   50$         ;IF LO NO
                                                     CLR   (R0)        ;YES, MARK END OF FREE ENTIRE LIST
                                                     MOV   #^D256-10,[illegible] ;SET ENTIRE ASSIGNED INDICATOR
                                                     CLR   [illegible] ;CLEAR ALL'D ENTRIES
                                                     MOV   #[illegible],(R0)+ ;INCREMENT AVAILABLE TABLE POINTER
                                                     SOB   R0,60$      ;LOOP FOR MORE ENTRIES
```

```
[illegible]
        [illegible]                   [illegible] BUFFER SPACE, AND START ORDERS FOR DRIVES [illegible]
[illegible]
[illegible]                           [illegible]                         ;START FROM THE FIRST LOCATION
[illegible]                                                               ;ANY [illegible] ACTIVE ?
[illegible]                                                               ;[illegible] IF [illegible]
[illegible]                                                               ;[illegible] AUTO MODE ?
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]                   10:                                         ;GIVE CONTROL TO [illegible]

[illegible]                   20:  TST   [illegible]                      ;ANY DRIVES WAITING FOR THE BUFFER ?
[illegible]                          [illegible] 50                       ;[illegible] IF NO
[illegible]                          [illegible]                          ;[illegible] THE [illegible] ADDRESS
[illegible]                                                               ;[illegible] THE [illegible]
[illegible]                          JSR   PC,[illegible]                 ;[illegible] TO [illegible] THE BUFFER [illegible]
[illegible]                                                               ;[illegible] BUFFER IS [illegible] AVAILABLE
[illegible]                                                               ;BRANCH IF NO [illegible] AVAILABLE
[illegible]                                                               ;[illegible] TO SELECT FLAG
[illegible]                          CLR   [illegible]                    ;CLEAR THE [illegible] FLAG

[illegible]                          JSR   PC,[illegible]                 ;FILL THE BUFFER
[illegible]                          JSR   PC,[illegible]                 ;[illegible] AND GO
[illegible]                                                               ;[illegible] THE [illegible] QUE INTO ORDER QUE
[illegible]                   30:  TST   [illegible]                      ;[illegible] AVAILABLE ?
[illegible]                          BNE   30                             ;[illegible] IF NO
[illegible]                          MOV   [illegible]                    ;[illegible] THE [illegible] ADDRESS INTO THE ORDER QUE
[illegible]                          MOV   [illegible]                    ;REMOVE THE DRIVE FROM THE WAIT QUE
[illegible]                          ADD   [illegible]                    ;[illegible] THE QUE POSITION
[illegible]                          JSR   PC,[illegible]                 ;[illegible] THE QUE
[illegible]                          BR    20                             ;BRANCH IF DONE
[illegible]                   40:  TST   (R2)+                            ;CHECK THE NEXT QUE
007032  000760                       BR    20                             ;[illegible]

007034  005737  001520        50:  TST   ORDERQ                           ;ANY OUTSTANDING ORDERS ?
007040  001075                       BNE   IDLE                           ;GO IF YES

007042  005002                       CLR   R2                             ;CLEAR DRIVE TABLE POINTER
007044  [illegible]  001610   60:  TST   AWAIL(R2)                        ;ANY DRIVES WAITING FOR PARAMETERS
[illegible]                          BNE   70                             ;BRANCH IF ANY
[illegible]           007236         JMP   IDLE                           ;BRANCH IF NONE
[illegible]           [illegible] 70: MOV AWAIL(R2),R0                    ;[illegible] BLOCK ADDR IN R0
[illegible]           [illegible]    TST   [illegible](R0)                ;PARAMETERS BEEN SELECTED ?
[illegible]                          BNE   90                             ;GO IF THEY HAVE
[illegible]           000026         TSTB  [illegible](R0)                ;[illegible] COMMAND FOR THIS DRIVE ?
[illegible]                          BEQ   80                             ;GO IF YES
[illegible]           020530         JSR   PC,SEQPAR                      ;GET SEQUENTIAL PARAMETERS FOR READ OR WRITE
007102  000404                       BR    100                            ;GET THE BUFFER

007104  004737  020672        80:  JSR   PC,GENPAR                        ;GO GENERATE THE PARAMETERS
```

```
[illegible]
```

```
                                ;WAIT FOR A COMMAND TO PROCESS
                        ;
                        ;
007256  012701  001520          TIME:   MOV     #ORDERQ,R1      ;ADDRESS OF THE ORDER QUE IN R1
007262  012100                  10$:    MOV     (R1)+,R0        ;GET QUEUE ADDRESS INTO R0
007264  001447                          BEQ     7$              ;BR IF END OF QUE
007266  005760  000016          20$:    TST     STATUS(R0)      ;SEE IF DRIVE FINISHED
007272  001775                          BEQ     20$             ;BR IF DRIVE NOT FINISHED
007274  005741                          TST     -(R1)           ;BACKUP THE QUE POINTER
007276  010146                          MOV     R1,-(SP)        ;SAVE THE QUE ADDRESS
007300  004737  017270                  JSR     PC,$STATS       ;GENERATE STATISTICS FOR DRIVE IN R0
007304  004737  007472                  JSR     PC,PROCES       ;PROCESS END OF COMMAND
007310  042737  001536                  BIC     #BADSEC,@#ERRSTS        ;CLEAR THE BAD TRK/SEC ERROR INDICATOR
007316  004737  031452                  JSR     PC,ERRCHK       ;SEE IF ANY DRIVES HAVE TOO MANY ERRORS
                                        ;NOW SEE IF WE ARE AT THE END OF A PASS
007322  122760  177777  000026          CMPB    #-1,EPOCH(R0)   ;ANY COMMAND FOR THIS DRIVE ?
007330  001434                          BEQ     5$              ;BR IF YES
007332  122760  000001  000026          CMPB    #1,EPOCH(R0)    ;ANY COMMAND FOR THIS DRIVE ?
007340  001430                          BEQ     5$              ;BR IF YES
007342  005737  001504                  TST     ENDING          ;WILL THE EOP BE DETERMINED BY # OF SEEKS ?
007346  001412                          BEQ     3$              ;BR IF YES
007350  026037  000040  001450          CMP     @#OPAS+2(R0),ENDCOM+2   ;IS IT THE EOP BY DATA READ ?
007356  101017                          BHI     4$              ;BR IF YES
007360  103420                          BLO     5$              ;BR IF NO
007362  026037  000036  001446          CMP     @#OPAS(R0),ENDCOM       ;IS IT THE EOP BY DATA READ ?
007370  103414                          BLO     5$              ;BR IF NO
007372  000411                          BR      4$              ;THIS IS THE END OF PASS
                        ;
007374  026037  000050  001454  3$:     CMP     @#SEEKS+2(R0),ENDSEK+2  ;IS IT THE EOP BY SEEKS ?
007402  101005                          BHI     4$              ;BR IF YES
007404  103406                          BLO     5$              ;BR IF NO
007406  026037  000046  001452          CMP     @#SEEKS(R0),ENDSEK      ;IS IT THE EOP BY SEEKS ?
007414  103402                          BLO     5$              ;BR IF NO
007416  004737  031500          4$:     JSR     PC,@#EOP        ;THIS IS THE END OF PASS
                        ;
007422  012601                  5$:     MOV     (SP)+,R1        ;RESTORE THE ORDER TABLE INDEX
007424  012705  001610                  MOV     #AVAIL,R5       ;ADDRESS OF THE 'AVAIL' TABLE
007430  005725                  6$:     TST     (R5)+           ;IS IT THE END OF THE 'AVAIL' TABLE ?
007432  001376                          BNE     6$              ;BR IF NO
007434  011145                          MOV     (R1),-(R5)      ;MOVE THE DPB INTO THE 'AVAIL' TABLE
007436  004737  022260                  JSR     PC,CMPRES       ;COMPRESS THE ORDER QUE
007442  004737  017726                  JSR     PC,RELBUF       ;RESTORE BUFFER
                        ;
007446  032777  000004  171524  7$:     BIT     #SW02,@#SWR     ;TYPE PERFORMANCE SUMMARY
007454  001016                          BNE     8$              ;BR IF NOT
007456  005737  001314                  TST     STATIN          ;TIME TO TYPE THE PERFORMANCE SUMMARY ?
007462  001413                          BEQ     8$              ;BR IF NOT
007464  005037  001314                  CLR     STATIN          ;CLEAR THE INDICATOR
007470  005737  001542                  TST     ASMLST          ;ANY DRIVES ASSIGNED ?
007474  001406                          BEQ     8$              ;BR IF NO
007476  104401  057167                  TYPE    ,MSGREP         ;TYPE '/\/\/\/\/-PERFORMANCE REPORT-\/\/\/\/\'
007502  004737  025020                  JSR     PC,STATPR       ;TYPE THE SUMMARY
007506  104401  057274                  TYPE    ,TRMREP         ;TYPE '/\/\/\/\/\...ETC'
                        ;
007512  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          OFFLIN: 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  051362                  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$:     BIT     @#BIT04!BIT03,$STATUS(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 'WLF'
 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     $RPEC1(R0),#10040       ;IS POSITION COUNT OVER MAXIMUM ?
010614  101013                          BHI     2$              ;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$:     JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
010724  104414  051640                  DISPLY  .EM21           ;DATA CHECK ERROR
010730                          7$:
```

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                ;
                ;
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,$RPER1(R0)       ;IS IT 'ECH' ?
010774  001403                          BEQ     1$              ;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,$RPER1(R0)  ;'ECH' OR 'DTE' STILL SET ?
011076  001421                          BEQ     9$              ;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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*1 011252  000737  020136          148;    JSR     PC,LOG7          ;PRINT LINE # OF ERROR MESSAGE
*2 011256  000240                  158;    NOP
*3 011260  000207                  015     PC                       ;RETURN
```

```
                                        ;WRITE CHECK ERROR PROCESSING
                                        ;
011242  005760  000202        WCHER:  TST     @WPER1(R0)      ;SEE IF 'DCK' SET ALSO
011246  100434                BMI     20              ;BR IF IT IS
011250  004737  022276                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      10              ;RETRY UNSUCESSFUL
                                        ;
011324  004737  024076                JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
011330  000532                        BR      15$             ;FINISH PROCESSING THE ERROR
                                        ;
011332  004737  024104        10$:    JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
011336  000527                        BR      15$             ;FINISH PROCESSING THE ERROR
                                        ;
011340  012737  000012  001324  20$:    MOV     #10.,RETRY      ;RETRY LIMIT
011346  004737  022276                JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
011352  012737  051671  011500        MOV     #EM22,@#8       ;ASSUME THAT EM22 WILL BE PRINTED
011360  032760  040000  000176        BIT     #BIT14,@MPCS2(R0)  ;DID 'WCK' ALSO SET ?
011366  001003                        BNE     30              ;BR IF IT DID
011370  012737  052572  011500        MOV     #EM37,@#8       ;MESSAGE FOR 'DCK' AND 'WCK' NOT DURING
                                        ;WRITE CHECK
011376  032760  000100  000202  30$:    BIT     #ECH,@WPER1(R0) ;WRITE CHECK ERROR WITH , ECH SET ?
011404  001410                        BEQ     40              ;BRANCH IF NOT
011406  012737  053536  011500        MOV     #EM32,@#8       ;REPORT 'ECH' ERROR
011414  022760  010040  000232        CMP     #10040,@MPEC1(R0)       ;OTHERWISE MPEC1=10040
011422  001017                        BNE     50              ;REPORT ECC LOGICAL FAILURE
011424  000424                        BR      70
                                        ;
011426  026027  000232  010040  40$:    CMP     @MPEC1(R0),#10040       ;IS POSITION COUNT OVER MAXIMUM ?
011434  101012                        BHI     50              ;BR IF YES
011436  005760  000232                TST     @MPEC1(R0)      ;POSITION COUNT 0 ?
011442  001407                        BEQ     50              ;BR IF YES
011444  005760  000234                TST     @MPEC2(R0)      ;VALUE IN PATTERN REGISTER ?
011450  001007                        BNE     60              ;BR IF YES
011452  012737  053360  011500        MOV     #EM47,@#8       ;ELSE, REPORT THE ECC LOGIC FAILURE
011460  000403                        BR      60
011462  012737  053220  011500  50$:    MOV     #EM45,@#8       ;ELSE, REPORT THE ECC LOGIC FAILURE
011470  012737  000003  001324  60$:    MOV     #3,RETRY        ;RETRY LIMIT
                                        ;
011476  104414                70$:    DISPLY                  ;TYPE THE ERROR MESSAGE
011500  000000                80$:    .WORD   0               ;MESSAGE ADDRESS GOES HERE
011502  004737  022342                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
011506  004737  022776                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
011512  004737  023446                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
011516  004737  023536                JSR     PC,LINE5        ;PRINT LINE 5 OF ERROR MESSAGE
                                        ;
011522  004737  020240        90$:    JSR     PC,GODRIV       ;RETRY THE ORDER
011526  005760  000016        100$:   TST     @STATUS(R0)     ;ORDER FINISHED ?
011532  001775                        BEQ     100$            ;BR IF NOT
```

```
60 011550  100005                  BPT     11$             ;GO IF ERROR ON ERROR
61 011552  105237  001525          INCB    RETRY+1         ;INCREMENT RETRY COUNT
62 011556  004737  004076          JSR     PC,LINE4C       ;PRINT 'CORRECTED ON N RETRY(S)'
63 011562  000416                  BR      13$             ;FINISH ERROR PROCESSING
64
65 011564  105237  001525  11$:    INCB    RETRY+1         ;INCREMENT RETRY COUNT
66 011570  121737  001526  001525  CMPB    RETRY,RETRY+1   ;DONE ?
67 011576  001403                  BEQ     12$             ;GO IF AT RETRY LIMIT
68 011600  032760  100000  000002  BIT     #BIT15,ERPER1(R0)  ; DCK: SET
69 011606  001401                  BEQ     12$             ;GO IF NOT - DIFFERENT ERROR
70 011610  000752                  BR      9$              ;CONTINUE RETRY
71
72 011612  004737  004156  12$:    JSR     PC,LINE8        ;PRINT LINE 8 - 'DIFFERENT ERROR'
73 011616  000405                  BR      13$
74 011620  004737  004062  13$:    JSR     PC,INCSOF       ;COUNT AS A SOFT ERROR
75 011624  000402                  BR      15$             ;EXIT
76
77 011626  004737  004106  14$:    JSR     PC,INCHRD       ;COUNT AS A HARD ERROR
78 011632  004737  004202  15$:    JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
79 011636  004737  004136          JSR     PC,LINE7        ;FINISH THE ERROR MESSAGE
80 011642  000207                  RTS     PC              ;RETURN
```

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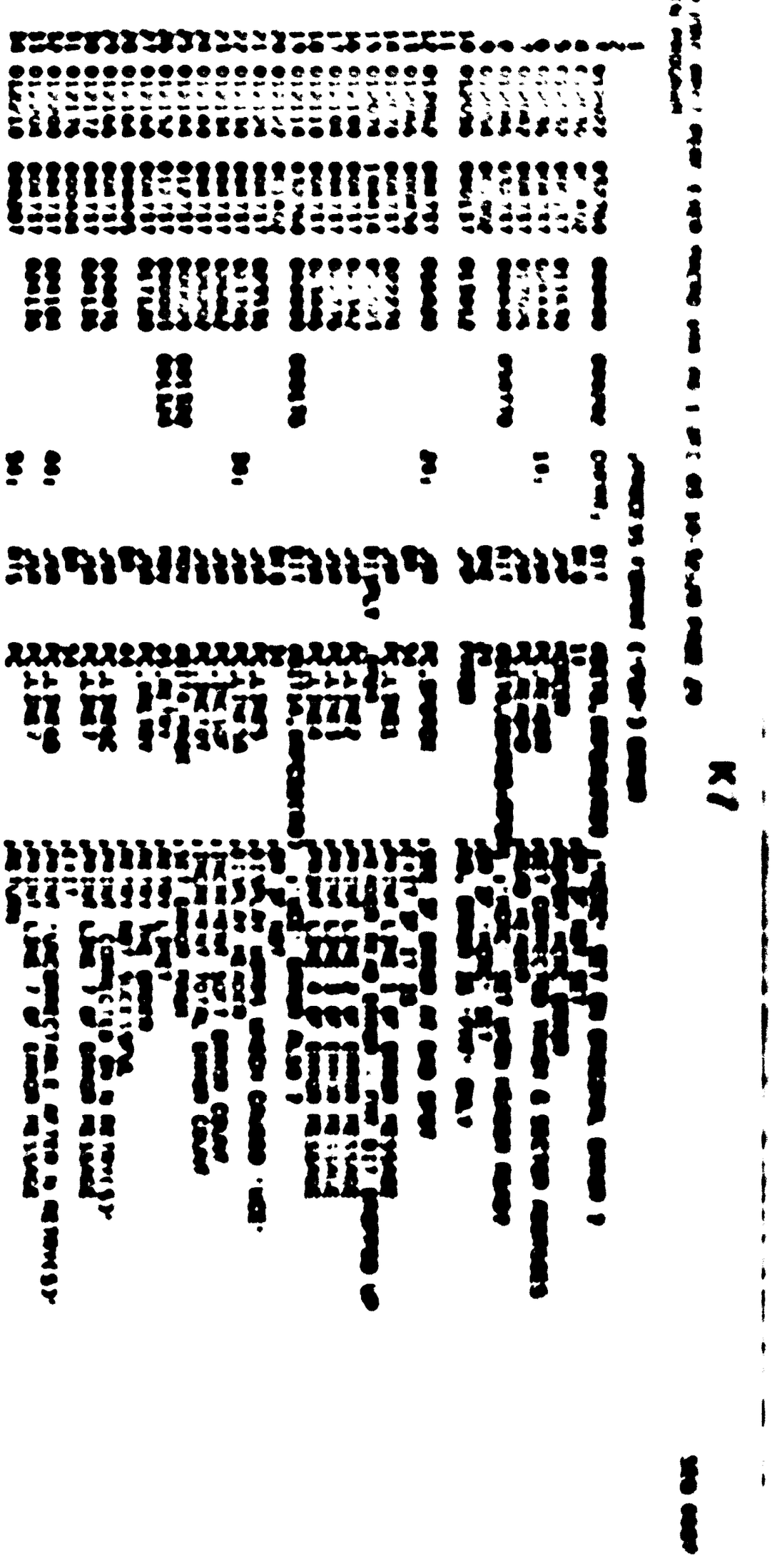
C70 ASMC REV 1 07:07 (WED MARCH 08TH 09 1 SEC 05 10-SEP-79 PAGE 20                                                    SEQ 0088
MAIN PROGRAM

                                        ;REPORT  MISC  ERRORS

                        000737  010420          MISCERR: JSR     PC,SPOTCH       ;SET UP ERROR AT END SPOT
                        000256                   CLR     (SP)                    ;POP UP IF IT IS
                        000737  020366           JSR     PC,.MISCERR             ;READ ERROR SECTOR NUMBER
                        000737  017636           JSR     PC,.MISCERR             ;GET THE WORD FOR THE ACTION
                        000737  020270           JSR     PC,.LINE1               ;PRINT LINE 1 OF ERROR MESSAGE
                        100410  012717           BLOS    ERR30                   ;REPORT DRIVE ERROR
                        000737  020342           JSR     PC,.LINE2               ;PRINT LINE 2 OF ERROR MESSAGE
                        000737  020276           JSR     PC,.LINE3               ;PRINT LINE 3 OF ERROR MESSAGE
                        000737  020306           JSR     PC,.LINE4               ;PRINT LINE 4 OF ERROR MESSAGE
                        000737  020326           JSR     PC,.LINE50              ;PRINT THE WORDING FOR OPERATION
                000176  012760  000000  000176   MOV     @#176,6(SP)             ; SET ERROR BLOB )
                        012702                   MOV     #2,R2                   ;GO UP ONE
                        000737  017736           JSR     PC,.LINE5               ;PRINT OUT WORDING WHICH CAUSED ERROR
                000712  000737  020342   10:     JSR     PC,.INCSOF              ;INCREMENT SOFT ERROR COUNT
                000716  000737  020342           JSR     PC,.INCTOT              ;INCREMENT TOTAL ERROR COUNT
                000722  012737  177560  001522   MOV     #177560,@#ERRVEC        ;SET ERROR TRAP
                000730  012737  000003  001524   MOV     #3,@#ERRVEC+2           ;NEW PRIO LEVEL
                000736  000737  017620           JSR     PC,.MESTRY              ;NEW TRY AGAIN
                000742  000005                   RESET                           ;NEW TRY NOT SUCCESSFUL
                000744  000737  020076           JSR     PC,.LINEC               ;PRINT "CORRECTED ON N RETRY(S)"
                000750  000737  020126           JSR     PC,.LINE7               ;PRINT LINE 7 OF ERROR MESSAGE
                000754  000000                   HALT                            ;HALT!!
                000756  000737  020106           JSR     PC,.LINE60              ;PRINT "UNCORRECTABLE AFTER N RETRY(S)"
                000762  000737  020126           JSR     PC,.LINE7               ;PRINT LINE 7 OF ERROR MESSAGE
                000766  000207           10:     RTS     PC                      ;RETURN
                                        ;REPORT DRIVE ERROR
                011770  000737  020270  DRVERR:  JSR     PC,.LINE1               ;PRINT LINE 1 OF ERROR MESSAGE
                011774  100410  012702          BLOS    ERR30                   ;REPORT DRIVE ERROR
                012000  000737  020342           JSR     PC,.LINE2               ;PRINT LINE 2 OF ERROR MESSAGE
                012004  000737  020276           JSR     PC,.LINE3               ;PRINT LINE 3 OF ERROR MESSAGE
                012010  000737  020302           JSR     PC,.INCTOT              ;INCREMENT TOTAL ERROR COUNT
                012016  000737  020126           JSR     PC,.LINE7               ;PRINT LINE 7 OF ERROR MESSAGE
                012022  000207                   RTS     PC                      ;RETURN
```



```
                                        ;[illegible] ( [illegible] ) ERROR

  [illegible]  012760 [illegible] [illegible]  [illegible]:  BIT   [illegible]  ;[illegible] SET [illegible] ?
  [illegible]  [illegible]                                   BEQ   10$          ;[illegible] SET
  [illegible]  [illegible]  011670                           JSR   [illegible]  ;[illegible] ERROR
  [illegible]  [illegible]  [illegible]         10$:         JSR   PC,[illegible] ;[illegible] CURRENT SECTOR & [illegible]
  [illegible]  [illegible]  [illegible]                      JSR   PC,[illegible] ;[illegible] OF CURRENT SECTOR
  [illegible]  [illegible]  [illegible] 000770               BIT   [illegible]  ;[illegible] SET ?
  [illegible]  [illegible]                                   BEQ   [illegible]  ;[illegible] SET
  [illegible]  [illegible]  [illegible]                      MOV   [illegible],(SP) ;[illegible] ON STACK
  [illegible]  [illegible]  [illegible] [illegible]          BIC   [illegible]  ;[illegible] BITS FROM [illegible]
  [illegible]  [illegible]  [illegible] [illegible]          CMP   [illegible]  ;[illegible] CORRECT [illegible] ?
  [illegible]  [illegible]                                   BEQ   20$          ;[illegible] IF IT IS
  [illegible]  [illegible]  [illegible]                      JSR   [illegible]  ;REPORT POSITIONING ERROR
  [illegible]                               20$:
  [illegible]  [illegible]  [illegible]                      MOV   (SP)+,CYLNDR ;POP STACK INTO CYLNDR
  [illegible]  [illegible]  [illegible]                      JSR   [illegible]  ;REPORT '[illegible]' ERROR

  [illegible]  004737  [illegible]          30$:         JSR   PC,[illegible] ;[illegible] ERROR [illegible]
  [illegible]  [illegible]                                   BR    [illegible]  ;[illegible] IF IT IS
  [illegible]  004737  022770                           JSR   PC,LINE1     ;PRINT LINE 1 OF ERROR MESSAGE
  [illegible]  104416  [illegible]                      DISPLY [illegible]  ;[illegible] ERROR - '[illegible]' SET
  [illegible]  004737  [illegible]                      JSR   PC,LINE2     ;PRINT LINE 2 OF ERROR MESSAGE
  [illegible]  004737  [illegible]                      JSR   PC,LINE3     ;PRINT LINE 3 OF ERROR MESSAGE
  [illegible]  004737  [illegible]                      JSR   PC,LINE4     ;PRINT LINE 4 OF ERROR MESSAGE
  [illegible]  032760  [illegible] 000176               BIT   [illegible]  ;[illegible] ERROR ALSO ?
  [illegible]  [illegible]                                   BEQ   40$          ;[illegible] NOT
  [illegible]  004737  [illegible]                      JSR   PC,[illegible] ;[illegible] WHICH CAUSED '[illegible]'
  [illegible]  004737  [illegible]          40$:         JSR   PC,LINE5A    ;PRINT LINE 5 OF ERROR MESSAGE
  [illegible]  004737  [illegible]                      JSR   PC,[illegible] ;INCREMENT SOFT ERROR COUNT
  [illegible]  004737  [illegible]                      JSR   PC,INCTOT    ;INCREMENT TOTAL ERROR COUNT
  [illegible]  012737  [illegible] 001372               MOV   [illegible]  ;SET [illegible]
  [illegible]  012737  [illegible] 001346               MOV   [illegible],RETRY ;[illegible] LIMIT
  012402  004737  [illegible]                           JSR   PC,RETRY     ;[illegible] THE ERROR
  012406  [illegible]                                   BR    [illegible]  ;[illegible] NOT SUCCESSFUL
  012410  004737  [illegible]                           JSR   PC,LINEC     ;PRINT 'CORRECTED ON N RETRY(S)'
  012414  004737  [illegible]                           JSR   PC,LINE7     ;PRINT LINE 7 OF ERROR MESSAGE
  012420  [illegible]                                   BR    60$          ;EXIT
  012422  004737  [illegible]          50$:         JSR   PC,LINEC0    ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
  012426  004737  [illegible]                           JSR   PC,LINE7     ;PRINT LINE 7 OF ERROR MESSAGE
  012432  000207                       60$:         RTS   PC           ;RETURN


                                        ;REPORT POSSIBLE POSITIONING ERROR

  012434  004737  022770                POSERR:  JSR   PC,LINE1     ;PRINT LINE 1 OF ERROR MESSAGE
  012440  104416  0?3478                         DISPLY ,EMS1       ;PRINT [illegible] DETECTED POSITIONING ERROR
  012444  004737  0?2342                         JSR   PC,LINE2     ;PRINT LINE 2 OF ERROR MESSAGE
  012450  004737  0?3026                         JSR   PC,LINE3C    ;PRINT LINE 3C OF ERROR MESSAGE
  012454  012637  0?3364                         MOV   (SP)+,CYLNDR ;POP STACK INTO CYLNDR
  012460  004737  0?3746                         JSR   PC,LINE5A    ;PRINT LINE 5A OF THE ERROR MESSAGE
  012464  004737  0?4156                         JSR   PC,INCMIS    ;INCREMENT MISPOSITIONING COUNT
  012470  004737  0?4202                         JSR   PC,INCTOT    ;INCREMENT TOTAL ERROR COUNT
  012474  004737  0?4256                         JSR   PC,LINE7A    ;PRINT LINE 7A OF ERROR MESSAGE
  012500  004737  016710                         JSR   PC,RECALT    ;RECALIBRATE
  012504  000207                                 RTS   PC           ;EXIT


                                        ;REPORT 'OPI' ERROR
```

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57
58 012466  004737  016420          SPERR:  JSR     PC,SPOTCK       ;SEE IF ERROR AT BAD SPOT
59 012472  000207                          RTS     PC              ;RETURN IF IT IS
60 012474  004737  022270                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
61 012500  104414  000151                  DISPLY  ,EMS2           ;'SPOT' ERROR
62 012504  004737  022342                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
63 012510  004737  022376                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
64 012514  004737  023000                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
65 012520  004737  020662                  JSR     PC,INCSOF       ;COUNT 'SPOT' AS A SOFT DATA ERROR
66                                                                 ;PUT ON BOOT'S ERR MSG
67 012524  004737  020700                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
68 012530  012737  000000  001322          MOV     #0,@#ERRMSK     ;ERR IN MAIN
69 012536  012737  000001  001326  SPERR1: MOV     #1,@#ERRLIM     ;ERR LIMIT
70 012544  004737  017120                  JSR     PC,ERETRY       ;ERR TRY THE OPPOS
71 012550  000405                          BR      10              ;ERR TRY SAME P
72 012552  004737  020076                  JSR     PC,LINE4C       ;ERR TRY (SAME, 10 TRYS BEFORE)
73 012556  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
74 012562  000207                          RTS     PC              ;EXIT
75 012564  004737  024106          10:     JSR     PC,LINE6D       ;ERR INCORRECT DATA 0 BEFORE RETRY(S)
76 012570  004737  024136                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
77 012574  000207                          RTS     PC              ;RETURN
78
79                                 ;REPORT 'DTE' ERROR
80
81 012576  004737  016420          DTEERR: JSR     PC,SPOTCK       ;SEE IF ERROR AT BAD SPOT
82 012602  000207                          RTS     PC              ;RETURN IF IT IS
83 012604  004737  022270                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
84 012610  104414  000151                  DISPLY  ,EMS2           ;'DTE' ERROR
85 012614  000137  010750                  JMP     @CRLER1         ;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  .EM35           ;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
```

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                                        ;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 & RPO7 REGISTERS
                                        ;
014010  032760  060000  000166  CKERR:  BIT     #060000,@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  001552          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  001562          1$:     CLR     ERCTR           ;CLEAR THE ERROR COUNTER
014216  016001  000006                  MOV     $BUF(R0),R1     ;BUFFER ADDRESS
014222  016037  000020  001566          MOV     $WPOL(R0),CMCNT ;WORD COUNT TO WORKING LOCATION
014230  066037  000170  001566          ADD     $WPWC(R0),CMCNT ;CALCULATE WORDS TRANSFERED
014236  001001                          BNE     2$
014240  000207                          RTS     PC              ;EXIT--NO WORDS XFERED
                                        ;
014242  016037  000012  001570  2$:     MOV     $CYL(R0),CMCYL  ;CYLINDER ADDRESS WORKING LOCATION
014250  052737  150000  001570          BIS     #150000,CMCYL   ;SET MFG, USER AND FMT BITS
014256  016037  000010  001572          MOV     $SEC(R0),CMSEC  ;SECTOR & TRACK ADDRESSES TO WORKING LOCNS
014264  013737  001460  001564          MOV     CMPLMT,LIMIT    ;DISPLAY LIMIT
014272  005237  001564                  INC     LIMIT           ;CONVERT PARAMETER INTO LIMIT VALUE
014276  012737  177777  001550  CMSTR:  MOV     #-1,ZROIND      ;CLEAR THE 'ZERO'S' INDICATOR
014304  005037  001556                  CLR     SAVER1          ;CLEAR THE R1 SAVE WORD
014310  005037  001560                  CLR     SAVER5          ;CLEAR THE R5 SAVE WORD
014314  023760  001566  000022          CMP     CMCNT,$SSEC(R0) ;IS BUFFER SIZE GREATER THAN ONE SECTOR ?
014322  101005                          BHI     1$              ;BR IF IT IS
014324  013702  001566                  MOV     CMCNT,R2        ;LESS THAN, USE REMAINING BUFFER
014330  005037  001566                  CLR     CMCNT           ;SET COUNTER TO 0
014334  000405                          BR      2$
014336  016002  000022          1$:     MOV     $SSEC(R0),R2    ;COMPARE SECTOR
014342  166037  000022  001566          SUB     $SSEC(R0),CMCNT ;DECREMENT WORD COUNT
014350  126027  000024  000005  2$:     CMPB    $CODE(R0),#5    ;READ HEADER & DATA?
014356  001034                          BNE     CMDAT           ;BR IF NOT
                                        ;
                                        ;COMPARE HEADER WORDS
                                        ;
014360  012705  001570          CMHED:  MOV     #CMCYL,R5       ;ADDRESS OF COMPARING CYLINDER
014364  052711  150000                  BIS     #150000,(R1)    ;SET BITS INCASE BAD SECTOR ENCOUNTER
014370  022521                          CMP     (R5)+,(R1)+     ;CHECK CYLINDER
014372  001405                          BEQ     1$              ;BR IF COMPARE OK
014374  012737  177777  001574          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  001574          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  001562          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,WORDPOS     ;INITIALIZE WORD POSITION
014456  004737  015506          1$:     JSR     PC,MATCH        ;FIND THE PATTERN
014462  000403                          BR      1$              ;FOUND A PATTERN
014464  004737  015616                  JSR     PC,NOMTCH       ;RETURN HERE IF NO MATCH WITH PATTERN MODE
014470  000463                          BR      7$              ;BYPASS COMPARE ROUTINE
                ;
014472  011405          1$:     MOV     (R0),R5         ;ADDRESS OF PATTERN ADDRESS IN R0
014474  012703  000020          2$:     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          3$:     TST     ERCTR           ;ERRORS DETECTED ?
014514  001406                          BEQ     3$              ;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  121760  001372  000152          CMPB    CYREC,SECLIM(R0)        ;RUN SECTOR 0 ?
59 014722  101426                          BLOS    10$                     ;NO
60 014724  105037  001372                  CLRB    CYREC                   ;RESET SECTOR 0
61 014730  105237  001373                  INCB    CYTRK                   ;INCREMENT TRACK 0
62 014734  121760  001373  000156          CMPB    CYTRK,TRKLIM(R0)        ;RUN TRACK 0 ?
63 014742  101414                          BLOS    10$                     ;NO
64 014744  105037  001373                  CLRB    CYTRK                   ;RESET TRACK 0
65 014750  005237  001370                  INC     CYCYL                   ;INCREMENT CYLINDER NUMBER
66 014754  013746  001370                  MOV     CYCYL,-(SP)             ;GET COMPARING CYLINDER
67 014760  042716  150000                  BIC     #150000,(SP)            ;SAVE ONLY THE CYLINDER BITS
68 014764  021660  000150                  CMP     (SP)+,CYLLIM(R0)        ;LAST CYLINDER ?
69 014770  101401                          BLOS    10$                     ;NO
70 014772  000427                          BR      CYPRX                   ;NORMAL RETURN,NOT WRAP AROUND
71
72 014776  012705  001370          10$:    MOV     #CYCYL,R5               ;ADDRESS OF COMPARING CYLINDER
73 015000  052711  150000                  BIS     #150000,(R1)            ;SET BITS INCASE BAD SECTOR ENCOUNTER
74 015004  021521                          CMP     (R5)+,(R1)+             ;COMPARE 1ST HEADER WORD
75 015006  001405                          BEQ     11$                     ;MATCH
76 015010  012737  177777  001376          MOV     #-1,WRDPOS              ;INDICATE WORD POSITION IS HEADER WRD 1
77 015016  004737  014436                  JSR     PC,CMSTR2               ;NOT MATCH
78 015022  021521                  11$:    CMP     (R5)+,(R1)+             ;SECOND WORD OF HEADER
79 015024  001405                          BEQ     12$                     ;MATCH
80 015026  012737  177776  001376          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$:    SUB     #2,CYCNT                ;ADJUST WORD COUNT
84 015046  003401                          BLE     CYPRX                   ;COMPARE IS DONE
85 015050  000677                          BR      8$                      ;RETURN TO COMPARE LOOP
86
93 015052  004737  015460          CYPRX:  JSR     PC,ENDCYP               ;PRINT LAST LINE OF ERRORS
94 015056  000207                          RTS     PC
```

```
(29-MAY-80)  PAGE  (4)0 RECORD WAS 80 1 SEC 05 10-52-28 PAGE 50                                                    SEQ 0049
MAIN PROGRAM

                                        ;TYPE DATA COMPARE ERRORS
                                        ;
 015060  000250                 COMPT:  WORD
                                        ;
 015062  005737  001356         10$:    TST     SAVED1          ;PRINT SAVED VALUES ?
 015066  001005                         BNE     20$             ;BR IF YES
 015070  004737  015106                 JSR     PC,PRINT        ;PRINT INITIAL MESSAGE INFO
 015074  004737  015250                 JSR     PC,PR           ;PRINT REMAINDER OF MESSAGE
 015100  000436                         BR      50              ;EXIT
 015102                         20$:
 015102  010146                         MOV     R1,-(SP)        ;SAVE R1 ON STACK
 015104  010246                         MOV     R2,-(SP)        ;SAVE R2 ON STACK
 015106  011746  001374                 MOV     @#PS,-(SP)      ;SAVE PROCESSOR PS STACK
 015112  011701  001356                 MOV     SAVED1,R1       ;RESTORE SAVED R1
 015116  011705  001360                 MOV     SAVED2,R5       ;RESTORE SAVED R5
 015122  011737  001354  001370         MOV     SAVED0,@#PS     ;RESTORE SAVED PROCESSOR PRIORITY
 015130  004737  015106                 JSR     PC,PRINT        ;PRINT INITIAL MESSAGE INFO
 015134  004737  015250                 JSR     PC,PR           ;PRINT SAVED VALUES
 015140  005037  001354                 CLR     SAVED0          ;CLEAR SAVED PROCESSOR INDICATORS
 015144  005037  001360                 CLR     SAVED2          ;CLR SAVED R5 FOR ONE
 015150  014537  001356                 MOV     (SP)+,SAVED1    ;POP STACK INTO SAVED1
 015154  014505                         MOV     (SP)+,R5        ;POP STACK INTO R5
 015156  014501                         MOV     (SP)+,R1        ;POP STACK INTO R1
 015160  004737  015250                 JSR     PC,PR           ;PRINT REMAINDER OF MESSAGE
 015164  000207                 50$:    RTS     PC              ;RETURN
                                        ;
 015166  105737  001352         60$:    TSTB    @#PS,TMP        ;ERROR ?
 015172  100003                         BPL     90              ;BR IF NO!
 015174  001013                         BNE     50              ;BR IF FIRST ERROR AND PROCESSING 'DCN' ERROR.
                                        ;I.E. FIRST ERROR AND CURRENT ERROR W/O 'DCN'
 015176  004737  022770                 JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
 015202  104414  000766                 DISPLY  .LINE2          ;DATA COMPARE ERROR W/O 'DCN' ERROR
 015206  004737  024342                 JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
 015212  004737  024004                 JSR     PC,LINE3A       ;PRINT LINE 3A OF ERROR MESSAGE
 015216  004737  023666                 JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
 015222  000404                         BR      60              ;GO TO TYPE HEADER
                                        ;
 015224  104414  000673         90$:    DISPLY  .LINE0          ;PRINT 'DATA COMPARISON ERRORS'
 015230  104414  001205                 DISPLY  .DCRLF          ;CR LF
 015234  104414  023722         60$:    DISPLY  .LINE0A         ;PRINT '        WORD EXPCTD RECEIVD
                                        ;       ADDR    POS     DATA    DATA'
 015240  012737  177777  001352         MOV     @-1,@#FIRSTER   ;SET FIRST ERROR FLAG
 015246  000207                         RTS     PC              ;RETURN
                                        ;
 015250  005737  001356         70$:    TST     CFLAG           ;WAS (PC) 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  163364 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
```

```
[illegible]                                  JSR     PC,11$              ;GET WORD POSITION
[illegible]                                  MOV     [illegible],-(SP)   ;PUT EXPECTED DATA ON THE STACK
[illegible]                                  JSR     PC,[illegible]      ;TYPE IT
[illegible]                                  DISPLAY .BLANK              ;TYPE 2 BLANKS
[illegible]                                  MOV     [illegible],-(SP)   ;[illegible] DATA
[illegible]                                  JSR     PC,[illegible]      ;TYPE IT
[illegible]                                  DISPLAY .CRLF               ;CR LF
[illegible]                                  RTS     PC                  ;RETURN

[illegible]                           11$:   CMP     [illegible],#1      ;IS IT HEADER WORD 1 ?
[illegible]                                  BNE     12$                 ;GO IF NO
[illegible]                                  DISPLAY [illegible]         ;TYPE [illegible]
[illegible]                                  BR      14$
[illegible]                           12$:   CMP     [illegible],#2      ;IS IT HEADER WORD 2 ?
[illegible]                                  BNE     13$                 ;GO IF NO
[illegible]                                  DISPLAY [illegible]         ;TYPE [illegible]
[illegible]                                  BR      14$
[illegible]                           13$:   MOV     [illegible],-(SP)   ;PUT THE WORD POS ON THE STACK
[illegible]                                  JSR     PC,[illegible]      ;CONVERT IT TO DECIMAL
[illegible]                                  JSR     [illegible]         ;TYPE IT (REPLACE LEADING ZEROS)
[illegible]                                  .WORD   6                   ;TYPE 6 DIGITS
[illegible]                                  DISPLAY [illegible]         ;TYPE [illegible]
[illegible]                           14$:   DISPLAY [illegible]         ;TYPE 2 BLANKS
[illegible]                                  RTS     PC

                                      ;LAST LINE OF COMPARE ERROR REPORTING

[illegible]                           ERROP: TSTB    [illegible]-1       ;ANY COMPARE ERRORS FOUND ?
[illegible]                                  BEQ     2$                  ;GO IF NOT
[illegible]                                  TST     [illegible]         ;SEE HOW MANY ERRORS
[illegible]                                  BEQ     1$                  ;GO IF ONLY CAN'T MATCH PATTERN
[illegible]                                  DISPLAY [illegible]         ;NUMBER OF [illegible]
[illegible]                                  MOV     [illegible],-(SP)   ;NUMBER OF ERRORS
[illegible]                                  JSR     PC,[illegible]      ;TYPE IT
[illegible]                                  DISPLAY .CRLF               ;CR LF
[illegible]                           1$:    JSR     PC,INCTOT           ;INCREMENT TOTAL ERROR COUNT
[illegible]                                  JSR     PC,[illegible]      ;PRINT LINE [illegible] OF ERROR MESSAGE
[illegible]                           2$:    RTS     PC                  ;RETURN
```

```
[illegible]
```

```
                                        ;ADD ECC TO CORRECT THE DATA WORD
                                        ;
016000  016037  000234  000000  ECC:    MOV     @#PEC2(R0),ECMSK0       ;ADDRESS OF LAST WORD WITH ERROR
016004  016046  001376                  MOV     @#PEC1(R0),-(SP)        ;BIT WITHIN WITH ERROR (2'S COMP)
016010  060616  000000                  ADD     @#PEC0(R0),(SP)         ;ADD WORDS REQUESTED
016014  011692                          MOV     (R2),(SP)               ;RESTORE STACK
016016  005726                          TST     (SP)+                   ;POINT TO WORD WITH ERROR
016020  005767                          TST     -2(SP)                  ;CLEAR NEXT STACK LOCN
016024  016600  000002          10:     MOV     2(R0),-(SP)             ;SECTOR SIZE
016030  004737  012L56                  JSR     R2,DIV                  ;DIVIDE WORDS WITH BY SECTOR SIZE
016034  005716                          TST     (SP)                    ;PARTIAL SECTOR WORKED ?
016036  001415                          BEQ     20                      ;BR IF NOT
016040  006116                          ROL     (SP)                    ;CONVERT DATA NUMBER OF BYTES
016042  161637  001400                  SUB     (SP),ECSEC              ;SUBTRACT SECTOR RESIDUE
016046  122760  000006  000004          MOVB    #6,ECCO(R0)             ;SET OPTIONAL READ HEAD & DATA
016054  001007                          BNE     20                      ;BR IF NOT
016056  062737  000004  001400          ADD     #4,ECSEC                ;ADD HEADER SIZE (TO BYTES) BACK IN
016064  000403                          BR      30                      ;GO ADJUST THE STACK POINTER
016066  162737  001000  001400  20:     SUB     #1024.,#2,ECSEC         ;SUBTRACT SECTOR DATA FIELD SIZE (TO BYTES)
016074  062706  000004          30:     ADD     #4,SP                   ;ADJUST THE STACK POINTER
016100  016037  000252  001376          MOV     @#C1(R0),ECBIT          ;ECC POSITION COUNT
016106  005337  001376                  DEC     ECBIT                   ;ADJUST BIT POSITION
016112  013737  001376  001406          MOV     ECBIT,ECWRD             ;LOAD THE WORD COUNT LOCATION
016120  042737  177760  001376          BIC     #^C17,ECBIT             ;SAVE THE BIT OFFSET COUNT
016126  042737  000017  001406          BIC     #17,ECWRD               ;CLEAR THE BIT OFFSET
016134  006237  001406                  ASR     ECWRD                   ;CHANGE TO BYTE COUNT(DIVIDE BY 2)
016140  006237  001406                  ASR     ECWRD                   ;CHANGE TO BYTE COUNT(DIVIDE BY 4)
016144  006237  001406                  ASR     ECWRD                   ;CHANGE TO BYTE COUNT(DIVIDE BY 8.)
016150  104414  056145                  DISPLY  #LIN10A                 ;'ERROR BURST BEGINS AT '
016154  013746  001406                  MOV     @#ECWRD,-(SP)           ;PUT THE WORD COUNT ON THE STACK
016160  006216                          ASR     (SP)                    ;GET STARTING WORD FOR MESSAGE(DIVIDE BY 16.)
016162  011637  001374                  MOV     (SP),WRDPOS             ;GET CURRENT WORD POSITION
016166  004737  015412                  JSR     PC,@#SB.20              ;CONVERT IT TO DECIMAL
016172  004737  05[illegible]            JSR     PC,@#SUPRL              ;TYPE IT (LEFT JUSTIFIED)
016176  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     @#PEC2(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  163520  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  .LIN1OH         ;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,$B2D         ;CONVERT IT TO DECIMAL
 9 016234  004537  032742                  JSR     R5,$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  .$CRLF          ;CR-LF
25 016314  013746  001414                  MOV     ECWRD1,-(SP)    ;PUT ECWRD1 ON THE STACK
   016320  004737  024366                  JSR     PC,LINOCT       ;TYPE ECWRD1
26 016324  013746  001374                  MOV     WRDPOS,(SP)     ;PUT THE WORD POS ON THE STACK
27 016330  005216                          INC     (SP)            ;INC TO SECOND WORD OF BURST
28 016332  004737  033412                  JSR     PC,$B2D         ;CONVERT IT TO DECIMAL
29 016336  004537  032742                  JSR     R5,$REPLZ       ;TYPE IT (REPLACE LEADING ZEROS)
30 016342  000006                          .WORD   6               ;TYPE 6 DIGITS
31 016344  104414  057771                  DISPLY  .PERIOD         ;TYPE '.'
32 016350  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
37 016354  013746  001420                  MOV     ECBAD1,-(SP)    ;PUT ECBAD1 ON THE STACK
   016360  004737  024366                  JSR     PC,LINOCT       ;TYPE ECBAD1
   016364  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
   016370  017746  163020                  MOV     @ECWRD1,-(SP)   ;PUT @ECWRD1 ON THE STACK
   016374  004737  024366                  JSR     PC,LINOCT       ;TYPE @ECWRD1
   016400  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
38 016404  000402                          BR      ECCX            ;EXIT
39
40 016406  104414  056241          ECC2:   DISPLY  .LIN1OC         ;ERROR BURST WAS NOT TRANSFERED TO MEMORY
41 016412  104414  001203          ECCX:   DISPLY  .$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
                                        ;
  16420  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          58:     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     #BIT7!BIT6,STATUS(R0) ;CHECK FOR DATA TERMINATION
017276  001533                  10$:    BEQ     7$              ;BR IF NOT DATA TERMINATION
017300  016037  000172  017570          MOV     BUFBA(R0),FACTOR        ;STORE THE FINAL BUFFER ADDRESS
017306  166037  000006  017570          SUB     BUF(R0),FACTOR  ;SUBTRACT THE INITIAL ADDRESS
017314  001524                  20$:    BEQ     7$              ;BR IF NO DATA TRANSFER
017316  006237  017570                  ASR     FACTOR          ;CONVERT TO A WORD COUNT

017322  122760  000002  000024          CMPB    #2,$CODE(R0)    ;SEE IF COMMAND WAS A WRITE
017330  001404                  30$:    BEQ     1$              ;BRANCH IF YES
017332  122760  000000  000024          CMPB    #0,$CODE(R0)    ;PRESENT OPERATION AN AUTO WRITE CHECK ?
017340  001043                  40$:    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     $WTOTL+6(R0),-(SP)      ;GET HIGH DIVIDEND
017376  012746  041100                  MOV     #41100,-(SP)    ;GET LOW DIVISOR
017402  012746  000017                  MOV     #17,-(SP)       ;GET HIGH DIVISOR
017406  004737  032174                  JSR     PC,$DBDIV       ;DIVIDE BY 1 X10**6
017412  005766  000004                  TST     4(SP)           ;DID REP COUNTER REACH LIMIT YET ?
017416  001412                  50$:    BEQ     2$              ;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 WORDS WRITTEN
017436  005560  000060                  ADC     $WTOTL+2(R0)    ;ADD ANY CARRY
017442  000401                  60$:    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                  70$:    BEQ     7$              ;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     $RTOTL+6(R0),-(SP)      ;GET HIGH DIVIDEND
017514  012746  041100                  MOV     #41100,-(SP)    ;GET LOW DIVISOR
017520  012746  000017                  MOV     #17,-(SP)       ;GET HIGH DIVISOR
017524  004737  032174                  JSR     PC,$DBDIV       ;DIVIDE BY 1 X10**6
017530  005766  000004                  TST     4(SP)           ;DID REP COUNTER REACH LIMIT YET ?
017534  001412                  80$:    BEQ     5$              ;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 WORDS READ
017554  005560  000070                  ADC     $RTOTL+2(R0)    ;ADD ANY CARRY
017560  000401                  90$:    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
```

[illegible]

```
                                ;ROUTINE TO GET A BUFFER
                                ;CALL:
                                ;       MOV     #BUF,R0         ;BUF 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  011702  001656                  MOV     BUFTBL,R2       ;NUMBER OF SEPARATE BUFFERS
017604  001444                  10$:    BEQ     5$              ;BR IF NONE AVAILABLE
017606  012701  001656                  MOV     BUFTBL+2,R1     ;POINT AT START OF ALLOCATION TABLE
017612  026061  000020  000002  10$:    CMP     1+WORD(R0),2(R1) ;SEE IF THERE IS A BLOCK LARGE ENOUGH
017620  101405                          BLOS    20$             ;BRANCH IF IT IS
017622  005302                          DEC     R2              ;DECREMENT TABLE COUNT
017624  001436                          BEQ     5$              ;BR IF THROUGH TABLE
017626  062701  000004                  ADD     #4,R1           ;INCREMENT TABLE POINTER
017632  000767                          BR      10$             ;CONTINUE LOOKING
017634  011166  000010          20$:    MOV     (R1),10(SP)     ;BUFFER ADDRESS TO STACK
017640  164061  000020  000002          SUB     1+WORD(R0),2(R1) ;ADJUST BUFFER WORD CNT
017646  001407                          BEQ     30$             ;BR IF DIFFERENCE IS ZERO
017650  004760  000020                  ASL     WORD(R0)        ;CONVERT # WORDS TO BYTES
017656  066011  000020                  ADD     WORD(R0),(R1)   ;MAKE NEW STARTING ADDRESS
017662  006260  000020                  ASR     WORD(R0)        ;RETURN # BYTES TO WORDS
017666  000414                          BR      5$              ;RETURN
017670  005337  001656          30$:    DEC     BUFTBL          ;DECREMENT ENTRY COUNT
017674  001411                          BEQ     5$              ;BR IF ALLOCATION TABLE EMPTY
017676  005302                          DEC     R2              ;DECREMENT TABLE COUNT
017700  001407                          BEQ     5$              ;BR IF ITEM WAS LAST ENTRY
017702  010103                          MOV     R1,R3           ;MOVE TABLE POINTER
017704  062703  000004                  ADD     #4,R3           ;POINT TO NEXT ENTRY
017710  012321          40$:    MOV     (R3)+,(R1)+     ;MOVE ITEMS
017712  012321                  MOV     (R3)+,(R1)+
017714  005302                  DEC     R2              ;DECREMENT TABLE COUNT
017716  001374                  BNE     40$             ;CONTINUE IF NOT AT END OF TABLE
017720  012603          5$:     MOV     (SP)+,R3        ;RESTORE R3
017722  012602                  MOV     (SP)+,R2        ;RESTORE R2
017724  012601                  MOV     (SP)+,R1        ;RESTORE R1
017726  000207                  RTS     PC              ;RETURN
```

```
                                        ;ROUTINE TO PUT BUFFER D     N TABLE
                                        ;CALL:
                                        ;       R5      BUFF ID
                                        ;       R2      BLOCK ADDR
                                        ;       R4      FLAG
                                        ;
 1                                      ;
 2                                      ;
 3                                      ;
 4                                      ;
 5                                      ;
 6 017726  010146               BUFPUT: MOV     R1,-(SP)        ;SAVE R1
 7 017730  010246                       MOV     R2,-(SP)        ;SAVE R2
 8 017732  010346                       MOV     R3,-(SP)        ;SAVE R3
 9 017734  010446                       MOV     R4,-(SP)        ;SAVE R4
10 017736  010546                       MOV     R5,-(SP)        ;SAVE R5
11 017740  016701  001636               MOV     BUFTBL+2,R1     ;R1 = ADDR OF TABLE
12 017744  011702                       MOV     (R7),R2         ;R2 = BLOCK ADDR
13 017746  005201                       INC     R1              ;R1 = ADDR OF TABLE
14 017750  006303                       ASL     R3              ;R3 = R3 * 2
15 017752  016103  000120               MOV     BUFLEN(R3),R3   ;R3 = BUFFER LENGTH
16 017756  005004                       CLR     R4              ;R4 = 0 IF NO ADJACENT BLOCK
17 017760  020211  000000               CMP     (R2),(R1)       ;IS BLOCK = ADR ADJACENT BLOCK
18 017764  001003                       BNE     10$             ;BR IF NOT ADJACENT BLOCK
19 017766  005204                       INC     R4              ;R4 = 1 IF ADJACENT BLOCK
20 017770  005201  000004               INC     4(R1)           ;INCREMENT BUFFER ID
21 017774  005202                       INC     R2              ;INCREMENT BLOCK COUNT
22 017776  005211                       INC     (R1)            ;INCREMENT ENTRY COUNT
23 020000  010211  000000               MOV     R2,(R1)         ;PUT THE BLOCK ADDR INTO THE TABLE
24 020004  010361  000120  000002       MOV     R3,BUFLEN+2(R1) ;PUT BUFFER LENGTH
25 020012  005267  001636               INC     BUFTBL          ;INCREMENT ENTRY COUNT
26 020016  005202                       INC     R2              ;INCREMENT BLOCK COUNT LATER
27 020020  005704                       TST     R4              ;IS THE ADJACENT BLOCK IN THE TABLE
28 020022  010421  000000       20$:    MOV     R4,(R1)+        ;BLOCK ADDR TO TABLE
29 020026  010361  000120               MOV     R3,BUFLEN(R1)+  ;BUFFER LENGTH TO TABLE
30 020032  005267  001636               INC     BUFTBL          ;INCREMENT ENTRY COUNT
31 020036  005001                       CLR     R1              ;CLEAR R1
32 020040  016011  000000       30:     MOV     @(R0)+,(R1)     ;MOVE SAVED BUFFER ID TO TABLE
33 020044  006301  000120  000002       ASL     BUFLEN+2(R1)    ;INCREMENTED BUFFER CNT
34 020050  010246               40:     MOV     R2,-(SP)        ;SAVE R2
35 020052  013702  001636               MOV     BUFTBL,R2       ;R2 = ENTRY COUNT
36 020056  012705  001636               MOV     #BUFTBL+2,R5    ;R5 = ADDR OF TABLE
37 020062  016504  000002       50:     MOV     2(R5),R4        ;R4 = BUFFER ID (IN WORDS)
38 020066  005704                       TST     R4              ;CHECK ID BUFFER ONLY
39 020070  001410                       BEQ     60$             ;BR IF NO BUFFER ID
40 020072  021504                       CMP     (R5),R4         ;ADD BLOCK BUFFER ADDRESS
41 020074  001411                       BEQ     70$             ;BR IF STILL BUFFER ID IN FIELD ENTRY
42 020076  005202                       INC     R2              ;INCREMENT BLOCK ADDR IN TABLE
43 020100  005705  000004               TST     4(R5)           ;INCREMENT BUFFER ID
44 020104  005502                       ADC     R2              ;INCREMENT ENTRY COUNT
45 020106  001366                       BNE     50$             ;CHECK LOOPING
46 020110  005726                       TST     (SP)+           ;RESTORE STACK POINTER
47 020112  000415                       BR      60$             ;END
48 020114  012602               70$:    MOV     (SP)+,R2        ;RESTORE R2
49 020116  006365  000002  000002       ASL     2(R1),2(R5)     ;INCREMENT LOWER BLOCK LENGTH
50 020124  005337  001636               DEC     BUFTBL          ;DECREMENT ENTRY COUNT
51 020130  010105                       MOV     R1,R5           ;GET READY TO COMPARES
52 020132  062705  000004               ADD     #4,R5           ;INCREMENT TO NEXT ENTRY
53 020136  012521               80$:    MOV     (R5)+,(R1)+     ;COMPRESS TABLE
54 020140  012521                       MOV     (R5)+,(R1)+     ;MOVE SIZE FIELD DOWN
55 020142  005302                       DEC     R2              ;DECREMENT ENTRY COUNT
56 020144  001374                       BNE     80$             ;BR IF NOT FINISHED
57 020146  012605               60$:    MOV     (SP)+,R5        ;RESTORE R5
58 020150  012604                       MOV     (SP)+,R4        ;RESTORE R4
```

```
                        ;FILL THE ASSIGNED BUFFER (IF WRITE OR WRITE CHECK COMMAND)
                        ;CALL:
                        ;       MOV     #BUF,R0         ;BUFF ADDRESS
                        ;       MOV     BUF(R0),BUFPTR  ;LOAD BUFFER ADDRESS INTO THE DPB
                        ;       MOVB    #PATTERN,PATT(R0)       ;PATTERN CODE
                        ;       JSR     PC,FILBUF
                        ;       RETURN
                        ;
 0 020162  100412       FILBUF: BPL     10$             ;SAVE THE REGISTERS
10 020164  132760  000004  000005        BITB    #8.,CODE(R0)    ;SEE IF READ COMMAND
11 020172  001020       BNE     20$             ;BR IF READ
12 020174  016101  000000        10$:    MOV     BUF(R0),R1      ;BUFFER ADDRESS
13 020200  016002  000002        MOV     NUM(R0),R2      ;POSITIVE WORD COUNT
14 020204  116003  000003        MOVB    PATT(R0),R3     ;RELATIVE PATTERN ADDRESS
15 020210  016005  002154        MOV     $PBAT(R3),R5    ;PATTERN ADDRESS
16 020214  012704  000020        MOV     #16.,R4         ;PATTERN COUNT
17 020220  012521        20$:    MOV     (R5)+,(R1)+     ;MOVE THE PATTERN INTO THE BUFFER
18 020222  005302        DEC     R2              ;DECREMENT THE WORD COUNT
19 020224  001403        BEQ     30$             ;BR IF DONE (WORD COUNT = 0)
20 020226  005304        DEC     R4              ;DECREMENT THE PATTERN COUNT
21 020230  001372        BNE     20$             ;BR IF MORE PATTERN
22 020232  000766        BR      10$             ;CONTINUE DISTRIBUTING THE PATTERN
23 020234  100413        30$:    BMI     40$             ;RESTORE THE REGISTERS
24 020236  000207        RTS     PC              ;RETURN
```

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

```
                                        ;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
```

MAIN PROGRAM

```
     58 020602  112760  000171  000002          MOVB    @RDDAT,$COMND(R0)       ;DRIVE CODE FOR OPERATION
     59 020610  000415                          BR      "$                      ;SET UP FOR EXIT
     61 020612  005737  001424          6$:     TST     RDONLY                  ;LOCKED IN "READ ONLY" MODE ?
     62 020616  001366                          BNE     5$                      ;BR IF YES
     63 020620  112760  000002  000024          MOVB    @2,$CODE(R0)            ;CODE FOR WRTDAT
     67 020626  112760  000161  000002          MOVB    @WRTDAT,$COMND(R0)      ;OP CODE
     68 020634  004737  021352                  JSR     PC,GETPAT               ;GET PATTERN CODE
     69 020640  110560  000030                  MOVB    R5,$PATTC(R0)           ;PATTERN CODE
     70 020644  012760  177777  000130  7$:     MOV     @ 1,$NEXT(R0)           ;SET PARAMETERS SELECTED INDICATOR
     71 020652  000207                          RTS     PC                      ;RETURN
     72
     73 020654  105060  000026          8$:     CLRB    $PACK(R0)               ;SET 'T' COMMAND FLAG IN DPB TABLE
     74 020660  005060  000130          9$:     CLR     $NEXT(R0)               ;CLEAR 'PARAMETER SELECTED  INDICATOR
     75 020664  005726                          TST     (SP)+                   ;CLEAR STACK LEVEL
     76 020666  000137  006340                  JMP     MAIN                    ;JUMP TO MAIN BACKGROUND LOOP
```

```
                                        ;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     #SW0,@SWR       ;SEE IF SW0 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
```

```
                                ;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 (0SEC OR 0NSEC) 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(PC)        ;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
```

```
                                        ;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    DPACK(R0)       ;'T' COMMAND FOR THIS DRIVE ?
021750  001127                        BNE     6$              ;BR IF NO
021752  116060  000166  000027        MOVB    INPCS1(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,PHCODE(R0)   ;SEE IF NEXT OPERATION IS READ OR WRITE
021774  001007                        BNE     1$              ;BR IF EITHER
021776  016060  000012  000034        MOV     DCYL(R0),PREVA+2(R0)    ;SAVE STARTING CYLINDER
022004  016060  000010  000032        MOV     DSEC(R0),PREVA(R0)      ;SAVE STARTING SECTOR AND TRACK
022012  000410                        BR      2$
022014  004737  024444        1$:     JSR     PC,READDR       ;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,@ESWR     ;LOOP ON PREVIOUS VALUES (SW6=1) ?
022056  001413                        BEQ     4$              ;BR IF NO
022060  122760  000151  000002  3$:     CMPB    #WCHD,@COMMD(R0)        ;IS COMMAND A WRITE CHECK DATA ?
022066  001060                        BNE     6$              ;BR IF NO
022070  112760  000002  000024        MOVB    #2,@CODE(R0)    ;CODE FOR WRTDAT
022076  112760  000161  000002        MOVB    #WRTDAT,@COMMD(R0)      ;PUT WRITE DATA COMMAND BACK FOR LOOP
022104  000451                        BR      6$

022106  116060  000122  000024  4$:     MOVB    @PHCODE(R0),@CODE(R0)   ;LOGICAL CODE FOR OPERATION
022114  116005  000122                MOVB    @PHCODE(R0),R5  ;LOAD R5 FOR USE AS TABLE INDEX
022120  116560  002076  000002        MOVB    COMTBL(R5),@COMMD(R0)   ;COMMAND CODE
022126  122760  000151  000002        CMPB    #WCHD,@COMMD(R0)        ;IS NEW COMMAND A WRITE CHECK DATA ?
022134  001012                        BNE     5$              ;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,@COMMD(R0)       ;CHANGE WRITE CHECK TO READ DATA COMMAND
022154  112760  000004  000024        MOVB    #4,@CODE(R0)    ;CODE NUMBER CHANGED TO READ DATA

022162  116060  000125  000030  5$:     MOVB    @PATC(R0),@PATTC(R0)    ;PATTERN CODE
022170  016060  000124  000010        MOV     @SEC(R0),@SEC(R0)       ;TRACK AND SECTOR ADDRESSES
022176  016060  000126  000012        MOV     @CYL(R0),@CYL(R0)       ;CYLINDER ADDRESS
022204  012760  000400  000022        MOV     #256.,@SSEC(R0) ;INITIAL VALUE OF SECTOR SIZE
022212  132760  000001  000024        BITB    #1,@CODE(R0)    ;HEADER OPERATION ?
022220  001403                        BEQ     6$              ;BR IF NOT
022222  062760  000002  000022        ADD     #2,@SSEC(R0)    ;ADD HEADER SIZE
022230  016060  000020  000004  6$:     MOV     @WROL(R0),@WCNT(R0)     ;GET WORD COUNT AND
022236  016060  000020  000120        MOV     @WROL(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              ;[illegible] ZERO FOUND
022266  005721                  TST     (R1)+           ;INCREMENT R1
022270  000773                  BR      CMPRES          ;CONTINUE COMPRESSING TABLE
022272  000207          10:     RTS     PC              ;RETURN
```

```
                        .SBTTL  ERROR MESSAGE GENERATION ROUTINES

                        ;+
                        ; ENTRY FOR ERROR MESSAGE:
                        ; R0=ERR CD
                        ;
 0 022776  012777  000000  136652 ERR1:   MOV     #0,@#ERRCD      ;SWITCH IS SET ?
 1 023002  001402                         BEQ     10$             ;BR IF NOT
 2 023004  105001  001176                 CLRB    ERRFLG          ;YES, RESET FLAG
 3 023010  012777  020000  136636 10$:    MOV     #BIT13,@#ERRCD  ;TURN ON BIT INDICATING (ERR=1) ?
 4 023016  001016                         BNE     20$             ;BR IF YES
 5 023020  105001  001705                 CLRB    .SCNLF          ;CLR LF
 6 023024  105001  001704                 CLRB    .SCNLF          ;CLR LF
 7 023030  004737  023176                 JSR     PC,GETTIME      ;TIME ELAPSED TIME
 8 023034  105001  004611                 CLRB    @R1(R5)         ;TYPE 1 CHAR
 9 023040  000207                 20$:    RTS     PC              ;RETURN & TYPE DESCRIPTION
10
11                                       ;ENTRY FOR 2 OF ERROR MESSAGE
12                                       ;R0=ERR CODE * #### R1=ADDR OF ERROR * ####
13                                       ;R2=ADDR OF BAD TRACK/SECTOR
14                                       ;ERR=1   BAD(1)   BAD(2)   BAD(3)   ERRTYP   ERRCNT   ERRLIM   ERR(1)
15                                       ;ERR=2   BAD4     BAD5     BAD6     BAD7     RETRY    RETRY    ERR(2)
16                                       ;ERR=3   BAD8     BAD9     BAD10    BAD11    STATUS
17                                       ;ERR=4   ERR(3)   (UNIT NUMBER)
18                                       ;ERR=5 ERROR(1) OR WORD COUNT NOT CONSISTENT
19                                       ;ERR=6 ######   ERR# ######
20                                       ;BUFFER ADR = ######   WRD CNT = ####   ERROR WORD NUM = ###
21
22 023042                        LINE2:
23 023042  010046                        MOV     R0,-(SP)        ;PUSH R0 ON STACK
24 023044  010146                        MOV     R1,-(SP)        ;PUSH R1 ON STACK
25 023046  010246                        MOV     R2,-(SP)        ;PUSH R2 ON STACK
26 023050  104414  001705                CLRB    .SCNLF          ;CLR LF
27 023054  012737  022502  022502        MOV     #ERRTBL,ERRPTR  ;CLEAR MESSAGE ADDRESS STORAGE
28 023062  005001                        CLR     R1              ;CLEAR THE REGISTER
29 023064  012737  000016  022502        MOV     #16,ERRPTR      ;ADDRESS OF PREVIOUS ERROR * * MSG
30 023072  116002  000166                MOVB    ERRTBL(R0),R2   ;GET THE OPCODE
31 023076  042702  177701                BIC     #^C376,R2       ;SAVE ONLY 8 SIGNIFICANT BITS
32 023102  006302                        ASL     R2              ;TIME THE FIRST PREFIXLC
33 023104  005737  022506                TST     SS              ;SEE IF PREFIXLC ENTRY FOUND
34 023110  001440                        BEQ     LINE20          ;BR IF NOT
35 023112  012737  000016  022502        MOV     #16,ERRPTR      ;ADDRESS OF  PREVIOUS ERROR * * MSG
36 023120  116002  000027                MOVB    OPNTBL(R0),R2   ;PREVIOUS OPERATION CODE
37 023124  042702  177701                BIC     #^C376,R2       ;SAVE ONLY 8 SIGNIFICANT BITS
38 023130  006302                        ASL     R2              ;TIME THE PREVIOUS PREFIXLC
39 023132  000426                        BR      LINE20          ;CONTINUE
40 023134  005003                 10$:   CLR     R3              ;CLEAR THE TABLE INDEX
41 023136  126002  000104           20$:  CMPB    OPTBL(R3),R2    ;LOOK FOR THE OPCODE
42 023142  001405                        BEQ     30$             ;BR WHEN OPCODE COUNT = OPCODE
43 023144  105763  000104                TSTB    OPTBL(R3)       ;LOOK FOR END OF TABLE
44 023150  100402                        BPL     30$             ;BR IF END
45 023152  005203                        INC     R3              ;INCREMENT THE POINTER
46 023154  000770                        BR      20$             ;CONTINUE - NOT END OF TABLE
47 023156  006303                 30$:   ASL     R3              ;SHIFT INDEX
48 023160  006303                        ASL     R3              ;SHIFT THE INDEX
49 023162  006303                        ASL     R3              ;SHIFT THE INDEX
50 023164  012737  002126  022506        MOV     OPNTBL+3,R0     ;ADDRESS OF ASCII TEXT TABLE
51 023172  060337  022506                ADD     R3,R0           ;ADD THE INDEX
```

```
022500  104414                         DISPLY              ;TYPE IT
02250[illegible]  000000        60:    .WORD   0           ;ADDRESS OF "PRESENT" OR "PREVIOUS" MESSAGE
02250[illegible]  104414                DISPLY              ;TYPE THE OPERATION PERFORMED
02250[illegible]  000000        50:    .WORD   0           ;ADDRESS OF MESSAGE
022510  000207                         RTS     PC          ;RETURN TO MAIN ROUTINE

022512  005737  001[illegible]  LINE2A: TST  [illegible]   ;PRINT THE BAD SECTOR LINE ?
0225[illegible]  001[illegible]        BEQ     LINE2B      ;BR IF NOT
0225[illegible]  104414  [illegible]   DISPLY  .CRLF       ;CR LF
0225[illegible]  104414  [illegible]   DISPLY  [illegible] ;[illegible] ADDRESS DEFINED AS BAD AREA
0225[illegible]  104414  [illegible]  LINE2B: DISPLY .CRLF ;CR LF
0225[illegible]  104414  [illegible]   DISPLY  [illegible] ;STANDARD DRIVE REGISTER HEADER
0225[illegible]  013746  [illegible]   MOV     [illegible],-(SP) ;PUT THE DRIVE NUMBER ON THE STACK
0225[illegible]  004737  [illegible]   JSR     PC,[illegible]    ;TYPE IT
0225[illegible]  104414  [illegible]   DISPLY  [illegible] ;[illegible]
0225[illegible]  012705  [illegible]   MOV     [illegible],R5    ;[illegible] INDEXES
022[illegible]  004737  022742         JSR     PC,3$       ;PRINT THE REGISTERS

022[illegible]  032777  000000  [illegible]  BIT  [illegible] ;PRINT THE OPTIONAL REGISTERS ?
0225[illegible]  001[illegible]        BEQ     1$          ;BR IF NOT
0225[illegible]  104414  [illegible]   DISPLY  [illegible] ;STANDARD DRIVE REGISTER HEADER
0226[illegible]  012705  [illegible]   MOV     [illegible],R5    ;[illegible] DATA LINE
0226[illegible]  004737  022742        JSR     PC,3$       ;PRINT THEM

022610  104414  [illegible]     1$:    DISPLY  [illegible] ;STANDARD DRIVE REGISTER HEADER
0226[illegible]  012705  [illegible]   MOV     [illegible],R5    ;[illegible] DATA LINE
0226[illegible]  004737  022742        JSR     PC,3$       ;PRINT THE REGISTERS

0226[illegible]  013746  001750        MOV     [illegible],-(SP) ;CHECK THE CPU (BUS) TYPE
0226[illegible]  042716  [illegible]   BIC     [illegible],(SP)  ;LEAVE THE CPU BITS
0226[illegible]  [illegible]  030000   CMP     #030000,(SP)+     ;[illegible]
0226[illegible]  001[illegible]        BNE     1$          ;BR IF NO
0226[illegible]  104414  [illegible]   DISPLY  [illegible] ;STANDARD DRIVE REGISTER HEADER
0226[illegible]  012705  [illegible]   MOV     [illegible],R5    ;OPTIONAL FOURTH DATA LINE
0226[illegible]  004737  [illegible]   JSR     PC,3$       ;PRINT THE REGISTERS
0226[illegible]  032760  [illegible]  000016  10$: BIT [illegible],STATUS(R0) ;DATA ERROR ?
0226[illegible]  001[illegible]        BEQ     2$          ;BR IF NOT
0226[illegible]  016046  000020        MOV     [illegible](R0),-(SP) ;TRANSFER SIZE
0226[illegible]  066016  000170        ADD     [illegible](R0),(SP)  ;ADD REMAINING WORD COUNT
0226[illegible]  006316                ASL     (SP)        ;CONVERT TO AN BYTE INCREMENT
022700  066016  [illegible]            ADD     [illegible](R0),(SP)  ;BUFFER STARTING ADDRESS
022704  [illegible]  000172            CMP     (SP)+,[illegible](R0) ;CORRECT BUFFER ADDRESS ?
022710  001410                         BEQ     2$          ;BR IF YES
022712  104414  [illegible]            DISPLY  [illegible] ;"BUS ADDRESS AND WORD COUNT ARE NOT CONSISTENT"
022716  104414  001[illegible]         DISPLY  .CRLF       ;CR LF
022722  004737  02[illegible]          JSR     PC,LINE3D   ;PRINT LINE 3D OF ERROR MESSAGE
022726  004737  023446                 JSR     PC,LINE4    ;PRINT LINE 4 OF ERROR MESSAGE
022732                          20$:
022732  012605                         MOV     (SP)+,R5    ;;POP STACK INTO R5
022734  012604                         MOV     (SP)+,R4    ;;POP STACK INTO R4
022736  012603                         MOV     (SP)+,R3    ;;POP STACK INTO R3
022740  000207                         RTS     PC          ;RETURN TO ERROR PROCESSING ROUTINE

022742  012546                  3$:    MOV     (R5)+,-(SP) ;PUT THE REGISTER INDEX ON THE STACK
022744  060016                         ADD     R0,(SP)     ;ADD DRIVE'S TABLE ADDRESS
022746  017646  000000                 MOV     @(SP),-(SP) ;VALUE
022752  004737  024366                 JSR     PC,LINOCT   ;TYPE IT
```

```
                                                        ;CONNECT THE STATUS REGISTER
                                                        ;TYPE 2 BLANKS
                                                        ;AT END OF LINE ?
                                                        ;NO IF NOT
                                                        ;CR LF
                                                        ;AND RETURN
                        ;PRINT LINE 1 OF ERROR MESSAGE
                        ; ERROR AT CCC TT SS   WHERE CCC = CCC TT SS
                        ;
000000 104414 056710    LINE1:  DISPLY  .LIN1S          ;LINE 1 ENTRANCE
000002 000517                   BR      LIN1.1          ;FINISH PRINTOUT
                        ;
                        ;PRINT LINE 1A OF ERROR MESSAGE
                        ; START CYL. CCC  END CYL. CCC
                        ;
000006 104414 056751    LINE1A: DISPLY  .LIN1S          ;LINE 1A ENTRANCE
000010 000514                   BR      LIN1.1          ;FINISH ERROR LINE
                        ;
                        ;PRINT LINE 1B OF ERROR MESSAGE
                        ; START CYL. CCC  END CYL. CCC  ACTUAL CYL. CCC
                        ;
000012 004737 021150    LINE1B: JSR     PC,LIN1.3       ;LINE 1B ENTRANCE
000016 104414 001205            DISPLY  ,SCRLF
000022 000207                   RTS     PC
                        ;
                        ;PRINT LINE 1C OF ERROR MESSAGE
                        ;'START CYL. CCC  END CYL. CCC  ACTUAL CYL. CCC  TRK. TT
                        ;
000024 004737 021350    LINE1C: JSR     PC,LIN1.3       ;LINE 1C ENTRANCE
000030 000137 021402            JMP     LIN1.4          ;FINISH MESSAGE
                        ;
                        ;PRINT LINE 1D OF ERROR MESSAGE
                        ;'RPBA = XXXXXX   RPWC = XXXXXX'
                        ;
000034 032777 000040 156112 LINE1D: BIT     @SWR0,#BIT5     ;SWITCH 5 SET ?
000042 001416                   BEQ     10              ;BR IF IT IS
000044 104414 055070            DISPLY  .LIN1S          ;'RPBA = '
000050 016046 000172            MOV     @RPBA(R0),-(SP) ;BUFFER ADDR REG CONTENTS
000054 004737 024366            JSR     PC,LINOCT       ;CONVERT TO OCTAL AND TYPE IT
000060 104414 055077            DISPLY  .LIN1S          ;'   RPWC = '
000064 016046 000170            MOV     @RPWC(R0),-(SP) ;WORD COUNT REGISTER CONTENTS
000070 004737 024366            JSR     PC,LINOCT       ;CONVERT TO OCTAL AND TYPE IT
000074 104414 001205            DISPLY  ,SCRLF
000100 000207           10:     RTS     PC
                        ;
                        ;PRINT LINE 1E OF ERROR MESSAGE
                        ;'START CYL = CCC   START TRK = TT   START SEC = SS'
                        ;
000102 104414 054772    LINE1E: DISPLY  .LIN1S          ;'START CYL = '
000106 016046 000012            MOV     @CYL(R0),-(SP)  ;MOVE CYL TO STACK
000112 004737 024420            JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
000116 104414 056610            DISPLY  .BLNKS2         ;TYPE 2 BLANKS
000122 104414 055110            DISPLY  .LIN1S3         ;'START TRK = '
000126 005046                   CLR     -(SP)           ;CLEAR STACK
000130 116016 000011            MOVB    @TRK(R0),(SP)   ;TRACK TO STACK
000134 004737 024420            JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
```

```
                                        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'

023170  032777  000040  155756 LINE3F: BIT     #SW5,@SWR       ;SWITCH 5 SET ?
023176  001420                 1$:     BEQ     1$              ;BR IF NOT
023200  104414  055061                 DISPLY  .LINDA3         ;'RPDA = '
023204  016046  000174                 MOV     $RPDA(R0),-(SP) ;PUT SECTOR/TRACK ADDRESS ON THE STACK
023210  004737  024366                 JSR     PC,LINOCT       ;TYPE IT
023214  104414  056610                 DISPLY  .BLNKS2         ;TYPE 2 BLANKS
023220  104414  055051                 DISPLY  .LINCA3         ;' RPDC = '
023224  016046  000222                 MOV     $RPDC(R0),-(SP) ;PUT DESIRED CYLINDER ADDRESS ON THE STACK
023230  004737  024366                 JSR     PC,LINOCT       ;TYPE IT
023234  104414  001203                 DISPLY  .$CRLF
023240  000207                         RTS     PC

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

023242  004737  024444         LIN3.1: JSR     PC,READDR       ;DECREMENT TRACK AND SECTOR ADDRESS
023246  004737  024420                 JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023252  104414  054726                 DISPLY  .T              ;PRINT 'T'
023256  004737  024420                 JSR     PC,LINDEC       ;TYPE TRACK IN DECIMAL
023262  104414  054747                 DISPLY  .S              ;PRINT 'S'
023266  004737  024420                 JSR     PC,LINDEC       ;TYPE SECTOR ADDRESS
023272  104414  054752                 DISPLY  .LINP3          ;PRINT 'PREV ADDR'
023276  016046  000034                 MOV     $PREVA+2(R0),-(SP) ;PREVIOUS CYLINDER
023302  004737  024420                 JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023306  104414  054726                 DISPLY  .T              ;PRINT 'T'
023312  005046                         CLR     -(SP)           ;MAKE ROOM ON THE STACK
023314  116016  000033                 MOVB    $PREVA+1(R0),(SP)  ;PREVIOUS TRACK ADDRESS
023320  004737  024420                 JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023324  104414  054747                 DISPLY  .S              ;PRINT 'S'
023330  005046                         CLR     -(SP)           ;MAKE ROOM ON THE STACK
023332  116016  000032                 MOVB    $PREVA(R0),(SP)  ;PREVIOUS SECTOR DDRESS
023336  004737  024420                 JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023342  104414  001203                 DISPLY  .$CRLF
023346  000207                         RTS     PC

                                ;'START CYL= CCC  END CYL= CCC'

023350  104414  054772         LIN3.3: DISPLY  .LINS3          ;LINE '3B & 3C' ENTRANCE
023354  016046  000034                 MOV     $PREVA+2(R0),-(SP) ;PREVIOUS CYLINDER
023360  004737  024420                 JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023364  104414  055006                 DISPLY  .LINEN3         ;PRINT ' END CYL'
023370  016046  000222                 MOV     $RPDC(R0),-(SP) ;PRESENT CYLINDER
023374  004737  024420                 JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023400  000207                         RTS     PC

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

```
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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280 023674  013746  001234                  MOV     $CPUOP,(SP)     ;CHECK THE CPU (RH) TYPE
281 023700  042716  003777                  BIC     #^C174000,(SP)  ;LEAVE THE CPU BITS
282 023704  022726  030000                  CMP     #30000,(SP)+    ;SEE IF RH70
283 023710  001007                          BNE     2$              ;BR IF NO
284 023712  162716  000002                  SUB     #2,(SP)         ;SUBTRACT 2 FOR A DOUBLE WORD
285 023716  032760  004000  000240          BIT     #BIT11,$RPCS3(R0)       ;SEE WHICH WORD HALF DIDN'T COMPARE
286 023724  001401                          BEQ     2$              ;IF EQ, EVEN HALF DIDN'T COMPARE
287 023726  005316                          DEC     (SP)            ;SUBTRACT 1 FOR AN ODD WORD
288 023730  104414  055253          2$:     DISPLY  .LINP5          ;PRINT 'WORD POS
289 023734  004737  024420                  JSR     PC,LINDEC       ;TYPE THE POSITION
290 023740  104414  001203                  DISPLY  .$CRLF
291 023744  000207                          RTS     PC
292
293                                 ;PRINT LINE 5A OF THE ERROR MESSAGE
294                                 ;'HEADER FROM ERROR SECTOR  XXXXXX  XXXXXX  XXXXXX  XXXXXX'
295
296 023746                          LINE5A:
297 023746  104414  055270                  DISPLY  .LINS5          ;'HEADER CONTENTS OF ERROR SECTOR'
302 023752  013746  063364                  MOV     CYLNDR,(SP)     ;HEADER POSITION
    023756  004737  024366                  JSR     PC,LINOCT       ;TYPE IT
    023762  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
    023766  013746  063366                  MOV     CYLNDR+2,-(SP)  ;HEADER POSITION +2
    023772  004737  024366                  JSR     PC,LINOCT       ;TYPE IT
    023776  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
303 024002  104414  056613                  DISPLY  .LINX5
304 024006  104414  001203                  DISPLY  .$CRLF
305 024012  000207                          RTS     PC
306
307                                 ;PRINT LINE 5B OF ERROR MESSAGE
308                                 ;'RPEC1 = XXXXXX   RPEC2 = XXXXXX'
309
310 024014  104414  055323          LINE5B: DISPLY  .LINEP5         ;'RPEC1 = '
311 024020  016046  000232                  MOV     $RPEC1(R0),-(SP)  ;PUT REGISTER CONTENTS ON THE STACK
312 024024  004737  024366                  JSR     PC,LINOCT       ;TYPE IT
313 024030  104414  056610                  DISPLY  .BLNKS2         ;TYPE 2 BLANKS
314 024034  104414  055333                  DISPLY  .LINE05         ;' RPEC2 = '
315 024040  016046  000234                  MOV     $RPEC2(R0),-(SP)  ;PUT REGISTER CONTENTS ON THE STACK
316 024044  004737  024366                  JSR     PC,LINOCT       ;TYPE IT
317 024050  104414  001203                  DISPLY  .$CRLF
318 024054  000207                          RTS     PC              ;RETURN
319
320                                 ;PRINT LINE 6 OF ERROR MESSAGE
321                                 ;'SECTOR IS ECC CORRECTABLE'
322
323 024056  104414  055345          LINE6:  DISPLY  .LINB6          ;PRINT 'SECTOR IS ECC CORRECTABLE '
324 024062  104414  001203                  DISPLY  .$CRLF
325 024066  000207                          RTS     PC
326
327                                 ;PRINT LINE 6A OF THE ERROR MESSAGE
328                                 ;'SECTOR READ CORRECTLY AFTER N RETRY(S)'
329
330 024070  104414  055400          LINE6A: DISPLY  .LINC6          ;PRINT 'SECTOR READ CORRECTLY AFTER N RETRY(S)'
331 024074  000406                          BR      LIN6.2          ;TYPE THE REST OF THE LINE
332
333                                 ;PRINT LINE 6C OF THE ERROR MESSAGE
334                                 ;'CORRECTED ON N RETRY(S)'
335
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ERROR MESSAGE GENERATION ROUTINES

```
                                ;PRINT LINE 6C OF THE ERROR MESSAGE
                                ;' CORRECTED ON N RETRY(S)'

024076  104414  055435   LINE6C: DISPLY  .LIN6C           ; CORRECTED ON N RETRY(S)
024102  000403                   BR      LIN6.2          ;TYPE THE REST OF THE LINE

                                ;PRINT LINE 6D OF THE ERROR MESSAGE
                                ;'UNCORRECTABLE AFTER N RETRY(S)'

024104  104414  055465   LINE6D: DISPLY  .LINU06         ;'UNCORRECTABLE AFTER N RETRY(S)'
024110  000400                   BR      LIN6.2          ;FINISH

                                ;RETRY COUNT TYPEOUT

024112  005046           LIN6.2: CLR     -(SP)           ;CLEAR STACK
024114  113716  001325           MOVB    RETRY+1,(SP)    ;RETRY COUNT
024120  004737  024420           JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
024124  104414  055453           DISPLY  .LINR6          ;' RETRY(S)'
024130  104414  001203           DISPLY  .$CRLF
024134  000207                   RTS     PC

                                ;PRINT LINE 7 OF THE ERROR MESSAGE
                                ;'TOTALS; ERRORS:XXX  WRDS WRITN:XXXXX X10+6 WRDS READ:XXXXX X10+6'

024136  104414  055574   LINE7:  DISPLY  .LIN7T          ;TOTALS; ERRORS
024142  016046  000102           MOV     $TOTAL(R0),-(SP)        ;TO STACK
024146  004737  024420           JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
024152  104414  055615           DISPLY  .LIN7X          ;PRINT ' WRDS WRITN'
024156  012746  000056           MOV     #$WTOTL,-(SP)   ;ADDRESS OF LOW WORD ON STACK
024162  060016                   ADD     R0,(SP)
024164  004737  037404           JSR     PC,$D82D        ;CONVERT
024170  004737  032526           JSR     PC,$SUPRL       ;PRINT
024174  104414  057771           DISPLY  .PERIOD         ;TYPE '.'
024200  104414  057632           DISPLY  .MSGX10         ;TYPE ' X10+6'
024204  104414  055633           DISPLY  .LIN7R          ;PRINT ' WRDS READ'
024210  012746  000066           MOV     #$RTOTL,-(SP)   ;LOW WORD ADDRESS
024214  060016                   ADD     R0,(SP)
024216  004737  037404           JSR     PC,$D82D        ;CONVERT
024222  004737  032526           JSR     PC,$SUPRL       ;PRINT IT
024226  104414  057771           DISPLY  .PERIOD         ;TYPE '.'
024232  104414  057632           DISPLY  .MSGX10         ;TYPE ' X10+6'
024236  104414  001203           DISPLY  .$CRLF          ;CR-LF
024242  032777  100000  154704   BIT     #SW15,@SWR      ;SEE IF 'HALT ON ERROR' - SWITCH 15
024250  001401                   BEQ     1$              ;BR IF NOT
024252  000000                   HALT                    ;SWITCH 15 HALT
024254  000207           1$:     RTS     PC

                                ;PRINT LINE 7A OF ERROR MESSAGE
                                ;'TOTALS; SEEKS= XXXXX  MIS POS ERRORS= XXX  SKI ERRORS= XXX'

024256  104414  055535   LINE7A: DISPLY  .LIN7P          ;'TOTALS; SEEKS= '
024262  012746  000076           MOV     #$STOTL,-(SP)   ;TOTAL SEEKS
024266  060016                   ADD     R0,(SP)         ;DEVICE TABLE ADDRESS
024270  004737  037404           JSR     PC,$D82D        ;CONVERT THE SEEK COUNT
024274  004737  032526           JSR     PC,$SUPRL       ;PRINT IT
024300  104414  057771           DISPLY  .PERIOD         ;TYPE '.'
024304  104414  055512           DISPLY  .LIN7M          ;'  MIS POS ERRORS= '
024310  016046  000112           MOV     $MISPO(R0),-(SP)        ;TOTAL ERRORS
024314  004737  024420           JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
024320  104414  055555           DISPLY  .LIN7S          ;'  SKI ERRORS= '
```

```
                                        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,$B2D         ;CONVERT IT TO DECIMAL
                                        JSR     PC,$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

 7  025020                      STATPR:
    025020  010046                      MOV     R0,-(SP)        ;;PUSH R0 ON STACK
    025022  010446                      MOV     R4,-(SP)        ;;PUSH R4 ON STACK
 8  025024  005737  001542              TST     ASMLST          ;ANY DRIVES ASSIGNED ?
 9  025030  001431                      BEQ     5$              ;BR IF NOT
21  025032  005004              2$:     CLR     R4              ;CLEAR THE DRIVE INDEX
22  025034  104401  001203              TYPE    ,$CRLF          ;CR-LF
23  025040  006304              3$:     ASL     R4              ;CHANGE TO INDEX WORDS
24  025042  016400  002056              MOV     BLKADR(R4),R0   ;GET THE DRIVE'S BLOCK ADDRESS
25  025046  006204                      ASR     R4              ;RESTORE R4
26  025050  136437  040630  001542      BITB    ATABIT(R4),ASMLST       ;IS THIS DRIVE ASSIGNED ?
27  025056  001412                      BEQ     4$              ;BR IF NOT
28  025060  104401  001203              TYPE    ,$CRLF          ;CR-LF
29  025064  004737  026226              JSR     PC,$TIME        ;TYPE ELAPSED TIME
30  025070  104401  057401              TYPE    ,DASH5          ;TYPE '-----'
31  025074  104401  057425              TYPE    ,MSGSUM         ;TYPE 'SUMMARY, '
32  025100  004737  025150              JSR     PC,TYPSUM       ;TYPE THE SUMMARY
33  025104  005204              4$:     INC     R4              ;INCREMENT THE INDEX
34  025106  020427  000010              CMP     R4,#8.          ;FINISHED ?
35  025112  001352                      BNE     3$              ;BR IF NO
36  025114                      5$:
    025114  012604                      MOV     (SP)+,R4        ;;POP STACK INTO R4
    025116  012600                      MOV     (SP)+,R0        ;;POP STACK INTO R0
37  025120  000207                      RTS     PC              ;RETURN
38
39                              ;ROUTINE TO TYPE THE SUMMARY FOR ONLY ONE DRIVE
40                              ;CALL:
41                              ;       MOV     #DPB,R0         ;DPB ADDRESS
42                              ;       JSR     PC,ONESUM
43                              ;       RETURN
44
45  025122  010046              ONESUM: MOV     R0,-(SP)        ;SAVE R0
46  025124  010446                      MOV     R4,-(SP)        ;SAVE R4
47  025126  005004                      CLR     R4              ;CLEAR R4 FOR DRIVE NUMBER
48  025130  111004                      MOVB    (R0),R4         ;DRIVE NUMBER
49  025132  004737  025150              JSR     PC,TYPSUM       ;TYPE THE SUMMARY
50  025136  104401  057407              TYPE    ,DASH13         ;TYPE '-------------'
51  025142  012604                      MOV     (SP)+,R4        ;RESTORE R4
52  025144  012600                      MOV     (SP)+,R0        ;RESTORE R0
53  025146  000207                      RTS     PC              ;RETURN
54
55                              ;TYPE THE SUMMARY
56                              ;CALL:
57                              ;       MOV     #DRIVE,R4       ;DRIVE NUMBER
58                              ;       MOV     #DPB,R0         ;DPB ADDRESS
59                              ;       RETURN
60
64  025150  000240              TYPSUM: NOP
66
67                              ;TYPE REST OF SUMMARY LINE 1
68  025152  104401  056661              TYPE    ,DRVMSG         ;TYPE 'DRIVE'
```

```
 69 025156  010046                    MOV     R0, -(SP)       ;;SAVE R0 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
 70 025164  104401  056611            TYPE    .BLNKS1         ;TYPE 1 BLANK
 71 025170  104401  056655            TYPE    .DASH           ;TYPE '-'
 72 025174  104401  056611            TYPE    .BLNKS1         ;TYPE 1 BLANK
 73 025200  012737  057155  025226    MOV     #1RP07,2$       ;ADDRESS OF RP07 MESSAGE
 74 025206  122764  000005  040344    CMPB    #5.DRVTYP(R0)   ;IS DEVICE AN RP07 ?
 75 025214  001403                    BEQ     1$              ;BR IF YES
 76 025216  012737  057162  025226    MOV     #1RP07P,2$      ;ADDRESS OF RP07+ MESSAGE
 77 025224  104401                1$: TYPE                    ;TYPE THE DRIVE TYPE MESSAGE
 78 025226  000000                2$: .WORD   0               ;MESSAGE ADDRESS HERE
 79 025230  104401  056653            TYPE    .COMMA          ;TYPE ','
 80 025234  104401  056611            TYPE    .BLNKS1         ;TYPE 1 BLANK
 81 025240  004737  033044            JSR     PC,TYDRV        ;TYPE DRIVE SERIAL NUMBER
 82 025244  104401  025252            TYPE    .65$            ;;TYPE ASCIZ STRING
    025250  000404                    BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$: .ASCIZ  /, PASS /
    025262                      64$:
 83 025262  016046  000114            MOV     @PASSC(R0),-(SP)        ;PUT THE PASS COUNT ON THE STACK
 84 025266  004737  033412            JSR     PC,$SB2D        ;CONVERT IT
 85 025272  004537  032632            JSR     R5,REPLZ        ;TYPE IT
 86 025276  000003                    .WORD   3               ;TYPE 3 DIGITS
 87 025300  104401  057771            TYPE    .PERIOD         ;TYPE '.'
 88
 89                                 ;TYPE LINE 2 OF SUMMARY
 90                                 ;;;     TYPE    .$CRLF          ;CR-LF
 91
 92                                 ;TYPE LINE 3 OF SUMMARY
 93 025304  104401  025312            TYPE    .67$            ;;TYPE ASCIZ STRING
    025310  000407                    BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$: .ASCIZ  <CRLF>/WRDS WRITN /
    025330                      66$:
 94 025330  104401  057612            TYPE    .MSPASS         ;TYPE '/ PASS '
 95 025334  010046                    MOV     R0,-(SP)        ;GET ADDRESS OF DPB
 96 025336  062716  000042            ADD     #WTPAS,(SP)     ;POINT TO LOW NUMBER OF WRDS WRITTEN PER PASS
 97 025342  004737  037404            JSR     PC,$DB2D        ;CONVERT DECIMAL NUMBER
 98 025346  004737  032442            JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
 99 025352  104401  057771            TYPE    .PERIOD         ;TYPE '.'
100 025356  104401  057622            TYPE    .MSTOTL         ;TYPE '  TOTAL '
101 025362  010046                    MOV     R0,-(SP)        ;GET ADDRESS OF DPB
102 025364  062716  000056            ADD     #WTOTL,(SP)     ;POINT TO LOW NUMBER OF WRDS WRITTEN
103 025370  004737  037404            JSR     PC,$DB2D        ;CONVERT DECIMAL NUMBER
104 025374  004737  032442            JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
105 025400  104401  057771            TYPE    .PERIOD         ;TYPE '.'
106 025404  104401  057632            TYPE    .MSGX10         ;TYPE ' X10^6'
107
108                                 ;TYPE LINE 4 OF SUMMARY
109 025410  104401  025416            TYPE    .69$            ;;TYPE ASCIZ STRING
    025414  000407                    BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$: .ASCIZ  <CRLF>/WRDS READ  /
    025434                      68$:
110 025434  104401  057612            TYPE    .MSPASS         ;TYPE '/ PASS '
111 025440  010046                    MOV     R0,-(SP)        ;GET ADDRESS OF DPB
112 025442  062716  000036            ADD     #RDPAS,(SP)     ;POINT TO LOW NUMBER OF WRDS READ PER PASS
```

```
                                ;TYPE OCTAL NUMBER
                                ;SUPPRESS LEADING ZEROS AND TYPE
                                ;TYPE ' '
                                ;TYPE ' TOTAL '
                                ;GET ADDRESS OF DMB
                                ;POINT TO LOW NUMBER OF WDS READ
                                ;CONVERT DECIMAL NUMBER
                                ;SUPPRESS LEADING ZEROS AND TYPE
                                ;TYPE ' '
                                ;TYPE ' R10=0'

                        ;TYPE LINE 5 OF SUMMARY
                                ;;TYPE ASCIZ STRING
                                ;;GET OVER THE ASCIZ
                        ;;710:  .ASCIZ  <CRLF>/SEEKS    /
                        %06:
                                ;TYPE ' / PASS '
                                ;PUT OSTOTL ON THE STACK
                                ;POINT TO LOW NUMBER OF SEEK COUNT
                                ;CONVERT DECIMAL NUMBER
                                ;SUPPRESS LEADING ZEROS AND TYPE
                                ;TYPE ' '
                                ;TYPE ' TOTAL '
                                ;PUT OSTOTL ON THE STACK
                                ;POINT TO LOW NUMBER OF SEEK COUNT
                                ;CONVERT DECIMAL NUMBER
                                ;SUPPRESS LEADING ZEROS AND TYPE
                                ;TYPE ' '

                        ;TYPE LINES 6 AND 7 OF SUMMARY
                                ;;TYPE ASCIZ STRING
                                ;;GET OVER THE ASCIZ
                        ;;730:  .ASCIZ  <CRLF>/CUMULATIVE ERRORS:/
                        %20:
                                ;;TYPE ASCIZ STRING
                                ;;GET OVER THE ASCIZ
                        ;;750:  .ASCIZ  <CRLF>/SOFT /
                        %40:
                                ;;SAVE @SOFT(R0) FOR TYPEOUT
                                ;;GO TYPE -DECIMAL ASCII WITH SIGN
                                ;TYPE ' '
                                ;;TYPE ASCIZ STRING
                                ;;GET OVER THE ASCIZ
                        ;;770:  .ASCIZ  / HARD /
                        %60:
                                ;;SAVE @HARD(R0) FOR TYPEOUT
                                ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                ;TYPE ' '
                                ;;TYPE ASCIZ STRING
                                ;;GET OVER THE ASCIZ
                        ;;790:  .ASCIZ  / SKI /
                        %80:
                                ;;SAVE @SKI(R0) FOR TYPEOUT
                                ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                ;TYPE ' '
                                ;;TYPE ASCIZ STRING
                                ;;GET OVER THE ASCIZ
```

```
                        025772
149  025772  016006  000112          MOV     BYTSPR(R0),-(SP)        ;SAVE BYTSPR(R0) FOR TYPOUT
                        104405          TYPDS                   ;GO TYPE - DECIMAL ASCII WITH SIGN
160  026000  104401  025771          TYPE    .BYTSPR                 ;TYPE
161  026004  104401  026012          TYPE    .ASC                    ;TYPE ASCII STRING
                        026010  000000          BR      $20             ;GET OVER THE ASCII
                        026020          ;ASC    / BYTES /
                        026022
162  026022  016006  000102          MOV     BYTCNT(R0),-(SP)        ;CALCULATE NUMBER OF BYTES ERRORS
165  026026  166016  000106          SUB     BYTCNT(R0),(SP)         ;SUB-BACK BYTCNT FROM BYTCNT
                        026032  166016  000104          SUB     BYTMSG(R0),(SP)         ;SUB-BACK BYTMSG FROM BYTCNT
                        026036  166016  000110          SUB     BYTSPR(R0),(SP)         ;SUB-BACK BYTSPR FROM BYTCNT
                        026042  166016  000112          SUB     BYTSPR(R0),(SP)         ;SUB-BACK BYTSPR FROM BYTCNT
166  026046  104405          TYPDS                   ;GO TYPE - DECIMAL ASCII WITH SIGN
167  026050  104401  025771          TYPE    .BYTSPR                 ;TYPE
168  026054  104401  001200          TYPE    .CRLF                   ;CR-LF
169  026060  000207          RTS     PC
```

```
15
16
                                ;ROUTINE TO INCREMENT MSGCT
                                ;
                                ;NOTE:  MSGCT WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

 026162  005737  001336         INCMSG: TST     @#MSGSEC        ;SEE IF BAD TRK/SEC INDICATOR SET
 026166  001006                         BNE     10$             ;BR IF IT'S SET, DON'T INCREMENT COUNT
 026170  026027  000166  077777         CMP     MSGCT(R0),#77777        ;IS MSGCT ALREADY AT MAXIMUM ?
 026176  103002                         BCS     10$             ;BR IF IT IS
 026200  005260  000166                 INC     MSGCT(R0)               ;INCREMENT MSGCT
 026204  000207                 10$:    RTS     PC              ;RETURN
17
                                ;ROUTINE TO INCREMENT BADSEC
                                ;
                                ;NOTE:  BADSEC WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

 026206  005737  001336         INCBAD: TST     @#BADSEC        ;SEE IF BAD TRK/SEC INDICATOR SET
 026212  001006                         BNE     10$             ;BR IF IT'S SET, DON'T INCREMENT COUNT
 026214  026027  000172  077777         CMP     BADSEC(R0),#77777       ;IS BADSEC ALREADY AT MAXIMUM ?
 026222  103002                         BCS     10$             ;BR IF IT IS
 026224  005260  000172                 INC     BADSEC(R0)              ;INCREMENT BADSEC
 026230  000207                 10$:    RTS     PC              ;RETURN
18
                                ;ROUTINE TO INCREMENT DSKI
                                ;
                                ;NOTE:  DSKI WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

 026232  005737  001336         INCDSKI: TST    @#BADSEC        ;SEE IF BAD TRK/SEC INDICATOR SET
 026236  001006                         BNE     10$             ;BR IF IT'S SET, DON'T INCREMENT COUNT
 026240  026027  000130  077777         CMP     DSKI(R0),#77777 ;IS DSKI ALREADY AT MAXIMUM ?
 026246  103002                         BCS     10$             ;BR IF IT IS
 026250  005260  000130                 INC     DSKI(R0)                ;INCREMENT DSKI
 026254  000207                 10$:    RTS     PC              ;RETURN
19
                                ;ROUTINE TO INCREMENT DMISPO
                                ;
                                ;NOTE:  DMISPO WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

 026256  005737  001336         INCDMIS: TST    @#BADSEC        ;SEE IF BAD TRK/SEC INDICATOR SET
 026262  001006                         BNE     10$             ;BR IF IT'S SET, DON'T INCREMENT COUNT
 026264  026027  000112  077777         CMP     DMISPO(R0),#77777       ;IS DMISPO ALREADY AT MAXIMUM ?
 026272  103002                         BCS     10$             ;BR IF IT IS
 026274  005260  000112                 INC     DMISPO(R0)              ;INCREMENT DMISPO
 026300  000207                 10$:    RTS     PC              ;RETURN
20
                                ;ROUTINE TO INCREMENT DTOTAL
                                ;
                                ;NOTE:  DTOTAL WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

 026302  005737  001336         INCTOT: TST     @#BADSEC        ;SEE IF BAD TRK/SEC INDICATOR SET
 026306  001006                         BNE     10$             ;BR IF IT'S SET, DON'T INCREMENT COUNT
 026310  026027  000102  077777         CMP     DTOTAL(R0),#77777       ;IS DTOTAL ALREADY AT MAXIMUM ?
 026316  103002                         BCS     10$             ;BR IF IT IS
 026320  005260  000102                 INC     DTOTAL(R0)              ;INCREMENT DTOTAL
 026324  000207                 10$:    RTS     PC              ;RETURN
```

```
                                        ;ROUTINE TO TYPE THE ELAPSED CPU RUN TIME
026726  005737  001310        BTIME:  TST     CLKFLG          ;IS CLOCK AVAILABLE ?
026732  001046                  BNE     10$             ;BR IF NO
026734  012737  000002  026302        MOV     #2,2$           ;A TOTAL OF 2 DIGITS TO TYPE
026742  013746  001300          MOV     @#HOURS,-(SP)   ;PUT HOURS ON THE STACK
026746  021627  000100          CMP     (SP),#100       ;1000 HOURS OR MORE ?
026752  103407                  BLO     10$             ;BR IF NO
026754  005737  026302          TST     2$              ;TYPE 3 DIGITS
026760  023727  001750          CMP     (SP),#1000      ;1000 HOURS OR MORE ?
026766  103402                  BLO     10$             ;BR IF NO
026770  005737  026302          TST     2$              ;TYPE 4 DIGITS
026774  004737  015412        10$:    JSR     PC,$BIN2O       ;CONVERT TO DECIMAL
027000  004537  012626          JSR     R5,$FILL2       ;TYPE IT
027004  000000        20$:    .WORD   0               ;NUMBER OF HOUR DIGITS TO TYPE
027006  104401  060156          .TYPE   .COLON          ;:
027012  013746  001342          MOV     @#MINUTE,-(SP)  ;PUT MINUTES ON THE STACK
027016  004737  015412          JSR     PC,$BIN2O       ;CONVERT TO DECIMAL
027022  004537  012626          JSR     R5,$FILL2       ;TYPE IT
027026  000002          .WORD   2               ;TYPE 2 DIGITS
027030  104401  060156          .TYPE   .COLON          ;:
027034  013746  001344          MOV     @#SECOND,-(SP)  ;PUT SECONDS ON THE STACK
027040  004737  015412          JSR     PC,$BIN2O       ;CONVERT TO DECIMAL
027044  004537  012626          JSR     R5,$FILL2       ;TYPE IT
027050  000002          .WORD   2               ;TYPE 2 DIGITS
027052  000207          30$:    RTS     PC

                                        ;RV11 CLOCK INTERRUPT SERVICE ROUTINE

027054  005337  001346        RVSVR:  DEC     @#ONESEC        ;INCREMENT THE 1/60 SECOND COUNTER
027060  001037                  BNE     10$             ;BR IF A SECOND NOT COUNTED
027062  013737  001312  001346        MOV     @#HERTZ,@#ONESEC ;RESTORE THE VALUE
027070  005237  001344          INC     @#SECOND        ;COUNT THE SECOND
027074  023727  001344  000074        CMP     @#SECOND,#60.   ;AT MAXIMUM ?
027102  103426                  BLO     10$             ;BR IF NOT
027104  005037  001344          CLR     @#SECOND        ;CLEAR THE SECOND'S COUNTER
027110  005237  001472          INC     @#INTRVL+2      ;COUNT SUMMARY INTERVAL COUNTER
027114  005237  001464          INC     @#CMPTIM+2      ;COUNT COMPARE TIME INTERVAL COUNTER
027120  005237  001342          INC     @#MINUTE        ;COUNT THE MINUTE
027124  023727  001342  000074        CMP     @#MINUTE,#60.   ;AT MAXIMUM ?
027132  103412                  BLO     10$             ;BR IF NOT
027134  005037  001342          CLR     @#MINUTE        ;CLEAR THE MINUTE'S COUNTER
027140  005237  001340          INC     @#HOUR          ;COUNT THE HOURS
027144  023727  001340  023417        CMP     @#HOUR,#9999.   ;AT MAXIMUM
027152  101402                  BLOS    10$             ;BR IF NOT
027154  005037  001340          CLR     @#HOUR          ;CLEAR THE HOURS
027160  012746  000024        10$:    MOV     #20.,-(SP)      ;20MS ON THE STACK @ 50HZ
027164  023727  001312  000062        CMP     @#HERTZ,#50.    ;CPU RUNNING @ 50HZ ?
027172  001402                  BEQ     20$             ;BR IF YES
027174  012716  000020          MOV     #16.,(SP)       ;16MS ON THE STACK @ 60HZ
027200  004737  044402        20$:    JSR     PC,@#RPTMR      ;DRIVER TIMER ROUTINE
027204  005737  001470          TST     @#INTRVL        ;DISPLAY THE PERFORMANCE SUMMARY ?
027210  001411                  BEQ     30$             ;BR IF NOT
027212  023737  001472  001470        CMP     @#INTRVL+2,@#INTRVL ;DISPLAY INTERVAL FINISHED ?
027220  002405                  BLT     30$             ;BR IF NO
027222  012737  177777  001314        MOV     #-1,@#STATIN    ;SET PERFORMANCE SUMMARY DISPLAY FLAG
```

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CZRJOBO RP07 PERF EXER MACRO V04 00 1 DEC 83 10:52:28 PAGE 41 1                                SEQ 0142
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
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 59 026770  004737  030006                    JSR     PC,$CMND        ;TYPE STATISTICS
 60 026774  000471                            BR      13$             ;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 ( 'I', '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
```

```
                                                ;GET DRIVE NUMBER
                                                ;MAKE R4 WORD INDEX
                                                ;PUT BLOCK'S ADDR INTO R0
                                                ;RECALIBRATE DRIVE
                                                ;MAKE R4 BYTE INDEX
                                                ;DRIVE AVAILABLE?
                                                ;BR IF DRIVE OFFLINE OR NONEXISTENT
                                                ;BR IF DRIVE UNSAFE
                                                ;CLEAR BLOCK FOR DRIVE JUST ASSIGNED
                                                ;GET DRIVE SERIAL NUMBER
                                                ;INTERLEAVE SECTOR SET ?
                                                ;BR IF NO
                                                ;CHANGE DRIVE PARAMETERS ?
                                                ;BR IF NO
                                                ;CR-LF
                                                ;TYPE 'DRIVE'
                                                ;;SAVE R4 FOR TYPEOUT
                                                ;;TYPE DRIVE NUMBER
                                                ;;GO TYPE--OCTAL ASCII
                                                ;;TYPE 2 DIGIT(S)
                                                ;;SUPPRESS LEADING ZEROS
                                                ;TYPE ','
                                                ;TYPE 1 BLANK
                                                ;TYPE DRIVE SERIAL NUMBER
                                                ;MAKE R4 WORD INDEX
                                                ;GET THE DRIVE'S ADDRESS LIMITS
                                                ;DPB ADDRESS
                                                ;SET COMMAND INDICATOR
                                                ;MAKE R4 BYTE INDEX
                                                ;RETURN

                                                ;'UNSAFE' MESSAGE ADDRESS
                                                ;TO ERROR ROUTINE

                                                ;DRIVE PRESENT?
                                                ;BR IF NOT
                                                ;BR IF DRIVE OFFLINE
                                                ;ADDRESS OF  NOT RP07' MSG
                                                ;EXIT
                                                ;ADDRESS OF 'NOT PRESENT' MSG
                                                ;EXIT
                                                ;ADDRESS OF 'DRIVE OFFLINE' MESSAGE
                                                ;TO ERROR ROUTINE

                                                ;ADDRESS OF 'NON-INTERLEAVED' MESSAGE
                                                ;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,DFIRST(R0)  ;SEE IF FIRST TIME STARTED
030420  103426                         BCS     40              ;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     20              ;BR IF YES
030452  016060  000156  000136          MOV     FE1(R0),MINCYL(R0)      ;RESET MINIMUM CYLINDER ADDRESS
030460  000402                         BR      30
030462  005060  000136          20:     CLR     MINCYL(R0)      ;CLEAR MINIMUM CYLINDER
030466  005060  000142          30:     CLR     MINTRK(R0)      ;CLEAR MINIMUM TRACK
030472  005060  000146                  CLR     MINSEC(R0)      ;CLEAR MINIMUM SECTOR

030476  105737  001150          40:     TSTB    @AUTOB          ;RUNNING IN AUTO MODE ?
030502  001074                         BNE     70              ;BR IF YES
030504  005737  001332                 TST     CHGADR          ;PROGRAM STARTED AT 200 ?
030510  003071                         BGT     70              ;BR IF YES
030512  005737  001426                 TST     DRVPAR          ;CHANGE DRIVE PARAMETERS ?
030516  001066                         BNE     70              ;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     50              ;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          50:     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     60              ;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          60:     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     70              ;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.
```

```
64
65 050676  005737  001422          78:     TST     TSTERR          ;ARE YOU TESTING ANYWHERE ON MEDIA ?
66 050700  001016                          BNE     90              ;BR IF YES
67 050702  026060  000136  000196          CMP     MINCYL(R0),FE1(R0)      ;IS MIN. CYLINDER < 1ST FE CYLINDER ?
68 050710  103003                          BCS     81              ;BR IF NO
69 050712  016060  000196  000136          MOV     FE1(R0),MINCYL(R0)      ;RESET MINIMUM CYLINDER ADDRESS
70 050720  026060  000134  000196  80:     CMP     MAXCYL(R0),FE1(R0)      ;IS MAX. CYLINDER < 1ST FE CYLINDER ?
71 050726  103003                          BCS     90              ;BR IF NO
72 050730  016060  000190  000134          MOV     CYLLMT(R0),MAXCYL(R0)   ;RESET MAXIMUM CYLINDER ADDRESS
73
74 050736  016060  000136  000012  90:     MOV     MINCYL(R0),DCYL(R0)     ;INITIAL CYLINDER VALUE
75 050744  116060  000142  000011          MOVB    MINTRK(R0),DTRK(R0)     ;INITIAL TRACK VALUE
76 050752  116060  000146  000010          MOVB    MINSEC(R0),DSEC(R0)     ;INITIAL SECTOR VALUE
77 050760  012604                          MOV     (SP)+,R4        ;POP STACK INTO R4
   050762  012603                          MOV     (SP)+,R3        ;POP STACK INTO R3
78 050764  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

                                        GETLMT:
                                                MOV     R1,-(SP)        ;PUSH R1 ON STACK
                                                CLR     R1              ;START FROM 0
                                                MOV     @R0,.PE1(R0)    ;GET ADDRESS OF 1ST PE CYLINDER
                                                MOV     @R0,.CYLMT(R0)          ;ASSUME CYLINDER LIMIT FOR NPR?
                                                MOV     @R0,.TRKLMT(R0) ;ASSUME TRACK LIMIT     -
                                                MOV     @R0,.SECLMT(R0) ;ASSUME SECTOR LIMIT    -
                                                MOVB    (R0),R1         ;GET DRIVE NUMBER
                                                CMPB    R1,@#DRVTYP(R1) ;IS DRIVE AN RP07 ?
                                                BLO     10$             ;BR IF YES
                                                MOV     @R0,.PE1(R0)    ;GET ADDRESS OF 1ST PE CYLINDER
                                                MOV     @R0,.CYLMT(R0)          ;GET CYLINDER LIMIT FOR RP07.
                                                MOV     @R0,.TRKLMT(R0) ;GET TRACK LIMIT        -
                                                MOV     @R0,.SECLMT(R0) ;GET SECTOR LIMIT.      -
                                        10$:
                                                MOV     (SP)+,R1        ;POP STACK INTO R1
                                                RTS     PC              ;RETURN
```

```
                                ;ROUTINE TO GET THE DRIVE SERIAL NUMBER FROM DRIVE REGISTERS
                                ;THIS NUMBER IS CONTAINED IN THE REGISTERS ARE ONLY THE 6 LSB'S OF THE
                                ;SERIAL NUMBER
                                ;CALL:
                                ;       MOV     #BUF,R0         ;BUFFER ADDRESS
                                ;       JSR     PC,GETSN        ;CALL ROUTINE
                                ;
                                ;R0 = BUFFER ADDRESS BEFORE CALLING THE ROUTINE

001070                          GETSN:
001070  010046                          MOV     R0,-(SP)        ;PUSH R0 ON STACK
001072  010146                          MOV     R1,-(SP)        ;PUSH R1 ON STACK
001074  010246                          MOV     R2,-(SP)        ;PUSH R2 ON STACK
001076  010546                          MOV     R5,-(SP)        ;PUSH R5 ON STACK
001100  010002                          MOV     R0,R2           ;GET INDEX TO BUF
001102  004737  001142                  JSR     R3,$SAVREG      ;SAVE ALL REGISTERS
001106  012702  000006                  MOV     #6,R2           ;6 DIGITS TO STORE
001112  016001  000216                  MOV     SERNUM(R0),R1   ;SERIAL NUMBER
001116  000005                  10$:    RESET                   ;CLEAR
001120  006101                          ROL     R1              ;PUT THE NEXT DIGIT
001122  006105                          ROL     R5              ;INTO R5
001124  006101                          ROL     R1
001126  006105                          ROL     R5
001130  006101                          ROL     R1
001132  006105                          ROL     R5
001134  006101                          ROL     R1
001136  006105                          ROL     R5
001140  042705  000060                  BIC     #60,R5          ;MASK IT EXCEPT
001144  110560  000160                  MOVB    R5,SERNUM(R0)   ;SAVE DRIVE SERIAL NUMBER DIGIT
001150  005200                          INC     R0              ;GET NEXT INDEX FOR DRIVE SERIAL NUMBER
001152  005302                          DEC     R2              ;ALL DIGITS TYPED?
001154  001360                          BNE     10$             ;NO -- BRANCH
001156  012605                          MOV     (SP)+,R5        ;POP STACK INTO R5
001160  012602                          MOV     (SP)+,R2        ;POP STACK INTO R2
001162  012601                          MOV     (SP)+,R1        ;POP STACK INTO R1
001164  012600                          MOV     (SP)+,R0        ;POP STACK INTO R0
001166  000207                          RTS     PC              ;RETURN
```

```
                                        .TITLE  PARAMETER ENTRY ROUTINE
                                        ;
                                        ;PARAMETER ENTRY ROUTINE
                                        ;CALL:
                                        ;       MOV     #ADDR,R5        ;PARAMETER TABLE ADDRESS
                                        ;       JSR     PC,PARENT       ;GET THE PARAMETERS
                                        ;
 8 031170  010546                       PARENT: MOV     R5,-(SP)        ;SAVE THE PARAMETER TABLE ADDRESS
 9 031172  005037  001334               10:     CLR     CFLAG           ;CLEAR THE 'CONTROL C' FLAG
10 031176  012537  031206               10:     MOV     (R5)+,20        ;ADDRESS OF PARAMETER NAME
11 031202  001451                               BEQ     70              ;BR IF AT END OF TABLE
12 031204  104401                               TYPE                    ;TYPE THE PARAMETER NAME
13 031206  000000                       20:     .WORD   0               ;ADDRESS OF PARAMETER NAME TEXT
14 031210  012502                               MOV     (R5)+,R2        ;MAXIMUM PARAMETER VALUE
15 031212  012503                               MOV     (R5)+,R3        ;ADDRESS OF PARAMETER
16 031214  011546                               MOV     (R5),-(SP)      ;CURRENT VALUE OF PARAMETER
17 031216  004737  031412                       JSR     PC,$BIN2O       ;CONVERT IT TO DECIMAL
18 031222  004737  032436                       JSR     PC,$OUTSL       ;TYPE IT (LEFT JUSTIFIED)
19                                              ;TYPE THE CURRENT VALUE OF THE PARAMETER
20 031226  104001  056611                       TYPE    .BLNKS1         ;TYPE 1 BLANK
21 031232  104401  047447                       TYPE    .QUES           ;'?'
22 031236  104401  056611                       TYPE    .BLNKS1         ;TYPE 1 BLANK
23 031242  104411                               RDLIN                   ;READ THE KEYBOARD
24 031244  011601                               MOV     (SP),R1         ;INPUT ASCII STRING ADDRESS
25 031246  005737  001334                       TST     CFLAG           ;WAS (^C) TYPED?
26 031252  001021                               BNE     60              ;BR IF IT WAS
27 031254  004537  031254                       JSR     R5,CK.DIG       ;CHECK THE DIGIT(S)
   031260  031176                               10                      ;CARRIAGE RETURN ONLY ENTERED
   031262  031326                               70                      ;PERIOD ONLY ENTERED
   031264  031300                               40                      ;ILLEGAL INPUT
   031266  031274                               30                      ;TERMINATED WITH A CARRIAGE RETURN
   031270  031300                               40                      ;TERMINATED WITH A "."
   031272  031312                               50                      ;TERMINATED WITH A ","
28 031274  010215                       30:     MOV     R2,(R5)         ;MOVE NEW VALUE TO PARAMETER LOCATION
29 031276  000737                               BR      10              ;GET MORE PARAMETERS
30 031300  104401  060163               40:     TYPE    .BADENT         ;'BAD ENTRY'
31 031304  162705  000006                       SUB     #6,R5           ;DECREMENT THE TABLE POINTER
32 031310  000732                               BR      10              ;TRY AGAIN
33 031312  010215                       50:     MOV     R2,(R5)         ;NEW VALUE
34 031314  000404                               BR      70              ;EXIT
35 031316  005037  001334               60:     CLR     CFLAG           ;CLEAR THE 'CONTROL C' FLAG
36 031322  011603                               MOV     (SP),R3         ;RELOAD THE PARAMETER TABLE ADDRESS
37 031324  000724                               BR      10              ;TRY AGAIN
38 031326  005726                       70:     TST     (SP)+           ;CORRECT THE STACK POINTER
39 031330  000207                               RTS     PC              ;RETURN
```

```
                                        ;TYPEOUT ASSIGN/DROP ERROR MESSAGE
                                        ;CALL:
                                        ;       MOV     @MESADR,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
```

```
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     $PASS           ;INCRFMENT THE PASS COUNT
031624  042737  100000  001214                  BIC     @100000,$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
2
3 032050  005037  177776        RTURN:  CLR     PS              ;SET PRIORITY TO 0
4 032054  012706  001100                MOV     #STACK,SP       ;RESTORE STACK
5 032060  005237  001212                INC     $TESTN          ;INCREMENT THE TEST NUMBER IN THE MAIL BOX
6 032064  004737  033510                JSR     PC,$TKINT       ;MAKE SURE KEYBOARD INTERRUPT AND
7 032070  004737  024574                JSR     PC,CKCLK        ;SYSTEM CLOCK ARE STILL ON.
8 032074  000137  006340                JMP     MAIN            ;RETURN TO LOOP
9
10 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').

                                        $DIV:   SAVREG                  ;STORE R0 - R5
                                                MOV     26(SP),R5       ;DIVISOR
                                                CLR     R4              ;OTHER DIVISOR WORD
                                                MOV     30(SP),R2       ;UPPER DIVIDEND WORD
                                                MOV     32(SP),R3       ;LOWER DIVIDEND WORD
                                                CLR     R0              ;CLEAR OTHER DIVIDEND REGISTERS
                                                CLR     R1
                                                JSR     PC,M.DPID       ;GO TO THE DIVIDE ROUTINE
                                                MOV     R1,30(SP)       ;REMAINDER ON THE STACK
                                                MOV     R3,32(SP)       ;QUOTIENT ON THE STACK
                                                RESREG                  ;RESTORE R0 - R5
                                                MOV     (SP)+,(SP)      ;MOVE RETURN UP THE STACK
                                                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                        BIS     PC
```

```
                                .SBTTL  SUPPS   TYPE ASCIZ, REPLACE LEADING 0'S WITH BLANKS
                                .SBTTL  SUPPSL  TYPE ASCIZ, LEFT JUSTIFY
                                ;
                                ;;*****************************************************************
                                ;CALL:
                                ;       MOV     @#UPMADR,-(SP)  ;FIRST ADDRESS OF ASCIZ STRING
                                ;       JSR     PC,SUPPS
                                ;  OR
                                ;       MOV     @#UPMADR,-(SP)  ;FIRST ADDRESS OF ASCIZ STRING
                                ;       JSR     PC,SUPPSL
                                ;
032426  010046                  SUPPSL: 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                  SUPPS:  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
```

```
                        .SBTTL      TYPE ASCIZ, REPLACE LEADING 0'S WITH BLANKS
                        .SBTTL  $SUPRL   TYPE ASCIZ, LEFT JUSTIFY

                        ;;*****************************************************************
                        ;
                        ;THIS ROUTINE IS SAME AS '$UPRSL' AND '$UPRS', 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     ERRMSG,-(SP)    ;FIRST ADDRESS OF ASCIZ STRING
                        ;       JSR     PC,$SUPRS
                        ;  OR
                        ;       MOV     ERRMSG,-(SP)    ;FIRST ADDRESS OF ASCIZ STRING
                        ;       JSR     PC,$SUPRL

052526  010046          $SUPRL: MOV     R0,-(SP)        ;SAVE R0
052530  016600  000004          MOV     4(SP),R0        ;GET POINTER TO MESSAGE
052534  005037  052616          CLR     $SUPR2
052540  000405                  BR      $SUPR1

052542  010046          $SUPRS: MOV     R0,-(SP)        ;SAVE R0
052544  016600  000004          MOV     4(SP),R0        ;GET POINTER TO MESSAGE
052550  010037  052616          MOV     R0,$SUPR2       ;GET POINTER FOR TYPING
                        $SUPR1:
052554  105710          10:     TSTB    (R0)            ;TEST FOR TERMINATOR
052556  001406                  BEQ     20              ;YES
052560  122710  000060          CMPB    #'0,(R0)        ;IS THIS A "0" ?
052564  001006                  BNE     30              ;NO
052566  112720  000040          MOVB    #40,(R0)+       ;REPLACE IT WITH A "BLANK"
052572  000770                  BR      10              ;NEXT CHAR.
052574  005300          20:     DEC     R0              ;BACKUP 1
052576  112710  000060          MOVB    #'0,(R0)        ;MAKE IT "0"
052602  005737  052616  30:     TST     $SUPR2          ;LEFT JUSTIFY ?
052606  001002                  BNE     40              ;NO
052610  010037  052616          MOV     R0,$SUPR2       ;YES
052614  104414          40:     DISPLY                  ;TYPE, UNLESS SW13=1
052616  000000          $SUPR2: .WORD   0
052620  012600                  MOV     (SP)+,R0        ;RESTORE R0
052622  012616                  MOV     (SP)+,(SP)      ;RESTORE STACK
052624  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

052626  005297  052736        FILLZ:  INC     FILLO           ;LEAVE ZEROS

052632  010046                REPLZ:  MOV     R0,-(SP)        ;SAVE R0
052634  016400  000004                MOV     4(SP),R0        ;ADDRESS OF NUMBER TO R0
052640  005737  052736                TST     FILLO           ;LEAVE PRECEDING ZEROS ?
052644  001014                        BNE     3$              ;BR IF YES
052646  122710  000060        1$:     CMPB    #'0,(R0)        ;BYTE EQUAL TO ASCII '0' ?
052652  001006                        BNE     2$              ;BR IF NOT
052654  112710  000040                MOVB    #40,(R0)        ;REPLACE THE ZERO WITH A SPACE
052660  005200                        INC     R0              ;INCREMENT THE BYTE ADDRESS
052662  000771                        BR      1$              ;GO BACK AND LOOK FOR MORE LEADING ZEROS
052664  105710          2$:     TSTB    (R0)            ;SEE IF ZERO BYTE TERMINATOR
052666  001003                        BNE     3$              ;BR IF NOT
052670  005300                        DEC     R0              ;BACKUP STRING POINTER
052672  112710  000060                MOVB    #'0,(R0)        ;PUT A ZERO BACK IN
052676  016400  000004        3$:     MOV     4(SP),R0        ;PUT ADDRESS OF FIRST CHARACTER ON STACK
052702  105720          4$:     TSTB    (R0)+           ;SEE IF ZERO BYTE TERMINATOR
052704  001376                        BNE     4$              ;BR IF NOT
052706  005300                        DEC     R0              ;BACKUP STRING POINTER
052710  162700                        SUB     #6,R0           ;ADJUST ADDRESS
052712  010037  052720                MOV     R0,5$           ;GET ADDRESS FOR TYPEOUT
052716  104401                        TYPE                    ;TYPE THE NUMBER
052720  000000          5$:     .WORD   0               ;ADDRESS OF NUMBER
052722  012600                        MOV     (SP)+,R0        ;POP STACK INTO R0
052724  012616                        MOV     (SP)+,(SP)      ;MOVE STACK
052726  005037  052736                CLR     FILLO           ;CLEAR FILL FLAG
052732  000205                        RTS     R5              ;RETURN

052736  000000          FILLO:  .WORD   0               ;IF SET, LEAVE PRECEDING ZEROS FOR TYPE
```

```
                                        ;THIS ROUTINE IS SAME AS .DECB, AND .FBLZ, EXCEPT THAT IT
                                        ;WILL SUPPRESS THE LEADING ZEROS OF SWR3-1. THIS ACCOMPLISHED BY
                                        ;USING THOMP CALL .DISPLY, INSTEAD OF .TYPE.
                                        ;CALL:
                                        ;       MOV     #NUM,(SP)       ;ADDRESS OF NUMBER (IN ASCII)
                                        ;       JSR     R5,.DECBLZ      ;REPLACE PRECEDING ZEROS WITH BLANKS
                                        ;       .WORD   N               ; N IS NUMBER OF DIGITS TO BE TYPED
                                        ;  OR
                                        ;       MOV     #NUM,(SP)       ;ADDRESS OF NUMBER (IN ASCII)
                                        ;       JSR     R5,.FBLZ        ;TYPE PRECEDING ZEROS
                                        ;       .WORD   N               ; N IS NUMBER OF DIGITS TO BE TYPED

012736  005257  012736          .FBLZ:  INC     FBLZ0           ;LEAVE ZEROS

012742  010046                  .DECBLZ: MOV    R0,-(SP)        ;SAVE R0
012744  016400  000006                   MOV    6(R4),R0        ;ADDRESS OF NUMBER TO R0
012750  005737  012736                   TST    FBLZ0           ;LEAVE PRECEDING ZEROS ?
012754  001016                           BNE    2$              ;BR IF YES
012756  122710  000060           1$:     CMPB   #'0,(R0)        ;BYTE EQUAL TO ASCII '0' ?
012762  001004                           BNE    2$              ;BR IF NOT
012764  112710  000040                   MOVB   #40,(R0)        ;REPLACE THE ZERO WITH A SPACE
012770  005200                           INC    R0              ;INCREMENT THE BYTE ADDRESS
012772  000771                           BR     1$              ;GO BACK AND LOOK FOR MORE LEADING ZEROS
012774  105710                  2$:     TSTB   (R0)            ;SEE IF ZERO BYTE TERMINATOR
012776  001003                           BNE    3$              ;BR IF NOT
013000  005300                           DEC    R0              ;BACKUP STRING POINTER
013002  112710  000060                   MOVB   #'0,(R0)        ;PUT A ZERO BACK IN
013006  016400  000006           3$:     MOV    6(R4),R0        ;PUT ADDRESS OF FIRST CHARACTER ON STACK
013012  105720                  4$:     TSTB   (R0)+           ;SEE IF ZERO BYTE TERMINATOR
013014  001376                           BNE    4$              ;BR IF NOT
013016  005300                           DEC    R0              ;BACKUP STRING POINTER
013020  162500                           SUB    (R5)+,R0        ;ADJUST ADDRESS
013024  010037  013030                   MOV    R0,$4           ;GET ADDRESS FOR TYPEOUT
013030  104414                           .DISPLY                ;TYPE, UNLESS SW13=1
013032  000000                  $4:     .WORD  0               ;ADDRESS OF NUMBER
013034  012600                           MOV    (SP)+,R0        ;;POP STACK INTO R0
013036  012604                           MOV    (SP)+,(SP)      ;RESTORE STACK
013040  005037  012736                   CLR    FBLZ0           ;RESET FBLZ FLAG
013044  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  060252  TYDRV:  TYPE    .DRVSN          ;TYPE 'DRV S/N:'
033050  104401  057152  TYPDRV: TYPE    .PSGPG          ;TYPE PG
033054  010037  033070          MOV     R0,10           ;ADDRESS OF DPB
033060  062737  000160  033070  ADD     #16DRVSN,10     ;INDEX TO DRIVE SERIAL NUMBER
033066  104401                  TYPE                    ;TYPE THE DRIVE SERIAL NUMBER
033070  000000          10:     .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  052777  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     R ,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                          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  001?03                          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  001?02          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  03350.          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
```

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034564  104401  034722                  TYPE    .$CNTLU         ;;TYPE A CONTROL "U"
034570  000726                          BR      1$              ;;GO START OVER
034572  122715  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  001354  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=ENT AND N=ERROR ITEM NUMBER

035022  105037  035410          $ERROR: CLRB    IBSAVE          ;;CLEAR THE ITEM BYTE SAVE LOCATION
035026  104407                          CPSWR                   ;;TEST FOR CHANGE IN SOFT SWR
035030  010337  001316                  MOV     R3,ATTN         ;SAVE THE ATTENTION REGISTER CONTENTS
035034  010137  001320                  MOV     R1,DRVNO        ;DRIVE NUMBER
035040  032777  020000  144106          BIT     #SW13,@SWR      ;INHIBIT PRINTOUTS ?
035046  001004                          BNE     .+12            ;BR IF YES
035050  104401  001203                  TYPE    ,$CRLF          ;CR-LF
035054  104401  001203                  TYPE    ,$CRLF          ;CR-LF
035060  004737  026226                  JSR     PC,$TIME        ;TYPE ELAPSED TIME
035064  105237  001117          70:     INCB    $ERFLG          ;;SET THE ERROR FLAG
035070  001775                          BEQ     70              ;;DON'T LET THE FLAG GO TO ZERO
035072  013777  001116  144056          MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
035100  032777  002000  144046          BIT     #BIT10,@SWR     ;;BELL ON ERROR?
035106  001402                          BEQ     10              ;;NO - SKIP
035110  104401  001176                  TYPE    ,$BELL          ;;RING BELL
035114  005237  001126          10:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
035120  011637  001132                  MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
035124  162737  000002  001132          SUB     #2,$ERRPC
035132  117737  143774  0011            MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
035140  032777  001000  144000          BIT     #BIT09,@SWR     ;;SEE IF LOOP ON ERROR IS SET
035146  001060                          BNE     10048           ;;BRANCH AROUND ROUTINE IF SO
035150  122737  000177  001130          CMPB    #177,$ITEMB     ;;SEE IF THIS IS THE POWER FAIL CALL
035156  001454                          BEQ     10048           ;;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     10038           ;;BRANCH IF SO
035166  022737  177777  035406          CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
035174  001445                          BEQ     10048           ;;BRANCH IF SO
035176  013746  000004                  MOV     ERRVEC,-(SP)    ;;SAVE CONTENTS OF ERROR VECTOR
035202  012737  035220  000004          MOV     #10008,ERRVEC   ;;SETUP 'TRAP' RETURN ADDRESS
035210  013737  177766  035406          MOV     177766,CPSAVE   ;;MOVE CPU ERROR REGISTER TO CPSAVE FOR TEST
035216  000406                          BR      10018
035220  012737  177777  035406  10008:  MOV     #-1,CPSAVE      ;;SET CPU ERROR REGISTER TIMEOUT INDICATOR
035226  012716  035234                  MOV     #10018,(SP)     ;;SETUP RETURN ADDRESS
035232  000002                          RTI
035234  012637  000004          10018:  MOV     (SP)+,ERRVEC    ;;RESTORE CONTENTS OF ERROR VECTOR

035240  022737  177777  035406  10028:  CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
035246  001420                          BEQ     10048           ;;BRANCH IF SO
035250  032737  000001  035406          BIT     #BIT00,CPSAVE   ;;SEE IF POWER MONITOR BIT IS SET IN CPU ERR REG
035256  001414                          BEQ     10048           ;;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      10048           ;;BRANCH OVER IBSAVE CLEARING
```

```
035306  105037  035410          10038:  CLRB    IBSAVE          ;;CLEAR IBSAVE SO 2ND TIME THROUGH EXITS
035310                          10048:
035310  032777  020000  143636          BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
035316  001006                          BNE     20$             ;;SKIP TYPEOUTS
035320  004737  035412                  JSR     PC,@ERRTYP      ;;GO TO USER ERROR ROUTINE
035324  104401  001203                  TYPE    ,BCRLF
035330                          20$:
035330  122737  000001  001226          CMPB    #APTFLW,@FLW    ;;RUNNING IN APT MODE
035336  001007                          BNE     21$             ;;NO,SKIP APT ERROR REPORT
035340  113737  001150  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          21$:    TSTB    IBSAVE          ;;SEE IF IBSAVE IS LOADED
035362  001005                          BNE     31$             ;;BRANCH IF NOT - NO HALT ON PWR FDN BIT ERROR
035364  005777  143564                  TST     @SWR            ;;HALT ON ERROR
035370  100002                          BPL     31$             ;;SKIP IF CONTINUE
035372  000000                          HALT                    ;;HALT ON ERROR.
035374  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT.SWR
035376                          31$:
035376  105737  035410                  TSTB    IBSAVE          ;;SEE IF ITEM BYTE SAVE LOCATION HAS AN ERROR CALL
035402  001230                          BNE     71$             ;;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" (SERRTB),
                        ;;AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.

035612                  SERRTYP:
035612  104401  001203          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
035616  010046                  MOV     R0,-(SP)        ;;SAVE R0
035620  005000                  CLR     R0              ;;PICKUP THE ITEM INDEX
035622  153700  001130          BISB    @#ITEMB,R0
035626  001004                  BNE     10$             ;;IF ITEM NUMBER IS ZERO, JUST
                                                        ;;TYPE THE PC OF THE ERROR
035630  013706  001132          MOV     SERRPC,-(SP)    ;;SAVE SERRPC FOR TYPEOUT
                                                        ;;ERROR ADDRESS
035634  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
035636  000457                  BR      6$              ;;GET OUT
035640  122700  000177  10$:    CMPB    #177,R0         ;;SEE IF THIS ERROR CALL IS SPECIAL POWER FAIL CALL
035644  001006                  BNE     10000$          ;;BRANCH IF NOT
035646  013737  001212  035730  MOV     $TESTN,PFTSTN   ;;GET TEST NUMBER
035654  012700  035570          MOV     #PFECH,R0       ;;MOVE POWER FAIL ERROR CALL TABLE TO R0
035660  000406                  BR      10010$          ;;BRANCH TO CALL ERROR
035662  005300  10000$: DEC     R0                      ;;ADJUST THE INDEX SO THAT IT WILL
035664  006300                  ASL     R0              ;;      WORK FOR THE ERROR TABLE
035666  006300                  ASL     R0
035670  006300                  ASL     R0
035672  062700  003560          ADD     #SERRTB,R0      ;;FORM TABLE POINTER
035676  012037  035506  10010$: MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
03'502  001404                  BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
03'504  104401                  TYPE                    ;;TYPE THE "ERROR MESSAGE"
03'506  000000          2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
03'510  104401  001203          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
03'514  012037  035524  3$:     MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
03'520  001404                  BEQ     5$              ;;SKIP TYPEOUT IF 0
03'522  104401                  TYPE                    ;;TYPE THE "DATA HEADER"
03'524  000000          4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
03'526  104401  001203          TYPE    ,$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
```

```
[illegible]  000     000     000  SPECIAL  BYTE   0,0,0,0
[illegible] 000000           ;PSTN:   WORD   0

;+COMPARES TEST NUMBER FOR PF BIT ERROR
```

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                                .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,$RAND        ;;CALL THE ROUTINE
                                ;*      RETURN                  ;;RETURN HERE THE RANDOM
                                ;*                              ;;NUMBER WILL BE IN
                                ;*                              ;;$HINUM,$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     $HINUM,R1       ;;SET R1 WITH HIGH
037224  012702  177771                 MOV     #-7,R2          ;;SET SHIFT COUNT
037230  006300                  1$:    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     $HINUM,R1       ;;ADD NUMBER TO MAKE X 129
037252  062700  001057                 ADD     #1057,R0        ;;ADD LOW CONSTANT
037256  005501                         ADC     R1              ;;PROPOGATE CARRY
037260  062701  047401                 ADD     #47401,R1       ;;ADD HIGH CONSTANT
037264  010037  037306                 MOV     R0,$LONUM       ;;SAVE R0
037270  010137  037304                 MOV     R1,$HINUM       ;;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                  $HINUM: .WORD   176543
037306  123456                  $LONUM: .WORD   123456
```

```
                                .SBTTL  SAVE AND RESTORE RO R5 ROUTINES

                                ;;*****************************************************************
                                ;*SAVE RO 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 RO-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,@#DB20
                                ;*      RETURN                  ;;THE FIRST ADDRESS OF ASCIZ
                                ;;                              ;;IS ON THE STACK

037404  104412                  $DB20:  SAVREG                  ;;SAVE REGISTERS
037406  016602  000002                  MOV     2(SP),R2        ;;PICKUP THE DATA POINTER
037412  012700  037564                  MOV     #DECVL,R0       ;;GET ADDRESS OF "$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
037456  002402                          BLT     3$              ;;BR IF TEN POWER TO LARGE
037460  005203                          INC     R3              ;;ADD 1 TO PARTIAL
037462  000772                          BR      2$              ;;LOOP
037464  062401                  3$:     ADD     (R4)+,R1        ;;RESTORE SUBTRACTED VALUE
037466  005502                          ADC     R2
037470  062402                          ADD     (R4)+,R2
037472  022525                          CMP     (R5)+,(R5)+     ;;MOVE TO NEXT TEN POWER
037474  052703  000060                  BIS     #'0,R3          ;;CHANGE PARTIAL TO ASCII
037500  110320                          MOVB    R3,(R0)+        ;;SAVE IT
037502  005327                          DEC     (PC)+           ;;DONE?
037504  000000                  4$:     .WORD   0
037506  001357                          BNE     1$              ;;BR IF NO
037510  105020                          CLRB    (R0)+           ;;TERMINATOR
037512  104413                          RESREG                  ;;RESTORE REGISTERS
037514  000207                          RTS     PC              ;;RETURN
037516  145000                  $TNPWR: 145000                  ;;1.0E09
037520  035632                          35632
037522  160400                          160400                  ;;1.0E08
037524  002765                          2765
037526  113200                          113200                  ;;1.0E07
037530  000230                          230
037532  041100                          041100                  ;;1.0E06
037534  000017                          17
037536  103240                          103240                  ;;1.0E05
037540  000001                          1
037542  023420                          23420                   ;;1.0E04
037544  000000                          0
037546  001750                          1750                    ;;1.0E03
037550  000000                          0
037552  000144                          144                     ;;1.0E02
037554  000000                          0
```

DOUBLE LENGTH BINARY TO DECIMAL ASCII CONVERT ROUTINE

```
0[illegible]7554  000012                          12                      ;;1.0E01
0[illegible]7556  000000                          0
0[illegible]7560  000001                          1                       ;;1.0E00
0[illegible]7562  000000                          0
0[illegible]7564                        $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 ASCII NUMBER.
                                ;*CALL
                                ;*      MOV     @PNTR,-(SP)     ;;POINTER TO LOW WORD OF BINARY NUMBER
                                ;*      JSR     PC,@#OBJ20      ;;CALL THE ROUTINE
                                ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK

037600  104412                  #OBJ20: 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        10:     INC     $SAVR6          ;;WAIT FOR THE INC
040014  001375                        BNE     10              ;;OF  WORD
040016  005337  040100        20:     DEC     PWRFLG          ;TTY WAIT LOOP & SET POWER FAIL FLAG
040022  003775                        BLE     20              ;WAIT FOR FLAG= 1
040024  012677  141124                MOV     (SP)+,@SWR      ;;POP STACK INTO @SWR
040030  012605                        MOV     (SP)+,R5        ;;POP STACK INTO R5
040032  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
040034  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
040036  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
040040  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
040042  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
040044  012737  037720  000024        MOV     #$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    ,$CRLF          ;CR-LF
040174  005037  001334                CLR     CFLAG           ;CLEAR (^C) FLAG
040200  105737  001542                TSTB    ASMLST          ;ANY DRIVES ASSIGNED ?
040204  001414                        BEQ     2$              ;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 RP07.
                                        ;DRVTYP= 5 IF DRIVE IS RP07  MOVING HEAD OPTION
                                        ;DRVTYP=-1 IF NOT RP07

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
```

```
                                ;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.+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  1777,7  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      5$              ;EXIT

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

RPO2 DRIVER

```
     58 041240  012746  010000                    MOV     #BIT12,(SP)     ;SET FMT16=1
     59 041244  004037  045210                    JSR     R0,WRT.RP
     60 041250  000032                            RPOF
     61 041252  041342                            8$
     62 041254  004037  045116                    JSR     R0,RD.RP        ;READ RPDS
     63 041260  000012                            RPDS
     64 041262  041342                            8$
     65 041264  012605                            MOV     (SP)+,R5        ;AND SAVE IT IN R5
     66 041266  100015                            BPL     5$              ;BRANCH IF ATA=0
     67 041270  116164  040630  000016            MOVB    ATABIT(R1),RPAS(R4) ;CLEAR ATTENTION BIT
     68 041276  004037  045116                    JSR     R0,RD.RP        ;FIND OUT WHY ATA=1
     69 041302  000014                            RPER1
     70 041304  041342                            8$
     71 041306  006126                            ROL     (SP)+           ;IS IT UNSAFE?
     72 041310  100004                            BPL     5$              ;BR IF NOT
     73 041312  112761  177777  040534            MOVB    #-1,DRVSTA(R1)  ;SET UNSAFE INDICATOR
     74 041320  000407                            BR      6$              ;EXIT
     75
     76 041322  005105                    5$:     COM     R5              ;CHECK MOL, DPR, DRY, AND VV
     77 041324  042705  167077                    BIC     #^C<BIT12!BIT08!BIT07!BIT06>,R5
     78 041330  001003                            BNE     6$              ;BRANCH IF MOL, DPR, DRY, OR VV IS CLEAR
     79 041332  112761  000001  040534            MOVB    #1,DRVSTA(R1)   ;SET DRIVE STATUS TO ONLINE
     80 041340  005720                    6$:     TST     (R0)+           ;STEP OVER THE ERROR RETURN
     81 041342                            7$:
     82 041342  006301                    8$:     ASL     R1              ;WORD INDEX
     83 041344  012761  177777  040606            MOV     #-1,TIMER(R1)   ;STOP THE CLOCK
     84 041352  006201                            ASR     R1              ;DRIVE ADDRESS
     85 041354  105061  040554                    CLRB    DPINT(R1)
     86 041360  012605                            MOV     (SP)+,R5        ;RESTORE R5
     87 041362  000200                            RTS     R0              ;EXIT
```

```
                                        ;REQUEST PRE PROCESSOR HANDLES SUBSYSTEM REQUEST
                                        ;
                                        ;CALL
                                        ;
                                        ;       JSR     R0,RPO7         ;CALL THE RPO7 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          RPO7:   MOV     @#PS,-(SP)      ;SAVE THE CALLING STATUS
041370  013737  040644  177776          MOV     RPVEC+2,@#PS    ;DON'T ALLOW ANY RPO7 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
055 041552  105761  040544              TSTB    DRVTYP(R1)      ;SEE IF OFFLINE OR NONEXISTENT
056 041556  001007                      BNE     7$              ;BR IF OFFLINE
057 041560  012762  100002  000016      MOV     #BIT15!BIT01,16(R2)  ;REPORT DRIVE NONEXISTENT
058 041566  000403                      BR      7$              ;GO TO EXIT

060 041570  012762  110000  000016  6$: MOV     #BIT15!BIT12,16(R2)  ;DRIVE IS UNSAFE
```

```
     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  00020*                          HTS     PC
```

M16


```
                                        ;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  ^O00006                        RPDA                    ;INDEX OF REGISTER TO LOAD
042166  ^O42750                        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
```

```
 64 042274  004037  045210                JSR     R0,WRT.RP
 65 042300  000034                        RPDC
 66 042302  042750                        CI7
 67 042304  004737  042232                JSR     PC,CI2          ;SEE IF BIT15 SHOULD BE SET IN RPM 1
 68
 69 042310  116203  000010                MOVB    10(R2),R3       ;PICKUP SECTOR ADDRESS
 70 042314  163703  040650                SUB     MXWNDW,R3       ;BACKUP BY MAX. SEARCH FOR I/O WINDOW
 71 042320  002002                        BGE     1$              ;BR IF >= 0
 72 042322  062703  000032                ADD     #30.,R3         ;ADD MAXIMUM SECTOR COUNT BACK
 73 042326  010346                1$:     MOV     R3,-(SP)        ;COMBINE THE ADJUSTED SECTOR WITH
 74 042330  116266  000011  000001        MOVB    11(R2),1(SP)    ;THE DESIRED TRACK
 75 042336  004037  045210                JSR     R0,WRT.RP       ;LOAD DESIRED TRACK & SECTOR
 76 042342  000006                        RPDA
 77 042344  042750                        CI7
 78
 79 042346  012746  000131                MOV     #131,(SP)       ;START A SEARCH
 80 042352  004037  045210                JSR     R0,WRT.RP
 81 042356  000000                        RPCS1
 82 042360  042750                        CI7
 83 042362  156137  040630  040576        BISB    ATABIT(R1),SRCH+1       ;SET "SEARCH WAIT" KEY
 84 042370  000550                        BR      CI5
 85
 86 042372  013704  040640        CI4:    MOV     RPADR,R4        ;RPCS1 ADDRESS
 87 042376  010164  000010                MOV     R1,RPCS2(R4)    ;SELECT DRIVE
 88 042402  116203  000002                MOVB    2(R2),R3        ;PICKUP THE REQUESTED COMMAND
 89 042406  122703  000131                CMPB    #131,R3         ;IS IT A SEARCH COMMAND?
 90 042412  001007                        BNE     1$              ;BRANCH IF NO
 91 042414  016246  000010                MOV     10(R2),-(SP)    ;LOAD DESIRED TRACK & SECTOR
 92 042420  004037  045210                JSR     R0,WRT.RP
 93 042424  000006                        RPDA
 94 042426  042750                        CI7
 95 042430  000403                        BR      2$              ;GO LOAD CYLINDER
 96
 97 042432  122703  000105        1$:     CMPB    #105,R3         ;IS IT A SEEK COMMAND
 98 042436  001011                        BNE     3$              ;BRANCH IF NO
 99 042440  016246  000012        2$:     MOV     12(R2),-(SP)    ;LOAD DESIRED CYLINDER
100 042444  004037  045210                JSR     R0,WRT.RP
101 042450  000034                        RPDC
102 042452  042750                        CI7
103 042454  004737  042232                JSR     PC,CI2          ;SEE IF BIT15 SHOULD BE SET IN RPMR1
104 042460  000525                        BR      CI6
105
106 042462  122703  000115        3$:     CMPB    #115,R3         ;IS IT AN "OFFSET" COMMAND ?
107 042466  001013                        BNE     4$              ;BR IF NO
108 042470  004037  045116                JSR     R0,RD.RP        ;MERGE THE OFFSET VALUE INTO RPOF
109 042474  000032                        RPOF                    ;BUT DON'T CHANGE THE UPPER
110 042476  042750                        CI7
111 042500  116216  000001                MOVB    1(R2),(SP)      ;BYTE WHEN LOADING THE
112 042504  004037  045210                JSR     R0,WRT.RP       ;REGISTER (RPOF)
113 042510  000032                        RPOF
114 042512  042750                        CI7
115 042514  000507                        BR      CI6             ;GO START THE COMMAND
116
117 042516  122703  000107        4$:     CMPB    #107,R3         ;IS IT A "RECALIBRATE" COMMAND?
118 042522  001504                        BEQ     CI6             ;BRANCH IF YES
119 042524  122703  000117                CMPB    #117,R3         ;IS IT A RETURN TO CENTER?
120 042530  001501                        BEQ     CI6             ;BRANCH IF YES
```

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042532  122703  000143          5$:     CMPB    #145,R3         ;IS IT A "SET FORMAT' COMMAND?
042536  001014                          BNE     6$              ;BRANCH IF NO
042540  004037  045116                  JSR     R0,RD.RP        ;READ THE OFFSET REGISTER
042544  000032                          RPOF
042546  042750                          CI7
042550  116266  000001  000001          MOVB    1(R2),1(SP)     ;COMBINE 'FMT16","ECI", AND  HCI
042556  004037  045210                  JSR     R0,WRT.RP
042562  000032                          RPOF
042564  042750                          CI7
042566  000436                          BR      12$

042570  122703  000141          6$:     CMPB    #141,R3         ;IS IT A "GET REGISTER' COMMAND?
042574  001023                          BNE     10$             ;BRANCH IF NO
042576  016203  000006          7$:     MOV     6(R2),R3        ;POINTS TO 1ST ADDRESS OF WHERE
                                                                ;TO PUT THE REGISTER(S)
042602  116237  000010  042620          MOVB    10(R2),9$       ;INIT. THE INDEX FOR THE FIRST REG.
042610  116205  000011                  MOVB    11(R2),R5       ;INDEX OF LAST REG. TO MOVE
042614  004037  045116          8$:     JSR     R0,RD.RP        ;READ RHXX/RP07 REGISTER
042620  000000                  9$:     RPCS1                   ;INDEX OF REG. TO READ
042622  042750                          CI7
042624  012623                          MOV     (SP)+,(R3)+     ;GET THE CONTENTS OF RHXX//RP07 REG.
042626  023705  042620                  CMP     9$,R5           ;LAST REG. BEEN READ?
042632  001414                          BEQ     12$             ;GET OUT IF YES
042634  062737  000002  042620          ADD     #2,9$           ;INCREASE THE INDEX BY 2
042642  000764                          BR      8$              ;LOOP--MORE TO READ

042644  122703  000145          10$:    CMPB    #145,R3         ;IS IT A "SELECT DRIVE' COMMAND?
042650  001405                          BEQ     12$             ;BRANCH IF YES
042652  010346                  11$:    MOV     R3,-(SP)        ;LOAD THE COMMAND
042654  004037  045210                  JSR     R0,WRT.RP
042660  000000                          RPCS1
042662  042750                          CI7
042664  004737  046246          12$:    JSR     PC,POPQUE       ;REMOVE REQ. FROM QUEUE
042670  052762  000200  000016          BIS     #BIT07,16(R2)   ;SET THE "DONE" BIT
042676  005737  040602                  TST     SAVEFG          ;SAVE RHXX/RP07 REGISTERS ?
042702  100002                          BPL     13$             ;BR IF NO
042704  004737  045342                  JSR     PC,SVRHXX       ;YES--GO SAVE THE REGISTERS
042710  000207                  13$:    RTS     PC              ;RETURN TO USER

042712  006301                  CI5:    ASL     R1
042714  012761  023420  040606          MOV     #10000.,TIMER(R1)       ;START 10. SECOND TIMER
042722  006201                          ASR     R1
042724  112761  000001  040524          MOVB    #1,DRVACT(R1)   ;SET THE DRIVE ACTIVE
042732  000207                          RTS     PC              ;RETURN TO THE USER

042734  010346                  CI6:    MOV     R3,-(SP)        ;LOAD THE COMMAND
042736  004037  045210                  JSR     R0,WRT.RP
042742  000000                          RPCS1
042744  042750                          CI7
042746  000761                          BR      CI5

042750  005702                  CI7:    TST     R2              ;ANYTHING IN QUEUE ?
042752  001001                          BNE     1$              ;BRANCH IF QUEUE IS THERE
042754  000207                          RTS     PC              ;OTHERWISE EXIT
042756  012762  104000  000016  1$:     MOV     #BIT15!BIT11,16(R2)     ;SET "PARITY" ERROR INDICATOR

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$:     CMPB    #135,2(R2)      ;IF FROM DIAGNOSTIC COMMAND ?
043512  001003                          BNE     2$              ;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
```

```
 61 044042  010164  000010                    MOV     R1,RPCS2(R4)     ;SELECT DRIVE
 62 044046  000137  044102                    JMP     SC11             ;PROCESS THE SEARCH
 63
 64 044052  105761  040524          SC8:      TSTB    DRVACT(R1)       ;IS DRIVE IDLE?
 65 044056  001405                             BEQ     1$               ;YES--BRANCH
 66 044060  004737  046224                    JSR     PC,GETREQ        ;GET DPB POINTER
 67 044064  004737  042750                    JSR     PC,CI7           ;PROCESS THE PARITY ERROR
 68 044070  000402                             BR      2$               ;CONTINUE
 69
 70 044072  004737  042764          1$:       JSR     PC,CI7B          ;PROCESS THE UNCORRECTABLE PARITY ERROR
 71 044076  000137  043702          2$:       JMP     SC4              ;CHECK MORE DRIVES
 72
 73 044102  105061  040524          SC11:     CLRB    DRVACT(R1)       ;SET DRIVE IDLE
 74 044106  136137  040630  040576            BITB    ATABIT(R1),SRCHWT  ;DOING A SEARCH OPERATION FOR
 75                                                                     ;AN I/O COMMAND?
 76 044114  001012                             BNE     1$               ;BRANCH IF YES
 77 044116  004737  046246                    JSR     PC,POPQUE        ;REMOVE REQUEST FROM QUEUE
 78 044122  052762  000200  000016            BIS     #BIT07,16(R2)    ;SET "DONE" BIT
 79 044130  005737  040602                    TST     SAVEFG           ;SAVE THE REGISTERS?
 80 044134  100002                             BPL     1$               ;BR IF NO
 81 044136  004737  045342                    JSR     PC,SVRHXX        ;YES--SAVE ALL OF THE RH%XX/RP07 REG'S
 82 044142  116164  040630  000016  1$:       MOVB    ATABIT(R1),RPAS(R4)  ;CLEAR ATTENTION BIT
 83 044150  146137  040630  040576            BICB    ATABIT(R1),SRCHWT      ;CLEAR IMPLIED SEEK SET
 84 044156  006301                             ASL     R1               ;WORD INDEX
 85 044160  012761  177777  040606            MOV     #-1,TIMER(R1)    ;STOP CLOCK
 86 044166  006201                             ASR     R1               ;RESTORE R1
 87 044170  004737  041622                    JSR     PC,OPT           ;START A REQUEST
 88 044174  000137  043702                    JMP     SC4              ;CHECK FOR MORE DRIVES
 89
 90 044200  010164  000010          SC12:     MOV     R1,RPCS2(R4)     ;SELECT DRIVE
 91 044204  006301                             ASL     R1
 92 044206  006301                             ASL     R1
 93 044210  006301                             ASL     R1
 94 044212  016461  000012  040424            MOV     RPDS(R4),RPSTU0(R1)      ;STORE DRIVE STATUS
 95 044220  016461  000014  040426            MOV     RPER1(R4),RPSTU0+2(R1)   ;STORE ERROR REG #1
 96 044226  016461  000040  040430            MOV     RPER2(R4),RPSTU0+4(R1)   ;STORE ERROR REG #2
 97 044234  016461  000042  040432            MOV     RPER3(R4),RPSTU0+6(R1)   ;STORE ERROR REG #3
 98 044242  006201                             ASR     R1
 99 044244  006201                             ASR     R1
100 044246  006201                             ASR     R1
101 044250  004037  041030                    JSR     R0,DRVINT        ;INIT. THE STATE OF THE DRIVE
102 044254  000401                             BR      1$               ;TAKE ERROR EXIT
103 044256  000207                             RTS     PC               ;RETURN
104 044260  005726                  1$:       TST     (SP)+            ;CLEAR THE STACK
105 044262  000673                             BR      SC8              ;PROCESS THE PARITY ERROR
106
112 044264  010164  000010          SC13:     MOV     R1,RPCS2(R4)     ;SELECT THE DRIVE
113 044270  116164  040630  000016            MOVB    ATABIT(R1),RPAS(R4)  ;CLEAR THE ATTENTION BIT
114 044276  105761  040554          1$:       TSTB    DPINT(R1)        ;INITIALIZING THE DRIVE ?
115 044302  001424                             BEQ     2$               ;BR IF NOT
116 044304  105061  040554                    CLRB    DPINT(R1)        ;CLEAR THE INIT INDICATOR
117 044310  004037  041030                    JSR     R0,DRVINT        ;GO INIT THE DRIVE
118 044314  000240                             NOP                      ;DUMMY PARITY ERROR RETURN
119 044316  105761  040534                    TSTB    DRVSTA(R1)       ;DRIVE ONLINE ?
120 044322  003014                             BGT     2$               ;BR IF YES -- START ORDER
121 044324  005702                             TST     R2               ;QUEUE ENTRY FOR THE DRIVE
122 044326  001423                             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,SVRMXX       ;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

044402  005737  040600          RPTMR:  TST     ACTDRV          ;CHECK "ACTDRV & ACTSTR"
044406  001027                  1$:     BNE     4$              ;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
```

```
     58 044722  105761  040554                TSTB    DPINT(R1)          ;TRYING TO INTIALIZE THE DRIVE ?
     59 044726  001031                      BNE     10$                ;BR IF YES - DRIVE NOT ONLINE
     60 044730  105761  040564                TSTB    DPRQS(R1)          ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
     61 044734  001045                      BNE     11$                ;BR IF YES - NO RESPONSE TO REQUEST
     62 044736  020137  040626                CMP     R1,DTUW            ;DATA TRANSFER UNDERWAY FOR THIS DRIVE
     63 044742  001267                      BNE     1$                 ;BR IF NO
     64 044744  004037  045116                JSR     R0,RD.RP           ;READ CONTROL AND STATUS REGISTER
     65 044750  000000                      RPCS1
     66 044752  045004                      9$
     67 044754  105726                      TSTB    (SP)+              ;CHECK 'RDY'
     68 044756  100261                      BPL     1$                 ;BR IF "RDY"=0
     69 044760  105761  040554          7$: TSTB    DPINT(R1)          ;INITIALIZING THE DRIVE ?
     70 044764  001003                      BNE     8$                 ;BR IF INIT PENDING
     71 044766  105761  040564                TSTB    DPRQS(R1)          ;PORT REQUEST PENDING ?
     72 044772  001446                      BEQ     13$                ;BR IF NOT
     73 044774  012763  177777  040606  8$: MOV     #-1,TIMER(R3)      ;STOP THE TIMER
     74 045002  000442                      BR      13$                ;EXIT
     75
     76 045004  004737  043036          9$: JSR     PC,CI8             ;GO HANDLE THE 'NED'
     77 045010  000437                      BR      13$
     78
     79 045012  105061  040554         10$: CLRB    DPINT(R1)          ;CLEAR THE INITIALIZE INDICATOR
     80 045016  105061  040534                CLRB    DRVSTA(R1)         ;SET DRIVE OFFLINE
     81 045022  012763  177777  040606        MOV     #-1,TIMER(R3)      ;STOP THE TIMER
     82 045030  004737  046224                JSR     PC,GETREQ          ;GET THE DPB ADDRESS
     83 045034  005702                      TST     R2                 ;REQUEST IN QUEUE ?
     84 045036  001424                      BEQ     13$                ;BR IF NOT
     85 045040  052762  140000  000016        BIS     #BIT15!BIT14,16(R2)     ;INFORM THE USER DRIVE NOT AVAILABLE
     86 045046  000414                      BR      12$                ;FINISH
     87
     88 045050  012763  177777  040606 11$: MOV     #-1,TIMER(R3)      ;STOP THE TIMER
     89 045056  105061  040564                CLRB    DPRQS(R1)          ;CLEAR PORT REQUEST INDICATOR
     90 045062  004737  046224                JSR     PC,GETREQ          ;GET DPB ADDRESS
     91 045066  005702                      TST     R2                 ;QUEUE ENTRY FOR DRIVE ?
     92 045070  001407                      BEQ     13$                ;BR IF NONE
     93 045072  012762  100004  000016        MOV     #BIT15!BIT2,16(R2)      ;INFORM USER OF PORT REQUEST ERROR
     94 045100  004737  046130         12$: JSR     PC,EMPTYQ          ;CLEAR THE QUEUE FOR THE DRIVE
     95 045104  004737  045342                JSR     PC,SVRHXX          ;SAVE RHXX/RP07 REGISTERS
     96 045110  012603                 13$: MOV     (SP)+,R3           ;RESTORE R3
     97 045112  012601                      MOV     (SP)+,R1           ;RESTORE R1
     98 045114  000207                      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     #OPT07,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
```

RPO* DRIVER

```
                                ;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
```

RPO" DRIVER

```
                                ;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
```

```
                                        ;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
```

DEVICE PARAMETER BLOCKS

```
                                .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 OR LAST REG ADDR
000012                          $CYL    = $FMT+11               ;CYLINDER ADDR
000014                          $REG    = $FMT+13               ;REGISTER STORAGE (IF ERROR)
000016                          $STATUS = $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              ;WDPOS READ PER PASS (DOUBLE WORD)
000042                          $WTPAS  = $WRDL+22              ;WDPOS 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
```

DEVICE PARAMETER BLOCKS

```
                                ;DPB FOR DRIVE 0
046514      000     000         DRIVE0: .BYTE   0,0             ;DRIVE NUMBER 0
046516                                  .BLKW   5
046530  046502                          .WORD   .+10$RPCS1_10$REG
046532                                  .BLKB   10$RPCS3_10$REG

                                ;DPB FOR DRIVE 1
046556      001     000         DRIVE1: .BYTE   1,0             ;DRIVE NUMBER 1
046560                                  .BLKW   5
046572  046744                          .WORD   .+10$RPCS1_10$REG
046574                                  .BLKB   10$RPCS3_10$REG

                                ;DPB FOR DRIVE 2
047020      002     000         DRIVE2: .BYTE   2,0             ;DRIVE NUMBER 2
047022                                  .BLKW   5
047034  047206                          .WORD   .+10$RPCS1_10$REG
047036                                  .BLKB   10$RPCS3_10$REG

                                ;DPB FOR DRIVE 3
047262      003     000         DRIVE3: .BYTE   3,0             ;DRIVE NUMBER 3
047264                                  .BLKW   5
047276  047450                          .WORD   .+10$RPCS1_10$REG
047300                                  .BLKB   10$RPCS3_10$REG

                                ;DPB FOR DRIVE 4
047524      004     000         DRIVE4: .BYTE   4,0             ;DRIVE NUMBER 4
047526                                  .BLKW   5
047540  047712                          .WORD   .+10$RPCS1-10$REG
047542                                  .BLKB   10$RPCS3-10$REG

                                ;DPB FOR DRIVE 5
047766      005     000         DRIVE5: .BYTE   5,0             ;DRIVE NUMBER 5
047770                                  .BLKW   5
050002  050154                          .WORD   .+10$RPCS1-10$REG
050004                                  .BLKB   10$RPCS3-10$REG

                                ;DPB FOR DRIVE 6
050230      006     000         DRIVE6: .BYTE   6,0             ;DRIVE NUMBER 6
050232                                  .BLKW   5
050244  050416                          .WORD   .+10$RPCS1-10$REG
050246                                  .BLKB   10$RPCS3-10$REG

                                ;DPB FOR DRIVE 7
050472      007     000         DRIVE7: .BYTE   7,0             ;DRIVE NUMBER 7
050474                                  .BLKW   5
050506  050660                          .WORD   .+10$RPCS1_10$REG
050510                                  .BLKB   10$RPCS3-10$REG
```

DEVICE PARAMETER BLOCKS

```
                                ;GENERAL PURPOSE DEVICE PARAMETER BLOCK
                        ;
050734      000         GENDPB: .BYTE   0           ;DRIVER PARAMETER BLOCK. DRIVE 0
050735      000                 .BYTE   0           ;OFFSET VALUE OR FMT16. MCI OR ECI
050736      000                 .BYTE   C           ;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 RH11/RP07 REG'S
050752   000000                 .WORD   0           ;STATUS WORD
                        ;
050754              GENREG: .BLKW   24              ;REGISTER STORAGE
```

```
                        .SBTTL  ERROR MESSAGES

051024  122  110  040  EM1:    .ASCIZ  /RH 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)/
051250  101  104  104  EM5:    .ASCIZ  /ADDRESS PLUG CHANGE BIT SET/
051264  122  110  040  EM6:    .ASCIZ  /RH 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  /RHXX 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 RH 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

 4 054616  120  122  123  LIN2C:  .ASCIZ  /PRSNT COMMAND= /
 5 054636  040  040  120  LIN2P:  .ASCIZ  /  PREVS COMAND= /
 6 054657  052  040  105  LIN2S:  .ASCIZ  @= ERROR AT BAD TRACK/SECTOR@
 7 054713  105  122  122  LINM3:  .ASCIZ  /ERROR AT C/
 8 054726  040  124  000  T:      .ASCIZ  / T/
 9 054731  120  122  123  LINN3:  .ASCIZ  /PRSNT ADDR= C/
10 054747  040  123  000  S:      .ASCIZ  / S/
11 054752  040  040  120  LINP3:  .ASCIZ  /  PREVS ADDR= C/
12 054772  123  124  101  LINS3:  .ASCIZ  /START CYL= /
13 055006  040  040  105  LINEN3: .ASCIZ  /  END CYL= /
14 055022  040  040  1 1  LINA3:  .ASCIZ  /  ACTUAL CYL= /
15 055041  040  040  124  LINT3:  .ASCIZ  /  TRK= /
16 055051  040  122  120  LINCA3: .ASCIZ  / RPDC= /
17 055061  122  120  104  LINDA3: .ASCIZ  /RPDA= /
18 055070  122  120  102  LINB3:  .ASCIZ  /RPBA= /
19 055077  040  040  122  LINW3:  .ASCIZ  /  RPWC= /
20 055110  123  124  101  LINST3: .ASCIZ  /START TRK= /
21 055124  123  124  101  LINSS3: .ASCIZ  /START SEC= /
22 055140  102  125  106  LINM4:  .ASCIZ  /BUFFER ADDR= /
23 055156  040  040  127  LINS4:  .ASCIZ  /  WRD CNT= /
24 055172  040  040  116  LINX4:  .ASCIZ  /  NMBR WRDS XFRD= /
25 055215  105  130  120  LIND5:  .ASCIZ  /EXPCTD DATA= /
26 055233  040  040  122  LINB5:  .ASCIZ  /  RECEVD DATA= /
27 055253  040  040  127  LINP5:  .ASCIZ  /  WORD POS= /
28 055270  110  105  101  LINS5:  .ASCIZ  /HEADER FROM ERROR SECTOR= /
29 055323  122  120  105  LINEP5: .ASCIZ  /RPEC1= /
30 055333  040  040  122  LINEO5: .ASCIZ  /  RPEC2= /
31 055345  123  105  103  LINB6:  .ASCIZ  /SECTOR IS ECC CORRECTABLE /
32 055400  123  105  103  LINC6:  .ASCIZ  /SECTOR READ CORRECTLY AFTER /
33 055435  103  117  122  LING6:  .ASCIZ  /CORRECTED ON /
34 055453  040  122  105  LINR6:  .ASCIZ  / RETRY(S)/
35 055465  125  116  103  LINUO6: .ASCIZ  /UNCORRECTABLE AFTER /
36 055512  040  040  115  LIN7M:  .ASCIZ  /  MIS POS ERRORS= /
40 055535  124  117  124  LIN7P:  .ASCIZ  /TOTALS; SEEKS= /
41 055555  040  040  123  LIN7S:  .ASCIZ  /  SKI ERRORS= /
42 055574  124  117  124  LIN7T:  .ASCIZ  /TOTALS; ERRORS= /
43 055615  040  127  122  LIN7X:  .ASCIZ  / WRDS WRITN= /
44 055633  040  127  122  LIN7R:  .ASCIZ  / WRDS READ= /
45
46 055650  105  122  122  LIN8M:  .ASCIZ  /ERROR DURING RETRY/
47 055673  104  101  124  LIN9B:  .ASCIZ  /DATA COMPARISON ERRORS/
48 055722  040  040  040  LIN9M:  .ASCII  /          WORD  EXPCTD  RECEVD/<CRLF>
49 055760  101  104  104          .ASCIZ  /ADDR     POS   DATA    DATA/<CRLF>
50 056015  040  040  040  LIN9I:  .ASCII  /          WORD  RECEVD/<CRLF>
51 056043  101  104  104          .ASCIZ  /ADDR     POS   DATA/<CRLF>
52 056070  124  117  124  LIN9E:  .ASCIZ  /TOTAL COMPARE ERRORS= /
53 056117  124  110  105  LIN9G:  .ASCIZ  /THE DATA COMPARED OK/<CRLF>
54 056145  105  122  122  LIN10A: .ASCIZ  /ERROR BURST BEGINS AT WORD /
55 056201  040  111  116  LIN10B: .ASCIZ  / IN DATA FIELD OF ERROR SECTOR/<CRLF>
56 056241  105  122  122  LIN10C: .ASCII  /ERROR WAS NOT IN THE DATA READ - /<CRLF>
57 056303  105  103  103          .ASCIZ  /ECC CORRECTION CAN'T BE PERFORMED/
58 056345  105  103  103  LIN10H: .ASCII  /ECC CORRECTION RESULTS/<CRLF>
59 056374  040  040  040          .ASCII  /          WORD  BAD     CORRECTED /<CRLF>
60 056436  101  104  104          .ASCIZ  /ADDR     POS   DATA    DATA/<CRLF>
61 056473  103  117  116  LIN11H: .ASCIZ  /CONTENTS OF ERROR SECTOR (REPORTED ABOVE)/<CRLF>
```

ASCII MESSAGES

```
     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 RDMD COMMAND/
```

```
                                .SBTTL  TELETYPE MESSAGES

056647  077     000             QUES:   .ASCIZ  /?/
056651  075     000             EQUAL:  .ASCIZ  /=/
056653  054     000             COMMA:  .ASCIZ  /,/
056655  055     000             DASH:   .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     DROPMG: .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: @
```

```
     62 060244      200      103      110  MSPRM:  .ASCIZ  <CRLF>/CHANGE DRIVE PARAMETERS (L) N ? /
     63 060306      200      104      117  MESFE:  .ASCIZ  <CRLF>/DO YOU WANT TO WRITE ANYWHERE ON MEDIA (L) N ? /
     64 060367      200               OVRWRT: .ASCII  <CRLF>
     65 060370      007      011      041          .ASCII  <BELL>/ ! CUSTOMER DATA WILL BE OVERWRITTEN !/<CRLF>
     66 060440      007      011      055          .ASCII  <BELL>/ --  --  ----  ---  --  /<CRLF>
     67 060510      103      117      116          .ASCIZ  /CONTINUE (L)  ? /
     68 060531      200      052      040  FEONLY: .ASCIZ  <CRLF>/* TESTING FE CYLINDER ONLY */<CRLF>
     69 060570      200      052      040  MREAD:  .ASCIZ  <CRLF>/* PROGRAM IS LOCKED IN 'READ ONLY' MODE */<CRLF>
     70                                    .EVEN
```

```
                                        .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   PAR4.650.,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   PAR4.650.,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   PAR4.650.,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   PAR4.650.,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   PAR4.650.,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   PAR4.650.,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
```

H3

DRIVE PARAMETER TABLES (DPB)

```
062290  061207  000000  050566  TABLE6:  .WORD   PARM5.0,PTRCTL-DRIVE6
062336  061176  001166  050564           .WORD   PARM4.650.,PARCTL-DRIVE6
062344  061251  000055  050572           .WORD   PARM7.29.,MINTRK-DRIVE6
062352  061240  000035  050570           .WORD   PARM6.29.,MAXTRK-DRIVE6
062360  061253  000041  050576           .WORD   PARM9.33.,MINSEC-DRIVE6
062366  061242  000041  050574           .WORD   PARM8.33.,MAXSEC-DRIVE6.0

062276  061207  000000  050630  TABLE7:  .WORD   PARM5.0,PTRCTL-DRIVE7
062506  061176  001166  050626           .WORD   PARM4.650.,PARCTL-DRIVE7
062512  061251  000055  050634           .WORD   PARM7.29.,MINTRK-DRIVE7
062520  061240  000035  050632           .WORD   PARM6.29.,MAXTRK-DRIVE7
062526  061253  000041  050640           .WORD   PARM9.33.,MINSEC-DRIVE7
062334  061242  000041  050636           .WORD   PARM8.33.,MAXSEC-DRIVE7.0
```

```
                        .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     #2,@#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
062406  106400                  TRAP                    ;;PUSH OLD PSW AND PC ON STACK
062410  012637  000006          MOV     (SP)+,@#ERRVEC+2        ;;SAVE THE PSW IN ERRVEC+2
062414  012737  062456  000004  MOV     #21$,@#ERRVEC   ;;SET FOR TIME OUT
062422  012701  020000          MOV     #20000,R1       ;;FIRST ADDRESS
062426  005711          10$:    TST     (R1)            ;;TEST THIS ADDRESS
062430  005721                  TST     (R1)+           ;;STEP TO NEXT ADDRESS
062432  000775                  BR      10$             ;;TRY ANOTHER
062434  162701  000002  20$:    SUB     #2,R1           ;;DROP BACK
062440  010006                  MOV     R0,SP           ;;RESTORE THE STACK
062442  012637  000006          MOV     (SP)+,@#ERRVEC+2 ;;RESTORE ERROR VECTOR
062446  012637  000004          MOV     (SP)+,@#ERRVEC
062452  012637  000116          MOV     (SP)+,@#116     ;;RESTORE MEMORY ERROR VECTOR
062456  012637  000114          MOV     (SP)+,@#114
062462  010137  062474          MOV     R1,@LSTAD       ;;LAST ADDRESS
062466  012601                  MOV     (SP)+,R1        ;;RESTORE R1
062470  012600                  MOV     (SP)+,R0        ;;RESTORE R0
062472  000207                  RTS     PC
062474  000000          @LSTAD: .WORD   0               ;;CONTAINS THE LAST ADDRESS
```

```
                                        .SBTTL  BUSADR - GET BUS ADDRESS AND VECTOR ADDRESS

                                        ;
                                        ;THIS ROUTINE IS USED TO INQUIRE THE BUS ADDRESS OF THE DMV11 BOOT
                                        ;IS SETUP FOR THE ENTERED ADDRESS. IT WILL ALSO READ THE ADDRESS
                                        ;FROM THE TTY IF REQUIRED.
                                        ;
                                        ;NOTE: THIS ROUTINE DESTROYS R0-R5
                                        ;CALL:
                                        ;
                                        ;       JSR     PC,BUSADR
                                        ;       RETURN
                                        ;
062476  005737  001552          BUSADR: TST     CHGADR          ;INPUT FROM TTY REQUESTED?
062502  001046                          BNE     1$              ;NO  BRANCH
062504  005037  001552                  CLR     CHGADR          ;YES--CLEAR THE REQUEST FLAG
062510  104401  001205                  TYPE    ,SCRLF          ;CR LF
062514  005037  001534          1$:     CLR     CFLAG           ;CLEAR CONTROL C FLAG
062520  012700  001272                  MOV     #ENPADR,R0      ;FIRST ADDRESS
062524  104401  062636                  TYPE    ,MNPCS1         ;"NPCS1:"
062530  011046                          MOV     (R0),-(SP)      ;PRESENT NPCS1 ADDRESS
062532  104402                          TYPOC                   ;TYPE IT
062534  104401  056610                  TYPE    ,BLANK2         ;TYPE 2 BLANKS
062540  104411                          RDLIN                   ;GET THE ENTRY
062542  012701                          MOV     (SP)+,R1        ;ADDRESS OF ASCII TEXT
062544  005737  001534                  TST     CFLAG           ;WAS (^C) TYPED?
062550  001361                          BNE     1$              ;BR IF YES
062552  004537  062656                  JSR     R5,CK.NUM       ;ENTER AND STORE THE NEW ADDRESS
062556  000756                          BR      1$              ;ERROR EXIT
                                        ;
062560  012700  001274          2$:     MOV     #NPVEC,R0       ;VECTOR ADDRESS
062564  104401  062645                  TYPE    ,MNPVEC         ;"NPVEC:"
062570  011046                          MOV     (R0),-(SP)      ;PRESENT DMV11/BOOT VECTOR ADDRESS ON THE STACK
062572  104402                          TYPOC                   ;TYPE IT
062574  104401  056610                  TYPE    ,BLANK2         ;TYPE 2 BLANKS
062600  104411                          RDLIN                   ;READ THE ENTRY
062602  012601                          MOV     (SP)+,R1        ;ASCII TEXT ADDRESS
062604  005737  001534                  TST     CFLAG           ;WAS (^C) TYPED?
062610  001361                          BNE     1$              ;BR IF YES
062612  004537  062656                  JSR     R5,CK.NUM       ;ENTER AND STORE NEW ADDRESS
062616  000760                          BR      2$              ;ERROR EXIT
                                        ;
062620  012700  001272          3$:     MOV     #ENPADR,R0      ;FIRST ADDRESS OF NEW PARAMETERS
062624  012701  040040                  MOV     #NPADR,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 MNPCS1: .ASCIZ   <NPCS1>
062645      122     120     126 MNPVEC: .ASCIZ   <NPVEC>
```

```
                                        ;CK.OCM  CHECK NUMBER (OCTAL)
                                        ;THIS ROUTINE CHECKS AN ASCII STRING FOR LEGAL CHARACTERS
                                        ;AND FORMS AN OCTAL NUMBER IN R2
                                        ;CALL:
                                        ;       MOV     #MAX,R1         ;#DIGITS OF ASCII STRING
                                        ;       JSR     R5,CK.OCM       ;R5 CHANGED
                                        ;       RET                     ;ERROR EXIT
                                        ;       RET                     ;NORMAL EXIT
                                        ;
062656  010206                  CK.OCM: MOV     R2,-(SP)        ;SAVE R2
062660  010346                          MOV     R3,-(SP)        ;SAVE R3
062662  010446                          MOV     R4,-(SP)        ;SAVE R4
062664  012703  000006                  MOV     #6,R3           ;MAX OCTAL DIGITS IN THE NUMBER
062670  005002                          CLR     R2              ;FINAL OCTAL VALUE
062672  112104                  10$:    MOVB    (R1)+,R4        ;GET CURRENT POINTED BYTE
062674  001424                          BEQ     3$              ;BRANCH,IF TERMINATOR DETECTED
062676  120427  000060                  CMPB    R4,#'0          ;SMALLER THAN ASCII-0
063702  103425                          BLO     5$              ;YES,ERROR EXIT
063702  120427  000067                  CMPB    R4,#'7          ;LARGER THAN ASCII-7 ?
063706  101022                          BHI     5$              ;YES,ERROR EXIT
063710  006302                          ASL     R2              ;SHIFT LEFT
063712  103420                          BCS     5$              ;
063714  006302                          ASL     R2              ;ONE
063716  103416                          BCS     5$              ;
063720  006302                          ASL     R2              ;OCTAL DIGIT
063722  103414                          BCS     5$              ;ERROR IF CARRY BIT SET
063724  042704  177770                  BIC     #177770,R4      ;CHOP OFF HIGHER BITS
063730  060402                          ADD     R4,R2           ;APPENDING CURRENT DIGIT TO NUMBER
063732  005303                          DEC     R3              ;DECREMENT BYTE COUNT
063734  001401                          BEQ     2$              ;BRANCH,IF LAST BYTE
063736  000754                          BR      1$              ;LOOPING BACK
                                        ;
063740  112104                  2$:     MOVB    (R1)+,R4        ;CHECK TERMINATOR
063742  001004                          BNE     5$              ;ERROR EXIT
063744  005702                  3$:     TST     R2              ;FINAL VALUE= 0
063746  001401                          BEQ     4$              ;YES,THEN NOT REPLACE THE ORIGINAL VALUE
063750  010210                          MOV     R2,(R0)         ;REPLACE THE ORIGINAL VALUE
063752  005725                  4$:     TST     (R5)+           ;ADJUST FOR NORMAL RETURN
063754  012604                  5$:     MOV     (SP)+,R4        ;RESTORE R4
063756  012603                          MOV     (SP)+,R3        ;RESTORE R3
063760  012602                          MOV     (SP)+,R2        ;RESTORE R2
063762  000205                          RTS     R5              ;EXIT
                                .EVEN
063764  000000                  PATCH:  .WORD   0               ;ALLOCATE 200 OCTAL LOCATIONS FOR PATCHING
                                
064370                          CYLNDR: .BLKW   256.            ;ONE SECTOR OF WORDS
                                ENDPGM=.
```

```
C7M_DOBO RP07 PRINT FILER MACRO V04.00 1 DEC 83 10:52:20 PAGE 134                                                    SEQ 0249
HELP TEXT MESSAGE

                                                .SBTTL  HELP TEXT MESSAGE
                                                
                                        MSHELP: .ASCII  <CRLF>
  7 064371      007     126     110             .ASCII  <BELL>/THE HELP MESSAGE CAN ONLY BE TYPED ONCE./
  8 064442      007                             .ASCII  <BELL>
  9 064443      200     106     117             .ASCII  <CRLF>/DO YOU WANT IT TYPED (Y) ? /
 10 064500      200                     HELPTX: .ASCII  <CRLF>
 11 064501      200     106     122             .ASCII  <CRLF>/DRIVE PARAMETERS:/
 12 064525      200     115     101             .ASCII  <CRLF>/MAXCYL   ;max cylinder addr/
 13 064557      200     115     111             .ASCII  <CRLF>/MINCYL   ;min cylinder addr/
 14 064613      200     115     101             .ASCII  <CRLF>/MAXTRK   ;max track addr/
 15 064644      200     115     111             .ASCII  <CRLF>/MINTRK   ;min track addr/
 16 064675      200     115     101             .ASCII  <CRLF>/MAXSEC   ;max sector addr/
 17 064727      200     115     111             .ASCII  <CRLF>/MINSEC   ;min sector addr/
 18 064761      200                             .ASCII  <CRLF>
 19 064762      200     126     110             .ASCII  <CRLF>/THE FOLLOWING ARE VALID COMMANDS:/
 20 065024      200     040     127             .ASCII  <CRLF>/ W0<CR> exercise drive and do SEQUENTIAL WRITE data/
 21 065106      200     040     122             .ASCII  <CRLF>/ R0<CR> exercise drive and do SEQUENTIAL READ data/
 22 065167      200     040     124             .ASCII  <CRLF>/ T0<CR> exercise drive  to do (random or sequential) TEST/
 23 065257      200     127     124             .ASCII  <CRLF>/WTO<CR> exercise drive, to do SEQUENTIAL WRITE data only/
 24 065345      200     040     040             .ASCII  <CRLF>/        to do (random or sequential) TEST/
 25 065417      200     040     104             .ASCII  <CRLF>/ D0<CR> DROP a drive from test/
 26 065456      200     040     123             .ASCII  <CRLF>/ S0<CR> type the performance SUMMARY report/
 27 065532      200                             .ASCII  <CRLF>
 28 065533      200     040     040             .ASCII  <CRLF>/  0 is the drive number (0-7 or  A  for all drives)/
 29 065617      200                             .ASCII  <CRLF>
 30 065620      200     123     127             .ASCII  <CRLF>/SWITCH REGISTER SETTINGS:/
 31 065652      200     123     127             .ASCII  <CRLF>/SW15= (100000)  halt on error/
 32 065710      200     123     127             .ASCII  <CRLF>/SW14= (040000)  /
 33 065731      200     123     127             .ASCII  <CRLF>/SW13= (020000)  inhibit error typeout/
 34 065777      200     123     127             .ASCII  <CRLF>/SW12= (010000)  /
 35 066020      200     123     127             .ASCII  <CRLF>/SW11= (004000)  /
 36 066041      200     123     127             .ASCII  <CRLF>/SW10= (002000)  ring tty bell on error/
 37 066110      200     123     127             .ASCII  <CRLF>BSW09= (001000)  change end of pass to 1/4 of normal8
 38 066174      200     123     127             .ASCII  <CRLF>/SW08= (000400)  inh bit end of pass messages/
 39 066251      200     123     127             .ASCII  <CRLF>/SW07= (000200)  display all data compare errors/
 40 066331      200     123     127             .ASCII  <CRLF>/SW06= (000100)  don't change parameters (loop on present values)/
 41 066432      200     123     127             .ASCII  <CRLF>/SW05= (000040)  A. partial register display if error/
 42 066517      200     040     040             .ASCII  <CRLF>/                B. no ECC correction results displayed if error/
 43 066617      200     123     127             .ASCII  <CRLF>/SW04= (000020)  A. do not check for maximum error count/
 44 066707      200     040     040             .ASCII  <CRLF>/                B. do not drop drive at end of test/
 45 066773      200     123     127             .ASCII  <CRLF>/SW03= (000010)  A. display error sector if DCK, DTE or WCF error/
 46 067074      200     040     040             .ASCII  <CRLF>/                B. display sector if DCK uncorrectable after 28th retry/
 47 067204      200     040     040             .ASCII  <CRLF>/                C. if data compare error & SW07 set, display remainder of bu
 48 067325      200     123     127             .ASCII  <CRLF>/SW02= (000004)  A. do not type drive status at program start/
 49 067422      200     040     040             .ASCII  <CRLF>/                B. do not type performance report after specified t me/
 51 067531      200     040     040             .ASCII  <CRLF>/                C. prompt 'write anywhere' question during auto test mode/
 53 067643      200     123     127             .ASCII  <CRLF>BSW01= (000002)  inhibit data compare after read without DCK errors
 54 067745      200     123     127             .ASCII  <CRLF>/SW00= (000001)  read only mode/
```

M3

HELP TEXT MESSAGE

```
      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 RMXX 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
```

N3

SYMBOL TABLE

```
ABASE = 176700          ASGN7   027624          BIT5  = 000040          CMPTIM  001462          DPR   = 000400
ABNRML  031452          ASGN8   027666          BIT6  = 000100          CMSEC   001372          DPRQS   040564
ACDW1 = 000000          ASKPAR  060746          BIT7  = 000200          CMSTR   014276          DRIVE = 001220
ACDW2 = 000000          ASNERR  031332          BIT8  = 000400          CMSTR2  014436          DRIVE0  046314
ACPUOP= 000000          ASNLST  001542          BIT9  = 001000          CMTRK   001373          DRIVE1  046556
ACTDRV  040600          ASNMSG  031356          BLKADR  002056          COLON   060154          DRIVE2  047020
ACTSTR  040601          ASSIGN  027202          BLNKS1  056611          COMMA   056653          DRIVE3  047262
ADDW0 = 000000          ASWREG= 000000          BLNKS2  056610          COMTBL  002076          DRIVE4  047524
ADDW1 = 000000          ATA   = 100000          BLNKS3  056607          CPSAVE  035406          DRIVE5  047766
ADDW10= 000000          ATABIT  040630          BLNKS4  056606          CR    = 000015          DRIVE6  050230
ADDW11= 000000          ATESTN= 000000          BPE   = 000020          CRLF  = 000200          DRIVE7  050472
ADDW12= 000000          ATTN    001316          BPTVEC= 000014          CTRAP   034756          DROP    031362
ADDW13= 000000          AT0   = 000001          BSE   = 100000          CYLLMT= 000150          DROPD   027700
ADDW14= 000000          AT1   = 000002          BUFTBL  001654          CYLNDR  063364          DROPNG  057641
ADDW15= 000000          AT2   = 000004          BUSADR  062476          DASH    056655          DRQ   = 004000
ADDW2 = 000000          AT3   = 000010          CFLAG   001334          DASH13  057407          DRSTAT  057113
ADDW3 = 000000          AT4   = 000020          CHGADR  001332          DASH5   057401          DRVACT  040524
ADDW4 = 000000          AT5   = 000040          CHKWC   021572          DATAPK  030132          DRVCLR= 000111
ADDW5 = 000000          AT6   = 000100          CI1     042066          DATA0   002360          DRVER   011770
ADDW6 = 000000          AT7   = 000200          CI2     042232          DATA1   002420          DRVINT  041030
ADDW7 = 000000          AUNIT = 000000          CI3     042260          DATA10  003060          DRVMSG  056661
ADDW8 = 000000          AUSWR = 000000          CI4     042372          DATA11  003120          DRVNO   001320
ADDW9 = 000000          AUTLST  032100          CI5     042712          DATA12  003160          DRVPAR  001426
ADEVCT= 000000          AVAIL   001610          CI6     042734          DATA13  003220          DRVPRM  030402
ADEVM = 0 0000          AVECT1= 000254          CI7     042750          DATA14  003260          DRVQUE  046150
AENV  = 000000          AVECT2= 000000          CI7B    042764          DATA15  003320          DRVSN   060232
AENVM = 000000          A16   = 000400          CI8     043036          DATA2   002460          DRVSTA  040534
AFATAL= 000000          A17   = 001000          CKBUS   014110          DATA3   002520          DRVTYP  040544
AIR   = 000004          BADENT  060163          CKCLK   024574          DATA4   002560          DRY   = 000200
AMADR1= 000000          BADSEC  001336          CKCLK1  024656          DATA5   002620          DSWR  = 177570
AMADR2= 000000          BADTMO  003440          CKCLK2  024730          DATA6   002660          DTE   = 010000
AMADR3= 00000C          BAI   = 000010          CKCLK3  024762          DATA7   002720          DTEER   012616
AMADR4= 000000          BEGCOD  001514          CKERR   014010          DATA8   002760          DTUW    040626
AMAMS1= 000000          BEGPAT  001512          CKFMT   012022          DATA9   003020          DT00  = 000001
AMAMS2= 000000          BEGWC   001516          CKHCE   012212          DCK   = 100000          DT01  = 000002
AMAMS3= 000000          BELL  = 000007          CKLMTS  021412          DCKER   010546          DT02  = 000004
AMAMS4= 000000          BIT0  = 000001          CKSWR = 104407          DCKER1  010730          DT03  = 000010
AMSGAD= 000000          BIT00 = 000001          CK.CHR  033202          DCU   = 000040          DT04  = 000020
AMSGLG= 000000          BIT01 = 000002          CK.DEC  033154          DDISP = 177570          DT05  = 000040
AMSGTY= 000000          BIT02 = 000004          CK.DIG  033254          DDRVS   001544          DT06  = 000100
AMTYP1= 000000          BIT03 = 000010          CK.NUM  062654          DGE   = 000001          DT07  = 000200
AMTYP2= 000000          BIT04 = 000020          CK.OCT  033126          DH1     054031          DT08  = 000400
AMTYP3= 000000          BIT05 = 000040          CLKFLG  001310          DH14    054206          DT1     054504
AMTYP4= 000000          BIT06 = 000100          CLKOFF  024770          DH15    054305          DT14    054530
AOE   = 001000          BIT07 = 000200          CLR   = 000040          DH16    054404          DT15    054550
APASS = 000000          BIT08 = 000400          CLRDPB  030164          DH17    054464          DT16    054572
APRIOR= 000000          BIT09 = 001000          CLRQUE  046052          DH2     054036          DT17    054610
APTCSU= 000040          BIT1  = 000002          CMCNT   001366          DH3     054113          DT2     054510
APTENV= 000001          BIT10 = 002000          CMCYL   001370          DH4     054141          DT3     054514
APTSIZ= 000200          BIT11 = 004000          CMDAT   014450          DH6     054200          DT4     054520
APTSPO= 000100          BIT12 = 010000          CMHED   014360          DISPLA  001156          DT6     054524
ASGND   057703          BIT13 = 020000          CMPAR   014174          DISPLY= 104414          DVA   = 004000
ASGN1   027300          BIT14 = 040000          CMPARD  014200          DISPRE  000174          DVC   = 000200
ASGN2   027354          BIT15 = 100000          CMPLMT  001460          DLT   = 100000          ECBAD0  001412
ASGN3   027444          BIT2  = 000004          CMPRES  022260          DONE    010206          ECBAD1  001420
ASGN4   027610          BIT3  = 000010          CMPRT   015060          DPE   = 000010          ECBIT   001376
ASGN6   027612          BIT4  = 000020          CMPRX   015052          DPINT   040554          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
ECGL	001410	ENDPGM-	061370	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	INCWRD	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	MSWRO	057773
EM4	051173	GENREG	050754	LINEN3	055006	LIN7M	055512	MXF -	001000
EM40	052644	GETBUF	017572	LINEO5	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

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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
RHEXT   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
```

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SYMBOL TABLE

```
TYPDRV  033050   $CHARC  036262   $MLDWC= 000120   $PSEL = 000003   $SUPRL  032526
TYPDS = 104405   $CKSWR  034010   $ICNT   001120   $PWRAD  040066   $SUPRS  032542
TYPE  = 104401   $CMTAG  001114   $ILLUP  040072   $PWRDN  037720   $SUPR1  032554
TYPOC = 104402   $CM3  = 000000   $INTAG  001151   $PWRMG  040062   $SUPR2  032616
TYPON = 104404   $CM4  = 000001   $ITEMB  001130   $PWRUP  037772   $SVPC = 000210
TYPOS = 104403   $CNTLC  034715   $LF     001204   $QUES   001202   $SWR  = 122000
TYPSUM  025150   $CNTLG  034727   $LFLG   037203   $RAND   037206   $SWREG  001230
UCPAR   007760   $CNTLU  034722   $LKCSB  001300   $RDCHR  034352   $TATUS= 000016
UNS   = 040000   $CODE = 000024   $LKCSR  001276   $RDLIN  034442   $TERM = 000032
UNSAF   013402   $COMND= 000002   $LKS    001304   $RDPAS= 000036   $TESTN  001212
UNTASN  056732   $CPUOP  001234   $LLVEC  001306   $RDSZ = 000017   $TIME   026226
UNTNOT  056710   $CRLF   001203   $LONUM  037306   $REG  = 000014   $TKB    001162
UNTOFF  056667   $CYL  = 000012   $LPADR  001122   $REPLZ  032742   $TKCNT  033472
UNTON   056700   $DBDIV  032174   $LPERR  001124   $RESRE  037346   $TKINT  033510
UPE   = 020000   $DBLK   036730   $LPVEC  001302   $RETRY  017120   $TKQEN= 033507
US1   = 000001   $DB2D   037404   $LSTAD  062474   $RPADR  001272   $TKQIN  033474
US2   = 000002   $DB2O   037600   $MADR1  001240   $RPAS = 000204   $TKQOU  033476
US4   = 000004   $DECVL  037564   $MADR2  001244   $RPBA = 000172   $TKQSR  033500
VV    = 000100   $DEVCT  001216   $MADR3  001250   $RPBAE= 000236   $TKS    001160
WAIT    001632   $DEVM   001264   $MADR4  001254   $RPCC = 000224   $TKSRV  033560
WATPAK  030144   $DIV    032126   $MAIL   001206   $RPCS1= 000166   $TMPO   001174
WCE   = 040000   $DOAGN  032044   $MAMS1  001236   $RPCS2= 000176   $TN   = 000002
WCF   = 000040   $DRVSN= 000160   $MAMS2  001242   $RPCS3= 000240   $TNPWR  037514
WCFER   013304   $DSPLY  033100   $MAMS3  001246   $RPDA = 000174   $TOTAL= 000102
WCHKX = 040424   $DTBL   036720   $MAMS4  001252   $RPDB = 000210   $TPB    001166
WCKD  = 000151   $ENDAD  032034   $MBADR  001102   $RPDC = 000222   $TPFLG  001173
WCKER   011242   $ENDCT  032020   $MFLG   037202   $RPDS = 000200   $TPS    001164
WCKHD = 000153   $ENV    001226   $MISPO= 000112   $RPDT = 000214   $TRAP   040336
WC.HK   043316   $ENVM   001227   $MNEW   034745   $RPEC1= 000232   $TRAP2  040360
WLE   = 004000   $EOP    031500   $MSGAD  001222   $RPEC2= 000234   $TRK  = 000011
WLEER   012764   $EOPCT  032012   $MSGLG  001224   $RPER1= 000202   $TRP  = 000015
WOR   = 001000   $ERFLG  001117   $MSGTY  001206   $RPER2= 000226   $TRPAD  040372
WRDCNT  001466   $ERMAX  001131   $MSWR   034734   $RPER3= 000230   $TSTM   001104
WRDPOS  001374   $ERROR  035022   $MTYP1  001237   $RPLA = 000206   $TSTNM  001116
WRL   = 004000   $ERRPC  001132   $MTYP2  001243   $RPMR1= 000212   $TTYIN  034676
WRTCHK  001506   $ERRTB  003360   $MTYP3  001247   $RPOF = 000220   $TYPDS  036514
WRTDAT= 000161   $ERRTY  035412   $MTYP4  001253   $RPSN = 000216   $TYPE   035732
WRT.RP  045210   $ERTTL  001126   $NCODE= 000122   $RPVEC  001274   $TYPEC  036144
WRYUNS= 000400   $ETABL  001226   $NCYL = 000126   $RPWC = 000170   $TYPEX  036264
XXDP    001430   $ETEND  001272   $NEXT = 000130   $RPO7   057155   $TYPOC  036312
Y       057767   $FATR = 000116   $NPATC= 000123   $RPO7P  057162   $TYPON  036326
ZEROS   002360   $FATAL  001210   $NSEC = 000124   $RTNAD  032046   $TYPOS  036266
ZROIND  001350   $FFLG   037204   $NTRK = 000125   $RTOTL= 000066   $UNIT   001220
$APTHD  001100   $FILLC  001172   $NULL   001170   $SAVRE  037310   $UNITM  001110
$ATYC   036764   $FILLS  001171   $NWTST= 000000   $SAVR6  040076   $USWR   001232
$ATY1   036740   $FILLZ  032736   $OCNT   036510   $SB2D   033412   $VECT1  001256
$ATY3   036746   $FIRST= 000132   $OCTVL  037702   $SB2O   033442   $VECT2  001260
$ATY4   036756   $FMT  = 000001   $OMODE  036512   $SEC  = 000010   $WCNT = 000004
$AUTOB  001150   $GDADR  001134   $OPERC= 000052   $SEEKS= 000046   $WRDL = 000020
$BASE   001262   $GDDAT  001140   $PACK = 000026   $SETUP= 000156   $WTOTL= 000056
$BDADR  001136   $GET42  032024   $PASS   001214   $SIZE   062344   $WTPAS= 000042
$BDDAT  001142   $GTSWR  034100   $PASSC= 000114   $SKI  = 000110   $XOFF = 000023
$BELL   001176   $HARD = 000106   $PASTM  001106   $SOFT = 000104   $XON  = 000021
$BUF  = 000006   $HD   = 000000   $PATTC= 000030   $SSEC = 000022   $$GET4= 000000
$CDW1   001266   $HIBTS  001100   $PREVA= 000032   $STOTL= 000076   $OFILL  036511
$CDW2   001270   $HINUM  037304   $PREVO= 000027   $STUP = 177777   .$X   = 001100
```

```
CZRJOBC APO7 PERF EXER MACRO V04.00 1-DEC 85 10:52:29 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
```

C2RJOBO.RPOT PERF FIXER MACRO V04.00 1 DEC 83 10:3?:2A PAGE S 1 SEQ 0250
CROSS REFERENCE TABLE (CREF V04.00)

```
$$$EOP   73 1
$$$EOT   73 1
$$$IT   129 16    129-48
$$$MFG    1 5      1-11     4 5      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 5     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
$APTHD    7-11     7-110
$ASTAT   91-1     91-1
$ATY1    91 10
$ATY3    88-1     91-10
$ATY4    86-1     91-10
$ATYC    91-1     91-10
$AUTOB    8-00    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 00    12-72    12-74
$BDADR    8-00
$BDDAT    8-00
$BELL     8-00    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
        120-100
$CDW1     8-00
$CDW2     8-00
$CHARC   88-1     88 10    88-1•    88-1•    88 1•
$CKSWR   85-10    97-1     97-1
$CM3      8-0      8-0      8 00     8-00
$CMTAG    8-00    12 25    12-25    12 25
$CNTLC   85-1     85-1     85-1     85-1     85 10
$CNTLG   85-1     85-10
$CNTLU   85-1     85-1     85-10
$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•  120-210
$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 70
$CPUOP    8 00    13-5•    13-33•   57-83    57-258   57-280   114-32
$CRLF     8 00    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
        120 130
$DB2D    57-383   57-390   57-415   59-97    59-103   59-113   59-119   59-129   59-135   84-13    94-10
$DB2O    84-30    95-10
$DBDIV   45-26    45-47    75-260
$DBLK    90-1     90-1     90-10
$DECVL   94-1     94-10
$DEVCT    8-00    73-1•    73-1•
$DEVM     8-00
$DIV     40-11    42 26    57-275   74-10    74-380
$DOAGN   73-1     73-1     73-10
```

CROSS REFERENCE TABLE (CREF V04.00)

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$DRVSN   66 25    66 27    69 25#   81 14   121 19#  121 23
$DSPLY   81 26#   97 2
$DTBL    90 1     90 1#
$ENDAD    8 8     73 1#
$ENDCT   73 1#
$ENV      8 0#    12 51    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#
```

C2R JOBO 8P07 PREP (VER MACRO V04 00) 1 DEC 83 10:52:28 PAGE 5 5 SEQ 0252
CROSS REFERENCE TABLE (CREF V04.00)

```
$MAMS2     8 00
$MAMS3     8 00
$MAMS4     8 00
$MBADR     7 110
$MFLG     91 1      91 10     91 1•     91 1•
$MISP0    57 419    59-159    59-165    60 19     60 19•    120 590
$MMEM     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•
$OCTYL    95 1      95 10
$OMODE    89 1      89-10     89 1•     89-1•     89-1•     89 1•
$OPLRC    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      98 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
$RPO7     16-50     59 73     128 240
$RPO7P    16 53     59-76     128-250
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C29 XIRO 8PC7 8V8M 6VE0 MACRO V3A /NO 1 DEC 83 10 % PAGE %4

SE0 0253

CROSS REFERENCE TABLE (CREF V08 (8C))

```
$RPADR    9 00    12 74#   12 80    15 8     15 22    126 5    132 25   132 47
$RPAS   121 300   126 8
$RPBA    35 31    40 3     40 39    40 61    42 18    42 57    45 9     57 96    57-147   57 206   57 257#  57 262#  57 245#  57 264
        121 250   126 8
$RPBASE 121 450   126-10
$RPCC   121 300   126 9
$RPCS1   22 9     22 11    24-49    35 3     43 8     50 22    56-11    57 33    107 28   121 230  121-28   121 25   121 26   121 27
        121 28   121 29   121 30   121 31   121 32   121 33   121 34   121 35   121 36   121 37   121 38   121 39   121 40   121 41
        121 42   121 43   121 44   122 8     122 8     122-8     122 8     122 8     122 8     122 8     122 8     126 7
$RPCS2   24 45    27 25    28 13    29 19    30 25    31 45    32 8     32 24    35 5     57 270   121 270  126-7
$RPCS3   57-263   57 285   66 27    121 440  122 8     122-8     122 8     122 8     122-8     122 8     122-8     122-8     126-10
$RPDA    50 25    51 26    57 180   57 229   57 483   57 484   121 260  126 8
$RPDB    57 269   121 320  126 8
$RPDC    30 12    50 26    51 27    57 184   57 217   57 485   121 370  126 9
$RPDS    16-62    17 33    22 13    24 41    24 87    44 52    63 68    121 280  126 7
$RPDT   121 340   126-9
$RPMC1   25-7     25 13    25 15    27 32    27 36    27 38    40-22    57 311   121-410  126 7
$RPMC2   25-17    27-40    40 43    57 315   121 420  126 8
$RPLA1   24 57    24 53    24 57    24 61    24 65    24 69    24 73    24 77    24 81    24 85    24 91    24 95    25 5     26 7
        26 9     26-30    26 32    27-3     27 29    27 68    29-3     30 3     35 7     44 46    44 56    121 290  126 7
$RPMR2   35-12   121-390  126 7
$RPMR3   24-99    24 101   33-43    33-47    35-9     42-7     121 400  126-7
$RPLA   121-310  126 8
$RPPDR1 121 330   126-8
$RPOF   121 360   126-9
$RPSN    69 14    121 350  126-9
$RPVEC    9 00    12-71#   12 81    132-35
$RPWC    35 26    36 12    40-4     42 20    57-93    57 150   57-271   121 240  126-8
$RTNAD   73 10
$RTOTL   45-41#   45-42#   45-43    45 44    45 50#   45-51#   45 52#   45 53#   57 388   59 118   120 320
$SAVR6   96-1     96 10    96-1#    96 1#    96-1#
$SAVRE   93 10    97 1     97 1
$SH.D    34 30    38 77    40 34    41 8     41-28    57-460   59 84    61 14    61 19    61 24    70 17    84 110
$SH20    57-444   84-280
$SEC     36 18    43 21#   44-11#   50 18    50-23    50 25#   50 28    50 32#   50-43    56 16    56 45#   57-169   67 80#   101 42
        107-26   120-110
$SEEKS   21 28    21 31    49-17#   49-18#   59-128   120-280
$SETUP    6-29     6-29     6 29     6-29     6 29     6 290    6 290    6 290    6-290    6 290    6 290    12-25    1_ 25    12 25
        12 25    12-25    12-25    12 25    12 25    12-25    12 25    12 25    12-25    12 31    12-31    12 31    73 1     73 1
        85-1     85-1     85 1     85-1     85-1     86 1     86 1     86 1     86 1
$SIZE    14-5    131-10
$SKI     57 422   59-156   59-165   60-18    60 18#   120-380
$SOFT    59-150   59-165   60 16    60-16#   120 360
$SSEC    36 24    36-29    36-30    40 10    42 25    50-53#   56-47#   56-50#   57 274   66-41#   66 45#   120 200
$STOTL   49 19#   49 20#   57-413   59 134   120 340
$STUP     6-29     6-29     6-29     6-29     6-29     6 290    6-290    6 290    6-290    6 290    6-290    6-290    6 290    6-290
        6 290
$SUPR1   78 19    78 240
$SUPR2   78-18#   78-23#   78 33    78-35#   78 370
$SUPRL   40 35    57 384   57-391   57-416   57 461   78-160
$SUPRS   78 210
$SVPC     7-8      7-80
$SWR      5 730    5 85     5-87     5 87     5 87     5-87     5 87     5 87     5 87     5 87     8 0      8 0      8 0      12 19
        12 25    73 1     73 1     73 1     73 1     73-1     86 1     86 1     86 1     86 1     86 1     86 1     86 1     86 1
        86 1     86 1     86 1     96 1
$SWREG    8 00    12 25
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CROSS REFERENCE TABLE (CREF VOR 00)

$STATUS	21 6	22 7	22 36	22 51	22 53	22 55	22 57	22 59	22 61	26 53	26 21	26 24	27 58	43 14	
	43 34	44 19	44 55	44 62	45 7	57 48	57 257	66 20	101-48	107 234	120 150	126 9			
$TIMM	97 30														
$TI_TM	8 00	12 196	79 36	87 1	87 1										
$TIME	18 40	57 13	59 29	61 40	62 21	79 1	85 1	85 20							
$TMB	8 00	62 97	85 1	85 1	85 1	85 1	85 1	85 1	85 1	88 1	88 1				
$TMCNT	85 1	85 1	85-10	85 10	85 10	85 10	85 10								
$TMINT	12 66	17 3	62 26	73 4	85 1	85 1	85 10	96 10							
$TMMIN	85 1	85 1	85 10	85 9											
$TMMIN	85 1	85 1	85 10	85 10	85-10	85 10	85 10	85 70	85 84	85 9	85 110				
$TMMIN	85 1	85 1	85 10	85 10	85 10	85 10									
$TMMSR	85 1	85 1	85 1	85 10	85 11										
$TMS	8 00	62 90•	85-1	85 1	85 1	85 1	85 1	85 10	85-10	85 10	85-10	85 10	85 10	88 1	
	88 1														
$TMSRV	85 1	85-10													
$TMPO	8 00														
$TMN	5 740	5 85	12-10	12-10	12-10	12 190									
$TMPSR	88 1	88 1	88 10												
$TOTAL	57 370	59 162	60-20	60 20•	71-48	120-350									
$TPB	8-00	88 1	88 1	88-10											
$TRFLG	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 35•	57-164	67-79•	101-48	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										
$TRPRO	97-1	97-10	97-3												
$TSTM	7-110														
$TSTMM	8 00	86 1	86 1	86 1											
$TTYIN	85 1	85 1	85-1	85 1	85-1	85-10									
$TYPBN	97-1														
$TYPOS	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	7 110														
$USER	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						
$WKOL	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 23•	56-51	56-52	57-92	57-243	57-272	66-38•	120 190	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	120-300				
$WTPAS	45 18•	45 19•	59-96	120-270											
$XOFF	88-1	88-1													
$XON	85-1	88-1	88-1												

ABORTA	91 1	91 1					
AB	7 11	7 110					
A16	5 1120	13 26	13 31				
A17	5 1130	13 26	17 31				
ADATA	6 260	8 0	8 0				
ADDRESS	21 15	71 410					
ADDR1	8 0	8 0					
ADDR2	8 0	8 0					
ADDR3	8 0	8 0					
ADDRDMP	99 450	106 150	106 470	107 50	107-110	110-0	
ADDRTB	99 510	110 80	110 220				
ADDR0	8 0						
ADDR1	8 0						
ADDR10	8 0						
ADDR11	8 0						
ADDR12	8 0						
ADDR13	8 0						
ADDR14	8 0						
ADDR15	8 0						
ADDR2	8 0						
ADDR3	8 0						
ADDR4	8 0						
ADDR5	8 0						
ADDR6	8 0						
ADDR7	8-0						
ADDR8	8-0						
ADDR9	8-0						
ADR VCT	8 0	8-0					
ADR WR	8 0	8 0					
ADRWV	8-0	8-0					
ADRWVR	8 0	8 0					
ADATADL	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						

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ASCAN2    63 25    63 300
ASCAN3    63 34    63 48    63 360
ASCAN4    63 57    63 850
ASCAN5    63 65    63 850
ASCAN7    63 68    63 880
ASCAN8    63 69    63 900
ASCAND    19 22   128 470
ASMPOR    15 91   129-250
ASMBLY     9-0
ASMERR    63 36    63 55    63 86    63 96    63 99    64-22    64 30    71 70
ASMLST     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 20    64 34•
           64-40    64-47•   71 26•   73 1     73 1     73 1•    96 29
ASMPSG    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
ATO        5-1900
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    50-26    63 32    63-46    63 56    64 10    64 12    64-13    64 32    64 36    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•    73 100
AVAIL      9-00     18-22    19-25    19-27•   20-46    20-49    20-86    21-36
AVECT1     6-270    8 0      8-0
AVECT2     8-0      8-0
BADENT    12 130   15-32    15-53    15 104   63-19    70-30    128 590
BADSEC     9-00    21 12•   57-61    60 16    60 17    60-18    60 19    60-20
BADTMO    12 30    12-27
BAI        5-1300
BEGCOD     9 00    66-33    66-34
BEGPAT     9 00    66-36
BEGSEC     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
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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       5-2666#
BPTVEC    5-1040#
BSE       5-2740#  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
CHGADR    9-0#     12-15#   12-18#   17-18    17-47#   67-32    96-30#   132-13   132-15#
CHKWC    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
CMHED    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)

DATAF. 62 69 65-132
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     71-38    128 80
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    67-80
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#
DRV       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    124-12#
EM14     24 4     124-13#
EM15     24 15    124-14#
EM2      11 11    124-4#
EM20     28-8     124-15#
EM21     25-39    124-16#
EM22     27-24    124-17#
EM23     27-6     124-18#
EM24     29-15    124-19#
EM25     30-21    124-20#
EM26     31-41    124-21#
EM27     32-4     124-22#
EM3      11-18    124-5#
EM30     28-32    124-23#
EM31     30-61    124-24#
EM32     30-84    124-25#
EM33     31-4     124-26#
EM34     33-4     124-27#
EM35     31-22    124-28#
EM36     31-32    124-29#
EM37     27-27    124-30#
EM4      11-25    124-6#
EM40     32-19    124-31#
EM41     35-34    124-32#
EM42     38-33    124-33#
EM43     34-16     34-21   124-34#
EM44     35-16    124-35#
EM45     25-23     27-44   124-36#
EM46     57-98    124-37#
EM47     25-20     27-42   124-38#
EM5      11-32    124-7#
EM50     32-39    124-39#
EM51     30-45    124-40#
EM52     25-10     27-31   124-41#
EM6      11-39    124-8#
EM60     33-23    124-42#
EM70     33-45    124-43#
EM71     33-49    124-44#
EM72     33-51    124-45#
EMPTYQ  106-181   106-230  108-40   111-94   118-7#
EMTVEC    5-104#   12-25*   12-25*
ENDCMP   37-93     38-86#
ENDCON    9-0#     17-4*    17-5*    17-8*    17-9*    17-13*   17-14*   21-21    21-24
ENDING    9-0#     21-19   129-10
ENDPGM   14-8      14-13   133-80#
ENDSEK    9-0#     21-28    21-31
ENTADR  128-56#
ENTCOM   62-28    128-54#
ENTLMT   67-43    128-55#
ENTPR    15-101    15-108#
EQUAL   128-4#
ERCTR     9-0#     36-9*    36-50*   37-14    37-29*   38-88    38-91
ERPRC1   22-44     22-50#   26-28    44-69
ERPROC   22-8      22-12    22-14    22-36#
ERR       5-172#
ERROR     5-104#
```

CROSS REFERENCE TABLE (CREF V04.00)

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#
GOODRIV 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    60-170
INCMIS  30 50    60 190
INCSKI  32-43    60-180
INCSOF  26 56    26-64    27-80    28 16    29 23    30 29    30 65    60-160
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    60-200
INTRVL   9 00    12-93*   20-14*   61 38*   61 53    61-55    61-55    61-58*   96 17*   96 28    129-4
INVLD   62-94   128-530
IOTVEC   5-1040
IR       5-1330
ISR    102-34   107-30
ITCNT   56 23*   56-25    56-25*   56-570
IXU      5-2680
KIPARO 131-1
KSR     18-8     62-100   62-11
KSR1    62-120
KWSVR   58-11    58-23    61-310
LBC      5-2720
LBT      5-1680
LCE      5-2710
LF       5-1040   12-6     88-1     88-1     96-5    128-26   128-60
LIMIT    9-00     34-43*   36-19*   36-20*   38-48    38-50*
LIN10A  40-30   127-540
LIN10B  40-37   127-550
LIN10C  41-40   127-560
LIN10M  41-2    127-580
LIN11   42-41   127-620
LIN11A  42-52   127-630
LIN11M  42-38   127-610
LIN2C   57-32   127-40
LIN2P   57-38   127-50
LIN2S   57-64   127-60
LIN3.1  57-120   57-126   57-1910
LIN3.3  57-131   57-138   57-2130
LIN3.4  57-139   57-2230
LIN6.2  57-331   57-337   57-343   57-3580
LIN7M   57-418  127-360
LIN7P   57-412  127-400
LIN7R   57-387  127-440
LIN7S   57-421  127-410
LIN7T   57-377  127-420
LIN7X   57-380  127-430
LIN8M   26-27    44-68    57-433  127-460
LIN9B   38-39   127-470
LIN9E   38-90   127-520
LIN9G   26-70   127-530
LIN9M   38-41   127-480
LIN9I   34-23   127-500
LINA3   57-223  127-140
LINB3   57-146  127-180
LINB5   57-268  127-260
LINB6   57-323  127-310
LINC6   57-330  127-320
LINCA3  57-183  127-160
LIND5   57-256  127-250
```

CROSS REFERENCE TABLE (CREF V04.00)

```
LINDAS  57 179   127 170
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 4590
LINE1   23 5     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    57-60
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
        57-280   57-434
LINE2A  57-37    57-42    57-610
LINE2B  57-62    57-650
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 1190
LINE3A  33-6     34-18    38-35    57-1250
LINE3B  32-41    57-1310
LINE3C  30-47    57-1380
LINE3D  35-36    57-100   57-1440
LINE3E  31-6     57-1580
LINE3F  31-24    57-1770
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   57-2370
LINE5   27-10    27-51    28-15    29-21    30-27    31-47    32-10    57-2560
LINE5A  28-12    29-22    30-28    30-49    31-48    32-11    57-2960
LINE5B  26-55    57-3100
LINE6   26-13    26-54    57-3230
LINE6A  26-63    57-3300
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 3360
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    57-3420
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    57-3770
LINE7A  30 52    32-44    57 4120
LINE8   26-47    27-78    44-63    57-4330
LINEN3  57-216   127-130
LINEO5  57-314   127-300
LINEP5  57-310   127-290
LING6   57-336   127-330
LINM3   57-119   127-70
LINM4   57-239   127-220
LINN3   57-125   127-90
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   57-4430
LINP3   57-197   127-110
LINP5   57-288   127-270
LINR6   57-361   127-340
LINS3   57-158    57-213   127-120
LINS4   57-242   127-230
LINS5   57-297   127-280
LINSS3  57-167   127-210
LINST3  57-162   127-200
LINT3   57-227   127-150
LINU06  57-342   127-350
LINW3   57-149   127-190
LINX4   57-245   127-240
LINX5   57-303   127-680
```

CROSS REFERENCE TABLE (CREF V04 00)

```
LKPAR    15 30    15 23    15 33    15 44
LODEV    16 44    63 30    63 44   128 :70
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•   67-55    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
MSGOM    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
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CROSS REFERENCE TABLE (CREF V04 00)

MWAIT	96 25	96 370							
MXBRO	62 92	128 520							
MYF	5 1360								
MXRANDM	101 100	106 70							
N	128 490								
NED	5 1390								
NEDCLK	58 30	128 480							
NEM	5 1380								
NEWASN	62 51	65 50							
NEWINT	9 00	17 95•	19-7	19 20	19-27	19 28•	63 80•		
NXNEW	16 64	63 98	128 180						
NXXCLT	12 132	15 55	128 190						
NXXRVS	20 16	128 600							
NXXTCH	34 50	37 6							
NXNE	128 580								
NXXP	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 2250								
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•	65 220			
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)

```
PARMLST   14 220    15 108   129 30
PARSDB     9 0      71-45
PARSET     9 00     73-1     129-6
PAT        5 1510
PATCH    133 720
PATTLB     9 00     39 21    53 36    53 38    129 7
PERIOD    36 33     38 60    40 36    41 11    41 31    57 305   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
PFRM      71 200   108 36   108 460  108 530
PFLCH     87 1     87 10
PFLCH1    87 1     87 10
PFLCH2    87 1     87 10
PFLCH3    87 1     87-10
PFLCH4    87-1     87 10
PFLSTN    87-1     87 10    87-16
PGE        5 1570   5-2500
PGM        5 1670
PIP        5-1710
PINB       5 1040
PINOVE     5 1040
POPQUE   105 21   106 12   106-153  109 77   109 126  119 260
POSLR     30 14    30 460
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
PROCESS   21 11    22 30
PRTHAD    26 5     26 51    33 9     42 160
PRTIM     22 62    24 140
PS         5 104     5 1040   12-88•   62 15•   62 99•   73 5•    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
PUNSAV    22 52    23-30
PUSHLG    15 3     16-12    17 37    17-51•   66-10    96 1•    96 50
PUSHUP    96-1     96-110
PUSHVEC    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   119-35•
QSTART    116 250  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
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CROSS REFERENCE TABLE (CONT'D)

[illegible]	5 1080	12 25	12 25•	12 25•										
[illegible]	5 1080													
[illegible]	51 30	52 30	52 60											
[illegible]	9 00	51 29	129 15											
[illegible]	9 00	51 4	129 8											
[illegible]	51 250													
[illegible]	52 250													
[illegible]	51 45	51 30	51 11											
[illegible]	52 140													
[illegible]	51 27	51 300												
[illegible]	9 00	51 16	129 9											
[illegible]	101 37	101 62	103 68	106 108	106 123	106 130	108 14	109 5	111 15	111 60	112 100	114 22		
[illegible]	85 1	97 10												
[illegible]	6 250	9 0	50 58	56 41										
[illegible]	6 240	9 0	44 14											
[illegible]	12 110	15 20	15 41	15 92	62 50	63 7	70 29	97 10	132 29	132 60				
[illegible]	9 00	12 1050	12 1060	15 58	15 61	50 61	51 9	62 64	62 70					
[illegible]	5 1110													
[illegible]	28 5	29 6	30 6	43 16	56 18	57 191	57 4700							
[illegible]	28 6	29 7	30 7	44 100										
[illegible]	6 120													
[illegible]	6 50	43 9	43 30											
[illegible]	43 300	43 61												
[illegible]	30 53	43 70												
[illegible]	62 73	65 80												
[illegible]	21-41	47-70												
[illegible]	6-70													
[illegible]	59 65	79 150												
[illegible]	48 23	62 96	76-48	75-37	94 1	95 1	97-10	102 48	104-61	104-65	105-97	106-250	107 10	110 21
	114-39	117-34												
[illegible]	5-1060													
[illegible]	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 24•	30 32•	30 69•	31 10•	32 26•	33 10•	33 28•	33 56•	44-38•	44-58•	44-59	44-59	57 359	
[illegible]	9 00	12 30												
[illegible]	13 4•	13-13•	13-17•	13-23	101-60	114-36								
[illegible]	5-1790													
RPOT	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	152 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	101-200	103-69	109-95	113-29								

CROSS REFERENCE TABLE (CREF VER 00)

```
OPMOR2   101 900   109 96
OPMOR3   101 310   109 97
OPINIT    16 5     102 140
OPMLA    101 220
OPMOR1   101 240   105 22    105 57
OPOF     101 270   103 60    106 109   106 113   106 120   106 120
OPSAV    101 260
OPSTUB    98 160   102 18    109 90•   109 95•   109 96•   109 97•
OPSTU1    98 160
OPSTU2    98 160
OPSTU3    98 160
OPSTU4    98 160
OPSTU5    98 160
OPSTU6    98 160
OPSTU7    98 160
OPTMP     61 52    110-60
OPVEC     12 81•   101-50    102-33    102 35    104 12
OPWAC    101 150
OTC        6 110
OTUMRN    73 1      73-30
OWU1       5 2550
OWU2       5 2560
OWU3       5 2570
S         57 195    57-204    127-100
SAVEFG    16 9•    100 70    106 155   108 19    109 79
SAVIR1     9 00     36 22•    37 36•    38 11     38 17     38 22•
SAVIR5     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     90-1      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       109-200   109-24
SC4       109-220   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						
SRCMUT	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•	77-33•								
SUPRS	59-98	59-104	59-114	59-120	59-130	59-136	77-170						
SUPRSL	70-18	77-120											
SVRHXX	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)

```
UNSPC    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    65-28#
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
```

CROSS REFERENCE TABLE (CREF V04.00)

```
$$CMRE    7 600#
$$CMTM    7 600#    8 0
$$ESCA    5 104#
$$NEWT    5 104#   12 19
$$SET    97-1      97-1      97 1     97-1     97 1     97 1     97 1     97-1     97 1     97 1     97 1     97-1#    97 2
$$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
.$D82D    5-78#    94-1
.$D82O    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     97-1#    97-2
SETUP     5-104#   12-25
SKIP      5-104#
SLASH     5 104#
```

```
STARS     5 1040   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 1040   12-25    12-250
TRMTRP   97 10     97-3
TYPBIN    5-1040
TYPDEC    5-1040   59-150   59-153   59-156   59-159
TYPNAM    5-1040   12-31
TYPNUM    5-1040
TYPOCS    5 1040   16-19    19-17    23-27    59-69    63-74    71 10    71-35
TYPOCT    5-1040   62-25    85-1     87-1     87-1
TYPTXT    5-1040   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   95-20     96-1
XXEP     72-110    73-1
```