RP07

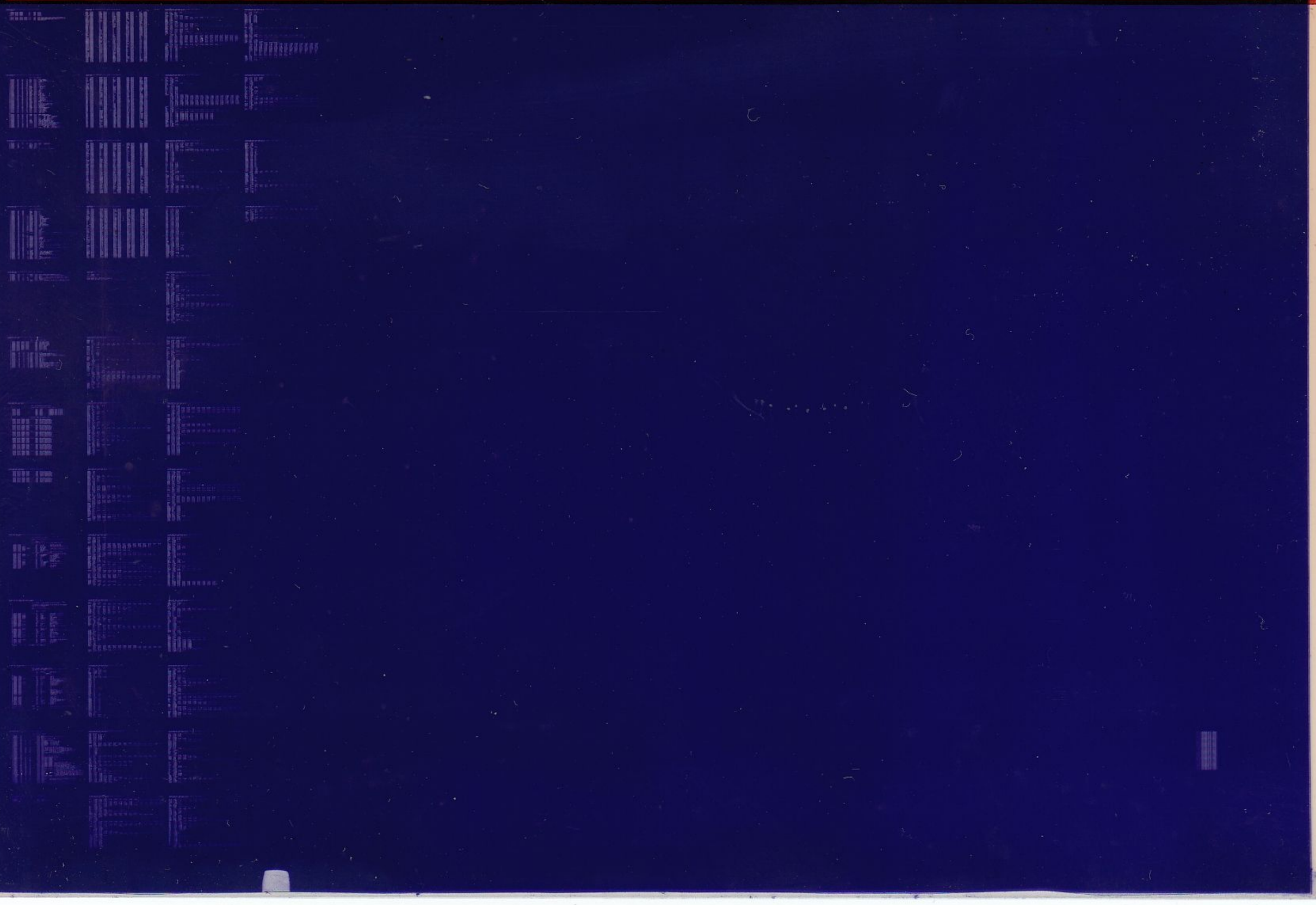
PERF EXER
CZRJOA0

AH-F965A-MC
FICHE 1 OF 2

RP07

PERF EXER
CZRJOA0

AH-F965A-MC
FICHE 2 OF 2



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IDENTIFICATION

PRODUCT CODE: AC-F964A-MC

PRODUCT NAME: CZRJOA0 RP07 PERF EXER

PRODUCT DATE: JANUARY 1, 1983

MAINTAINER: CX DIAGNOSTIC ENGINEERING

AUTHOR: MIKE LEAVITT


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1. ABSTRACT

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

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

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

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

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

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

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

1.1 GENERAL DOCUMENT NOTES

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

2. REQUIREMENTS

2.1 EQUIPMENT

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

2.2 MEDIA

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

2.3 PRELIMINARY PROGRAMS

RP07 FRONT-END TEST

RP07 FUNCTIONAL TEST

3. OPERATING PROCEDURE

3.1 LOADING THE PROGRAM

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

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

3.2 STARTING ADDRESSES

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

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

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

3.3 PROGRAM CONTROL

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

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

3.4 SWITCH OPTIONS

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

```
'SWR = NNNNNN    NEW ='
```

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

ON PROCESSORS WITH HARDWARE SWITCH REGISTERS, THE 'SOFTWARE' SWITCH REGISTER MAY BE USED, IF THE PROGRAM FINDS ALL 1'S IN THE SWITCHES. ALL SWITCH REGISTER REFERENCES WILL BE TO THE 'SOFTWARE' REGISTER AND THE PROCEDURES DESCRIBED ABOVE MUST BE FOLLOWED.

SW<15>=1	HALT ON ERROR
SW<14>	NOT USED
SW<13>=1	INHIBIT ERROR TYPEOUT
SW<12>	NOT USED
SW<11>	NOT USED
SW<10>=1	BELL ON ERROR
SW<09>=1	CHANGE END OF PASS TO 1/4 OF NORMAL
SW<09>	NOT USED
SW<08>=1	INHIBIT END OF PASS MESSAGES
SW<07>=1	DISPLAY ALL DATA COMPARE ERRORS
SW<06>=1	DO NOT ALTER THE CURRENT OPERATION PARAMETERS
SW<05>=1	PARTIAL REGISTER DISPLAY IF ERROR; DO NOT DISPLAY ECC CORRECTION RESULTS
SW<04>=1	INHIBIT MAXIMUM ERROR COUNT CHECK; DO NOT DEASSIGN DRIVES WHEN END OF TEST IS REACHED
SW<03>=1	DISPLAY THE SECTOR IN ERROR (BEFORE RETRY ATTEMPTS) IF 'DCK', 'DTE', OR 'WCF' ERRORS OR AFTER THE 28TH RETRY IF UNCORRECTABLE 'DCK' ERROR IF DATA COMPARE ERRORS & SW<07> SET, DISPLAY REST OF BUFFER
SW<02>=1	INHIBIT SUBSYSTEM STATUS TYPEOUT DURING STARTUP

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

3.5 PASS/TEST TERMINATION

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

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

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

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

3.5.1 PASS TERMINATION

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

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

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

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

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

3.5.2 TEST TERMINATION

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

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

3.6 RUN TIME

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

3.6.1 DATA TRANSFER MODE (DEFAULT)

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

3.6.2 SEEK VERIFICATION MODE

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

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

3.7 DUAL PORT OPERATION

A. LOAD THE PERFORMANCE EXERCISER PROGRAM INTO BOTH PROCESSORS.

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

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

3.8 XXDP, ACT11, APT11 COMPATIBILITY

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

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

AUTOMATIC MODE OR CHAIN MODE (MONITOR)

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

DUMP MODE (NO MONITOR)

1. INPUT DIALOGUE PROMPTED AFTER PROGRAM STARTS

3.9 APT ETABLE DEFINITIONS

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

1. SOFTWARE ENVIRONMENT:

   = 1 IF APT SCRIPT MODE
   = 0 IF STANDLONE MODE

2. ENVIRONMENT MODE:

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

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

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

   BIT 4 TO BIT 0 ARE NOT USED

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

4. SWITCH 2 (USER SWITCH REGISTER)
   NOT USED

5. CPU OPTIONS
   NOT USED

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

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

8. BUS PRIORITY 1:
   NOT USED.

9. INTERRUPT VECTOR 2:
   NOT USED

10. BUS PRIORITY 2:
    NOT USED

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

12. DEVICE MAP:
    NOT USED

13. CONTROLLER DESCRIPTOR WORDS:
    NOT USED

14. CONTROLLER DESCRIPTOR WORDS:
    NOT USED

4. CONTROLLING THE PROGRAM

THE FOLLOWING KEYBOARD CONVENTIONS ARE USED BY THE KEYBOARD ENTRY ROUTINES IN THE PROGRAM:

A. TO DELETE AN INCORRECT CHARACTER FROM AN ENTRY STRING, TYPE A 'RUBOUT'. TYPING A RUBOUT WILL DELETE SUCESSIVE CHARACTERS FROM THE INPUT.

B. TO DELETE AN ENTIRE LINE, TYPE A 'CONTROL U' (^U).

C. AN ENTRY MUST BE TERMINATED BY EITHER A 'CARRIAGE RETURN' OR A 'PERIOD'. THE 'PERIOD' TERMINATION IS RECOGNIZED BY THE PROGRAM AS A DEFAULT ENTRY REQUEST. WHEN A LINE IS TERMINATED BY A 'PERIOD' INSTEAD OF A 'CARRIAGE RETURN', THE PROGRAM WILL ACCEPT THE ENTERED VALUE AND WILL DEFAULT TO THE PRELOADED VALUES FOR ANY REMAINING ENTRIES.

D. IF A 'CONTROL C' IS TYPED DURING DRIVE TESTING MODE, THE PROGRAM WILL ENTER THE COMMAND MODE. IF A 'CONTROL C' IS TYPED DURING 'ENTER COMMAND' SEQUENCE, WITH NO DRIVES ASSIGNED, THE PROGRAM WILL BE RESTARTED AT LOCATION 204 . OTHERWISE, THE PROGRAM WILL RETURN TO 'ENTER COMMAND' PROMPT AND WAIT FOR A CORRECT SEQUENCE OF CHARACTERS. IF 'CONTROL C' IS TYPED DURING ANY OTHER ENTRY SEQUENCE, THE PROGRAM WILL RETURN TO THE BEGINNING OF THE GROUP SEQUENCE BEING ENTERED.

4.1 PARAMETERS

THE FOLLOWING QUESTIONS ARE ASKED TO DETERMINE HOW THE RP07 WILL BE TESTED. THE DEFAULT ANSWERS TO THESE QUESTIONS ARE ALWAYS AS DOCUMENTED HERE.

'THE HELP MESSAGE CAN ONLY BE TYPED ONCE,
DO YOU WANT IT TYPED (L) ?

A 'Y' RESPONSE WILL TYPE A SUMMARY OF THE SWITCH REGISTER DEFINITIONS, ALONG WITH ALL THE COMMANDS AVAILABLE TO THE USER. A 'N' RESPONSE WILL NOT TYPE ANY HELP MESSAGE AND THE NEXT PROMPT WILL BE TYPED.

IF RUNNING THE MANUFACTURES VERSION OF THIS PROGRAM, THE FOLLOWING QUESTION WILL ASKED. OTHERWISE, CONTINUE TO THE NEXT PROMPT.

'DO YOU WANT 132. CHARACTER ERROR MODE (L) Y ?

A 'Y' RESPONSE WILL ALLOW THE 132. CHARACTER ERROR MESSAGES TO BE TYPED TO THE OUTPUT DEVICE WHEN AN ERROR OCCURS. A 'N' RESPONSE WILL OUTPUT THE NORMAL LONG ERROR TYPE MESSAGES TO THE OUTPUT DEVICE.

THE 132. CHARACTER ERROR MODE, IS A 132. CHARACTER STRING, WHICH IS SEPERATED INTO COLUMNS OF DATA FOR THE ERROR REPORT. THIS FORM OF ERROR REPORTING HELPS MANUFACTURING FIND DIFFERENT TYPES OF ERRORS MORE

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

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

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

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

'! CUSTOMER DATA WILL BE OVERWRITTEN !
CONTINUE (L) ?'

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

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

'* TESTING WILL OCCUR ON FE CYLINDER ONLY *'

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

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

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

'CHANGE PARAMETERS (L) N ?'

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

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

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

THE FOLLOWING IS AN EXAMPLE DRIVE STATUS PRINTOUT:

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

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

4.1.1 KEYBOARD ENTRY PARAMETERS

QUESTION #	BASE	DEFAULT VALUE	VALUE RANGE	FUNCTION
1	10.	8192. (SEE NOTE)	6 - 8192.	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 8192.(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 8192. WORDS OR MEMORY AVAILABLE. (WHICH EVER VALUE IS SMALLER)
2	10.	0	0 - 32767.	DETERMINES THE INTERVAL (IN MINUTES) BETWEEN AUTOMATIC PERFORMANCE REPORT TYPEOUTS; NO TYPEOUT IF THIS PARAMETER IS 0 OR IF SW<02> =1
3	10.	15.	0 - 32767.	DETERMINES THE INTERVAL (IN MINUTES) BETWEEN DATA COMPARES TO MEMORY AFTER A READ DATA COMMAND. ALWAYS DO COMPARE IF THIS PARAMETER IS 0. IF SW01 =1, THEN NO DATA COMPARES WILL BE GRANTED,UNLESS A 'DCK' ERROR OCCURS.
4	10.	1	1 - 32767.	NUMBER OF PASSES TO END OF TEST. (THIS PARAMETER IS NOT USED WHEN THE PROGRAM IS

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

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

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

4.1.2 CHANGE DEVICE ADDRESS

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

(DEFAULT ADDRESS = 176700, VECTOR = 254)

ADDRESS SELECTION EXAMPLES

EXAMPLE 1

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

EXAMPLE 2

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

4.2 KEYBOARD COMMANDS

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

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

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

'NO DRIVES ASSIGNED'

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

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

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

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

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

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

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

'CHANGE DRIVE PARAMETERS (L) N ?'

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

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

'DRIVE # N, PGXXXX. ADDRESS LIMITS;'

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

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

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

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

4.2.1 'T' COMMAND

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

FORMAT: TN<CR>

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

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

4.2.2 'D' COMMAND

USED TO DEASSIGN A DRIVE(S) BEING EXERCISED.

FORMAT: DN<CR>

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

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

4.2.3 'S' COMMAND

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

FORMAT: SN<CR>

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

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

4.2.4 'W' COMMAND

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

FORMAT: WN<CR>

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

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

4.2.5 'R' COMMAND

USED TO PERFORM A SEQUENTIAL READ OF THE DISK.

FORMAT: RN<CR>

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

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

4.2.6 'WT' COMMAND

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

FORMAT: WTN<CR>

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

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

5. PERFORMANCE SUMMARY TYPEOUT

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

THE REPORT TYPEOUT CONTAINS THE FOLLOWING FIELDS:

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

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

5.2 SOFT/HARD ERROR DEFINITIONS

5.2.1 HARD ERRORS

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

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

BOTH AT POSITIVE AND NEGATIVE OFFSETS.

5.2.2 SOFT ERRORS

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

6. DATA CHECKING & ERROR RECOVERY

6.1 DATA COMPARISON

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

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

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

6.2 VERIFICATION OF DATA WRITTEN

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

6.3 BAD ADDRESS FLAGGING

ACCOMPLISHED BY THE RP07 HARDWARE SKIP DEFECT.

7. ERROR MESSAGES

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

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

7.1 ERROR DESCRIPTION LINES

(THE MESSAGE TAGS ARE GIVEN FOR REFERENCE.)

MESSAGE

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

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

EM15 NO RESPONSE TO PORT REQUEST

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

EM20 HEADER CRC ERROR

A HEADER CRC ERROR WAS DETECTED AT THE INDICATED DISK ADDRESS. THE CONTENTS OF THE HEADER ARE DISPLAYED. THE OPERATION WILL BE RETRIED 3 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 3 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 3 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 3 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 3 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 3 TIMES.

EM27 HEADER COMPARE ('HCE') ERROR

SIMILAR TO EM26 EXCEPT THAT THE 'HCE' BIT WAS SET INITIALLY. THE OPERATION WILL BE RETRIED 3 TIMES.

EM30 MISCELLANEOUS DRIVE ERROR

THIS MESSAGE IS GIVEN FOR THE FOLLOWING ERROR BITS: 'AOE', 'AMR', 'ILF', OR 'ILR'

EM31 OPERATION INCOMPLETE ('OPI') ERROR

AN OPERATION INCOMPLETE ERROR OCCURRED AT THE INDICATED SECTOR.

EM32 DRIVE TIMING ('DTE') ERROR

DRIVE TIMING ERROR OCCURRED ON THE INDICATED SECTOR. THE OPERATION WILL BE RETRIED 3 TIMES.

EM33 PARITY ('PAR') ERROR AFTER OPERATION STARTED

THE 'PAR' BIT WAS SET WHEN THE OPERATION WAS COMPLETED. THE OPERATION WILL BE RETRIED 3 TIMES.

EM34 WRITE CLOCK FAILURE ('WCF')

A WRITE CLOCK FAILURE OCCURRED DURING THE OPERATION. THE OPERATION WILL BE RETRIED 3 TIMES.

EM35 INVALID ADDRESS ('IAE') ERROR

AN INVALID ADDRESS ERROR OCCURRED DURING THE OPERATION.

EM36 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 3 TIMES IF THE ERROR WAS CAUSED BY 'DLT', 'UPE', 'MXF', OR 'MDPE'.

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 RP SET OR ERROR BITS IN THE RH CONTROLLER SET.

EM45 ECC LOGIC FAILURE

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

EM46 BUS ADDRESS OR WORD COUNT NOT CONSISTENT

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

EM50 SEEK INCOMPLETE ERROR

THE DRIVE SIGNALED EITHER 'SKI' ERROR.

EM51 NOT USED

EM60 DEVICE UNSAFE

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

7.2 DETAIL ERROR LINES

THE LINE NUMBERS GIVEN BELOW ARE FOR REFERENCE ONLY.

LINE 1

HH:MM:SS

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

LINE 2

'PRSNT COMMAND= XXXX PREV COMMAND= YYYY'

MNEMONICS USED FOR THE COMMANDS ARE DEFINED BELOW:

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

* SPECIAL RP DRIVER COMMAND (NOT A CONTROLLER COMMAND)

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

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

'* ERROR AT BAD TRACK/SECTOR'

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

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

LINE 3

ERROR AT CXXX TYY SZZ PREV ADDR= CUUU TVV SWW

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

LINE 4

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

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

ADDRESSES ARE GIVEN IN DECIMAL.

LINE 5

START CYL= XXX END CYL= YYY

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

LINE 6

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

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

LINE 7

RPBA= XXXX RPWC= YYYY

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

LINE 8

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

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

LINE 9

RPDA= XXXX RPCA= YYYY

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

LINE 10

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

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

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 SUCCESSFUL RETRY OF A SECTOR WHICH BECAME ECC CORRECTABLE DURING RETRY.

LINE 14

ECC CORRECTABLE WITHOUT OFFSET

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

LINE 15

READ CORRECTLY AT (NEG OR POS) OFFSET

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

LINE 16

ECC CORRECTABLE AT (NEG OR POS) OFFSET

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

LINE 17

CORRECTED ON X RETRY

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

LINE 18

UNCORRECTABLE AFTER X RETRIES

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

LINE 19

DIFFERENT ERROR DURING RETRY

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

LINE 20

DATA COMPARISON ERRORS

A PRINTOUT OF THE DATA COMPARISON ERRORS FOLLOW THIS LINE.

LINE 21

TOTAL COMPARE ERRORS= XXXX

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

LINE 22

THE DATA COMPARED OK

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

LINE 23

ECC CORRECTION RESULTS

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

LINE 24

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

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

RETRY. 'XXX' IS THE WORD OFFSET VALUE FROM 'RMEC1' 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. RH CONTROLLER INTERRUPT ENABLE ('IE') IS SET, TTY KEYBOARD INTERRUPT ENABLE IS SET, AND THE KW11-L OR KW11-P CLOCK IS STARTED. COMMAND ENTRIES WILL NOW BE ACCEPTED BY THE PROGRAM.

THE PROGRAM SCANS ITS INTERNAL ASSIGNMENT TABLES, LOOKING FOR:

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

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

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

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

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

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

IF THE OPERATION HAS BEEN COMPLETED NORMALLY, THE SAVED DRIVE REGISTERS ARE CHECKED TO VERIFY THAT NO ERROR BITS ARE SET; THE RH 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	133331	052525	147556	155555	030221
000003	177774	000000	133331	052525	147556	133333	030221
000007	177770	000000	133331	052525	147556	155555	030221
000017	177760	177777	133331	125252	147556	133333	030221
000037	177740	177777	133331	125252	147556	155555	030221
000077	177700	177777	133331	125252	147556	133333	030221
000177	177600	000000	133331	052525	147556	155555	030221
000377	177400	000000	133331	052525	147556	133333	030221
000777	177000	177777	133331	125252	147556	155555	030221
001777	176000	177777	133331	125252	147556	133333	030221
003777	174000	000000	133331	052525	147556	155555	030221
007777	170000	177777	133331	125252	147556	133333	030221
017777	160000	000000	133331	052525	147556	155555	030221
037777	140000	177777	133331	125252	147556	133333	030221
077777	100000	000000	133331	052525	147556	155555	030221
177777	000000	177777	133331	125252	147556	133333	030221

PAT 9	PAT 10	PAT 11	PAT 12	PAT 13	PAT 14	PAT 15
000001	177776	172666	077777	153333	000000	177777
000002	177775	155555	137777	066667	177777	000000
000004	177773	172666	157777	153333	177777	000000
000010	177767	155555	167777	066667	177777	000000
000020	177757	172666	173777	153333	177777	000000
000040	177737	155555	175777	066667	177777	000000
000100	177677	172666	176777	153333	177777	000000
000200	177577	155555	177377	066667	177777	000000
000400	177377	172666	177577	153333	177777	000000
001000	176777	155555	177677	066667	177777	000000
002000	175777	172666	177737	153333	177777	000000
004000	173777	155555	177757	066667	177777	000000
010000	167777	172666	177767	153333	177777	000000
020000	157777	155555	177773	066667	177777	000000
040000	137777	172666	177775	153333	177777	000000
100000	077777	155555	177776	066667	177777	000000

* WORST CASE PATTERN

9.1 RH/RP DRIVER

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

9.2 TO INITIALIZE THE DRIVER:

```
        JSR     PC,RPINIT
        RETURN
```

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

DRVSTA	DRIVE STATE

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

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

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

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

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

CALL:

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

*DPB (DATA PARAMETER BLOCK)

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

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

```
        MOV     #16.,-(SP)      ;16. 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

```
1$:     JSR     R0,RP07         ;CALL THE DRIVER
        WRTDPB                  ;DPB ADDRESS
        BR      1$              ;WAIT FOR QUEUE IF FULL
2$:     TST     WRTDPB+16       ;WAIT FOR COMMAND TO COMPLETE
        BEQ     2$
        BMI     ERROR1          ;ERROR OCCURRED
        .
        .
        .

WRTDPB: .BYTE   5               ;DRIVE #5
        .BYTE   0               ;
        .BYTE   161             ;WRITE COMMAND
        .BYTE   0               ;
        .WORD   -1000.          ;WORD COUNT
        .WORD   WRTBUF          ;BUFFER ADDRESS
        .BYTE   3               ;SECTOR
        .BYTE   5               ;TRACK
        .WORD   400             ;CYLINDER
        .WORD   ERRTB5          ;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,ERRTB5,0
```

9.5 RH/RP REGISTERS

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

RPLA	20
RPDB	22
RPMR1	24
RPDT	26
RPSN	30
RPOF	32
RPDC	34
RPHR	36
RPMR2	40
RPER2	42
RPEC1	44
RPEC2	46
RPBAE	50*
RPCS3	52*

* RH70 CONTROLLER REGISTERS

9.6 COMMANDS PERFORMED BY THE DRIVER

COMMAND	CODE	COMMAND TYPE
SEEK	105	P
RECALIRATE	107	P
DRIVE CLEAR	111	N
RELEASE	113	N
OFFSET	115	P
RETURN TO CENTER	117	P
READIN PRESET	121	N
PACK ACKNOWLEDGE	123	N
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

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

9.7 DPB STATUS/ERROR INDICATOR WORD

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

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

DONE (BIT07=0); BITS 14-9 SPECIFIES TYPE
DONE (BIT07=1); BITS 6-3 SPECIFIES TYPE

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 MASSBUS CLEAR WAS PERFORMED, ALL QUEUES WERE EMPTIED, AND ALL DRVACT'S SET TO THE IDLE STATE
9(3)(4)	SOFTWARE TIMEOUT OCCURRED ON THIS DRIVE
8(4)	SOFTWARE TIMEOUT OCCURRED ON ANOTHER DRIVE
7	DONE
6(2)	ERROR OCCURRED DURING AN I/O OPERATION
5(2)	ERROR OCCURRED DURING AN OPERATION OTHER THAN I/O.
4(2)	CORRECTABLE UNSAFE CONDITION OCCURRED
3(2)	DRIVE ERROR OCCURRED THAT CAUSED AN AUTOMATIC "RECALIBRATE" SEQUENCE
2	PORT REQUEST TIMEOUT. THE DRIVER REQUESTED THE DRIVE BUT THE OPPOSITE PORT DID NOT RELEASE THE DRIVE WITHIN 15. SECONDS.
1	NON-EXISTENT DRIVE REQUESTED. USER MADE A REQUEST FOR A NON-EXISTENT DRIVE.

NOTES FOR ABOVE

---

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

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

9.8 ERROR CALLS MADE BY THE DRIVER.

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

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

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

* THIS IS THE ACTUAL UNIBUS ADDRESS (176700)

```
.REM @

        VERSION (CZRJO-A-0)

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

@
```

HISTORY

```
                        ;*LAST REVISION 01-JAN-83
                        ;
                        .TITLE  CZRJOA0 RP07 PERF EXER
                        ;*COPYRIGHT (C) 1983
                        ;*DIGITAL EQUIPMENT CORPORATION
                        ;*COLORADO SPGS., CO. 80919
                        ;*
                        ;*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
```

BASIC DEFINITIONS

```
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)
```

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

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

                        .SBTTL  RP07 REGISTERS

                        ;CONTROL AND STATUS 1 REGISTER. (#00)

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

                        ;DRIVE STATUS REGISTER (RPDS1) (#01)

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

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

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

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                                ;MAINTENANCE REGISTER (RPMR1)(#03)

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

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

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

                                ;DRIVE TYPE REGISTER (RPDT) (#06)

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

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

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

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

                                ;OFFSET REGISTER (RPOF) (#11)

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

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

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

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

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

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

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

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

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

                                .SBTTL  RP07 DRIVER COMMANDS

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

176700                          ABASE   = 176700
000254                          AVECT1  = 254
```

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                        .SBTTL  TRAP CATCHER

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

                        .SBTTL  STARTING ADDRESS(ES)

000200  000137  003532          JMP     @#START1                ;;JUMP TO STARTING ADDRESS OF PROGRAM
2
3
000204  000137  003522          JMP     @#START         ;CHANGE THE RHXX/RP07 ADDRESS
7
8
                        .SBTTL  ACT11 HOOKS

                        ;;**************************************************************
                        ;HOOKS REQUIRED BY ACT11
                                $SVPC=.                 ;SAVE PC
                                .=46
000046  031754                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                                .=52
000052  040000                  .WORD   40000           ;;2)SET LOC.52 TO 40000
                                .=$SVPC                 ;; RESTORE PC
9
10                      .=1100
11                      .SBTTL  APT PARAMETER BLOCK

                        ;;**************************************************************
                        ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                        ;;**************************************************************
                                .$X=.   ;;SAVE CURRENT LOCATION
                                .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
000024  000200                  200     ;;FOR APT START UP
                                .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
000044  001100                  $APTHDR ;;POINT TO APT HEADER BLOCK
                                .=.$X   ;;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  001206          $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001104  014234          $TSTM:  .WORD   6300.   ;;RUN TIM OF LONGEST TEST
001106  014234          $PASTM: .WORD   6300.   ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001110  014234          $UNITM: .WORD   6300.   ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDED UNIT
001112  000032                  .WORD   $ETEND-$MAIL/2  ;;LENGTH MAILBOX-ETABLE(WORDS)
12      001114          TAB.XY=.        ;CMTAGSTARING ADDRESS
13
```

```
      0                                 .SBTTL  COMMON TAGS

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

            001114                              .=TAB.XY
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                  $TMP0:  .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
```

```
001226  000                 $ENV:    .BYTE   AENV    ;;ENVIRONMENT BYTE
001227  000                 $ENVM:   .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
001230  000000              $SWREG:  .WORD   ASWREG  ;;APT SWITCH REGISTER
001232  000000              $USWR:   .WORD   AUSWR   ;;USER SWITCHES
001234  000000              $CPUOP:  .WORD   ACPUOP  ;;CPU TYPE,OPTIONS
                            ;*                       BITS 15-11=CPU TYPE
                            ;*                              11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
                            ;*                              11/70=06,PDQ=07,Q=10
                            ;*                       BIT 10=REAL TIME CLOCK
                            ;*                       BIT  9=FLOATING POINT PROCESSOR
                            ;*                       BIT  8=MEMORY MANAGEMENT
001236  000                 $MAMS1:  .BYTE   AMAMS1  ;;HIGH ADDRESS,M.S. BYTE
001237  000                 $MTYP1:  .BYTE   AMTYP1  ;;MEM. TYPE,BLK#1
                            ;*                       MEM.TYPE BYTE   --  (HIGH BYTE)
                            ;*                              900 NSEC CORE=001
                            ;*                              300 NSEC BIPOLAR=002
                            ;*                              500 NSEC MOS=003
001240  000000              $MADR1:  .WORD   AMADR1  ;;HIGH ADDRESS,BLK#1
                            ;*                         MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
001242  000                 $MAMS2:  .BYTE   AMAMS2  ;;HIGH ADDRESS,M.S. BYTE
001243  000                 $MTYP2:  .BYTE   AMTYP2  ;;MEM.TYPE,BLK#2
001244  000000              $MADR2:  .WORD   AMADR2  ;;MEM.LAST ADDRESS,BLK#2
001246  000                 $MAMS3:  .BYTE   AMAMS3  ;;HIGH ADDRESS,M.S.BYTE
001247  000                 $MTYP3:  .BYTE   AMTYP3  ;;MEM.TYPE,BLK#3
001250  000000              $MADR3:  .WORD   AMADR3  ;;MEM.LAST ADDRESS,BLK#3
001252  000                 $MAMS4:  .BYTE   AMAMS4  ;;HIGH ADDRESS,M.S.BYTE
001253  000                 $MTYP4:  .BYTE   AMTYP4  ;;MEM.TYPE,BLK#4
001254  000000              $MADR4:  .WORD   AMADR4  ;;MEM.LAST ADDRESS,BLK#4
001256  000254              $VECT1:  .WORD   AVECT1  ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
001260  000000              $VECT2:  .WORD   AVECT2  ;;INTERRUPT VECTOR#2BUS PRIORITY#2
001262  176700              $BASE:   .WORD   ABASE   ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
001264  000000              $DEVM:   .WORD   ADEVM   ;;DEVICE MAP
001266  000000              $CDW1:   .WORD   ACDW1   ;;CONTROLLER DESCRIPTION WORD#1
001270  000000              $CDW2:   .WORD   ACDW2   ;;CONTROLLER DESCRIPTION WORD#2
001272                      $ETEND:
                            .MEXIT
```

USER DEFINED TAGS

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                                .SBTTL  USER DEFINED TAGS

001272  176700          $RPADR: .WORD   176700  ;FIRST ADDRESS OF RHXX/RP07 REGISTERS
001274  000254          $RPVEC: .WORD   254     ;RP07 VECTOR ADDRESS
001276  172540          $LKCSR: .WORD   172540  ;ADDR OF KW11-P STATUS REGISTER
001300  172542          $LKCSB: .WORD   172542  ;ADDR OF KW11-P COUNTER BUFFER
001302  000104          $LPVEC: .WORD   104     ;ADDR OF KW11-P VECTOR
001304  177546          $LKS:   .WORD   177546  ;ADDR OF KW11-L STATUS REGISTER
001306  000100          $LLVEC: .WORD   100     ;ADDR OF KW11-L VECTOR
001310  000000          CLKFLG: .WORD   0       ;NO CLOCK= 0, P-CLOCK= 1 OR L-CLOCK= -1
001312  000074          HERTZ:  .WORD   60.     ;60HZ SYSTEM= 60. OR 50HZ SYSTEM= 50.
001314  000000          STATIN: .WORD   0       ;'TYPE STATISTICS' INDICATOR

        001220          DRIVE   =$UNIT          ;DRIVE # STORAGE: ERRORS 1-5 & 10
                                                ;SAME AS USED IN APT
001316  000000          ATTN:   .WORD   0       ;ATTN REG STORAGE: ERRORS 1-5 & 10
001320  000000          DRVNO:  .WORD   0       ;DRIVE # STORAGE FOR PRINTOUT
001322  000000          MASK:   .WORD   0       ;ERROR RETRY REGISTER MASK
001324     000      000 RETRY:  .BYTE   0,0     ;ERROR RETRY LIMIT IN THE LOWER BYTE
                                                ;RETRY COUNT IN THE UPPER BYTE
001326  000003          FAIRNS: .WORD   3       ;MAXIMUM TIME IN QUEUE VALUE
001330  000000          LSTAD:  .WORD   0       ;STORE LAST MEMORY ADDRESS HERE
001332  000000          CHGADR: .WORD   0       ;CHANGE RHXX/RP07 UNIBUS ADDRESS FLAG
001334  000000          CFLAG:  .WORD   0       ;'CONTROL C' FLAG
001336  000000          BADSEC: .WORD   0       ;BAD TRACK/SECTOR FLAG
001340  000000          HOUR:   .WORD   0       ;HOUR COUNT STORED HERE
001342  000000          MINUTE: .WORD   0       ;MINUTE'S COUNT STORED HERE
001344  000000          SECOND: .WORD   0       ;SECOND'S COUNT STORED HERE
001346  000000          ONESEC: .WORD   0       ;TIMER ROUTINE COUNTER (FOR ONE SECOND)
001350  177777          ZROIND: .WORD   -1      ;ZERO INDICATOR FOR THE DATA COMPARE ROUTINE
001352     000          FRSTER: .BYTE   0       ;DATA COMPARE ERROR FLAG
                                                ;IF > 0, PROCESSING 'DCKER' OR CAN'T MATCH PATTERN
                                                ;IF < 0, MISCOMPARSION FOUND
001353     000                  .BYTE   0       ;MISCOMPARSION OR CAN'T MATCH PATTERN FLAG
                                                ;IF < 0, ERROR IN BUFFER
001354  000000          SAVPOS: .WORD   0       ;SAVE WORD POSITION IN COMPARE ROUTINE
001356  000000          SAVER1: .WORD   0       ;SAVE R1 HERE
001360  000000          SAVER5: .WORD   0       ;SAVE R5 HERE
001362  000000          ERCTR:  .WORD   0       ;NUMBER OF ERRORS
001364  000000          LIMIT:  .WORD   0       ;DISPLAY LIMIT
001366  000000          CMCNT:  .WORD   0       ;WORD COUNT
001370  000000          CMCYL:  .WORD   0       ;CYLINDER ADDRESS
001372     000          CMSEC:  .BYTE   0       ;SECTOR ADDRESS
001373     000          CMTRK:  .BYTE   0       ;TRACK ADDRESS
001374  000000          WRDPOS: .WORD   0       ;WORD POSITION IN COMPARE ROUTINE
001376  000000          ECBIT:  .WORD   0       ;ERROR BURST BIT OFFSET
001400  000000          ECSEC:  .WORD   0       ;ERROR BURST WORD OFFSET (RELATIVE TO SECTOR)
001402  000000          ECMSK0: .WORD   0       ;CORRECTION MASK FOR FIRST ERROR WORD
001404  000000          ECMSK1: .WORD   0       ;CORRECTION MASK FOR SECOND ERROR WORD
001406  000000          ECWRD:  .WORD   0       ;LOCATION OF FIRST ERROR WORD
001410  000000          ECGD:   .WORD   0       ;GOOD (CORRECTED) DATA, FIRST WORD
001412  000000          ECBAD0: .WORD   0       ;BAD (RECEIVED) DATA, FIRST WORD
001414  000000          ECWRD1: .WORD   0       ;LOCATION OF SECOND ERROR WORD
001416  000000          ECGD1:  .WORD   0       ;GOOD (CORRECTED) DATA, SECOND WORD
001420  000000          ECBAD1: .WORD   0       ;BAD (RECEIVED) DATA, SECOND WORD
001422  000000          TSTANY: .WORD   0       ;TEST ON FE CYLINDER ONLY =0, TEST ANYWHERE ON MEDIA =1
001424  000000          RDONLY: .WORD   0       ;READ/WRITE MODE=0, READ MODE ONLY=1
```

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001426  000000                  DRVPAR: .WORD   0       ;WHEN DRIVES ARE BEING ASSIGNED,
                                                        ;0=CHANGE DRIVE PARAMETERS
                                                        ;1=DO NOT CHANGE DRIVE PARAMETERS
001430  000000                  XXDP:   .WORD   0       ;THE LOW BYTE CONTAINS THE DRIVE NUMBER FROM WHICH
                                                        ;THE PROGRAM WAS LOADED. THE HIGH BYTE CONTAINS THE
                                                        ;'XXDP' DEVICE CODE FOR THE RP07.
                                .LIST   BEX
001432      200                 REV:    .ASCII  <CRLF>
001433      103     132     122         .ASCII  /CZRJO/ ;PROGRAM ID
001436      112     117
001440      055                         .ASCII  /-/
001441      101                         .ASCII  /A/     ;REVISION LEVEL
001442      055                         .ASCII  /-/
001443      060     000                 .ASCIZ  /0/     ;PATCH LEVEL
                                .NLIST  BEX

                                        .EVEN

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

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

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

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

001456  000062                  MAXER:  .WORD   50.      ;MAXIMUM ERRORS ALLOWED PER DRIVE
001460  000004                  CMPLMT: .WORD   4       ;NUMBER OF COMPARE ERRORS TYPED OUT
001462  000017  000017          CMPTIM: .WORD   15.,15. ;FIRST WORD IS THE INTERVAL BETWEEN DATA COMPARES.
                                                        ;(IN MINUTES). SECOND WORD IS THE INTERVAL COUNTER.
                                                        ;IF FIRST WORD IS ZERO, THEN DATA COMPARE IS ALWAYS ON.
                                                        ;THIS TIMER HAS NO AFFECT IF SW01=1.
001466  031000                  WRDCNT: .WORD   12800.  ;MAXIMUM WORD COUNT (6-12800.)
001470  000000  000000          INTRVL: .WORD   0,0     ;FIRST WORD IS THE PERFORMANCE TYPEOUT INTERVAL
                                                        ;(IN MINUTES). SECOND WORD IS THE INTERVAL COUNTER.
                                                        ;IF FIRST WORD IS ZERO, NO REPORT IS TYPED.
001474  000001                  PASSES: .WORD   1       ;NUMBER OF PASSES TO END OF TEST [THIS PARAMETER IS
                                                        ;NOT USED WHEN PROGRAM IS OPERATING IN AUTO RUN(CHAIN)
                                                        ;MODE].
001476  000000                  PATTERN:.WORD   0       ;IF EQ 0,RANDOMLY SELECT DATA PATTERN
                                                        ;IF NOT EQ 0,SELECT ONE SET OF PATTERN
                                                        ;POINTED BY THE "PATTERN".
001500  000000                  RANDWC: .WORD   0       ;IF EQ TO 0, GENERATE A RANDOM WORD COUNT
                                                        ;FOR THE OPERATION.
                                                        ;IF NOT EQ TO 0, USE THE VALUE IN 'WRDCNT' FOR
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001502  000003                  RATIO:  .WORD   3       ;THE WORD COUNT
                                                        ;READ/WRITE RATIO [RANGE 0 - 7]
                                                        ;0 - 15/1       (READ/WRITE)
                                                        ;1 -  7/1
                                                        ;2 -  6/2
                                                        ;3 -  5/3
                                                        ;4 -  4/4
                                                        ;5 -  3/5
                                                        ;6 -  2/6
                                                        ;7 -  1/7
001504  000001                  ENDING: .WORD   1       ;IF NOT EQ 0, END OF PASS DETERMINED
                                                        ;BY THE 'WORDS READ' COUNT. (2.58 X 10^8 WORDS)
                                                        ;IF EQ 0, END OF PASS DETERMINED
                                                        ;BY THE SEEK COUNT. (1 X 10^6 SEEKS)
001506  000001                  WRTCHK: .WORD   1       ;IF NOT EQ 0, DO AN APPROPRIATE WRITE
                                                        ;CHECK AFTER EACH WRITE COMMAND.
                                                        ;IF EQ 0, SELECT WRITE CHECK COMMANDS
                                                        ;RANDOMLY.
001510  000000                  RANDOM: .WORD   0       ;IF EQ TO 0, RANDOMLY SELECT DATA BLOCK
                                                        ;ADDRESS. IF NOT EQU 0,SEQUENTIALLY
                                                        ;SELECT DATA BLOCK ADDRESS

                                .SBTTL  VALUES FOR FIRST OPERATION

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

                                .SBTTL  TABLES, CONSTANTS, AND VARIABLE LOCATIONS

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

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

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

```
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

001632  000000                  ;LIST OF DRIVES WAITING FOR BUFFERS
001634  000000                  WAIT:   .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  046234                  BLKADR: .WORD   DRIVE0  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 0
002060  046476                          .WORD   DRIVE1  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 1
002062  046740                          .WORD   DRIVE2  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 2
002064  047202                          .WORD   DRIVE3  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 3
002066  047444                          .WORD   DRIVE4  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 4
002070  047706                          .WORD   DRIVE5  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 5
002072  050150                          .WORD   DRIVE6  ;ADDRESS OF THE PARAMETER BLOCK FOR DRIVE 6
002074  050412                          .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  113          .ASCIZ  /WCKHD  /
002244  127  122  124          .ASCIZ  /WRTDAT /
002254  106  115  124          .ASCIZ  /FMTRK  /
002264  122  104  104          .ASCIZ  /RDDAT  /
002274  122  104  110          .ASCIZ  /RDHD   /
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
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
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
003164  157777                          .WORD   157777
```

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

003220  153333                  DATA13: .WORD   153333  ;STANDARD PATTERN 13
003222  066667                          .WORD   066667
003224  153333                          .WORD   153333
003226  066667                          .WORD   066667
003230  153333                          .WORD   153333
003232  066667                          .WORD   066667
003234  153333                          .WORD   153333
003236  066667                          .WORD   066667
003240  153333                          .WORD   153333
003242  066667                          .WORD   066667
003244  153333                          .WORD   153333
003246  066667                          .WORD   066667
003250  153333                          .WORD   153333
003252  066667                          .WORD   066667
003254  153333                          .WORD   153333
003256  066667                          .WORD   066667

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

003320  177777                  DATA15: .WORD   177777  ;STANDARD PATTERN 15
003322  000000                          .WORD   000000
003324  000000                          .WORD   000000
003326  000000                          .WORD   000000
003330  000000                          .WORD   000000
003332  000000                          .WORD   000000
003334  000000                          .WORD   000000
003336  000000                          .WORD   000000
003340  000000                          .WORD   000000
```

```
003342  000000                          .WORD   000000
003344  000000                          .WORD   000000
003346  000000                          .WORD   000000
003350  000000                          .WORD   000000
003352  000000                          .WORD   000000
003354  000000                          .WORD   000000
003356  000000                          .WORD   000000
```

ERROR POINTER TABLE

```
                                .SBTTL  ERROR POINTER TABLE

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

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

  003360                        $ERRTB:
    1
    2                           ;ERROR 1
    3
    4 003360  050744                    EM1             ;RH CONTROLLER INTERRUPT OCCURRED (RPAS = 0)
    5 003362  053751                    DH1
    6 003364  054424                    DT1
    7 003366  000000                    0
    8
    9                           ;ERROR 2
   10
   11 003370  051017                    EM2             ;UNEXPECTED ATTENTION OCCURRED
   12 003372  053756                    DH2
   13 003374  054430                    DT2
   14 003376  000000                    0
   15
   16                           ;ERROR 3
   17
   18 003400  051055                    EM3             ;MASSBUS PARITY ERROR (MCPE=1)
   19 003402  054033                    DH3
   20 003404  054434                    DT3
   21 003406  000000                    0
   22
   23                           ;ERROR 4
   24
   25 003410  051113                    EM4             ;MASSBUS PARITY ERROR (PAR=1)
   26 003412  054061                    DH4
   27 003414  054440                    DT4
   28 003416  000000                    0
   29
   30                           ;ERROR 5
   31
   32 003420  051150                    EM5             ;NOT USED
   33 003422  053756                    DH2
   34 003424  054430                    DT2
   35 003426  000000                    0
   36
   37                           ;ERROR 6
   38
   39 003430  051204                    EM6             ;RHXX DIDN'T RESPOND TO ADDRESSING
   40 003432  054120                    DH6
   41 003434  054444                    DT6
   42 003436  000000                    0
```

ERROR POINTER TABLE

```
                                        ;THIS ROUTINE HANDLES UNEXPECTED TIMEOUTS

003440  011600                BADTMO: MOV     (SP),R0         ;SAVE PC WHERE THE TIME OUT OCCURED
003442  005740                        TST     -(R0)           ;ADJUST PC -2
003444  022626                        CMP     (SP)+,(SP)+     ;RESTORE STACK POINTER
003446  104401  003454                TYPE    ,65$            ;;TYPE ASCIZ STRING
003452  000417                        BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <CRLF><LF>/UNEXPECTED BUS TIMEOUT, PC=/
003512                          64$:
003512  010046                        MOV     R0,-(SP)        ;SETUP FOR TYPING OUT PC
003514  104402                        TYPOC
003516  000240                        NOP                     ;PUT 'HALT(0)' INSTRUCTION HERE IF YOU WISH
                                                                ;TO STOP ON UNEXPECTED TIMEOUT.
003520  000404                        BR      START1          ;BRANCH TO START1

                                .SBTTL  START OF PROGRAM

003522  012737  177777  001332  START:  MOV     #-1,CHGADR      ;ALLOW RHXX/RP07 ADDRESS TO BE CHANGED
003530  000407                        BR      START2          ;START THE PROGRAM

003532  012737  000400  001332  START1: MOV     #400,CHGADR     ;CLEAR RHXX/RP07 ADDRESS CHANGE FLAG
                                ;;**************************************************************
003540  000240                  TST1:   NOP
003542  012737  000001  001212        MOV     #1,$TESTN       ;;SET TEST NUMBER IN APT MAIL BOX

003550  005227  000000          START2: INC     #0              ;TTY LOOP, WAIT FOR INCREMENT
003554  001375                        BNE     .-4             ;OF WORD
003556  000005                        RESET                   ;CLEAR THE WORLD

                                .SBTTL  INITIALIZE THE COMMON TAGS
                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
003560  012706  001114                MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
003564  005026                        CLR     (R6)+           ;;CLEAR MEMORY LOCATION
003566  022706  001154                CMP     #SWR,R6         ;;DONE?
003572  001374                        BNE     .-6             ;;LOOP BACK IF NO
003574  012706  001100                MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                ;;INITIALIZE A FEW VECTORS
003600  012737  034742  000030        MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
003606  012737  000340  000032        MOV     #340,@#EMTVEC+2 ;;LEVEL 7
003614  012737  040256  000034        MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
003622  012737  000340  000036        MOV     #340,@#TRAPVEC+2;LEVEL 7
003630  012737  037640  000024        MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
003636  012737  000340  000026        MOV     #340,@#PWRVEC+2 ;;LEVEL 7
003644  012737  176543  037224        MOV     #176543,$HINUM  ;;PRIME THE RANDOM NUMBER GENERATOR
003652  012737  123456  037226        MOV     #123456,$LONUM  ;;BOTH HIGH AND LOW WORDS
                                ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
003660  013746  000004                MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
003664  012737  003720  000004        MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
003672  012737  177570  001154        MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
003700  012737  177570  001156        MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
003706  022777  177777  175240        CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
003714  001012                        BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                ;;AND  THE HARDWARE SWR IS NOT = -1
003716  000403                        BR      65$             ;;BRANCH IF NO TIMEOUT
003720  012716  003726          64$:  MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
003724  000002                        RTI
```

INITIALIZE THE COMMON TAGS

```
003726  012737  000176  001154  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
003734  012737  000174  001156           MOV     #DISPREG,DISPLAY
003742  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

003746  005037  001214                   CLR     $PASS           ;;CLEAR PASS COUNT
003752  132737  000200  001227           BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
003760  001403                           BEQ     67$             ;;YES,USE NON-APT SWITCH
003762  012737  001230  001154           MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
003770                           67$:
 26                      ;SETUP "TIMEOUT" TRAP VECTOR FOR UNEXPECTED BUS TIMEOUTS
 27 003770  012737  003440  000004       MOV     #BADTMO,ERRVEC  ;SETUP FOR UNEXPECTED TIMEOUT
 28 003776  012737  000300  000006       MOV     #PR6,ERRVEC+2   ;LEVEL 6
 29
 30 004004  104401  001432               TYPE    ,REV            ;TYPE PROGRAM ID, REV LEVEL & PATCH LEVEL
 31                              .SBTTL  TYPE PROGRAM NAME
                                 ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
004010  005227  177777                   INC     #-1             ;;FIRST TIME?
004014  001022                           BNE     68$             ;;BRANCH IF NO
004016  104401  004024                   TYPE    ,69$            ;;TYPE ASCIZ STRING
004022  000417                           BR      68$             ;;GET OVER THE ASCIZ
                                 ;;69$:  .ASCIZ  <CRLF>@RP07 PERFORMANCE EXERCISER@<CRLF>
004062                           68$:
                                 .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
004062  005737  000042                   TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
004066  001012                           BNE     70$             ;;BRANCH IF YES
004070  123727  001226  000001           CMPB    $ENV,#1         ;;ARE WE RUNNING UNDER APT?
004076  001406                           BEQ     70$             ;;BRANCH IF YES
004100  023727  001154  000176           CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
004106  001005                           BNE     71$             ;;BRANCH IF NO
004110  104406                           GTSWR                   ;;GET SOFT-SWR SETTINGS
004112  000403                           BR      71$
004114  112737  000001  001150  70$:     MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
004122                           71$:
 32
 33                              ;THE FOLLOWING FINDS OUT THE PROGRAM CONTROL MODE:
 34                              ;PAPER TAPE (MANUAL), ACT11, XXDP CHAIN OR DUMP
 35
 36 004122  005037  001430               CLR     XXDP            ;CLEAR 'XXDP' LOAD DEVICE STORAGE
 37 004126  122737  177777  000041       CMPB    #-1,@#41        ;LOADED FROM AN RP07 ? (UNKNOWN)
 38 004134  001121                       BNE     3$              ;BR IF NOT
 39 004136  013737  000040  001430       MOV     @#40,XXDP       ;GET DEVICE INDICATOR AND NUMBER
 40 004144  122737  000007  001430       CMPB    #7,XXDP         ;IS IT A VALID NUMBER ?
 41 004152  103002                       BHIS    1$              ;YES
 42 004154  105037  001430               CLRB    XXDP            ;NO, DEFAULT TO DRIVE 0
 43 004160  005737  000042       1$:     TST     @#42            ;CHAIN MODE OR ACT11 AUTO ACCEPT ?
 44 004164  001425                       BEQ     2$              ;BR IF NEITHER
 45 004166  104401  004174               TYPE    ,73$            ;;TYPE ASCIZ STRING
004172  000412                           BR      72$             ;;GET OVER THE ASCIZ
                                 ;;73$:  .ASCIZ  <CRLF>/NOT TESTING DRIVE /
004220                           72$:
 46 004220  005046                       CLR     -(SP)           ;CLEAR WORD ON STACK
 47 004222  113716  001430               MOVB    XXDP,(SP)       ;GET DRIVE ADDRESS
 48 004226  104403                       TYPOS                   ;TYPE THE ADDRESS
 49 004230     001                       .BYTE   1               ;ONLY 1 CHARACTER
 50 004231     000                       .BYTE   0               ;SUPRESS LEADING ZEROS
 51 004232  104401  001203               TYPE    ,$CRLF          ;CR-LF
 52 004236  000460                       BR      3$              ;GET NUMBER OF DRIVES
```

```
                                                2$:     INC     #-1             ;FIRST TIME THRU HERE ?
                                                        BNE     3$              ;NO
                                                        TYPE    ,75$            ;;TYPE ASCIZ STRING
                                                        BR      74$             ;;GET OVER THE ASCIZ
                                                ;;75$:  .ASCIZ  <CRLF>/TO TEST DRIVE /
                                                74$:
                                                        CLR     -(SP)           ;CLEAR WORD ON STACK
                                                        MOVB    XXDP,(SP)       ;GET DRIVE ADDRESS
                                                        TYPOS                   ;TYPE DRIVE ADDRESS
                                                        .BYTE   1               ;ONLY 1 CHARACTER
                                                        .BYTE   0               ;SUPRESS LEADING ZEROS
                                                        TYPE    ,76$            ;;TYPE ASCIZ STRING
                                                        BR      3$              ;;GET OVER THE ASCIZ
                                                ;;76$:  .ASCIZ  /, HALT PROGRAM, CLEAR LOC. 40 AND RESTART PROGRAM./<CRLF>
                                                3$:
                                                        JSR     PC,$TKINT       ;TURN ON THE KEYBOARD INTERRUPT
                                                        TSTB    $ENV            ;RUN UNDER APT MODE
                                                        BEQ     5$              ;NO,DO NOT BOTHER
                                                        TSTB    $VECT1          ;NEW VECTOR ?
                                                        BEQ     4$              ;NOT LOAD IF = 0
                                                        MOVB    $VECT1,$RPVEC   ;NEW VECTOR
                                                4$:     TST     $BASE           ;NEW BASE ADDRESS ?
                                                        BEQ     6$              ;NO
                                                        MOV     $BASE,$RPADR    ;NEW BASE ADDRESS
                                                        BR      6$

                                                5$:     TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
                                                        BNE     6$              ;YES
                                                        JSR     PC,BUSADR       ;CHECK RHXX/RP07 BUS ADDRESS
                                                6$:     MOV     $RPADR,RPADR    ;LOAD ADDRESS INTO DRIVER
                                                        MOV     $RPVEC,RPVEC    ;LOAD VECTOR INTO DRIVER
                                                        CLR     STATIN          ;CLEAR PERFORMANCE SUMMARY TYPEOUT FLAG
                                                        MOV     #ORDERQ,R5      ;START OF AREA TO CLEAR
                                                7$:     CLR     (R5)+
                                                        CMP     #BLKADR,R5      ;LOOK FOR END OF CLEAR AREA
                                                        BNE     7$              ;BR IF NOT FINISHED
                                                        MOV     #STACK,SP       ;SETUP THE STACK POINTER
                                                        CLR     PS              ;CLEAR THE PROCESSOR STATUS WORD
                                                        MOV     HERTZ,ONESEC    ;RESTORE ONE SECOND COUNTER VALUE
                                                        CLR     HOUR            ;CLEAR THE HOUR'S COUNTER
                                                        CLR     MINUTE          ;CLEAR THE MINUTE'S COUNTER
                                                        CLR     SECOND          ;CLEAR THE SECOND'S COUNTER
                                                        CLR     INTRVL+2        ;CLEAR INTERVAL COUNTER
                                                        MOV     CMPTIM,CMPTIM+2 ;INIT COMPARE TIME COUNTER
                                                        CLR     CFLAG           ;CLEAR THE 'CONTROL C' FLAG
                                                        CLR     DRIVE0+$FIRST   ;RESET $FIRST FLAG FOR DRIVE 0
                                                        CLR     DRIVE1+$FIRST   ;RESET $FIRST FLAG FOR DRIVE 1
                                                        CLR     DRIVE2+$FIRST   ;RESET $FIRST FLAG FOR DRIVE 2
                                                        CLR     DRIVE3+$FIRST   ;RESET $FIRST FLAG FOR DRIVE 3
                                                        CLR     DRIVE4+$FIRST   ;RESET $FIRST FLAG FOR DRIVE 4
                                                        CLR     DRIVE5+$FIRST   ;RESET $FIRST FLAG FOR DRIVE 5
                                                        CLR     DRIVE6+$FIRST   ;RESET $FIRST FLAG FOR DRIVE 6
                                                        CLR     DRIVE7+$FIRST   ;RESET $FIRST FLAG FOR DRIVE 7
                                                        CLR     RDONLY          ;ASSUME READ/WRITE CONDITION
                                                        BIT     #SW0,@SWR       ;IS EXERCISER IN 'READ ONLY' MODE ?
                                                        BEQ     8$              ;BR IF NO
```

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                                                8$:     INC     RDONLY          ;LOCK PROGRAM IN 'READ ONLY' MODE

                                                ;SEE IF OPERATOR WANTS HELP TEXT PRINTED

                                                        TSTB    $AUTOB          ;AUTO MODE ?
                                                        BNE     13$             ;BR IF YES
                                                        INC     #-1             ;FIRST TIME THRU HERE ?
                                                        BNE     13$             ;BR IF NO

                                                9$:     TYPE    ,MSHELP         ;TYPE 'TYPE HELP MESSAGE (L) N ? '
                                                        RDLIN                   ;READ THE ENTRY
                                                        MOV     (SP)+,R0        ;SAVE ADDRESS OF RESPONSE
                                                        TST     CFLAG           ;WAS (^C) TYPED?
                                                        BNE     10$             ;BR IF YES
                                                        TSTB    (R0)            ;WAS RESPONSE A CARRIAGE RETURN ?
                                                        BEQ     11$             ;BR IF YES (DEFAULT)
                                                        TSTB    1(R0)           ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
                                                        BNE     10$             ;BR IF NO
                                                        CMPB    #'Y,(R0)        ;WAS IT A 'Y' RESPONSE ?
                                                        BEQ     12$             ;BR IF YES
                                                        CMPB    #'N,(R0)        ;WAS IT A 'N' RESPONSE ?
                                                        BEQ     13$             ;BR IF YES
                                                10$:    TYPE    ,BADENT         ;TYPE BAD ENTRY MESSAGE
                                                        BR      9$              ;TRY AGAIN
                                                11$:    TYPE    ,NODFLT         ;TYPE 'NO DEFAULT'
                                                        BR      9$              ;TRY AGAIN
                                                12$:    TYPE    ,HELPTX         ;TYPE HELP TEXT MESSAGE
                                                13$:

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

                                                SIZE70: CLR     RHEXT           ;CLEAR RPBAE OFFSET
                                                        BIC     #174000,$CPUOP  ;CLEAR CPU TYPE REGISTER
                                                        MOV     ERRVEC,-(SP)    ;SAVE CONTENTS OF ERROR VECTOR
                                                        MOV     #2$,ERRVEC      ;SETUP 'TRAP' RETURN ADDRESS
                                                        MOV     $RPADR,R0       ;GET RPCS1 ADDRESS
                                                        ADD     #50,R0          ;GET REGISTER OFFSET FOR RH70
                                                        MOV     #10.,R1         ;GET NUMBER OF REGISTERS TO CHECK
                                                        TST     (R0)+           ;TRAP IF NOT A VALID RPBAE
                                                        TST     (R0)+           ;TRAP IF NOT A VALID RPCS3
                                                        MOV     #50,RHEXT       ;LOAD OFFSET FOR RPBAE (22 REGISTER RH)
                                                1$:     TST     (R0)+           ;TRAP IF NOT A VALID REGISTER
                                                        DEC     R1              ;DONE WITH ALL 32 REGISTERS ?
                                                        BNE     1$              ;BR IF NO
                                                        MOV     #74,RHEXT       ;LOAD OFFSET FOR RPBAE (32 REGISTER RH)
                                                        BR      3$
                                                2$:     MOV     #3$,(SP)        ;SETUP RETURN ADDRESS
                                                        RTI

                                                3$:     MOV     $RPADR,R0       ;GET RPCS1 REGISTER
                                                        MOV     RHEXT,R1        ;GET RPBAE REGISTER OFFSET
                                                        BEQ     4$              ;BR IF NONE
                                                        ADD     R0,R1           ;GET RPBAE REGISTER
                                                        BIS     #A17!A16,(R0)   ;SET EXTENDED ADDRESS BITS IN RPCS1
                                                        CMP     #3,(R1)         ;ARE THE EXTENDED BITS SET IN RPBAE ?
```

```
                                        BNE     4$              ;BR IF NO
                                        CLR     (R1)            ;CLEAR EXTENDED ADDRESS BITS IN RPBAE
                                        MOV     (R0),-(SP)      ;SAVE RPCS1 REG CONTENTS
                                        BIC     #^C<A17!A16>,(SP)+      ;ARE THE EXTEND BITS CLEAR IN RPCS1 ?
                                        BNE     4$              ;BR IF NO
                                        BIS     #BIT13!BIT12,$CPUOP     ;SET THE 11/70 CPU TYPE CODE
                                4$:     MOV     (SP)+,ERRVEC    ;RESTORE CONTENTS OF ERROR VECTOR

                                ;ROUTINE TO DETERMINE BUFFER MAX WORD COUNT

                                SIZMEM: INC     #-1             ;FIRST TIME THRU HERE ?
                                        BNE     1$              ;BR IF NO
                                        JSR     PC,$SIZE        ;SEE HOW MUCH MEMORY ON SYSTEM
                                        MOV     $LSTAD,LSTAD    ;SAVE THE LAST ADDRESS
                                1$:     MOV     #1,BUFTBL       ;LOAD NUMBER OF BUFFERS
                                        MOV     #ENDPGM,BUFTBL+2        ;STARTING ADDRESS OF BUFFER
                                        MOV     LSTAD,BUFTBL+4  ;LAST ADDR TO BUFFER ALLOCATION TABLE
                                        CMP     LSTAD,#160000   ;OVER 28K ?
                                        BLOS    2$              ;NO
                                        MOV     #160000,BUFTBL+4        ;XXDP MAX MEMORY 28K
                                2$:     SUB     #ENDPGM,BUFTBL+4        ;SUBTRACT PROGRAM SPACE
                                        CLC                     ;CLEAR THE 'C' BIT
                                        ROR     BUFTBL+4        ;CONVERT TO WORD COUNT
                                        TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
                                        BEQ     3$              ;BR IF NO
                                        SUB     #1536.,BUFTBL+4 ;SUBTRACT 'XXDP' LOADER SIZE (1.5K WORDS)
                                3$:     CMP     WRDCNT,BUFTBL+4 ;IS MAX WORD COUNT TOO LARGE ?
                                        BLE     4$              ;BR IF NO
                                        MOV     BUFTBL+4,WRDCNT ;USE MAX AVAIL MEMORY AS MAX WRD CNT
                                        MOV     WRDCNT,PARLST+2 ;VALUE FOR THE PARAMETER TABLE
                                4$:

                                ;SEE IF THE OPERATOR WANTS TO CHANGE ANY PARAMETERS

                                LKPAR:  TST     PWRFLG          ;RETURNING FROM POWER FAIL ?
                                        BNE     SETVEC          ;BRANCH IF YES
                                        TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
                                        BEQ     1$              ;BR IF NO
                                        BIT     #SW02,@SWR      ;DOES USER WANT MANUAL INTERVENTION ?
                                        BEQ     8$              ;BR IF YES

                                1$:     CLR     CFLAG           ;CLEAR CONTROL C FLAG
                                        TYPE    ,MESFE          ;TYPE 'DO YOU WANT TO WRITE ANYWHERE ON MEDIA (L) N ?'
                                        RDLIN                   ;READ THE ENTRY
                                        MOV     (SP)+,R0        ;SAVE ADDRESS OF RESPONSE
                                        TST     CFLAG           ;WAS IT CONTROL C ?
                                        BNE     LKPAR           ;BR IF YES
                                        TSTB    (R0)            ;WAS RESPONSE A CARRIAGE RETURN ?
                                        BEQ     8$              ;BR IF YES
                                        TSTB    1(R0)           ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
                                        BNE     2$              ;BR IF NO
                                        CMPB    #'Y,(R0)        ;WAS IT A 'Y' RESPONSE ?
                                        BEQ     3$              ;BR IF YES
                                        CMPB    #'N,(R0)        ;WAS IT A 'N' RESPONSE ?
                                        BEQ     8$              ;BR IF YES
                                2$:     TYPE    ,BADENT         ;TYPE BAD ENTRY MESSAGE
                                        BR      LKPAR           ;TRY AGAIN
```

```
                                                ;PROGRAM RUNNING IN READ ONLY MODE ?
                                                ;BR IF YES

                                                ;CLEAR CONTROL C FLAG
                                                ;TYPE '   ! CUSTOMER DATA WILL BE OVERWRITTEN !
                                                ;                 -----------------------------------
                                                ;CONTINUE (L)  ?'
                                                ;READ THE ENTRY
                                                ;SAVE ADDRESS OF RESPONSE
                                                ;WAS IT CONTROL C ?
                                                ;BR IF YES
                                                ;WAS RESPONSE A CARRIAGE RETURN ?
                                                ;BR IF YES
                                                ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
                                                ;BR IF NO
                                                ;WAS IT A 'Y' RESPONSE ?
                                                ;BR IF YES
                                                ;WAS IT A 'N' RESPONSE ?
                                                ;BR IF YES
                                                ;TYPE BAD ENTRY MESSAGE
                                                ;TRY AGAIN
                                                ;TYPE 'NO DEFAULT'
                                                ;TRY AGAIN
                                                ;ENABLE TEST ANYWHERE OPTION
                                                ;TYPE '* TESTING WILL OCCUR ON FE CYLINDER ONLY *'

                                                ;IS PROGRAM LOCKED IN ''READ ONLY'' MODE ?
                                                ;BR IF NO
                                                ;TYPE '* PROGRAM IS LOCKED IN 'READ ONLY' MODE *'

                                                ;CLEAR CONTROL C FLAG
                                                ;RUNNING IN AUTO MODE ?
                                                ;BR IF YES
                                                ;TYPE 'CHANGE PARAMETERS ?'
                                                ;READ THE ENTRY
                                                ;SAVE ADDRESS OF RESPONSE
                                                ;WAS (^C) TYPED?
                                                ;BR IF YES
                                                ;WAS RESPONSE A CARRIAGE RETURN (DEFAULT 'N')?
                                                ;BR IF YES
                                                ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
                                                ;BR IF NO
                                                ;WAS IT A 'Y' RESPONSE ?
                                                ;BR IF YES
                                                ;WAS IT A 'N' RESPONSE ?
                                                ;BR IF YES
                                                ;TYPE BAD ENTRY MESSAGE
                                                ;TRY AGAIN

                                                ;PARAMETER TABLE ADDRESS
                                                ;GET THE PARAMETER ENTRY
                                                ;IS THE 'WRDCNT' VALUE OK ?
                                                ;BR IF IT IS
                                                ;SET 'WRDCNT' TO THE MINIMUM VALUE
```

229	005354	005737	001424		3$:	TST	RDONLY	
230	005360	001032				BNE	7$	
231								
232	005362	005037	001334		4$:	CLR	CFLAG	
233	005366	1044C1	060307			TYPE	,OVRWRT	
234								
235								
236	005372	104411				RDLIN		
237	005374	012600				MOV	(SP)+,R0	
238	005376	005737	001334			TST	CFLAG	
239	005402	001321				BNE	LKPAR	
240	005404	1C5710				TSTB	(R0)	
241	005406	001414				BEQ	6$	
242	005410	105760	000001			TSTB	1(R0)	
243	005414	001006				BNE	5$	
244	005416	122710	000131			CMPB	#'Y,(R0)	
245	005422	001411				BEQ	7$	
246	005424	122710	000116			CMPB	#'N,(R0)	
247	005430	001411				BEQ	8$	
248	005432	104401	060103		5$:	TYPE	,BADENT	
249	005436	000751				BR	4$	
250	005440	104401	057017		6$:	TYPE	,NODFLT	
251	005444	000746				BR	4$	
252	005446	005237	001422		7$:	INC	TSTANY	
253	005452	000402				BR	9$	
254	005454	104401	060451		8$:	TYPE	,FEONLY	
255								
256	005460	005737	001424		9$:	TST	RDONLY	
257	005464	001402				BEQ	13$	
258	005466	104401	060526			TYPE	,MREAD	
280								
281	005472	005037	001334		13$:	CLR	CFLAG	
283	005476	105737	001150			TSTB	$AUTOB	
284	005502	001040				BNE	SETVEC	
286	005504	104401	060706			TYPE	,ASKPAR	
287	005510	104411				RDLIN		
288	005512	012600				MOV	(SP)+,R0	
289	005514	005737	001334			TST	CFLAG	
290	005520	001364				BNE	13$	
291	005522	105710				TSTB	(R0)	
292	005524	001427				BEQ	SETVEC	
293	005526	105760	000001			TSTB	1(R0)	
294	005532	001006				BNE	14$	
295	005534	122710	000131			CMPB	#'Y,(R0)	
296	005540	001406				BEQ	ENTPR	
297	005542	122710	000116			CMPB	#'N,(R0)	
298	005546	001416				BEQ	SETVEC	
299	005550	104401	060103		14$:	TYPE	,BADENT	
300	005554	000746				BR	13$	
301	005556				15$:			
302								
303	005556	012703	060604		ENTPR:	MOV	#PARLST,R3	
304	005562	004737	031110			JSR	PC,PARENT	
305	005566	023727	001466	000006		CMP	WRDCNT,#6	
306	005574	103003				BHIS	SETVEC	
307	005576	012737	000006	001466		MOV	#6,WRDCNT	
308								

```
                                        ;DISPLAY DRIVE STATUS AND SET UP THE OTHER SYSTEM DEVICES THAT
                                        ;THE PROGRAM WILL USE. PROGRAM RETURN HERE ON POWER FAIL

005604  004737  024514        SETVEC: JSR     PC,CKCLK        ;START THE CLOCK
005610  004737  040572                JSR     PC,RPINIT       ;INITIALIZE THE RP07 DRIVER
005614  012737  177777  040522        MOV     #-1,SAVEFG      ;SET THE SAVE REGISTERS FLAG
005622  005227  177777                INC     #-1             ;FIRST TIME THRU ?
005626  001407                        BEQ     1$              ;BR IF YES
005630  005737  040020                TST     PWRFLG          ;RETURNING FROM POWER FAIL ?
005634  001004                        BNE     1$              ;BRANCH IF YES
005636  032777  000004  173310        BIT     #SW02,@SWR      ;TYPEOUT THE DRIVE STATUS TABLE ?
005644  001113                        BNE     12$             ;BR IF NOT
005646  005004                1$:     CLR     R4              ;DRIVE TABLE POINTER
005650  104401  057033                TYPE    ,DRSTAT         ;TYPE 'DRIVE STATUS'
005654  104401  001203        2$:     TYPE    ,$CRLF          ;CR-LF
005660  010446                        MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                                ;;TYPE DRIVE NUMBER
005662  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
005664     002                        .BYTE   2               ;;TYPE 2 DIGIT(S)
005665     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
005666  104401  056526                TYPE    ,BLNKS4         ;TYPE 4 BLANKS
005672  105764  040454                TSTB    DRVSTA(R4)      ;CHECK DRIVE'S STATUS
005676  100416                        BMI     5$              ;BR IF UNSAFE
005700  001020                        BNE     6$              ;BR IF ONLINE

005702  105764  040464                TSTB    DRVTYP(R4)      ;SEE IF OFFLINE OR NONEXISTENT
005706  001404                        BEQ     3$              ;BR IF NONEXISTENT
005710  100006                        BPL     4$              ;BR IF OFFLINE
005712  104401  056700                TYPE    ,NOTRP          ;DRIVE NOT AN RP07
005716  000460                        BR      11$             ;CHECK NEXT DRIVE

005720  104401  056715        3$:     TYPE    ,NOTPRS         ;DRIVE NOT PRESENT
005724  000455                        BR      11$             ;CHECK NEXT DRIVE

005726  104401  056607        4$:     TYPE    ,UNTOFF         ;DRIVE OFFLINE
005732  000416                        BR      8$              ;PRINT DRIVE TYPE

005734  104401  056751        5$:     TYPE    ,NOTSAF         ;DRIVE UNSAFE
005740  000413                        BR      8$              ;PRINT DRIVE TYPE

005742  005737  001430        6$:     TST     XXDP            ;LOADED FROM THIS DEVICE ?
005746  001406                        BEQ     7$              ;BR IF NO
005750  123704  001430                CMPB    XXDP,R4         ;LOADED FROM THIS DRIVE ?
005754  001003                        BNE     7$              ;BR IF NO
005756  104401  056761                TYPE    ,LODEV          ;TYPE 'LOAD DEVICE'
005762  000436                        BR      11$
005764  104401  056620        7$:     TYPE    ,UNTON          ;DRIVE ONLINE
005770  104401  056530        8$:     TYPE    ,BLNKS2         ;TYPE 2 BLANKS
005774  005000                        CLR     R0
005776  116400  040464                MOVB    DRVTYP(R4),R0   ;GET DRIVE TYPE
006002  012737  057075  006026        MOV     #$RP07,10$      ;ASSUME ADDRESS OF RP07 MESSAGE
006010  122700  000005                CMPB    #5,R0           ;IS DEVICE AN RP07 ?
006014  001403                        BEQ     9$              ;TYPE IT IF YES
006016  012737  057102  006026        MOV     #$RP07P,10$     ;ASSUME ADDRESS OF RP07+ MESSAGE

006024  104401                9$:     TYPE                    ;TYPE THE DRIVE TYPE MESSAGE
006026  000000                10$:    .WORD   0               ;MESSAGE ADDRESS HERE
```

```
365
366 006030  006304                          ASL     R4                  ;CHANGE TO WORD INDEX
367 006032  016402  002056                  MOV     BLKADR(R4),R2       ;GET BASE ADDRESS
368 006036  006204                          ASR     R4                  ;CHANGE TO BYTE INDEX
369 006040  004737  045262                  JSR     PC,SVRHXX           ;SAVE ALL REGISTERS
370 006044  032762  000004  000200          BIT     #ILV,$RPDS(R2)      ;INTERLEAVE SECTOR SET ?
371 006052  001002                          BNE     11$                 ;BR IF YES
372 006054  104401  056776                  TYPE    ,NINLEV             ;TYPE NON-INTERLEAVED MESSAGE
373
374 006060  005204                  11$:    INC     R4                  ;INCREMENT DRIVE NUMBER/TABLE POINTER
375 006062  020427  000010                  CMP     R4,#8.              ;FINISHED ?
376 006066  001272                          BNE     2$                  ;BR IF NOT
377 006070  104401  001203                  TYPE    ,$CRLF              ;CR-LF
378 006074                          12$:
```

```
                                        ;INITIALIZE PROGRAM PARAMETERS FOR STARTUP
                                        
006074  004737  033430          STA:    JSR     PC,$TKINT       ;INITIALIZE THE KEYBOARD INTERRUPT HANDLER
006100  012737  142200  001446          MOV     #142200,ENDCON  ;INITIALIZE NORMAL XFER COUNT(LSB)
006106  012737  007540  001450          MOV     #7540,ENDCON+2  ;(MSB)
006114  032777  001000  173032          BIT     #SW9,@SWR       ;DO YOU WANT SHORT RUN TIME (SW9=1) ?
006122  001406                          BEQ     1$              ;BR IF NO
006124  012737  030440  001446          MOV     #030440,ENDCON  ;INITIALIZE (1/4 OF NORMAL) XFER COUNT(LSB)
006132  012737  001730  001450          MOV     #1730,ENDCON+2  ;(MSB)
                                        
006140  105737  001226          1$:     TSTB    $ENV            ;APT SCRIPT MODE ?
006144  001406                          BEQ     2$              ;NO
006146  012737  006110  001446          MOV     #006110,ENDCON  ;INITIALIZE (1/16 OF NORMAL) XFER COUNT(LSB)
006154  012737  000366  001450          MOV     #366,ENDCON+2   ;(MSB)
                                        
006162  105737  001150          2$:     TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
006166  001003                          BNE     3$              ;BR IF YES
006170  005737  001332                  TST     CHGADR          ;START AT 200 ?
006174  003454                          BLE     8$              ;NO
                                        
006176  005001          3$:     CLR     R1              ;DRIVE #
006200  005002                  CLR     R2              ;AVAIL TABLE INDEX
006202  005003                  CLR     R3              ;DRIVE# * 2
006204  005737  001430          4$:     TST     XXDP            ;LOADED FROM THIS DEVICE ?
006210  001403                          BEQ     5$              ;BR IF NO
006212  123701  001430                  CMPB    XXDP,R1         ;LOADED FROM THIS DRIVE ?
006216  001433                          BEQ     7$              ;BR IF YES
006220  105761  040454          5$:     TSTB    DRVSTA(R1)      ;DRIVE ON LINE ?
006224  003430                          BLE     7$              ;NO
006226  016300  002056                  MOV     BLKADR(R3),R0   ;LOAD DPB ADDRESS
006232  004737  030104                  JSR     PC,CLRDPB       ;CLEAR DPB BLOCK
006236  004737  031010                  JSR     PC,GETID        ;GET DRIVE SERIAL NUMBER
006242  032760  000004  000200          BIT     #ILV,$RPDS(R0)  ;INTERLEAVE SECTOR SET ?
006250  001402                          BEQ     6$              ;BR IF NO
006252  010062  001566                  MOV     R0,NEWUNT(R2)   ;LOAD DPB ADDRESS TO ABAIL QUEUE
006256  004737  030322          6$:     JSR     PC,DRVPRM       ;SETUP DRIVE PARAMETER LIMITS
006262  005737  040020                  TST     PWRFLG          ;RETURNING FROM POWER FAIL ?
006266  001007                          BNE     7$              ;BRANCH IF YES
006270  005060  000132                  CLR     $FIRST(R0)      ;RESET $FIRST FLAG FOR FIRST 204 START
006274  112760  177776  000026          MOVB    #-2,$PACK(R0)   ;SETUP COMMAND 'WT' (WRITE DATA AND TEST)
006302  004737  020250                  JSR     PC,SEQPAR       ;SETUP SEQUENTIAL PARAMETERS FOR WRITE
                                        
006306  022322          7$:     CMP     (R3)+,(R2)+     ;INCREMENT INDEX
006310  005201                  INC     R1              ;NEXT DRIVE
006312  020127  000007                  CMP     R1,#7           ;ALL DRIVES ASSIGNNED ?
006316  003732                          BLE     4$              ;NO
006320  005037  001332                  CLR     CHGADR          ;CLEAR START FLAG
006324  000403                          BR      9$
                                        
006326  012737  000001  001334  8$:     MOV     #1,CFLAG        ;DUMMY 'CONTROL C' FLAG
006334  005037  040020          9$:     CLR     PWRFLG          ;CLEAR POWER FAIL FLAG
```

```
                                .SBTTL  MAIN PROGRAM
                        
006340  005737  001334        MAIN:   TST     CFLAG           ;WAS (^C) TYPED?
006344  001407                        BEQ     3$              ;BR IF NO
006346  005737  001520        1$:     TST     ORDERQ          ;ANY DRIVES IN ORDER QUE ?
006352  001402                        BEQ     2$              ;BR IF NO, ELSE
006354  000137  007234                JMP     IDLE            ;LET ALL DRIVES FINISH ORDER
006360  004737  026454        2$:     JSR     PC,KSR          ;SERVICE THE KEYBOARD
006364                          3$:
                        
                                ;CHECK FOR DRIVES TO BE DROPPED
                        
006364  012703  000010        MAINDA: MOV     #8.,R3          ;DRIVE COUNTER
006370  012705  001544                MOV     #DDRVS,R5       ;ADDRESS OF 'DROPPED DRIVE' TABLE
006374  005715                1$:     TST     (R5)            ;SEE IF ENTRY AT PRESENT POSITION
006376  001004                        BNE     3$              ;BR IF THERE IS ONE
006400  005725                2$:     TST     (R5)+           ;INCREMENT TO NEXT TABLE POSITION
006402  005303                        DEC     R3              ;DECREMENT DRIVE COUNTER
006404  001373                        BNE     1$              ;BR IF MORE TO CHECK
006406  000437                        BR      MAIN1           ;GO CHECK FOR NEW ASSIGNED DRIVES
                        
006410  012701  001610        3$:     MOV     #AVAIL,R1       ;ADDRESS OF 'AVAILABLE DRIVES' TABLE
006414  005711                4$:     TST     (R1)            ;IF AT END OF 'AVAIL' TABLE ?
006416  001404                        BEQ     5$              ;BR IF YES
006420  021115                        CMP     (R1),(R5)       ;IS DRIVE IN 'AVAIL' THE TABLE ?
006422  001412                        BEQ     7$              ;BR IF YES
006424  005721                        TST     (R1)+           ;NO, INCREMENT 'AVAIL' TABLE ADDRESS
006426  000772                        BR      4$              ;AND CONTINUE LOOKING
                        
006430  012701  001632        5$:     MOV     #WAIT,R1        ;ADDRESS OF THE 'WAIT' BUFFER TABLE
006434  005711                6$:     TST     (R1)            ;AT THE END OF 'WAIT' TABLE ?
006436  001760                        BEQ     2$              ;BR IF YES
006440  021115                        CMP     (R1),(R5)       ;IS DRIVE IN THE 'WAIT' TABLE ?
006442  001402                        BEQ     7$              ;BR IF YES
006444  005721                        TST     (R1)+           ;NO, INCREMENT 'WAIT' TABLE ADDRESS
006446  000772                        BR      6$              ;AND CONTINUE LOOKING
                        
006450  011100                7$:     MOV     (R1),R0         ;PUT THE DRIVE'S BLOCK ADDRESS IN R0
006452  104401  001203                TYPE    ,$CRLF          ;CR-LF
006456  004737  026146                JSR     PC,$TIME        ;TYPE ELAPSED TIME
006462  104401  057321                TYPE    ,DASH5          ;TYPE '-----'
006466  104401  057357                TYPE    ,MSGDRP         ;TYPE 'DROPPED, '
006472  004737  025042                JSR     PC,ONESUM       ;TYPE ONE DRIVE SUMMARY
006476  005015                        CLR     (R5)            ;CLEAR THE 'DROP DRIVE' TABLE ENTRY
006500  004737  022200                JSR     PC,CMPRES       ;COMPRESS THE RESPECTIVE TABLE
006504  000735                        BR      2$              ;SEE IF ANY MORE DRIVES
                        
                                ;LOOK FOR DRIVES TO BE ASSIGNED
                        
006506  012703  000010        MAIN1:  MOV     #8.,R3          ;DRIVE COUNT
006512  005001                        CLR     R1              ;ASSIGN LIST INDEX
006514  005002                        CLR     R2              ;'AVAIL' INDEX
006516  005005                        CLR     R5              ;NEW DRIVE INDEX
006520  005765  001566        1$:     TST     NEWUNT(R5)      ;NEW DRIVE IN THIS POSITION
006524  001005                        BNE     3$              ;BR IF THERE IS
006526  005725                2$:     TST     (R5)+           ;INCREMENT R5
006530  005201                        INC     R1              ;INCREMENT ASSIGN INDEX
```

```
                                                DEC     R3              ;DECREMENT DRIVE COUNT
                                                BNE     1$              ;BR IF MORE DRIVES
                                                BR      MAIN2           ;START OPERATIONS FOR THE AVAILABLE DRIVES

                                        3$:     TYPE    ,$CRLF          ;CR-LF
                                                TYPE    ,DRVMSG         ;'DRIVE'
                                                MOV     R1,-(SP)        ;;SAVE R1 FOR TYPEOUT
                                                                        ;;TYPE DRIVE NUMBER
006552  104403                                  TYPOS                   ;;GO TYPE--OCTAL ASCII
006554      002                                 .BYTE   2               ;;TYPE 2 DIGIT(S)
006555      000                                 .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                TYPE    ,COMMA          ;TYPE ','
                                                TYPE    ,BLNKS1         ;TYPE 1 BLANK
                                                MOV     NEWUNT(R5),R0   ;PUT ADDRESS OF DPB IN R0
                                                JSR     PC,TYPDRV       ;TYPE DRIVE SERIAL NUMBER
                                                TYPE    ,ASGND          ;'STARTED'
                                        4$:     TST     AVAIL(R2)       ;AT END OF AVAILABLE TABLE
                                                BEQ     5$              ;BR IF YES
                                                TST     (R2)+           ;INCREMENT AVAILABLE TABLE INDEX
                                                BR      4$              ;CONTINUE LOOKING FOR END OF TABLE
                                        5$:     MOV     NEWUNT(R5),AVAIL(R2)    ;MOVE ADDR OF DRIVE INTO AVAIL LST
                                                CLR     NEWUNT(R5)      ;TAKE DRIVE OUT OF NEW DRIVE TABLE
                                                BISB    ATABIT(R1),ASNLST       ;SET DRIVE ASSIGNED INDICATOR
                                                CLR     AUTLST          ;CLEAR AUTO ASSIGN
                                                TST     (R2)+           ;INCREMENT AVAILABLE TABLE POINTER
                                                BR      2$              ;LOOK FOR MORE DRIVES

                                        ;GET PARAMETERS, BUFFER SPACE, AND START ORDERS FOR DRIVES IN
                                        ;THE 'AVAILABLE' QUEUE

                                        MAIN2:  CLR     R2              ;START FROM THE FIRST LOCATION
                                                TSTB    ASNLST          ;ANY DRIVES ACTIVE ?
                                                BNE     2$              ;BR IF YES
                                                TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
                                                BNE     1$              ;BR IF YES
                                                MOV     #1,CFLAG        ;DUMMY 'CONTROL C' FLAG
                                                MOV     HERTZ,ONESEC    ;RESTORE ONE SECOND COUNTER VALUE
                                                CLR     HOUR            ;CLEAR THE HOUR'S COUNTER
                                                CLR     MINUTE          ;CLEAR THE MINUTE'S COUNTER
                                                CLR     SECOND          ;CLEAR THE SECOND'S COUNTER
                                                CLR     INTRVL+2        ;CLEAR INTERVAL COUNTER
                                                MOV     CMPTIM,CMPTIM+2 ;INIT COMPARE TIME COUNTER
                                                TYPE    ,NODRVS         ;TYPE 'NO DRIVES ASSIGNED'
                                        1$:     JMP     $GET42          ;GIVE CONTROL TO MONITOR

                                        2$:     TST     WAIT(R2)        ;ANY DRIVES WAITING FOR THE BUFFER ?
                                                BEQ     5$              ;BR IF NO
                                                MOV     WAIT(R2),R0     ;LOAD R0 WITH THE DPB ADDRESS
                                                CLR     -(SP)           ;CLEAR THE STACK FOR BUFFER REQ
                                                JSR     PC,GETBUF       ;CALL TO GET THE BUFFER RT.
                                                MOV     (SP)+,$BUF(R0)  ;IF 0,BUFFER IS STILL NOT AVAILABLE
                                                BEQ     4$              ;BRANCH IF NO BUFFER AVAILABLE
                                                CLR     $NEXT(R0)       ;CLEAR PARAMETER SELECT FLAG
                                                CLR     $FAIR(R0)       ;CLEAR THE FAIR FLAG

                                                JSR     PC,FILBUF       ;FILL THE BUFFER
                                                JSR     PC,GODRIV       ;SET COMMAND AND GO
```

```
                                                        ;PUT THE WAIT QUE INTO ORDER QUE
                                                        ;QUE AVAILABLE ?
                                                        ;BR IF NO
                                                        ;LOAD THE DPB ADDRESS INTO THE ORDER QUE
                                                        ;REMOVE THE DRIVE FROM THE 'WAIT' QUE
                                                        ;OFFSET THE QUE POSITION
                                                        ;COMPRESS THE QUE
                                                        ;BRANCH IF DONE
                                                        ;CHECK THE NEXT QUE
                                                        ;LOOPING BACK

                                                        ;ANY OUTSTANDING ORDERS ?
                                                        ;BR IF YES

                                                        ;CLEAR DRIVE TABLE POINTER
                                                        ;ANY DRIVES WAITING FOR PARAMETERS
                                                        ;BRANCH IF ANY
                                                        ;BRANCH IF NONE
                                                        ;CONTROL BLOCK ADDR IN R0
                                                        ;PARAMETERS BEEN SELECTED ?
                                                        ;BR IF THEY HAVE
                                                        ;'T' COMMAND FOR THIS DRIVE ?
                                                        ;BR IF YES
                                                        ;GET SEQUENTIAL PARAMETERS FOR READ OR WRITE
                                                        ;GET THE BUFFER

                                                        ;GO GENERATE THE PARAMETERS
                                                        ;LOAD THE PARAMETERS JUST GENERATED

                                                        ;MAKE ROOM ON THE STACK FOR THE BUFFER ADDR
                                                        ;GET BUFFER
                                                        ;MOVE BUFFER ADDR TO DPB
                                                        ;BR IF '0' ADDR (NO BUFFER)
                                                        ;FILL THE BUFFER
                                                        ;CLEAR PARAMETER SELECT FLAG
                                                        ;CLEAR THE 'FAIRNESS' COUNT

                                                        ;PUT CURRENT DPB IN DRIVER
                                                        ;ADDRESS OF ORDER QUE IN R5
                                                        ;END OF QUE ?
                                                        ;BR IF NOT
                                                        ;PUT BLOCK ADDRESS INTO QUE
                                                        ;CONTINUE LOOKING

                                                        ;INCREMENT THE FAIR COUNT
                                                        ;THREE TIMES,BUFFER IS NOT AVAILABLE?
                                                        ;BRANCH IF NOT OVER THREE TIMES
                                                        ;LOAD INTO THE WAIT QUE
                                                        ;AN AVAILABLE LOCATION ?
                                                        ;BRANCH IF NOT
                                                        ;LOAD INTO WAIT QUE
                                                        ;REMOVE THE DPB FROM AVAILABLE QUE

                                                        ;INCREMENT INDEX
                                                        ;BRANCH BACK TO FIRE NEXT DRIVE
                                                        ;'AVAILABLE' TABLE ADDRESS
                                                        ;FORM ADDRESS OF LAST ENTRY
```

```
                                                JSR     PC,CMPRES       ;COMPRESS THE TABLE
                                                BR      6$              ;CONTINUE LOOKING

                                        ;WAIT FOR A COMMAND TO FINISH

                                IDLE:   MOV     #ORDERQ,R1      ;ADDRESS OF THE ORDER QUE IN R1
                                1$:     MOV     (R1)+,R0        ;PUT BLOCK ADDRESS INTO R0
                                        BEQ     7$              ;BR IF END OF QUE
                                2$:     TST     $STATUS(R0)     ;SEE IF DRIVE FINISHED
                                        BEQ     2$              ;BR IF DRIVE NOT FINISHED
                                        TST     -(R1)           ;BACK UP THE QUE POINTER
                                        MOV     R1,-(SP)        ;SAVE THE QUE ADDRESS
                                        JSR     PC,STATIS       ;ACCUMULATE STATISTICS FOR DRIVE IN R0
                                        JSR     PC,PROCES       ;PROCESS END OF COMMAND
                                        CLR     BADSEC          ;CLEAR THE BAD TRK/SEC ERROR INDICATOR
                                        JSR     PC,ABNRML       ;SEE IF ANY DRIVES HAVE TOO MANY ERRORS
                                                                ;NOW SEE IF WE ARE AT THE END OF A PASS
                                        CMPB    #-1,$PACK(R0)   ;'W' COMMAND FOR THIS DRIVE ?
                                        BEQ     5$              ;BR IF YES
                                        CMPB    #1,$PACK(R0)    ;'R' COMMAND FOR THIS DRIVE ?
                                        BEQ     5$              ;BR IF YES
                                        TST     ENDING          ;WILL THE EOP BE DETERMINED BY # OF SEEKS ?
                                        BEQ     3$              ;BR IF YES
                                        CMP     $RDPAS+2(R0),ENDCON+2   ;IS IT THE EOP BY DATA READ ?
                                        BHI     4$              ;BR IF YES
                                        BLO     5$              ;BR IF NO
                                        CMP     $RDPAS(R0),ENDCON       ;IS IT THE EOP BY DATA READ ?
                                        BLO     5$              ;BR IF NO
                                        BR      4$              ;THIS IS THE END OF PASS

                                3$:     CMP     $SEEKS+2(R0),ENDSEK+2   ;IS IT THE EOP BY SEEKS ?
                                        BHI     4$              ;BR IF YES
                                        BLO     5$              ;BR IF NO
                                        CMP     $SEEKS(R0),ENDSEK       ;IS IT THE EOP BY SEEKS ?
                                        BLO     5$              ;BR IF NO
                                4$:     JSR     PC,$EOP         ;THIS IS THE END OF PASS

                                5$:     MOV     (SP)+,R1        ;RESTORE THE ORDER TABLE INDEX
                                        MOV     #AVAIL,R5       ;ADDRESS OF THE 'AVAIL' TABLE
                                6$:     TST     (R5)+           ;IS IT THE END OF THE 'AVAIL' TABLE ?
                                        BNE     6$              ;BR IF NO
                                        MOV     (R1),-(R5)      ;MOVE THE DPB INTO THE 'AVAIL' TABLE
                                        JSR     PC,CMPRES       ;COMPRESS THE ORDER QUE
                                        JSR     PC,RELBUF       ;RESTORE BUFFER

                                7$:     BIT     #SW02,@SWR      ;TYPE PERFORMANCE SUMMARY
                                        BNE     8$              ;BR IF NOT
                                        TST     STATIN          ;TIME TO TYPE THE PERFORMANCE SUMMARY ?
                                        BEQ     8$              ;BR IF NOT
                                        CLR     STATIN          ;CLEAR THE INDICATOR
                                        TST     ASNLST          ;ANY DRIVES ASSIGNED ?
                                        BEQ     8$              ;BR IF NO
                                        TYPE    ,MSGREP         ;TYPE '/\/\/\/\/-PERFORMANCE REPORT-\/\/\/\/\'
                                        JSR     PC,STATPR       ;TYPE THE SUMMARY
                                        TYPE    ,TRMREP         ;TYPE '/\/\/\/\/\...ETC'

                                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  013746          1$:     JSR     PC,CKERR        ;CHECK ERROR BITS
007540  004737  014046                  JSR     PC,CKBUS        ;CHECK BUS ADDRESS & WORD COUNT
007544  032777  000002  171402          BIT     #SW01,@SWR      ;INHIBIT DATA COMPARE (SW01=1) ?
007552  001022                          BNE     3$              ;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  014132          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  022214          PUNSAF: JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
007724  104414  051355                  DISPLY  ,EM12           ;PERSISTENT DEVICE UNSAFE MESSAGE
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 69 007730  004737  022262                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
 70 007734  004737  022716                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
 71 007740  004737  023366                  JSR     PC,LINE4        ;PRINT LINE 4 OF THE ERROR MESSAGE
 72 007744  004737  026122                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
 73 007750  004737  024056                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
 74 007754  000137  031302                  JMP     DROP            ;DROP THE DRIVE
 75
 76                                 ;UNCORRECTABLE MASSBUS PARITY ERROR OCCURRED
 77
 78 007760  104401  001203         UCPAR:  TYPE    ,$CRLF          ;CR-LF
 79 007764  104401  001203                 TYPE    ,$CRLF          ;CR-LF
 80 007770  104401  051257                 TYPE    ,EM10           ;'UNCORRECTABLE PARITY ERROR' MESSAGE
 81 007774  000406                         BR      FALPR1          ;FINISH PROCESSING THE ERROR
 82
 83                                 ;'FATAL' MASSBUS PARITY ERROR OCCURRED
 84
 85 007776  104401  001203         FALPAR: TYPE    ,$CRLF          ;CR-LF
 86 010002  104401  001203                 TYPE    ,$CRLF          ;CR-LF
 87 010006  104401  051322                 TYPE    ,EM11           ;'FATAL PARITY ERROR' MESSAGE
 88
 89 010012  104401  057616         FALPR1: TYPE    ,MSGON          ;TYPE 'ON'
 90 010016  104401  056601                 TYPE    ,DRVMSG         ;TYPE 'DRIVE'
 91 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
 92 010032  004737  026122                 JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
 93 010036  032777  100000  171110         BIT     #SW15,@SWR      ;HALT ON ERROR ?
 94 010044  001401                         BEQ     1$              ;BR IF NOT
 95 010046  000000                         HALT                    ;ERROR HALT
 96 010050  000207                 1$:     RTS     PC
 97
 98                                 ;SOFTWARE TIMEOUT OCCURRED
 99
100 010052  004737  022214         SWTIM:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
101 010056  104414  051406                 DISPLY  ,EM13           ;PRINT THE TIME OUT MESSAGE
102 010062  004737  022262                 JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
103 010066  004737  022716                 JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
104 010072  004737  023366                 JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
105 010076  004737  026122                 JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
106 010102  004737  024056                 JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
107 010106  000207                         RTS     PC              ;RETURN
108
109                                ;DRIVE WENT OFFLINE
110
111 010110  004737  022214         OFLIN:  JSR     PC,LINE1        ;PRINT LINE 1 OF THE ERROR MESSAGE
112 010114  104414  051460                 DISPLY  ,EM14           ;PRINT OFFLINE MESSAGE
113 010120  004737  022262                 JSR     PC,LINE2        ;PRINT LINE 2 OF THE ERROR MESSAGE
114 010124  004737  022716                 JSR     PC,LINE3        ;PRINT LINE 3 OF THE ERROR MESSAGE
115 010130  004737  023366                 JSR     PC,LINE4        ;PRINT LINE 4 OF THE ERROR MESSAGE
116 010134  004737  026122                 JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
117 010140  004737  024056                 JSR     PC,LINE7        ;PRINT LINE 7 OF THE ERROR MESSAGE
118 010144  000137  031302                 JMP     DROP            ;DROP THE DRIVE
119
120                                ;PORT REQUEST TIMEOUT ERROR
121
```

```
                                PRTIM:  JSR     PC,LINE1        ;TYPE LINE 1 OF THE ERROR MESSAGE
                                        DISPLY  ,EM15           ;PRINT PORT TIME OUT MESSAGE
                                        JSR     PC,LINE2        ;TYPE LINE 2 OF THE ERROR MESSAGE
                                        JSR     PC,LINE3        ;TYPE LINE 3 OF THE ERROR MESSAGE
                                        JSR     PC,LINE4        ;TYPE LINE 4 OF THE ERROR MESSAGE
                                        JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                        JSR     PC,LINE7        ;TYPE LINE 7 OF THE ERROR MESSAGE
                                        RTS     PC              ;RETURN

                                ;PROCESS ORDER COMPLETION WITH 'ERROR' & 'DONE' BIT SET

                                DONE:   NOP
000030  000016                 1$:     BIT     #BIT04!BIT03,$TATUS(R0) ;UNSAFE OCCURRED
                                        BEQ     2$              ;BR IF NOT
013340                                  JMP     UNSAF           ;REPORT UNSAFE

040000  000202                 2$:     BIT     #BIT14,$RPER1(R0)       ;SEE IF 'UNS' SET
                                        BEQ     3$              ;BR IF NO
013340                                  JMP     UNSAF           ;REPORT UNSAFE

000002  000200                 3$:     BIT     #BIT1,$RPDS(R0) ;SEE IF 'EWN' SET
                                        BEQ     4$              ;BR IF NOT
013432                                  JMP     EWNERR          ;REPORT EARLY WARNING

040000  000176                 4$:     BIT     #BIT14,$RPCS2(R0)       ;IS 'WCE' SET ?
                                        BEQ     5$              ;BRANCH IF NOT SET
011234                                  JMP     WCKER           ;WRITE CHECK ERROR

040000  000166                 5$:     BIT     #BIT14,$RPCS1(R0)       ;CHECK 'TRE'
001002                                  BNE     6$              ;BR IF SET
013104                                  JMP     TRFER           ;PROCESS 'TRE'

000400  000202                 6$:     BIT     #BIT08,$RPER1(R0)       ;'HCRC' SET?
                                        BEQ     7$              ;BR IF NOT
011624                                  JMP     HCRCER          ;PROCESS 'HCRC'

000020  000202                 7$:     BIT     #BIT04,$RPER1(R0)       ;'FMT' SET?
                                        BEQ     8$              ;BR IF NOT SET
012010                                  JMP     CKFMT           ;CHECK FORMAT ERROR

000200  000202                 8$:     BIT     #BIT07,$RPER1(R0)       ;'HCE' SET?
                                        BEQ     9$              ;BR IF NOT SET
012172                                  JMP     CKHCE           ;CHECK 'HCE' ERROR

020000  000202                 9$:     BIT     #BIT13,$RPER1(R0)       ;'OPI' SET?
                                        BEQ     10$             ;BR IF NOT SET
012460                                  JMP     OPIER           ;REPORT 'OPI'

000010  000202                 10$:    BIT     #BIT3,$RPER1(R0)        ;'PAR' SET?
                                        BEQ     11$             ;BR IF NOT SET
012576                                  JMP     PARER           ;REPORT 'PAR'

000040  000202                 11$:    BIT     #BIT5,$RPER1(R0)        ;'WCF' SET?
                                        BEQ     12$             ;BR IF NOT SET
013242                                  JMP     WCFER           ;REPORT 'WCF'

002000  000202                 12$:    BIT     #BIT10,$RPER1(R0)       ;'IAE' SET?
```

```
186 010422  001402                          BEQ     13$             ;BR IF NOT SET
187 010424  000137  012670                   JMP     IAEER           ;REPORT 'IAE'
188
189 010430  032760  004000  000202  13$:    BIT     #BIT11,$RPER1(R0)       ;'WLE' SET?
190 010436  001402                          BEQ     14$             ;BR IF NOT SET
191 010440  000137  012722                   JMP     WLEER           ;REPORT 'WLE'
192
193 010444  032760  001000  000202  14$:    BIT     #BIT9,$RPER1(R0)        ;'AOE' SET?
194 010452  001405                          BEQ     15$             ;BR IF NOT SET
195 010454  032760  002000  000200          BIT     #BIT10,$RPDS(R0)        ;'LBT' SET?
196 010462  001401                          BEQ     15$             ;BR IF NOT SET
197 010464  000207                          RTS     PC              ;'AOE' & 'LBT' SET, EXIT
198
199 010466  032760  010000  000202  15$:    BIT     #BIT12,$RPER1(R0)       ;SEE IF 'DTE' SET
200 010474  001402                          BEQ     16$             ;BR IF NOT
201 010476  000137  012562                   JMP     DTEER           ;REPORT 'DTE' ERROR
202
203 010502  005760  000202          16$:    TST     $RPER1(R0)      ;SEE IF 'DCK' SET
204 010506  100002                          BPL     17$             ;BR IF NOT
205 010510  000137  010546                   JMP     DCKER           ;PROCESS 'DCK'
206
207 010514  032760  040000  000230  17$:    BIT     #BIT14,$RPER3(R0)       ;'SKI' SET
208 010522  001006                          BNE     18$             ;BRANCH IF SKI, OCYL SET
209 010524  032760  100000  000230          BIT     #BIT15,$RPER3(R0)       ;BAD SPOT ?
210 010532  001004                          BNE     19$             ;BRANCH IF SO
211 010534  000137  011756                   JMP     DRVER           ;REPORT ERROR
212
213 010540  000137  013204          18$:    JMP     SKIER           ;REPORT SKI ERROR
214 010544  000207                  19$:    RTS     PC              ;EXIT FROM ERROR ANALYSIS  ROUT.
```

```
                                        ;PROCESS DATA ('DCK') CHECK ERROR
                                        
010546  032760  000100  000202  DCKER:  BIT     #ECH,$RPER1(R0) ;ECH ERROR SET ?
010554  001411                          BEQ     1$              ;BR IF NO
010556  022760  010040  000232          CMP     #10040,$RPEC1(R0)       ;OTHERWISE RPEC1=10040
010564  001024                          BNE     2$              ;REPORT ECC LOGICAL FAILURE
010566  004737  022214                  JSR     PC,LINE1        ;FIRST LINE OF ERROR MESSAGE
010572  104414  053456                  DISPLY  ,EM52           ;ECH ERROR - ECC UNCORRECTABLE
010576  000451                          BR      7$
                                        
010600  026027  000232  010040  1$:     CMP     $RPEC1(R0),#10040       ;IS POSITION COUNT OVER MAXIMUM ?
010606  101013                          BHI     2$              ;BR IF YES
010610  005760  000232                  TST     $RPEC1(R0)      ;POSITION COUNT 0 ?
010614  001410                          BEQ     2$              ;BR IF YES
010616  005760  000234                  TST     $RPEC2(R0)      ;VALUE IN PATTERN REGISTER ?
010622  001033                          BNE     6$              ;BR IF YES
010624  004737  022214                  JSR     PC,LINE1        ;TYPE FIRST LINE OF ERROR MESSAGE
010630  104414  053300                  DISPLY  ,EM47           ;TYPE 'ECC LOGIC ERROR'
010634  000404                          BR      3$
010636  004737  022214          2$:     JSR     PC,LINE1        ;TYPE FIRST LINE OF ERROR MESSAGE
010642  104414  053140                  DISPLY  ,EM45           ;TYPE 'ECC LOGIC ERROR'
010646  004737  022262          3$:     JSR     PC,LINE2        ;TYPE LINE 2 OF ERROR MESSAGE
010652  004737  026122                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
010656  012737  000003  001324          MOV     #3,RETRY        ;RETRY COUNT
010664  004737  017040                  JSR     PC,$RETRY       ;RETRY THE ORDER
010670  000403                          BR      4$              ;RETRY WAS NOT SUCCESSFUL
010672  004737  024016                  JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
010676  000402                          BR      5$              ;FINISH THE ERROR REPORT
                                        
010700  004737  024024          4$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
010704  004737  024056          5$:     JSR     PC,LINE7        ;TYPE LINE 7 OF ERROR MESSAGE
010710  000207                          RTS     PC              ;RETURN
                                        
                                        ;THE VALUES IN THE ECC REGISTERS ARE CORRECT, REPORT 'DCK' ERROR
                                        
010712  004737  022214          6$:     JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
010716  104414  051560                  DISPLY  ,EM21           ;DATA CHECK ERROR
010722                          7$:
                                        
010722  004737  022262          DCKER1: JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
010726  004737  022716                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
010732  004737  023366                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
010736  004737  016356                  JSR     PC,PRTBAD       ;SEE IF BAD SECTOR TO BE PRINTED
010742  012737  110100  001322          MOV     #BIT15!BIT12!BIT06,MASK ;LOAD ERROR MASK
010750  032760  010000  000202          BIT     #BIT12,$RPER1(R0)       ;IS IT 'DTE' ?
010756  001012                          BNE     2$              ;BR IF YES
010760  032760  000100  000202          BIT     #BIT06,$RPER1(R0)       ;IS IT 'ECH' ?
010766  001403                          BEQ     1$              ;BR IF NO
010770  004737  011174                  JSR     PC,13$          ;COMPARE BAD DATA
010774  000403                          BR      2$
010776  004737  023776          1$:     JSR     PC,LINE6        ;PRINT 'SECTOR IS ECC CORRECTABLE'
011002  000460                          BR      10$             ;FINISH THE ERROR REPORT
011004  012737  000012  001324  2$:     MOV     #10.,RETRY      ;RETRY COUNT
                                        
011012  004737  020160          3$:     JSR     PC,GODRIV       ;RETRY
011016  005760  000016          4$:     TST     $TATUS(R0)      ;TEST FOR DONE
011022  001775                          BEQ     4$              ;BR IF NOT DONE
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 67 011024  100057                        BPL     12$                ;BR IF NOT ERROR
 68 011026  032760  000200  000016        BIT     #BIT7,$TATUS(R0)   ;SEE IF ORDER TERMINIATED NORMALLY
 69 011034  001006                        BNE     5$                 ;BR IF NOT
 70 011036  004737  026122                JSR     PC,INCTOT          ;INCREMENT TOTAL ERROR COUNT
 71 011042  104414  055570                DISPLY  ,LIN8M             ;'DIFFERENT ERROR DURING RETRY'
 72 011046  000137  007636                JMP     ERPRC1             ;SEE WHICH ERROR
 73
 74 011052  033760  001322  000202  5$:   BIT     MASK,$RPER1(R0)    ;LOOK AT CURRENT ERROR
 75 011060  001412                        BEQ     7$                 ;BR IF DIFFERENT ERROR
 76 011062  032760  010100  000202        BIT     #BIT12!BIT6,$RPER1(R0)  ;'ECH' OR 'DTE' STILL SET ?
 77 011070  001421                        BEQ     9$                 ;BR IF NEITHER SET
 78 011072  105237  001325                INCB    RETRY+1            ;INCREMENT RETRY COUNT
 79 011076  123737  001324  001325        CMPB    RETRY,RETRY+1      ;DONE ?
 80 011104  001342                        BNE     3$                 ;BR IF NOT
 91 011106  004737  024274          7$:   JSR     PC,LINE8           ;PRINT LINE 8 OF ERROR MESSAGE
 92 011112  004737  026026          8$:   JSR     PC,INCHRD          ;INCREMENT 'HARD' ERROR COUNT
 93 011116  004737  026122                JSR     PC,INCTOT          ;INCREMENT TOTAL ERROR COUNT
 94 011122  004737  024056                JSR     PC,LINE7           ;PRINT LINE 7 OF ERROR MESSAGE
 95 011126  004737  016356                JSR     PC,PRTBAD          ;PRINT THE BAD SECTOR
 96 011132  000436                        BR      15$                ;CLEAN UP AND RETURN
 97
 98 011134  004737  023776          9$:   JSR     PC,LINE6           ;PRINT 'SECTOR IS ECC CORRECTABLE'
 99 011140  004737  023734                JSR     PC,LINE5B          ;PRINT LINE 5B OF THE ERROR MESSAGE
100 011144  004737  026002          10$:  JSR     PC,INCSOF          ;INCREMENT 'SOFT' ERROR COUNT
101 011150  004737  015534                JSR     PC,ECC             ;CORRECT THE ERROR USING ECC AND CHECK IT
102 011154  000407                        BR      13$                ;COMPARE THE BUFFER
103
104 011156  004737  024024          11$:  JSR     PC,LINE6D          ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
105 011162  000753                        BR      8$                 ;INCREMENT ERROR COUNT
106
107 011164  004737  024010          12$:  JSR     PC,LINE6A          ;PRINT 'SECTOR READ CORRECTLY AFTER N RETRY(S)'
108 011170  004737  026002                JSR     PC,INCSOF          ;INCREMENT 'SOFT' ERROR COUNT
109 011174  012737  000001  001352  13$:   MOV     #1,FRSTER          ;SET PROCESSING 'DCKER' INDICATOR
110 011202  004737  014136                JSR     PC,CMPARD          ;COMPARE THE BUFFER
111 011206  105737  001353                TSTB    FRSTER+1           ;ERROR IN COMPARE ?
112 011212  100406                        BMI     15$                ;BRANCH IF ERROR
113 011214  004737  026122                JSR     PC,INCTOT          ;INCREMENT TOTAL ERROR COUNT
114 011220  104414  056037                DISPLY  ,LIN9G             ;'DATA COMPARE OK' MESSAGE
115 011224  004737  024056          14$:  JSR     PC,LINE7           ;PRINT LINE 7 OF ERROR MESSAGE
116 011230  000240                  15$:  NOP
117 011232  000207                        RTS     PC                 ;RETURN
118
119                                 ;WRITE CHECK ERROR PROCESSING
120
121 011234  032760  100000  000202  WCKER:  BIT     #BIT15,$RPER1(R0)  ;SEE IF 'DCK' SET ALSO
122 011242  001034                        BNE     2$                 ;BR IF IT IS
123 011244  004737  022214                JSR     PC,LINE1           ;PRINT LINE 1 OF ERROR MESSAGE
124 011250  104414  051664                DISPLY  ,EM23              ;PRINT WCE & DCK NOT SET
125 011254  005037  001322                CLR     MASK               ;CLEAR ERROR MASK
128 011260  004737  022262                JSR     PC,LINE2           ;PRINT LINE 2 OF ERROR MESSAGE
    011264  004737  022716                JSR     PC,LINE3           ;PRINT LINE 3 OF ERROR MESSAGE
    011270  004737  023366                JSR     PC,LINE4           ;PRINT LINE 4 OF ERROR MESSAGE
    011274  004737  023456                JSR     PC,LINE5           ;PRINT LINE 5 OF ERROR MESSAGE
129 011300  004737  026122                JSR     PC,INCTOT          ;INCREMENT TOTAL ERROR COUNT
130 011304  012737  000003  001324        MOV     #3,RETRY           ;RETRY LIMIT
131 011312  004737  017040                JSR     PC,$RETRY          ;RETRY THE OPERATION
132 011316  000403                        BR      1$                 ;RETRY UNSUCESSFUL
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133
134 011320  004737  024016              JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
135 011324  000532                      BR      15$             ;FINISH PROCESSING THE ERROR
136
137 011326  004737  024024      1$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
138 011332  000527                      BR      15$             ;FINISH PROCESSING THE ERROR
139
144 011334  012737  000012  001324  2$: MOV     #10.,RETRY      ;RETRY LIMIT
145 011342  004737  022214              JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
146 011346  012737  051611  011474      MOV     #EM22,8$        ;ASSUME THAT EM22 WILL BE PRINTED
147 011354  032760  040000  000176      BIT     #BIT14,$RPCS2(R0)  ;DID 'WCK' ALSO SET ?
148 011362  001003                      BNE     3$              ;BR IF IT DID
149 011364  012737  052512  011474      MOV     #EM37,8$        ;MESSAGE FOR 'DCK' AND 'WCK' NOT DURING
150                                                             ;WRITE CHECK
151 011372  032760  000100  000202  3$: BIT     #ECH,$RPER1(R0) ;WRITE CHECK ERROR WITH , ECH SET ?
152 011400  001410                      BEQ     4$              ;BRANCH IF NOT
153 011402  012737  053456  011474      MOV     #EM52,8$        ;REPORT 'ECH' ERROR
154 011410  022760  010040  000232      CMP     #10040,$RPEC1(R0)       ;OTHERWISE RPEC1=10040
155 011416  001017                      BNE     5$              ;REPORT ECC LOGICAL FAILURE
156 011420  000424                      BR      7$
157
158 011422  026027  000232  010040  4$: CMP     $RPEC1(R0),#10040       ;IS POSITION COUNT OVER MAXIMUM ?
159 011430  001012                      BHI     5$              ;BR IF YES
160 011432  005760  000232              TST     $RPEC1(R0)      ;POSITION COUNT 0 ?
161 011436  001407                      BEQ     5$              ;BR IF YES
162 011440  005760  000234              TST     $RPEC2(R0)      ;VALUE IN PATTERN REGISTER ?
163 011444  001007                      BNE     6$              ;BR IF YES
164 011446  012737  053300  011474      MOV     #EM47,8$        ;ELSE, REPORT THE ECC LOGIC FAILURE
165 011454  000403                      BR      6$
166 011456  012737  053140  011474  5$: MOV     #EM45,8$        ;ELSE, REPORT THE ECC LOGIC FAILURE
167 011464  012737  000003  001324  6$: MOV     #3,RETRY        ;RETRY LIMIT
168
169 011472  104414              7$:     DISPLY                  ;TYPE THE ERROR MESSAGE
170 011474  000000              8$:     .WORD   0               ;MESSAGE ADDRESS GOES HERE
173 011476  004737  022262              JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
    011502  004737  022716              JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
    011506  004737  023366              JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
    011512  004737  023456              JSR     PC,LINE5        ;PRINT LINE 5 OF ERROR MESSAGE
174
179 011516  004737  020160      9$:     JSR     PC,GODRIV       ;RETRY THE ORDER
180 011522  005760  000016      10$:    TST     $STATUS(R0)     ;ORDER FINISHED ?
181 011526  001775                      BEQ     10$             ;BR IF NOT
182 011530  100405                      BMI     11$             ;BR IF ERROR ON ORDER
183 011532  105237  001325              INCB    RETRY+1         ;INCREMENT RETRY COUNT
184 011536  004737  024016              JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
185 011542  000416                      BR      13$             ;FINISH ERROR PROCESSING
186
187 011544  105237  001325      11$:    INCB    RETRY+1         ;INCREMENT RETRY COUNT
188 011550  123737  001324  001325      CMPB    RETRY,RETRY+1   ;DONE ?
189 011556  001663                      BEQ     1$              ;BR IF AT RETRY LIMIT
190 011560  032760  100000  000202      BIT     #BIT15,$RPER1(R0)  ;'DCK' SET
191 011566  001401                      BEQ     12$             ;BR IF NOT - DIFFERENT ERROR
198 011570  000752                      BR      9$              ;CONTINUE RETRY
199
200 011572  004737  024274      12$:    JSR     PC,LINE8        ;PRINT LINE 8 - 'DIFFERENT ERROR '
201 011576  000405                      BR      15$
202 011600  004737  026002      13$:    JSR     PC,INCSOF       ;COUNT AS A SOFT ERROR
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                                        BR      15$             ;EXIT

                        14$:    JSR     PC,INCHRD       ;COUNT AS A HARD ERROR
                        15$:    JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                JSR     PC,LINE7        ;FINISH THE ERROR MESSAGE
                                RTS     PC              ;RETURN

                        ;REPORT 'HCRC' ERROR

                        HCRCER: JSR     PC,READDR       ;READ ERROR SECTOR HEADER
                                JSR     PC,READHD       ;GET THE HEAD INFORMATION
                                JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                DISPLY  ,EM20           ;REPORT 'HCRC'
                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
                                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
                                JSR     PC,LINE5A       ;PRINT THE HEADER INFORMATION
                                BIT     #BIT14,$RPCS2(R0)  ;'WCE' ERROR ALSO ?
                                BEQ     1$              ;BR IF NOT
                                JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
                        1$:     JSR     PC,INCSOF       ;INCREMENT 'SOFT' ERROR COUNT
                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                MOV     #BIT8,MASK      ;SET ERROR MASK
                                MOV     #3,RETRY        ;RETRY LIMIT
                                JSR     PC,$RETRY       ;RETRY ORDER
                                BR      2$              ;RETRY NOT SUCESSFUL
                                JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
                                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                BR      3$              ;EXIT
                        2$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
                                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                        3$:     RTS     PC              ;RETURN

                        ;REPORT DRIVE ERROR

                        DRVER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                DISPLY  ,EM30           ;REPORT DRIVE ERROR
                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                RTS     PC              ;RETURN

                        ;PROCESS FORMAT ('FER') ERROR

                        CKFMT:  BIT     #BIT8,$RPER1(R0) ;'HCRC' SET ON ORIGINAL ERROR ?
                                BEQ     1$              ;BR IF NOT SET
                                JMP     HCRCER          ;REPORT HCRC ERROR
                        1$:     JSR     PC,READDR       ;GET CORRECTED TRACK & SECTOR ADDRSSES
                                JSR     PC,READHD       ;READ HEADER
                                BIT     #BIT8,GENREG+RPER1 ;'HCRC' SET WHEN HEADER READ?
                                BNE     2$              ;BR IF 'HCRC' SET
                                JMP     FMTER           ;NO, ERROR IS 'FMT' ONLY

                        2$:     JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                DISPLY  ,EM24           ;HEADER READ ERROR - FMT BIT DROPPED UP
                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
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272 012064  004737  022716                    JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
273 012070  004737  023366                    JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
274 012074  032760  040000  000176            BIT     #BIT14,$RPCS2(R0)  ;'WCE' ERROR ALSO ?
275 012102  001402                            BEQ     3$              ;BR IF NOT
276 012104  004737  023456                    JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
277 012110  004737  023666            3$:     JSR     PC,LINE5A       ;DISPLAY HEADER
278 012114  004737  026002                    JSR     PC,INCSOF       ;INCREMENT SOFT ERROR COUNT
279 012120  004737  026122                    JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
280 012124  012737  000020  001322            MOV     #BIT4,MASK      ;SET ERROR MASK
281 012132  012737  000003  001324            MOV     #3,RETRY        ;RETRY LIMIT
282 012140  004737  017040                    JSR     PC,$RETRY       ;RETRY THE ORDER
283 012144  000405                            BR      4$              ;RETRY NOT SUCESSFUL
284 012146  004737  024016                    JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
285 012152  004737  024056                    JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
286 012156  000404                            BR      5$              ;EXIT
287 012160  004737  024024            4$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
288 012164  004737  024056                    JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
289 012170  000207                    5$:     RTS     PC              ;RETURN
290
291                                           ;PROCESS HEADER COMPARE ('HCE') ERROR
292
293 012172  032760  000400  000202    CKHCE:  BIT     #BIT8,$RPER1(R0) ;HCRC SET ON ORIGINAL ERROR ?
294 012200  001402                            BEQ     1$              ;BR IF NOT SET
295 012202  000137  011624                    JMP     HCRCER          ;REPORT HEADER CRC ERROR
296 012206  004737  024364            1$:     JSR     PC,READDR       ;GET CURRENT SECTOR & TRACK ADDRS
297 012212  004737  016746                    JSR     PC,READHD       ;READ HEADER OF CURRENT SECTOR
298 012216  032737  000400  050710            BIT     #BIT8,GENREG+RPER1 ;'HCRC' SET ?
299 012224  001017                            BNE     3$              ;BR IF SET
300 012226  013746  063324                    MOV     CYLNDR,-(SP)    ;;PUSH CYLNDR ON STACK
301 012232  042737  150000  063324            BIC     #150000,CYLNDR  ;CLEAR FORMAT, MFG AND USER BITS FROM HEADER
302 012240  026037  000222  063324            CMP     $RPDC(R0),CYLNDR        ;CORRECT CYLINDER ?
303 012246  001402                            BEQ     2$              ;BR IF IT IS
304 012250  000137  012406                    JMP     POSER           ;REPORT POSITIONING ERROR
305 012254                            2$:
    012254  012637  063324                    MOV     (SP)+,CYLNDR    ;;POP STACK INTO CYLNDR
306 012260  000137  013026                    JMP     HCEER           ;REPORT 'HCE' ERROR
307
313 012264  004737  022214            3$:     JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
315 012270  104414  052011                    DISPLY  ,EM25           ;HEADER READ ERROR - 'HCE' SET
316 012274  004737  022262                    JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
317 012300  004737  022716                    JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
318 012304  004737  023366                    JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
319 012310  032760  040000  000176            BIT     #BIT14,$RPCS2(R0)  ;'WCE' ERROR ALSO ?
320 012316  001402                            BEQ     4$              ;BR IF NOT
321 012320  004737  023456                    JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
322 012324  004737  023666            4$:     JSR     PC,LINE5A       ;PRINT LINE 5 OF ERROR MESSAGE
323 012330  004737  026002                    JSR     PC,INCSOF       ;INCREMENT SOFT ERROR COUNT
324 012334  004737  026122                    JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
325 012340  012737  000200  001322            MOV     #BIT7,MASK      ;SET ERROR MASK
326 012346  012737  000003  001324            MOV     #3,RETRY        ;RETRY LIMIT
327 012354  004737  017040                    JSR     PC,$RETRY       ;RETRY THE ORDER
328 012360  000405                            BR      5$              ;RETRY NOT SUCESSFUL
329 012362  004737  024016                    JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
330 012366  004737  024056                    JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
331 012372  000404                            BR      6$              ;EXIT
332 012374  004737  024024            5$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
333 012400  004737  024056                    JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
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                                        6$:     RTS     PC              ;RETURN
                                        ;REPORT POSSIBLE POSITIONING ERROR
                                        POSER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM51           ;PROGRAM DETECTED POSITIONING ERROR
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3C       ;PRINT LINE 3C OF ERROR MESSAGE
                                                MOV     (SP)+,CYLNDR    ;;POP STACK INTO CYLNDR
                                                JSR     PC,LINE5A       ;PRINT LINE 5A OF THE ERROR MESSAGE
                                                JSR     PC,INCMIS       ;INCREMENT MISPOSITIONING COUNT
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                JSR     PC,LINE7A       ;PRINT LINE 7A OF ERROR MESSAGE
                                                JSR     PC,RECALT       ;RECALIBRATE
                                                RTS     PC              ;EXIT
                                        ;REPORT 'OPI' ERROR
                                        OPIER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM31           ;'OPI' ERROR
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
                                                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
                                                JSR     PC,INCSOF       ;COUNT "OPI" AS A SOFT DATA ERROR
                                                                        ;SEPT. 26 ADDED FOR RP07
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                MOV     #BIT13,MASK     ;ERROR MASK
                                        OPIER1: MOV     #3,RETRY        ;RETRY LIMIT
                                                JSR     PC,$RETRY       ;RETRY THE ORDER
                                                BR      1$              ;RETRY UNSUCESSFUL
                                                JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
                                                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                                RTS     PC              ;EXIT
                                        1$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
                                                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                                RTS     PC              ;RETURN
                                        ;REPORT 'DTE' ERROR
                                        DTEER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM32           ;'DTE' ERROR
                                                JMP     DCKER1          ;FINISH PROCESSING THE 'DTE' ERROR
                                        ;REPORT 'PAR' ERROR
                                        PARER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM33           ;REPORT 'PAR'
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3E       ;PRINT LINE 3E OF ERROR MESSAGE
                                                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                MOV     #BIT03,MASK     ;ERROR MASK
                                                MOV     #3,RETRY        ;RETRY LIMIT
                                                JSR     PC,$RETRY       ;RETRY ORDER
                                                BR      2$              ;RETRY UNSUCESSFUL
                                                JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
                                        1$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
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                                                RTS     PC              ;EXIT
                                2$:             JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
                                                BR      1$              ;FINISH ERROR MESSAGE

                                ;REPORT 'IAE' ERROR

                                IAEER:          JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM35           ;REPORT 'IAE'
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3F       ;PRINT LINE 3F OF ERROR MESSAGE
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                                RTS     PC              ;RETURN

                                ;REPORT 'WLE' ERROR

                                WLEER:          JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM36           ;REPORT 'WLE'
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                                RTS     PC              ;RETURN

                                ;REPORT FORMAT ERROR

                                FMTER:          JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM26           ;FORMAT ERROR
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
                                                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
                                                BIT     #BIT14,$RPCS2(R0)  ;'WCE' ERROR ALSO ?
                                                BEQ     1$              ;BR IF NOT
                                                JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
                                1$:             JSR     PC,LINE5A       ;PRINT LINE 5A OF ERROR MESSAGE
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                                RTS     PC

                                ;REPORT HEADER COMPARE ERROR

                                HCEER:          JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM27           ;HEADER COMPARE ERROR
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
                                                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
                                                BIT     #BIT14,$RPCS2(R0)  ;'WCE' ERROR ALSO ?
                                                BEQ     1$              ;BR IF NOT
                                                JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
                                1$:             JSR     PC,LINE5A       ;PRINT LINE 5A OF ERROR MESSAGE
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                                RTS     PC              ;RETURN

                                ;PROCESS CONTROL/INTERFACE TRANSFER ERROR

                                TRFER:          JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM40           ;RHXX OR UNIBUS TRANSFER ERROR
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                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
                                                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                BIT     #BIT15!BIT13!BIT9!BIT8,$RPCS2(R0)  ;'DLT','UPE','MXF', 'MDPE' SET ?
                                                BEQ     2$              ;BR IF NONE SET
                                                MOV     #3,RETRY        ;RETRY LIMIT
                                                CLR     MASK            ;CLEAR ERROR MASK
                                                JSR     PC,$RETRY       ;RETRY THE OPERATION
                                                BR      1$              ;RETURN HERE IF RETRY UNSUCESSFUL
                                                JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
                                                BR      2$              ;FINISH THE ERROR REPORT
                                        1$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
                                        2$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                                RTS     PC

                                        ;PROCESS 'SKI' ERRORS

                                        SKIER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM50           ;'SKI' ERROR
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3B       ;PRINT LINE 3B OF ERROR MESSAGE
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                JSR     PC,INCSKI       ;INCREMENT 'SKI' OR 'OCYL' ERROR COUNT
                                                JSR     PC,LINE7A       ;PRINT LINE 7A OF ERROR MESSAGE
                                                RTS     PC

                                        ;REPORT WRIRE CLOCK FAILURE ('WCF')

                                        WCFER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM34           ;REPORT WRITE CLOCK FAILURE
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3A       ;PRINT LINE 3A OF ERROR MESSAGE
                                                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                JSR     PC,PRTBAD       ;SEE IF BAD SECTOR TO BE PRINTED
                                                MOV     #3,RETRY        ;RETRY COUNT
                                                MOV     #BIT05,MASK     ;ERROR MASK
                                                JSR     PC,$RETRY       ;RETRY THE ORDER
                                                BR      2$              ;RETURN HERE IF RETRY UNSUCESSFUL
                                                JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
                                        1$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                                RTS     PC
                                        2$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
                                                BR      1$

                                        ;PROCESS DRIVE UNSAFE ERROR

                                        UNSAF:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM60           ;REPORT DRIVE UNSAFE
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                MOV     #BIT14,MASK     ;RETRY MASK
                                                MOV     #3,RETRY        ;RETRY COUNT
                                                JSR     PC,$RETRY       ;RETRY THE ORDER
                                                BR      1$              ;RETRY WAS UNSUCESSFUL
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                                                JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
                                                BR      2$              ;CONTINUE WITH ERROR REPORT
                                        1$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
                                                JMP     DROP            ;DROP UNSAFE DRIVE

                                        2$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
                                                RTS     PC              ;RETURN

                                        ;REPORT EARLY WARNING ERROR

                                        EWNERR: JSR     PC,LINE1        ;SKIP LINES
                                                NOP
                                                BIT     #BIT1,$RPER3(R0)        ;'TPE' SET?
                                                BEQ     1$              ;BR IF NO
                                                DISPLY  ,EM70           ;PRINT TEMPERATURE WARNING ERROR
                                                BR      3$              ;TYPE REMAINING ERROR MESSAGE
                                        1$:     BIT     #BIT2,$RPER3(R0)        ;'AIR' SET?
                                                BEQ     2$              ;BR IF NO
                                                DISPLY  ,EM71           ;'AIR SYSTEM WARNING ERROR'
                                                BR      3$
                                        2$:     DISPLY  ,EM72           ;'EARLY WARNING ERROR,AIR TPE NOT SET'
                                        3$:     JSR     PC,LINE2        ;ERROR MESSAGE
                                                JSR     PC,LINE3        ;PRINT OUT
                                                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
                                                MOV     #7,MASK         ;SET UP ERROR MASK
                                                MOV     #3,RETRY        ;RETRY COUNT
                                                JSR     PC,$RETRY       ;RETRY THE ORDER
                                                BR      4$              ;RETRY UNSUCESSFUL RETURN
                                                JSR     PC,LINE6C       ;PRINT 'CORRECTED ON N RETRY(S)'
                                                RTS     PC              ;RETURN
                                        4$:     JSR     PC,LINE6D       ;PRINT 'UNCORRECTABLE AFTER N RETRY(S)'
                                                JMP     DROP            ;DROP DRIVE

                                        ;REPORT AN 'UNKNOWN' DATA PATTERN
                                        ;
                                        ;R1 = POINTER FIRST WORD OF DATA BUFFER

                                        NOMTCH: TST     CFLAG           ;WAS (^C) TYPED?
                                                BNE     5$              ;BR IF YES
                                        1$:     TSTB    FRSTER          ;FIRST ERROR IN THE SECTOR ?
                                                BNE     2$              ;BR IF NOT OR IF PROCESSING 'DCKER'
                                                JSR     PC,LINE1        ;TYPE LINE 1 OF ERROR MESSAGE
                                                DISPLY  ,EM43           ;'CAN'T MATCH DATA WITH PATTERN'
                                                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
                                                JSR     PC,LINE3A       ;PRINT LINE 3A OF ERROR MESSAGE
                                                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
                                                BR      3$              ;CONTINUE PROCESSING ERROR
                                        2$:     DISPLY  ,EM43           ;'CAN'T MATCH DATA WITH PATTERN'
                                                DISPLY  ,$CRLF          ;CR-LF
                                        3$:     DISPLY  ,LIN9I          ;HEADER FOR DATA PRINTOUT
                                        4$:     TST     CFLAG           ;WAS (^C) TYPED?
                                                BNE     5$              ;BR IF YES
                                                MOV     R1,-(SP)        ;ADDRESS OF WORD POSITION
                                                JSR     PC,LINOCT       ;TYPE WORD NUMBER
                                                INC     WRDPOS          ;INC WORD POSITION
                                                MOV     WRDPOS,-(SP)    ;PUT THE WORD POS ON THE STACK
                                                JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
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581 013662  004537  032662                    JSR     R5,$REPLZ       ;TYPE IT (REPLACE LEADING ZEROS)
582 013666  000006                            .WORD   6               ;TYPE 6 DIGITS
583 013670  104414  057711                    DISPLY  ,PERIOD         ;TYPE '.'
584 013674  104414  056530                    DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
585 013700  012146                            MOV     (R1)+,-(SP)     ;ADDRESS OF DATA WORD
586 013702  004737  024306                    JSR     PC,LINOCT       ;TYPE DATA
587 013706  104414  001203                    DISPLY  ,$CRLF          ;CR-LF
588 013712  023727  001374  000003            CMP     WRDPOS,#3       ;DONE ALL WORDS ?
589 013720  001344                            BNE     4$              ;BR IF NO
590 013722  062701  000770          5$:       ADD     #<252.*2.>,R1   ;INCREMENT BUFFER POINTER - 4 MATCHING WORDS
591 013726  005002                            CLR     R2              ;CLEAR 'WORDS TO COMPARE' COUNT IN R2
592 013730  012737  177777  001352            MOV     #-1,FRSTER      ;SET ERROR FOUND INDICATOR
593 013736  013737  001460  001364            MOV     CMPLMT,LIMIT    ;RESET THE COMPARE ERROR TYPEOUT LIMIT
594 013744  000207                            RTS     PC              ;RETURN
595
596                                 ;CHECK ERROR BITS IN THE RHXX & RP07 REGISTERS
597
598 013746  032760  060000  000166  CKERR:    BIT     #60000,$RPCS1(R0)  ;SEE IF 'TRE' OR 'MCPE' SET
599 013754  001015                            BNE     1$              ;BR IT EITHER SET
600 013756  032760  177400  000176            BIT     #177400,$RPCS2(R0)  ;SEE IF ERROR BITS IN CS2 SET
601 013764  001011                            BNE     1$              ;BR IF ANY SET
602 013766  005760  000202                    TST     $RPER1(R0)      ;ANY BITS SET IN ER1
603 013772  001006                            BNE     1$              ;BR IF ANY SET
604 013774  005760  000230                    TST     $RPER3(R0)      ;ANY BITS SET IN ER3 ?
605 014000  001003                            BNE     1$              ;BR IF YES
606
607 014002  005760  000226                    TST     $RPER2(R0)      ;ANY BIT SET IN ER2
608 014006  000416                            BR      2$              ;BR IF NO
609
610 014010  004737  022214          1$:       JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
611 014014  104414  053043                    DISPLY  ,EM44           ;ERROR BITS SET, BUT NO ERROR BITS SET
612 014020  004737  022262                    JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
613 014024  004737  022716                    JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
614 014030  004737  023366                    JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
615 014034  004737  026122                    JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
616 014040  004737  024056                    JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
617 014044  000207                  2$:       RTS     PC              ;RETURN
618
619                                 ;CHECK BUS ADDRESS REGISTER & WORD COUNT REGISTER
620
621 014046  005760  000170  CKBUS:   TST     $RPWC(R0)       ;CHECK WORD COUNT
622 014052  001010                            BNE     1$              ;BR IF NOT ZERO
623 014054  016046  000020                    MOV     $WRDL(R0),-(SP) ;WORD LENGTH
624 014060  006316                            ASL     (SP)            ;CHANGE INTO BYTE COUNT
625 014062  066016  000006                    ADD     $BUF(R0),(SP)   ;ADD THE STARTING LOCATION
626 014066  022660  000172                    CMP     (SP)+,$RPBA(R0) ;BUFFER ADDRESS PROPER ?
627 014072  001416                            BEQ     2$              ;BR IF OK
628 014074  004737  022214          1$:       JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
629 014100  104414  052622                    DISPLY  ,EM41           ;BUS ADDRESS OR WORD COUNT INCORRECT
630 014104  004737  022262                    JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
631 014110  004737  022754                    JSR     PC,LINE3D       ;PRINT LINE 3D OF ERROR MESSAGE
632 014114  004737  023366                    JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
633 014120  004737  026122                    JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
634 014124  004737  024056                    JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
635 014130  000207                  2$:       RTS     PC
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                                        ;COMPARE THE BUFFER
                                        
014132  005037  001352          CMPAR:  CLR     FRSTER          ;CLEAR 'FIRST ERROR' AND 'NO DCK' INDICATOR
                                        
014136  132760  000004  000024  CMPARD: BITB    #4,$CODE(R0)    ;SEE IF READ COMMAND
014144  001001                          BNE     1$              ;BR IF IT IS
014146  000207                          RTS     PC              ;RETURN
                                        
014150  005037  001362          1$:     CLR     ERCTR           ;CLEAR THE ERROR COUNTER
014154  016001  000006                  MOV     $BUF(R0),R1     ;BUFFER ADDRESS
014160  016037  000020  001366          MOV     $WRDL(R0),CMCNT ;WORD COUNT TO WORKING LOCATION
014166  066037  000170  001366          ADD     $RPWC(R0),CMCNT ;CALCULATE WORDS TRANSFERED
014174  001001                          BNE     2$
014176  000207                          RTS     PC              ;EXIT--NO WORDS XFERED
                                        
014200  016037  000012  001370  2$:     MOV     $CYL(R0),CMCYL  ;CYLINDER ADDRESS WORKING LOCATION
014206  052737  150000  001370          BIS     #150000,CMCYL   ;SET MFG, USER AND FMT BITS
014214  016037  000010  001372          MOV     $SEC(R0),CMSEC  ;SECTOR & TRACK ADDRESSES TO WORKING LOCNS
014222  013737  001460  001364          MOV     CMPLMT,LIMIT    ;DISPLAY LIMIT
014230  005237  001364                  INC     LIMIT           ;CONVERT PARAMETER INTO LIMIT VALUE
014234  012737  177777  001350  CMSTR:  MOV     #-1,ZROIND      ;CLEAR THE 'ZERO'S' INDICATOR
014242  005037  001356                  CLR     SAVER1          ;CLEAR THE R1 SAVE WORD
014246  005037  001360                  CLR     SAVER5          ;CLEAR THE R5 SAVE WORD
014252  023760  001366  000022          CMP     CMCNT,$SSEC(R0) ;IS BUFFER SIZE GREATER THAN ONE SECTOR ?
014260  101005                          BHI     1$              ;BR IF IT IS
014262  013702  001366                  MOV     CMCNT,R2        ;LESS THAN, USE REMAINING BUFFER
014266  005037  001366                  CLR     CMCNT           ;SET COUNTER TO 0
014272  000405                          BR      2$
014274  016002  000022          1$:     MOV     $SSEC(R0),R2    ;COMPARE SECTOR
014300  166037  000022  001366          SUB     $SSEC(R0),CMCNT ;DECREMENT WORD COUNT
014306  126027  000024  000005  2$:     CMPB    $CODE(R0),#5    ;READ HEADER & DATA?
014314  001034                          BNE     CMDAT           ;BR IF NOT
                                        
                                        ;COMPARE HEADER WORDS
                                        
014316  012705  001370          CMHED:  MOV     #CMCYL,R5       ;ADDRESS OF COMPARING CYLINDER
014322  052711  150000                  BIS     #150000,(R1)    ;SET BITS INCASE BAD SECTOR ENCOUNTER
014326  022521                          CMP     (R5)+,(R1)+     ;CHECK CYLINDER
014330  001405                          BEQ     1$              ;BR IF COMPARE OK
014332  012737  177777  001374          MOV     #-1,WRDPOS      ;INDICATE WORD POSITION IS HEADER WRD 1
014340  004737  014374                  JSR     PC,CMSTR2       ;REPORT ERROR
014344  022521                  1$:     CMP     (R5)+,(R1)+     ;COMPARE SECTOR/TRACK
014346  001405                          BEQ     2$              ;BR IF EQ
014350  012737  177776  001374          MOV     #-2,WRDPOS      ;INDICATE WORD POSITION IS HEADER WRD 2
014356  004737  014374                  JSR     PC,CMSTR2       ;REPORT ERROR
014362  162702  000002          2$:     SUB     #2,R2           ;SUBTRACT HEADER LENGTH FROM SIZE
014366  003007                          BGT     CMDAT           ;BR IF NOT FINISHED
014370  000137  015010                  JMP     CMPRX           ;COMPARE THE DATA PORTION
                                        
014374  005237  001362          CMSTR2: INC     ERCTR           ;INCREMENT THE ERROR COUNT
014400  004737  015016                  JSR     PC,CMPRT        ;REPORT THE COMPARISON ERROR
014404  000207                          RTS     PC              ;CHECK THE REST OF THE HEADER
                                        
                                        ;COMPARE DATA FIELD
                                        
014406  012737  177777  001374  CMDAT:  MOV     #-1,WRDPOS      ;INITIALIZE WORD POSITION
014414  004737  015444                  JSR     PC,MATCH        ;FIND THE PATTERN
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 58 014420  000403                        BR      1$              ;FOUND A PATTERN
 59 014422  004737  013554                JSR     PC,NOMTCH       ;RETURN HERE IF NO MATCH WITH PATTERN MADE
 60 014426  000463                        BR      7$              ;BYPASS COMPARE ROUTINE
 61
 62 014430  011405                1$:     MOV     (R4),R5         ;ADDRESS OF PATTERN ADDRESS IN R4
 63 014432  012703  000020                MOV     #16.,R3         ;R3 IS PATTERN POS COUNTER
 64 014436  005237  001374          2$:   INC     WRDPOS          ;INCREMENT TO CURRENT WORD POSITION
 65 014442  022125                        CMP     (R1)+,(R5)+     ;COMPARE BUFFER WITH PATTERN
 66 014444  001016                        BNE     4$              ;BR IF NOT EQUAL
 67 014446  005737  001362                TST     ERCTR           ;ERRORS DETECTED ?
 68 014452  001406                        BEQ     3$              ;BR IF NO ERRORS
 69 014454  032777  000010  164472        BIT     #SW3,@SWR       ;SWITCH 3 SET ?
 70 014462  001402                        BEQ     3$              ;BR IF NOT SET
 71 014464  004737  015016                JSR     PC,CMPRT        ;DISPLAY THE WORD
 72
 73 014470  005302                3$:     DEC     R2              ;DECREMENT SIZE COUNT
 74 014472  003441                        BLE     7$              ;BR WHEN AT END
 75 014474  005303                        DEC     R3              ;DECREMENT PATT POS COUNT
 76 014476  001357                        BNE     2$              ;BR IF NOT AT END OF PATT
 77 014500  000753                        BR      1$              ;RESTART THE PATTERN
 78
 79 014502  005761  177776          4$:   TST     -2(R1)          ;IS MISCOMPARED CHARACTER=0
 80 014506  001410                        BEQ     5$              ;BR IF YES
 81 014510  012737  177777  001350        MOV     #-1,ZROIND      ;SET NON-ZERO MISCOMPARED INDCATOR
 82 014516  005237  001362                INC     ERCTR           ;INCREMENT THE ERROR COUNTER
 83 014522  004737  015016                JSR     PC,CMPRT        ;REPORT ERROR
 84 014526  000760                        BR      3$              ;CONTINUE COMPARE
 85
 86 014530  105737  001352          5$:   TSTB    FRSTER          ;FIRST ERROR?
 87 014534  100412                        BMI     6$              ;BR IF NOT
 88 014536  005037  001350                CLR     ZROIND          ;SET THE ZERO INDICATOR
 89 014542  010137  001356                MOV     R1,SAVER1       ;SAVE CURRENT R1
 90 014546  010537  001360                MOV     R5,SAVER5       ;SAVE CURRENT R5
 91 014552  013737  001374  001354        MOV     WRDPOS,SAVPOS   ;SAVE CURRENT WORD POSITION
 92 014560  000743                        BR      3$              ;CONTINUE COMPARE
 93 014562  005737  001350          6$:   TST     ZROIND          ;ANY MISCOMPARIONS NOT ZEROS ?
 94 014566  001740                        BEQ     3$              ;BR IF NONE-ALL ERRORS=ZERO
 95 014570  004737  015016                JSR     PC,CMPRT        ;REPORT ERROR
 96 014574  000735                        BR      3$              ;CONTINUE COMPARING
 97
 98 014576  126027  000024  000005  7$:   CMPB    $CODE(R0),#5    ;READ HEAD AND DATA ?
 99 014604  001414                        BEQ     9$              ;YES
100 014606  013702  001366          8$:   MOV     CMCNT,R2        ;SET COUNTER = REMAIN BUFFER LENGTH
101 014612  020227  000004                CMP     R2,#4           ;IS THERE AT LEAST 4 WORDS TO MATCH PATTERN ?
102 014616  002474                        BLT     CMPRX           ;BR IF NO
103 014620  162737  000400  001366        SUB     #256.,CMCNT     ;GREATER THAN A SECTOR ?
104 014626  003667                        BLE     CMDAT           ;NO,RETURN TO COMPARE LOOP
105 014630  012702  000400                MOV     #256.,R2        ;SET COUNTER =SECTOR SIZE
106 014634  000664                        BR      CMDAT           ;RETURN TO COMPARE LOOP
107
108 014636  023727  001366  000002  9$:   CMP     CMCNT,#2        ;IS THERE AT LEAST 2 WORDS TO COMPARE HEADER ?
109 014644  002461                        BLT     CMPRX           ;BR IF NO
110 014646  105237  001372                INCB    CMSEC           ;INCREMENT COUNTER
111 014652  123760  001372  000152        CMPB    CMSEC,SECLMT(R0)        ;MAX SECTOR # ?
112 014660  101424                        BLOS    10$             ;NO
113 014662  105037  001372                CLRB    CMSEC           ;RESET SECTOR #
114 014666  105237  001373                INCB    CMTRK           ;INCREMENT TRACK #
```

```
                                                        ;MAX TRACK # ?
                                                ;NO
                                                ;RESET TRACK #
                                                ;INCREMENT CYLINDER NUMBER
                                                ;GET COMPARING CYLINDER
                                                ;SAVE ONLY THE CYLINDER BITS
                                                        ;LAST CYLINDER ?
                                                ;NO
                                                ;NORMAL RETURN,NOT WRAP AROUND

                                                ;ADDRESS OF COMPARING CYLINDER
                                                ;SET BITS INCASE BAD SECTOR ENCOUNTER
                                                ;COMPARE 1ST HEADER WORD
                                                ;MATCH
                                                ;INDICATE WORD POSITION IS HEADER WRD 1
                                                ;NOT MATCH
                                                ;SECOND WORD OF HEADER
                                                ;MATCH
                                                ;INDICATE WORD POSITION IS HEADER WRD 2
                                                ;NOT MATCH

                                                ;ADJUST WORD COUNT
                                                ;COMPARE IS DONE
                                                ;RETURN TO COMPARE LOOP

                                                ;PRINT LAST LINE IF ERRORS


                                                ;TYPE DATA COMPARE ERRORS

                                                ;PRINT SAVED VALUES ?
                                                ;BR IF YES
                                                ;PRINT INITIAL MESSAGE INFO
                                                ;PRINT REMAINDER OF MESSAGE
                                                ;EXIT

                                                ;;PUSH R1 ON STACK
                                                ;;PUSH R5 ON STACK
                                                ;;PUSH WRDPOS ON STACK
                                                ;DISPLAY SAVED R1
                                                ;DISPLAY SAVED R5
                                                ;DISPLAY SAVED WORD POSITION
                                                ;PRINT INITIAL MESSAGE INFO
                                                ;PRINT SAVED VALUES
                                                ;CLEAR SAVED REGISTER INDICATORS
                                                ;CLEAR THE OTHER ONE
                                                ;;POP STACK INTO WRDPOS
                                                ;;POP STACK INTO R5
                                                ;;POP STACK INTO R1
                                                ;PRINT REMAINDER OF MESSAGE
                                                ;RETURN

                                                ;FIRST ERROR ?
                                                ;BR IF NOT
                                                ;BR IF FIRST ERROR AND PROCESSING 'DCK' ERROR,
```

```
                                                        ;ELSE, FIRST ERROR AND COMPARE ERROR W/O 'DCK'
015134  004737  022214                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
015140  104414  052666                  DISPLY  ,EM42           ;DATA COMPARE ERROR W/O 'DCK' ERROR
015144  004737  022262                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
015150  004737  022724                  JSR     PC,LINE3A       ;PRINT LINE 3A OF ERROR MESSAGE
015154  004737  023366                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
015160  000404                          BR      6$              ;GO TO TYPE HEADER

015162  104414  055613          5$:     DISPLY  ,LIN9B          ;PRINT 'DATA COMPARISON ERRORS'
015166  104414  001203                  DISPLY  ,$CRLF          ;CR-LF
015172  104414  055642          6$:     DISPLY  ,LIN9H          ;PRINT '         WORD  EXPCTD  RECEVD
                                                        ;       ADDR    POS   DATA    DATA'
015176  012737  177777  001352          MOV     #-1,FRSTER      ;SET FIRST ERROR FLAG
015204  000207                          RTS     PC              ;RETURN

015206  005737  001334          7$:     TST     CFLAG           ;WAS (^C) TYPED?
015212  100412                          BMI     9$              ;BR IF YES
015214  005737  001364                  TST     LIMIT           ;TYPEOUT LIMIT REACHED ?
015220  001403                          BEQ     8$              ;BR IF IT HAS
015222  005337  001364                  DEC     LIMIT           ;DECREMENT LIMIT COUNTER
015226  001005                          BNE     10$             ;BR IF NOT AT LIMIT
015230  032777  000200  163716  8$:     BIT     #SW07,@SWR      ;PRINT ALL DATA COMPARE ERRORS ?
015236  001001                          BNE     10$             ;BR IF YES
015240  000207                  9$:     RTS     PC              ;RETURN

015242  010146                  10$:    MOV     R1,-(SP)        ;BUFFER ADDRESS
015244  162716  000002                  SUB     #2,(SP)         ;ADJUST ADDRESS
015250  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
015254  004737  015312                  JSR     PC,11$          ;GET WORD POSITION
015260  016546  177776                  MOV     -2(R5),-(SP)    ;PUT EXPECTED DATA ON THE STACK
015264  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
015270  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
015274  016146  177776                  MOV     -2(R1),-(SP)    ;RECEIVED DATA
015300  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
015304  104414  001203                  DISPLY  ,$CRLF          ;CR-LF
015310  000207                          RTS     PC              ;RETURN

015312  023727  001374  177777  11$:    CMP     WRDPOS,#-1      ;IS IT HEADER WORD 1 ?
015320  001003                          BNE     12$             ;BR IF NO
015322  104414  057055                  DISPLY  ,MSHW1          ;TYPE '   HW1 '
015326  000420                          BR      14$
015330  023727  001374  177776  12$:    CMP     WRDPOS,#-2      ;IS IT HEADER WORD 2 ?
015336  001003                          BNE     13$             ;BR IF NO
015340  104414  057065                  DISPLY  ,MSHW2          ;TYPE '   HW2 '
015344  000411                          BR      14$
015346  013746  001374          13$:    MOV     WRDPOS,-(SP)    ;PUT THE WORD POS ON THE STACK
015352  004737  033332                  JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
015356  004537  032662                  JSR     R5,$REPLZ       ;TYPE IT (REPLACE LEADING ZEROS)
015362  000006                          .WORD   6               ;TYPE 6 DIGITS
015364  104414  057711                  DISPLY  ,PERIOD         ;TYPE '.'
015370  104414  056530          14$:    DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
015374  000207                          RTS     PC

                                ;LAST LINE OF COMPARE ERROR REPORTING

015376  105737  001353          ENDCMP: TSTB    FRSTER+1        ;ANY COMPARE ERRORS FOUND ?
015402  001417                          BEQ     2$              ;BR IF NOT
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237 015404  005737  001362                TST     ERCTR           ;SEE HOW MANY ERRORS
238 015410  001410                        BEQ     1$              ;BR IF ONLY CAN'T MATCH PATTERN
239 015412  104414  056010                DISPLY  ,LIN9E          ;'NUMBER OF ERRORS='
240 015416  013746  001362                MOV     ERCTR,-(SP)     ;NUMBER OF ERRORS
241 015422  004737  024340                JSR     PC,LINDEC       ;TYPE IT
242 015426  104414  001203                DISPLY  ,$CRLF          ;CR-LF
243 015432  004737  026122        1$:     JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
244 015436  004737  024056                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
245 015442  000207                2$:     RTS     PC              ;RETURN
```

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                                        ;ROUTINE TO MATCH THE DATA WITH A PATTERN, ONLY WHEN LOCATION 'PATTERN'
                                        ;IS EQUAL TO 0 (RANDON DATA PATTERN MODE). OTHERWISE, THIS ROUTINE WILL
                                        ;RETURN THE ADDRESS OF THE EXPECTED FIXED DATA PATTERN IN R4.
                                        ;CALL:
                                        ;       MOV     #BUFFER,R1      ;BUFFER ADDRESS
                                        ;       JSR     PC,MATCH
                                        ;       RETURN1                 ;PATTERN ADDRESS IN R4
                                        ;       RETURN2                 ;COULDN'T MATCH PATTERN

015444  010146                  MATCH:  MOV     R1,-(SP)        ;SAVE R1 ON THE STACK
015446  013704  001476                  MOV     PATTERN,R4      ;WAS RANDOM PATTERN ENABLED ?
015452  001402                          BEQ     1$              ;BR IF YES
015454  006304                          ASL     R4              ;* 2
015456  000416                          BR      4$              ;USE KNOWN PATTERN
015460  012704  000044          1$:     MOV     #44,R4          ;PATTERN TABLE INDEX
015464  011601                  2$:     MOV     (SP),R1         ;RELOAD R1
015466  162704  000002                  SUB     #2,R4           ;DECREMENT INDEX
015472  001413                          BEQ     5$              ;BR IF PATTERN NOT MATCH
015474  016405  002314                  MOV     STNDAT(R4),R5   ;ADDRESS OF PATTERN ADDRESS
015500  012703  000004                  MOV     #4,R3           ;NUMBER OF LOCATIONS TO CHECK
015504  022125                  3$:     CMP     (R1)+,(R5)+     ;COMPARE THE BUFFER AGAINST THE PATTERN
015506  001366                          BNE     2$              ;BR IF NOT EQUAL, TRY NEXT PATTERN
015510  005303                          DEC     R3              ;FINISHED CHECKING?
015512  001374                          BNE     3$              ;BR IF NOT FINISHED
015514  062704  002314          4$:     ADD     #STNDAT,R4      ;MAKE PATTERN ADDRESS ABSOLUTE
015520  000403                          BR      6$              ;EXIT
015522  062766  000002  000002  5$:     ADD     #2,2(SP)        ;INCREMENT RETURN ADDRESS
015530  012601                  6$:     MOV     (SP)+,R1        ;RESTORE R1
015532  000207                          RTS     PC              ;RETURN

                                        ;USE ECC TO CORRECT THE DATA ERROR

015534  016037  000172  001400  ECC:    MOV     $RPBA(R0),ECSEC ;ADDRESS OF LAST LOCN XFERED
015542  016046  000170                  MOV     $RPWC(R0),-(SP) ;ACT WORDS XFERED (2'S COMP)
015546  066016  000020                  ADD     $WRDL(R0),(SP)  ;ADD WORDS REQUESTED
015552  001002                          BNE     1$
015554  005726                          TST     (SP)+           ;RESTORE STACK
015556  000207                          RTS     PC              ;EXIT--NO WORDS XFERRED
015560  005046                  1$:     CLR     -(SP)           ;CLEAR NEXT STACK LOCN
015562  016046  000022                  MOV     $SSEC(R0),-(SP) ;SECTOR SIZE
015566  004737  032046                  JSR     PC,$DIV         ;DIVIDE WORDS XFERED BY SECTOR SIZE
015572  005716                          TST     (SP)            ;PARTIAL SECTOR XFERED ?
015574  001413                          BEQ     2$              ;BR IF NOT
015576  006316                          ASL     (SP)            ;CONVERT INTO NUMBER OF BYTES
015600  161637  001400                  SUB     (SP),ECSEC      ;SUBTRACT SECTOR RESIDUE
015604  122760  000005  000024          CMPB    #5,$CODE(R0)    ;WAS OPERATION, READ HEAD & DATA
015612  001007                          BNE     3$              ;BR IF NOT
015614  062737  000004  001400          ADD     #4,ECSEC        ;ADD HEADER SIZE (IN BYTES) BACK IN
015622  000403                          BR      3$              ;GO ADJUST THE STACK POINTER
015624  162737  001000  001400  2$:     SUB     #256.*2,ECSEC   ;SUBTRACT SECTOR DATA FIELD SIZE (IN BYTES)
015632  062706  000004          3$:     ADD     #4,SP           ;ADJUST THE STACK POINTER
015636  016037  000232  001376          MOV     $RPEC1(R0),ECBIT        ;ECC POSITION COUNT
015644  005337  001376                  DEC     ECBIT           ;ADJUST BIT POSITION
015650  013737  001376  001406          MOV     ECBIT,ECWRD     ;LOAD THE WORD COUNT LOCATION
015656  042737  177760  001376          BIC     #^C17,ECBIT     ;SAVE THE BIT OFFSET COUNT
015664  042737  000017  001406          BIC     #17,ECWRD       ;CLEAR THE BIT OFFSET
015672  006237  001406                  ASR     ECWRD           ;CHANGE TO BYTE COUNT(DIVIDE BY 2)
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 68 015676  006237  001406                    ASR     ECWRD           ;CHANGE TO BYTE COUNT(DIVIDE BY 4)
 69 015702  006237  001406                    ASR     ECWRD           ;CHANGE TO BYTE COUNT(DIVIDE BY 8.)
 70 015706  104414  056065                    DISPLY  ,LIN10A         ;'ERROR BURST BEGINS AT '
 71 015712  013746  001406                    MOV     ECWRD,-(SP)     ;PUT THE WORD COUNT ON THE STACK
 72 015716  006216                            ASR     (SP)            ;GET STARTING WORD FOR MESSAGE(DIVIDE BY 16.)
 73 015720  011637  001374                    MOV     (SP),WRDPOS     ;GET CURRENT WORD POSITION
 74 015724  004737  033332                    JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
 75 015730  004737  032446                    JSR     PC,$SUPRL       ;TYPE IT (LEFT JUSTIFIED)
 76 015734  104414  057711                    DISPLY  ,PERIOD         ;TYPE '.'
 77 015740  104414  056121                    DISPLY  ,LIN10B         ;' IN DATA FIELD OF ERROR SECTOR'
 78 015744  063737  001400  001406            ADD     ECSEC,ECWRD     ;FIND THE BEGINNING OF THE ERROR BURST
 79 015752  026037  000172  001406            CMP     $RPBA(R0),ECWRD ;SEE IF BURST WAS IN DATA READ
 80 015760  101002                            BHI     4$              ;BR IF IN DATA READ
 81 015762  000137  016344                    JMP     ECC2            ;NOT IN DATA READ - REPORT IT
 82
 83 015766  016037  000234  001402  4$:       MOV     $RPEC2(R0),ECMSK0       ;GET THE ERROR BIT MASK
 84 015774  005037  001404                    CLR     ECMSK1          ;CLEAR THE UPPER MASK WORD
 85 016000  005337  001376          5$:       DEC     ECBIT           ;DECREMENT THE BIT OFFSET COUNT
 86 016004  002405                            BLT     6$              ;BR IF DONE
 87 016006  006337  001402                    ASL     ECMSK0          ;SHIFT THE ERROR MASK
 88 016012  006137  001404                    ROL     ECMSK1          ;SHIFT THE LOWER INTO THE UPPER
 89 016016  000770                            BR      5$              ;CONTINUE THE SHIFT
 90
 91 016020  017737  163362  001412  6$:       MOV     @ECWRD,ECBAD0   ;SAVE THE INCORRECT WORD
 92 016026  013746  001402                    MOV     ECMSK0,-(SP)    ;PUT LOWER MASK ON STACK
 93 016032  047716  163350                    BIC     @ECWRD,(SP)     ;CLEAR ERRONEOUS ONE BITS FROM MASK
 94 016036  043777  001402  163342            BIC     ECMSK0,@ECWRD   ;CLEAR ERRONEOUS ONE BITS FROM BAD WORD
 95 016044  052677  163336                    BIS     (SP)+,@ECWRD    ;SET DROPPED BITS
 96
 97 016050  005737  001404                    TST     ECMSK1          ;DOES ERROR GO INTO NEXT WORD ?
 98 016054  001415                            BEQ     7$              ;BR IF NO
 99 016056  013737  001406  001414            MOV     ECWRD,ECWRD1    ;DUPLICATE ADDRESS
100 016064  062737  000002  001414            ADD     #2,ECWRD1       ;INCREMENT ERROR ADDRESS
101 016072  026037  000172  001414            CMP     $RPBA(R0),ECWRD1        ;IS NEXT WORD IN THE BUFFER ?
102 016100  101006                            BHI     8$              ;BR IF YES, ELSE,
103 016102  005737  001402                    TST     ECMSK0          ;WAS ERROR IN FIRST WORD ?
104 016106  001516                            BEQ     ECC2            ;BR IF NO
105 016110  005037  001414          7$:       CLR     ECWRD1          ;CLEAR 2ND WORD ADDRESS
106 016114  000414                            BR      ECC1            ;PRINT WORD CORRECTED
107
108 016116  017737  163272  001420  8$:       MOV     @ECWRD1,ECBAD1  ;SAVE THE SECOND BAD WORD
109 016124  013746  001404                    MOV     ECMSK1,-(SP)    ;PUT THE UPPER MASK ON THE STACK
110 016130  047716  163260                    BIC     @ECWRD1,(SP)    ;CLEAR ERRONEOUS ONE BITS FROM UPPER MASK
111 016134  043777  001404  163252            BIC     ECMSK1,@ECWRD1  ;CLEAR ERRONEOUS ONE BITS FROM DATA WORD
112 016142  052677  163246                    BIS     (SP)+,@ECWRD1   ;SET DROPPED BITS
113
114 016146  104414  056265          ECC1:     DISPLY  ,LIN10H         ;HEADER
118 016152  013746  001406                    MOV     ECWRD,-(SP)     ;PUT ECWRD ON THE STACK
    016156  004737  024306                    JSR     PC,LINOCT       ;TYPE ECWRD
119 016162  013746  001374                    MOV     WRDPOS,-(SP)    ;PUT THE WORD POS ON THE STACK
120 016166  004737  033332                    JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
121 016172  004537  032662                    JSR     R5,$REPLZ       ;TYPE IT (REPLACE LEADING ZEROS)
122 016176  000006                            .WORD   6               ;TYPE 6 DIGITS
123 016200  104414  057711                    DISPLY  ,PERIOD         ;TYPE '.'
124 016204  104414  056530                    DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
129 016210  013746  001412                    MOV     ECBAD0,-(SP)    ;PUT ECBAD0 ON THE STACK
    016214  004737  024306                    JSR     PC,LINOCT       ;TYPE ECBAD0
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                016220  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
                016224  017746  163156                  MOV     @ECWRD,-(SP)    ;PUT @ECWRD ON THE STACK
                016230  004737  024306                  JSR     PC,LINOCT       ;TYPE @ECWRD
                016234  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
        130
        131     016240  005737  001414                  TST     ECWRD1          ;PRINT THE NEXT WORD ?
        132     016244  001441                          BEQ     ECCX            ;BR IF NOT
        133     016246  104414  001203                  DISPLY  ,$CRLF          ;CR-LF
        137     016252  013746  001414                  MOV     ECWRD1,-(SP)    ;PUT ECWRD1 ON THE STACK
                016256  004737  024306                  JSR     PC,LINOCT       ;TYPE ECWRD1
        138     016262  013746  001374                  MOV     WRDPOS,-(SP)    ;PUT THE WORD POS ON THE STACK
        139     016266  005216                          INC     (SP)            ;INC TO SECOND WORD OF BURST
        140     016270  004737  033332                  JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
        141     016274  004537  032662                  JSR     R5,$REPLZ       ;TYPE IT (REPLACE LEADING ZEROS)
        142     016300  000006                          .WORD   6               ;TYPE 6 DIGITS
        143     016302  104414  057711                  DISPLY  ,PERIOD         ;TYPE '.'
        144     016306  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
        149     016312  013746  001420                  MOV     ECBAD1,-(SP)    ;PUT ECBAD1 ON THE STACK
                016316  004737  024306                  JSR     PC,LINOCT       ;TYPE ECBAD1
                016322  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
                016326  017746  163062                  MOV     @ECWRD1,-(SP)   ;PUT @ECWRD1 ON THE STACK
                016332  004737  024306                  JSR     PC,LINOCT       ;TYPE @ECWRD1
                016336  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
        150     016342  000402                          BR      ECCX            ;EXIT
        151
        152     016344  104414  056161          ECC2:   DISPLY  ,LIN10C         ;ERROR BURST WAS NOT TRANSFERED TO MEMORY
        153     016350  104414  001203          ECCX:   DISPLY  ,$CRLF          ;CR-LF
        154     016354  000207                          RTS     PC              ;RETURN
```

```
                                        ;ROUTINE TO DISPLAY THE SECTOR WHICH GAVE THE HARD ERROR

016356  032777  000010  162570  PRTBAD: BIT     #SW3,@SWR       ;PRINT THE BAD SECTOR ?
016364  001520                          BEQ     8$              ;BR IF NOT
016366  016001  000172                  MOV     $RPBA(R0),R1    ;PUT THE END ADDRESS INTO R1
016372  016046  000020                  MOV     $WRDL(R0),-(SP) ;FIND THE BEGINNING OF THE SECTOR
016376  066016  000170                  ADD     $RPWC(R0),(SP)  ;SUBTRACT THE WORDS NOT TRANSFERED
016402  001002                          BNE     1$
016404  005726                          TST     (SP)+           ;RESTORE STACK
016406  000207                          RTS     PC              ;EXIT--NO WORDS XFERRED
016410  005046                  1$:     CLR     -(SP)           ;MAKE THE UPPER DIVIDEND 0
016412  016046  000022                  MOV     $SSEC(R0),-(SP) ;DIVIDE THE WORDS XFERED BY THE SECTOR SIZE
016416  004737  032046                  JSR     PC,$DIV         ;DIVIDE
016422  005716                          TST     (SP)            ;REMANDER = 0 ?
016424  001403                          BEQ     2$              ;BR IF IT IS - COMPLETE SECTOR TRANSFERED
016426  006316                          ASL     (SP)            ;CONVERT THE RESIDUAL SECTOR INTO BYTE COUNT
016430  161601                          SUB     (SP),R1         ;SUBTRACT IT FROM THE END ADDRESS
016432  000410                          BR      3$              ;FINISH THE SIZING
016434  162701  001000          2$:     SUB     #256.*2,R1      ;SUBTRACT FULL SECTOR FROM END ADDR (IN BYTES)
016440  122760  000005  000024          CMPB    #5,$CODE(R0)    ;WAS OPERATION READ HEADER & DATA ?
016446  001002                          BNE     3$              ;BR IF NOT
016450  162701  000004                  SUB     #4,R1           ;SUBTRACT HEADER SIZE FROM ADDR
016454  062706  000004          3$:     ADD     #4,SP           ;RESTORE THE STACK POINTER
016460  104414  001203                  DISPLY  ,$CRLF          ;CR-LF
016464  104414  056413                  DISPLY  ,LIN11H         ;PRINT THE HEADER
016470  122760  000005  000024          CMPB    #5,$CODE(R0)    ;WAS OPERATION READ HEADER & DATA ?
016476  001021                          BNE     4$              ;BR IF NOT
016500  104414  056466                  DISPLY  ,LIN11          ;TYPE 'ADDR    HEADER'
016504  010146                          MOV     R1,-(SP)        ;PUT THE ADDRESS ON THE STACK
016506  004737  024306                  JSR     PC,LINOCT       ;TYPE THE ADDRESS
016512  104414  056527                  DISPLY  ,BLNKS3         ;TYPE 3 BLANKS
016516  012146                          MOV     (R1)+,-(SP)     ;PUT WORD ON STACK
016520  004737  024306                  JSR     PC,LINOCT       ;TYPE THE 1ST HEADER WORD
016524  104414  056531                  DISPLY  ,BLNKS1         ;TYPE 1 BLANK
016530  012146                          MOV     (R1)+,-(SP)     ;PUT WORD ON STACK
016532  004737  024306                  JSR     PC,LINOCT       ;TYPE THE 2ND HEADER WORD
016536  104414  001203                  DISPLY  ,$CRLF          ;CR-LF

016542  104414  056507          4$:     DISPLY  ,LIN11A         ;TYPE 'ADDR    DATA'
016546  012702  000010          5$:     MOV     #8.,R2          ;8. DATA WORDS PER LINE
016552  010146                          MOV     R1,-(SP)        ;PUT THE ADDRESS ON THE STACK
016554  004737  024306                  JSR     PC,LINOCT       ;TYPE THE ADDRESS
016560  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
016564  020160  000172          6$:     CMP     R1,$RPBA(R0)    ;PRINTED ALL THE SECTOR ?
016570  001412                          BEQ     7$              ;BR IF ALL PRINTED
016572  104414  056531                  DISPLY  ,BLNKS1         ;TYPE 1 BLANK
016576  012146                          MOV     (R1)+,-(SP)     ;PUT THE DATA ON THE STACK
016600  004737  024306                  JSR     PC,LINOCT       ;TYPE THE DATA
016604  005302                          DEC     R2              ;DECREMENT THE HORIZONTAL COUNT
016606  001366                          BNE     6$              ;BR IF NOT AT THE END OF THE LINE
016610  104414  001203                  DISPLY  ,$CRLF          ;CR-LF
016614  000754                          BR      5$              ;RESTORE THE WORDS/LINE COUNT
016616  104414  001203          7$:     DISPLY  ,$CRLF          ;CR-LF
016622  104414  001203                  DISPLY  ,$CRLF          ;CR-LF
016626  000207                  8$:     RTS     PC              ;RETURN

                                        ;ROUTINE TO DO A RECALIBRATE USING ACTIVE DPB
```

```
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       JSR     PC,RECALT
                                        ;       RETURN
                                        RECALT: MOV     R0,2$           ;LOAD THE DPB ADDRESS
016630  010037  016654                  1$:     MOV     R0,2$           ;LOAD THE DPB ADDRESS
016634  116060  000166  000027                  MOVB    $RPCS1(R0),$PREVO(R0)   ;SAVE THE PREVIOUS COMMAND
016642  112760  000107  000002                  MOVB    #RECAL,$COMND(R0)       ;LOAD THE NEW COMMAND
016650  004037  041304                  1$:     JSR     R0,RP07         ;START THE RECALIBRATE
016654  000000                          2$:     .WORD   0               ;DPB ADDRESS
016656  000774                                  BR      1$              ;DRIVER DIDN'T ACCEPT THE COMMAND
016660  005760  000016                  3$:     TST     $TATUS(R0)      ;SEE IF FINISHED
016664  001775                                  BEQ     3$              ;IF EQ NO
016666  004737  024364                          JSR     PC,READDR       ;DECREMENT THE ADDRESSES
016672  012660  000034                          MOV     (SP)+,$PREVA+2(R0)      ;MOVE THE CYLINDER ADDRESS
016676  112660  000033                          MOVB    (SP)+,$PREVA+1(R0)      ;MOVE THE TRACK ADDRESS
016702  112660  000032                          MOVB    (SP)+,$PREVA(R0)        ;MOVE THE SECTOR ADDRESS
016706  005060  000012                          CLR     $CYL(R0)        ;CLEAR THE CURRENT CYLINDER ADDRESS
016712  005060  000010                          CLR     $SEC(R0)        ;CLEAR THE CURRENT TRK/SEC ADDRESS
016716  000207                                  RTS     PC              ;RETURN

                                        ;ROUTINE TO A RECAL WITH NO DPB ACTIVE
                                        ;CALL:
                                        ;       MOVB    #DRIVE,GENDPB   ;DRIVE ADDRESS
                                        ;       JSR     PC,RECAL0
                                        ;       RETURN
016720  112737  000107  050656          RECAL0: MOVB    #RECAL,GENDPB+$COMND    ;RELCALIBRATE COMMAND
016726  004037  041304                  1$:     JSR     R0,RP07         ;DRIVER ENTRANCE
016732  050654                                  GENDPB                  ;DPB ADDRESS FOR COMMAND
016734  000774                                  BR      1$              ;DRIVER DIDN'T ACCEPT THE COMMAND
016736  005737  050672                  2$:     TST     GENDPB+$TATUS   ;SEE IF FINISHED
016742  001775                                  BEQ     2$              ;BR IF NOT FINISHED
016744  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
016746  116637  000004  050665  READHD: MOVB    4(SP),GENDPB+$TRK       ;TRACK ADDRESS
016754  116637  000006  050664          MOVB    6(SP),GENDPB+$SEC       ;SECTOR ADDRESS
016762  016637  000002  050666          MOV     2(SP),GENDPB+$CYL       ;CYLINDER ADDRESS
016770  111037  050654                  MOVB    (R0),GENDPB     ;DRIVE NUMBER
016774  112737  000173  050656          MOVB    #RDHD,GENDPB+$COMND     ;COMMAND
017002  012737  177776  050660          MOV     #-2,GENDPB+$WCNT        ;WORD CTR = 2
017010  004037  041304                  1$:     JSR     R0,RP07         ;DRIVER ENTRANCE
017014  050654                                  GENDPB                  ;DPB ADDRESS FOR COMMAND
017016  000774                                  BR      1$              ;DRIVER DIDN'T ACCEPT COMMAND
017020  005737  050672                  2$:     TST     GENDPB+$TATUS   ;FINISHED?
017024  001775                                  BEQ     2$              ;BR IF NOT
017026  011666  000006                          MOV     (SP),6(SP)      ;ADJUST STACK FOR RETURN
017032  062706  000006                          ADD     #6,SP           ;ADJUST RETRUN POINTER
```

```
                                        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'
017040  004737  020160          $RETRY: JSR     PC,GODRIV       ;RE-START ORDER
017044  005760  000016          1$:     TST     $TATUS(R0)      ;ORDER FINISHED?
017050  001775                          BEQ     1$              ;BR IF NOT
017052  100405                          BMI     2$              ;BR IF ERROR
017054  105237  001325                  INCB    RETRY+1         ;INCREMENT RETRY COUNT
017060  062716  000002                  ADD     #2,(SP)         ;INCREMENT RETURN
017064  000436                          BR      6$              ;GO TO EXIT

017066  032760  000200  000016  2$:     BIT     #BIT7,$TATUS(R0)  ;DID ORDER TERMINATE NORMALLY ?
017074  001441                          BEQ     8$              ;BR IF NOT
017076  005737  001322                  TST     MASK            ;IS ERROR MASK 0 ?
017102  001004                          BNE     3$              ;BR IF NOT
017104  005760  000202                  TST     $RPER1(R0)      ;MAKE SURE THAT THE DRIVE ERROR REG IS CLEAR
017110  001025                          BNE     7$              ;BR IF NOT
017112  000415                          BR      5$              ;CONTINUE RETRY

017114  022737  000007  001322  3$:     CMP     #7,MASK         ;EWN ERROR?
017122  001005                          BNE     4$              ;BR IF NO
017124  032760  000002  000200          BIT     #BIT1,$RPDS(R0) ;'EWN' STILL SET?
017132  001414                          BEQ     7$              ;NO, REPORT DIFFERENT ERROR
017134  000404                          BR      5$              ;SET, RETRY

017136  033760  001322  000202  4$:     BIT     MASK,$RPER1(R0) ;SAME ERROR?
017144  001407                          BEQ     7$              ;BR IF NOT
017146  105237  001325          5$:     INCB    RETRY+1         ;INCREMENT RETRY COUNT
017152  123737  001324  001325          CMPB    RETRY,RETRY+1   ;DONE ?
017160  001327                          BNE     $RETRY          ;BR IF NOT DONE
017162  000207                  6$:     RTS     PC              ;RETURN

017164  004737  024274          7$:     JSR     PC,LINE8        ;REPORT DIFFERENT ERROR
017170  004737  024056                  JSR     PC,LINE7        ;PRINT LINE 7
017174  005726                          TST     (SP)+           ;ADJUST STACK POINTER FOR DIRECT RETURN
017176  000207                          RTS     PC              ;RETURN

017200  104414  055570          8$:     DISPLY  ,LIN8M          ;'DIFFERENT ERROR DURING RETRY'
017204  000137  007636                  JMP     ERPRC1          ;REPORT THE ERROR
```

```
                                        ;ROUTINE TO UPDATE THE PERFORMANCE SUMMARY STATISTICS
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       JSR     PC,STATIS
                                        ;       RETURN

 017210  032760  000300  000016  STATIS: BIT     #BIT07!BIT06,$STATUS(R0) ;CHECK FOR DATA TERMINATION
 017216  001533                          BEQ     7$                      ;BR IF NOT DATA TERMINATION
 017220  016037  000172  017510          MOV     $RPBA(R0),FACTOR        ;STORE THE FINAL BUFFER ADDRESS
 017226  166037  000006  017510          SUB     $BUF(R0),FACTOR ;SUBTRACT THE INITIAL ADDRESS
 017234  001524                          BEQ     7$                      ;BR IF NO DATA TRANSFER
 017236  006237  017510                  ASR     FACTOR                  ;CONVERT TO A WORD COUNT

 017242  122760  000002  000024          CMPB    #2,$CODE(R0)    ;SEE IF COMMAND WAS A WRITE
 017250  001404                          BEQ     1$              ;BRANCH IF YES
 017252  122760  000000  000024          CMPB    #0,$CODE(R0)    ;PRESENT OPERATION AN AUTO WRITE CHECK ?
 017260  001043                          BNE     4$              ;BR IF NO
 017262  063760  017510  000042  1$:     ADD     FACTOR,$WTPAS(R0)       ;ADD WORDS WRITTEN PER PASS
 017270  005560  000044                  ADC     $WTPAS+2(R0)    ;ADD ANY CARRY
 017274  063760  017510  000062          ADD     FACTOR,$WTOTL+4(R0)     ;ADD WORDS WRITTEN TO REP COUNTER
 017302  005560  000064                  ADC     $WTOTL+6(R0)    ;ADD ANY CARRY
 017306  016046  000062                  MOV     $WTOTL+4(R0),-(SP)      ;GET LOW DIVIDEND
 017312  016046  000064                  MOV     $WTOTL+6(R0),-(SP)      ;GET HIGH DIVIDEND
 017316  012746  041100                  MOV     #041100,-(SP)   ;GET LOW DIVISOR
 017322  012746  000017                  MOV     #17,-(SP)       ;GET HIGH DIVISOR
 017326  004737  032114                  JSR     PC,$DBDIV       ;DIVIDE BY 1 X10^6
 017332  005766  000004                  TST     4(SP)           ;DID REP COUNTER REACH LIMIT YET ?
 017336  001412                          BEQ     2$              ;BR IF NO
 017340  012660  000064                  MOV     (SP)+,$WTOTL+6(R0)      ;GET HIGH REMAINDER
 017344  012660  000062                  MOV     (SP)+,$WTOTL+4(R0)      ;GET LOW REMAINDER
 017350  062760  000001  000056          ADD     #1,$WTOTL(R0)   ;UPDATE THE TOTAL WRDS WRITTEN
 017356  005560  000060                  ADC     $WTOTL+2(R0)    ;ADD ANY CARRY
 017362  000401                          BR      3$
 017364  022626                  2$:     CMP     (SP)+,(SP)+     ;GET HIGH & LOW REMAINDER OFF STACK
 017366  005726                  3$:     TST     (SP)+           ;GET QUOTIENT OFF STACK

 017370  122760  000002  000024  4$:     CMPB    #2,$CODE(R0)    ;SEE IF COMMAND WAS A WRITE
 017374  001443                          BEQ     7$              ;BRANCH IF YES
 017400  063760  017510  000036          ADD     FACTOR,$RDPAS(R0)       ;ADD WORDS READ PER PASS
 017406  005560  000040                  ADC     $RDPAS+2(R0)    ;ADD ANY CARRY
 017412  063760  017510  000072          ADD     FACTOR,$RTOTL+4(R0)     ;ADD WORDS READ TO REP COUNTER
 017420  005560  000074                  ADC     $RTOTL+6(R0)    ;ADD ANY CARRY
 017424  016046  000072                  MOV     $RTOTL+4(R0),-(SP)      ;GET LOW DIVIDEND
 017430  016046  000074                  MOV     $RTOTL+6(R0),-(SP)      ;GET HIGH DIVIDEND
 017434  012746  041100                  MOV     #041100,-(SP)   ;GET LOW DIVISOR
 017440  012746  000017                  MOV     #17,-(SP)       ;GET HIGH DIVISOR
 017444  004737  032114                  JSR     PC,$DBDIV       ;DIVIDE BY 1 X10^6
 017450  005766  000004                  TST     4(SP)           ;DID REP COUNTER REACH LIMIT YET ?
 017454  001412                          BEQ     5$              ;BR IF NO
 017456  012660  000074                  MOV     (SP)+,$RTOTL+6(R0)      ;GET HIGH REMAINDER
 017462  012660  000072                  MOV     (SP)+,$RTOTL+4(R0)      ;GET LOW REMAINDER
 017466  062760  000001  000066          ADD     #1,$RTOTL(R0)   ;UPDATE THE TOTAL WRDS READ
 017474  005560  000070                  ADC     $RTOTL+2(R0)    ;ADD ANY CARRY
 017500  000401                          BR      6$
 017502  022626                  5$:     CMP     (SP)+,(SP)+     ;GET HIGH & LOW REMAINDER OFF STACK
 017504  005726                  6$:     TST     (SP)+           ;GET QUOTIENT OFF STACK
 017506  000207                  7$:     RTS     PC
```

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58
59 017510  000000                FACTOR: .WORD   0              ;USED FOR WORDS TRANSFERED
```

```
                                        ;ROUTINE TO GET A BUFFER
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       CLR     -(S?)           ;CLEAR THE STACK
                                        ;       JSR     PC,GETBUF
                                        ;       RETURN                  ;BUFFER ADDRESS WILL BE ON THE STACK
                                        ;                               ;STACK WILL BE ZERO IF NO BUFFER AVAILABLE
017512  010146                  GETBUF: MOV     R1,-(SP)        ;SAVE R1
017514  010246                          MOV     R2,-(SP)        ;SAVE R2
017516  010346                          MOV     R3,-(SP)        ;SAVE R3
017520  013702  001654                  MOV     BUFTBL,R2       ;NUMBER OF SEPARATE BUFFERS
017524  001444                          BEQ     5$              ;BR IF NONE AVAILABLE
017526  012701  001656                  MOV     #BUFTBL+2,R1    ;FIRST ADDRESS OF ALLOCATION TABLE
017532  026061  000020  000002  1$:     CMP     $WRDL(R0),2(R1) ;SEE IF THERE IS A BLOCK LARGE ENOUGH
017540  101405                          BLOS    2$              ;BRANCH IF IT IS
017542  005302                          DEC     R2              ;DECREMENT TABLE COUNT
017544  001434                          BEQ     5$              ;BR IF THROUGH TABLE
017546  062701  000004                  ADD     #4,R1           ;INCREMENT TABLE POINTER
017552  000767                          BR      1$              ;CONTINUE LOOKING
017554  011166  000010          2$:     MOV     (R1),10(SP)     ;BUFFER ADDRESS TO STACK
017560  166061  000020  000002          SUB     $WRDL(R0),2(R1) ;ADJUST BUFFER WRD CNT
017566  001407                          BEQ     3$              ;BR IF DIFFERENCE IS ZERO
017570  006360  000020                  ASL     $WRDL(R0)       ;CONVERT # WORDS TO BYTES
017574  066011  000020                  ADD     $WRDL(R0),(R1)  ;MAKE NEW STARTING ADDRESS
017600  006260  000020                  ASR     $WRDL(R0)       ;RETURN # BYTES TO WORDS
017604  000414                          BR      5$              ;RETURN
017606  005337  001654          3$:     DEC     BUFTBL          ;DECREMENT ENTRY COUNT
017612  001411                          BEQ     5$              ;BR IF ALLOCATION TABLE EMPTY
017614  005302                          DEC     R2              ;DECREMENT TABLE COUNT
017616  001407                          BEQ     5$              ;BR IF ITEM WERE LAST ENTRY
017620  010103                          MOV     R1,R3           ;MOVE TABLE POINTER
017622  062703  000004                  ADD     #4,R3           ;POINT TO NEXT ENTRY
017626  012321                  4$:     MOV     (R3)+,(R1)+     ;MOVE ITEMS
017630  012321                          MOV     (R3)+,(R1)+
017632  005302                          DEC     R2              ;DECREMENT TABLE COUNT
017634  001374                          BNE     4$              ;CONTINUE IF NOT AT END OF TABLE
017636  012603                  5$:     MOV     (SP)+,R3        ;RESTORE R3
017640  012602                          MOV     (SP)+,R2        ;RESTORE R2
017642  012601                          MOV     (SP)+,R1        ;RESTORE R1
017644  000207                          RTS     PC              ;RETURN

                                        ;ROUTINE TO PUT BUFFER BACK IN TABLE
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       JSR     PC,RELBUF
                                        ;       RETURN

017646  010146                  RELBUF: MOV     R1,-(SP)        ;SAVE R1
017650  010246                          MOV     R2,-(SP)        ;SAVE R2
017652  010346                          MOV     R3,-(SP)        ;SAVE R3
017654  010446                          MOV     R4,-(SP)        ;SAVE R4
017656  010546                          MOV     R5,-(SP)        ;SAVE R5
017660  012701  001656                  MOV     #BUFTBL+2,R1    ;BEGINNING OF TABLE
017664  013702  001654                  MOV     BUFTBL,R2       ;ENTRY COUNT
017670  001424                          BEQ     2$              ;BR IF EMPTY TABLE
017672  016003  000120                  MOV     $HLDWC(R0),R3   ;TRIAL ADDRESS
```

```
 58 017676  006303                        ASL     R3                      ;CHANGE TO BYTE COUNT
 59 017700  066003  000006                ADD     $BUF(R0),R3             ;ADDRESS OF HIGHER ADJACENT BLOCK
 60 017704  021103                 1$:    CMP     (R1),R3                 ;UPPER ADJACENT BLOCK
 61 017706  001424                        BEQ     3$                      ;BR IF YES
 62 017710  062701  000004                ADD     #4,R1                   ;INCREMENT POINTER
 63 017714  005302                        DEC     R2                      ;DECREMENT ENTRY COUNT
 64 017716  001372                        BNE     1$                      ;CONTINUE SEARCHING
 65 017720  016011  000006                MOV     $BUF(R0),(R1)           ;PUT THE BUFFER BLOCK INTO THE TABLE
 66 017724  016061  000120  000002        MOV     $HLDWC(R0),2(R1)                ;BLOCK WRD CNT
 67 017732  005237  001654                INC     BUFTBL                  ;INCREMENT ENTRY COUNT
 68 017736  005202                        INC     R2                      ;INCREMENT R2 FOR USE LATER
 69 017740  000414                        BR      4$                      ;SEE IF A LOWER ADJACENT BLOCK IS IN THE TABLE
 70 017742  016021  000006         2$:    MOV     $BUF(R0),(R1)+          ;BLOCK ADDRESS TO TABLE
 71 017746  016021  000120                MOV     $HLDWC(R0),(R1)+                ;WRD CNT TO TABLE
 72 017752  005237  001654                INC     BUFTBL                  ;INCREMENT ENTRY COUNT
 73 017756  000443                        BR      8$                      ;EXIT
 74 017760  016011  000006         3$:    MOV     $BUF(R0),(R1)           ;RELEASED BUFFER IS LOWER ADJACENT
 75 017764  066061  000120  000002        ADD     $HLDWC(R0),2(R1)                ;INCREMENTED WRD CNT
 76 017772  010246                 4$:    MOV     R2,-(SP)                ;SAVE R2
 77 017774  013702  001654                MOV     BUFTBL,R2               ;ENTRY COUNT
 78 020000  012705  001656                MOV     #BUFTBL+2,R5            ;BEGINNING OF TABLE
 79 020004  016504  000002         5$:    MOV     2(R5),R4                ;BLOCK SIZE (IN WORDS)
 80 020010  006304                        ASL     R4                      ;CHANGE TO BYTE COUNT
 81 020012  061504                        ADD     (R5),R4                 ;ADD BLOCK BEGINNING ADDRESS
 82 020014  020411                        CMP     R4,(R1)                 ;R1 STILL POINTS TO INSERTED ENTRY
 83 020016  001406                        BEQ     6$                      ;LOWER ADJACENT IN TABLE
 84 020020  062705  000004                ADD     #4,R5                   ;INCREMENT POINTER
 85 020024  005302                        DEC     R2                      ;DECREMENT ENTRY COUNT
 86 020026  001366                        BNE     5$                      ;CONTINUE LOOKING
 87 020030  005726                        TST     (SP)+                   ;RESTORE STACK POINTER
 88 020032  000415                        BR      8$                      ;END
 89 020034  012602                 6$:    MOV     (SP)+,R2                ;RESTORE R2
 90 020036  066165  000002  000002        ADD     2(R1),2(R5)             ;INCREMENT LOWER BLOCK LENGTH
 91 020044  005337  001654                DEC     BUFTBL                  ;DECREMENT ENTRY COUNT
 92 020050  010105                        MOV     R1,R5                   ;GET READY TO COMPRESS
 93 020052  062705  000004                ADD     #4,R5                   ;INCREMENT TO NEXT ENTRY
 94 020056  012521                 7$:    MOV     (R5)+,(R1)+             ;COMPRESS TABLE
 95 020060  012521                        MOV     (R5)+,(R1)+             ;MOVE SIZE FIELD DOWN
 96 020062  005302                        DEC     R2                      ;DECREMENT ENTRY COUNT
 97 020064  001374                        BNE     7$                      ;BR IF NOT FINISHED
 98 020066  012605                 8$:    MOV     (SP)+,R5                ;RESTORE R5
 99 020070  012604                        MOV     (SP)+,R4                ;RESTORE R4
100 020072  012603                        MOV     (SP)+,R3                ;RESTORE R3
101 020074  012602                        MOV     (SP)+,R2                ;RESTORE R2
102 020076  012601                        MOV     (SP)+,R1                ;RESTORE R1
103 020100  000207                        RTS     PC                      ;RETURN
104
105                                 ;FILL THE ASSIGNED BUFFER (IF WRITE OR WRITE CHECK COMMAND)
106                                 ;CALL:
107                                 ;       MOV     #DPB,R0                 ;DPB ADDRESS
108                                 ;       MOV     #BUFADR,$BUF(R0)                ;LOAD BUFFER ADDRESS INTO THE DPB
109                                 ;       MOVB    #PATTERN,$PATTC(R0)     ;PATTERN CODE
110                                 ;       JSR     PC,FILBUF
111                                 ;       RETURN
112
113 020102  104412                 FILBUF: SAVREG                          ;SAVE THE REGISTERS
114 020104  132760  000004  000024        BITB    #4,$CODE(R0)            ;SEE IF READ COMMAND
```

```
                                                BNE     4$                      ;BR IF READ
                                1$:             MOV     $BUF(R0),R1             ;BUFFER ADDRESS
                                                MOV     $WRDL(R0),R2            ;POSITIVE WORD COUNT
                                                MOVB    $PATTC(R0),R4           ;RELATIVE PATTERN ADDRESS
                                2$:             MOV     STNDAT(R4),R5           ;PATTERN ADDRESS
                                                MOV     #16.,R3                 ;PATTERN COUNT
                                3$:             MOV     (R5)+,(R1)+             ;MOVE THE PATTERN INTO THE BUFFER
                                                DEC     R2                      ;DECREMENT THE WORD COUNT
                                                BLE     4$                      ;BR IF DONE (WORD COUNT = 0)
                                                DEC     R3                      ;DECREMENT THE PATTERN COUNT
                                                BNE     3$                      ;BR IF MORE PATTERN
                                                BR      2$                      ;CONTINUE DISTRIBUTING THE PATTERN
                                4$:             RESREG                          ;RESTORE THE REGISTERS
                                                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
                                                MOV     R0,2$                   ;CURRENT DPB ADDRESS
                                1$:             JSR     R0,RP07                 ;CALL THE DRIVE HANDLER
                                2$:             .WORD   0                       ;DRIVE BLOCK ADDRESS GOES HERE
                                                HALT                            ;DRIVER REJECTED REQUEST
                                                MOV     (SP)+,R0                ;RESTORE R0
                                                ADD     #1,$OPERC(R0)           ;INCREMENT THE OPERATION COUNT
                                                ADC     $OPERC+2(R0)
                                                CMP     $PREVA+2(R0),$CYL(R0)   ;DID COMMAND REQUIRE A CYLINDER CHANGE ?
                                                BEQ     3$                      ;BR IF NO
                                                ADD     #1,$SEEKS(R0)           ;INCREMENT SEEK COUNT PER PASS
                                                ADC     $SEEKS+2(R0)            ;ADD ANY CARRY
                                                ADD     #1,$STOTL(R0)           ;INCREMENT SEEK COUNT TOTAL
                                                ADC     $STOTL+2(R0)            ;ADD ANY CARRY
                                3$:             RTS     PC
```

```
                                ;ROUTINE TO SETUP PARAMETERS FOR A SEQUENTIAL READ OR WRITE OF THE DISK
                                ;CALL
                                ;       MOV     #DPB,R0         ;DPB ADDRESS
                                ;       MOV     #NN,$PACK(R0)   ;GET COMMAND NUMBER
                                ;       JSR     PC,SEQPAR       ;CALL ROUTINE
                                ;       RETURN
                                ;
                                ;WHERE 'NN' CAN BE ONE OF THE FOLLOW NUMBERS;
                                ;       'WT' COMMAND= -2
                                ;       'W'  COMMAND= -1
                                ;       'T'  COMMAND=  0        (NOT USED IN ROUTINE)
                                ;       'R'  COMMAND=  1

020250  005760  000054          SEQPAR: TST     $OPERC+2(R0)    ;IS THIS THE FIRST OPERATION ?
020254  001010                          BNE     1$              ;BR IF NO
020256  005760  000052                  TST     $OPERC(R0)      ;IS THIS THE FIRST OPERATION ?
020262  001005                          BNE     1$              ;BR IF NO
020264  012704  000010                  MOV     #$SEC,R4        ;GET INDEX TO SECTOR ADDR STORAGE IN DPB
020270  004737  021332                  JSR     PC,CKLMTS       ;GO CHECK DISK ADDRESS LIMITS
020274  000453                        BR      3$              ;BR IF NOT AT END OF SEQUENTIAL ADDRESSING

020276  116060  000166  000027  1$:   MOVB    $RPCS1(R0),$PREVO(R0)   ;SAVE CURRENT PARAMETERS
020304  016060  000010  000032        MOV     $SEC(R0),$PREVA(R0)     ;SAVE PREVIOUS TRACK/SECTOR ADDRESS
020312  016060  000012  000034        MOV     $CYL(R0),$PREVA+2(R0)   ;SAVE PREVIOUS CYLINDER ADDRESS
020320  016060  000174  000010        MOV     $RPDA(R0),$SEC(R0)      ;CURRENT SECTOR & TRACK ADDRESS
020326  016060  000222  000012        MOV     $RPDC(R0),$CYL(R0)      ;CURRENT CYLINDER ADDRESS

020334  012704  000010          2$:   MOV     #$SEC,R4        ;GET INDEX TO SECTOR ADDR STORAGE IN DPB
020340  004737  021332                JSR     PC,CKLMTS       ;GO CHECK DISK ADDRESS LIMITS
020344  000427                        BR      3$              ;BR IF NOT AT END OF SEQUENTIAL ADDRESSING

020346  116060  000146  000010        MOVB    MINSEC(R0),$SEC(R0)     ;RESET SECTOR ADDRESS
020354  116060  000142  000011        MOVB    MINTRK(R0),$TRK(R0)     ;RESET TRACK ADDRESS
020362  016060  000136  000012        MOV     MINCYL(R0),$CYL(R0)     ;RESET CYLINDER ADDRESS
020370  112760  000004  000024        MOVB    #4,$CODE(R0)    ;SET CODE TO READ DATA
020376  122760  177776  000026        CMPB    #-2,$PACK(R0)   ;WAS WRITE DATA IN PROGESS ?
020404  001473                        BEQ     8$              ;BR IF YES (START TESTING, 'T' COMMAND)
020406  004737  031420                JSR     PC,$EOP         ;THIS IS THE END OF PASS
020412  032777  000020  160534        BIT     #SW04,@SWR      ;DO NOT DROP DRIVE AT EOT (SW04=1) ?
020420  001467                        BEQ     9$              ;BR IF NO
020422  000744                        BR      2$              ;MUST SURE ADDRESS IS NOT 'BSF' TRACK

020424  012704  000010          3$:   MOV     #$SEC,R4        ;GET INDEX TO SECTOR STORAGE
020430  013705  001466                MOV     WRDCNT,R5       ;WORD COUNT IS MAXIMUM
020434  004737  021512                JSR     PC,CHKWC        ;CHECK WORD COUNT FOR MAXCYL/MAXTRK
020440  010560  000020                MOV     R5,$WRDL(R0)    ;GET WORD COUNT
020444  042760  000377  000020        BIC     #377,$WRDL(R0)  ;IS IT LESS THAN ONE SECTOR WORD COUNT ?
020452  001002                        BNE     4$              ;BR IF NO
020454  105260  000021                INCB    $WRDL+1(R0)     ;SET TO ONE SECTOR
020460  016060  000020  000004  4$:   MOV     $WRDL(R0),$WCNT(R0)     ;STORE FOR 2'S COMPLEMENT WORD
020466  016060  000020  000120        MOV     $WRDL(R0),$HLDWC(R0)    ;HOLD WORD FOR 'RELBUF' ROUTINE
020474  005460  000004                NEG     $WCNT(R0)       ;CHANGE WORD COUNT TO 2'S COMPLEMENT
020500  012760  000400  000022        MOV     #256.,$SSEC(R0) ;SECTOR SIZE FOR READ OR WRITE

020506  105760  000026                TSTB    $PACK(R0)       ;'R' OR 'W' COMMAND FOR THIS DRIVE ?
020512  100407                        BMI     6$              ;BR IF WRITE
020514  112760  000004  000024  5$:   MOVB    #4,$CODE(R0)    ;CODE FOR READ DATA
```

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      58 020522  112760  000171  000002          MOVB    #RDDAT,$COMND(R0)       ;DRIVE CODE FOR OPERATION
      59 020530  000415                          BR      7$                      ;SET UP FOR EXIT
      61 020532  005737  001424          6$:     TST     RDONLY                  ;LOCKED IN "READ ONLY" MODE ?
      62 020536  001366                          BNE     5$                      ;BR IF YES
      63 020540  112760  000002  000024          MOVB    #2,$CODE(R0)            ;CODE FOR WRTDAT
      67 020546  112760  000161  000002          MOVB    #WRTDAT,$COMND(R0)      ;OP CODE
      68 020554  004737  021272                  JSR     PC,GETPAT               ;GET PATTERN CODE
      69 020560  110560  000030                  MOVB    R5,$PATTC(R0)           ;PATTERN CODE
      70 020564  012760  177777  000130  7$:     MOV     #-1,$NEXT(R0)           ;SET PARAMETERS SELECTED INDICATOR
      71 020572  000207                          RTS     PC                      ;RETURN
      72
      73 020574  105060  000026          8$:     CLRB    $PACK(R0)               ;SET 'T' COMMAND FLAG IN DPB TABLE
      74 020600  005060  000130          9$:     CLR     $NEXT(R0)               ;CLEAR 'PARAMETER SELECTED' INDICATOR
      75 020604  005726                          TST     (SP)+                   ;CLEAR STACK LEVEL
      76 020606  000137  006340                  JMP     MAIN                    ;JUMP TO MAIN BACKGROUND LOOP
```

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

020612  004737  037126          GENPAR: JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
020616  005737  001424                  TST     RDONLY          ;LOCKED IN "READ ONLY" MODE ?
020622  001016                          BNE     1$              ;BR IF YES
020624  032777  000001  160322          BIT     #SW0,@SWR       ;SEE IF SW0 SET
020632  001012                          BNE     1$              ;BR IF SET - READ ONLY
020634  012705  000010                  MOV     #8.,R5          ;READ/WRITE SELECTION DIVISOR
020640  004737  032022                  JSR     PC,GETREM       ;GET SELECTION VALUE
020644  020537  001502                  CMP     R5,RATIO        ;DETERMINE IF READ OR WRITE
020650  103003                          BHIS    1$              ;BR IF READ
020652  012705  000002                  MOV     #2,R5           ;SELECT WRITE DATA COMMAND
020656  000407                          BR      2$              ;SELECT ADDRESS

020660  013705  037226          1$:     MOV     $LONUM,R5       ;SELECT READ OPERATION CODE
020664  000305                          SWAB    R5              ;SWAP BYTES IN R5
020666  042705  177776                  BIC     #^C1,R5         ;MASK OUT ALL BUT BIT 0
020672  062705  000004                  ADD     #4,R5           ;TABLE OFFSET FOR READ CODE
020676  110560  000122          2$:     MOVB    R5,$NCODE(R0)   ;COMMAND SELECTION CODE TO CONTROL BLOCK
020702  016060  000174  000124          MOV     $RPDA(R0),$NSEC(R0)     ;SECTOR AND TRACK
020710  016060  000222  000126          MOV     $RPDC(R0),$NCYL(R0)     ;CYLINDER NUMBER

020716  005737  001510          THEAD:  TST     RANDOM          ;ENABLE RANDOM ADDRESS SELECT ?
020722  001427                          BEQ     RANCYL          ;YES
020724  005760  000054                  TST     $OPERC+2(R0)    ;IS THIS THE FIRST OPERATION ?
020730  001003                          BNE     1$              ;BR IF NO
020732  005760  000052                  TST     $OPERC(R0)      ;IS THIS THE FIRST OPERATION ?
020736  001405                          BEQ     2$              ;BR IF YES

020740  012704  000124          1$:     MOV     #$NSEC,R4       ;GET INDEX TO SECTOR ADDR STORAGE IN DPB
020744  004737  021332                  JSR     PC,CKLMTS       ;GO CHECK DISK ADDRESS LIMITS
020750  000412                          BR      3$              ;BR IF NOT AT END OF SEQUENTIAL ADDRESSING
020752  116060  000146  000124  2$:     MOVB    MINSEC(R0),$NSEC(R0)    ;RESET SECTOR ADDRESS
020760  116060  000142  000125          MOVB    MINTRK(R0),$NTRK(R0)    ;RESET TRACK ADDRESS
020766  016060  000136  000126          MOV     MINCYL(R0),$NCYL(R0)    ;RESET CYLINDER ADDRESS
020774  000761                          BR      1$              ;RE-CHECK FOR 'BSF' TRACK
020776  000137  021150          3$:     JMP     RANSIZ          ;GO CHECK FOR RANDOM WORD SIZE
```

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

                                        RANCYL: MOV     MAXCYL(R0),R5   ;GET MAXIMUM CYLINDER ADDRESS
                                                CMP     MINCYL(R0),R5   ;'MINCYL' AND 'MAXCYL' THE SAME ?
                                                BEQ     1$              ;BR IF THEY ARE
                                                SUB     MINCYL(R0),R5   ;GET NUMBER OF ALLOWABLE CYLINDERS
                                                INC     R5              ;INCREMENT DIFFERENCE TO USE AS DIVISOR
                                                JSR     PC,GETREM       ;GET THE RANDOM AUGMENT
                                                ADD     MINCYL(R0),R5   ;NEW CYLINDER ADDRESS
                                        1$:     MOV     R5,$NCYL(R0)    ;STORE CYLINDER ADDRESS IN DPB

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

                                        RANTRK: MOV     MAXTRK(R0),R5   ;GET MAXIMUM TRACK ADDRESS
                                                CMP     MINTRK(R0),R5   ;'MINTRK' AND 'MAXTRK' THE SAME ?
                                                BEQ     1$              ;BR IF THEY ARE
                                                SUB     MINTRK(R0),R5   ;GET NUMBER OF ALLOWABLE TRACKS
                                                INC     R5              ;INCREMENT DIFFERENCE TO USE AS DIVISOR
                                                JSR     PC,GETREM       ;GET THE RANDOM AUGMENT
                                                ADD     MINTRK(R0),R5   ;NEW TRACK ADDRESS
                                        1$:     MOVB    R5,$NTRK(R0)    ;STORE TRACK ADDRESS IN DPB

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

                                        RANSEC: MOV     MAXSEC(R0),R5   ;GET MAXIMUM SECTOR ADDRESS
                                                CMP     MINSEC(R0),R5   ;'MINSEC' AND 'MAXSEC' THE SAME ?
                                                BEQ     1$              ;BR IF THEY ARE
                                                SUB     MINSEC(R0),R5   ;GET NUMBER OF ALLOWABLE SECTORS
                                                INC     R5              ;INCREMENT DIFFERENCE TO USE AS DIVISOR
                                                JSR     PC,GETREM       ;GET THE RANDOM AUGMENT
                                                ADD     MINSEC(R0),R5   ;NEW SECTOR ADDRESS
                                        1$:     MOVB    R5,$NSEC(R0)    ;STORE SECTOR ADDRESS IN DPB

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

                                                MOV     #$NSEC,R4       ;GET INDEX TO SECTOR ADDR STORAGE IN DPB
                                                JSR     PC,CKLMTS       ;GO CHECK DISK ADDRESS LIMITS
                                                BR      2$              ;BR IF NOT AT END OF SEQUENTIAL ADDRESSING
                                                JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
                                                JMP     RANCYL          ;GO GENERATE NEW ADDRESS
                                        2$:

                                        ;GENERATE A RANDOM BUFFER LENGTH BETWEEN 6 & THE VALUE IN 'WRDCNT'

                                        RANSIZ: MOV     WRDCNT,R5       ;GET MAX WORD COUNT
                                                TST     RANDWC          ;SELECT A RANDOM WORD COUNT ?
                                                BNE     2$              ;BR IF NOT
                                                INC     R5              ;INCREMENT THE MAXIMUM WRD CNT
                                                JSR     PC,GETREM       ;DIVIDE BY MAX VALUE
                                                CMP     R5,#6           ;WORD COUNT LESS THAN 6 ?
                                                BGE     2$              ;BR IF NO
                                        1$:     JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
                                                BR      RANSIZ

                                        2$:     MOV     #$NSEC,R4       ;GET INDEX TO SECTOR STORAGE
                                                JSR     PC,CHKWC        ;SEE IF WORD COUNT IS TOO LARGE TO FIT
                                                                        ;IN REMAINDER OF TRACK. IF SO, THEN ADJUST
```

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                                                                ;WORD COUNT TO FIT ON TRACK.
021214  122760  000002  000122  3$:     CMPB    #2,$NCODE(R0)   ;WRITE OPERATION ?
021222  001005                          BNE     4$              ;BR IF NO
021224  042705  000377                  BIC     #377,R5         ;WRITTING PARTIAL SECTOR ?
021230  001002                          BNE     4$              ;BR IF NO, ELSE,
021232  012705  000400                  MOV     #256.,R5        ;WRITE AT LEAST ONE SECTOR
021236  010560  000020          4$:     MOV     R5,$WRDL(R0)    ;WORD COUNT

                        ;GET A RANDOM PATTERN NUMBER

021242  122760  000002  000122  RANPAT: CMPB    #2,$NCODE(R0)   ;WRITE OPERATION ?
021250  001004                          BNE     RANXIT          ;BR IF NO
021252  004737  021272                  JSR     PC,GETPAT       ;GET PATTERN CODE
021256  110560  000123                  MOVB    R5,$NPATC(R0)   ;MOVE PATTERN CODE TO CONTROL BLOCK
021262  012760  177777  000130  RANXIT: MOV     #-1,$NEXT(R0)   ;SET PARAMETERS SELECTED INDICATOR
021270  000207                          RTS     PC              ;RETURN

                        ;ROUTINE TO SELECT A PATTERN

021272  012705  000020          GETPAT: MOV     #16.,R5         ;SELECT PATTERN
021276  005737  001476                  TST     PATTERN         ;ENABLE RANDOM PATTERN SELECTION ?
021302  001403                          BEQ     1$              ;YES
021304  013705  001476                  MOV     PATTERN,R5      ;USE INDEXED PATTERN
021310  000406                          BR      2$              ;NO
021312  004737  037126          1$:     JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
021316  004737  032022                  JSR     PC,GETREM       ;GET CODE
021322  005705                          TST     R5              ;WAS PATTERN ZERO SELECTED ?
021324  001762                          BEQ     GETPAT          ;BR IF YES
021326  006305          2$:     ASL     R5                      ;MAKE CODE INTO TABLE INDEX
021330  000207                          RTS     PC
```

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                                        ;THIS ROUTINE IS USED TO CHECK ADDRESS LIMITS BEFORE THE NEXT COMMAND
                                        ;IS PERFORMED. ALSO, IT WILL CHECK FOR MAXIMUM ADDRESS LIMITS TO LOOK
                                        ;FOR AN END TO THE SEQUENTIAL ADDRESSING AND WILL MAKE SURE THE CURRENT
                                        ;ADDRESS IS NOT THE 'BAD SECTOR FILE'
                                        ;CALL:
                                        ;       MOV     #DPB,R0         ;DPB ADDRESS
                                        ;       MOV     #POINTER,R4     ;POINTER TO SECTOR STORAGE ($SEC OR $NSEC) IN DPB
                                        ;       JSR     PC,CKLMTS       ;CALL ADDRESS LIMITS ROUTINE
                                        ;       BR      ???             ;RETURN HERE IF NOT END OF SEQUENTIAL ADDRESSING
                                        ;       ------                  ;ELSE, RETURN HERE TO RESET DISK ADDRESS
                                        ;
                                        ;R0 = DPB ADDRESS BEFORE CALLING THE ROUTINE
                                        ;R4 = POINTER TO SECTOR STORAGE BEFORE CALLING THE ROUTINE

021332  060004                 CKLMTS: ADD     R0,R4           ;POINT TO SECTOR STORAGE POINT IN DPB
021334  026460  000002  000136         CMP     2(R4),MINCYL(R0)        ;IS CYLINDER ADDRESS BELOW MIN. ?
021342  002003                         BGE     1$              ;BR IF NO
021344  016064  000136  000002         MOV     MINCYL(R0),2(R4)        ;RESET CYLINDER TO MIN.
021352  126460  000001  000142  1$:    CMPB    1(R4),MINTRK(R0)        ;IS TRACK ADDRESS BELOW MIN. ?
021360  002003                         BGE     2$              ;BR IF NO
021362  116064  000142  000001         MOVB    MINTRK(R0),1(R4)        ;RESET TRACK TO MIN.
021370  121460  000146         2$:     CMPB    (R4),MINSEC(R0) ;IS SECTOR ADDRESS BELOW MIN. ?
021374  002002                         BGE     3$              ;BR IF NO
021376  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'

021402  121460  000144         3$:     CMPB    (R4),MAXSEC(R0) ;IS SECTOR ADDRESS AT MAXIMUM ?
021406  003404                         BLE     5$              ;BR IF NO
021410  116014  000146                 MOVB    MINSEC(R0),(R4) ;RESET SECTOR ADDRESS
021414  105264  000001         4$:     INCB    1(R4)           ;INCREMENT TO NEXT TRACK ADDRESS
021420  126460  000001  000140  5$:     CMPB    1(R4),MAXTRK(R0)        ;IS TRACK ADDRESS OVER MAXIMUM ?
021426  003407                         BLE     6$              ;BR IF NO
021430  116014  000146                 MOVB    MINSEC(R0),(R4) ;RESET SECTOR ADDRESS
021434  116064  000142  000001         MOVB    MINTRK(R0),1(R4)        ;RESET TRACK ADDRESS
021442  005264  000002                 INC     2(R4)           ;INCREMENT TO NEXT CYLINDER ADDRESS
021446  026460  000002  000134  6$:     CMP     2(R4),MAXCYL(R0)        ;IS CYLINDER ADDRESS OVER MAXIMUM ?
021454  003403                         BLE     7$              ;BR IF NO
021456  062716  000002                 ADD     #2,(SP)         ;ADJUST RETURN TO RESET DISK ADDRESS PARAMETERS
021462  000412                         BR      8$
                                        ;CHECK NOT TO READ OR WRITE BAD SECTOR TRACK
021464  016046  000156         7$:     MOV     FE1(R0),-(SP)   ;GET 1ST FE CYLINDER (LAST CYL+1)
021470  005316                         DEC     (SP)            ;LOOK AT LAST USER CYLINDER
021472  026426  000002                 CMP     2(R4),(SP)+     ;ARE WE ON LAST USER CYLINDER ?
021476  001004                         BNE     8$              ;BR IF NO
021500  126460  000001  000154         CMPB    1(R4),TRKLMT(R0)        ;IS THIS THE BAD SECTOR TRACK ?
021506  001742                         BEQ     4$              ;BR IF YES
021510  000207                 8$:     RTS     PC              ;RETURN
```

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                                        ;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

021512  060004                  CHKWC: ADD     R0,R4           ;POINT TO SECTOR STORAGE POINT IN DPB
021514  105760  000146                 TSTB    MINSEC(R0)      ;ALLOW SPIRAL RD/WRT ?
021520  001023                         BNE     2$              ;BR IF NO
021522  126060  000144  000152         CMPB    MAXSEC(R0),SECLMT(R0)   ;ALLOW SPIRAL RD/WRT ?
021530  001017                         BNE     2$              ;BR IF NO
021532  105760  000142                 TSTB    MINTRK(R0)      ;ALLOW SPIRAL RD/WRT ?
021536  001010                         BNE     1$              ;BR IF NO
021540  126060  000140  000154         CMPB    MAXTRK(R0),TRKLMT(R0)   ;ALLOW SPIRAL RD/WRT ?
021546  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
021550  026064  000134  000002         CMP     MAXCYL(R0),2(R4)        ;ON MAXIMUM CYLINDER ?
021556  001022                         BNE     4$              ;BR IF NO
021560  126064  000140  000001  1$:    CMPB    MAXTRK(R0),1(R4)        ;ON MAXIMUM TRACK ?
021566  001016                         BNE     4$              ;BR IF NO
                                                               ;ADJUST WORD COUNT TO FIT ON REMAINDER OF TRACK
021570  111404                  2$:    MOVB    (R4),R4         ;GET STARTING SECTOR ($SEC OR $NSEC) ADDRESS
021572  016046  000144                 MOV     MAXSEC(R0),-(SP)        ;GET MAXIMUM SECTOR
021576  160416                         SUB     R4,(SP)         ;GET NUMBER SECTORS TO BE XFERD
021600  005004                         CLR     R4              ;CLEAR R4
021602  062704  000400          3$:    ADD     #256.,R4        ;ADD 1 SECTOR OF WORDS TO R4
021606  005316                         DEC     (SP)            ;DONE ALL SECTORS YET ?
021610  002374                         BGE     3$              ;BR IF NO
021612  005726                         TST     (SP)+           ;RESTORE STACK
021614  020504                         CMP     R5,R4           ;TOO MANY WORDS FOR TRACK ?
021616  003420                         BLE     5$              ;BR IF NO
021620  010405                         MOV     R4,R5           ;YES, CHANGE WORD COUNT
021622  000416                         BR      5$

021624  016046  000156          4$:    MOV     FE1(R0),-(SP)   ;GET 1ST FE CYLINDER (LAST CYL+1)
021630  005316                         DEC     (SP)            ;LOOK AT LAST USER CYLINDER
021632  026426  000002                 CMP     2(R4),(SP)+     ;ARE WE ON LAST USER CYLINDER ?
021636  001010                         BNE     5$              ;BR IF NO
021640  016046  000154                 MOV     TRKLMT(R0),-(SP)        ;GET LAST TRACK
021644  005316                         DEC     (SP)            ;LOOK AT NEXT TO LAST TRACK
021646  005046                         CLR     -(SP)           ;PUSH STACK
021650  116416  000001                 MOVB    1(R4),(SP)      ;GET CURRENT TRACK
021654  022626                         CMP     (SP)+,(SP)+     ;IS IT TRACK BEFORE BAD SECTOR TRACK ?
021656  001744                         BEQ     2$              ;BR IF YES (DON'T ALLOW SPIRAL TO BAD SEC TRK)
021660  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,LODPAR       ;LOAD THE PARAMETERS JUST GENERATED
                                ;       RETURN

021662  010546                  LODPAR: MOV     R5,-(SP)        ;SAVE R5
021664  105760  000026                  TSTB    $PACK(R0)       ;'T' COMMAND FOR THIS DRIVE ?
021670  001127                          BNE     6$              ;BR IF NO
021672  116060  000166  000027          MOVB    $RPCS1(R0),$PREVO(R0)   ;SAVE CURRENT PARAMETERS
021700  142760  177701  000027          BICB    #^C76,$PREVO(R0)        ;STRIP GO,AND IE BITS
021706  132760  000006  000122          BITB    #6,$NCODE(R0)   ;SEE IF NEXT OPERATION IS READ OR WRITE
021714  001007                          BNE     1$              ;BR IF EITHER
021716  016060  000012  000034          MOV     $CYL(R0),$PREVA+2(R0)   ;SAVE STARTING CYLINDER
021724  016060  000010  000032          MOV     $SEC(R0),$PREVA(R0)     ;SAVE STARTING SECTOR AND TRACK
021732  000410                          BR      2$
021734  004737  024364          1$:     JSR     PC,READDR       ;GET THE DECREMENTED SECTOR AND TRACK ADDRESSES
021740  012660  000034                  MOV     (SP)+,$PREVA+2(R0)      ;CYLINDER ADDRESS
021744  112660  000033                  MOVB    (SP)+,$PREVA+1(R0)      ;TRACK ADDRESS
021750  112660  000032                  MOVB    (SP)+,$PREVA(R0)        ;SECTOR ADDRESS

021754  005337  022176          2$:     DEC     ITCNT+2         ;REPEAT THIS COMMAND AGAIN ?
021760  002007                          BGE     3$              ;BR IF YES
021762  013737  022174  022176          MOV     ITCNT,ITCNT+2   ;RESTORE ITERATION COUNT
021770  032777  000100  157156          BIT     #SW06,@SWR      ;LOOP ON PREVIOUS VALUES (SW6=1) ?
021776  001413                          BEQ     4$              ;BR IF NO
022000  122760  000151  000002  3$:     CMPB    #WCKD,$COMND(R0)        ;IS COMMAND A WRITE CHECK DATA ?
022006  001060                          BNE     6$              ;BR IF NO
022010  112760  000002  000024          MOVB    #2,$CODE(R0)    ;CODE FOR WRTDAT
022016  112760  000161  000002          MOVB    #WRTDAT,$COMND(R0)      ;PUT WRITE DATA COMMAND BACK FOR LOOP
022024  000451                          BR      6$

022026  116060  000122  000024  4$:     MOVB    $NCODE(R0),$CODE(R0)    ;LOGICAL CODE FOR OPERATION
022034  116005  000122                  MOVB    $NCODE(R0),R5   ;LOAD R5 FOR USE AS TABLE INDEX
022040  116560  002076  000002          MOVB    COMTBL(R5),$COMND(R0)   ;COMMAND CODE
022046  122760  000151  000002          CMPB    #WCKD,$COMND(R0)        ;IS NEW COMMAND A WRITE CHECK DATA ?
022054  001012                          BNE     5$              ;BR IF NO
022056  122760  000060  000027          CMPB    #60,$PREVO(R0)  ;WAS PREVIOUS COMMAND A WRITE DATA ?
022064  001431                          BEQ     6$              ;BR IF YES
022066  112760  000171  000002          MOVB    #RDDAT,$COMND(R0)       ;CHANGE WRITE CHECK TO READ DATA COMMAND
022074  112760  000004  000024          MOVB    #4,$CODE(R0)    ;CODE NUMBER CHANGED TO READ DATA

022102  116060  000123  000030  5$:     MOVB    $NPATC(R0),$PATTC(R0)   ;PATTERN CODE
022110  016060  000124  000010          MOV     $NSEC(R0),$SEC(R0)      ;TRACK AND SECTOR ADDRESSES
022116  016060  000126  000012          MOV     $NCYL(R0),$CYL(R0)      ;CYLINDER ADDRESS
022124  012760  000400  000022          MOV     #256.,$SSEC(R0) ;INITIAL VALUE OF SECTOR SIZE
022132  132760  000001  000024          BITB    #1,$CODE(R0)    ;HEADER OPERATION ?
022140  001403                          BEQ     6$              ;BR IF NOT
022142  062760  000002  000022          ADD     #2,$SSEC(R0)    ;ADD HEADER SIZE
022150  016060  000020  000004  6$:     MOV     $WRDL(R0),$WCNT(R0)     ;GET WORD COUNT AND
022156  016060  000020  000120          MOV     $WRDL(R0),$HLDWC(R0)    ;HOLD WORD FOR 'RELBUF' ROUTINE
022164  005460  000004                  NEG     $WCNT(R0)       ;MAKE IT 2'S COMPLEMENT
022170  012605                          MOV     (SP)+,R5        ;RESTORE R5
022172  000207                          RTS     PC              ;RETURN

022174  000000  000000          ITCNT:  .WORD   0,0             ;'ITCNT' CONTAINS THE NUMBER OF TIMES TO
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                                                                ;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

022200  016111  000002          CMPRES: MOV     2(R1),(R1)      ;COMPRESS THE TABLE IN R1
022204  001402                          BEQ     1$              ;BR WHEN ZERO FOUND
022206  005721                          TST     (R1)+           ;INCREMENT R1
022210  000773                          BR      CMPRES          ;CONTINUE COMPRESSING TABLE
022212  000207                  1$:     RTS     PC              ;RETURN
```

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                                .SBTTL  ERROR MESSAGE GENERATION ROUTINES

                                ;PRINT LINE 1 OF ERROR MESSAGE:
                                ;'HH:MM:SS'

022214  032777  002000  156732 LINE1:  BIT     #SW10,@SWR      ;SWITCH 10 SET ?
022222  001402                 BEQ     1$              ;BR IF NOT
022224  104401  001176         TYPE    ,$BELL          ;RING THE BELL
022230  032777  020000  156716 1$:     BIT     #SW13,@SWR      ;INHIBIT TYPEOUT (SW13=1) ?
022236  001010                 BNE     2$              ;BR IF YES
022240  104401  001203         TYPE    ,$CRLF          ;CR-LF
022244  104401  001203         TYPE    ,$CRLF          ;CR-LF
022250  004737  026146         JSR     PC,$TIME        ;TYPE ELAPSED TIME
022254  104401  056531         TYPE    ,BLNKS1         ;TYPE 1 BLANK
022260  000207                 2$:     RTS     PC              ;RETURN & TYPE DESCRIPTION

                                ;PRINT LINE 2 OF ERROR MESSAGE
                                ;'PRESENT ORDER = XXXX  PREVIOUS ORDER = XXXX'
                                ;'* ERROR AT BAD TRACK/SECTOR'
                                ;'DRIVE   RPCS1   RPCS2   RPDS1   RPER1   RPER2  RPER3  RPEC1'
                                ;'RPEC2   RPWC    RPBA    RPDA    RPAS    RPLA   RPDB   RPMR1'
                                ;'RPDT    RPSN    RPOF    RPDC    RPCC    STATUS'
                                ;'RPBAE   RPCS3'  (RH70 ONLY)
                                ;'BUS ADDRESS OR WORD COUNT NOT CONSISTENT'
                                ;'RPBA = XXXXXX   RPWC = XXXXXX'
                                ;'BUFFER ADR = XXXXXX   WRD CNT = XXXX   NMBR WRDS XFRD = XXX'

022262                          LINE2:
022262  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
022264  010446                         MOV     R4,-(SP)        ;;PUSH R4 ON STACK
022266  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
022270  104414  001203                 DISPLY  ,$CRLF          ;CR-LF
022274  005037  022422                 CLR     4$              ;CLEAR MESSAGE ADDRESS STORAGE
022300  005004                         CLR     R4              ;WORKING REGISTER
022302  012737  054536  022422         MOV     #LIN2C,4$       ;ADDRESS OF 'PRESENT ORDER = ' MSG
022310  116004  000166                 MOVB    $RPCS1(R0),R4   ;GET THE OPCODE
022314  042704  177701                 BIC     #^C76,R4        ;SAVE ONLY SIGNIFICANT BITS
022320  004737  022356                 JSR     PC,1$           ;TYPE THE FIRST MNEMONIC
022324  005737  022426                 TST     5$              ;SEE IF MNEMONIC ENTRY FOUND
022330  001440                         BEQ     LINE2A          ;BR IF NOT
022332  012737  054556  022422         MOV     #LIN2P,4$       ;ADDRESS OF 'PREVIOUS ORDER = ' MSG
022340  116004  000027                 MOVB    $PREVO(R0),R4   ;PREVIOUS OPERATION CODE
022344  042704  177701                 BIC     #^C76,R4        ;SAVE ONLY SIGNIFICANT BITS
022350  004737  022356                 JSR     PC,1$           ;TYPE THE PREVIOUS MNEMONIC
022354  000426                         BR      LINE2A          ;CONTINUE
022356  005005                 1$:     CLR     R5              ;CLEAR THE TABLE INDEX
022360  126504  002104         2$:     CMPB    OPTBL(R5),R4    ;LOOK FOR THE OPCODE
022364  001405                         BEQ     3$              ;BR WHEN OPCODE COUNT = OPCODE
022366  105765  002104                 TSTB    OPTBL(R5)       ;LOOK FOR END OF TABLE
022372  100402                         BMI     3$              ;BR IF END
022374  005205                         INC     R5              ;INCREMENT THE POINTER
022376  000770                         BR      2$              ;CONTINUE - NOT END OF TABLE
022400  006305                 3$:     ASL     R5              ;SHIFT INDEX
022402  006305                         ASL     R5              ;SHIFT THE INDEX
022404  006305                         ASL     R5              ;SHIFT THE INDEX
022406  012737  002124  022426         MOV     #MNTBL,5$       ;ADDRESS OF ASCII TEXT TABLE
022414  060537  022426                 ADD     R5,5$           ;ADD THE INDEX
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                                        DISPLY                  ;TYPE IT
                              4$:       .WORD   0               ;ADDRESS OF 'PRESENT' OR 'PREVIOUS' MESSAGE
                                        DISPLY                  ;TYPE THE OPERATION MNEMONIC
                              5$:       .WORD   0               ;ADDRESS OF MESSAGE
                                        RTS     PC              ;RETURN TO MAIN ROUTINE

                              LINE2A:   TST     BADSEC          ;PRINT THE BAD SECTOR LINE ?
                                        BEQ     LINE2B          ;BR IF NOT
                                        DISPLY  ,$CRLF          ;CR-LF
                                        DISPLY  ,LIN2S          ;ERROR ADDRESS DEFINED AS BAD AREA
                              LINE2B:   DISPLY  ,$CRLF          ;CR-LF
                                        DISPLY  ,DH14           ;STANDARD RP07 REGISTER HEADER
                                        MOV     DRVNO,-(SP)     ;PUT THE DRIVE NUMBER ON THE STACK
                                        JSR     PC,LINOCT       ;TYPE IT
                                        DISPLY  ,BLNKS2         ;TYPE 2 BLANK
                                        MOV     #DT14,R5        ;REGISTER INDEXES
                                        JSR     PC,3$           ;PRINT THE REGISTERS

                                        BIT     #SW05,@SWR      ;PRINT THE OPTIONAL REGISTERS ?
                                        BNE     1$              ;BR IF NOT
                                        DISPLY  ,DH15           ;STANDARD RP07 REGISTER HEADER
                                        MOV     #DT15,R5        ;SECOND DATA LINE
                                        JSR     PC,3$           ;PRINT THEM

                                        DISPLY  ,DH16           ;STANDARD RP07 REGISTER HEADER
                                        MOV     #DT16,R5        ;THIRD DATA LINE
                                        JSR     PC,3$           ;PRINT THE REGISTERS

                                        MOV     $CPUOP,-(SP)    ;CHECK THE CPU (RH) TYPE
                                        BIC     #^C174000,(SP)  ;LEAVE THE CPU BITS
                                        CMP     #30000,(SP)+    ;SEE IF RH70
                                        BNE     1$              ;BR IF NO
                                        DISPLY  ,DH17           ;STANDARD RP07 REGISTER HEADER
                                        MOV     #DT17,R5        ;OPTIONAL FOURTH DATA LINE
                                        JSR     PC,3$           ;PRINT THE REGISTERS
                              1$:       BIT     #BIT6,$STATUS(R0)  ;DATA ERROR ?
                                        BEQ     2$              ;BR IF NOT
                                        MOV     $WRDL(R0),-(SP) ;TRANSFER SIZE
                                        ADD     $RPWC(R0),(SP)  ;ADD REMAINING WORD COUNT
                                        ASL     (SP)            ;CONVERT TO AN BYTE INCREMENT
                                        ADD     $BUF(R0),(SP)   ;BUFFER STARTING ADDRESS
                                        CMP     (SP)+,$RPBA(R0) ;CORRECT BUFFER ADDRESS ?
                                        BEQ     2$              ;BR IF YES
                                        DISPLY  ,EM46           ;'BUS ADDRESS AND WORD COUNT ARE NOT CONSISTENT'
                                        DISPLY  ,$CRLF          ;CR-LF
                                        JSR     PC,LINE3D       ;PRINT LINE 3D OF ERROR MESSAGE
                                        JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
                              2$:
                                        MOV     (SP)+,R5        ;;POP STACK INTO R5
                                        MOV     (SP)+,R4        ;;POP STACK INTO R4
                                        MOV     (SP)+,R3        ;;POP STACK INTO R3
                                        RTS     PC              ;RETURN TO ERROR PROCESSING ROUTINE

                              3$:       MOV     (R5)+,-(SP)     ;PUT THE REGISTER INDEX ON THE STACK
                                        ADD     R0,(SP)         ;ADD DRIVE'S TABLE ADDRESS
                                        MOV     @(SP),-(SP)     ;VALUE
                                        JSR     PC,LINOCT       ;TYPE IT
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                        TST     (SP)+           ;CORRECT THE STACK POINTER
                        DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
                        TST     (R5)            ;AT END OF LINE ?
                        BNE     3$              ;BR IF NOT
                4$:     DISPLY  ,$CRLF          ;CR-LF
                        RTS     PC              ;RETURN

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

                LINE3:  DISPLY  ,LINM3          ;LINE 3 ENTRANCE
                        BR      LIN3.1          ;FINISH PRINTOUT

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

                LINE3A: DISPLY  ,LINN3          ;LINE 3A ENTRANCE
                        BR      LIN3.1          ;FINISH ERROR LINE

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

                LINE3B: JSR     PC,LIN3.3       ;LINE 3B ENTRANCE
                        DISPLY  ,$CRLF
                        RTS     PC

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

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

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

 156172         LINE3D: BIT     #SW05,@SWR      ;SWITCH 5 SET ?
                        BEQ     1$              ;BR IF IT IS
                        DISPLY  ,LINB3          ;'RPBA = '
                        MOV     $RPBA(R0),-(SP) ;BUFFER ADDR REG CONTENTS
                        JSR     PC,LINOCT       ;CONVERT TO OCTAL AND TYPE IT
                        DISPLY  ,LINW3          ;'  RPWC = '
                        MOV     $RPWC(R0),-(SP) ;WORD COUNT REGISTER CONTENTS
                        JSR     PC,LINOCT       ;CONVERT TO OCTAL AND TYPE IT
                        DISPLY  ,$CRLF
                1$:     RTS     PC

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

                LINE3E: DISPLY  ,LINS3          ;'START CYL = '
                        MOV     $CYL(R0),-(SP)  ;MOVE CYL TO STACK
                        JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
                        DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
                        DISPLY  ,LINST3         ;'START TRK = '
                        CLR     -(SP)           ;CLEAR STACK
                        MOVB    $TRK(R0),(SP)   ;TRACK TO STACK
                        JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
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023060  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
023064  104414  055044                  DISPLY  ,LINSS3         ;'START SEC = '
023070  005046                          CLR     -(SP)           ;CLEAR STACK
023072  116016  000010                  MOVB    $SEC(R0),(SP)   ;SECTOR ADDR TO STACK
023076  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023102  104414  001203                  DISPLY  ,$CRLF
023106  000207                          RTS     PC

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

023110  032777  000040  156036  LINE3F: BIT     #SW5,@SWR       ;SWITCH 5 SET ?
023116  001420                          BEQ     1$              ;BR IF NOT
023120  104414  055001                  DISPLY  ,LINDA3         ;'RPDA = '
023124  016046  000174                  MOV     $RPDA(R0),-(SP) ;PUT SECTOR/TRACK ADDRESS ON THE STACK
023130  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
023134  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
023140  104414  054771                  DISPLY  ,LINCA3         ;' RPDC = '
023144  016046  000222                  MOV     $RPDC(R0),-(SP) ;PUT DESIRED CYLINDER ADDRESS ON THE STACK
023150  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
023154  104414  001203                  DISPLY  ,$CRLF
023160  000207                  1$:     RTS     PC

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

023162  004737  024364          LIN3.1: JSR     PC,READDR       ;DECREMENT TRACK AND SECTOR ADDRESS
023166  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023172  104414  054646                  DISPLY  ,T              ;PRINT 'T'
023176  004737  024340                  JSR     PC,LINDEC       ;TYPE TRACK IN DECIMAL
023202  104414  054667                  DISPLY  ,S              ;PRINT 'S'
023206  004737  024340                  JSR     PC,LINDEC       ;TYPE SECTOR ADDRESS
023212  104414  054672                  DISPLY  ,LINP3          ;PRINT 'PREV ADDR'
023216  016046  000034                  MOV     $PREVA+2(R0),-(SP) ;PREVIOUS CYLINDER
023222  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023226  104414  054646                  DISPLY  ,T              ;PRINT 'T'
023232  005046                          CLR     -(SP)           ;MAKE ROOM ON THE STACK
023234  116016  000033                  MOVB    $PREVA+1(R0),(SP)  ;PREVIOUS TRACK ADDRESS
023240  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023244  104414  054667                  DISPLY  ,S              ;PRINT 'S'
023250  005046                          CLR     -(SP)           ;MAKE ROOM ON THE STACK
023252  116016  000032                  MOVB    $PREVA(R0),(SP)  ;PREVIOUS SECTOR DDRESS
023256  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023262  104414  001203                  DISPLY  ,$CRLF
023266  000207                          RTS     PC

                                ;'START CYL= CCC  END CYL= CCC'

023270  104414  054712          LIN3.3: DISPLY  ,LINS3          ;LINE '3B & 3C' ENTRANCE
023274  016046  000034                  MOV     $PREVA+2(R0),-(SP) ;PREVIOUS CYLINDER
023300  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023304  104414  054726                  DISPLY  ,LINEN3         ;PRINT ' END CYL'
023310  016046  000222                  MOV     $RPDC(R0),-(SP) ;PRESENT CYLINDER
023314  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023320  000207                          RTS     PC

                                ;'ACTUAL CYL= CCC  TRK= TT'
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023322  104414  054742          LIN3.4: DISPLY  ,LINA3          ;PRINT 'ACTUAL CYL= '
023326  013746  063324                  MOV     CYLNDR,-(SP)    ;ACTUAL CYLINDER
023332  042716  010000                  BIC     #BIT12,(SP)     ;CLEAR THE FORMAT BIT
023336  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023342  104414  054761                  DISPLY  ,LINT3          ;PRINT 'TRK= '
023346  005046                          CLR     -(SP)           ;CLEAR STACK WORD
023350  116016  000175                  MOVB    $RPDA+1(R0),(SP) ;PUT TRACK ON STACK
023354  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023360  104414  001203                  DISPLY  ,$CRLF
023364  000207                          RTS     PC

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

023366  032760  000100  000016  LINE4:  BIT     #BIT06,$TATUS(R0)  ;DATA ERROR ?
023374  001427                          BEQ     1$              ;BR IF NOT
023376  104414  055060                  DISPLY  ,LINM4          ;PRINT 'BUFFER ADR= '
023402  016046  000006                  MOV     $BUF(R0),-(SP)  ;BUFFER ADDR ON STACK
023406  004737  024306                  JSR     PC,LINOCT       ;CONVERT TO OCTAL & PRINT
023412  104414  055076                  DISPLY  ,LINS4          ;PRINT 'WRD CNT= '
023416  016046  000020                  MOV     $WRDL(R0),-(SP) ;BUFFER SIZE
023422  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023426  104414  055112                  DISPLY  ,LINX4          ;'  NMBR WRDS XFRD = '
023432  016046  000172                  MOV     $RPBA(R0),-(SP)  ;VALUE IN BUFFER ADDR REGISTER
023436  166016  000006                  SUB     $BUF(R0),(SP)   ;SUBTRACT STARTING ADDRESS
023442  006216                          ASR     (SP)            ;CONVERT INTO A WORD COUNT
023444  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
023450  104414  001203                  DISPLY  ,$CRLF          ;CR-LF
023454  000207                  1$:     RTS     PC              ;RETURN

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

023456  104414  055135          LINE5:  DISPLY  ,LIND5          ;PRINT 'EXPCTD DATA'
023462  162760  000002  000172          SUB     #2,$RPBA(R0)    ;BACK THE ADDRESS UP
023470  013746  001234                  MOV     $CPUOP,-(SP)    ;CHECK THE CPU (RH) TYPE
023474  042716  003777                  BIC     #^C174000,(SP)  ;LEAVE THE CPU BITS
023500  022726  030000                  CMP     #30000,(SP)+    ;SEE IF RH70
023504  001012                          BNE     1$              ;BR IF NO
023506  162760  000004  000172          SUB     #4,$RPBA(R0)    ;BACKUP THE BUFFER POINTER
023514  032760  004000  000240          BIT     #BIT11,$RPCS3(R0)       ;SEE WHICH WORD HALF DIDN'T COMPARE
023522  001403                          BEQ     1$              ;IF EQ, EVEN HALF DIDN'T COMPARE
023524  162760  000002  000172          SUB     #2,$RPBA(R0)    ;BACKUP THE BUFFER POINTER AGAIN
023532  017046  000172          1$:     MOV     @$RPBA(R0),-(SP)        ;'EXPCTD' DATA - AT THE BUFFER LOCATION
023536  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
023542  104414  055153                  DISPLY  ,LINB5          ;PRINT 'RECEVD DATA'
023546  016046  000210                  MOV     $RPDB(R0),-(SP) ;RECEVD DATA FROM BUFFER
023552  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
023556  016046  000170                  MOV     $RPWC(R0),-(SP) ;WORD LENGTH ON STACK
023562  066016  000020                  ADD     $WRDL(R0),(SP)  ;MAKE INTO A POSITIVE NUMBER
023566  005046                          CLR     -(SP)           ;UPPER DIVIDEND TO ZERO
023570  016046  000022                  MOV     $SSEC(R0),-(SP) ;SECTOR SIZE ON THE STACK
023574  004737  032046                  JSR     PC,$DIV         ;DIVIDE WORDS XFERED BY SECTOR SIZE
023600  012616                          MOV     (SP)+,(SP)      ;MOVE REMAINDER UP THE STACK
023602  005316                          DEC     (SP)            ;DECREMENT WORD POSITION BY 1
023604  032760  040000  000176          BIT     #BIT14,$RPCS2(R0)       ;IS 'WCE' SET ?
023612  001416                          BEQ     2$              ;BR IF NO
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023614  013746  001234                  MOV     $CPUOP,-(SP)    ;CHECK THE CPU (RH) TYPE
023620  042716  003777                  BIC     #^C174000,(SP)  ;LEAVE THE CPU BITS
023624  022726  030000                  CMP     #30000,(SP)+    ;SEE IF RH70
023630  001007                          BNE     2$              ;BR IF NO
023632  162716  000002                  SUB     #2,(SP)         ;SUBTRACT 2 FOR A DOUBLE WORD
023636  032760  004000  000240          BIT     #BIT11,$RPCS3(R0)       ;SEE WHICH WORD HALF DIDN'T COMPARE
023644  001401                          BEQ     2$              ;IF EQ, EVEN HALF DIDN'T COMPARE
023646  005316                          DEC     (SP)            ;SUBTRACT 1 FOR AN ODD WORD
023650  104414  055173          2$:     DISPLY  ,LINP5          ;PRINT 'WORD POS'
023654  004737  024340                  JSR     PC,LINDEC       ;TYPE THE POSITION
023660  104414  001203                  DISPLY  ,$CRLF
023664  000207                          RTS     PC

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

023666                          LINE5A:
023666  104414  055210                  DISPLY  ,LINS5          ;'HEADER CONTENTS OF ERROR SECTOR'
023672  013746  063324                  MOV     CYLNDR,-(SP)    ;HEADER POSITION
023676  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
023702  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
023706  013746  063326                  MOV     CYLNDR+2,-(SP)  ;HEADER POSITION +2
023712  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
023716  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
023722  104414  056533                  DISPLY  ,LINX5
023726  104414  001203                  DISPLY  ,$CRLF
023732  000207                          RTS     PC

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

023734  104414  055243          LINE5B: DISPLY  ,LINEP5         ;'RPEC1 = '
023740  016046  000232                  MOV     $RPEC1(R0),-(SP)  ;PUT REGISTER CONTENTS ON THE STACK
023744  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
023750  104414  056530                  DISPLY  ,BLNKS2         ;TYPE 2 BLANKS
023754  104414  055253                  DISPLY  ,LINE05         ;' RPEC2 = '
023760  016046  000234                  MOV     $RPEC2(R0),-(SP)  ;PUT REGISTER CONTENTS ON THE STACK
023764  004737  024306                  JSR     PC,LINOCT       ;TYPE IT
023770  104414  001203                  DISPLY  ,$CRLF
023774  000207                          RTS     PC              ;RETURN

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

023776  104414  055265          LINE6:  DISPLY  ,LINB6          ;PRINT 'SECTOR IS ECC CORRECTABLE '
024002  104414  001203                  DISPLY  .$CRLF
024006  000207                          RTS     PC

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

024010  104414  055320          LINE6A: DISPLY  ,LINC6          ;PRINT 'SECTOR READ CORRECTLY AFTER N RETRY(S)'
024014  000406                          BR      LIN6.2          ;TYPE THE REST OF THE LINE

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

024024  104414  055405        LINE6D: DISPLY  ,LINU06         ;'UNCORRECTABLE AFTER N RETRY(S)'
024030  000400                        BR      LIN6.2          ;FINISH

                                ;RETRY COUNT TYPEOUT

024032  005046                LIN6.2: CLR     -(SP)           ;CLEAR STACK
024034  113716  001325                MOVB    RETRY+1,(SP)    ;RETRY COUNT
024040  004737  024340                JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
024044  104414  055373                DISPLY  ,LINR6          ;' RETRY(S)'
024050  104414  001203                DISPLY  ,$CRLF
024054  000207                        RTS     PC

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

024056  104414  055514        LINE7:  DISPLY  ,LIN7T          ;TOTALS; ERRORS
024062  016046  000102                MOV     $TOTAL(R0),-(SP)        ;TO STACK
024066  004737  024340                JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
024072  104414  055535                DISPLY  ,LIN7X          ;PRINT ' WRDS WRITN'
024076  012746  000056                MOV     #$WTOTL,-(SP)   ;ADDRESS OF LOW WORD ON STACK
024102  060016                        ADD     R0,(SP)
024104  004737  037324                JSR     PC,$DB2D        ;CONVERT
024110  004737  032446                JSR     PC,$SUPRL       ;PRINT
024114  104414  057711                DISPLY  ,PERIOD         ;TYPE '.'
024120  104414  057552                DISPLY  ,MSGX10         ;TYPE ' X10^6'
024124  104414  055553                DISPLY  ,LIN7R          ;PRINT ' WRDS READ'
024130  012746  000066                MOV     #$RTOTL,-(SP)   ;LOW WORD ADDRESS
024134  060016                        ADD     R0,(SP)
024136  004737  037324                JSR     PC,$DB2D        ;CONVERT
024142  004737  032446                JSR     PC,$SUPRL       ;PRINT IT
024146  104414  057711                DISPLY  ,PERIOD         ;TYPE '.'
024152  104414  057552                DISPLY  ,MSGX10         ;TYPE ' X10^6'
024156  104414  001203                DISPLY  ,$CRLF          ;CR-LF
024162  032777  100000  154764        BIT     #SW15,@SWR      ;SEE IF 'HALT ON ERROR' - SWITCH 15
024170  001401                        BEQ     1$              ;BR IF NOT
024172  000000                        HALT                    ;SWITCH 15 HALT
024174  000207                1$:     RTS     PC

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

024176  104414  055455        LINE7A: DISPLY  ,LIN7P          ;'TOTALS; SEEKS= '
024202  012746  000076                MOV     #$STOTL,-(SP)   ;TOTAL SEEKS
024206  060016                        ADD     R0,(SP)         ;DEVICE TABLE ADDRESS
024210  004737  037324                JSR     PC,$DB2D        ;CONVERT THE SEEK COUNT
024214  004737  032446                JSR     PC,$SUPRL       ;PRINT IT
024220  104414  057711                DISPLY  ,PERIOD         ;TYPE '.'
024224  104414  055432                DISPLY  ,LIN7M          ;'  MIS POS ERRORS= '
024230  016046  000112                MOV     $MISPO(R0),-(SP)        ;TOTAL ERRORS
024234  004737  024340                JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
024240  104414  055475                DISPLY  ,LIN7S          ;'  SKI ERRORS= '
```

```
024244  016046  000110                  MOV     $SKI(R0),-(SP)  ;CONVERT & PRINT IT
024250  004737  024340                  JSR     PC,LINDEC       ;TYPE IT IN DECIMAL
024254  104414  001203                  DISPLY  ,$CRLF          ;CR-LF
024260  032777  100000  154666          BIT     #SW15,@SWR      ;SEE IF HALT ON ERROR - SWITCH 15 SET
024266  001401                          BEQ     1$              ;BR IF NOT
024270  000000                          HALT                    ;SWITCH 15 HALT
024272  000207                  1$:     RTS     PC

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

024274  104414  055370          LINE8:  DISPLY  ,LIN8M
024300  004737  022262                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
024304  000207                          RTS     PC

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

024306  016646  000002          LINOCT: MOV     2(SP),-(SP)     ;PUT NUMBER IN PROPER LOCATION ON STACK
024312  004737  033362                  JSR     PC,$SB2O        ;CONVERT THE NUMBER TO OCTAL
024316  012637  024332                  MOV     (SP)+,1$        ;GET THE ADDRESS OF THE ASCII STRING
024322  062737  000005  024332          ADD     #5.,1$          ;ADDRESS THE LAST 6 ASCII DIGITS
024330  104414                          DISPLY                  ;TYPE IT
024332  000000                  1$:     .WORD   0               ;ADDRESS
024334  012616                          MOV     (SP)+,(SP)      ;CORRECT THE STACK
024336  000207                          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

024340  016646  000002          LINDEC: MOV     2(SP),-(SP)     ;SET UP STACK FOR CONVERT
024344  004737  033332                  JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
024350  004737  032446                  JSR     PC,$SUPRL       ;TYPE IT (LEFT JUSTIFIED)
024354  104414  057711                  DISPLY  ,PERIOD         ;TYPE '.'
024360  012616                          MOV     (SP)+,(SP)      ;RESTORE STACK POINTER
024362  000207                          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 024364  162706  000006          READDR: SUB     #6,SP               ;DECREMENT THE STACK POINTER
 480 024370  016616  000006                  MOV     6(SP),(SP)          ;MOVE THE RETURN ADDR DOWN THE STACK
 481 024374  005066  000006                  CLR     6(SP)               ;CLEAR STACK FOR SECTOR
 482 024400  005066  000004                  CLR     4(SP)               ;CLEAR STACK FOR TRACK
 483 024404  116066  000174  000006          MOVB    $RPDA(R0),6(SP)     ;SECTOR ON STACK
 484 024412  116066  000175  000004          MOVB    $RPDA+1(R0),4(SP)           ;TRACK ADDRESS
 485 024420  016066  000222  000002          MOV     $RPDC(R0),2(SP)     ;CYLINDER ADDRESS
 486 024426  005766  000006          1$:     TST     6(SP)               ;SECTOR 0 ?
 487 024432  001403                          BEQ     2$                  ;BRANCH IF SO
 488 024434  105366  000006                  DECB    6(SP)               ;DECREMENT ONE SECTOR
 489 024440  000424                          BR      4$                  ;BRANCH TO EXIT
 490 024442  005766  000004          2$:     TST     4(SP)               ;ALSO ON TRACK 0 ?
 491 024446  001406                          BEQ     3$                  ;BRANCH IF SO
 492 024450  116066  000152  000006          MOVB    SECLMT(R0),6(SP)            ;LAST SECTOR
 493 024456  105366  000004                  DECB    4(SP)               ;DECREMENT ONE TRACK
 494 024462  000413                          BR      4$                  ;EXIT
 495 024464  005766  000002          3$:     TST     2(SP)               ;ALSO ON CYLINDER 0 ?
 496 024470  001410                          BEQ     4$                  ;BRANCH IF SO
 497 024472  116066  000152  000006          MOVB    SECLMT(R0),6(SP)            ;LAST SECTOR
 498 024500  116066  000154  000004          MOVB    TRKLMT(R0),4(SP)            ;GET LAST TRACK
 499 024506  005366  000002                  DEC     2(SP)               ;DECREMENT ONE CYLINDER COUNT
 500 024512  000207                  4$:     RTS     PC                  ;RETURN
```

```
                                .SBTTL  KW11 CLOCK CHECK ROUTINE

                                ;ROUTINE TO CHECK FOR KW11-L OR KW11-P CLOCKS

024514  005037  001310          CKCLK:  CLR     CLKFLG          ;ASSUME "NO CLOCK" AVAILABLE
024520  013746  000004                  MOV     ERRVEC,-(SP)    ;;PUSH ERRVEC ON STACK
024524  012737  024576  000004        MOV     #CKCLK1,ERRVEC  ;SETUP ERROR TRAP VECTOR FOR P-CLOCK CHECK
024532  005777  154540                TST     @$LKCSR         ;CHECK FOR KW11-P
024536  012737  000001  001310        MOV     #1,CLKFLG       ;SET P-CLOCK FLAG
024544  013701  001302                MOV     $LPVEC,R1       ;KW11-P VECTOR ADDRESS
024550  012721  026272                MOV     #KWSVR,(R1)+    ;SETUP KW11-P VECTOR
024554  012711  000300                MOV     #PR6,(R1)       ;SET INTERRUPT PRIORITY TO 6
024560  012777  174575  154512        MOV     #-1667.,@$LKCSB ;LOAD COUNTER BUFFER WITH 16.67
024566  012777  000131  154502        MOV     #131,@$LKCSR    ;SET KW11-P INTERRUPT, CNT UP, 10US, REPEAT MODE
024574  000442                      BR      CKCLK3

024576  012716  024604          CKCLK1: MOV     #1$,(SP)        ;SETUP RETURN ADDRESS
024602  000002                  RTI
024604  012737  024650  000004  1$:     MOV     #CKCLK2,ERRVEC  ;SETUP ERROR TRAP VECTOR FOR L-CLOCK CHECK
024612  005777  154466                TST     @$LKS           ;CHECK FOR KW11-L
024616  012737  177777  001310        MOV     #-1,CLKFLG      ;SET L-CLOCK FLAG
024624  013701  001306                MOV     $LLVEC,R1       ;KW11-L VECTOR ADDRESS
024630  012721  026272                MOV     #KWSVR,(R1)+    ;SETUP KW11-L VECTOR
024634  012711  000300                MOV     #PR6,(R1)       ;SET INTERRUPT PRIORITY TO 6
024640  012777  000100  154436        MOV     #100,@$LKS      ;SET KW11-L INTERRUPT
024646  000415                      BR      CKCLK3

024650  012716  024656          CKCLK2: MOV     #1$,(SP)        ;SETUP RETURN ADDRESS
024654  000002                  RTI
024656  104401  057634          1$:     TYPE    ,NEDCLK         ;'P OR L CLOCK MUST BE ON SYSTEM'
024662  105737  001150                TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
024666  001402                      BEQ     2$              ;BR IF NOT
024670  000137  031744                JMP     $GET42          ;ABORT PROGRAM
024674  000000                  2$:     HALT                    ;HALT
024676  000137  003522                JMP     START           ;TRY AGAIN

024702  012637  000004          CKCLK3: MOV     (SP)+,ERRVEC    ;RESTORE THE ERROR VECTOR
024706  000207                      RTS     PC

                                ;THIS ROUTINE IS USED TO SHUT OFF INTERRUPT TO THE SYSTEM CLOCK
                                ;CALL
                                ;       JSR     PC,CLKOFF       ;CALL ROUTINE

024710  005737  001310          CLKOFF: TST     CLKFLG          ;IS CLOCK AVAILABLE ?
024714  001410                      BEQ     2$              ;BR IF NO
024716  100404                      BMI     1$              ;BR IF L-CLOCK
024720  042777  000101  154350        BIC     #101,@$LKCSR    ;SHUT OFF KW11-P INTERRUPT
024726  000403                      BR      2$
024730  042777  000100  154346  1$:     BIC     #100,@$LKS      ;SHUT OFF KW11-L INTERRUPT
024736  000207                  2$:     RTS     PC              ;EXIT
```

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

024740                          STATPR:
024740  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
024742  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
024744  005737  001542                  TST     ASNLST          ;ANY DRIVES ASSIGNED ?
024750  001431                          BEQ     5$              ;BR IF NOT
024752  005004                  2$:     CLR     R4              ;CLEAR THE DRIVE INDEX
024754  104401  001203                  TYPE    ,$CRLF          ;CR-LF
024760  006304                  3$:     ASL     R4              ;CHANGE TO INDEX WORDS
024762  016400  002056                  MOV     BLKADR(R4),R0   ;GET THE DRIVE'S BLOCK ADDRESS
024766  006204                          ASR     R4              ;RESTORE R4
024770  136437  040550  001542          BITB    ATABIT(R4),ASNLST       ;IS THIS DRIVE ASSIGNED ?
024776  001412                          BEQ     4$              ;BR IF NOT
025000  104401  001203                  TYPE    ,$CRLF          ;CR-LF
025004  004737  026146                  JSR     PC,$TIME        ;TYPE ELAPSED TIME
025010  104401  057321                  TYPE    ,DASH5          ;TYPE '-----'
025014  104401  057345                  TYPE    ,MSGSUM         ;TYPE 'SUMMARY, '
025020  004737  025070                  JSR     PC,TYPSUM       ;TYPE THE SUMMARY
025024  005204                  4$:     INC     R4              ;INCREMENT THE INDEX
025026  020427  000010                  CMP     R4,#8.          ;FINISHED ?
025032  001352                          BNE     3$              ;BR IF NO
025034                          5$:
025034  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
025036  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
025040  000207                          RTS     PC              ;RETURN

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

025042  010046                  ONESUM: MOV     R0,-(SP)        ;SAVE R0
025044  010446                          MOV     R4,-(SP)        ;SAVE R4
025046  005004                          CLR     R4              ;CLEAR R4 FOR DRIVE NUMBER
025050  111004                          MOVB    (R0),R4         ;DRIVE NUMBER
025052  004737  025070                  JSR     PC,TYPSUM       ;TYPE THE SUMMARY
025056  104401  057327                  TYPE    ,DASH13         ;TYPE '-------------'
025062  012604                          MOV     (SP)+,R4        ;RESTORE R4
025064  012600                          MOV     (SP)+,R0        ;RESTORE R0
025066  000207                          RTS     PC              ;RETURN

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

025070  000240                  TYPSUM: NOP

                                ;TYPE REST OF SUMMARY LINE 1
025072  104401  056601                  TYPE    ,DRVMSG         ;TYPE 'DRIVE'
```

```
 69 025076  010446                          MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                                     ;;TYPE DRIVE NUMBER
    025100  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
    025102     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
    025103     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
 70 025104  104401  056531                  TYPE    ,BLNKS1         ;TYPE 1 BLANK
 71 025110  104401  056575                  TYPE    ,DASH           ;TYPE '-'
 72 025114  104401  056531                  TYPE    ,BLNKS1         ;TYPE 1 BLANK
 73 025120  012737  057075  025146          MOV     #$RP07,2$       ;ADDRESS OF RP07 MESSAGE
 74 025126  122764  000005  040464          CMPB    #5,DRVTYP(R4)   ;IS DEVICE AN RP07 ?
 75 025134  001403                          BEQ     1$              ;BR IF YES
 76 025136  012737  057102  025146          MOV     #$RP07P,2$      ;ADDRESS OF RP07+ MESSAGE
 77 025144  104401                  1$:     TYPE                    ;TYPE THE DRIVE TYPE MESSAGE
 78 025146  000000                  2$:     .WORD   0               ;MESSAGE ADDRESS HERE
 79 025150  104401  056573                  TYPE    ,COMMA          ;TYPE ','
 80 025154  104401  056531                  TYPE    ,BLNKS1         ;TYPE 1 BLANK
 81 025160  004737  032764                  JSR     PC,TYDRV        ;TYPE DRIVE SERIAL NUMBER
 82 025164  104401  025172                  TYPE    ,65$            ;;TYPE ASCIZ STRING
    025170  000404                          BR      64$             ;;GET OVER THE ASCIZ
                                    ;;65$:  .ASCIZ  /, PASS /
    025202                          64$:
 83 025202  016046  000114                  MOV     $PASSC(R0),-(SP)        ;PUT THE PASS COUNT ON THE STACK
 84 025206  004737  033332                  JSR     PC,$SB2D        ;CONVERT IT
 85 025212  004537  032552                  JSR     R5,REPLZ        ;TYPE IT
 86 025216  000003                          .WORD   3               ;TYPE 3 DIGITS
 87 025220  104401  057711                  TYPE    ,PERIOD         ;TYPE '.'
 88
 89                                         ;TYPE LINE 2 OF SUMMARY
 90                                 :::     TYPE    ,$CRLF          ;CR-LF
 91
 92                                         ;TYPE LINE 3 OF SUMMARY
 93 025224  104401  025232                  TYPE    ,67$            ;;TYPE ASCIZ STRING
    025230  000407                          BR      66$             ;;GET OVER THE ASCIZ
                                    ;;67$:  .ASCIZ  <CRLF>/WRDS WRITN /
    025250                          66$:
 94 025250  104401  057532                  TYPE    ,MSPASS         ;TYPE '/ PASS '
 95 025254  010046                          MOV     R0,-(SP)        ;GET ADDRESS OF DPB
 96 025256  062716  000042                  ADD     #$WTPAS,(SP)    ;POINT TO LOW NUMBER OF WRDS WRITTEN PER PASS
 97 025262  004737  037324                  JSR     PC,$DB2D        ;CONVERT DECIMAL NUMBER
 98 025266  004737  032362                  JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
 99 025272  104401  057711                  TYPE    ,PERIOD         ;TYPE '.'
100 025276  104401  057542                  TYPE    ,MSTOTL         ;TYPE '  TOTAL '
101 025302  010046                          MOV     R0,-(SP)        ;GET ADDRESS OF DPB
102 025304  062716  000056                  ADD     #$WTOTL,(SP)    ;POINT TO LOW NUMBER OF WRDS WRITTEN
103 025310  004737  037324                  JSR     PC,$DB2D        ;CONVERT DECIMAL NUMBER
104 025314  004737  032362                  JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
105 025320  104401  057711                  TYPE    ,PERIOD         ;TYPE '.'
106 025324  104401  057552                  TYPE    ,MSGX10         ;TYPE ' X10^6'
107
108                                         ;TYPE LINE 4 OF SUMMARY
109 025330  104401  025336                  TYPE    ,69$            ;;TYPE ASCIZ STRING
    025334  000407                          BR      68$             ;;GET OVER THE ASCIZ
                                    ;;69$:  .ASCIZ  <CRLF>/WRDS READ  /
    025354                          68$:
110 025354  104401  057532                  TYPE    ,MSPASS         ;TYPE '/ PASS '
111 025360  010046                          MOV     R0,-(SP)        ;GET ADDRESS OF DPB
112 025362  062716  000036                  ADD     #$RDPAS,(SP)    ;POINT TO LOW NUMBER OF WRDS READ PER PASS
```

```
                                        JSR     PC,$DB2D        ;CONVERT DECIMAL NUMBER
                                        JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
                                        TYPE    ,PERIOD         ;TYPE '.'
                                        TYPE    ,MSTOTL         ;TYPE '  TOTAL '
                                        MOV     R0,-(SP)        ;GET ADDRESS OF DPB
                                        ADD     #$RTOTL,(SP)    ;POINT TO LOW NUMBER OF WRDS READ
                                        JSR     PC,$DB2D        ;CONVERT DECIMAL NUMBER
                                        JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
                                        TYPE    ,PERIOD         ;TYPE '.'
                                        TYPE    ,MSGX10         ;TYPE ' X10^6'

                                ;TYPE LINE 5 OF SUMMARY
                                        TYPE    ,71$            ;;TYPE ASCIZ STRING
                                        BR      70$             ;;GET OVER THE ASCIZ
                                ;;71$:  .ASCIZ  <CRLF>/SEEKS    /
                                70$:
                                        TYPE    ,MSPASS         ;TYPE '/ PASS '
                                        MOV     R0,-(SP)        ;PUT $STOTL ON THE STACK
                                        ADD     #$SEEKS,(SP)    ;POINT TO LOW NUMBER OF SEEK COUNT
                                        JSR     PC,$DB2D        ;CONVERT DECIMAL NUMBER
                                        JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
                                        TYPE    ,PERIOD         ;TYPE '.'
                                        TYPE    ,MSTOTL         ;TYPE '  TOTAL '
                                        MOV     R0,-(SP)        ;PUT $STOTL ON THE STACK
                                        ADD     #$STOTL,(SP)    ;POINT TO LOW NUMBER OF SEEK COUNT
                                        JSR     PC,$DB2D        ;CONVERT DECIMAL NUMBER
                                        JSR     PC,SUPRS        ;SUPPRESS LEADING ZEROS AND TYPE
                                        TYPE    ,PERIOD         ;TYPE '.'

                                ;TYPE LINES 6 AND 7 OF SUMMARY
                                        TYPE    ,73$            ;;TYPE ASCIZ STRING
                                        BR      72$             ;;GET OVER THE ASCIZ
                                ;;73$:  .ASCIZ  <CRLF>/CUMULATIVE ERRORS:/
                                72$:
                                        TYPE    ,75$            ;;TYPE ASCIZ STRING
                                        BR      74$             ;;GET OVER THE ASCIZ
                                ;;75$:  .ASCIZ  <CRLF>/SOFT /
                                74$:
                                        MOV     $SOFT(R0),-(SP) ;;SAVE $SOFT(R0) FOR TYPEOUT
                                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                        TYPE    ,PERIOD         ;TYPE '.'
                                        TYPE    ,77$            ;;TYPE ASCIZ STRING
                                        BR      76$             ;;GET OVER THE ASCIZ
                                ;;77$:  .ASCIZ  / HARD /
                                76$:
                                        MOV     $HARD(R0),-(SP) ;;SAVE $HARD(R0) FOR TYPEOUT
                                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                        TYPE    ,PERIOD         ;TYPE '.'
                                        TYPE    ,79$            ;;TYPE ASCIZ STRING
                                        BR      78$             ;;GET OVER THE ASCIZ
                                ;;79$:  .ASCIZ  / SKI /
                                78$:
                                        MOV     $SKI(R0),-(SP)  ;;SAVE $SKI(R0) FOR TYPEOUT
                                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                        TYPE    ,PERIOD         ;TYPE '.'
                                        TYPE    ,81$            ;;TYPE ASCIZ STRING
                                        BR      80$             ;;GET OVER THE ASCIZ
```

```
                                        ;;81$:  .ASCIZ  / MISP /
                                        80$:
     025712
159  025712  016046  000112                     MOV     $MISPO(R0),-(SP)        ;;SAVE $MISPO(R0) FOR TYPEOUT
     025716  104405                             TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
160  025720  104401  057711                     TYPE    ,PERIOD         ;TYPE '.'
161  025724  104401  025732                     TYPE    ,83$            ;;TYPE ASCIZ STRING
     025730  000404                             BR      82$             ;;GET OVER THE ASCIZ
                                        ;;83$:  .ASCIZ  / OTHER /
                                        82$:
     025742
162  025742  016046  000102                     MOV     $TOTAL(R0),-(SP)        ;CALCULATE NUMBER OF OTHER ERRORS
165  025746  166016  000104                     SUB     $SOFT(R0),(SP)  ;SUBTRACT $SOFT FROM $TOTAL
     025752  166016  000106                     SUB     $HARD(R0),(SP)  ;SUBTRACT $HARD FROM $TOTAL
     025756  166016  000110                     SUB     $SKI(R0),(SP)   ;SUBTRACT $SKI FROM $TOTAL
     025762  166016  000112                     SUB     $MISPO(R0),(SP) ;SUBTRACT $MISPO FROM $TOTAL
166  025766  104405                             TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
167  025770  104401  057711                     TYPE    ,PERIOD         ;TYPE '.'
168  025774  104401  001203                     TYPE    ,$CRLF          ;CR-LF
169  026000  000207                             RTS     PC
```

```
 1
15
16
                                        ;ROUTINE TO INCREMENT $SOFT
                                        ;
                                        ;NOTE:  $SOFT WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

026002  005737  001336          INCSOF: TST     BADSEC          ;SEE IF BAD TRK/SEC INDICATOR SET
026006  001006                          BNE     1$              ;BR IF IT'S SET, DON'T INCREMENT COUNT
026010  026027  000104  077777          CMP     $SOFT(R0),#77777        ;IS $SOFT ALREADY AT MAXIMUM ?
026016  103002                          BHIS    1$              ;BR IF IT IS
026020  005260  000104                  INC     $SOFT(R0)               ;INCREMENT $SOFT
026024  000207                  1$:     RTS     PC              ;RETURN
17
                                        ;ROUTINE TO INCREMENT $HARD
                                        ;
                                        ;NOTE:  $HARD WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

026026  005737  001336          INCHRD: TST     BADSEC          ;SEE IF BAD TRK/SEC INDICATOR SET
026032  001006                          BNE     1$              ;BR IF IT'S SET, DON'T INCREMENT COUNT
026034  026027  000106  077777          CMP     $HARD(R0),#77777        ;IS $HARD ALREADY AT MAXIMUM ?
026042  103002                          BHIS    1$              ;BR IF IT IS
026044  005260  000106                  INC     $HARD(R0)               ;INCREMENT $HARD
026050  000207                  1$:     RTS     PC              ;RETURN
18
                                        ;ROUTINE TO INCREMENT $SKI
                                        ;
                                        ;NOTE:  $SKI WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

026052  005737  001336          INCSKI: TST     BADSEC          ;SEE IF BAD TRK/SEC INDICATOR SET
026056  001006                          BNE     1$              ;BR IF IT'S SET, DON'T INCREMENT COUNT
026060  026027  000110  077777          CMP     $SKI(R0),#77777 ;IS $SKI ALREADY AT MAXIMUM ?
026066  103002                          BHIS    1$              ;BR IF IT IS
026070  005260  000110                  INC     $SKI(R0)                ;INCREMENT $SKI
026074  000207                  1$:     RTS     PC              ;RETURN
19
                                        ;ROUTINE TO INCREMENT $MISPO
                                        ;
                                        ;NOTE:  $MISPO WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

026076  005737  001336          INCMIS: TST     BADSEC          ;SEE IF BAD TRK/SEC INDICATOR SET
026102  001006                          BNE     1$              ;BR IF IT'S SET, DON'T INCREMENT COUNT
026104  026027  000112  077777          CMP     $MISPO(R0),#77777       ;IS $MISPO ALREADY AT MAXIMUM ?
026112  103002                          BHIS    1$              ;BR IF IT IS
026114  005260  000112                  INC     $MISPO(R0)              ;INCREMENT $MISPO
026120  000207                  1$:     RTS     PC              ;RETURN
20
                                        ;ROUTINE TO INCREMENT $TOTAL
                                        ;
                                        ;NOTE:  $TOTAL WILL NOT BE INCREMENTED BEYOND 77777 (32767.)

026122  005737  001336          INCTOT: TST     BADSEC          ;SEE IF BAD TRK/SEC INDICATOR SET
026126  001006                          BNE     1$              ;BR IF IT'S SET, DON'T INCREMENT COUNT
026130  026027  000102  077777          CMP     $TOTAL(R0),#77777       ;IS $TOTAL ALREADY AT MAXIMUM ?
026136  103002                          BHIS    1$              ;BR IF IT IS
026140  005260  000102                  INC     $TOTAL(R0)              ;INCREMENT $TOTAL
026144  000207                  1$:     RTS     PC              ;RETURN
```

```
                                        ;ROUTINE TO TYPE THE ELAPSED CPU RUN TIME

026146  005737  001310        $TIME:  TST     CLKFLG          ;IS CLOCK AVAILABLE ?
026152  001446                        BEQ     3$              ;BR IF NO
026154  012737  000002  026222        MOV     #2,2$           ;ASSUME 2 DIGITS TO TYPE
026162  013746  001340                MOV     HOUR,-(SP)      ;PUT 'HOURS' ON THE STACK
026166  021627  000144                CMP     (SP),#100.      ;100. HOURS OR MORE ?
026172  002407                        BLT     1$              ;BR IF NO
026174  005237  026222                INC     2$              ;TYPE 3 DIGITS
026200  021627  001750                CMP     (SP),#1000.     ;1000. HOURS OR MORE ?
026204  002402                        BLT     1$              ;BR IF NO
026206  005237  026222                INC     2$              ;TYPE 4 DIGITS
026212  004737  033332        1$:     JSR     PC,$SB2D        ;CONVERT TO DECIMAL
026216  004537  032546                JSR     R5,FILLZ        ;TYPE IT
026222  000000                2$:     .WORD   0               ;NUMBER OF HOUR DIGITS TO TYPE
026224  104401  060074                TYPE    ,COLON          ;':'
026230  013746  001342                MOV     MINUTE,-(SP)    ;PUT 'MINUTES' ON THE STACK
026234  004737  033332                JSR     PC,$SB2D        ;CONVERT TO DECIMAL
026240  004537  032546                JSR     R5,FILLZ        ;TYPE IT
026244  000002                        .WORD   2               ;TYPE 2 DIGITS
026246  104401  060074                TYPE    ,COLON          ;':'
026252  013746  001344                MOV     SECOND,-(SP)    ;PUT SECONDS ON THE STACK
026256  004737  033332                JSR     PC,$SB2D        ;CONVERT TO DECIMAL
026262  004537  032546                JSR     R5,FILLZ        ;TYPE IT
026266  000002                        .WORD   2               ;TYPE 2 DIGITS
026270  000207                3$:     RTS     PC

                                        ;KW11 CLOCK INTERRUPT SERVICE ROUTINE

026272  005337  001346        KWSVR:  DEC     ONESEC          ;INCREMENT THE 1/60 SECOND COUNTER
026276  001037                        BNE     1$              ;BR IF A SECOND NOT COUNTED
026300  013737  001312  001346        MOV     HERTZ,ONESEC    ;RESTORE THE VALUE
026306  005237  001344                INC     SECOND          ;COUNT THE SECOND
026312  023727  001344  000074        CMP     SECOND,#60.     ;AT MAXIMUM ?
026320  103426                        BLO     1$              ;BR IF NOT
026322  005037  001344                CLR     SECOND          ;CLEAR THE SECOND'S COUNTER
026326  005237  001472                INC     INTRVL+2        ;COUNT SUMMARY INTERVAL COUNTER
026332  005237  001464                INC     CMPTIM+2        ;COUNT COMPARE TIME INTERVAL COUNTER
026336  005237  001342                INC     MINUTE          ;COUNT THE MINUTE
026342  023727  001342  000074        CMP     MINUTE,#60.     ;AT MAXIMUM ?
026350  103412                        BLO     1$              ;BR IF NOT
026352  005037  001342                CLR     MINUTE          ;CLEAR THE MINUTE'S COUNTER
026356  005237  001340                INC     HOUR            ;COUNT THE HOURS
026362  023727  001340  023417        CMP     HOUR,#9999.     ;AT MAXIMUM
026370  101402                        BLOS    1$              ;BR IF NOT
026372  005037  001340                CLR     HOUR            ;CLEAR THE HOURS
026376  012746  000024        1$:     MOV     #20.,-(SP)      ;20MS ON THE STACK @ 50HZ
026402  023727  001312  000062        CMP     HERTZ,#50.      ;CPU RUNNING @ 50HZ ?
026410  001402                        BEQ     2$              ;BR IF YES
026412  012716  000020                MOV     #16.,(SP)       ;16MS ON THE STACK @ 60HZ
026416  004737  044322        2$:     JSR     PC,RPTMR        ;DRIVER TIMER ROUTINE
026422  005737  001470                TST     INTRVL          ;DISPLAY THE PERFORMANCE SUMMARY ?
026426  001411                        BEQ     3$              ;BR IF NOT
026430  023737  001472  001470        CMP     INTRVL+2,INTRVL ;DISPLAY INTERVAL FINISHED ?
026436  002405                        BLT     3$              ;BR IF NO
026440  012737  177777  001314        MOV     #-1,STATIN      ;SET PERFORMANCE SUMMARY DISPLAY FLAG
```

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     58 026446  005037  001472                CLR     INTRVL+2        ;CLEAR THE PERFORMANCE INTERVAL COUNTER
     59 026452  000002            3$:         RTI
```

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                                        ;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

026454  005737  040546          KSR:  TST     DTUW            ;ANY DATA TRANSFERS UNDER WAY ?
026460  100375                  KSR1: BPL     KSR             ;BR IF YES
026462  104412                        SAVREG                  ;SAVE THE REGISTERS
026464  012737  000200  177776        MOV     #PR4,PS         ;SET PRIORITY TO 4
026472  013704  040560          1$:   MOV     RPADR,R4        ;GET RP/RH BASE ADDRESS
026476  012764  000040  000010        MOV     #CLR,RPCS2(R4)  ;CLEAR MASSBUS CONTROLLER
026504  005037  001334                CLR     CFLAG           ;CLEAR THE 'CONTROL C' FLAG
026510  104401  001203                TYPE    ,$CRLF          ;CR-LF
026514  004737  026146                JSR     PC,$TIME        ;TYPE ELAPSED TIME
026520  104401  056573                TYPE    ,COMMA          ;TYPE ','
026524  104401  056531                TYPE    ,BLNKS1         ;TYPE 1 BLANK
026530  104401  034656                TYPE    ,$MSWR+2        ;TYPE 'SWR = '
026534  017746  152414                MOV     @SWR,-(SP)      ;;SAVE @SWR FOR TYPEOUT
                                                              ;;CONTENTS OF SWITCH REGISTER
026540  104402                        TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
026542  004737  033430                JSR     PC,$TKINT       ;INITIALIZE TTY KEYBOARD
026546  004737  024710                JSR     PC,CLKOFF       ;SHUT OFF CLOCK INTERRUPT WHILE WAITING
026552  104401  060001                TYPE    ,ENTCOM         ;'ENTER COMMAND'

026556  104411                        RDLIN                   ;READ THE KEYBOARD
026560  012605                        MOV     (SP)+,R5        ;GET ADDRESS OF INPUT STRING
026562  005737  001334                TST     CFLAG           ;WAS (^C) TYPED?
026566  001405                        BEQ     2$              ;BR IF NO
026570  005737  001542                TST     ASNLST          ;ANY DRIVES ASSIGNED ?
026574  001141                        BNE     13$             ;BR IF YES
026576  000137  003522                JMP     START           ;JUMP TO START

026602  004737  024514          2$:   JSR     PC,CKCLK        ;START SYSTEM CLOCK
026606  005205                        INC     R5              ;POINT TO SECOND CHARACTER
026610  122715  000124                CMPB    #'T,(R5)        ;EQ TO A 'T' ?
026614  001465                        BEQ     9$              ;YES
026616  122715  000101                CMPB    #'A,(R5)        ;EQ TO AN 'A'
026622  001410                        BEQ     3$              ;BR IF IT IS
026624  121527  000067                CMPB    (R5),#'7        ;DRIVE NUMBER GREATER THAN AN ASCII 7 ?
026630  101117                        BHI     12$             ;BR IF IT IS
026632  121527  000060                CMPB    (R5),#'0        ;DRIVE NUMBER LESS THAN AN ASCII 0 ?
026636  103514                        BLO     12$             ;BR IF IT IS
026640  142715  177770                BICB    #^C7,(R5)       ;LEAVE ONLY LOWER 3 BITS IF CHAR NOT 'A'
026644  122765  000124  177777  3$:   CMPB    #'T,-1(R5)      ;EQ TO 'T'
026652  001003                        BNE     4$              ;BR IF NOT EQ
026654  004737  030030                JSR     PC,NEWASN       ;ASSIGN DRIVE FOR TEST
026660  000507                        BR      13$             ;EXIT
026662  122765  000104  177777  4$:   CMPB    #'D,-1(R5)      ;EQ TO 'D' ?
026670  001003                        BNE     5$              ;BR IF NOT EQ
026672  004737  027620                JSR     PC,DROPD        ;DROP DRIVE
026676  000500                        BR      13$             ;EXIT
026700  122765  000123  177777  5$:   CMPB    #'S,-1(R5)      ;EQ TO 'S'
026706  001003                        BNE     6$              ;BR IF NOT EQ
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 59 026710  004737  027726                    JSR     PC,SCMND        ;TYPE STATISTICS
 60 026714  000471                            BR      13$             ;EXIT
 61 026716  122765  000127  177777  6$:       CMPB    #'W,-1(R5)      ;EQ TO 'W'
 62 026724  001012                            BNE     8$              ;BR IF NOT EQ
 64 026726  005737  001424                    TST     RDONLY          ;LOCKED IN "READ ONLY" MODE ?
 65 026732  001053                            BNE     11$             ;BR IF YES
 67 026734  032777  000001  152212            BIT     #SW0,@SWR       ;IS SWITCH 0 SET ?
 68 026742  001047                            BNE     11$             ;BR IF SET, CAN'T DO 'W' COMMAND
 69 026744  004737  030052          7$:       JSR     PC,DATAPK       ;WRITE DATA
 70 026750  000453                            BR      13$             ;EXIT
 71 026752  122765  000122  177777  8$:       CMPB    #'R,-1(R5)      ;EQ TO 'R' ?
 72 026760  001043                            BNE     12$             ;BR IF NOT EQ
 73 026762  004737  030040                    JSR     PC,REDAPK       ;READ DATA
 74 026766  000444                            BR      13$             ;EXIT
 75 026770  122765  000127  177777  9$:       CMPB    #'W,-1(R5)      ;WT COMMAND ?
 76 026776  001034                            BNE     12$             ;NO
 78 027000  005737  001424                    TST     RDONLY          ;LOCKED IN "READ ONLY" MODE ?
 79 027004  001026                            BNE     11$             ;BR IF YES
 81 027006  032777  000001  152140            BIT     #SW0,@SWR       ;IS SWITCH 0 SET ?
 82 027014  001022                            BNE     11$             ;BR IF SET, CAN'T DO 'W' COMMAND
 83 027016  122765  000101  000001            CMPB    #'A,1(R5)       ;ALL DRIVES ?
 84 027024  001413                            BEQ     10$             ;YES
 85 027026  126527  000001  000067            CMPB    1(R5),#'7       ;GREAT THAN 7
 86 027034  101015                            BHI     12$             ;YES
 87 027036  126527  000001  000060            CMPB    1(R5),#'0       ;LESS THAN 0
 88 027044  103411                            BLO     12$             ;YES
 89 027046  142765  177770  000001            BICB    #^C7,1(R5)      ;CHOP OFF THE HIGHER BITS
 90 027054  004737  030064          10$:      JSR     PC,WATPAK       ;ASSIGN DRIVES WITH WT COMMAND
 91 027060  000407                            BR      13$
 92 027062  104401  057713          11$:      TYPE    ,MSWRO          ;TYPE 'CAN'T WRITE IN READ ONLY MODE'
 93 027066  000601                            BR      1$              ;TRY AGAIN
 94 027070  104401  057756          12$:      TYPE    ,INVLD          ;TYPE 'INVALID COMMAND' MESSAGE
 95 027074  000137  026472                    JMP     1$              ;TRY AGAIN
 96 027100  104413                  13$:      RESREG                  ;RESTORE R0 - R5
 97 027102  005777  152054                    TST     @$TKB           ;CLEAR THE TTY BUFFER
 98 027106  052777  000100  152044            BIS     #BIT06,@$TKS    ;SET TTY INTERRUPT ENABLE
 99 027114  005037  177776                    CLR     PS              ;SET PRIORITY BACK TO ZERO
100 027120  000207                            RTS     PC              ;RETURN
101
102                                ;ROUTINE TO PROCESS THE ASSIGN REQUEST ('T', 'R', OR 'W' COMMANDS)
103
104 027122  111504                  ASSIGN:   MOVB    (R5),R4         ;PUT DRIVE # IN R4
105 027124  005037  001334          1$:       CLR     CFLAG           ;CLEAR CONTROL C FLAG
106 027130  005037  001426                    CLR     DRVPAR          ;ASSUME CHANGING DRIVE PARAMETERS
107 027134  104401  060164                    TYPE    ,MSPRM          ;TYPE 'CHANGE DRIVE PARAMETERS ?'
108 027140  104411                            RDLIN                   ;READ THE ENTRY
109 027142  012600                            MOV     (SP)+,R0        ;SAVE ADDRESS OF RESPONSE
110 027144  005737  001334                    TST     CFLAG           ;WAS (^C) TYPED?
111 027150  001365                            BNE     1$              ;BR IF YES
112 027152  105710                            TSTB    (R0)            ;WAS RESPONSE A CARRIAGE RETURN (DEFAULT 'N')?
113 027154  001414                            BEQ     3$              ;BR IF YES
114 027156  105760  000001                    TSTB    1(R0)           ;WAS IT TERMINATED WITH CARRIAGE RETURN ?
115 027162  001006                            BNE     2$              ;BR IF NO
116 027164  122710  000131                    CMPB    #'Y,(R0)        ;WAS IT A 'Y' RESPONSE ?
117 027170  001410                            BEQ     4$              ;BR IF YES
118 027172  122710  000116                    CMPB    #'N,(R0)        ;WAS IT A 'N' RESPONSE ?
119 027176  001403                            BEQ     3$              ;BR IF YES
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120 027200  104401  060103          2$:     TYPE    ,BADENT         ;TYPE BAD ENTRY MESSAGE
121 027204  000747                  BR      1$              ;TRY AGAIN
122 027206  005237  001426          3$:     INC     DRVPAR          ;DO NOT CHANGE DRIVE PARAMETERS
123 027212  122704  000101          4$:     CMPB    #'A,R4          ;ASSIGN ALL DRIVES ?
124 027216  001426                  BEQ     ASGN2           ;BR IF YES
125
126 027220  012737  056652  031276  ASGN1:  MOV     #UNTASN,ASNMSG  ;ERROR MESSAGE
127 027226  005737  001430          TST     XXDP            ;LOADED FROM THIS DEVICE ?
128 027232  001407                  BEQ     1$              ;BR IF NO
129 027234  123704  001430          CMPB    XXDP,R4         ;LOADED FROM THIS DRIVE ?
130 027240  001004                  BNE     1$              ;BR IF NO
131 027242  012737  056761  031276  MOV     #LODEV,ASNMSG   ;'LOAD DEVICE' MESSAGE ADDRESS
132 027250  000407                  BR      2$
133 027252  136437  040550  001542  1$:     BITB    ATABIT(R4),ASNLST       ;DRIVE ALREADY ASSIGNED ?
134 027260  001003                  BNE     2$              ;BR IF IT IS
135 027262  004737  027364          JSR     PC,ASGN3        ;SEE IF DRIVE ON THE SYSTEM
136 027266  000207                  RTS     PC              ;RETURN
137 027270  000137  031252          2$:     JMP     ASNERR          ;EXIT ERROR
138
139 027274  005004          ASGN2:  CLR     R4              ;START WITH DRIVE 0
140 027276  012737  056652  031276  1$:     MOV     #UNTASN,ASNMSG  ;ERROR MESSAGE
141 027304  005737  001430          TST     XXDP            ;LOADED FROM THIS DEVICE ?
142 027310  001407                  BEQ     2$              ;BR IF NO
143 027312  123704  001430          CMPB    XXDP,R4         ;LOADED FROM THIS DRIVE ?
144 027316  001004                  BNE     2$              ;BR IF NO
145 027320  012737  056761  031276          MOV     #LODEV,ASNMSG   ;'LOAD DEVICE' MESSAGE ADDRESS
146 027326  000413                  BR      4$
147 027330  136437  040550  001542  2$:     BITB    ATABIT(R4),ASNLST       ;ALREADY ASSIGNED ?
148 027336  001007                  BNE     4$              ;YES
149 027340  004737  027364          JSR     PC,ASGN3        ;ASSIGN THE DRIVE
150 027344  005204          3$:     INC     R4              ;INCREMENT DRIVE #
151 027346  020427  000007          CMP     R4,#7           ;ALL DRIVE CHECKED ?
152 027352  003751                  BLE     1$              ;NO
153 027354  000207                  RTS     PC              ;YES
154 027356  004737  031252          4$:     JSR     PC,ASNERR       ;ERROR MESSAGE
155 027362  000770                  BR      3$              ;TO LOOP
156
157 027364  136437  040550  001542  ASGN3:  BITB    ATABIT(R4),ASNLST       ;DRIVE ALREADY ASSIGNED ?
158 027372  001056                  BNE     ASGN4           ;BR IF IT IS
159 027374  110437  050654          MOVB    R4,GENDPB       ;GET DRIVE NUMBER
160 027400  006304                  ASL     R4              ;MAKE R4 WORD INDEX
161 027402  016400  002056          MOV     BLKADR(R4),R0   ;PUT BLOCK'S ADDR INTO R0
162 027406  004737  016720          JSR     PC,RECAL0       ;RECALIBRATE DRIVE
163 027412  006204                  ASR     R4              ;MAKE R4 BYTE INDEX
164 027414  105764  040454          TSTB    DRVSTA(R4)      ;DRIVE AVAILABLE?
165 027420  001451                  BEQ     ASGN7           ;BR IF DRIVE OFFLINE OR NONEXISTENT
166 027422  100443                  BMI     ASGN6           ;BR IF DRIVE UNSAFE
167 027424  004737  030104          JSR     PC,CLRDPB       ;CLEAR BLOCK FOR DRIVE JUST ASSIGNED
168 027430  004737  031010          JSR     PC,GETID        ;GET DRIVE SERIAL NUMBER
169 027434  032760  000004  000200  BIT     #ILV,$RPDS(R0)  ;INTERLEAVE SECTOR SET ?
170 027442  001461                  BEQ     ASGN8           ;BR IF NO
171 027444  005737  001426          TST     DRVPAR          ;CHANGE DRIVE PARAMETERS ?
172 027450  001015                  BNE     1$              ;BR IF NO
173 027452  104401  001203          TYPE    ,$CRLF          ;CR-LF
174 027456  104401  056601          TYPE    ,DRVMSG         ;TYPE 'DRIVE'
175 027462  010446                  MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                            ;;TYPE DRIVE NUMBER
```

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                027464  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
                027466     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
                027467     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
    176         027470  104401  056573                  TYPE    ,COMMA          ;TYPE ','
    177         027474  104401  056531                  TYPE    ,BLNKS1         ;TYPE 1 BLANK
    178         027500  004737  032770                  JSR     PC,TYPDRV       ;TYPE DRIVE SERIAL NUMBER
    179         027504  006304                  1$:     ASL     R4              ;MAKE R4 WORD INDEX
    180         027506  004737  030322                  JSR     PC,DRVPRM       ;GET THE DRIVE'S ADDRESS LIMITS
    181         027512  016464  002056  001566          MOV     BLKADR(R4),NEWUNT(R4)   ;DPB ADDRESS
    182         027520  113760  030102  000026          MOVB    PACK,$PACK(R0)  ;SET COMMAND INDICATOR
    183         027526  006204                          ASR     R4              ;MAKE R4 BYTE INDEX
    184         027530  000207                  ASGN4:  RTS     PC              ;RETURN
    185
    186         027532  012737  056751  031276  ASGN6:  MOV     #NOTSAF,ASNMSG  ;'UNSAFE' MESSAGE ADDRESS
    187         027540  000137  031252                  JMP     ASNERR          ;TO ERROR ROUTINE
    188
    189         027544  105764  040464          ASGN7:  TSTB    DRVTYP(R4)      ;DRIVE PRESENT?
    190         027550  001405                          BEQ     1$              ;BR IF NOT
    191         027552  100010                          BPL     2$              ;BR IF DRIVE OFFLINE
    192         027554  012737  056700  031276          MOV     #NOTRP,ASNMSG   ;ADDRESS OF 'NOT RP07' MSG
    193         027562  000407                          BR      3$              ;EXIT
    194         027564  012737  056715  031276  1$:     MOV     #NOTPRS,ASNMSG  ;ADDRESS OF 'NOT PRESENT' MSG
    195         027572  000403                          BR      3$              ;EXIT
    196         027574  012737  056607  031276  2$:     MOV     #UNTOFF,ASNMSG  ;ADDRESS OF 'DRIVE OFFLINE' MESSAGE
    197         027602  000137  031252          3$:     JMP     ASNERR          ;TO ERROR ROUTINE
    198
    199         027606  012737  056776  031276  ASGN8:  MOV     #NINLEV,ASNMSG  ;ADDRESS OF 'NON-INTERLEAVED' MESSAGE
    200         027614  000137  031252                  JMP     ASNERR          ;TO ERROR ROUTINE
```

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                                        ;'D' COMMAND (ROUTINE TO DROP A DRIVE)

027620  005004                  DROPD:  CLR     R4              ;START WITH DRIVE 0
027622  012703  000010                  MOV     #8.,R3          ;COUNTER
027626  122715  000101                  CMPB    #'A,(R5)        ;DROP ALL DRIVES ?
027632  001403                          BEQ     1$              ;BR IF YES
027634  111504                          MOVB    (R5),R4         ;GET DRIVE NUMBER
027636  012703  000001                  MOV     #1,R3           ;SET R3 FOR ONE DRIVE
027642  136437  040550  001542  1$:     BITB    ATABIT(R4),ASNLST       ;DRIVE ASSIGNED ?
027650  001417                          BEQ     3$              ;BR IF NOT
027652  146437  040550  001542          BICB    ATABIT(R4),ASNLST       ;DELETE THE DRIVE FROM THE ASSIGNED LIST
027660  146437  040550  032020          BICB    ATABIT(R4),AUTLST       ;DELETE DRIVE FROM AUTO ASSIGN LIST
027666  006304                          ASL     R4              ;MAKE ADDR INTO A WORD INDEX
027670  016464  002056  001544          MOV     BLKADR(R4),DDRVS(R4)    ;PUT ADDRESS IN DROP LIST
027676  006204                          ASR     R4
027700  005303                  2$:     DEC     R3              ;ANY MORE DRIVES ?
027702  001410                          BEQ     4$              ;BR IF NOT
027704  005204                          INC     R4
027706  000755                          BR      1$
027710  012737  056630  031276  3$:     MOV     #UNTNOT,ASNMSG  ;ADDR OF 'NOT ASSIGNED' MESSAGE
027716  004737  031252                  JSR     PC,ASNERR       ;REPORT IT
027722  000766                          BR      2$
027724  000207                  4$:     RTS     PC

                                        ;'S' COMMAND (ROUTINE TO TYPE DRIVE PERFORMANCE SUMMARY)

027726                          SCMND:
027726  013746  001542                  MOV     ASNLST,-(SP)    ;;PUSH ASNLST ON STACK
027732  122715  000101                  CMPB    #'A,(R5)        ;ALL STATISTICS ?
027736  001416                          BEQ     2$              ;BR IF YES
027740  111504                          MOVB    (R5),R4         ;GET DRIVE NUMBER
027742  136414  040550                  BITB    ATABIT(R4),(SP) ;IS THIS DRIVE ASSIGNED ?
027746  001404                          BEQ     1$              ;BR IF NO
027750  116437  040550  001542          MOVB    ATABIT(R4),ASNLST       ;GET DRIVE ASSIGN BIT
027756  000411                          BR      3$

027760  012737  056630  031276  1$:     MOV     #UNTNOT,ASNMSG  ;ADDR OF 'NOT ASSIGNED' MSG
027766  004737  031252                  JSR     PC,ASNERR       ;TYPE ERROR MESSAGE
027772  000413                          BR      4$              ;EXIT
027774  105737  001542          2$:     TSTB    ASNLST          ;ANY DRIVE ASSIGNED ?
030000  001410                          BEQ     4$              ;BR IF NO
030002  004737  024740          3$:     JSR     PC,STATPR       ;TYPE ALL STATISTICS
030006  104401  057327                  TYPE    ,DASH13         ;TYPE '-------------'
030012  104401  001203                  TYPE    ,$CRLF          ;CR-LF
030016  104401  057513                  TYPE    ,MSGCON         ;TYPE 'CONTINUING...'

030022                          4$:
030022  012637  001542                  MOV     (SP)+,ASNLST    ;;POP STACK INTO ASNLST
030026  000207                          RTS     PC

                                        ;'T' COMMAND (ROUTINE TO TEST A DRIVE)

030030  005037  030102          NEWASN: CLR     PACK            ;SET 'T' COMMAND INDICATOR
030034  000137  027122                  JMP     ASSIGN          ;GO TO THE ASSIGN ROUTINE

                                        ;'R' COMMAND (ROUTINE TO DO SEQUENTIAL READ DATA)
```

```
   030040  012737  000001  030102  REDAPK: MOV     #1,PACK         ;SET 'R' COMMAND INDICATOR
   030046  000137  027122                  JMP     ASSIGN          ;ASSIGN THE REQUESTED DRIVE

                                   ;'W' COMMAND (ROUTINE TO DO SEQUENTIAL WRITE DATA)

   030052  012737  177777  030102  DATAPK: MOV     #-1,PACK        ;SET 'W' COMMAND INDICATOR
   030060  000137  027122                  JMP     ASSIGN          ;ASSIGN REQUESTED DRIVE

                                   ;'WT' COMMAND (ROUTINE TO DO WRITE DATA AND TEST A DRIVE)

   030064  116515  000001          WATPAK: MOVB    1(R5),(R5)      ;ADJUST DRIVE NUMBER ADDRESS
   030070  012737  177776  030102          MOV     #-2,PACK        ;SET 'WT' COMMAND INDICATOR
   030076  000137  027122                  JMP     ASSIGN          ;JUMP TO ASSIGN ROUTINE

   030102  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

                                CLRDPB:
 030104  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 030106  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
 030110  010446                        MOV     R4,-(SP)        ;;PUSH R4 ON STACK
 030112  010546                        MOV     R5,-(SP)        ;;PUSH R5 ON STACK
 030114  005737  040020                TST     PWRFLG          ;RETURNING FROM POWER FAIL ?
 030120  001073                        BNE     4$              ;BRANCH IF YES
 030122  010004                        MOV     R0,R4           ;GET THE DPB ADDRESS
 030124  062704  000002                ADD     #2,R4           ;ADDRESS OF FIRST LOCN TO BE CLEARED
 030130  012703  000012                MOV     #<$CYL-$COMND>+2,R3     ;NUMBER OF LOCNS TO BE CLEARED
 030134  005024                1$:     CLR     (R4)+           ;CLEAR LOCATIONS '$COMND' - '$CYL' IN DPB
 030136  162703  000002                SUB     #2,R3           ;DONE CLEARING YET ?
 030142  001374                        BNE     1$              ;BR IF NO

 030144  062704  000002                ADD     #2,R4           ;SKIP OVER THE '$REG' LOCATION
 030150  012703  000114                MOV     #<$NEXT-$TATUS>+2,R3    ;NUMBER OF LOCNS TO BE CLEARED
 030154  005024                2$:     CLR     (R4)+           ;CLEAR LOCATIONS '$TATUS' - '$NEXT' IN DPB
 030156  162703  000002                SUB     #2,R3           ;DONE CLEARING YET ?
 030162  001374                        BNE     2$              ;BR IF NO

 030164  062704  000026                ADD     #<$DRVSN-$FIRST>,R4     ;SKIP OVER '$FIRST', MIN/MAX ADRS
                                                                ;LIMITS AND 'CYL, TRK, SEC, FE1' LIMITS
 030170  012703  000062                MOV     #<$RPCS3-$DRVSN>+2,R3   ;NUMBER OF LOCNS TO BE CLEARED
 030174  005024                3$:     CLR     (R4)+           ;CLEAR LOCATIONS '$DRVSN' - '$RPCS3' IN DPB
 030176  162703  000002                SUB     #2,R3           ;DONE CLEARING YET ?
 030202  001374                        BNE     3$              ;BR IF NO

                                                                ;INITIALIZE SOME OTHER LOCATIONS
 030204  113760  001514  000024        MOVB    BEGCOD,$CODE(R0)        ;INITIAL COMMAND CODE
 030212  013701  001514                MOV     BEGCOD,R1       ;GET THE ACTUAL OP CODE
 030216  116160  002076  000002        MOVB    COMTBL(R1),$COMND(R0)   ;OPERATION CODE
 030224  113760  001512  000030        MOVB    BEGPAT,$PATTC(R0)       ;PATTERN CODE
 030232  106360  000030                ASLB    $PATTC(R0)      ;CONVERT CODE TO A TABLE INDEX
 030236  013760  001516  000020        MOV     BEGWC,$WRDL(R0) ;BEGINNING WORD COUNT
 030244  013760  001516  000004        MOV     BEGWC,$WCNT(R0) ;VALUE FOR DATA TRANSFER
 030252  005460  000004                NEG     $WCNT(R0)       ;MAKE IT INTO 2'S COMPLEMENT
 030256  012760  000400  000022        MOV     #256.,$SSEC(R0) ;INITIAL VALUE OF SECTOR SIZE
 030264  012760  000001  000114        MOV     #1,$PASSC(R0)   ;PRESET PASS COUNT TO 1
 030272  132760  000001  000024        BITB    #1,$CODE(R0)    ;HEADER COMMAND ?
 030300  001403                        BEQ     4$              ;BR IF NOT
 030302  062760  000002  000022        ADD     #2,$SSEC(R0)    ;ADD HEADER SIZE TO SECTOR SIZE
 030310                         4$:
 030310  012605                        MOV     (SP)+,R5        ;;POP STACK INTO R5
 030312  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
 030314  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
 030316  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
 030320  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

030322  010346                 DRVPRM: MOV     R3,-(SP)        ;SAVE R3
030324  010446                         MOV     R4,-(SP)        ;SAVE R4
030326  004737  030706          1$:     JSR     PC,GETLMT       ;GET ADDRESS LIMITS
030332  062760  177777  000132         ADD     #-1,$FIRST(R0)  ;SEE IF FIRST TIME STARTED
030340  103426                         BCS     4$              ;BR IF NOT
030342  016060  000150  000134         MOV     CYLLMT(R0),MAXCYL(R0)   ;LOAD MAXIMUM CYLINDER
030350  016060  000154  000140         MOV     TRKLMT(R0),MAXTRK(R0)   ;LOAD MAXIMUM TRACK
030356  016060  000152  000144         MOV     SECLMT(R0),MAXSEC(R0)   ;LOAD MAXIMUM SECTOR
030364  005737  001422                 TST     TSTANY          ;ARE YOU TESTING ANYWHERE ON MEDIA ?
030370  001004                         BNE     2$              ;BR IF YES
030372  016060  000156  000136         MOV     FE1(R0),MINCYL(R0)      ;RESET MINIMUM CYLINDER ADDRESS
030400  000402                         BR      3$
030402  005060  000136          2$:     CLR     MINCYL(R0)      ;CLEAR MINIMUM CYLINDER
030406  005060  000142          3$:     CLR     MINTRK(R0)      ;CLEAR MINIMUM TRACK
030412  005060  000146                 CLR     MINSEC(R0)      ;CLEAR MINIMUM SECTOR

030416  105737  001150          4$:     TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
030422  001074                         BNE     7$              ;BR IF YES
030424  005737  001332                 TST     CHGADR          ;PROGRAM STARTED AT 200 ?
030430  003071                         BGT     7$              ;BR IF YES
030432  005737  001426                 TST     DRVPAR          ;CHANGE DRIVE PARAMETERS ?
030436  001066                         BNE     7$              ;BR IF NO
030440  016403  061604                 MOV     TABLE(R4),R3    ;PARAMETER TABLE ADDRESS
030444  016063  000150  000002         MOV     CYLLMT(R0),2(R3)        ;LOAD CYLINDER LIMIT FOR MINCYL
030452  016063  000150  000010         MOV     CYLLMT(R0),10(R3)       ;LOAD CYLINDER LIMIT FOR MAXCYL
030460  016063  000154  000016         MOV     TRKLMT(R0),16(R3)       ;LOAD TRACK LIMIT FOR MINTRK
030466  016063  000154  000024         MOV     TRKLMT(R0),24(R3)       ;LOAD TRACK LIMIT FOR MAXTRK
030474  016063  000152  000032         MOV     SECLMT(R0),32(R3)       ;LOAD SECTOR LIMIT FOR MINSEC
030502  016063  000152  000040         MOV     SECLMT(R0),40(R3)       ;LOAD SECTOR LIMIT FOR MAXSEC
030510  104401  060022                 TYPE    ,ENTLMT         ;' ADDRESS LIMITS;'
030514  004737  031110                 JSR     PC,PARENT       ;GET THE DRIVE'S PARAMETERS

030520  016003  000136                 MOV     MINCYL(R0),R3   ;STORE MINCYL VALUE
030524  016004  000134                 MOV     MAXCYL(R0),R4   ;STORE MAXCYL VALUE
030530  020304                         CMP     R3,R4           ;IS MIN. LESS THAN OR EQUAL TO MAX. ?
030532  003404                         BLE     5$              ;BR IF YES
030534  010360  000134                 MOV     R3,MAXCYL(R0)   ;SWAP MIN. TO MAX.
030540  010460  000136                 MOV     R4,MINCYL(R0)   ;SWAP MAX. TO MIN.
030544  016003  000142          5$:     MOV     MINTRK(R0),R3   ;STORE MINTRK VALUE
030550  016004  000140                 MOV     MAXTRK(R0),R4   ;STORE MAXTRK VALUE
030554  020304                         CMP     R3,R4           ;IS MIN. LESS THAN OR EQUAL TO MAX. ?
030556  003404                         BLE     6$              ;BR IF YES
030560  010360  000140                 MOV     R3,MAXTRK(R0)   ;SWAP MIN. TO MAX.
030564  010460  000142                 MOV     R4,MINTRK(R0)   ;SWAP MAX. TO MIN.
030570  016003  000146          6$:     MOV     MINSEC(R0),R3   ;STORE MINSEC VALUE
030574  016004  000144                 MOV     MAXSEC(R0),R4   ;STORE MAXSEC VALUE
030600  020304                         CMP     R3,R4           ;IS MIN. LESS THAN OR EQUAL TO MAX. ?
030602  003404                         BLE     7$              ;BR IF YES
030604  010360  000144                 MOV     R3,MAXSEC(R0)   ;SWAP MIN. TO MAX.
030610  010460  000146                 MOV     R4,MINSEC(R0)   ;SWAP MAX. TO MIN.
```

```
                                7$:     TST     TSTANY          ;ARE YOU TESTING ANYWHERE ON MEDIA ?
                                        BNE     9$              ;BR IF YES
                                        CMP     MINCYL(R0),FE1(R0)      ;IS MIN. CYLINDER < 1ST FE CYLINDER ?
                                        BHIS    8$              ;BR IF NO
                                        MOV     FE1(R0),MINCYL(R0)      ;RESET MINIMUM CYLINDER ADDRESS
                                8$:     CMP     MAXCYL(R0),FE1(R0)      ;IS MAX. CYLINDER < 1ST FE CYLINDER ?
                                        BHIS    9$              ;BR IF NO
                                        MOV     CYLLMT(R0),MAXCYL(R0)   ;RESET MAXIMUM CYLINDER ADDRESS

                                9$:     MOV     MINCYL(R0),$CYL(R0)     ;INITIAL CYLINDER VALUE
                                        MOVB    MINTRK(R0),$TRK(R0)     ;INITIAL TRACK VALUE
                                        MOVB    MINSEC(R0),$SEC(R0)     ;INITIAL SECTOR VALUE
                                        MOV     (SP)+,R4        ;;POP STACK INTO R4
                                        MOV     (SP)+,R3        ;;POP STACK INTO R3
                                        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 FRESH
                                        MOV     #559.,FE1(R0)   ;GET ADDRESS OF 1ST FE CYLINDER
                                        MOV     #560.,CYLLMT(R0)        ;ASSUME CYLINDER LIMIT FOR RP07
                                        MOV     #29.,TRKLMT(R0) ;ASSUME TRACK LIMIT     ''
                                        MOV     #33.,SECLMT(R0) ;ASSUME SECTOR LIMIT    ''
                                        MOVB    (R0),R1         ;GET DRIVE NUMBER
                                        CMPB    #5,DRVTYP(R1)   ;IS DRIVE AN RP07 ?
                                        BEQ     1$              ;BR IF YES
                                        MOV     #630.,FE1(R0)   ;GET ADDRESS OF 1ST FE CYLINDER
                                        MOV     #630.,CYLLMT(R0)        ;GET CYLINDER LIMIT FOR RP07+
                                        MOV     #31.,TRKLMT(R0) ;GET TRACK LIMIT        ''
                                        MOV     #49.,SECLMT(R0) ;GET SECTOR LIMIT       ''
                                1$:
                                        MOV     (SP)+,R1        ;;POP STACK INTO R1
                                        RTS     PC              ;RETURN
```

KW11 CLOCK CHECK ROUTINE

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

031010                          GETID:
031010  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
031012  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
031014  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
031016  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
031020  010002                          MOV     R0,R2           ;GET INDEX TO DPB
031022  004737  045262                  JSR     PC,SVRHXX       ;SAVE ALL REGISTERS
031026  012702  000004                  MOV     #4,R2           ;FOUR DIGITS TO STORE
031032  016001  000216                  MOV     $RPSN(R0),R1    ;SERIAL NUMBER
031036  005005                  1$:     CLR     R5              ;ZERO
031040  006101                          ROL     R1              ;PUT THE NEXT DIGIT
031042  006105                          ROL     R5              ;INTO R5
031044  006101                          ROL     R1
031046  006105                          ROL     R5
031050  006101                          ROL     R1
031052  006105                          ROL     R5
031054  006101                          ROL     R1
031056  006105                          ROL     R5
031060  062705  000060                  ADD     #'0,R5          ;MAKE IT ASCII
031064  110560  000160                  MOVB    R5,$DRVSN(R0)   ;SAVE DRIVE SERIAL NUMBER DIGIT
031070  005200                          INC     R0              ;GET NEXT INDEX FOR DRIVE SERIAL NUMBER
031072  005302                          DEC     R2              ;ALL DIGITS TYPED?
031074  003360                          BGT     1$              ;NO -- BRANCH
031076  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
031100  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
031102  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
031104  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
031106  000207                          RTS     PC              ;RETURN
```

```
                                .SBTTL  PARAMETER ENTRY ROUTINE

                                ;PARAMETER ENTRY ROUTINE
                                ;CALL:
                                ;       MOV     #ADR,R3         ;PARAMETER TABLE ADDRESS
                                ;       JSR     PC,PARENT       ;GET THE PARAMETERS

 8 031110  010346               PARENT: MOV     R3,-(SP)        ;SAVE THE PARAMETER TABLE ADDRESS
 9 031112  005037  001334              CLR     CFLAG           ;CLEAR THE 'CONTROL C' FLAG
10 031116  012337  031126       1$:     MOV     (R3)+,2$        ;ADDRESS OF PARAMETER NAME
11 031122  001451                       BEQ     7$              ;BR IF AT END OF TABLE
12 031124  104401                       TYPE                    ;TYPE THE PARAMETER NAME
13 031126  000000               2$:     .WORD   0               ;ADDRESS OF PARAMETER NAME TEXT
14 031130  012302                       MOV     (R3)+,R2        ;MAXIMUM PARAMETER VALUE
15 031132  012305                       MOV     (R3)+,R5        ;ADDRESS OF PARAMETER
16 031134  011546                       MOV     (R5),-(SP)      ;CURRENT VALUE OF PARAMETER
17 031136  004737  033332              JSR     PC,$SB2D        ;CONVERT IT TO DECIMAL
18 031142  004737  032346              JSR     PC,SUPRSL       ;TYPE IT (LEFT JUSTIFIED)
19                                                              ;TYPE THE CURRENT VALUE OF THE PARAMETER
20 031146  104401  056531              TYPE    ,BLNKS1         ;TYPE 1 BLANK
21 031152  104401  056567              TYPE    ,QUES           ;'?'
22 031156  104401  056531              TYPE    ,BLNKS1         ;TYPE 1 BLANK
23 031162  104411                       RDLIN                   ;READ THE KEYBOARD
24 031164  012601                       MOV     (SP)+,R1        ;INPUT ASCII STRING ADDRESS
25 031166  005737  001334              TST     CFLAG           ;WAS (^C) TYPED?
26 031172  001021                       BNE     6$              ;BR IF IT WAS
27 031174  004537  033174              JSR     R5,CK.DIG       ;CHECK THE DIGIT(S)
   031200  031116                       1$                      ;CARRIAGE RETURN ONLY ENTERED
   031202  031246                       7$                      ;PERIOD ONLY ENTERED
   031204  031220                       4$                      ;ILLEGAL INPUT
   031206  031214                       3$                      ;TERMINATED WITH A CARRIAGE RETURN
   031210  031220                       4$                      ;TERMINATED WITH A ''
   031212  031232                       5$                      ;TERMINATED WITH A '.'
28 031214  010215               3$:     MOV     R2,(R5)         ;MOVE NEW VALUE TO PARAMETER LOCATION
29 031216  000737                       BR      1$              ;GET MORE PARAMETERS
30 031220  104401  060103       4$:     TYPE    ,BADENT         ;'BAD ENTRY'
31 031224  162703  000006              SUB     #6,R3           ;DECREMENT THE TABLE POINTER
32 031230  000732                       BR      1$              ;TRY AGAIN
33 031232  010215               5$:     MOV     R2,(R5)         ;NEW VALUE
34 031234  000404                       BR      7$              ;EXIT
35 031236  005037  001334       6$:     CLR     CFLAG           ;CLEAR THE 'CONTROL C' FLAG
36 031242  011603                       MOV     (SP),R3         ;RELOAD THE PARAMETER TABLE ADDRESS
37 031244  000724                       BR      1$              ;TRY AGAIN
38 031246  005726               7$:     TST     (SP)+           ;CORRECT THE STACK POINTER
39 031250  000207                       RTS     PC              ;RETURN
```

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

031252  104401  001203        ASNERR: TYPE    ,$CRLF          ;CR-LF
031256  104401  056567                TYPE    ,QUES           ;'?'
031262  104401  056601                TYPE    ,DRVMSG         ;TYPE 'DRIVE'
031266  010446                        MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                                ;;TYPE DRIVE NUMBER
031270  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
031272     002                        .BYTE   2               ;;TYPE 2 DIGIT(S)
031273     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
031274  104401                        TYPE                    ;TYPE SPECIFIC MESSAGE
031276  000000                ASNMSG: .WORD   0               ;MESSAGE ADDRESS
031300  000207                        RTS     PC

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

031302  005037  043460        DROP:   CLR     PERM            ;CLR PERMENANT ERROR FLAG
031306  005004                        CLR     R4              ;CLEAR R4 FOR DRIVE NUMBER
031310  111004                        MOVB    (R0),R4         ;MOVE DRIVE NUMBER TO R4
031312  146437  040550  001542        BICB    ATABIT(R4),ASNLST       ;REMOVE DRIVE FROM ASSIGNED LIST
031320  146437  040550  032020        BICB    ATABIT(R4),AUTLST       ;DELETE DRIVE FROM AUTO ASSIGN LIST
031326  006304                        ASL     R4              ;MAKE DRIVE NUMBER INTO A TABLE INDEX
031330  010064  001544                MOV     R0,DDRVS(R4)    ;PUT DRIVE IN DROP LIST
031334  104401  001203                TYPE    ,$CRLF
031340  104401  057561                TYPE    ,DROPNG         ;TYPE '?FATAL OR EXCESSIVE ERRORS'
031344  104401  057616                TYPE    ,MSGON          ;TYPE 'ON'
031350  104401  056601                TYPE    ,DRVMSG         ;TYPE 'DRIVE'
031354  006204                        ASR     R4              ;DRIVE NUMBER
031356  010446                        MOV     R4,-(SP)        ;;SAVE R4 FOR TYPEOUT
                                                                ;;TYPE DRIVE NUMBER
031360  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
031362     002                        .BYTE   2               ;;TYPE 2 DIGIT(S)
031363     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
031364  104401  001203                TYPE    ,$CRLF          ;CR-LF
031370  000207                1$:     RTS     PC

                                        ;ROUTINE TO DROP DRIVE IF ERRORS BECOMES EXCESSIVE

031372  032777  000020  147554  ABNRML: BIT     #SW04,@SWR      ;SEE IF SWITCH 4 SET
031400  001006                        BNE     1$              ;BR IF IT'S SET
031402  023760  001456  000102        CMP     MAXER,$TOTAL(R0)        ;CHECK TOTAL ERROR VALUE
031410  101002                        BHI     1$              ;BR IF ERRORS DO NOT EXCEED MAX
031412  000137  031302                JMP     DROP            ;DROP THE DRIVE
031416  000207                1$:     RTS     PC              ;RETURN

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

END OF PASS ROUTINE

```
     1                                  .SBTTL  END OF PASS ROUTINE

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

031420                                  $EOP:
031420  010446                          1$:     MOV     R4,-(SP)        ;SAVE R4
031422  111004                                  MOVB    (R0),R4         ;MOVE DRIVE NUMBER

031424  105737  001150                          TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
031430  001410                                  BEQ     2$              ;BR IF NO
031432  136437  040550  032020                  BITB    ATABIT(R4),AUTLST       ;IS DRIVE ALREADY ASSIGNED TO AUTO LIST ?
031440  001110                                  BNE     6$              ;BR IF YES
031442  156437  040550  032020                  BISB    ATABIT(R4),AUTLST       ;ADD DRIVE TO AUTO ASSIGN LIST
031450  000441                                  BR      3$

031452  026037  000114  001474  2$:     CMP     $PASSC(R0),PASSES       ;SEE IF AT END OF TEST
031460  103435                                  BLO     3$              ;BR IF NOT
031462  032777  000020  147464                  BIT     #SW04,@SWR      ;TYPE END OF TEST MESSAGE (SW04=1) ?
031470  001031                                  BNE     3$              ;BR IF NO
031472  104401  001203                          TYPE    ,$CRLF          ;CR-LF
031476  104401  001203                          TYPE    ,$CRLF          ;CR-LF
031502  104401  057327                          TYPE    ,DASH13         ;TYPE '-------------'
031506  104401  057417                          TYPE    ,MSGEOT         ;TYPE 'END OF TEST------------------EOT'
031512  146437  040550  001542                  BICB    ATABIT(R4),ASNLST       ;DELETE DRIVE FROM ASSIGNED LIST
031520  006304                                  ASL     R4              ;MAKE DRIVE NUMBER INTO TABLE INDEX
031522  010064  001544                          MOV     R0,DDRVS(R4)    ;PUT BLOCK ADDRESS INTO DROP LIST
031526  105737  001542                          TSTB    ASNLST          ;ALL DRIVES ARE DROPPED ?
031532  001062                                  BNE     7$              ;BR IF NO
031534  005237  001216                          INC     $DEVCT          ;INCREMENT DEVICE COUNT
031540  005237  001214                          INC     $PASS           ;INCREMENT THE PASS COUNT
031544  042737  100000  001214                  BIC     #100000,$PASS   ;AVOID NEGATIVE NUMBER
031552  000452                                  BR      7$

031554  032777  000400  147372  3$:     BIT     #SW08,@SWR      ;INHIBIT END OF PASS TYPEOUT (SW08=1) ?
031562  001022                                  BNE     4$              ;BR IF YES
031564  104401  001203                          TYPE    ,$CRLF          ;CR-LF
031570  104401  001203                          TYPE    ,$CRLF          ;CR-LF
031574  104401  057327                          TYPE    ,DASH13         ;TYPE '-------------'
031600  104401  057371                          TYPE    ,MSGEOP         ;TYPE 'END OF PASS'
031604  104401  001203                          TYPE    ,$CRLF          ;CR-LF
031610  004737  026146                          JSR     PC,$TIME        ;TYPE ELAPSED TIME
031614  104401  057321                          TYPE    ,DASH5          ;TYPE '-----'
031620  104401  057345                          TYPE    ,MSGSUM         ;TYPE 'SUMMARY'
031624  004737  025042                          JSR     PC,ONESUM       ;TYPE ONE DRIVE SUMMARY

031630  010346                          4$:     MOV     R3,-(SP)        ;SAVE R3
031632  010004                                  MOV     R0,R4           ;DRIVE'S BLOCK ADDRESS
031634  062704  000036                          ADD     #$RDPAS,R4      ;ADD THE STARTING ADDR OF SECTIONS TO CLEAR
031640  012703  000016                          MOV     #<$OPERC-$RDPAS>+2,R3   ;NUMBER OF LOCNS TO BE CLEARED
031644  005024                          5$:     CLR     (R4)+           ;CLEAR LOCATIONS '$RDPAS' - '$OPERC' IN DPB
031646  162703  000002                          SUB     #2,R3           ;DONE CLEARING YET ?
031652  001374                                  BNE     5$              ;BR IF NO
031654  012603                                  MOV     (SP)+,R3        ;RESTORE R3
031656  005260  000114                          INC     $PASSC(R0)      ;INCREMENT THE PASS COUNT
```

END OF PASS ROUTINE

```
031662  105737  001150          6$:     TSTB    $AUTOB          ;RUNNING IN AUTO MODE ?
031666  001404                          BEQ     7$              ;BR IF NO
031670  023737  001542  032020          CMP     ASNLST,AUTLST   ;HAVE ALL DRIVES COMPLETED PASS IN AUTO MODE ?
031676  001402                          BEQ     8$              ;BR IF YES
031700  012604                  7$:     MOV     (SP)+,R4        ;RESTORE R4
031702  000207                          RTS     PC              ;RETURN

031704  005237  032020          8$:     INC     AUTLST          ;CLEAR AUTO ASSIGN LIST FOR NEXT PASS AND
031710  001375                          BNE     8$              ;WAIT FOR TTY
031712  005237  001216                  INC     $DEVCT          ;INCREMENT DEVICE COUNT
031716  005237  001214                  INC     $PASS           ;;INCREMENT THE PASS NUMBER
031722  042737  100000  001214          BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
031730  005327                          DEC     (PC)+           ;;LOOP?
031732  000001          $EJPCT: .WORD   1
031734  003013                          BGT     $DOAGN          ;;YES
031736  012737                          MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
031740  000001          $ENDCT: .WORD   1
031742  031732                  $EOPCT
031744  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
031750  001405                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
031752  000005                          RESET                   ;;CLEAR THE WORLD
031754  004710          $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
031756  000240                          NOP                     ;;SAVE ROOM
031760  000240                          NOP                     ;;FOR
031762  000240                          NOP                     ;;ACT11
031764                  $DOAGN:
031764  000137                          JMP     @(PC)+          ;;RETURN
031766  031770          $RTNAD: .WORD   RTURN

2
3  031770  005037  177776       RTURN:  CLR     PS              ;SET PRIORITY TO 0
4  031774  012706  001100               MOV     #STACK,SP       ;RESTORE STACK
5  032000  005237  001212               INC     $TESTN          ;INCREMENT THE TEST NUMBER IN THE MAIL BOX
6  032004  004737  033430               JSR     PC,$TKINT       ;MAKE SURE KEYBOARD INTERRUPT AND
7  032010  004737  024514               JSR     PC,CKCLK        ;SYSTEM CLOCK ARE STILL ON.
8  032014  000137  006340               JMP     MAIN            ;RETURN TO LOOP
9
10 032020  000000       AUTLST: .WORD   0               ;AUTO ASSIGN LIST (USED IN AUTO RUN MODE)
11
12                      ;ROUTINE TO GET THE REMAINDER OF THE RANDOM NUMBER
13                      ;CALL:
14                      ;       MOV     NUMBER,R5       ;DIVISOR INTO R5
15                      ;       JSR     PC,GETREM
16                      ;       RETURN                  ;REMAINDER IS IN R5
17
18 032022  013746  037226       GETREM: MOV     $LONUM,-(SP)    ;STORE RANDOM NUMBER ON THE STACK FOR DIVIDE
19 032026  013746  037224               MOV     $HINUM,-(SP)    ;UPPER PART
20 032032  010546                       MOV     R5,-(SP)        ;PUT THE DIVISOR ONTO THE STACK
21 032034  004737  032046               JSR     PC,$DIV         ;DIVIDE THE RANDOM NUMBERS
22 032040  012605                       MOV     (SP)+,R5        ;PUT THE REMAINDER INTO R5
23 032042  005726                       TST     (SP)+           ;ADJUST THE STACK POINTER
24 032044  000207                       RTS     PC
25
26                      .SBTTL  INTEGER DIVIDE ROUTINE
27
28                      ;;**************************************************************************
29                      ;*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').

032046  104412                  $DIV:   SAVREG                  ;STORE R0 - R5
032050  016605  000026                  MOV     26(SP),R5       ;DIVISOR
032054  005004                          CLR     R4              ;OTHER DIVISOR WORD
032056  016602  000030                  MOV     30(SP),R2       ;UPPER DIVIDEND WORD
032062  016603  000032                  MOV     32(SP),R3       ;LOWER DIVIDEND WORD
032066  005000                          CLR     R0              ;CLEAR OTHER DIVIDEND REGISTERS
032070  005001                          CLR     R1
032072  004737  032170                  JSR     PC,M.DPID       ;GO TO THE DIVIDE ROUTINE
032076  010166  000030                  MOV     R1,30(SP)       ;REMAINDER ON THE STACK
032102  010366  000032                  MOV     R3,32(SP)       ;QUOTIENT ON THE STACK
032106  104413                          RESREG                  ;RESTORE R0 - R5
032110  012616                          MOV     (SP)+,(SP)      ;MOVE RETURN UP THE STACK
032112  000207                          RTS     PC

                                .SBTTL  DOUBLE DIVIDE ROUTINE

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

```
                                ;SAVREG                 ;STORE R0 - R5
                                ;MOV    26(SP),R4       ;HIGH DIVISOR WORD
                                ;MOV    30(SP),R5       ;LOW DIVISOR WORD
                                ;MOV    32(SP),R2       ;UPPER DIVIDEND WORD
                                ;MOV    34(SP),R3       ;LOWER DIVIDEND WORD
                                ;CLR    R0              ;CLEAR OTHER DIVIDEND REGISTERS
                                ;CLR    R1
                                ;JSR    PC,M.DPID       ;GO TO THE DIVIDE ROUTINE
                                ;MOV    R0,30(SP)       ;REMAINDER ON THE STACK (MSD)
                                ;MOV    R1,32(SP)       ;REMAINDER ON THE STACK (LSD)
                                ;MOV    R3,34(SP)       ;QUOTIENT ON THE STACK
                                ;RESREG                 ;RESTORE R0 - R5
                                ;MOV    (SP)+,(SP)      ;MOVE RETURN UP THE STACK
                                ;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)

M.DPID: MOV     #40,-(SP)       ;COUNTER FOR DIVISION CYCLES
        MOV     R4,-(SP)        ;HIGH ORDER
        MOV     R5,-(SP)        ;LOW ORDER DIVISOR TO THE STACK
        NEG     2(SP)           ;FORM NEGATIVE
        NEG     @SP             ;VERSION OF THE DIVISOR
        SBC     2(SP)
        ADD     @SP,R1
        ADC     R0              ;PERFORM THE INITIAL SUBTRACTION
        ADD     2(SP),R0
        BCS     M.DP50          ;IF CARRY THEN OVERFLOW HAS OCCURRED
        CLR     -(SP)           ;THIS IS A LONGER LASTING CARRY BIT
M.DP40: ROL     R3
        ROL     R2
        ROL     R1
        ROL     R0
        TST     @SP             ;TEST "CARRY" INDICATOR
        BEQ     M.DP41          ;IF NO "CARRY" THEN ADD ELSE SUBTRACT
        CLR     @SP             ;CLEAR UP FOR NEXT TIME
        ADD     2(SP),R1
        ADC     R0              ;ADD -(DIVISOR)
        ADC     @SP     ;  I    ;SET "CARRY"
        ADD     4(SP),R0;<-
        BR      M.DP42
M.DP41: ADD     R5,R1
        ADC     R0              ;ADD +(DIVISOR)
        ADC     @SP     ;  I    ;SET "CARRY"
        ADD     R4,R0   ;<-
M.DP42: ADC     @SP             ;SET "CARRY"
```

```
144 032274  005716                      TST     @SP             ;TEST THE UPDATE INDICATOR
145 032276  001401                      BEQ     .+4     ;->     ;IF ZERO FORGET IT
146 032300  005203                      INC     R3      ;  I    ;NO CARRY POSSIBLE HERE
147 032302  005366  000006              DEC     6(SP)   ;<-     ;DECREMENT COUNTER
148 032306  003347                      BGT     M.DP40          ;BRANCH IF MORE TO DO
149 032310  006003                      ROR     R3
150 032312  103404                      BCS     M.DP44
151 032314  060501                      ADD     R5,R1
152 032316  005500                      ADC     R0
153 032320  060400                      ADD     R4,R0
154 032322  000241                      CLC
155 032324  006103              M.DP44: ROL     R3
156 032326  062706  000010              ADD     #10,SP          ;ADJUST STACK BY 4 WORDS
157 032332  000242                      CLV
158 032334  000207                      RTS     PC
159 032336  062706  000006      M.DP50: ADD     #6,SP
160 032342  000262                      SEV
161 032344  000207                      RTS     PC
```

```
                                .SBTTL  SUPRS - TYPE ASCIZ, REPLACE LEADING 0'S WITH BLANKS
                                .SBTTL  SUPRSL -TYPE ASCIZ, LEFT JUSTIFY
                                ;;*****************************************************************
                                ;CALL:
                                ;       MOV     #NUMADR,-(SP)   ;FIRST ADDRESS OF ASCIZ STRING
                                ;       JSR     PC,SUPRS
                                ;  OR
                                ;       MOV     #NUMADR,-(SP)   ;FIRST ADDRESS OF ASCIZ STRING
                                ;       JSR     PC,SUPRSL
                                
032346  010046                  SUPRSL: MOV     R0,-(SP)        ;SAVE R0
032350  016600  000004                  MOV     4(SP),R0        ;GET POINTER TO MESSAGE
032354  005037  032436                  CLR     SUPR2
032360  000405                          BR      SUPR1
                                
032362  010046                  SUPRS:  MOV     R0,-(SP)        ;SAVE R0
032364  016600  000004                  MOV     4(SP),R0        ;GET POINTER TO MESSAGE
032370  010037  032436                  MOV     R0,SUPR2        ;GET POINTER FOR TYPING
032374                          SUPR1:
032374  105710                  1$:     TSTB    (R0)            ;TEST FOR TERMINATOR
032376  001406                          BEQ     2$              ;YES
032400  122710  000060                  CMPB    #'0,(R0)        ;IS THIS A "0" ?
032404  001006                          BNE     3$              ;NO
032406  112720  000040                  MOVB    #40,(R0)+       ;REPLACE IT WITH A "BLANK"
032412  000770                          BR      1$              ;NEXT CHAR.
032414  005300                  2$:     DEC     R0              ;BACKUP 1
032416  112710  000060                  MOVB    #'0,(R0)        ;MAKE IT "0"
032422  005737  032436          3$:     TST     SUPR2           ;LEFT JUSTIFY ?
032426  001002                          BNE     4$              ;NO
032430  010037  032436                  MOV     R0,SUPR2        ;YES
032434  104401                  4$:     TYPE
032436  000000                  SUPR2:  .WORD   0
032440  012600                          MOV     (SP)+,R0        ;RESTORE R0
032442  012616                          MOV     (SP)+,(SP)      ;RESTORE STACK
032444  000207                          RTS     PC
```

```
                                .SBTTL   - TYPE ASCIZ, REPLACE LEADING 0'S WITH BLANKS
                                .SBTTL  $SUPRL - TYPE ASCIZ, LEFT JUSTIFY
                                ;
                                ;;*****************************************************************
                                ;
                                ;THIS ROUTINE IS SAME AS 'SUPRSL' AND 'SUPRS', EXCEPT THAT IT
                                ;WILL SUPPRESS THE ERROR TYPEOUT IF SW13=1. THIS IS ACCOMPLISHED BY
                                ;USING THE TRAP CALL 'DISPLY', INSTEAD OF 'TYPE'.
                                ;CALL:
                                ;       MOV     #NUMADR,-(SP)   ;FIRST ADDRESS OF ASCIZ STRING
                                ;       JSR     PC,$SUPRS
                                ;  OR
                                ;       MOV     #NUMADR,-(SP)   ;FIRST ADDRESS OF ASCIZ STRING
                                ;       JSR     PC,$SUPRL
                                ;
032446  010046                  $SUPRL: MOV     R0,-(SP)        ;SAVE R0
032450  016600  000004                  MOV     4(SP),R0        ;GET POINTER TO MESSAGE
032454  005037  032536                  CLR     $SUPR2
032460  000405                          BR      $SUPR1
                                ;
032462  010046                  $SUPRS: MOV     R0,-(SP)        ;SAVE R0
032464  016600  000004                  MOV     4(SP),R0        ;GET POINTER TO MESSAGE
032470  010037  032536                  MOV     R0,$SUPR2       ;GET POINTER FOR TYPING
032474                          $SUPR1:
032474  105710                  1$:     TSTB    (R0)            ;TEST FOR TERMINATOR
032476  001406                          BEQ     2$              ;YES
032500  122710  000060                  CMPB    #'0,(R0)        ;IS THIS A "0" ?
032504  001006                          BNE     3$              ;NO
032506  112720  000040                  MOVB    #40,(R0)+       ;REPLACE IT WITH A "BLANK"
032512  000770                          BR      1$              ;NEXT CHAR.
032514  005300                  2$:     DEC     R0              ;BACKUP 1
032516  112710  000060                  MOVB    #'0,(R0)        ;MAKE IT "0"
032522  005737  032536          3$:     TST     $SUPR2          ;LEFT JUSTIFY ?
032526  001002                          BNE     4$              ;NO
032530  010037  032536                  MOV     R0,$SUPR2       ;YES
032534  104414                  4$:     DISPLY                  ;TYPE, UNLESS SW13=1
032536  000000                  $SUPR2: .WORD   0
032540  012600                          MOV     (SP)+,R0        ;RESTORE R0
032542  012616                          MOV     (SP)+,(SP)      ;RESTORE STACK
032544  000207                          RTS     PC
```

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

032546  005237  032654        FILLZ:  INC     FILLO           ;LEAVE ZERO'S

032552  010046                REPLZ:  MOV     R0,-(SP)        ;SAVE R0
032554  016600  000004                MOV     4(SP),R0        ;ADDRESS OF NUMBER TO R0
032560  005737  032654                TST     FILLO           ;LEAVE PRECEDING ZEROS ?
032564  001014                        BNE     3$              ;BR IF YES
032566  122710  000060        1$:     CMPB    #'0,(R0)        ;BYTE EQUAL TO ASCII '0' ?
032572  001004                        BNE     2$              ;BR IF NOT
032574  112710  000040                MOVB    #40,(R0)        ;REPLACE THE ZERO WITH A SPACE
032600  005200                        INC     R0              ;INCREMENT THE BYTE ADDRESS
032602  000771                        BR      1$              ;GO BACK AND LOOK FOR MORE LEADING ZEROS
032604  105710                2$:     TSTB    (R0)            ;SEE IF ZERO BYTE TERMINATOR
032606  001003                        BNE     3$              ;BR IF NOT
032610  005300                        DEC     R0              ;BACKUP STRING POINTER
032612  112710  000060                MOVB    #'0,(R0)        ;PUT A ZERO BACK IN
032616  016600  000004        3$:     MOV     4(SP),R0        ;PUT ADDRESS OF FIRST CHARACTER ON STACK
032622  105720                4$:     TSTB    (R0)+           ;SEE IF ZERO BYTE TERMINATOR
032624  001376                        BNE     4$              ;BR IF NOT
032626  005300                        DEC     R0              ;BACKUP STRING POINTER
032630  162500                        SUB     (R5)+,R0        ;ADJUST ADDRESS
032632  010037  032640                MOV     R0,5$           ;GET ADDRESS FOR TYPEOUT
032636  104401                        TYPE                    ;TYPE THE NUMBER
032640  000000                5$:     .WORD   0               ;ADDRESS OF NUMBER
032642  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
032644  012616                        MOV     (SP)+,(SP)      ;RESTORE STACK
032646  005037  032654                CLR     FILLO           ;RESET FILL FLAG
032652  000205                        RTS     R5              ;RETURN

032654  000000                FILLO:  .WORD   0               ;IF SET, LEAVE PRECEDING ZEROS FOR TYPE

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

032656  005237  032654        $FILLZ: INC     FILLO           ;LEAVE ZERO'S

032662  010046                $REPLZ: MOV     R0,-(SP)        ;SAVE R0
032664  016600  000004                MOV     4(SP),R0        ;ADDRESS OF NUMBER TO R0
032670  005737  032654                TST     FILLO           ;LEAVE PRECEDING ZEROS ?
```

```
     58 032674  001014                      BNE     3$              ;BR IF YES
     59 032676  122710  000060      1$:     CMPB    #'0,(R0)        ;BYTE EQUAL TO ASCII '0' ?
     60 032702  001004                      BNE     2$              ;BR IF NOT
     61 032704  112710  000040              MOVB    #40,(R0)        ;REPLACE THE ZERO WITH A SPACE
     62 032710  005200                      INC     R0              ;INCREMENT THE BYTE ADDRESS
     63 032712  000771                      BR      1$              ;GO BACK AND LOOK FOR MORE LEADING ZEROS
     64 032714  105710              2$:     TSTB    (R0)            ;SEE IF ZERO BYTE TERMINATOR
     65 032716  001003                      BNE     3$              ;BR IF NOT
     66 032720  005300                      DEC     R0              ;BACKUP STRING POINTER
     67 032722  112710  000060              MOVB    #'0,(R0)        ;PUT A ZERO BACK IN
     68 032726  016600  000004      3$:     MOV     4(SP),R0        ;PUT ADDRESS OF FIRST CHARACTER ON STACK
     69 032732  105720              4$:     TSTB    (R0)+           ;SEE IF ZERO BYTE TERMINATOR
     70 032734  001376                      BNE     4$              ;BR IF NOT
     71 032736  005300                      DEC     R0              ;BACKUP STRING POINTER
     72 032740  162500                      SUB     (R5)+,R0        ;ADJUST ADDRESS
     73 032742  010037  032750              MOV     R0,5$           ;GET ADDRESS FOR TYPEOUT
     74 032746  104414                      DISPLY                  ;TYPE, UNLESS SW13=1
     75 032750  000000              5$:     .WORD   0               ;ADDRESS OF NUMBER
     76 032752  012600                      MOV     (SP)+,R0        ;;POP STACK INTO R0
     77 032754  012616                      MOV     (SP)+,(SP)      ;RESTORE STACK
     78 032756  005037  032654              CLR     FILLO           ;RESET FILL FLAG
     79 032762  000205                      RTS     R5              ;RETURN
     80
     91                             ;ROUTINE TO TYPE THE DRIVE SERIAL NUMBER IN DECIMAL
     92                             ;CALL:
     93                             ;       MOV     #DPB,R0         ;ADDRESS OF DRIVE PARAMETER BLOCK
     94                             ;       JSR     PC,TYDRV        ;CALL ROUTINE
     95                             ;   OR
     96                             ;       MOV     #DPB,R0         ;ADDRESS OF DRIVE PARAMETER BLOCK
     97                             ;       JSR     PC,TYPDRV       ;CALL ROUTINE(WITH NO HEADER MESSAGE)
     98                             ;
     99                             ;R0 = DPB ADDRESS BEFORE CALLING THE ROUTINE
    100
    101 032764  104401  060152      TYDRV:  TYPE    ,DRVSN          ;TYPE 'DRV S/N: '
    102 032770  104401  057052      TYPDRV: TYPE    ,MSGPG          ;TYPE 'PG'
    103 032774  010037  033010              MOV     R0,1$           ;ADDRESS OF DPB
    104 033000  062737  000160  033010      ADD     #$DRVSN,1$      ;INDEX TO DRIVE SERIAL NUMBER
    105 033006  104401                      TYPE                    ;TYPE THE DRIVE SERIAL NUMBER
    106 033010  000000              1$:     .WORD   0               ;ADDRESS OF DRIVE SERIAL NUMBER FIELD
    107 033012  104401  057711              TYPE    ,PERIOD         ;TYPE '.'
    108 033016  000207                      RTS     PC              ;RETURN
    109
    110                             ;ROUTINE TO TYPE ERRORS
    111                             ;CALL
    112                             ;       DISPLY                  ;MUST DEFINED IN 'TRAP' TABLE
    113                             ;       MESADR                  ;ADDRESS OF MESSAGE
    114                             ;       RETURN
    115
    116 033020  032777  020000  146126 $DSPLY: BIT     #BIT13,@SWR     ;INHIBIT ERROR TYPEOUT ?
    117 033026  001004                      BNE     1$              ;BR IF YES
    118 033030  005037  177776              CLR     @#PS            ;SET PRIORITY TO ZERO
    119 033034  000137  035652              JMP     $TYPE           ;TYPE THE MESSAGE
    120 033040  062716  000002      1$:     ADD     #2,(SP)         ;INCREMENT THE RETURN
    121 033044  000002                      RTI                     ;RETURN
    122
    123                             ;THIS ROUTINE IS USED TO CHECK IF AN
    124                             ;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

033046  121127  000060        CK.OCT: CMPB    (R1),#'0        ;LESS THAN ZERO?
033052  103407                 BLO     1$              ;YES -- BRANCH
033054  121127  000067         CMPB    (R1),#'7        ;GREATER THAN SEVEN?
033060  101004                 BHI     1$              ;YES -- BRANCH
033062  111102                 MOVB    (R1),R2         ;GET THE CHARACTER
033064  042702  177770         BIC     #^C7,R2         ;STRIP AWAY THE ASCII
033070  005725                 TST     (R5)+           ;ADJUST FOR RETURN
033072  000205                 1$:     RTS     R5              ;RETURN

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

033074  121127  000060        CK.DEC: CMPB    (R1),#'0        ;LESS THAN ZERO?
033100  103407                 BLO     1$              ;YES -- BRANCH
033102  121127  000071         CMPB    (R1),#'9        ;GREATER THAN NINE?
033106  101004                 BHI     1$              ;YES -- BRANCH
033110  111102                 MOVB    (R1),R2         ;GET THE CHARACTER
033112  042702  000060         BIC     #'0,R2          ;STRIP AWAY THE ASCII
033116  005725                 TST     (R5)+           ;ADJUST FOR RETURN
033120  000205                 1$:     RTS     R5              ;RETURN

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

033122  105711                 CK.CHR: TSTB    (R1)            ;"CARRIAGE RETURN"?
033124  001417                 BEQ     3$              ;YES -- BRANCH
033126  121127  000054         CMPB    (R1),#',        ;"COMMA"?
033132  001413                 BEQ     2$              ;YES -- BRANCH
033134  121127  000056         CMPB    (R1),#'.        ;"PERIOD"?
033140  001407                 BEQ     1$              ;YES -- BRANCH
033142  004537  033074         JSR     R5,CK.DEC       ;"DIGIT"?
033146  000410                 BR      4$              ;NO -- BRANCH
033150  004537  033046         JSR     R5,CK.OCT       ;OCTAL ?
033154  005725                 TST     (R5)+           ;DIGIT BETWEEN 8-9
```

```
                                                TST     (R5)+           ;DIGIT BETWEEN 0-7
                                        1$:     TST     (R5)+           ;PERIOD
                                        2$:     TST     (R5)+           ;COMMA
                                        3$:     TST     (R5)+           ;CARRIAGE RETURN
                                                INC     R1              ;MOVE POINTER TO NEXT CHARACTER
                                        4$:     MOV     (R5),R5         ;UNKNOWN CHARACTER
                                                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

                                        CK.DIG: MOV     R4,-(SP)        ;SAVE R4
                                                MOV     R3,-(SP)        ;SAVE R3
                                                MOV     R2,-(SP)        ;SAVE THE MAX. SIZE ON THE STACK
                                                CLR     R2              ;START WITH 0
                                                CLR     R3
                                                CLR     R4
                                                JSR     R5,CK.CHR       ;CHECK ONE CHARACTER
                                                6$                      ;ILLEGAL CHARACTER
                                                9$                      ;CARRIAGE RETURN
                                                6$                      ;" "
                                                7$                      ;"."
                                                1$                      ;DIGIT 0-7
                                                1$                      ;DIGIT 8-9
                                        1$:     ADD     #4,R5           ;STEP RETURN POINTER PAST "CR" & "PERIOD" RETURNS
                                        2$:     ASL     R3              ;INPUT NUMBER *2
                                                MOV     R3,-(SP)        ;SAVE *2
                                                ASL     R3              ;*4
                                                ASL     R3              ;*8
                                                ADD     (SP)+,R3        ;(*2)+(*8) = *10
                                                ADD     R2,R3           ;UPDATE THE INPUT NUMBER
                                                JSR     R5,CK.CHR       ;CHECK ONE CHARACTER
                                                8$                      ;ILLEGAL CHARACTER
                                                5$                      ;CARRIAGE RETURN
                                                4$                      ;" "
                                                3$                      ;"."
                                                2$                      ;DIGIT 0-7
                                                2$                      ;DIGIT 8-9
                                        3$:     TSTB    (R1)            ;DOES A "CR" FOLLOW THE "PERIOD"
                                                BNE     8$              ;BR IF NOT
                                                TST     (R4)+           ;INCREMENT THE RETURN
                                        4$:     TST     (R4)+           ;INCREMENT THE RETURN
                                        5$:     TST     (R4)+           ;INCREMENT THE RETURN
                                                CMP     R3,(SP)         ;CHECK THE MAGNITUDE OF THE NUMBER
                                                BHI     9$              ;BR IF ENTERED NUMBER TOO LARGE
                                                BR      8$              ;BYPASS INCREMENT
                                        6$:     TST     (R5)+           ;INCREMENT RETURN PAST INVALID RETURN
```

```
                                7$:     TST     (R5)+           ;INCREMENT RETURN
                                8$:     ADD     R4,R5           ;SETUP RETURN POINTER
                                9$:     MOV     R3,R2           ;ENTERED VALUE
                                        TST     (SP)+           ;CLEAN MAX. SIZE OFF OF STACK
                                        MOV     (SP)+,R3        ;RESTORE R3
                                        MOV     (SP)+,R4        ;RESTORE R4
                                        MOV     (R5),R5         ;GET RETURN ADDRESS
                                        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

033332  016637  000002  033356  $SB2D:  MOV     2(SP),1$        ;SAVE THE BINARY NUMBER
033340  012746  033356          MOV     #1$,-(SP)       ;SET THE POINTER
033344  004737  037324          JSR     PC,$DB2D        ;CALL THE DOUBLE LENGTH CONVERT
033350  012666  000002          MOV     (SP)+,2(SP)     ;PICKUP THE POINTER
033354  000207                  RTS     PC              ;RETURN
033356  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

033362  016637  000002  033406  $SB2O:  MOV     2(SP),1$        ;SAVE THE BINARY NUMBER
033370  012746  033406          MOV     #1$,-(SP)       ;SET THE POINTER
033374  004737  037520          JSR     PC,$DB2O        ;CALL THE DOUBLE LENGTH CONVERT
033400  012666  000002          MOV     (SP)+,2(SP)     ;PICKUP THE POINTER
033404  000207                  RTS     PC              ;RETURN
033406  000000  000000          1$:     .WORD   0,0
```

```
     1                                  .SBTTL  TTY INPUT ROUTINE

                                        ;;*************************************************************************
                                        .ENABL  LSB
033412  000000                          $TKCNT: .WORD   0               ;;NUMBER OF ITEMS IN QUEUE
033414  000000                          $TKQIN: .WORD   0               ;;INPUT POINTER
033416  000000                          $TKQOUT: .WORD  0               ;;OUTPUT POINTER
033420                                  $TKQSRT: .BLKB  7               ;;TTY KEYBOARD QUEUE
        033427                          $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
                                        ;
033430  005037  033412                  $TKINT: CLR     $TKCNT          ;;CLEAR COUNT OF ITEMS IN QUEUE
033434  012737  033420  033414                  MOV     #$TKQSRT,$TKQIN ;;MOVE THE STARTING ADDRESS OF THE
033442  013737  033414  033416                  MOV     $TKQIN,$TKQOUT  ;;QUEUE INTO THE INPUT & OUTPUT POINTERS.
033450  012737  033500  000060                  MOV     #$TKSRV,@#TKVEC ;;INITIALIZE THE KEYBOARD VECTOR
033456  012737  000200  000062                  MOV     #200,@#TKVEC+2  ;;"BR" LEVEL 4
033464  005777  145472                          TST     @$TKB           ;;CLEAR DONE FLAG
033470  012777  000100  145462                  MOV     #100,@$TKS      ;;ENABLE TTY KEYBOARD INTERRUPT
033476  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)
                                        ;
033500  117746  145456                  $TKSRV: MOVB    @$TKB,-(SP)     ;;PICKUP THE CHARACTER
033504  042716  177600                          BIC     #^C177,(SP)     ;;STRIP THE JUNK
033510  021627  000021                          CMP     (SP),#$XON      ;;IS IT A RANDOM XON?
033514  001002                                  BNE     30$             ;;BRANCH IF NO
033516  005726                                  TST     (SP)+           ;;CLEAN RANDOM XON OFF STACK
033520  000002                                  RTI                     ;;RETURN
033522                                  30$:
033522  021627  000003                          CMP     (SP),#3         ;;IS IT A CONTROL C?
033526  001007                                  BNE     1$              ;;BRANCH IF NO
033530  104401  034635                          TYPE    ,$CNTLC         ;;TYPE A CONTROL-C (^C)
033534  004737  033430                          JSR     PC,$TKINT       ;;INIT THE KEYBOARD
033540  005726                                  TST     (SP)+           ;;CLEAN UP STACK
033542  000137  034676                          JMP     CTRAP           ;;CONTROL C RESTART
033546  021627  000007                  1$:     CMP     (SP),#7         ;;IS IT A CONTROL G?
033552  001004                                  BNE     2$              ;;BRANCH IF NO
033554  022737  000176  001154                  CMP     #SWREG,SWR      ;;IS SOFT-SWR SELECTED?
033562  001500                                  BEQ     6$              ;;GO TO SWR CHANGE

033564                                  2$:
033564  022737  000007  033412                  CMP     #7,$TKCNT       ;;IS THE QUEUE FULL?
033572  001004                                  BNE     3$              ;;BRANCH IF NO
033574  104401  001176                          TYPE    ,$BELL          ;;RING THE TTY BELL
```

```
033600  005726                          TST     (SP)+           ;;CLEAN CHARACTER OFF OF STACK
033602  000451                          BR      5$              ;;EXIT
033604  021627  000023          3$:     CMP     (SP),#23        ;;IS IT A CONTROL-S?
033610  001021                          BNE     32$             ;;BRANCH IF NO
033612  005077  145342                  CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
033616  005726                          TST     (SP)+           ;;CLEAN CHAR OFF STACK
033620  105777  145334          31$:    TSTB    @$TKS           ;;WAIT FOR A CHAR
033624  100375                          BPL     31$             ;;LOOP UNTIL ITS THERE
033626  117746  145330                  MOVB    @$TKB,-(SP)     ;;GET THE CHARACTER
033632  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
033636  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
033642  001366                          BNE     31$             ;;BRANCH IF NO
033644  012777  000100  145306          MOV     #100,@$TKS      ;;REENABLE TTY KEYBOARD INTERRUPTS
033652  000002                          RTI                     ;;RETURN
033654  005237  033412          32$:    INC     $TKCNT          ;;COUNT THIS CHARACTER
033660  021627  000140                  CMP     (SP),#140       ;;IS IT UPPER CASE?
033664  002405                          BLT     4$              ;;BRANCH IF YES
033666  021627  000175                  CMP     (SP),#175       ;;IS IT A SPECIAL CHAR?
033672  003002                          BGT     4$              ;;BRANCH IF YES
033674  042716  000040                  BIC     #40,(SP)        ;;MAKE IT UPPER CASE
033700  112677  177510          4$:     MOVB    (SP)+,@$TKQIN   ;;AND PUT IT IN QUEUE
033704  005237  033414                  INC     $TKQIN          ;;UPDATE THE POINTER
033710  023727  033414  033427          CMP     $TKQIN,#$TKQEND ;;GO OFF THE END?
033716  001003                          BNE     5$              ;;BRANCH IF NO
033720  012737  033420  033414          MOV     #$TKQSRT,$TKQIN ;;RESET THE POINTER
033726  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.
033730  022737  000176  001154  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED
033736  001124                          BNE     15$             ;;EXIT IF NOT
033740  105777  145214                  TSTB    @$TKS           ;;IS A CHAR WAITING?
033744  100121                          BPL     15$             ;;IF NOT, EXIT
033746  117746  145210                  MOVB    @$TKB,-(SP)     ;;YES
033752  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT  7-BIT ASCII
033756  021627  000007                  CMP     (SP),#7         ;;IS IT A CONTROL-G?
033762  001300                          BNE     2$              ;;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.
033764  123727  001150  000001  6$:     CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
033772  001674                          BEQ     2$              ;;BRANCH IF YES
033774  005726                          TST     (SP)+           ;;CLEAR CONTROL-G OFF STACK
033776  004737  033430                  JSR     PC,$TKINT       ;;FLUSH THE TTY INPUT QUEUE
034002  005077  145152                  CLR     @$TKS           ;;DISABLE TTY KEYBOARD INTERRUPTS
034006  112737  000001  001151          MOVB    #1,$INTAG       ;;SET INTERRUPT MODE INDICATOR

034014  104401  034647                  TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
034020  104401  034654  $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
034024  013746  000176                  MOV     SWREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
034030  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
```

```
034032  104401  034665                  TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
034036  005046                  19$:    CLR     -(SP)           ;;CLEAR COUNTER
034040  005046                          CLR     -(SP)           ;;THE NEW SWR
034042  105777  145112          7$:     TSTB    @$TKS           ;;CHAR THERE?
034046  100375                          BPL     7$              ;;IF NOT TRY AGAIN

034050  117746  145106                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
034054  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII

034060  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL-C?
034064  001015                          BNE     9$              ;;BRANCH IF NOT
034066  104401  034635                  TYPE    ,$CNTLC         ;;YES, ECHO CONTROL-C (^C)
034072  062706  000006                  ADD     #6,SP           ;;CLEAN UP STACK
034076  123727  001151  000001          CMPB    $INTAG,#1       ;;REENABLE TTY KEYBOARD INTERRUPTS?
034104  001003                          BNE     8$              ;;BRANCH IF NO
034106  012777  000100  145044          MOV     #100,@$TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
034114  000137  034676          8$:     JMP     CTRAP           ;;CONTROL-C RESTART


034120  021627  000025          9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
034124  001005                          BNE     10$             ;;BRANCH IF NOT
034126  104401  034642                  TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
034132  062706  000006          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
034136  000737                          BR      19$             ;;LET'S TRY IT AGAIN

034140  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
034144  001022                          BNE     16$             ;;BRANCH IF NO
034146  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
034152  001403                          BEQ     11$             ;;BRANCH IF YES
034154  016677  000002  144772          MOV     2(SP),@SWR      ;;SAVE NEW SWR
034162  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
034166  104401  001203          14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
034172  123727  001151  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
034200  001003                          BNE     15$             ;;BRANCH IF NOT
034202  012777  000100  144750          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
034210  000002          15$:    RTI                             ;;RETURN
034212  004737  036064          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
034216  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
034222  002420                          BLT     18$             ;;BRANCH IF YES
034224  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
034230  003015                          BGT     18$             ;;BRANCH IF YES
034232  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
034236  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
034242  001403                          BEQ     17$             ;;BRANCH IF YES
034244  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
034246  006316                          ASL     (SP)            ;;    CHAR OVER TO MAKE
034250  006316                          ASL     (SP)            ;;    ROOM FOR NEW ONE.
034252  005266  000002          17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
034256  056616  177776                  BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
034262  000667                          BR      7$              ;;GET THE NEXT ONE
034264  104401  001202          18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
034270  000720                          BR      20$             ;;SIMULATE CONTROL-U
                                .DSABL  LSB

                                ;;**************************************************************
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```
                                ;*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
                                ;
034272  011646                  $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC AND
034274  016666  000004  000002          MOV     4(SP),2(SP)     ;;THE PS
034302  005066  000004                  CLR     4(SP)           ;;GET READY FOR A CHARACTER
034306  005046                          CLR     -(SP)           ;;PUT NEW PS ON STACK
034310  012746  034316                  MOV     #64$,-(SP)      ;;PUT NEW PC ON  STACK
034314  000002                          RTI                     ;;POP NEW PC AND PS
034316                          64$:
034316  005737  033412          1$:     TST     $TKCNT          ;;WAIT ON A CHARACTER
034322  001775                          BEQ     1$
034324  005337  033412                  DEC     $TKCNT          ;;DECREMENT THE COUNTER
034330  117766  177062  000004          MOVB    @$TKQOUT,4(SP)  ;;GET ONE CHARACTER
034336  005237  033416                  INC     $TKQOUT         ;;UPDATE THE POINTER
034342  023727  033416  033427          CMP     $TKQOUT,#$TKQEND ;;DID IT GO OFF OF THE END?
034350  001003                          BNE     2$              ;;BRANCH IF NO
034352  012737  033420  033416          MOV     #$TKQSRT,$TKQOUT ;;RESET THE POINTER
034360  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
034362  010346                  $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
034364  005046                          CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
034366  012703  034616          1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
034372  022703  034635          2$:     CMP     #$TTYIN+15.,R3  ;;BUFFER FULL?
034376  101456                          BLOS    4$              ;;BR IF YES
034400  104410                          RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
034402  112613                          MOVB    (SP)+,(R3)      ;;GET CHARACTER
034404  122713  000177          10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
034410  001022                          BNE     5$              ;;BR IF NO
034412  005716                          TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
034414  001007                          BNE     6$              ;;BR IF NO
034416  112737  000134  034614          MOVB    #'\,9$          ;;TYPE A BACK SLASH
034424  104401  034614                  TYPE    ,9$
034430  012716  177777                  MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
034434  005303                  6$:     DEC     R3              ;;BACKUP BY ONE
034436  020327  034616                  CMP     R3,#$TTYIN      ;;STACK EMPTY?
034442  103434                          BLO     4$              ;;BR IF YES
034444  111337  034614                  MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
034450  104401  034614                  TYPE    ,9$             ;;GO TYPE
034454  000746                          BR      2$              ;;GO READ ANOTHER CHAR.
034456  005716                  5$:     TST     (SP)            ;;RUBOUT KEY SET?
034460  001406                          BEQ     7$              ;;BR IF NO
034462  112737  000134  034614          MOVB    #'\,9$          ;;TYPE A BACK SLASH
034470  104401  034614                  TYPE    ,9$
034474  005016                          CLR     (SP)            ;;CLEAR THE RUBOUT KEY
034476  122713  000025          7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
034502  001003                          BNE     8$              ;;BR IF NO
```

```
034504  104401  034642                  TYPE    ,$CNTLU         ;;TYPE A CONTROL ''U''
034510  000726                          BR      1$              ;;GO START OVER
034512  122713  000022          8$:     CMPB    #22,(R3)        ;;IS CHARACTER A ''^R''?
034516  001011                          BNE     3$              ;;BRANCH IF NO
034520  105013                          CLRB    (R3)            ;;CLEAR THE CHARACTER
034522  104401  001203                  TYPE    ,$CRLF          ;;TYPE A ''CR'' & ''LF''
034526  104401  034616                  TYPE    ,$TTYIN         ;;TYPE THE INPUT STRING
034532  000717                          BR      2$              ;;GO PICKUP ANOTHER CHACTER
034534  104401  001202          4$:     TYPE    ,$QUES          ;;TYPE A '?'
034540  000712                          BR      1$              ;;CLEAR THE BUFFER AND LOOP
034542  111337  034614          3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
034546  104401  034614                  TYPE    ,9$
034552  122723  000015                  CMPB    #15,(R3)+       ;;CHECK FOR RETURN
034556  001305                          BNE     2$              ;;LOOP IF NOT RETURN
034560  105063  177777                  CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
034564  104401  001204                  TYPE    ,$LF            ;;TYPE A LINE FEED
034570  005726                          TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
034572  012603                          MOV     (SP)+,R3        ;;RESTORE R3
034574  011646                          MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
034576  016666  000004  000002          MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
034604  012766  034616  000004          MOV     #$TTYIN,4(SP)
034612  000002                          RTI                     ;;RETURN
034614     000          9$:     .BYTE   0                       ;;STORAGE FOR ASCII CHAR. TO TYPE
034615     000                  .BYTE   0                       ;;TERMINATOR
034616                  $TTYIN: .BLKB   15.                     ;;RESERVE 15. BYTES FOR TTY INPUT
034635     136     103     015  $CNTLC: .ASCIZ  /^C/<15><12>    ;;CONTROL ''C''
034642     136     125     015  $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL ''U''
034647     136     107     015  $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL ''G''
034654     015     012     123  $MSWR:  .ASCIZ  <15><12>/SWR = /
034665     040     040     116  $MNEW:  .ASCIZ  /  NEW = /
2
3                               ;THIS ROUTINE WILL PROCESS THE (^C) CHARACTER
4
5 034676  012737  000001  001334  CTRAP:  MOV     #1,CFLAG        ;SET THE 'CONTROL C' FLAG
6 034704  005237  033412                  INC     $TKCNT          ;COUNT THIS CHARACTER
7 034710  112777  000015  176476          MOVB    #15,@$TKQIN     ;PUT 'RETURN' CHARACTER IN QUEUE
8 034716  005237  033414                  INC     $TKQIN          ;UPDATE THE POINTER
9 034722  023727  033414  033427          CMP     $TKQIN,#$TKQEND ;GO OFF THE END ?
10 034730 001003                          BNE     1$              ;BR IF YES
11 034732 012737  033420  033414          MOV     #$TKQSRT,$TKQIN ;RESET THE POINTER
12 034740 000002                  1$:     RTI                     ;RETURN
```

```
1                                       .SBTTL  ERROR HANDLER ROUTINE

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

034742  105037  035330          $ERROR: CLRB    IBSAVE          ;;CLEAR THE ITEM BYTE SAVE LOCATION
034746  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
034750  010337  001316                  MOV     R3,ATTN         ;SAVE THE ATTENTION REGISTER CONTENTS
034754  010137  001320                  MOV     R1,DRVNO        ;DRIVE NUMBER
034760  032777  020000  144166          BIT     #SW13,@SWR      ;INHIBIT PRINTOUTS ?
034766  001004                          BNE     .+12            ;BR IF YES
034770  104401  001203                  TYPE    ,$CRLF          ;CR-LF
034774  104401  001203                  TYPE    ,$CRLF          ;CR-LF
035000  004737  026146                  JSR     PC,$TIME        ;TYPE ELAPSED TIME
035004  105237  001117          7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
035010  001775                          BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
035012  013777  001116  144136          MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
035020  032777  002000  144126          BIT     #BIT10,@SWR     ;;BELL ON ERROR?
035026  001402                          BEQ     1$              ;;NO - SKIP
035030  104401  001176                  TYPE    ,$BELL          ;;RING BELL
035034  005237  001126          1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
035040  011637  001132                  MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
035044  162737  000002  001132          SUB     #2,$ERRPC
035052  117737  144054  001130          MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
035060  032777  001000  144066          BIT     #BIT09,@SWR     ;;SEE IF LOOP ON ERROR IS SET
035066  001060                          BNE     1004$           ;;BRANCH AROUND ROUTINE IF SO
035070  122737  000177  001130          CMPB    #177,$ITEMB     ;;SEE IF THIS IS THE POWER FAIL CALL
035076  001454                          BEQ     1004$           ;;BRANCH AROUND ROUTINE IF IT IS
035100  105737  035330                  TSTB    IBSAVE          ;;SEE IF THIS IS THE 2ND ERROR CALL IN THIS ROUTINE
035104  001047                          BNE     1003$           ;;BRANCH IF SO
035106  022737  177777  035326          CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
035114  001445                          BEQ     1004$           ;;BRANCH IF SO
035116  013746  000004                  MOV     ERRVEC,-(SP)    ;;SAVE CONTENTS OF ERROR VECTOR
035122  012737  035140  000004          MOV     #1000$,ERRVEC   ;;SETUP 'TRAP' RETURN ADDRESS
035130  013737  177766  035326          MOV     177766,CPSAVE   ;;MOVE CPU ERROR REGISTER TO CPSAVE FOR TEST
035136  000406                          BR      1001$
035140  012737  177777  035326  1000$:  MOV     #-1,CPSAVE      ;;SET CPU ERROR REGISTER TIMEOUT INDICATOR
035146  012716  035154                  MOV     #1001$,(SP)     ;;SETUP RETURN ADDRESS
035152  000002                          RTI
035154  012637  000004          1001$:  MOV     (SP)+,ERRVEC    ;;RESTORE CONTENTS OF ERROR VECTOR

035160  022737  177777  035326  1002$:  CMP     #-1,CPSAVE      ;;SEE IF CPSAVE HAS CPU ERR REG TIMEOUT INDICATION
035166  001420                          BEQ     1004$           ;;BRANCH IF SO
035170  032737  000001  035326          BIT     #BIT00,CPSAVE   ;;SEE IF POWER MONITOR BIT IS SET IN CPU ERR REG
035176  001414                          BEQ     1004$           ;;BRANCH IF OK
035200  042737  000001  177766          BIC     #BIT00,177766   ;;CLEAR THE BIT FOUND SET
035206  113737  001130  035330          MOVB    $ITEMB,IBSAVE   ;;MAKE IBSAVE NON-ZERO FOR DUAL ERROR CALL
035214  112737  000177  001130          MOVB    #177,$ITEMB     ;;SET $ITEMB TO SPECIAL POWER FAIL POINTER
035222  000402                          BR      1004$           ;;BRANCH OVER IBSAVE CLEARING
```

```
035224  105037  035330          1003$:  CLRB    IBSAVE          ;;CLEAR IBSAVE SO 2ND TIME THROUGH EXITS
035230                          1004$:
035230  032777  020000  143716          BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
035236  001004                          BNE     20$             ;;SKIP TYPEOUTS
035240  004737  035332                  JSR     PC,$ERRTYP      ;;GO TO USER ERROR ROUTINE
035244  104401  001203                  TYPE    ,$CRLF
035250                          20$:
035250  122737  000001  001226          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
035256  001007                          BNE     2$              ;;NO,SKIP APT ERROR REPORT
035260  113737  001130  035272          MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
035266  004737  036676                  JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
035272     000                  21$:    .BYTE   0
035273     000                          .BYTE   0
035274  000777                  22$:    BR      22$             ;;APT ERROR LOOP
035276  105737  035330          2$:     TSTB    IBSAVE          ;;SEE IF IBSAVE IS LOADED
035302  001005                          BNE     3$              ;;BRANCH IF NOT - NO HALT ON PWR MON BIT ERROR
035304  005777  143644                  TST     @SWR            ;;HALT ON ERROR
035310  100002                          BPL     3$              ;;SKIP IF CONTINUE
035312  000000                          HALT                    ;;HALT ON ERROR!
035314  104407                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
035316                          3$:
035316  105737  035330                  TSTB    IBSAVE          ;;SEE IF ITEM BYTE SAVE LOCATION HAS AN ERROR CALL
035322  001230                          BNE     7$              ;;BRANCH BACK TO CALL ORIGINAL ERROR
035324  000002                          RTI                     ;;RETURN
035326  000000          CPSAVE: .WORD   0               ;;LOCATION TO SAVE CPU ERROR REG CONTENTS
035330  000000          IBSAVE: .WORD   0               ;;LOCATION TO SAVE ITEM BYTE
```

```
                                .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

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

035332                          $ERRTYP:
035332  104401  001203                  TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
035336  010046                          MOV     R0,-(SP)        ;;SAVE R0
035340  005000                          CLR     R0              ;;PICKUP THE ITEM INDEX
035342  153700  001130                  BISB    @#$ITEMB,R0
035346  001004                          BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                                ;;TYPE THE PC OF THE ERROR
035350  013746  001132                  MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
                                                                ;;ERROR ADDRESS
035354  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
035356  000437                          BR      6$              ;;GET OUT
035360  122700  000177          1$:     CMPB    #177,R0         ;;SEE IF THIS ERROR CALL IS SPECIAL POWER FAIL CALL
035364  001006                          BNE     1000$           ;;BRANCH IF NOT
035366  013737  001212  035650          MOV     $TESTN,PFTSTN   ;;GET TEST NUMBER
035374  012700  035510                  MOV     #PFECH,R0       ;;MOVE POWER FAIL ERROR CALL TABLE TO R0
035400  000406                          BR      1001$           ;;BRANCH TO CALL ERROR
035402  005300                  1000$:  DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
035404  006300                          ASL     R0              ;;      WORK FOR THE ERROR TABLE
035406  006300                          ASL     R0
035410  006300                          ASL     R0
035412  062700  003360                  ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
035416  012037  035426          1001$:  MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
035422  001404                          BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
035424  104401                          TYPE                    ;;TYPE THE "ERROR MESSAGE"
035426  000000                  2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
035430  104401  001203                  TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
035434  012037  035444          3$:     MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
035440  001404                          BEQ     5$              ;;SKIP TYPEOUT IF 0
035442  104401                          TYPE                    ;;TYPE THE "DATA HEADER"
035444  000000                  4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
035446  104401  001203                  TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
035452  011000                  5$:     MOV     (R0),R0         ;;PICKUP "DATA TABLE" POINTER
035454  001004                          BNE     7$              ;;GO TYPE THE DATA
035456  012600                  6$:     MOV     (SP)+,R0        ;;RESTORE R0
035460  104401  001203                  TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
035464  000207                          RTS     PC              ;;RETURN
035466                          7$:
035466  013046                          MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
035470  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
035472  005710                          TST     (R0)            ;;IS THERE ANOTHER NUMBER?
035474  001770                          BEQ     6$              ;;BR IF NO
035476  104401  035504                  TYPE    ,8$             ;;TYPE TWO(2) SPACES
035502  000771                          BR      7$              ;;LOOP
035504     040     040     000  8$:     .ASCIZ  /  /            ;;TWO(2) SPACES
                                        .EVEN
035510  035520  035602  035634  PFECH:  PFECH1,PFECH2,PFECH3,PFECH4 ;;WORDS DEFINING TABLES BELOW
035520     120     117     127  PFECH1: .ASCIZ  ?POWER MONITOR BIT IN CPU ERROR REGISTER FOUND SET?
035602     124     105     123  PFECH2: .ASCIZ  ?TESTNO  ERR PC  CPUERREG?
                                        .EVEN
035634  035650  001132  035326  PFECH3: .WORD   PFTSTN,$ERRPC,CPSAVE,0
```

```
035644      000     000     000  PFECH4: .BYTE   0,0,0,0
035650  000000                   PFTSTN: .WORD   0          ;;CONTAINS TEST NUMBER FOR PF BIT ERROR
```

```
                                .SBTTL  TYPE ROUTINE

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

035652  105737  001173          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
035656  100002                  BPL     1$              ;;BR IF YES
035660  000000                  HALT                    ;;HALT HERE IF NO TERMINAL
035662  000430                  BR      3$              ;;LEAVE
035664  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
035666  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
035672  122737  000001  001226          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
035700  001011                  BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
035702  132737  000100  001227          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
035710  001405                  BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
035712  010037  035722                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
035716  004737  036666                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
035722  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
035724  132737  000040  001227  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
035732  001003                  BNE     60$             ;;YES,SKIP TYPE OUT
035734  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
035736  001005                  BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
035740  005726                  TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
035742  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
035744  062716  000002                  3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
035750  000002                  RTI                     ;;RETURN
035752  122716  000011                  4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
035756  001430                  BEQ     8$
035760  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
035764  001006                  BNE     5$
035766  005726                  TST     (SP)+           ;;POP  <CR><LF> EQUIV
035770  104401                  TYPE                    ;;TYPE A CR AND LF
035772  001203                  $CRLF
035774  105037  036202                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
036000  000755                  BR      2$              ;;GET NEXT CHARACTER
036002  004737  036064          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
036006  123726  001172          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
036012  001350                  BNE     2$              ;;IF NO GO GET NEXT CHAR.
036014  013746  001170                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                        ;;AND THE NULL CHAR.
036020  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
036024  002770                  BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
036026  004737  036064                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
036032  105337  036202                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
036036  000770                  BR      7$              ;;LOOP
```

```
                                        ;HORIZONTAL TAB PROCESSOR

036040  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
036044  004737  036064          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
036050  132737  000007  036202          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
036056  001372                          BNE     9$              ;;TAB STOP
036060  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
036062  000724                          BR      2$              ;;GET NEXT CHARACTER
036064                          $TYPEC:
036064  105777  143070                  TSTB    @$TKS           ;;CHAR IN KYBD BUFFER?
036070  100022                          BPL     10$             ;;BR IF NOT
036072  017746  143064                  MOV     @$TKB,-(SP)     ;;GET CHAR
036076  042716  177600                  BIC     #177600,(SP)    ;;STRIP EXTRANEOUS BITS
036102  122716  000023                  CMPB    #$XOFF,(SP)     ;;WAS CHAR XOFF
036106  001012                          BNE     102$            ;;BR IF NOT
036110                          101$:
036110  105777  143044                  TSTB    @$TKS           ;;WAIT FOR CHAR
036114  100375                          BPL     101$
036116  117716  143040                  MOVB    @$TKB,(SP)      ;;GET CHAR
036122  042716  177600                  BIC     #177600,(SP)    ;;STRIP IT
036126  122716  000021                  CMPB    #$XON,(SP)      ;;WAS IT XON?
036132  001366                          BNE     101$            ;;BR IF NOT
036134                          102$:
036134  005726                          TST     (SP)+           ;;FIX STACK
036136                          10$:
036136  105777  143022                  TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
036142  100375                          BPL     10$
036144  116677  000002  143014          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
036152  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
036160  001003                          BNE     1$              ;;BRANCH IF NO
036162  105037  036202                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
036166  000406                          BR      $TYPEX          ;;EXIT
036170  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
036176  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
036200  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
036202  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
036204  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

036206  017646  000000        $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
036212  116637  000001  036431        MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
036220  112637  036433                MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
036224  062716  000002                ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
036230  000406                        BR      $TYPON
036232  112737  000001  036431 $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
036240  112737  000006  036433        MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
036246  112737  000005  036430 $TYPON: MOV3    #5,$OCNT        ;;SET THE ITERATION COUNT
036254  010346                        MOV     R3,-(SP)        ;;SAVE R3
036256  010446                        MOV     R4,-(SP)        ;;SAVE R4
036260  010546                        MOV     R5,-(SP)        ;;SAVE R5
036262  113704  036433                MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
036266  005404                        NEG     R4
036270  062704  000006                ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
036274  110437  036432                MOVB    R4,$OMODE       ;;SAVE IT FOR USE
036300  113704  036431                MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
036304  016605  000012                MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
036310  005003                        CLR     R3              ;;CLEAR THE OUTPUT WORD
036312  006105                1$:     ROL     R5              ;;ROTATE MSB INTO "C"
036314  000404                        BR      3$              ;;GO DO MSB
036316  006105                2$:     ROL     R5              ;;FORM THIS DIGIT
036320  006105                        ROL     R5
036322  006105                        ROL     R5
036324  010503                        MOV     R5,R3
036326  006103                3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
036330  105337  036432                DECB    $OMODE          ;;TYPE THIS DIGIT?
036334  100016                        BPL     7$              ;;BR IF NO
036336  042703  177770                BIC     #177770,R3      ;;GET RID OF JUNK
036342  001002                        BNE     4$              ;;TEST FOR 0
036344  005704                        TST     R4              ;;SUPPRESS THIS 0?
036346  001403                        BEQ     5$              ;;BR IF YES
036350  005204                4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
```

```
036352  052703  000060            BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
036356  052703  000040      5$:   BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
036362  110337  036426            MOVB    R3,8$           ;;SAVE FOR TYPING
036366  104401  036426            TYPE    ,8$             ;;GO TYPE THIS DIGIT
036372  105337  036430      7$:   DECB    $OCNT           ;;COUNT BY 1
036376  003347                    BGT     2$              ;;BR IF MORE TO DO
036400  002402                    BLT     6$              ;;BR IF DONE
036402  005204                    INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
036404  000744                    BR      2$              ;;GO DO THE LAST DIGIT
036406  012605      6$:           MOV     (SP)+,R5        ;;RESTORE R5
036410  012604                    MOV     (SP)+,R4        ;;RESTORE R4
036412  012603                    MOV     (SP)+,R3        ;;RESTORE R3
036414  016666  000002  000004    MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
036422  012616                    MOV     (SP)+,(SP)
036424  000002                    RTI                     ;;RETURN
036426     000      8$:           .BYTE   0               ;;STORAGE FOR ASCII DIGIT
036427     000                    .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
036430     000      $OCNT:        .BYTE   0               ;;OCTAL DIGIT COUNTER
036431     000      $OFILL:       .BYTE   0               ;;ZERO FILL SWITCH
036432  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

036434                          $TYPDS:
036434  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
036436  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
036440  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
036442  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
036444  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
036446  012746  020200                 MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
036452  016605  000020                 MOV     20(SP),R5       ;;GET THE INPUT NUMBER
036456  100004                         BPL     1$              ;;BR IF INPUT IS POS.
036460  005405                         NEG     R5              ;;MAKE THE BINARY NUMBER POS.
036462  112766  000055  000001         MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
036470  005000                 1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
036472  012703  036650                 MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
036476  112723  000040                 MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
036502  005002                 2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
036504  016001  036640                 MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
036510  160105                 3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
036512  002402                         BLT     4$              ;;BR IF DONE
036514  005202                         INC     R2              ;;INCREASE THE BCD DIGIT BY 1
036516  000774                         BR      3$
036520  060105                 4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
036522  005702                         TST     R2              ;;CHECK IF BCD DIGIT=0
036524  001002                         BNE     5$              ;;FALL THROUGH IF 0
036526  105716                         TSTB    (SP)            ;;STILL DOING LEADING 0'S?
036530  100407                         BMI     7$              ;;BR IF YES
036532  106316                 5$:     ASLB    (SP)            ;;MSD?
036534  103003                         BCC     6$              ;;BR IF NO
036536  116663  000001  177777         MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
036544  052702  000060         6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
036550  052702  000040         7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
036554  110223                         MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
036556  005720                         TST     (R0)+           ;;JUST INCREMENTING
036560  020027  000010                 CMP     R0,#10          ;;CHECK THE TABLE INDEX
036564  002746                         BLT     2$              ;;GO DO THE NEXT DIGIT
036566  003002                         BGT     8$              ;;GO TO EXIT
036570  010502                         MOV     R5,R2           ;;GET THE LSD
036572  000764                         BR      6$              ;;GO CHANGE TO ASCII
036574  105726                 8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
036576  100003                         BPL     9$              ;;BR IF NO
036600  116663  177777  177776         MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
036606  105013                 9$:     CLRB    (R3)            ;;SET THE TERMINATOR
036610  012605                         MOV     (SP)+,R5        ;;POP STACK INTO R5
036612  012603                         MOV     (SP)+,R3        ;;POP STACK INTO R3
036614  012602                         MOV     (SP)+,R2        ;;POP STACK INTO R2
036616  012601                         MOV     (SP)+,R1        ;;POP STACK INTO R1
```

```
036620  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
036622  104401  036650                  TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
036626  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
036634  012616                          MOV     (SP)+,(SP)
036636  000002                          RTI                     ;;RETURN TO USER
036640  023420                  $DTBL:  10000.
036642  001750                          1000.
036644  000144                          100.
036646  000012                          10.
036650                          $DBLK:  .BLKW   4
```

```
                                .SBTTL  APT COMMUNICATIONS ROUTINE
                                ;;**********************************************************************
036660  112737  000001  037124  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
036666  112737  000001  037122  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
036674  000403                        BR      $ATYC
036676  112737  000001  037124  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
036704                          $ATYC:
036704  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
036706  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
036710  105737  037122                TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
036714  001450                        BEQ     5$              ;;IF NOT:  BR
036716  122737  000001  001226        CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
036724  001031                        BNE     3$              ;;IF NOT:  BR
036726  132737  000100  001227        BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
036734  001425                        BEQ     3$              ;;IF NOT:  BR
036736  017600  000004                MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
036742  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
036750  005737  001206          1$:   TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
036754  001375                        BNE     1$              ;;IF NOT:  WAIT
036756  010037  001222                MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
036762  105720                  2$:   TSTB    (R0)+           ;;FIND END OF MESSAGE
036764  001376                        BNE     2$
036766  163700  001222                SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
036772  006200                        ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
036774  010037  001224                MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
037000  012737  000004  001206        MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
037006  000413                        BR      5$
037010  017637  000004  037034  3$:   MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
037016  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
037024  013746  177776                MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
037030  004737  035652                JSR     PC,$TYPE        ;;CALL TYPE MACRO
037034  000000                  4$:   .WORD   0
037036                          5$:
037036  105737  037124          10$:  TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
037042  001416                        BEQ     12$             ;;IF NOT:  BR
037044  005737  001226                TST     $ENV            ;;RUNNING UNDER APT?
037050  001413                        BEQ     12$             ;;IF NOT:  BR
037052  005737  001206          11$:  TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
037056  001375                        BNE     11$             ;;IF NOT:  WAIT
037060  017637  000004  001210        MOV     @4(SP),$FATAL   ;;GET ERROR #
037066  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
037074  005237  001206                INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
037100  105037  037124          12$:  CLRB    $FFLG           ;;CLEAR FATAL FLAG
037104  105037  037123                CLRB    $LFLG           ;;CLEAR LOG FLAG
037110  105037  037122                CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
037114  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
037116  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
037120  000207                        RTS     PC              ;;RETURN
037122     000          $MFLG:  .BYTE   0               ;;MESSG. FLAG
037123     000          $LFLG:  .BYTE   0               ;;LOG FLAG
037124     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

037126                          $RAND:
037126  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
037130  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
037132  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
037134  013700  037226                  MOV     $LONUM,R0       ;;SET R0 WITH LOW
037140  013701  037224                  MOV     $HINUM,R1       ;;SET R1 WITH HIGH
037144  012702  177771                  MOV     #-7,R2          ;;SET SHIFT COUNT
037150  006300                  1$:     ASL     R0              ;;SHIFT R0 LEFT AND
037152  006101                          ROL     R1              ;;ROTATE CARRY INTO R1 AND
037154  005202                          INC     R2              ;;CHECK FOR DONE
037156  001374                          BNE     1$              ;;CONTINUE SHIFT LOOP
037160  063700  037226                  ADD     $LONUM,R0       ;;ADD NUMBER TO MAKE X 129
037164  005501                          ADC     R1              ;;PROPOGATE CARRY
037166  063701  037224                  ADD     $HINUM,R1       ;;ADD NUMBER TO MAKE X 129
037172  062700  001057                  ADD     #1057,R0        ;;ADD LOW CONSTANT
037176  005501                          ADC     R1              ;;PROPOGATE CARRY
037200  062701  047401                  ADD     #47401,R1       ;;ADD HIGH CONSTANT
037204  010037  037226                  MOV     R0,$LONUM       ;;SAVE R0
037210  010137  037224                  MOV     R1,$HINUM       ;;SAVE R1
037214  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
037216  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
037220  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
037222  000207                          RTS     PC              ;;RETURN
037224  176543                  $HINUM: .WORD   176543
037226  123456                  $LONUM: .WORD   123456
```

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

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

037230                          $SAVREG:
037230  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
037232  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
037234  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
037236  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
037240  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
037242  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
037244  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
037250  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
037254  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
037260  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
037264  000002                          RTI

                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      RESREG
037266                          $RESREG:
037266  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
037272  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
037276  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
037302  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
037306  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
037310  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
037312  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
037314  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
037316  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
037320  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
037322  000002                          RTI
```

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

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


037324  104412                  $DB2D:  SAVREG                  ;;SAVE REGISTERS
037326  016602  000002                  MOV     2(SP),R2        ;;PICKUP THE DATA POINTER
037332  012700  037504                  MOV     #$DECVL,R0      ;;GET ADDRESS OF "$DECVL" STRING
037336  010066  000002                  MOV     R0,2(SP)        ;;PUT ADDRESS OF ASCIZ STRING ON STACK
037342  012201                          MOV     (R2)+,R1        ;;PICKUP THE BINARY NUMBER
037344  012202                          MOV     (R2)+,R2
037346  012737  000012  037422          MOV     #10.,4$         ;;SET UP TO DO 10 CONVERSIONS
037354  012704  037434                  MOV     #$TNPWR,R4      ;;ADDRESS OF TEN POWER
037360  012705  037436                  MOV     #$TNPWR+2,R5
037364  005003                  1$:     CLR     R3              ;;CLEAR PARTIAL
037366  161401                  2$:     SUB     (R4),R1         ;;SUBTRACT TEN POWER
037370  005602                          SBC     R2
037372  161502                          SUB     (R5),R2
037374  002402                          BLT     3$              ;;BR IF TEN POWER TO LARGE
037376  005203                          INC     R3              ;;ADD 1 TO PARTIAL
037400  000772                          BR      2$              ;;LOOP
037402  062401                  3$:     ADD     (R4)+,R1        ;;RESTORE SUBTRACTED VALUE
037404  005502                          ADC     R2
037406  062402                          ADD     (R4)+,R2
037410  022525                          CMP     (R5)+,(R5)+     ;;MOVE TO NEXT TEN POWER
037412  052703  000060                  BIS     #'0,R3          ;;CHANGE PARTIAL TO ASCII
037416  110320                          MOVB    R3,(R0)+        ;;SAVE IT
037420  005327                          DEC     (PC)+           ;;DONE?
037422  000000                  4$:     .WORD   0
037424  001357                          BNE     1$              ;;BR IF NO
037426  105020                          CLRB    .R0)+           ;;TERMINATOR
037430  104413                          RESREG                  ;;RESTORE REGISTERS
037432  000207                          RTS     PC              ;;RETURN
037434  145000                  $TNPWR: 145000                  ;;1.0E09
037436  035632                          35632
037440  160400                          160400                  ;;1.0E08
037442  002765                          2765
037444  113200                          113200                  ;;1.0E07
037446  000230                          230
037450  041100                          041100                  ;;1.0E06
037452  000017                          17
037454  103240                          103240                  ;;1.0E05
037456  000001                          1
037460  023420                          23420                   ;;1.0E04
037462  000000                          0
037464  001750                          1750                    ;;1.0E03
037466  000000                          0
037470  000144                          144                     ;;1.0E02
037472  000000                          0
```

```
037474  000012                          12                      ;;1.0E01
037476  000000                          0
037500  000001                          1                       ;;1.0E00
037502  000000                          0
037504                          $DECVL: .BLKB   12.             ;;RESERVE STORAGE FOR ASCIZ STRING
```

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

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

037520  104412                  $DB2O:  SAVREG                  ;;SAVE ALL REGISTERS
037522  016601  000002                  MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
037526  012705  037637                  MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
037532  012704  000014                  MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
037536  012703  177770                  MOV     #^C7,R3         ;;MASK
037542  012100                          MOV     (R1)+,R0        ;;LOWER WORD
037544  012101                          MOV     (R1)+,R1        ;;HIGH WORD
037546  005002                          CLR     R2              ;;TERMINATOR
037550  110245                  1$:     MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
037552  010002                          MOV     R0,R2           ;;GET THIS DIGIT
037554  005304                          DEC     R4              ;;COUNT THIS CHARACTER
037556  003007                          BGT     3$              ;;BR IF NOT THE LAST DIGIT
037560  001405                          BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
037562  005205                          INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
037564  010566  000002                  MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
037570  104413                          RESREG                  ;;RESTORE ALL REGISTERS
037572  000207                          RTS     PC              ;;RETURN TO USER
037574  006203                  2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
037576  006001                  3$:     ROR     R1              ;;POSITION THE BINARY "UMBER FOR
037600  006000                          ROR     R0              ;;      THE NEXT OCTAL DIGIT
037602  006001                          ROR     R1
037604  006000                          ROR     R0
037606  006001                          ROR     R1
037610  006000                          ROR     R0
037612  040302                          BIC     R3,R2           ;;MASK OUT ALL JUNK
037614  062702  000060                  ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
037620  000753                          BR      1$              ;;GO PUT IT IN THE DATA TABLE
037622                          $OCTVL: .BLKB   14.             ;;RESERVE DATA TABLE
```

```
                                .SBTTL  POWER DOWN AND UP ROUTINES

                                ;;*****************************************************************
                                ;POWER DOWN ROUTINE
037640  012737  040012  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
037646  012737  000340  000026         MOV     #340,@#PWRVEC+2 ;;PRIO:7
037654  010046                       MOV     R0,-(SP)        ;;PUSH R0 ON STACK
037656  010146                       MOV     R1,-(SP)        ;;PUSH R1 ON STACK
037660  010246                       MOV     R2,-(SP)        ;;PUSH R2 ON STACK
037662  010346                       MOV     R3,-(SP)        ;;PUSH R3 ON STACK
037664  010446                       MOV     R4,-(SP)        ;;PUSH R4 ON STACK
037666  010546                       MOV     R5,-(SP)        ;;PUSH R5 ON STACK
037670  017746  141260               MOV     @SWR,-(SP)      ;;PUSH @SWR ON STACK
037674  010637  040016               MOV     SP,$SAVR6       ;;SAVE SP
037700  012737  037712  000024       MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
037706  000000                       HALT
037710  000776                       BR      .-2             ;;HANG UP

                                ;;*****************************************************************
                                ;POWER UP ROUTINE
037712  012737  040012  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
037720  013706  040016               MOV     $SAVR6,SP       ;;GET SP
037724  005037  040016               CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
037730  005237  040016         1$:   INC     $SAVR6          ;;WAIT FOR THE INC
037734  001375                       BNE     1$              ;;OF  WORD
037736  005337  040020         2$:   DEC     PWRFLG          ;TTY WAIT LOOP & SET POWER FAIL FLAG
037742  003775                       BLE     2$              ;WAIT FOR FLAG= 1
037744  012677  141204               MOV     (SP)+,@SWR      ;;POP STACK INTO @SWR
037750  012605                       MOV     (SP)+,R5        ;;POP STACK INTO R5
037752  012604                       MOV     (SP)+,R4        ;;POP STACK INTO R4
037754  012603                       MOV     (SP)+,R3        ;;POP STACK INTO R3
037756  012602                       MOV     (SP)+,R2        ;;POP STACK INTO R2
037760  012601                       MOV     (SP)+,R1        ;;POP STACK INTO R1
037762  012600                       MOV     (SP)+,R0        ;;POP STACK INTO R0
037764  012737  037640  000024       MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
037772  012737  000340  000026       MOV     #340,@#PWRVEC+2 ;;PRIO:7
040000  104401                       TYPE                    ;;REPORT THE POWER FAILURE
040002  040022           $PWRMG: .WORD   MSGPWR          ;;POWER FAIL MESSAGE POINTER
040004  012716                       MOV     (PC)+,(SP)      ;;RESTART AT PWRUP
040006  040044           $PWRAD: .WORD   PWRUP           ;;RESTART ADDRESS
040010  000002                       RTI
040012  000000           $ILLUP: HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
040014  000776                       BR      .-2             ;; BEFORE THE POWER DOWN WAS COMPLETE
040016  000000           $SAVR6: 0                       ;;PUT THE SP HERE
2
3 040020  000000           PWRFLG: .WORD   0               ;POWER FAIL FLAG GOES HERE; FAILED= 1
4
5 040022     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 040044  005227  000000   PWRUP:  INC     #0              ;TTY LOOP, WAIT FOR INCREMENT
12 040050  001375                   BNE     .-4             ;OF WORD
13 040052  000005                   RESET                   ;CLEAR THE WORLD
14 040054  005037  177776           CLR     PS              ;CLEAR PSW
```

```
                                                MOV     #STACK,SP       ;SETUP STACK POINTER
                                                CLR     SECOND          ;RESET SECOND COUNT
                                                CLR     INTRVL+2        ;RESET THE INTERVAL COUNT
                                                JSR     PC,$TKINT       ;MAKE SURE KEYBOARD INTERRUPT AND
                                                JSR     PC,CKCLK        ;SYSTEM CLOCK ARE STILL ON.
                                                JSR     PC,$TIME        ;TYPE ELAPSED TIME
                                                TYPE    ,$CRLF          ;CR-LF
                                                CLR     CFLAG           ;CLEAR (^C) FLAG
                                                TSTB    ASNLST          ;ANY DRIVES ASSIGNED ?
                                                BEQ     2$              ;BR IF NO
                                                TYPE    ,MSWAIT         ;TYPE 'WAITING 3 MINUTES...TO START'
                                        1$:     TST     CFLAG           ;WAS (^C) TYPED?
                                                BNE     2$              ;BR IF YES
                                                CMP     INTRVL+2,#3     ;THREE MINUTES YET ?
                                                BLT     1$              ;WAIT IF NOT
                                                MOV     #400,CHGADR     ;FUDGE 200 START
                                        2$:     MOV     #ORDERQ,R5      ;CLEAR UP THE QUE AND BUFFER
                                        3$:     CLR     (R5)+
                                                CMP     #BLKADR,R5      ;ALL DONE ?
                                                BNE     3$              ;BRANCH IF NOT
                                                JMP     SIZMEM          ;LOOP BACK

                                        MSWAIT: .ASCII  <CRLF>/TYPE ^C TO ABORT/
                                                .ASCIZ  <CRLF>/WAITING 3 MINUTES...TO START/<CRLF>
                                                .EVEN
```

```
      1                                 .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.

 040256  010046                         $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
 040260  016600  000002                         MOV     2(SP),R0        ;;GET TRAP ADDRESS
 040264  005740                         TST     -(R0)           ;;BACKUP BY 2
 040266  111000                         MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
 040270  006300                         ASL     R0              ;;POSITION FOR INDEXING
 040272  016000  040312                 MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
 040276  000200                         RTS     R0              ;;GO TO ROUTINE

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

 040300  011646                         $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
 040302  016666  000004  000002                 MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
 040310  000002                         RTI                     ;;RESTORE THE PSW

                                        .SBTTL  TRAP TABLE

                                        ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                        ;*BY THE "TRAP" INSTRUCTION.
                                        ;       ROUTINE
                                        ;       -------
 040312  040300                         $TRPAD: .WORD   $TRAP2
 040314  035652                                 $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
 040316  036232                                 $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
 040320  036206                                 $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
 040322  036246                                 $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
 040324  036434                                 $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)

 040326  034020                                 $GTSWR  ;;CALL=GTSWR    TRAP+6(104406)  GET SOFT-SWR SETTING

 040330  033730                                 $CKSWR  ;;CALL=CKSWR    TRAP+7(104407)  TEST FOR CHANGE IN SOFT-SWR
 040332  034272                                 $RDCHR  ;;CALL=RDCHR    TRAP+10(104410) TTY TYPEIN CHARACTER ROUTINE
 040334  034362                                 $RDLIN  ;;CALL=RDLIN    TRAP+11(104411) TTY TYPEIN STRING ROUTINE
 040336  037230                                 $SAVREG ;;CALL=SAVREG   TRAP+12(104412) SAVE R0-R5 ROUTINE
 040340  037266                                 $RESREG ;;CALL=RESREG   TRAP+13(104413) RESTORE R0-R5 ROUTINE
2040342  033020                                 $DSPLY  ;;CALL=DISPLY   TRAP+14(104414) ROUTINE TO TYPE ERROR MESSAGES
3        000032                         $TERM=.-$TRPAD
```

```
                                .SBTTL  RP07 DRIVER

                                ;STORAGE FOR RPDS, RPER1, RPER2, AND RPER3

040344  000000  000000  000000  RPSTU0: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 0
040354  000000  000000  000000  RPSTU1: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 1
040364  000000  000000  000000  RPSTU2: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 2
040374  000000  000000  000000  RPSTU3: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 3
040404  000000  000000  000000  RPSTU4: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 4
040414  000000  000000  000000  RPSTU5: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 5
040424  000000  000000  000000  RPSTU6: .WORD   0,0,0,0        ;DS, ER1, ER2 & ER3 STORAGE FOR DRIVE 6
040434  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

040444      000                 DRVACT: .BYTE   0               ;DRIVE 0
040445      000                         .BYTE   0               ;DRIVE 1
040446      000                         .BYTE   0               ;DRIVE 2
040447      000                         .BYTE   0               ;DRIVE 3
040450      000                         .BYTE   0               ;DRIVE 4
040451      000                         .BYTE   0               ;DRIVE 5
040452      000                         .BYTE   0               ;DRIVE 6
040453      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

040454      000                 DRVSTA: .BYTE   0               ;DRIVE 0
040455      000                         .BYTE   0               ;DRIVE 1
040456      000                         .BYTE   0               ;DRIVE 2
040457      000                         .BYTE   0               ;DRIVE 3
040460      000                         .BYTE   0               ;DRIVE 4
040461      000                         .BYTE   0               ;DRIVE 5
040462      000                         .BYTE   0               ;DRIVE 6
040463      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

040464      000                 DRVTYP: .BYTE   0               ;DRIVE 0
040465      000                         .BYTE   0               ;DRIVE 1
040466      000                         .BYTE   0               ;DRIVE 2
040467      000                         .BYTE   0               ;DRIVE 3
040470      000                         .BYTE   0               ;DRIVE 4
040471      000                         .BYTE   0               ;DRIVE 5
040472      000                         .BYTE   0               ;DRIVE 6
040473      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

040474  000                     DPINT:  .BYTE   0               ;DRIVE 0
040475  000                             .BYTE   0               ;DRIVE 1
040476  000                             .BYTE   0               ;DRIVE 2
040477  000                             .BYTE   0               ;DRIVE 3
040500  000                             .BYTE   0               ;DRIVE 4
040501  000                             .BYTE   0               ;DRIVE 5
040502  000                             .BYTE   0               ;DRIVE 6
040503  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

040504  000                     DPRQS:  .BYTE   0               ;DRIVE 0
040505  000                             .BYTE   0               ;DRIVE 1
040506  000                             .BYTE   0               ;DRIVE 2
040507  000                             .BYTE   0               ;DRIVE 3
040510  000                             .BYTE   0               ;DRIVE 4
040511  000                             .BYTE   0               ;DRIVE 5
040512  000                             .BYTE   0               ;DRIVE 6
040513  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.

040514  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.

040516  000000                  SRCHWT: .WORD   0

                                ;RP07 DRIVER ACTIVE FLAG (ACTDRV=1 BYTE)
                                        ;ACTDRV=0 IF DRIVER IS INACTIVE
                                        ;ACTDRV>0 IF DRIVER IS ACTIVE

040520  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

040521  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.
```

```
                                ;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

                                SEEKFG: .WORD   -1

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

                                TIMER:  .WORD   -1      ;DRIVE 0
                                        .WORD   -1      ;DRIVE 1
                                        .WORD   -1      ;DRIVE 2
                                        .WORD   -1      ;DRIVE 3
                                        .WORD   -1      ;DRIVE 4
                                        .WORD   -1      ;DRIVE 5
                                        .WORD   -1      ;DRIVE 6
                                        .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

                                DTUW:   .WORD   -1

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

                                ATABIT: .BYTE   1       ;DRIVE 0
                                        .BYTE   2       ;DRIVE 1
                                        .BYTE   4       ;DRIVE 2
                                        .BYTE   10      ;DRIVE 3
                                        .BYTE   20      ;DRIVE 4
                                        .BYTE   40      ;DRIVE 5
                                        .BYTE   100     ;DRIVE 6
                                        .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)).

                                RPADR:  .WORD   176700          ;RHXX/RP07 CONTROL STATUS REGISTER
                                RPVEC:  .WORD   254.,5*32.      ;VECTOR ADDRESS & BR LEVEL 5
                                RHEXT:  .WORD   50              ;OFFSET TO RPBAE

                                ;SEARCH DIFFERENCE IS 1 SECTOR

                                MXWNDW: .WORD   1

                                ;DEFINITIONS OF THE RHXX/RP07 ADDRESS INDEXES

                                RPCS1   = 0                     ;CONTROL AND STATUS REGISTER #1 (DRIVE REG. 00)
                                RPWC    = 2                     ;WORD COUNT REGISTER (NOT A DRIVE REG)
                                RPBA    = 4                     ;UNIBUS ADDRESS REGISTER (NOT A DRIVE REG)
```

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176          000006                  RPDA    = 6             ;DESIRED SECTOR/TRACK ADDRESS REGISTER (DRIVE REG. 05)
177          000010                  RPCS2   = 10            ;CONTROL AND STATUS REGISTER #2 (NOT A DRIVE REG)
178          000012                  RPDS    = 12            ;DRIVE STATUS REGISTER (DRIVE REG 01)
179          000014                  RPER1   = 14            ;ERROR REGISTER #1 (DRIVE REG. 02)
180          000016                  RPAS    = 16            ;ATTENTION SUMMARY PSEUDO REGISTER (DRIVE REG. 04)
181          000020                  RPLA    = 20            ;LOOK AHEAD REGISTER (DRIVE REG. 07)
182          000022                  RPDB    = 22            ;DATA BUFFER REGISTER (NOT A DRIVE REG.)
183          000024                  RPMR1   = 24            ;MAINTAINABILITY REGISTER (DRIVE REG. 03)
184          000026                  RPDT    = 26            ;DRIVE TYPE REGISTER (DRIVE REG. 06)
185          000030                  RPSN    = 30            ;SERIAL NUMBER REGISTER (DRIVE REG. 10)
186          000032                  RPOF    = 32            ;OFFSET REGISTER (DRIVE REG. 11)
187          000034                  RPDC    = 34            ;DESIRED CYLINDER ADDRESS REGISTER (DRIVE REG. 12)
188          000036                  RPCC    = 36            ;DUMMY  ADDRESS REGISTER (DRIVE REG. 13)
189          000040                  RPER2   = 40            ;ERROR REGISTER #2
190          000042                  RPER3   = 42            ;ERROR REGISTER #2 (DRIVE REG. 15)
191          000044                  RPEC1   = 44            ;ECC POSITION REGISTER (DRIVE REG. 16)
192          000046                  RPEC2   = 46            ;ECC PATTERN REGISTER (DRIVE REG.  17)
193          000050                  RPBAE   = 50            ;BUS ADDRESS EXTENTION REGISTER
194          000052                  RPCS3   = 52            ;CONTROL AND STATUS REGISTER #3
195
```

```
                                ;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
                                ;
040572  104412                  RPINIT: SAVREG                  ;SAVE R0 - R5
040574  013746  177776                  MOV     @#PS,-(SP)      ;SAVE THE PRESENT PROCESSOR STATUS
040600  012737  000240  177776          MOV     #<5*32.>,@#PS   ;CHANGE THE PRIORITY TO 5
040606  004737  045772                  JSR     PC,CLRQUE       ;CLEAR ALL REQUEST QUEUES
040612  012701  040344                  MOV     #RPSTU0,R1      ;FIRST ADDRESS TO BE CLEARED
040616  012702  040524                  MOV     #SEEKFG,R2      ;LAST ADDRESS TO BE CLEARED
040622  005021                  1$:     CLR     (R1)+           ;CLEAR
040624  020102                          CMP     R1,R2           ;ARE WE DONE?
040626  103775                          BLO     1$              ;BRANCH IF NO
                                ;
040630  012702  040546                  MOV     #DTUW,R2        ;LAST ADDRESS
040634  012721  177777          2$:     MOV     #-1,(R1)+       ;INITIALIZE
040640  020102                          CMP     R1,R2           ;DONE?
040642  101774                          BLOS    2$              ;LOOP IF NO
                                ;
040644  005037  040454                  CLR     DRVSTA          ;SET ALL DRIVES TO OFFLINE
040650  005037  040456                  CLR     DRVSTA+2
040654  005037  040460                  CLR     DRVSTA+4
040660  005037  040462                  CLR     DRVSTA+6
040664  013703  040562                  MOV     RPVEC,R3        ;SETUP THE RHXX/RP07 VECTOR
040670  012723  043174                  MOV     #ISR,(R3)+
040674  013713  040564                  MOV     RPVEC+2,(R3)
040700  013704  040560                  MOV     RPADR,R4        ;FIRST ADDRESS OF RHXX/RP07
040704  012764  000040  000010          MOV     #BIT05,RPCS2(R4)  ;MASSBUS INIT
040712  005001                          CLR     R1              ;START WITH DRIVE 0
040714  004037  040750          3$:     JSR     R0,DRVINT       ;INIT THE DRIVE
040720  000401                          BR      4$              ;'DVA' NOT SET OR PARITY ERROR
040722  000402                          BR      5$              ;NORMAL RETURN
                                ;
040724  105061  040454          4$:     CLRB    DRVSTA(R1)      ;SET DRIVE STATUS TO OFFLINE
040730  005201                  5$:     INC     R1              ;GO TO NEXT DRIVE
040732  042701  177770                  BIC     #^C7,R1         ;MASK OUT UNUSED BITS
040736  001366                          BNE     3$              ;BR IF MORE DRIVES TO GO
040740  012637  177776                  MOV     (SP)+,@#PS      ;RESTORE THE PROCESSOR STATUS
040744  104413                          RESREG                  ;RESTORE R0 - R5
040746  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
                                        ;

040750  010546                  DRVINT: MOV     R5,-(SP)        ;SAVE R5
040752  112761  177777  040474          MOVB    #-1,DPINT(R1)   ;SET THE DUAL PORT INITIALIZE FLAG
040760  006301                          ASL     R1
040762  012761  023420  040526          MOV     #10000.,TIMER(R1)       ;START 10. SECOND TIMER
040770  006201                          ASR     R1              ;DRIVE ADDRESS

040772  105061  040454          1$:     CLRB    DRVSTA(R1)      ;START DRIVE STATUS AS OFFLINE
040776  105061  040464                  CLRB    DRVTYP(R1)      ;CLEAR THE DRIVE TYPE INDICATOR
041002  010164  000010                  MOV     R1,RPCS2(R4)    ;SELECT A DRIVE
041006  112764  000111  000000          MOVB    #111,RPCS1(R4)  ;DO A DRIVE CLEAR COMMAND (& SEIZE DRIVE)
041014  032764  010000  000010          BIT     #BIT12,RPCS2(R4) ;NONEXISTENT DRIVE?
041022  001403                          BEQ     2$              ;NO---BRANCH
041024  004737  045426                  JSR     PC,SET.IE       ;GO SET "IE" WITHOUT A "TRE"
041030  000513                          BR      6$              ;LEAVE THIS ROUTINE

041032  105061  040454          2$:     CLRB    DRVSTA(R1)      ;SET DRIVE STATUS TO OFFLINE
041036  032764  004000  000000          BIT     #BIT11,RPCS1(R4)  ;SEE IF DRIVE AVAILABLE
041044  001004                          BNE     3$              ;BRANCH IF DVA SET
041046  105761  040474                  TSTB    DPINT(R1)       ;SOFTWARE TIMEOUT ON DUAL PORT INITIALIZE ?
041052  001347                          BNE     1$              ;BRANCH IF NOT
041054  000501                          BR      6$              ;OTHERWISE EXIT

041056  004037  045036          3$:     JSR     R0,RD.RP        ;READ THE DRIVE TYPE REG.
041062  000026                          RPDT
041064  041262                          8$                      ;ERROR RETURN ADDRESS
041066  012605                          MOV     (SP)+,R5        ;PUT DRIVE TYPE IN R5
041070  112761  000005  040464          MOVB    #5,DRVTYP(R1)   ;SET RP07 INDICATOR
041076  022705  020040                  CMP     #20040,R5       ;SINGLE PORT RP07
041102  001420                          BEQ     4$              ;BR IF YES
041104  022705  024040                  CMP     #24040,R5       ;DUAL PORT RP07
041110  001415                          BEQ     4$              ;BR IF YES
041112  112761  000004  040464          MOVB    #4,DRVTYP(R1)   ;SET RP07+ INDICATOR
041120  022705  020042                  CMP     #20042,R5       ;SINGLE PORT RP07+
041124  001407                          BEQ     4$              ;BRANCH IF SO
041126  022705  024042                  CMP     #24042,R5       ;DUAL PORT RP07+
041132  001404                          BEQ     4$              ;BRANCH IF SO
041134  112761  177777  040464          MOVB    #-1,DRVTYP(R1)  ;SET INDICATOR TO 'OTHER'
041142  000446                          BR      6$              ;EXIT

041144  012746  000121          4$:     MOV     #121,-(SP)      ;DO A "READ-IN PRESET"
041150  004037  045130                  JSR     R0,WRT.RP
041154  000000                          RPCS1
041156  041262                          8$
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                                                MOV     #BIT12,-(SP)    ;SET FMT16=1
                                                JSR     R0,WRT.RP
                                                RPOF
                                                8$
                                                JSR     R0,RD.RP        ;READ RPDS
                                                RPDS
                                                8$
                                                MOV     (SP)+,R5        ;AND SAVE IT IN R5
                                                BPL     5$              ;BRANCH IF ATA=0
                                                MOVB    ATABIT(R1),RPAS(R4) ;CLEAR ATTENTION BIT
                                                JSR     R0,RD.RP        ;FIND OUT WHY ATA=1
                                                RPER1
                                                8$
                                                ROL     (SP)+           ;IS IT UNSAFE?
                                                BPL     5$              ;BR IF NOT
                                                MOVB    #-1,DRVSTA(R1)  ;SET UNSAFE INDICATOR
                                                BR      6$              ;EXIT

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


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

                                        RP07:   MOV     @#PS,-(SP)      ;SAVE THE CALLING STATUS
                                                MOV     RPVEC+2,@#PS    ;DON'T ALLOW ANY RP07 INTERRUPTS
                                                MOVB    #1,ACTDRV       ;SET "ACTIVE DRIVER" FLAG
                                                SAVREG                  ;SAVE R0 - R5
                                                MOV     (R0),R2         ;PICKUP THE DRIVE PARAMETER BLOCK POINTER
                                                CLR     16(R2)          ;CLEAR THE STATUS/ERROR INDICATOR
                                                MOVB    (R2),R1         ;PICKUP THE DRIVE NUMBER
                                                MOV     RPADR,R4        ;UNIBUS ADDRESS OF RPCS1
                                                TSTB    DRVSTA(R1)      ;CHECK DRIVES STATUS
                                                BGT     1$              ;BRANCH IF ONLINE
                                                JSR     R0,DRVINT       ;GO INIT. THE DRIVE
                                                BR      3$              ;ERROR RETURN

                                                TSTB    DRVSTA(R1)      ;IS DRIVE STATUS ONLINE?
                                                BLE     5$              ;BR IF NOT
                                        1$:     TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
```

```
                                                BNE     4$                      ;BR IF YES
                                                MOV     R1,RPCS2(R4)            ;SELECT THE DRIVE
                                                JSR     R0,DRVQUE               ;PUT THIS REQUEST IN QUEUE
                                                BR      8$                      ;QUEUE IS FULL

                                        2$:     TSTB    DRVACT(R1)              ;IS THIS DRIVE ACTIVE?
                                                BNE     7$                      ;BR IF YES
                                                JSR     PC,OPT                  ;CALL THE OPTIMIZER
                                                BR      7$

                                        3$:     JSR     PC,CI7                  ;GO HANDLE THE PARITY ERROR
                                                BR      7$

                                        4$:     JSR     R0,DRVQUE               ;PUT REQUEST IN QUEUE
                                                BR      8$                      ;QUEUE IS FULL

                                                MOV     #0,RPCC(R4)             ;WRITE THE CURRENT CYL REG
                                                BIT     #BIT06,(R4)             ;IE BIT SET ?
                                                BNE     7$                      ;YES
                                                JSR     PC,SET.IE               ;SET THE INTERRUPT
                                                BR      7$                      ;RETURN

                                        5$:     TSTB    DRVSTA(R1)              ;SEE IF DRIVE OFFLINE OR UNSAFE
                                                BLT     6$                      ;BR IF UNSAFE
                                                MOV     #BIT15!BIT14,16(R2)     ;SET OFFLINE ERROR INDICATOR
                                                TSTB    DRVTYP(R1)              ;SEE IF OFFLINE OR NONEXISTENT
                                                BNE     7$                      ;BR IF OFFLINE
                                                MOV     #BIT15!BIT01,16(R2)     ;REPORT DRIVE NONEXISTENT
                                                BR      7$                      ;GO TO EXIT

                                        6$:     MOV     #BIT15!BIT12,16(R2)     ;DRIVE IS UNSAFE
                                        7$:     RESREG                          ;RESTORE R0 - R5
                                                TST     (R0)+                   ;SETUP FOR NORMAL RETURN
                                                BR      9$                      ;FINISH UP, THEN EXIT

                                        8$:     RESREG                          ;RESTORE R0 - R5
                                        9$:     TST     (R0)+                   ;CORRECT THE RETURN ADDRESS
                                                CLRB    ACTDRV                  ;CLEAR "ACTIVE DRIVER" FLAG
                                                MOV     (SP)+,@#PS              ;RETURN "PS" TO USER LEVEL
                                                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
                                        ;
                                        OPT:    SAVREG                          ;SAVE R0 - R5
                                                MOV     @#PS,-(SP)              ;SAVE PROC. STATUS
                                                JICB    ATABIT(R1),SRCHWT       ;CLEAR SEARCH FLAG
                                                CLRB    DPRQS(R1)               ;RESET THE PORT REQ FLAG
                                                JSR     PC,GETREQ               ;GET "DPB" POINTER OF REQUEST
                                                TST     R2                      ;IS THERE A REQUEST IN QUEUE?
                                                BEQ     8$                      ;NO--BRANCH TO EXIT
                                                MOV     R1,RPCS2(R4)            ;LOAD THE DRIVE ADDRESS
                                                MOV     #111,RPCS1(R4)          ;CLEAR THE DRIVE
```

```
175 041604  032764  004000  000000          BIT     #BIT11,RPCS1(R4)        ;DVA SET ?
176 041612  001446                          BEQ     6$                      ;TO PROT REQUEST ,IF NOT
177 041614  105761  040454          1$:     TSTB    DRVSTA(R1)              ;IS DRIVE ONLINE?
178 041620  003014                          BGT     2$                      ;YES--BRANCH
179 041622  004737  046166                  JSR     PC,POPQUE               ;NO--REMOVE REQUEST FROM QUEUE
180 041626  012762  140000  000016          MOV     #BIT15!BIT14,16(R2)  ;SET OFFLINE STATUS/ERROR INDICATOR
181 041634  105761  040454                  TSTB    DRVSTA(R1)              ;IS DRIVE UNSAFE ?
182 041640  100056                          BPL     9$                      ;BR TO EXIT IF NOT
183 041642  012762  110000  000016          MOV     #BIT15!BIT12,16(R2)  ;SET UNSAFE STATUS/ERROR INDICATOR
184 041650  000452                          BR      9$                      ;BRANCH TO EXIT
185
186 041652  122762  000150  000002  2$:     CMPB    #150,2(R2)              ;IS THE REQUEST FOR I/O?
187 041660  002407                          BLT     3$                      ;YES--BRANCH
188 041662  122762  000135  000002          CMPB    #135,2(R2)              ;IS IT A DIAGNOSTIC COMMAND ?
189 041670  001403                          BEQ     3$                      ;BRANCH IF SO
190 041672  004737  042312                  JSR     PC,CI4                  ;CALL THE COMMAND INITIATOR
191 041676  000437                          BR      9$                      ;BRANCH TO EXIT
192
193 041700  005737  040546          3$:     TST     DTUW                    ;DATA TRANSFER UNDERWAY?
194 041704  002006                          BGE     5$                      ;BR IF YES
195 041706  005737  040524                  TST     SEEKFG                  ;DO IMPLIED SEEKS ?
196 041712  100003                          BPL     5$                      ;NO, DO SEARCH
197 041714  004737  042006          4$:     JSR     PC,CI1                  ;START A DATA TRANSFER
198 041720  000426                          BR      9$
199
200 041722  004737  042200          5$:     JSR     PC,CI3                  ;START A SEARCH ON TARGET SECTOR -1
201 041726  000423                          BR      9$                      ;GO TO THE EXIT
202
203 041730  112761  177777  040504  6$:     MOVB    #-1,DPRQS(R1)           ;SET PORT REQUEST INDICATOR
204 041736  010103                          MOV     R1,R3                   ;SET UP TO ADDRESS WORDS
205 041740  006303                          ASL     R3                      ;CONVERT TO WORD INDEX
206 041742  012763  035230  040526          MOV     #15000.,TIMER(R3)    ;START 15. SECOND TIMER
207 041750  012764  000000  000036          MOV     #0,RPCC(R4)             ;SET PORT REQUEST
208 041756  000402                          BR      8$                      ;EXIT
209
210 041760  004737  042670          7$:     JSR     PC,CI7                  ;PROCESS THE PARITY ERROR
211 041764  032714  000100          8$:     BIT     #BIT06,(R4)             ;SEE IF 'IE' ALREADY SET
212 041770  001002                          BNE     9$                      ;BR IF SET
213 041772  004737  045426                  JSR     PC,SET.IE               ;SET "IE" WITHOUT A "TRE"
214 041776  012637  177776          9$:     MOV     (SP)+,@#PS              ;RESTORE PROC. STATUS
215 042002  104413                          RESREG                          ;RESTORE R0 - R5
216 042004  000207                          RTS     PC
217
218                                 ;COMMAND INITIATOR
219                                 ;
220                                 ;CALL
221                                 ;       MOV     #DPB,R2                 ;ADDRESS OF DRIVE PARAMETER BLOCK
222                                 ;       MOV     #DRVNUM,R1              ;DRIVE NUMBER
223                                 ;       JSR     PC,CI????               ;CI???? = CI1, CI3, OR CI4
224                                 ;                                       ;WHERE:
225                                 ;                                       ; CI1 = DATA TRANSFER
226                                 ;                                       ; CI3 = SEARCH REQUESTED BY DATA XFER
227                                 ;                                       ; CI4 = NO DATA TRANSFER
228
229 042006  004737  046166          CI1:    JSR     PC,POPQUE               ;REMOVE REQUEST FROM "DRIVES WAIT" QUEUE
230 042012  010237  040514                  MOV     R2,TRNSWT               ;PUT REQ. IN TRANSFER WAIT QUEUE
231 042016  010203                          MOV     R2,R3                   ;DPB ADDRESS TO R3
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232 042020  013704  040560                    MOV     RPADR,R4        ;RPCS1 ADDRESS
233 042024  010164  000010                    MOV     R1,RPCS2(R4)    ;SELECT DRIVE
234 042030  122762  000135  000002            CMPB    #135,2(R2)      ;IS IT A DIAGNOSTIC COMMAND ?
235 042036  001011                            BNE     1$              ;BRANCH IF NOT
236 042040  016246  000004                    MOV     4(R2),-(SP)     ;GET THE ROUTINE NUMBER, PARAMETERS
237 042044  052716  100000                    BIS     #BIT15,(SP)     ;SET THE DIAGNOSTIC MODE BIT
238 042050  004037  045130                    JSR     R0,WRT.RP       ;WRITE THE RPMR1 REG
239 042054  000024                            RPMR1
240 042056  042670                            CI7
241 042060  000422                            BR      2$              ;LOAD THE COMMAND AND EXIT
242
243 042062  062703  000004          1$:       ADD     #4,R3           ;DESIRED WORD COUNT
244 042066  062704  000002                    ADD     #2,R4           ;RPWC ADDRESS
245 042072  012324                            MOV     (R3)+,(R4)+     ;LOAD WORD COUNT
246 042074  012324                            MOV     (R3)+,(R4)+     ;LOAD BUFFER ADDRESS
247 042076  012346                            MOV     (R3)+,-(SP)     ;LOAD SECTOR AND TRACK
248 042100  004037  045130                    JSR     R0,WRT.RP       ;CALL THE LOAD(WRITE) ROUTINE
249 042104  000006                            RPDA                    ;INDEX OF REGISTER TO LOAD
250 042106  042670                            CI7                     ;ERROR RETURN ADDRESS
251 042110  012346                            MOV     (R3)+,-(SP)     ;LOAD CYLINDER ADDRESS
252 042112  004037  045130                    JSR     R0,WRT.RP
253 042116  000034                            RPDC
254 042120  042670                            CI7
261 042122  004737  042152                    JSR     PC,CI2          ;SEE IF BIT15 SHOULD BE SET IN RPMR1
262
263 042126  016246  000002          2$:       MOV     2(R2),-(SP)     ;LOAD "COMMAND+GO", "A17&A16", AND "PSEL"
264 042132  004037  045130                    JSR     R0,WRT.RP
265 042136  000000                            RPCS1
266 042140  042670                            CI7
267 042142  010137  040546                    MOV     R1,DTUW         ;SET "DATA TRANSFER UNDERWAY"
268 042146  000137  042632                    JMP     CI5
269
270 042152  026262  000012  000156  CI2:      CMP     12(R2),FE1(R2)  ;DATA XFER TO FE CYLINDERS ?
271 042160  002406                            BLT     1$              ;BR IF NO
272 042162  012746  100000                    MOV     #BIT15,-(SP)    ;SET THE DIAGNOSTIC MODE BIT
273 042166  004037  045130                    JSR     R0,WRT.RP       ;WRITE THE RPMR1 REG
274 042172  000024                            RPMR1
275 042174  042670                            CI7
276 042176  000207                1$:       RTS     PC
277
278 042200  013704  040560          CI3:      MOV     RPADR,R4        ;RPCS1 ADDRESS
279 042204  010164  000010                    MOV     R1,RPCS2(R4)    ;SELECT DRIVE
280 042210  016246  000012                    MOV     12(R2),-(SP)    ;DESIRED CYLINDER ADDRESS
281 042214  004037  045130                    JSR     R0,WRT.RP
282 042220  000034                            RPDC
283 042222  042670                            CI7
284 042224  004737  042152                    JSR     PC,CI2          ;SEE IF BIT15 SHOULD BE SET IN RPMR1
285
286 042230  116203  000010                    MOVB    10(R2),R3       ;PICKUP SECTOR ADDRESS
287 042234  163703  040570                    SUB     MXWNDW,R3       ;BACKUP BY MAX. SEARCH FOR I/O WINDOW
288 042240  002002                            BGE     1$              ;BR IF >= 0
289 042242  062703  000062                    ADD     #50.,R3         ;ADD MAXIMUM SECTOR COUNT BACK
290 042246  010346                1$:       MOV     R3,-(SP)        ;COMBINE THE ADJUSTED SECTOR WITH
291 042250  116266  000011  000001            MOVB    11(R2),1(SP)    ;THE DESIRED TRACK
292 042256  004037  045130                    JSR     R0,WRT.RP       ;LOAD DESIRED TRACK & SECTOR
293 042262  000006                            RPDA
294 042264  042670                            CI7
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                295
042266  012746  000131                  MOV     #131,-(SP)      ;START A SEARCH
042272  004037  045130                  JSR     R0,WRT.RP
042276  000000                          RPCS1
042300  042670                          CI7
042302  156137  040550  040516          BISB    ATABIT(R1),SRCHWT       ;SET "SEARCH WAIT" KEY
042310  000550                          BR      CI5
                302
042312  013704  040560          CI4:    MOV     RPADR,R4        ;RPCS1 ADDRESS
042316  010164  000010                  MOV     R1,RPCS2(R4)    ;SELECT DRIVE
042322  116203  000002                  MOVB    2(R2),R3        ;PICKUP THE REQUESTED COMMAND
042326  122703  000131                  CMPB    #131,R3         ;IS IT A SEARCH COMMAND?
042332  001007                          BNE     1$              ;BRANCH IF NO
042334  016246  000010                  MOV     10(R2),-(SP)    ;LOAD DESIRED TRACK & SECTOR
042340  004037  045130                  JSR     R0,WRT.RP
042344  000006                          RPDA
042346  042670                          CI7
042350  000403                          BR      2$              ;GO LOAD CYLINDER
                313
042352  122703  000105          1$:     CMPB    #105,R3         ;IS IT A SEEK COMMAND
042356  001011                          BNE     3$              ;BRANCH IF NO
042360  016246  000012          2$:     MOV     12(R2),-(SP)    ;LOAD DESIRED CYLINDER
042364  004037  045130                  JSR     R0,WRT.RP
042370  000034                          RPDC
042372  042670                          CI7
042374  004737  042152                  JSR     PC,CI2          ;SEE IF BIT15 SHOULD BE SET IN RPMR1
042400  000525                          BR      CI6
                322
042402  122703  000115          3$:     CMPB    #115,R3         ;IS IT AN "OFFSET" COMMAND ?
042406  001013                          BNE     4$              ;BR IF NO
042410  004037  045036                  JSR     R0,RD.RP        ;MERGE THE OFFSET VALUE INTO RPOF
042414  000032                          RPOF                    ;BUT DON'T CHANGE THE UPPER
042416  042670                          CI7
042420  116216  000001                  MOVB    1(R2),(SP)      ;BYTE WHEN LOADING THE
042424  004037  045130                  JSR     R0,WRT.RP       ;REGISTER (RPOF)
042430  000032                          RPOF
042432  042670                          CI7
042434  000507                          BR      CI6             ;GO START THE COMMAND
                333
042436  122703  000107          4$:     CMPB    #107,R3         ;IS IT A "RECALIBRATE" COMMAND?
042442  001504                          BEQ     CI6             ;BRANCH IF YES
042444  122703  000117                  CMPB    #117,R3         ;IS IT A RETURN TO CENTER?
042450  001501                          BEQ     CI6             ;BRANCH IF YES
042452  122703  000143          5$:     CMPB    #143,R3         ;IS IT A "SET FORMAT" COMMAND?
042456  001014                          BNE     6$              ;BRANCH IF NO
042460  004037  045036                  JSR     R0,RD.RP        ;READ THE OFFSET REGISTER
042464  000032                          RPOF
042466  042670                          CI7
042470  116266  000001  000001          MOVB    1(R2),1(SP)     ;COMBINE "FMT16","ECI", AND "HCI"
042476  004037  045130                  JSR     R0,WRT.RP
042502  000032                          RPOF
042504  042670                          CI7
042506  000436                          BR      12$
                348
042510  122703  000141          6$:     CMPB    #141,R3         ;IS IT A "GET REGISTER" COMMAND?
042514  001023                          BNE     10$             ;BRANCH IF NO
042516  016203  000006          7$:     MOV     6(R2),R3        ;POINTS TO 1ST ADDRESS OF WHERE
```

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352
353 042522  116237  000010  042540          MOVB    10(R2),9$       ;TO PUT THE REGISTER(S)
354 042530  116205  000011                  MOVB    11(R2),R5       ;INIT. THE INDEX FOR THE FIRST REG.
355 042534  004037  045036          8$:     JSR     R0,RD.RP        ;INDEX OF LAST REG. TO MOVE
356 042540  000000                  9$:     RPCS1                   ;READ RHXX/RP07 REGISTER
357 042542  042670                          CI7                     ;INDEX OF REG. TO READ
358 042544  012623                          MOV     (SP)+,(R3)+     ;GET THE CONTENTS OF RHXX//RP07 REG.
359 042546  023705  042540                  CMP     9$,R5           ;LAST REG. BEEN READ?
360 042552  001414                          BEQ     12$             ;GET OUT IF YES
361 042554  062737  000002  042540          ADD     #2,9$           ;INCREASE THE INDEX BY 2
362 042562  000764                          BR      8$              ;LOOP--MORE TO READ
363
364 042564  122703  000145          10$:    CMPB    #145,R3         ;IS IT A "SELECT DRIVE" COMMAND?
365 042570  001405                          BEQ     12$             ;BRANCH IF YES
366 042572  010346                  11$:    MOV     R3,-(SP)        ;LOAD THE COMMAND
367 042574  004037  045130                  JSR     R0,WRT.RP
368 042600  000000                          RPCS1
369 042602  042670                          CI7
370 042604  004737  046166          12$:    JSR     PC,POPQUE       ;REMOVE REQ. FROM QUEUE
371 042610  052762  000200  000016          BIS     #BIT07,16(R2)   ;SET THE "DONE" BIT
372 042616  005737  040522                  TST     SAVEFG          ;SAVE RHXX/RP07 REGISTERS ?
373 042622  100002                          BPL     13$             ;BR IF NO
374 042624  004737  045262                  JSR     PC,SVRHXX       ;YES--GO SAVE THE REGISTERS
375 042630  000207                  13$:    RTS     PC              ;RETURN TO USER
376
377 042632  006301                  CI5:    ASL     R1
378 042634  012761  023420  040526          MOV     #10000.,TIMER(R1)       ;START 10. SECOND TIMER
379 042642  006201                          ASR     R1
380 042644  112761  000001  040444          MOVB    #1,DRVACT(R1)   ;SET THE DRIVE ACTIVE
381 042652  000207                          RTS     PC              ;RETURN TO THE USER
382
383 042654  010346                  CI6:    MOV     R3,-(SP)        ;LOAD THE COMMAND
384 042656  004037  045130                  JSR     R0,WRT.RP
385 042662  000000                          RPCS1
386 042664  042670                          CI7
387 042666  000761                          BR      CI5
388
389 042670  005702                  CI7:    TST     R2              ;ANYTHING IN QUEUE ?
390 042672  001001                          BNE     1$              ;BRANCH IF QUEUE IS THERE
391 042674  000207                          RTS     PC              ;OTHERWISE EXIT
392 042676  012762  104000  000016  1$:     MOV     #BIT15!BIT11,16(R2)     ;SET "PARITY" ERROR INDICATOR
393
394 042704  012746  000111          CI7B:   MOV     #111,-(SP)      ;DO A "DRIVE CLEAR"
395 042710  004037  045130                  JSR     R0,WRT.RP
396 042714  000000                          RPCS1
397 042716  042756                          CI8
398 042720  004737  046050                  JSR     PC,EMPTYQ       ;EMPTY THE QUEUE
399 042724  105061  040504                  CLRB    DPRQS(R1)       ;CLEAR THE PORT REQUEST FLAG
400 042730  105061  040444                  CLRB    DRVACT(R1)      ;DRIVE IS IDLE
401 042734  020237  040514                  CMP     R2,TRNSWT       ;IF THIS DRIVE HAD AN I/O REQUEST
402 042740  001005                          BNE     1$              ;IN PROGRESS CLEAR ALL OF THE FLAGS
403 042742  005037  040514                  CLR     TRNSWT
404 042746  012737  177777  040546          MOV     #-1,DTUW
405 042754  000207                  1$:     RTS     PC
406
407 042756  104412                  CI8:    SAVREG                  ;SAVE R0 - R5
408 042760  005001                          CLR     R1
```

```
                                                CLR     R3
                                        1$:     TSTB    DRVACT(R1)      ;DRIVE ACTIVE?
                                                BNE     2$              ;BRANCH IF IN ACTIVE
                                                TSTB    DPRQS(R1)       ;PORT REQUEST
                                                BEQ     6$              ;BRANCH IF NOT
                                        2$:     MOV     TRNSWT,R2       ;GET "DPB" FROM THE "TRANSFER WAIT" QUEUE
                                                CMP     R1,DTUW         ;DID THIS DRIVE HAVE AN I/O IN PROGRESS?
                                                BEQ     3$              ;BRANCH IF YES
                                                JSR     PC,CETREQ       ;GET THE DPB POINTER
                                        3$:     TST     R2              ;QUEUE ENTRY FOR DRIVE ?
                                                BEQ     5$              ;BR IF NOT
                                                BIT     #BIT12,RPCS2(R4)  ;'NED' SET ?
                                                BEQ     4$              ;BR IF NOT
                                                MOV     #BIT15!BIT01,16(R2)  ;SET 'DRIVE NON-EXISTENT' INDICATOR
                                                BR      5$              ;CONTINUE

                                        4$:     MOV     #BIT15!BIT10,16(R2) ;SET "NON-CLEARABLE PARITY" ERROR INDICATOR
                                        5$:     MOV     #-1,TIMER(R3)   ;STOP THE TIMER

                                                CLRB    DRVACT(R1)      ;SET "DRIVE ACTIVE" TO IDLE
                                                CLRB    DPRQS(R1)       ;CLEAR PORT REQUEST FLAG
                                                CMP     R1,DTUW         ;IS THIS DRIVE SETUP FOR A TRANSFER
                                                BNE     6$              ;BR IF NOT
                                                MOV     #-1,DTUW        ;RESET THE INDICATOR
                                                CLR     TRNSWT          ;CLEAR THE TRANSFER QUEUE
                                        6$:     INC     R1              ;MOVE TO THE NEXT DRIVE
                                                ADD     #2,R3
                                                BIC     #^C7,R1
                                                BNE     1$              ;BRANCH IF MORE DRIVES
                                                MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
                                                CLR     TRNSWT          ;CLEAR THE 'TRANSFER WAIT' QUEUE
                                                JSR     PC,CLRQUE       ;CLEAR ALL OF THE REQUEST QUEUES
                                                MOV     #BIT05,RPCS2(R4) ;DO A MASSBUS INIT.
                                                BR      8$              ;CONTINUE

                                        7$:     JSR     PC,EMPTYQ       ;CLEAR THE DRIVE'S QUEUE
                                                CLRB    DRVSTA(R1)      ;SET DRIVE TO OFFLINE
                                                CLRB    DRVTYP(R1)      ;CLEAR THE DRIVE TYPE INDICATOR
                                        8$:     JSR     PC,SET.IE       ;SET "IE" WITHOUT "TRE"
                                                RESREG                  ;RESTORE R0 - R5
                                                RTS     PC              ;RETURN

                                        ;INTERRUPT SERVICE ROUTINE

                                        ISR:    MOVB    #1,ACTDRV       ;SET "ACTIVE DRIVER" FLAG
                                                SAVREG                  ;SAVE R0 - R5
                                                MOV     RPADR,R4        ;ADDRESS OF RPCS1
                                                MOV     DTUW,R1         ;GET "DATA TRANSFER UNDERWAY" INDICATOR
                                                BLT     1$              ;BRANCH IF NO DATA TRANSFER UNDERWAY
                                                JSR     PC,TD           ;CALL TRANSFER DONE
                                        1$:     JSR     PC,SC           ;CALL SPECIAL CONDITIONS
                                                RESREG                  ;RESTORE R0 - R5
                                                CLRB    ACTDRV          ;CLEAR "ACTIVE DRIVER" FLAG
                                                RTI                     ;RETURN

                                        ;TRANSFER DONE ROUTINE
```

```
                                ;CLR PERMENANT ERROR FLAG
                                ;SET DRIVE ACTIVE INDICATOR TO IDLE
                                ;NO DATA TRANSFERS UNDERWAY
                                ;CANCEL TIMEOUT
                                ;GET "DPB" FROM THE "TRANSFER WAIT" QUEUE
                                ;TRANSFER WAIT QUEUE--CLEAR QUEUE
                                ;SET DONE
                                ;SELECT THE DRIVE
                                ;TRANSFER ERROR(TRE=1)?
                                ;BR IF YES
                                ;SAVE RHXX/RP07 REGISTERS ?
                                ;BR IF NO
                                ;YES--SAVE THE REGISTERS
                                ;IE FROM DIAGNOSTIC COMMAND ?
                                ;BRANCH IF NOT
                                ;RESET THE ATA BIT
                                ;SEE IF WRITE CHECK TO BE PUT IN QUEUE
                                ;GET DPB POINTER
                                ;ENTRY FOR DRIVE ?
                                ;BR IF NOT
                                ;CALL OPTIMIZER
                                ;RETURN
                                ;RELEASE THE DRIVE
                                ;RETURN

                                ;SET DATA ERROR FLAG
                                ;EMPTY THE "DRIVE'S WAIT" QUEUE
                                ;SAVE THE RHXX/RP07 REGISTERS
                                ;ISSUE A "DRIVE CLEAR"

                                ;DID ERROR BIT CLEAR?
                                ;BR IF YES
                                ;SET PERM ERROR FLAG
                                ;CLR ATA BIT
                                ;RETURN

                                ;ISSUE A RELEASE TO THE DRIVE
                                ;RETURN

                                ;PERMENANT ERROR FLAG

                                ;FORCE WRITE CHECK ROUTINE

                                ;DO WRITE CHECK ?
                                ;BR IF NO
                                ;LAST COMMAND A WRITE COMMAND ?
                                ;BRANCH IF NOT
                                ;PUT INTO THE QUEUE
                                ;BRANCH IF QUEUE IS FULL
```

```
                                        CLR     $TATUS(R2)          ;CLEAR 'DONE' BIT IN DPB
                                        MOVB    $RPCS1(R2),$PREVO(R2)   ;PREVIOUS COMMAND
                                        MOV     $CYL(R2),$PREVA+2(R2)   ;PREVIOUS CYLINDER ADDRESS
                                        MOV     $SEC(R2),$PREVA(R2)     ;PREVIOUS SEC , TRK ADDRESSES
                                        CLRB    $CODE(R2)           ;CHANGE WRITE DATA TO WRITE CHECK DATA
                                        MOVB    #WCKD,$COMND(R2)        ;CHANGE FUNCTION CODE TO WRITE CHECK
                                1$:     RTS     PC                  ;EXIT

                                ;SPECIAL CONDITION ROUTINE

                                SC:     MOVB    RPAS(R4),R3         ;READ "RPAS" REGISTER
                                        BNE     2$                  ;BRANCH IF ANY 'ATA' BITS SET
                                        JSR     R0,RD.RP            ;READ CONTROL AND STATUS REGISTER
                                        RPCS1
                                        CI8
                                        ROLB    (SP)+               ;IS "IE"=1?
                                        BMI     1$                  ;YES, NO DRIVES TO CHECK
                                        BR      1$-4                ;BRANCH OVER ERROR, REPLACE BRANCH WITH 'NOP'
                                                                    ;IF ERROR REPORT IS DESIRED
                                        EMT     1                   ;REPORT ILLEGAL INTERRUPT
                                        JSR     PC,SET.IE           ;SET INTERRUPT ENABLE
                                1$:     RTS     PC                  ;RETURN

                                2$:     CLR     -(SP)               ;PROCESS ALL DRIVES THAT HAVE
                                        MOVB    R3,(SP)             ;STORE ATA BITS ON STACK
                                        CLR     R1                  ;SETUP R1 & R3 TO CHECK DRIVE 0
                                        MOV     #1,R3
                                SC3:    BIT     R3,(SP)             ;IS THIS ATA BIT SET ?
                                        BNE     SC5                 ;BR IF YES
                                SC4:    INC     R1                  ;MOVE TO THE NEXT DRIVE
                                        ASLB    R3                  ;ANY MORE DRIVES TO CHECK ?
                                        BNE     SC3                 ;BR IF YES
                                        TST     (SP)+               ;CLEAN OFF THE STACK
                                        RTS     PC

                                SC5:    TSTB    DPRQS(R1)           ;IS THERE PORT REQUEST OUTSTANDING ?
                                        BEQ     1$                  ;BR IF NO
                                        JMP     SC13                ;START THE OUTSTANDING COMMAND

                                1$:     TSTB    DRVSTA(R1)          ;IS THIS DRIVE ON-LINE ?
                                        BGT     2$                  ;BR IF YES
                                        JSR     PC,GETREQ           ;GET DPB POINTER
                                        JSR     PC,SVRHXX           ;SAVE THE RHXX/RP07 REGISTERS
                                        JSR     PC,SC12             ;SAVE RPDS, RPER1, RPER2 AND RPER3
                                                                    ;ALSO DO A DRIVE INIT (DRVINT)
                                        TSTB    DRVSTA(R1)          ;DID DRIVE COME ON-LINE ?
                                        BLE     3$                  ;BR IF NO
                                2$:     TSTB    DRVACT(R1)          ;DRIVE ACTIVE WITH COMMAND OR ERROR RECOVERY ?
                                        BNE     SC6                 ;BR IF EITHER
                                        JSR     PC,SC12             ;SAVE RPDS, RPER1, RPER2 AND RPER3
                                                                    ;ALSO DO A DRIVE INIT (DRVINT)
                                3$:     TSTB    DRVSTA(R1)          ;CHECK ON DRIVE'S STATUS
                                        BMI     4$                  ;BR IF UNSAFE
                                        MOV     #111,-(SP)          ;DRIVE CLEAR
                                        JSR     R0,WRT.RP           ;WRITE THE COMMAND INTO RPCS1
                                        RPCS1                       ;REGISTER INDEX
                                        SC8                         ;PARITY EXIT ADDRESS
```

```
    587 043732  116164  040550  000016          MOVB    ATABIT(R1),RPAS(R4)     ;CLR ATTN BIT
    588 043740  000240                          NOP
    592 043742  000727                  4$:     BR      SC4                     ;CHECK FOR MORE DRIVES
    593
    594 043744  006301                  SC6:    ASL     R1                      ;SETUP TO ADDRESS WORDS
    595 043746  012761  177777  040526          MOV     #-1,TIMER(R1)           ;STOP THE TIMER
    596 043754  006201                          ASR     R1                      ;RESTORE THE DRIVE ADDRESS
    597 043756  004737  046144                  JSR     PC,GETREQ               ;GET THE DPB POINTER FROM THE QUEUE
    598 043762  010164  000010                  MOV     R1,RPCS2(R4)            ;SELECT DRIVE
    599 043766  000137  044022                  JMP     SC11                    ;PROCESS THE SEARCH
    600
    601 043772  105761  040444          SC8:    TSTB    DRVACT(R1)              ;IS DRIVE IDLE?
    602 043776  001405                          BEQ     1$                      ;YES--BRANCH
    603 044000  004737  046144                  JSR     PC,GETREQ               ;GET DPB POINTER
    604 044004  004737  042670                  JSR     PC,CI7                  ;PROCESS THE PARITY ERROR
    605 044010  000402                          BR      2$                      ;CONTINUE
    606
    607 044012  004737  042704          1$:     JSR     PC,CI7B                 ;PROCESS THE UNCORRECTABLE PARITY ERROR
    608 044016  000137  043622          2$:     JMP     SC4                     ;CHECK MORE DRIVES
    609
    610 044022  105061  040444          SC11:   CLRB    DRVACT(R1)              ;SET DRIVE IDLE
    611 044026  136137  040550  040516          BITB    ATABIT(R1),SRCHWT       ;DOING A SEARCH OPERATION FOR
    612                                                                         ;AN I/O COMMAND?
    613 044034  001012                          BNE     1$                      ;BRANCH IF YES
    614 044036  004737  046166                  JSR     PC,POPQUE               ;REMOVE REQUEST FROM QUEUE
    615 044042  052762  000200  000016          BIS     #BIT07,16(R2)           ;SET "DONE" BIT
    616 044050  005737  040522                  TST     SAVEFG                  ;SAVE THE REGISTERS?
    617 044054  100002                          BPL     1$                      ;BR IF NO
    618 044056  004737  045262                  JSR     PC,SVRHXX               ;YES--SAVE ALL OF THE RHXX/RP07 REG'S
    619 044062  116164  040550  000016  1$:     MOVB    ATABIT(R1),RPAS(R4)     ;CLEAR ATTENTION BIT
    620 044070  146137  040550  040516          BICB    ATABIT(R1),SRCHWT       ;CLEAR IMPLIED SEEK SET
    621 044076  006301                          ASL     R1                      ;WORD INDEX
    622 044100  012761  177777  040526          MOV     #-1,TIMER(R1)           ;STOP CLOCK
    623 044106  006201                          ASR     R1                      ;RESTORE R1
    624 044110  004737  041542                  JSR     PC,OPT                  ;START A REQUEST
    625 044114  000137  043622                  JMP     SC4                     ;CHECK FOR MORE DRIVES
    626
    627 044120  010164  000010          SC12:   MOV     R1,RPCS2(R4)            ;SELECT DRIVE
    628 044124  006301                          ASL     R1
    629 044126  006301                          ASL     R1
    630 044130  006301                          ASL     R1
    631 044132  016461  000012  040344          MOV     RPDS(R4),RPSTU0(R1)     ;STORE DRIVE STATUS
    632 044140  016461  000014  040346          MOV     RPER1(R4),RPSTU0+2(R1)  ;STORE ERROR REG #1
    633 044146  016461  000040  040350          MOV     RPER2(R4),RPSTU0+4(R1)  ;STORE ERROR REG #2
    634 044154  016461  000042  040352          MOV     RPER3(R4),RPSTU0+6(R1)  ;STORE ERROR REG #3
    635 044162  006201                          ASR     R1
    636 044164  006201                          ASR     R1
    637 044166  006201                          ASR     R1
    638 044170  004037  040750                  JSR     R0,DRVINT               ;INIT. THE STATE OF THE DRIVE
    639 044174  000401                          BR      1$                      ;TAKE ERROR EXIT
    640 044176  000207                          RTS     PC                      ;RETURN
    641 044200  005726                  1$:     TST     (SP)+                   ;CLEAR THE STACK
    642 044202  000673                          BR      SC8                     ;PROCESS THE PARITY ERROR
    643
    649 044204  010164  000010          SC13:   MOV     R1,RPCS2(R4)            ;SELECT THE DRIVE
    650 044210  116164  040550  000016          MOVB    ATABIT(R1),RPAS(R4)     ;CLEAR THE ATTENTION BIT
    651 044216  105761  040474          1$:     TSTB    DPINT(R1)               ;INITIALIZING THE DRIVE ?
```

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044222  001424                          BEQ     2$                      ;BR IF NOT
044224  105061  040474                  CLRB    DPINT(R1)               ;CLEAR THE INIT INDICATOR
044230  004037  040750                  JSR     R0,DRVINT               ;GO INIT THE DRIVE
044234  000240                          NOP                             ;DUMMY PARITY ERROR RETURN
044236  105761  040454                  TSTB    DRVSTA(R1)              ;DRIVE ONLINE ?
044242  003014                          BGT     2$                      ;BR IF YES -- START ORDER
044244  005702                          TST     R2                      ;QUEUE ENTRY FOR THE DRIVE
044246  001423                          BEQ     4$                      ;BR IF NOT
044250  004737  046144                  JSR     PC,GETREQ               ;GET DPB ADDRESS
044254  052762  140000  000016          BIS     #BIT15!BIT14,16(R2)  ;INFORM USER THAT DRIVE OFFLINE
044262  004737  045262                  JSR     PC,SVRHXX               ;SAVE THE REGISTERS
044266  004737  046166                  JSR     PC,POPQUE               ;REMOVE THE QUEUE
044272  000411                          BR      4$

044274  032764  004000  000000  2$:     BIT     #BIT11,RPCS1(R4)                ;DVA SET ?
044302  001003                          BNE     3$                      ;SET THEN CALL OPT
044304  004737  045426                  JSR     PC,SET.IE
044310  000402                          BR      4$

044312  004737  041542          3$:     JSR     PC,OPT                  ;START THE REQUEST
044316  000137  043622          4$:     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

044322  005737  040520  RPTMR:  TST     ACTDRV                  ;CHECK "ACTDRV & ACTSTR"
044326  001027                  BNE     4$                      ;IF NON ZERO EXIT
044330  112737  000001  040521  MOVB    #1,ACTSTR               ;SET "ACTSTR"
044336  104412                  SAVREG                          ;SAVE R0 - R5
044340  005001                  CLR     R1                      ;START WITH DRIVE 0
044342  005003                  CLR     R3
044344  005763  040526  1$:     TST     TIMER(R3)               ;IS THE TIMER RUNNING?
044350  002406                  BLT     2$                      ;BRANCH IF NO
044352  166663  000002  040526  SUB     2(SP),TIMER(R3)         ;COUNT THE INTERVAL
044360  003002                  BGT     2$                      ;BR IF NO SOFTWARE TIMEOUT
044362  004737  044412          JSR     PC,STO                  ;CALL SOFTWARE TIMEOUT ROUTINE
044366  005201          2$:     INC     R1                      ;MOVE TO NEXT DRIVE
044370  005723                  TST     (R3)+
044372  022701  000010          CMP     #8.,R1                  ;OUT OF DRIVES?
044376  003362                  BGT     1$                      ;BRANCH IF NO
044400  104413          3$:     RESREG                          ;RESTORE R0 - R5
044402  105037  040521          CLRB    ACTSTR                  ;ZERO ACTIVE SOFTWARE TIMEOUT ROUTINE FLAG
044406  012616          4$:     MOV     (SP)+,(SP)              ;ADJUST THE STACK
044410  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
```

```
                                        STO:    MOV     R1,-(SP)        ;SAVE R1
                                                MOV     R3,-(SP)        ;SAVE R3
                040560                          MOV     RPAD,R4         ;GET ADDRESS OF "RPCS1"
                000010                          MOV     R1,RPCS2(R4)    ;SELECT THE DRIVE
                045036                          JSR     R0,RD.RP        ;READ THE DRIVE STATUS REGISTER
                000012                          RPDS
                044724                          9$
                105726                          TSTB    (SP)+           ;IS "DRY"=1?
                100473                          BMI     6$              ;BR IF YES
                040474                  1$:     TSTB    DPINT(R1)       ;TRYING TO INTIALIZE THE DRIVE ?
                001070                          BNE     6$              ;BR IF YES
                040504                          TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
                001065                          BNE     6$              ;BR IF YES
                040514                          MOV     TRNSWT,R2       ;GET "DPB" FROM THE "TRANSFER WAIT" QUEUE
                040546                          CMP     R1,DTUW         ;TRANSFER UNDERWAY ON THIS DRIVE?
                001402                          BEQ     2$              ;BRANCH IF YES
                046144                          JSR     PC,GETREQ       ;GET DPB ADDRESS
101000  000016          2$:     BIS     #BIT15!BIT09,16(R2)     ;SET THE ERROR FLAGS
                045262                          JSR     PC,SVRHXX       ;SAVE RHXX/RP07 REGISTERS
C00040  000010                  MOV     #BIT05,RPCS2(R4)                ;"INIT" THE MASS BUS
                040444                          CLRB    DRVACT(R1)      ;DRIVE IS IDLE
                005001                          CLR     R1              ;START WITH DRIVE 0
                005003                          CLR     R3
                040750                  3$:     JSR     R0,DRVINT       ;INIT. THIS DRIVE
                000475                          BR      9$              ;PARITY ERROR RETURN

                040444                          TSTB    DRVACT(R1)      ;DRIVE IDLE BEFORE THE INIT.?
                001414                          BEQ     5$              ;YES--BRANCH
                040514                          MOV     TRNSWT,R2       ;GET "DPB" FROM THE "TRANSFER WAIT" QUEUE
                040546                          CMP     DTUW,R1         ;WAS A DATA TRANSFER UNDERWAY ON THIS DRIVE?
                001402                          BEQ     4$              ;YES--BRANCH
                046144                          JSR     PC,GETREQ       ;GET THE DPB POINTER FROM QUEUE
100400  000016          4$:     BIS     #BIT15!BIT08,16(R2)     ;INFORM USER OF INIT.
                040444                          CLRB    DRVACT(R1)      ;SET DRIVE ACTIVE TO IDLE
177777  040526          5$:     MOV     #-1,TIMER(R3)   ;STOP THE TIMER
                005723                          TST     (R3)+           ;UPDATE THE INDEX
                005201                          INC     R1              ;INCREMENT THE DRIVE NUMBER
                000010                          CMP     #8.,R1          ;LAST DRIVE BEEN CHECKED?
                003346                          BGT     3$              ;NO--LOOP
177777  040546                                  MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
                040514                          CLR     TRNSWT          ;CLEAR TRANSFER WAIT QUEUE
                045772                          JSR     PC,CLRQUE       ;CLEAR ALL REQUEST QUEUES
                000500                          BR      13$             ;EXIT

                000016                  6$:     MOVB    RPAS(R4),R5     ;READ ATTENTION REG
                040550                          BITB    ATABIT(R1),R5   ;IS ATTENTION FOR THIS DRIVE UP ?
                001017                          BNE     7$              ;YES--BRANCH
                040474                          TSTB    DPINT(R1)       ;TRYING TO INTIALIZE THE DRIVE ?
                001031                          BNE     10$             ;BR IF YES - DRIVE NOT ONLINE
                040504                          TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
                001045                          BNE     11$             ;BR IF YES - NO RESPONSE TO REQUEST
                040546                          CMP     R1,DTUW         ;DATA TRANSFER UNDERWAY FOR THIS DRIVE
                001267                          BNE     1$              ;BR IF NO
                045036                          JSR     R0,RD.RP        ;READ CONTROL AND STATUS REGISTER
                000000                          RPCS1
                044724                          9$
                105726                          TSTB    (SP)+           ;CHECK 'RDY'
```

```
                                                BPL     1$              ;BR IF ''RDY''=0
                                        7$:     TSTB    DPINT(R1)       ;INITIALIZING THE DRIVE ?
                                                BNE     8$              ;BR IF INIT PENDING
                                                TSTB    DPRQS(R1)       ;PORT REQUEST PENDING ?
                                                BEQ     13$             ;BR IF NOT
                                        8$:     MOV     #-1,TIMER(R3)   ;STOP THE TIMER
                                                BR      13$             ;EXIT

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

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

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

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

                                        RD.RP:  MOV     (SP),-(SP)      ;SAVE R0
                                                MOV     RPADR,-(SP)     ;ADDRESS OF THE
                                                ADD     (R0)+,(SP)      ;REG
                                                MOV     @(SP),4(SP)     ;READ THE CONTENTS OF THE REG
                                                MOV     RPADR,(SP)      ;CHECK IF NON-EXIST DRIVE
                                                ADD     #RPCS2,(SP)     ;
                                                BIT     #BIT12,@(SP)    ;NED BIT SET ?
                                                BNE     1$              ;ERROR EXIT
                                                BIT     #BIT13,@RPADR   ;MCPE SET ?
                                                BEQ     2$              ;EXIT
                                        1$:     MOV     2(SP),4(SP)     ;MOVE THE R0 TO TOP OF STACK
                                                CMP     (SP)+,(SP)+     ;CLEAR OFF THE STACK
                                                MOV     (R0),R0         ;ERROR EXIT ADDRESS
                                                BR      3$              ;EXIT

                                        2$:     ADD     #2,R0           ;NORMAL EXIT
```

```
045124  005726                          TST     (SP)+           ;CLEAR OFF STACK
045126  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

045130                          WRT.RP:
045130  012046                          MOV     (R0)+,-(SP)     ;FORMING THE REG ADDRESS
045132  001017                          BNE     2$              ;BRANCH IF NOT RPCS1
045134  122766  000150  000004          CMPB    #150,4(SP)      ;DATA XTRNS COMMAND ?
045142  002413                          BLT     2$              ;BRANCH IF NOT
045144  105777  173410          1$:     TSTB    @RPADR          ;SEE IF CONTROLLER READY
045150  100375                          BPL     1$
045152  017746  173402                  MOV     @RPADR,-(SP)    ;READ RPCS1
045156  000316                          SWAB    (SP)            ;MERG THE A17,A18,PSEL BITS
045160  042716  177770                  BIC     #^C7,(SP)       ;CHOP OFF THE REST BITS FROM RPCS1
045164  111666  000007                  MOVB    (SP),7(SP)      ;ATTACH A17,A18,PSEL TO COMMAND
045170  005726                          TST     (SP)+           ;RESTORE STACK LEVEL
045172  063716  040560          2$:     ADD     RPADR,(SP)      ;THE DEST REG ADDRESS
045176  016676  000004  000000          MOV     4(SP),@(SP)     ;WRITE THE REGISTER
045204  013716  040560                  MOV     RPADR,(SP)      ;CHECK NED,PAR BITS
045210  062716  000010                  ADD     #RPCS2,(SP)     ;
045214  032776  010000  000000          BIT     #BIT12,@(SP)    ;NONE EXIST DRIVE ?
045222  001013                          BNE     3$              ;BRANCH IF IT IS
045224  013716  040560                  MOV     RPADR,(SP)      ;ADDRESS RPER1
045230  062716  000014                  ADD     #RPER1,(SP)     ;
045234  032776  000010  000000          BIT     #BIT3,@(SP)     ;PAR SET ?
045242  001003                          BNE     3$              ;BRANCH IF SO
045244  062700  000002                  ADD     #2,R0           ;NORMAL RETURN
045250  000401                          BR      4$              ;EXIT

045252  011000                  3$:     MOV     (R0),R0         ;ERROR EXIT
045254  005726                  4$:     TST     (SP)+           ;CLEAR OFF THE STACK
045256  012616                          MOV     (SP)+,(SP)      ;MOVE R0 TO TOP OF STACK
045260  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

045262  104412                  SVRHXX: SAVREG                  ;SAVE R0 - R5
045264  005702                          TST     R2              ;QUEUE ENTRY FOR THE DRIVE ?
045266  001455                          BEQ     7$              ;BR IF NONE
045270  013704  040560                  MOV     RPADR,R4
045274  111264  000010                  MOVB    (R2),RPCS2(R4)  ;SELECT DRIVE
045300  016203  000014                  MOV     14(R2),R3       ;GET THE ERROR TABLE POINTER
045304  001446                          BEQ     7$              ;EXIT IF NO ADDRESS
045306  005037  045342                  CLR     3$              ;COUNTER & POINTER
045312  023727  045342  000022  1$:     CMP     3$,#RPDB        ;REACHED THE BUFFER REGISTER ?
```

```
045320  001006                          BNE     2$                      ;BR IF NOT
045322  032764  000200  000010          BIT     #BIT07,RPCS2(R4)                ;'OR' SET ?
045330  001002                          BNE     2$                      ;BR IF SET
045332  005023                          CLR     (R3)+                   ;STORE RPDB AS ZEROES
045334  000405                          BR      4$                      ;CONTINUE

045336  004037  045036          2$:     JSR     R0,RD.RP                ;READ THE SELECTED REGISTER
045342  000000                  3$:     .WORD   0                       ;REGISTER INDEX
045344  045370                          5$                              ;ERROR RETURN ADDRESS
045346  012623                          MOV     (SP)+,(R3)+             ;STORE THE REGISTER CONTENTS
045350  023727  045342  000046  4$:     CMP     3$,#RPEC2               ;REACHED THE END ?
045356  001406                          BEQ     6$                      ;BR IF YES
045360  062737  000002  045342          ADD     #2,3$                   ;INCREMENT THE REGISTER INDEX
045366  000751                          BR      1$                      ;CONTINUE READING THE REGISTERS

045370  004737  042670          5$:     JSR     PC,CI7                  ;PROCESS THE UNCORRECTABLE PARITY ERROR
045374  013746  001234          6$:     MOV     $CPUOP,-(SP)            ;CHECK THE CPU (RH) TYPE
045400  042716  003777                  BIC     #^C174000,(SP)          ;LEAVE THE CPU TYPE BITS
045404  022726  030000                  CMP     #30000,(SP)+            ;SEE IF RH70
045410  001004                          BNE     7$                      ;IF NE, NO
045412  063704  040566                  ADD     RHEXT,R4                ;POINT TO RPBAE
045416  012423                          MOV     (R4)+,(R3)+             ;STORE THE CONTENTS
045420  011413                          MOV     (R4),(R3)               ;GET RPCS3
045422  104413                  7$:     RESREG                          ;RESTORE R0 - R5
045424  000207                          RTS     PC                      ;RETURN

                                        ;ROUTINE TO SET THE INTERRUPT ENABLE (IE) BIT IN RPCS1 WITHOUT GETTING A
                                        ;TRANSFER ERROR (TRE).
                                        ;CALL
                                        ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                        ;       JSR     PC,SET.IE       ;SET INTERRUPT ENABLE ROUTINE
                                        ;       RETURN

045426  010446                  SET.IE: MOV     R4,-(SP)                ;SAVE R4
045430  013704  040560                  MOV     RPADR,R4                ;PICKUP ADDRESS OF RPCS1
045434  010164  000010                  MOV     R1,RPCS2(R4)            ;SELECT DRIVE
045440  011446                          MOV     (R4),-(SP)              ;READ RPCS1
045442  052716  040000                  BIS     #BIT14,(SP)             ;SET THE "TRE" BIT OF THE WORD READ
045446  000316                          SWAB    (SP)                    ;ADJUST FOR DATO
045450  112714  000100                  MOVB    #BIT06,(R4)             ;SET "IE"
045454  032764  010000  000010          BIT     #BIT12,RPCS2(R4)        ;IS "NED"=1?
045462  001002                          BNE     1$                      ;YES--CLEAR "TRE"
045464  005726                          TST     (SP)+                   ;CLEAN OFF THE STACK
045466  000402                          BR      2$

045470  112664  000001          1$:     MOVB    (SP)+,1(R4)             ;CLEAR "TRE"
045474  012604                  2$:     MOV     (SP)+,R4                ;RESTORE R4
045476  000207                          RTS     PC                      ;RETURN TO CALLER

                                        ;QUEUE COUNT
045500      000                 QCNT:   .BYTE   0                       ;DRIVE 0
045501      000                         .BYTE   0                       ;DRIVE 1
045502      000                         .BYTE   0                       ;DRIVE 2
045503      000                         .BYTE   0                       ;DRIVE 3
045504      000                         .BYTE   0                       ;DRIVE 4
045505      000                         .BYTE   0                       ;DRIVE 5
045506      000                         .BYTE   0                       ;DRIVE 6
```

```
                                        .BYTE   0               ;DRIVE 7
                                ;QUEUE INPUT POINTERS
                                QINPT:  .WORD   QDRV0           ;DRIVE 0
                                        .WORD   QDRV1           ;DRIVE 1
                                        .WORD   QDRV2           ;DRIVE 2
                                        .WORD   QDRV3           ;DRIVE 3
                                        .WORD   QDRV4           ;DRIVE 4
                                        .WORD   QDRV5           ;DRIVE 5
                                        .WORD   QDRV6           ;DRIVE 6
                                        .WORD   QDRV7           ;DRIVE 7
                                ;QUEUE OUTPUT POINTERS
                                QOUTPT: .WORD   QDRV0           ;DRIVE 0
                                        .WORD   QDRV1           ;DRIVE 1
                                        .WORD   QDRV2           ;DRIVE 2
                                        .WORD   QDRV3           ;DRIVE 3
                                        .WORD   QDRV4           ;DRIVE 4
                                        .WORD   QDRV5           ;DRIVE 5
                                        .WORD   QDRV6           ;DRIVE 6
                                        .WORD   QDRV7           ;DRIVE 7
                                QSTART: .WORD   QDRV0           ;DRIVE 0 START ADDRESS
                                QSTOP:  .WORD   QDRV1           ;DRIVE 0 STOP ADDRESS & DRIVE 1 START ADDRESS
                                        .WORD   QDRV2           ;STOP DRIVE 1--START DRIVE 2
                                        .WORD   QDRV3           ;STOP DRIVE 2--START DRIVE 3
                                        .WORD   QDRV4           ;STOP DRIVE 3--START DRIVE 4
                                        .WORD   QDRV5           ;STOP DRIVE 4--START DRIVE 5
                                        .WORD   QDRV6           ;STOP DRIVE 5--START DRIVE 6
                                        .WORD   QDRV7           ;STOP DRIVE 6--START DRIVE 7
                                        .WORD   QTERP           ;STOP DRIVE 7
                                ;DRIVE REQUEST QUEUES
                                QDRV0:  .BLKW   10
                                QDRV1:  .BLKW   10
                                QDRV2:  .BLKW   10
                                QDRV3:  .BLKW   10
                                QDRV4:  .BLKW   10
                                QDRV5:  .BLKW   10
                                QDRV6:  .BLKW   10
                                QDRV7:  .BLKW   10
                        045772  QTERP=.
                                ;ROUTINE TO CLEAR ALL OF THE REQUEST QUEUES
                                ;
                                ;CALL
                                ;       JSR     PC,CLRQUE
                                CLRQUE: SAVREG                  ;SAVE R0 - R5
                                        MOV     #QCNT,R2        ;ZERO THE QUEUE COUNTS
                                        CLR     (R2)+           ;DRIVES 0 & 1
                                        CLR     (R2)+           ;DRIVES 2 & 3
                                        CLR     (R2)+           ;DRIVES 4 & 5
                                        CLR     (R2)+           ;DRIVES 6 & 7
```

```
 999 046010  012703  000010                MOV     #8.,R3          ;MOVE THE STARTING
1000 046014  012701  045550                MOV     #QSTART,R1      ;ADDRESS OF THE QUEUE INTO
1001 046020  012122                1$:     MOV     (R1)+,(R2)+     ;THE QUEUE INPUT POINTER
1002 046022  005303                        DEC     R3
1003 046024  001375                        BNE     1$
1004 046026  012703  000010                MOV     #8.,R3          ;MOVE THE STARTING ADDRESS
1005 046032  012701  045550                MOV     #QSTART,R1      ;OF THE QUEUE INTO THE
1006 046036  012122                2$:     MOV     (R1)+,(R2)+     ;QUEUE OUTPUT POINTER
1007 046040  005303                        DEC     R3
1008 046042  001375                        BNE     2$
1009 046044  104413                        RESREG                  ;RESTORE R0 - R5
1010 046046  000207                        RTS     PC
1011
1012                               ;EMPTY THE QUEUE SPECIFIED BY R1
1013                               ;
1014                               ;CALL
1015                               ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
1016                               ;       JSR     PC,EMPTYQ
1017
1018 046050  105061  045500       EMPTYQ: CLRB    QCNT(R1)        ;CLEAR NUMBER OF ITEMS IN QUEUE
1019 046054  006301                        ASL     R1
1020 046056  016161  045510  045530        MOV     QINPT(R1),QOUTPT(R1) ;SET OUTPUT QUEUE POINTER=INPUT POINTER
1021 046064  006201                        ASR     R1
1022 046066  000207                        RTS     PC
1023
1024                               ;ROUTINE TO PUT A REQUEST IN QUEUE
1025                               ;
1026                               ;CALL
1027                               ;       MOV     #DPB,R2         ;ADDRESS OF DRIVE PARAMETER BLOCK
1028                               ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
1029                               ;       JSR     R0,DRVQUE       ;GO PUT REQUEST IN QUEUE
1030                               ;       ------                  ;RETURN HERE IF QUEUE IS FULL
1031                               ;       ------                  ;RETURN HERE IF REQUEST IS IN QUEUE
1032
1033 046070  122761  000010  045500  DRVQUE: CMPB    #10,QCNT(R1)    ;IS QUEUE FULL?
1034 046076  001421                        BEQ     2$              ;BR IF YES-TAKE RETURN1
1035 046100  105261  045500                INCB    QCNT(R1)        ;INCREMENT QUEUE COUNT
1036 046104  006301                        ASL     R1
1037 046106  010271  045510                MOV     R2,@QINPT(R1)   ;PUT THIS REQUEST IN QUEUE
1038 046112  062761  000002  045510        ADD     #2,QINPT(R1)    ;UPDATE THE QUEUE POINTER
1039 046120  026161  045510  045552        CMP     QINPT(R1),QSTOP(R1) ;TIME TO RESET THE POINTER
1040 046126  001003                        BNE     1$              ;BRANCH IF NO
1041 046130  016161  045550  045510        MOV     QSTART(R1),QINPT(R1) ;YES--RESET POINTER
1042 046136  006201                1$:     ASR     R1
1043 046140  005720                        TST     (R0)+           ;TAKE RETURN 2
1044 046142  000200                2$:     RTS     R0              ;RETURN TO USER
1045
1046                               ;ROUTINE TO GET THE "DPB" ADDRESS OF NEXT REQUEST IN QUEUE
1047                               ;
1048                               ;ON RETURN, R2 WILL CONTAIN POINTER ADDRESS OF "DPB" REQUESTED OR
1049                               ;ZERO IF NO REQUEST IN QUEUE.
1050                               ;
1051                               ;CALL
1052                               ;       MOV     #DRVNUM,R1      ;DRIVE NUMBER
1053                               ;       JSR     PC,GETREQ       ;GO GET THE REQUEST
1054
1055 046144  005002                GETRFQ: CLR     R2
```

```
1056 046146  105761  045500              TSTB    QCNT(R1)          ;IS THERE ANY REQUEST IN QUEUE?
1057 046152  001404                      BEQ     2$                ;NO---BRANCH
1058 046154  006301              1$:     ASL     R1
1059 046156  017102  045530              MOV     @QOUTPT(R1),R2    ;PICKUP "DPB" POINTER FOR THIS DRIVE
1060 046162  006201                      ASR     R1
1061 046164  000207              2$:     RTS     PC                ;RETURN TO USER
1062
1063                              ;ROUTINE TO "POP" THE REQUEST FROM QUEUE
1064                              ;
1065                              ;ON RETURN, R2 WILL CONTAIN POINTER ADDRESS OF "DPB" REMOVED
1066                              ;
1067                              ;CALL
1068                              ;       MOV     #DRVNUM,R1        ;DRIVE NUMBER
1069                              ;       JSR     PC,POPQUE         ;CALL TO REMOVE RLQUEST
1070
1071 046166  105361  045500        POPQUE: DECB    QCNT(R1)          ;DECREMENT QUEUE COUNT
1072 046172  006301                      ASL     R1
1073 046174  017102  045530              MOV     @QOUTPT(R1),R2    ;GET THE "DPB" POINTER
1074 046200  005071  045530              CLR     @QOUTPT(R1)       ;REMOVE DPB ADDRESS FROM THE QUEUE
1075 046204  062761  000002  045530      ADD     #2,QOUTPT(R1)     ;UPDATE THE QUEUE POINTER
1076 046212  026161  045530  045552      CMP     QOUTPT(R1),QSTOP(R1) ;TIME TO RESET THE POINTER?
1077 046220  001003                      BNE     1$                ;NO--BRANCH TO EXIT
1078 046222  016161  045550  045530      MOV     QSTART(R1),QOUTPT(R1) ;YES--RESET THE POINTER
1079 046230  006201              1$:     ASR     R1
1080 046232  000207                      RTS     PC                ;RETURN TO USER
```

```
                        .SBTTL  DEVICE PARAMETER BLOCKS

                        ;BLOCK LOCATION EQUATE STATEMENTS

                        .       = 0                     ;DRIVE NUMBER (BYTE)
000001                  $FMT    = 1                     ;FMT,HCI,ECI OR OFFSET CODE (BYTE)
000002                  $COMND  = $FMT+1                ;OPERATION CODE (BYTE)
000003                  $PSEL   = $FMT+2                ;PORT SELECT & BITS A16, A17 (BYTE)
000004                  $WCNT   = $FMT+3                ;WORD COUNT (2'S COMP)
000006                  $BUF    = $FMT+5                ;BUFFER ADDR OR REGISTER TABLE POINTER
000010                  $SEC    = $FMT+7                ;SECTOR ADDRESS OR 1ST REG ADDR
000011                  $TRK    = $FMT+10               ;TRACK ADDRESS OF LAST REG ADDR
000012                  $CYL    = $FMT+11               ;CYLINDER ADDR
000014                  $REG    = $FMT+13               ;REGISTER STORAGE (IF ERROR)
000016                  $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              ;WORDS READ PER PASS (DOUBLE WORD)
000042                  $WTPAS  = $WRDL+22              ;WORDS WRITTEN PER PASS (DOUBLE WORD)
000046                  $SEEKS  = $WRDL+26              ;NUMBER OF SEEKS PER PASS (DOUBLE WORD)
000052                  $OPERC  = $WRDL+32              ;OPERATION COUNT (DOUBLE WORD)
000056                  $WTOTL  = $WRDL+36              ;TOTAL WORDS WRITTEN X10^6 (DOUBLE WORD) &
                                                        ;1 X10^6 REPETITION COUNTER (DOUBLE WORD)
000066                  $RTOTL  = $WRDL+46              ;TOTAL WORDS READ X10^6 (DOUBLE WORD) &
                                                        ;1 X10^6 REPETITION COUNTER (DOUBLE WORD)
000076                  $STOTL  = $WRDL+56              ;TOTAL SEEK COUNT (DOUBLE WORD)
000102                  $TOTAL  = $WRDL+62              ;TOTAL ERRORS COUNT (ALL TYPES)
000104                  $SOFT   = $WRDL+64              ;'SOFT' ERROR COUNT
000106                  $HARD   = $WRDL+66              ;'HARD' ERROR COUNT
000110                  $SKI    = $WRDL+70              ;'SKI' ERROR COUNT
000112                  $MISPO  = $WRDL+72              ;PROG DETECTED MIS-POSITIONING ERROR COUNT
000114                  $PASSC  = $WRDL+74              ;PASS COUNTER
000116                  $FAIR   = $WRDL+76              ;OPERATION QUEUE 'FAIRNESS' COUNT
000120                  $HLDWC  = $WRDL+100             ;HOLD WORD FOR 'RELBUF' ROUTINE

                        ;INDEX EQUATES TO THE NEXT OPERATION PARAMETERS

000122                  $NCODE  = $WRDL+102             ;NEXT OPERATION CODE
000123                  $NPATC  = $NCODE+1              ;NEXT PATTERN
000124                  $NSEC   = $NCODE+2              ;NEXT SECTOR
000125                  $NTRK   = $NCODE+3              ;NEXT TRACK
000126                  $NCYL   = $NCODE+4              ;NEXT CYLINDER
000130                  $NEXT   = $NCODE+6              ;PARAMETER SELECTION INDICATOR
000132                  $FIRST  = $NCODE+10             ;FIRST OPERATION INDICATOR

                        ;INDEX EQUATES FOR MAXIMUM/MINIMUM ADDRESSES

000134                  MAXCYL  = $NCODE+12             ;MAXIMUM CYLINDER ADDRESS
000136                  MINCYL  = MAXCYL+2              ;MINIMUM CYLINDER ADDRESS
```

DEVICE PARAMETER BLOCKS

```
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/RH 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

                        ;DPB FOR DRIVE 0
046234    000   000     DRIVE0: .BYTE   0,0              ;DRIVE NUMBER 0
046236                          .BLKW   5
046250  046422                  .WORD   .+$RPCS1-$REG
046252                          .BLKB   $RPCS3-$REG

                        ;DPB FOR DRIVE 1
046476    001   000     DRIVE1: .BYTE   1,0              ;DRIVE NUMBER 1
046500                          .BLKW   5
046512  046664                  .WORD   .+$RPCS1-$REG
046514                          .BLKB   $RPCS3-$REG

                        ;DPB FOR DRIVE 2
046740    002   000     DRIVE2: .BYTE   2,0              ;DRIVE NUMBER 2
046742                          .BLKW   5
046754  047126                  .WORD   .+$RPCS1-$REG
```

```
046756                                          .BLKB   $RPCS3-$REG

                                        ;DPB FOR DRIVE 3
047202      003     000         DRIVE3: .BYTE   3,0             ;DRIVE NUMBER 3
047204                                  .BLKW   5
047216  047370                          .WORD   .+$RPCS1-$REG
047220                                  .BLKB   $RPCS3-$REG

                                        ;DPB FOR DRIVE 4
047444      004     000         DRIVE4: .BYTE   4,0             ;DRIVE NUMBER 4
047446                                  .BLKW   5
047460  047632                          .WORD   .+$RPCS1-$REG
047462                                  .BLKB   $RPCS3-$REG

                                        ;DPB FOR DRIVE 5
047706      005     000         DRIVE5: .BYTE   5,0             ;DRIVE NUMBER 5
047710                                  .BLKW   5
047722  050074                          .WORD   .+$RPCS1-$REG
047724                                  .BLKB   $RPCS3-$REG

                                        ;DPB FOR DRIVE 6
050150      006     000         DRIVE6: .BYTE   6,0             ;DRIVE NUMBER 6
050152                                  .BLKW   5
050164  050336                          .WORD   .+$RPCS1-$REG
050166                                  .BLKB   $RPCS3-$REG

                                        ;DPB FOR DRIVE 7
050412      007     000         DRIVE7: .BYTE   7,0             ;DRIVE NUMBER 7
050414                                  .BLKW   5
050426  050600                          .WORD   .+$RPCS1-$REG
050430                                  .BLKB   $RPCS3-$REG

107
108
109                                     ;GENERAL PURPOSE DEVICE PARAMETER BLOCK
110 050654      000         GENDPB: .BYTE   0               ;DRIVER PARAMETER BLOCK, DRIVE #
111 050655      000                 .BYTE   0               ;OFFSET VALUE OR FMT16, HCI OR ECI
112 050656      000                 .BYTE   0               ;COMMAND CODE
113 050657      000                 .BYTE   0               ;PSEL, A16 AND A17
114 050660  177776                  .WORD   -2              ;WORD COUNT (NEG)
115 050662  063324                  .WORD   CYLNDR          ;BUFFER ADDRESS
116 050664      000                 .BYTE   0               ;SECTOR ADDRESS
117 050665      000                 .BYTE   0               ;TRACK ADDRESS
118 050666  000000                  .WORD   0               ;CYLINDER ADDRESS
119 050670  050674                  .WORD   GENREG          ;ADDRESS TO SAVE ALL RHXX/RP07 REG'S
120 050672  000000                  .WORD   0               ;STATUS WORD
121
122 050674                  GENREG: .BLKW   24              ;REGISTER STORAGE
```

```
                                .SBTTL  ERROR MESSAGES

050744  122  110  040  EM1:    .ASCIZ  /RH CONTROLLER INTERRUPT OCCURRED (RPAS= 0)/
051017  125  116  105  EM2:    .ASCIZ  /UNEXPECTED ATTENTION OCCURRED/
051055  115  101  123  EM3:    .ASCIZ  /MASSBUS PARITY ERROR (MCPE=1)/
051113  115  101  123  EM4:    .ASCIZ  /MASSBUS PARITY ERROR (PAR=1)/
051150  101  104  104  EM5:    .ASCIZ  /ADDRESS PLUG CHANGE BIT SET/
051204  122  110  040  EM6:    .ASCIZ  /RH CONTROLLER DIDN'T RESPOND TO ADDRESSING/
051257  125  116  103  EM10:   .ASCIZ  /UNCORRECTABLE MASSBUS PARITY ERROR/
051322  106  101  124  EM11:   .ASCIZ  /FATAL MASSBUS PARITY ERROR/
051355  120  105  122  EM12:   .ASCIZ  /PERSISTENT DEVICE UNSAFE/
051406  117  120  105  EM13:   .ASCIZ  /OPERATION NOT COMPLETED WITHIN TIME LIMIT/
051460  104  122  111  EM14:   .ASCIZ  /DRIVE WENT OFFLINE/
051503  116  117  040  EM15:   .ASCIZ  /NO RESPONSE TO PORT REQUEST/
051537  110  105  101  EM20:   .ASCIZ  /HEADER CRC ERROR/
051560  104  101  124  EM21:   .ASCIZ  /DATA CHECK ('DCK') ERROR/
051611  127  122  111  EM22:   .ASCIZ  /WRITE CHECK ERROR - DATA CHECK ('DCK') SET/
051664  127  122  111  EM23:   .ASCIZ  /WRITE CHECK ERROR - DATA CHECK ('DCK') NOT SET/
051743  110  105  101  EM24:   .ASCIZ  /HEADER READ ERROR - 'FMT' BIT DROPPED/
052011  110  105  101  EM25:   .ASCIZ  /HEADER READ ERROR - HEADER COMPARE ('HCE') ERROR/
052072  106  117  122  EM26:   .ASCIZ  /FORMAT ERROR ('FER')/
052117  110  105  101  EM27:   .ASCIZ  /HEADER COMPARE ('HCE') ERROR/
052154  115  111  123  EM30:   .ASCIZ  /MISCELLANEOUS DRIVE ERROR/
052206  117  120  105  EM31:   .ASCIZ  /OPERATION INCOMPLETE ('OPI') ERROR/
052251  104  122  111  EM32:   .ASCIZ  /DRIVE TIMING ('DTE') ERROR/
052304  120  101  122  EM33:   .ASCIZ  /PARITY ('PAR') ERROR AFTER OPERATION STARTED/
052361  127  122  111  EM34:   .ASCIZ  /WRITE CLOCK FAILURE ('WCF') ERROR/
052423  111  116  126  EM35:   .ASCIZ  /INVALID ADDRESS ('IAE') ERROR/
052461  127  122  111  EM36:   .ASCIZ  /WRITE LOCK ('WLE') ERROR/
052512  104  101  124  EM37:   .ASCIZ  /DATA CHECK ('DCK') SET DURING WRITE CHECK/
052564  122  110  130  EM40:   .ASCIZ  /RHXX OR UNIBUS TRANSFER ERROR/
052622  102  125  123  EM41:   .ASCIZ  /BUS ADDRESS OR WORD COUNT INCORRECT/
052666  104  101  124  EM42:   .ASCIZ  /DATA COMPARE ERRORS - NO OTHER ERROR(S) DETECTED/
052747  103  101  116  EM43:   .ASCIZ  /CAN'T MATCH DATA READ WITH A PATTERN - UNKNOWN DATA PATTERN/
053043  105  122  122  EM44:   .ASCIZ  /ERROR BIT(S) SET, BUT NO ERROR SIGNALED BY THE RH CONTROLLER/
053140  105  103  103  EM45:   .ASCIZ  /ECC LOGIC FAILURE - POSITION REGISTER VALUE NOT VALID/
053226  102  125  123  EM46:   .ASCIZ  /BUS ADDRESS AND WORD COUNT NOT CONSISTENT/
053300  105  103  103  EM47:   .ASCIZ  /ECC LOGIC FAILURE - PATTERN REGISTER IS ZERO/
053355  123  105  105  EM50:   .ASCIZ  /SEEK INCOMPLETE ('SKI') ERROR/
053413  120  122  117  EM51:   .ASCIZ  /PROGRAM DETECTED POSITIONING ERROR/
053456  105  103  110  EM52:   .ASCIZ  /ECH ERROR - UNCORRECTABLE ECC ERROR/
053522  104  122  111  EM60:   .ASCIZ  /DRIVE UNSAFE ERROR/
053545  105  101  122  EM70:   .ASCIZ  /EARLY WARNING, TEMPERATURE WARNING (TPE) ERROR/
053624  105  101  122  EM71:   .ASCIZ  /EARLY WARNING, AIR SYSTEM WARNING (AIR) ERROR/
053702  105  101  122  EM72:   .ASCIZ  /EARLY WARNING ERROR, AIR, TPE, NOT SET/
```

ERROR MESSAGES

```
      1 053751     122     120     101  DH1:    .ASCIZ  /RPAS/
      2 053756     104     122     111  DH2:    .ASCIZ  /DRIVE   RPDS    RPER1   RPER3   RPER2   RPAS/
      3 054033     104     122     111  DH3:    .ASCIZ  /DRIVE   REG ADR  DATA/
      4 054061     104     122     111  DH4:    .ASCIZ  /DRIVE   REG ADR    GOOD    BAD/
      5 054120     122     120     101  DH6:    .ASCIZ  /RPADR/
      6 054126     104     122     111  DH14:   .ASCIZ  /DRIVE   RPCS1   RPCS2   RPDS    RPER1   RPER2   RPER3   RPEC1/<CRLF>
      7 054225     122     120     105  DH15:   .ASCIZ  /RPEC2   RPWC    RPBA    RPDA    RPAS    RPLA    RPDB    RPMR1/<CRLF>
      8 054324     122     120     104  DH16:   .ASCIZ  /RPDT    RPSN    RPOF    RPDC    RPCC    STATUS/<CRLF>
      9 054404     122     120     102  DH17:   .ASCIZ  /RPBAE   RPCS3/<CRLF>
     10                               .EVEN
```

```
      1 054424  001316  000000          DT1:    .WORD   ATTN,0
      2 054430  001220  000000          DT2:    .WORD   DRIVE,0
      3 054434  001220  000000          DT3:    .WORD   DRIVE,0
      4 054440  001220  000000          DT4:    .WORD   DRIVE,0
      5 054444  001272  000000          DT6:    .WORD   $RPADR,0
      6
      7 054450  000166  000176  000200 DT14:    .WORD   $RPCS1,$RPCS2,$RPDS,$RPER1,$RPER2,$RPER3,$RPEC1,0
      8 054470  000234  000170  000172 DT15:    .WORD   $RPEC2,$RPWC,$RPBA,$RPDA,$RPAS,$RPLA,$RPDB,$RPMR1,0
      9 054512  000214  000216  000220 DT16:    .WORD   $RPDT,$RPSN,$RPOF,$RPDC,$RPCC,$TATUS,0
     10 054530  000236  000240  000000 DT17:    .WORD   $RPBAE,$RPCS3,0
```

```
                                .SBTTL  ASCII MESSAGES

054536  120     122     123  LIN2C:  .ASCIZ  /PRSNT COMMAND= /
054556  040     040     120  LIN2P:  .ASCIZ  /  PREVS COMAND= /
054577  052     040     105  LIN2S:  .ASCIZ  @* ERROR AT BAD TRACK/SECTOR@
054633  105     122     122  LINM3:  .ASCIZ  /ERROR AT C/
054646  040     124     000  T:      .ASCIZ  / T/
054651  120     122     123  LINN3:  .ASCIZ  /PRSNT ADDR= C/
054667  040     123     000  S:      .ASCIZ  / S/
054672  040     040     120  LINP3:  .ASCIZ  /  PREVS ADDR= C/
054712  123     124     101  LINS3:  .ASCIZ  /START CYL= /
054726  040     040     105  LINEN3: .ASCIZ  /  END CYL= /
054742  040     040     101  LINA3:  .ASCIZ  /  ACTUAL CYL= /
054761  040     040     124  LINT3:  .ASCIZ  /  TRK= /
054771  040     122     120  LINCA3: .ASCIZ  / RPDC= /
055001  122     120     104  LINDA3: .ASCIZ  /RPDA= /
055010  122     120     102  LINB3:  .ASCIZ  /RPBA= /
055017  040     040     122  LINW3:  .ASCIZ  /  RPWC= /
055030  123     124     101  LINST3: .ASCIZ  /START TRK= /
055044  123     124     101  LINSS3: .ASCIZ  /START SEC= /
055060  102     125     106  LINM4:  .ASCIZ  /BUFFER ADDR= /
055076  040     040     127  LINS4:  .ASCIZ  /  WRD CNT= /
055112  040     040     116  LINX4:  .ASCIZ  /  NMBR WRDS XFRD= /
055135  105     130     120  LIND5:  .ASCIZ  /EXPCTD DATA= /
055153  040     040     122  LINB5:  .ASCIZ  /  RECEVD DATA= /
055173  040     040     127  LINP5:  .ASCIZ  /  WORD POS= /
055210  110     105     101  LINS5:  .ASCIZ  /HEADER FROM ERROR SECTOR= /
055243  122     120     105  LINEP5: .ASCIZ  /RPEC1= /
055253  040     040     122  LINEO5: .ASCIZ  /  RPEC2= /
055265  123     105     103  LINB6:  .ASCIZ  /SECTOR IS ECC CORRECTABLE /
055320  123     105     103  LINC6:  .ASCIZ  /SECTOR READ CORRECTLY AFTER /
055355  103     117     122  LING6:  .ASCIZ  /CORRECTED ON /
055373  040     122     105  LINR6:  .ASCIZ  / RETRY(S)/
055405  125     116     103  LINUO6: .ASCIZ  /UNCORRECTABLE AFTER /
055432  040     040     115  LIN7M:  .ASCIZ  /  MIS POS ERRORS= /
055455  124     117     124  LIN7P:  .ASCIZ  /TOTALS; SEEKS= /
055475  040     040     123  LIN7S:  .ASCIZ  /  SKI ERRORS= /
055514  124     117     124  LIN7T:  .ASCIZ  /TOTALS; ERRORS= /
055535  040     127     122  LIN7X:  .ASCIZ  / WRDS WRITN= /
055553  040     127     122  LIN7R:  .ASCIZ  / WRDS READ= /

055570  105     122     122  LIN8M:  .ASCIZ  /ERROR DURING RETRY/
055613  104     101     124  LIN9B:  .ASCIZ  /DATA COMPARISON ERRORS/
055642  040     040     040  LIN9H:  .ASCII  /          WORD  EXPCTD  RECEVD/<CRLF>
055700  101     104     104          .ASCIZ  /ADDR      POS   DATA    DATA/<CRLF>
055735  040     040     040  LIN9I:  .ASCII  /          WORD  RECEVD/<CRLF>
055763  101     104     104          .ASCIZ  /ADDR      POS   DATA/<CRLF>
056010  124     117     124  LIN9E:  .ASCIZ  /TOTAL COMPARE ERRORS= /
056037  124     110     105  LIN9G:  .ASCIZ  /THE DATA COMPARED OK/<CRLF>
056065  105     122     122  LIN10A: .ASCIZ  /ERROR BURST BEGINS AT WORD /
056121  040     111     116  LIN10B: .ASCIZ  / IN DATA FIELD OF ERROR SECTOR/<CRLF>
056161  105     122     122  LIN10C: .ASCII  /ERROR WAS NOT IN THE DATA READ - /<CRLF>
056223  105     103     103          .ASCIZ  /ECC CORRECTION CAN'T BE PERFORMED/
056265  105     103     103  LIN10H: .ASCII  /ECC CORRECTION RESULTS/<CRLF>
056314  040     040     040          .ASCII  /          WORD  BAD     CORRECTED /<CRLF>
056356  101     104     104          .ASCIZ  /ADDR      POS   DATA    DATA/<CRLF>
056413  103     117     116  LIN11H: .ASCIZ  /CONTENTS OF ERROR SECTOR (REPORTED ABOVE)/<CRLF>
```

```
     62 056466      101      104      104  LIN11:   .ASCIZ  /ADDR     HEADER/<CRLF>
     63 056507      101      104      104  LIN11A: .ASCIZ  /ADDR     DATA/<CRLF>
     64 056526      040                   BLNKS4: .ASCII  / /
     65 056527      040                   BLNKS3: .ASCII  / /
     66 056530      040                   BLNKS2: .ASCII  / /
     67 056531      040      000          BLNKS1: .ASCIZ  / /
     68 056533      122      105      124  LINX5:.ASCIZ    /RETRIEVED BY A RDHD COMMAND/
```

```
                                        .SBTTL  TELETYPE MESSAGES

056567  077     000             QUES:   .ASCIZ  /?/
056571  075     000             EQUAL:  .ASCIZ  /=/
056573  054     000             COMMA:  .ASCIZ  /,/
056575  055     000             DASH:   .ASCIZ  /-/
056577  011     000             TAB:    .ASCIZ  <11>
056601  104     122     111     DRVMSG: .ASCIZ  /DRIVE/
056607  040     117     106     UNTOFF: .ASCIZ  / OFFLINE/
056620  040     117     116     UNTON:  .ASCIZ  / ONLINE/
056630  040     116     117     UNTNOT: .ASCIZ  / NOT BEING TESTED/
056652  040     101     114     UNTASN: .ASCIZ  / ALREADY BEING TESTED/
056700  040     116     117     NOTRP:  .ASCIZ  / NOT AN RP07/
056715  040     116     117     NOTPRS: .ASCIZ  / NOT PRESENT/
056732  040     116     117     NOTAVL: .ASCIZ  / NOT AVAILABLE/
056751  040     125     116     NOTSAF: .ASCIZ  / UNSAFE/
056761  040     114     117     LODEV:  .ASCIZ  / LOAD DEVICE/
056776  040     116     117     NINLEV: .ASCIZ  / NON-INTERLEAVED/
057017  200     116     117     NODFLT: .ASCIZ  <CRLF>/NO DEFAULT/
057033  200     104     122     DRSTAT: .ASCIZ  <CRLF>/DRIVE STATUS:/
057052  120     107     000     MSGPG:  .ASCIZ  /PG/
057055  040     040     040     MSHW1:  .ASCIZ  /   HW1 /
057065  040     040     040     MSHW2:  .ASCIZ  /   HW2 /
057075  122     120     060     $RP07:  .ASCIZ  /RP07/
057102  122     120     060     $RP07P: .ASCIZ  /RP07/
057107  200     012             MSGREP: .ASCII  <CRLF><LF>
057111  057     134     057             .ASCIZ  @/\/\/\/\/\/\/\/\/\/\/\/-PERFORMANCE REPORT-\/\/\/\/\/\/\/\/\/\/\/\/\@
057214  200             TRMREP: .ASCII  <CRLF>
057215  134     057     134             .ASCII  @\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/\/@
057317  200     000             .ASCIZ  <CRLF>
057321  055     055     055     DASH5:  .ASCIZ  /-----/
057327  055     055     055     DASH13: .ASCIZ  /-------------/
057345  123     125     115     MSGSUM: .ASCIZ  /SUMMARY, /
057357  104     122     117     MSGDRP: .ASCIZ  /DROPPED, /
057371  105     040     116     MSGEOP: .ASCIZ  /E N D   O F   P A S S/
057417  105     040     116     MSGEOT: .ASCIZ  /E N D   O F   T E S T----------------------------------EOT/
057513  200     103     117     MSGCON: .ASCIZ  <CRLF>/CONTINUING.../
057532  057     040     120     MSPASS: .ASCIZ  @/ PASS @
057542  040     124     117     MSTOTL: .ASCIZ  / TOTAL /
057552  040     130     061     MSGX10: .ASCIZ  / X10^6/
057561  007     200     077     DROPNG: .ASCIZ  <BELL><CRLF>/?FATAL OR EXCESSIVE ERRORS/
057616  040     117     116     MSGON:  .ASCIZ  / ON /
057623  040     123     124     ASGND:  .ASCIZ  / STARTED/
057634  200     007     077     NEDCLK: .ASCIZ  <CRLF><BELL>/? 'L' OR 'P' CLOCK REQUIRED ON SYSTEM/<CRLF>
057705  116     000             N:      .ASCIZ  /N/
057707  131     000             Y:      .ASCIZ  /Y/
057711  056     000             PERIOD: .ASCIZ  /./
057713  040     077     103     MSWRO:  .ASCIZ  / ?CAN'T WRITE IN 'READ ONLY' MODE/<CRLF>
057756  040     077     111     INVLD:  .ASCIZ  / ?INVALID COMMAND/<CRLF>
060001  200     105     116     ENTCOM: .ASCIZ  <CRLF>/ENTER COMMAND: /
060022  040     101     104     ENTLMT: .ASCIZ  / ADDRESS LIMITS;/<CRLF>
060044  200     105     116     ENTADR: .ASCIZ  <CRLF>/ENTER BAD SECTR ADRS:/<CRLF>
060074  072     000             COLON:  .ASCIZ  /:/
060076  116     117     116     NONE:   .ASCIZ  /NONE/
060103  040     077     111     BADENT: .ASCIZ  / ?INVALID ENTRY/<CRLF>
060124  200     012     116     NODRVS: .ASCIZ  <CRLF><LF>/NO DRIVES ASSIGNED/<CRLF>
060152  104     122     126     DRVSN:  .ASCIZ  @DRV S/N: @
```

```
     62 060164  200  103  110  MSPRM:   .ASCIZ  <CRLF>/CHANGE DRIVE PARAMETERS (L) N ? /
     83 060226  200  104  117  MESFE:   .ASCIZ  <CRLF>/DO YOU WANT TO WRITE ANYWHERE ON MEDIA (L) N ? /
     84 060307  200            OVRWRT: .ASCII  <CRLF>
     85 060310  007  011  041           .ASCII  <BELL>/ ! CUSTOMER DATA WILL BE OVERWRITTEN !/<CRLF>
     86 060360  007  011  055           .ASCII  <BELL>/ ----------------------------------/<CRLF>
     87 060430  103  117  116           .ASCIZ  /CONTINUE (L)  ? /
     88 060451  200  052  040  FEONLY: .ASCIZ  <CRLF>/* TESTING WILL OCCUR ON FE CYLINDER ONLY */<CRLF>
     89 060526  200  052  040  MREAD:  .ASCIZ  <CRLF>/* PROGRAM  IS LOCKED IN 'READ ONLY' MODE */<CRLF>
     91                       .EVEN
```

```
                                .SBTTL  PARAMETER ENTRY TABLE

060604  060742  031000  001466  PARLST: .WORD   PAR1,12800.,WRDCNT
060612  061001  077777  001470          .WORD   PAR2,32767.,INTRVL
060620  061271  077777  001462          .WORD   PAR12,32767.,CMPTIM
060626  061515  077777  001474          .WORD   PAR19,32767.,PASSES
060634  061061  000017  001476          .WORD   PAR3,15.,PATTERN
060642  061224  000001  001500          .WORD   PAR11,1,RANDWC
060650  061354  000007  001502          .WORD   PAR14,7,RATIO
060656  061451  000001  001504          .WORD   PAR16,1,ENDING
060664  061407  000001  001506          .WORD   PAR15,1,WRTCHK
060672  061537  000001  001510          .WORD   PAR21,1,RANDOM
060700  000000                          .WORD   0                       ;TABLE TERMINATOR

060702      040     057     040 SLASH:  .ASCIZ  @ / @
060706      200     103     110 ASKPAR: .ASCIZ  <CRLF>/CHANGE PARAMETERS (L) N ? /
060742      115     101     130 PAR1:   .ASCIZ  /MAXIMUM WORD COUNT (6-12800.) /
061001      124     111     115 PAR2:   .ASCIZ  /TIME BETWEEN REPORTS (IN MINUTES, 0=NO REPORT) /
061061      104     101     124 PAR3:   .ASCIZ  /DATA PATTERN NUMBER (0=RANDOM, 1-15.=FIXED) /
061136      115     101     130 PAR4:   .ASCIZ  /MAX CYL /
061147      115     111     116 PAR5:   .ASCIZ  /MIN CYL /
061160      115     101     130 PAR6:   .ASCIZ  /MAX TRK /
061171      115     111     116 PAR7:   .ASCIZ  /MIN TRK /
061202      115     101     130 PAR8:   .ASCIZ  /MAX SEC /
061213      115     111     116 PAR9:   .ASCIZ  /MIN SEC /
061224      127     117     122 PAR11:  .ASCIZ  /WORD COUNT MODE (0=RANDOM, 1=FIXED) /
061271      124     111     115 PAR12:  .ASCIZ  /TIME BETWEEN DATA COMPARES (IN MINUTES, 0=ALWAYS) /
061354      122     105     101 PAR14:  .ASCIZ  /READ TO WRITE RATIO (0-7) /
061407      105     116     101 PAR15:  .ASCIZ  /ENABLE WRITE CHECK (0=NO, 1=YES) /
061451      105     116     104 PAR16:  .ASCIZ  /END OF PASS MODE (0=SEEKS, 1=DATA) /
061515      116     125     115 PAR19:  .ASCIZ  /NUMBER OF PASSES /
061537      123     105     105 PAR21:  .ASCIZ  /SEEK MODE (0=RANDOM, 1=SEQUENTIAL) /

                                .EVEN
```

```
                                        .SBTTL  DRIVE PARAMETER TABLES (DPB)

                                        ;PARAMETER TABLE POINTERS FOR ADDRESS LIMITS

061604  061624                  TABLE:  .WORD   TABLE0          ;PARAMETER TABLE FOR DRIVE 0
061606  061672                          .WORD   TABLE1          ;PARAMETER TABLE FOR DRIVE 1
061610  061740                          .WORD   TABLE2          ;PARAMETER TABLE FOR DRIVE 2
061612  062006                          .WORD   TABLE3          ;PARAMETER TABLE FOR DRIVE 3
061614  062054                          .WORD   TABLE4          ;PARAMETER TABLE FOR DRIVE 4
061616  062122                          .WORD   TABLE5          ;PARAMETER TABLE FOR DRIVE 5
061620  062170                          .WORD   TABLE6          ;PARAMETER TABLE FOR DRIVE 6
061622  062236                          .WORD   TABLE7          ;PARAMETER TABLE FOR DRIVE 7

                                        ;PARAMETER TABLE FOR ADDRESS LIMITS

061624  061147  000000  046372  TABLE0: .WORD   PAR5,0,MINCYL+DRIVE0
061632  061136  001166  046370          .WORD   PAR4,630.,MAXCYL+DRIVE0
061640  061171  000035  046376          .WORD   PAR7,29.,MINTRK+DRIVE0
061646  061160  000035  046374          .WORD   PAR6,29.,MAXTRK+DRIVE0
061654  061213  000041  046402          .WORD   PAR9,33.,MINSEC+DRIVE0
061662  061202  000041  046400          .WORD   PAR8,33.,MAXSEC+DRIVE0,0

061672  061147  000000  046634  TABLE1: .WORD   PAR5,0,MINCYL+DRIVE1
061700  061136  001166  046632          .WORD   PAR4,630.,MAXCYL+DRIVE1
061706  061171  000035  046640          .WORD   PAR7,29.,MINTRK+DRIVE1
061714  061160  000035  046636          .WORD   PAR6,29.,MAXTRK+DRIVE1
061722  061213  000041  046644          .WORD   PAR9,33.,MINSEC+DRIVE1
061730  061202  000041  046642          .WORD   PAR8,33.,MAXSEC+DRIVE1,0

061740  061147  000000  047076  TABLE2: .WORD   PAR5,0,MINCYL+DRIVE2
061746  061136  001166  047074          .WORD   PAR4,630.,MAXCYL+DRIVE2
061754  061171  000035  047102          .WORD   PAR7,29.,MINTRK+DRIVE2
061762  061160  000035  047100          .WORD   PAR6,29.,MAXTRK+DRIVE2
061770  061213  000041  047106          .WORD   PAR9,33.,MINSEC+DRIVE2
061776  061202  000041  047104          .WORD   PAR8,33.,MAXSEC+DRIVE2,0

062006  061147  000000  047340  TABLE3: .WORD   PAR5,0,MINCYL+DRIVE3
062014  061136  001166  047336          .WORD   PAR4,630.,MAXCYL+DRIVE3
062022  061171  000035  047344          .WORD   PAR7,29.,MINTRK+DRIVE3
062030  061160  000035  047342          .WORD   PAR6,29.,MAXTRK+DRIVE3
062036  061213  000041  047350          .WORD   PAR9,33.,MINSEC+DRIVE3
062044  061202  000041  047346          .WORD   PAR8,33.,MAXSEC+DRIVE3,0

062054  061147  000000  047602  TABLE4: .WORD   PAR5,0,MINCYL+DRIVE4
062062  061136  001166  047600          .WORD   PAR4,630.,MAXCYL+DRIVE4
062070  061171  000035  047606          .WORD   PAR7,29.,MINTRK+DRIVE4
062076  061160  000035  047604          .WORD   PAR6,29.,MAXTRK+DRIVE4
062104  061213  000041  047612          .WORD   PAR9,33.,MINSEC+DRIVE4
062112  061202  000041  047610          .WORD   PAR8,33.,MAXSEC+DRIVE4,0

062122  061147  000000  050044  TABLE5: .WORD   PAR5,0,MINCYL+DRIVE5
062130  061136  001166  050042          .WORD   PAR4,630.,MAXCYL+DRIVE5
062136  061171  000035  050050          .WORD   PAR7,29.,MINTRK+DRIVE5
062144  061160  000035  050046          .WORD   PAR6,29.,MAXTRK+DRIVE5
062152  061213  000041  050054          .WORD   PAR9,33.,MINSEC+DRIVE5
062160  061202  000041  050052          .WORD   PAR8,33.,MAXSEC+DRIVE5,0
```

DRIVE PARAMETER TABLES (DPB)

```
062170  061147  000000  050306  TABLE6: .WORD   PAR5,0,MINCYL+DRIVE6
062176  061136  001166  050304          .WORD   PAR4,630.,MAXCYL+DRIVE6
062204  061171  000035  050312          .WORD   PAR7,29.,MINTRK+DRIVE6
062212  061160  000035  050310          .WORD   PAR6,29.,MAXTRK+DRIVE6
062220  061213  000041  050316          .WORD   PAR9,33.,MINSEC+DRIVE6
062226  061202  000041  050314          .WORD   PAR8,33.,MAXSEC+DRIVE6,0

062236  061147  000000  050550  TABLE7: .WORD   PAR5,0,MINCYL+DRIVE7
062244  061136  001166  050546          .WORD   PAR4,630.,MAXCYL+DRIVE7
062252  061171  000035  050554          .WORD   PAR7,29.,MINTRK+DRIVE7
062260  061160  000035  050552          .WORD   PAR6,29.,MAXTRK+DRIVE7
062266  061213  000041  050560          .WORD   PAR9,33.,MINSEC+DRIVE7
062274  061202  000041  050556          .WORD   PAR8,33.,MAXSEC+DRIVE7,0
```

```
                                .SBTTL  ROUTINE TO SIZE MEMORY

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

062304  010046                  $SIZE:  MOV     R0,-(SP)        ;;SAVE R0 ON THE STACK
062306  010146                          MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
062310  013746  000114                  MOV     @#114,-(SP)     ;;SAVE MEMORY ERROR VECTOR PS & PC
062314  013746  000116                  MOV     @#116,-(SP)
062320  012737  000116  000114          MOV     #116,@#114      ;;IGNORE PARITY ERRORS WHILE SIZING
062326  012737  000002  000116          MOV     #RTI,@#116
062334  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE PRESENT ERROR VECTOR PS & PC
062340  013746  000006                  MOV     @#ERRVEC+2,-(SP)
062344  010600                          MOV     SP,R0           ;;SAVE THE STACK POINTER
                                ;;SET THE ERRVEC PS TO THE PRESENT PS
062346  104400                          TRAP                    ;;PUSH OLD PSW AND PC ON STACK
062350  012637  000006                  MOV     (SP)+,@#ERRVEC+2        ;;SAVE THE PSW IN @#ERRVEC+2
062354  012737  062374  000004          MOV     #2$,@#ERRVEC    ;;SET FOR TIMEOUT
062362  012701  020000                  MOV     #20000,R1       ;;FIRST ADDRESS
062366  005711                  1$:     TST     (R1)            ;;TEST THIS ADDRESS
062370  005721                          TST     (R1)+           ;;STEP TO NEXT ADDRESS
062372  000775                          BR      1$              ;;TRY ANOTHER
062374  162701  000002          2$:     SUB     #2,R1           ;;DROP BACK
062400  010006                          MOV     R0,SP           ;;RESTORE THE STACK
062402  012637  000006                  MOV     (SP)+,@#ERRVEC+2 ;;RESTORE ERROR VECTOR
062406  012637  000004                  MOV     (SP)+,@#ERRVEC
062412  012637  000116                  MOV     (SP)+,@#116     ;;RESTORE MEMORY ERROR VECTOR
062416  012637  000114                  MOV     (SP)+,@#114
062422  010137  062434                  MOV     R1,$LSTAD       ;;LAST ADDRESS
062426  012601                          MOV     (SP)+,R1        ;;RESTORE R1
062430  012600                          MOV     (SP)+,R0        ;;RESTORE R0
062432  000207                          RTS     PC
062434  000000          $LSTAD: .WORD   0               ;;CONTAINS THE LAST ADDRESS
```

```
                                .SBTTL  BUSADR - GET BUS ADDRESS AND VECTOR ADDRESS
                                
                                ;THIS ROUTINE IS USED TO INSURE THE BUS ADDRESS OF THE RHXX/RP07
                                ;IS SETUP FOR THE PROPER ADDRESS. IT WILL ALSO READ THE ADDRESS
                                ;FROM THE TTY IF REQUIRED.
                                ;
                                ;NOTE: THIS ROUTINE DESTROYS R0-R4
                                ;CALL:
                                ;
                                ;       JSR     PC,BUSADR
                                ;       RETURN
                                
 062436  005737  001332         BUSADR: TST     CHGADR          ;INPUT FROM TTY REQUESTED?
 062442  002046                         BGE     3$              ;NO--BRANCH
 062444  005037  001332                 CLR     CHGADR          ;YES--CLEAR THE REQUEST FLAG
 062450  104401  001203                 TYPE    ,$CRLF          ;CR-LF
 062454  005037  001334         1$:     CLR     CFLAG           ;CLEAR CONTROL C FLAG
 062460  012700  001272                 MOV     #$RPADR,R0      ;FIRST ADDRESS
 062464  104401  062576                 TYPE    ,MRPCS1         ;"RPCS1="
 062470  011046                         MOV     (R0),-(SP)      ;PRESENT RPCS1 ADDRESS
 062472  104402                         TYPOC                   ;TYPE IT
 062474  104401  056530                 TYPE    ,BLNKS2         ;TYPE 2 BLANKS
 062500  104411                         RDLIN                   ;GET THE ENTRY
 062502  012601                         MOV     (SP)+,R1        ;ADDRESS OF ASCII TEXT
 062504  005737  001334                 TST     CFLAG           ;WAS (^C) TYPED?
 062510  001361                         BNE     1$              ;BR IF YES
 062512  004537  062614                 JSR     R5,CK.NUM       ;ENTER AND STORE THE NEW ADDRESS
 062516  000756                         BR      1$              ;ERROR EXIT
                                
 062520  012700  001274         2$:     MOV     #$RPVEC,R0      ;VECTOR ADDRESS
 062524  104401  062605                 TYPE    ,MRPVEC         ;"RPVEC="
 062530  011046                         MOV     (R0),-(SP)      ;PRESENT RHXX/RP07 VECTOR ADDRESS ON THE STACK
 062532  104402                         TYPOC                   ;TYPE IT
 062534  104401  056530                 TYPE    ,BLNKS2         ;TYPE 2 BLANKS
 062540  104411                         RDLIN                   ;READ THE ENTRY
 062542  012601                         MOV     (SP)+,R1        ;ASCII TEXT ADDRESS
 062544  005737  001334                 TST     CFLAG           ;WAS (^C) TYPED?
 062550  001341                         BNE     1$              ;BR IF YES
 062552  004537  062614                 JSR     R5,CK.NUM       ;ENTER AND STORE NEW ADDRESS
 062556  000760                         BR      2$              ;ERROR EXIT
                                
 062560  012700  001272         3$:     MOV     #$RPADR,R0      ;FIRST ADDRESS OF NEW PARAMETERS
 062564  012701  040560                 MOV     #RPADR,R1       ;FIRST ADDRESS OF WHERE TO PUT THEM
 062570  012021                         MOV     (R0)+,(R1)+     ;BUS ADDRESS
 062572  012021                         MOV     (R0)+,(R1)+     ;VECTOR ADDRESS
 062574  000207                         RTS     PC              ;RETURN
                                
 062576     122     120     103 MRPCS1: .ASCIZ   @RPCS1=@
 062605     122     120     126 MRPVEC: .ASCIZ   @RPVEC=@
```

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

062614  010246                  CK.NUM: MOV     R2,-(SP)        ;SAVE R2
062616  010346                          MOV     R3,-(SP)        ;SAVE R3
062620  010446                          MOV     R4,-(SP)        ;SAVE R4
062622  012703  000006                  MOV     #6,R3           ;MAX OCTAL DIGITS IN THE NUMBER
062626  005002                          CLR     R2              ;FINAL OCTAL VALUE
062630  112104                  1$:     MOVB    (R1)+,R4        ;GET CURRENT POINTED BYTE
062632  001424                          BEQ     3$              ;BRANCH,IF TERMINATOR DETECTED
062634  120427  000060                  CMPB    R4,#'0          ;SMALLER THAN ASCII-0
062640  103425                          BLO     5$              ;YES,ERROR EXIT
062642  120427  000067                  CMPB    R4,#'7          ;LARGER THAN ASCII-7 ?
062646  101022                          BHI     5$              ;YES,ERROR EXIT
062650  006302                          ASL     R2              ;SHIFT LEFT
062652  103420                          BCS     5$              ;
062654  006302                          ASL     R2              ;ONE
062656  103416                          BCS     5$              ;
062660  006302                          ASL     R2              ;OCTAL DIGIT
062662  103414                          BCS     5$              ;ERROR IF CARRY BIT SET
062664  042704  177770                  BIC     #177770,R4      ;CHOP OFF HIGHER BITS
062670  060402                          ADD     R4,R2           ;APPENDING CURRENT DIGIT TO NUMBER
062672  005303                          DEC     R3              ;DECREMENT BYTE COUNT
062674  001401                          BEQ     2$              ;BRANCH,IF LAST BYTE
062676  000754                          BR      1$              ;LOOPING BACK

062700  112104                  2$:     MOVB    (R1)+,R4        ;CHECK TERMINATOR
062702  001004                          BNE     5$              ;ERROR EXIT
062704  005702                  3$:     TST     R2              ;FINAL VALUE= 0
062706  001401                          BEQ     4$              ;YES,THEN NOT REPLACE THE ORIGINAL VALUE
062710  010210                          MOV     R2,(R0)         ;REPLACE THE ORIGINAL VALUE
062712  005725                  4$:     TST     (R5)+           ;ADJUST FOR NORMAL RETURN
062714  012604                  5$:     MOV     (SP)+,R4        ;RESTORE R4
062716  012603                          MOV     (SP)+,R3        ;RESTORE R3
062720  012602                          MOV     (SP)+,R2        ;RESTORE R2
062722  000205                          RTS     R5              ;EXIT

                                .EVEN
062724  000000                  PATCH:  .WORD   0               ;ALLOCATE 200 OCTAL LOCATIONS FOR PATCHING

063324                          CYLNDR: .BLKW   258.            ;ONE SECTOR OF WORDS
        064330                  ENDPGM=.
```

```
                                .SBTTL  HELP TEXT MESSAGE

064330  200             MSHELP: .ASCII  <CRLF>
064331  007  124  110            .ASCII  <BELL>/THE HELP MESSAGE CAN ONLY BE TYPED ONCE./
064402  007                     .ASCII  <BELL>
064403  200  104  117            .ASCIZ  <CRLF>/DO YOU WANT IT TYPED (L) ? /
064440  200             HELPTX: .ASCII  <CRLF>
064441  200  104  122            .ASCII  <CRLF>/DRIVE PARAMETERS:/
064463  200  115  101            .ASCII  <CRLF>/MAXCYL    :max cylinder adrs/
064517  200  115  111            .ASCII  <CRLF>/MINCYL    :min cylinder adrs/
064553  200  115  101            .ASCII  <CRLF>/MAXTRK    :max track adrs/
064604  200  115  111            .ASCII  <CRLF>/MINTRK    :min track adrs/
064635  200  115  101            .ASCII  <CRLF>/MAXSEC    :max sector adrs/
064667  200  115  111            .ASCII  <CRLF>/MINSEC    :min sector adrs/
064721  200                     .ASCII  <CRLF>
064722  200  124  110            .ASCII  <CRLF>/THE FOLLOWING ARE VALID COMMANDS:/
064764  200  040  127            .ASCII  <CRLF>/ W#<CR> assign drive and do SEQUENTIAL WRITE data/
065046  200  040  122            .ASCII  <CRLF>/ R#<CR> assign drive and do SEQUENTIAL READ data/
065127  200  040  124            .ASCII  <CRLF>/ T#<CR> assign drive  to do (random or sequential) TEST/
065217  200  127  124            .ASCII  <CRLF>/WT#<CR> assign drive, to do SEQUENTIAL WRITE data and/
065305  200  040  040            .ASCII  <CRLF>/         to do (random or sequential) TEST/
065357  200  040  104            .ASCII  <CRLF>/ D#<CR> DROP a drive from test/
065416  200  040  123            .ASCII  <CRLF>/ S#<CR> type the performance SUMMARY report/
065472  200                     .ASCII  <CRLF>
065473  200  040  040            .ASCII  <CRLF>/  # is the drive number (0-7 or 'A' for all drives)/
065557  200                     .ASCII  <CRLF>
065560  200  123  127            .ASCII  <CRLF>/SWITCH REGISTER SETTINGS:/
065612  200  123  127            .ASCII  <CRLF>/SW15= (100000)  halt on error/
065650  200  123  127            .ASCII  <CRLF>/SW14= (040000)  /
065671  200  123  127            .ASCII  <CRLF>/SW13= (020000)  inhibit error typeout/
065737  200  123  127            .ASCII  <CRLF>/SW12= (010000)  /
065760  200  123  127            .ASCII  <CRLF>/SW11= (004000)  /
066001  200  123  127            .ASCII  <CRLF>/SW10= (002000)  ring tty bell on error/
066050  200  123  127            .ASCII  <CRLF>@SW09= (001000)  change end of pass to 1/4 of normal@
066134  200  123  127            .ASCII  <CRLF>/SW08= (000400)  inhibit end of pass messages/
066211  200  123  127            .ASCII  <CRLF>/SW07= (000200)  display all data compare errors/
066271  200  123  127            .ASCII  <CRLF>/SW06= (000100)  don't change parameters (loop on present values)/
066372  200  123  127            .ASCII  <CRLF>/SW05= (000040)  A. partial register display if error/
066457  200  040  040            .ASCII  <CRLF>/                B. no ECC correction results displayed if error/
066557  200  123  127            .ASCII  <CRLF>/SW04= (000020)  A. do not check for maximum error count/
066647  200  040  040            .ASCII  <CRLF>/                B. do not drop drive at end of test/
066733  200  123  127            .ASCII  <CRLF>/SW03= (000010)  A. display error sector if DCK, DTE or WCF error/
067034  200  040  040            .ASCII  <CRLF>/                B. display sector if DCK uncorrectable after 28th ret
067144  200  040  040            .ASCII  <CRLF>/                C. if data compare error & SW07 set, display remainde
067265  200  123  127            .ASCII  <CRLF>/SW02= (000004)  A. do not type drive status at program start/
067362  200  040  040            .ASCII  <CRLF>/                B. do not type performance report after specified tim
067471  200  040  040            .ASCII  <CRLF>/                C. prompt 'write anywhere' question during auto test
067603  200  123  127            .ASCII  <CRLF>@SW01= (000002)  inhibit data compare after read without DCK error@
067705  200  123  127            .ASCII  <CRLF>/SW00= (000001)  read only mode/
067744  200                     .ASCII  <CRLF>
067745  200  116  117            .ASCII  <CRLF>/NOTE: If a DCK error occurs,  the program  will execute/
070035  200  040  040            .ASCII  <CRLF>/      a data compare on the data in memory, reguardless/
070125  200  040  040            .ASCII  <CRLF>/      of the setting in SW01./
070163  200                     .ASCII  <CRLF>
070164  200  124  171            .ASCII  <CRLF>/Type control-c (^C) to HALT the program/
070234  200                     .ASCII  <CRLF>
070235  200  124  157            .ASCII  <CRLF>/To change RHXX adresses,  start program at address 204/
```

```
     63 070324      200                          .ASCII  <CRLF>
     64 070325      200      056     105         .ASCII  <CRLF>/.END OF HELP/
     65 070342      200                          .ASCII  <CRLF>
     66 070343      200      000                 .ASCIZ  <CRLF>
     67
     69           000200                 .END    200
```

SYMBOL TABLE

```
ABASE = 176700        ASGN7   027544        BIT5  = 000040        CMPTIM  001462        DPR   = 000400
ABNRML  031372        ASGN8   027606        BIT6  = 000100        CMSEC   001372        DPRQS   040504
ACDW1 = 000000        ASKPAR  060706        BIT7  = 000200        CMSTR   014234        DRIVE = 001220
ACDW2 = 000000        ASNERR  031252        BIT8  = 000400        CMSTR2  014374        DRIVE0  046234
ACPUOP= 000000        ASNLST  001542        BIT9  = 001000        CMTRK   001373        DRIVE1  046476
ACTDRV  040520        ASNMSG  031276        BLKADR  002056        COLON   060074        DRIVE2  046740
ACTSTR  040521        ASSIGN  027122        BLNKS1  056531        COMMA   056573        DRIVE3  047202
ADDW0 = 000000        ASWREG= 000000        BLNKS2  056530        COMTBL  002076        DRIVE4  047444
ADDW1 = 000000        ATA   = 100000        BLNKS3  056527        CPSAVE  035326        DRIVE5  047706
ADDW10= 000000        ATABIT  040550        BLNKS4  056526        CR    = 000015        DRIVE6  050150
ADDW11= 000000        ATESTN= 000000        BPE   = 000020        CRLF  = 000200        DRIVE7  050412
ADDW12= 000000        ATTN    001316        BPTVEC= 000014        CTRAP   034676        DROP    031302
ADDW13= 000000        AT0   = 000001        BSE   = 100000        CYLLMT= 000150        DROPD   027620
ADDW14= 000000        AT1   = 000002        BUFTBL  001654        CYLNDR  063324        DROPNG  057561
ADDW15= 000000        AT2   = 000004        BUSADR  062436        DASH    056575        DRQ   = 004000
ADDW2 = 000000        AT3   = 000010        CFLAG   001334        DASH13  057327        DRSTAT  057033
ADDW3 = 000000        AT4   = 000020        CHGADR  001332        DASH5   057321        DRVACT  040444
ADDW4 = 000000        AT5   = 000040        CHKWC   021512        DATAPK  030052        DRVCLR= 000111
ADDW5 = 000000        AT6   = 000100        CI1     042006        DATA0   002360        DRVER   011756
ADDW6 = 000000        AT7   = 000200        CI2     042152        DATA1   002420        DRVINT  04075C
ADDW7 = 000000        AUNIT = 000000        CI3     042200        DATA10  003060        DRVMSG  056601
ADDW8 = 000000        AUSWR = 000000        CI4     042312        DATA11  003120        DRVNO   001320
ADDW9 = 000000        AUTLST  032020        CI5     042632        DATA12  003160        DRVPAR  001426
ADEVCT= 000000        AVAIL   001610        CI6     042654        DATA13  003220        DRVPRM  030322
ADEVM = 000000        AVECT1= 000254        CI7     042670        DATA14  003260        DRVQUE  046070
AENV  = 000000        AVECT2= 000000        CI7B    042704        DATA15  003320        DRVSN   060152
AENVM = 000000        A16   = 000400        CI8     042756        DATA2   002460        DRVSTA  040454
AFATAL= 000000        A17   = 001000        CKBUS   014046        DATA3   002520        DRVTYP  040464
AIR   = 000004        BADENT  060103        CKCLK   024514        DATA4   002560        DRY   = 000200
AMADR1= 000000        BADSEC  001336        CKCLK1  024576        DATA5   002620        DSWR  = 177570
AMADR2= 000000        BADTMO  003440        CKCLK2  024650        DATA6   002660        DTE   = 010000
AMADR3= 000000        BA1   = 000010        CKCLK3  024702        DATA7   002720        DTEER   012562
AMADR4= 000000        BEGCOD  001514        CKERR   013746        DATA8   002760        DTUW    040546
AMAMS1= 000000        BEGPAT  001512        CKFMT   012010        DATA9   003020        DT00  = 000001
AMAMS2= 000000        BEGWC   001516        CKHCE   012172        DCK   = 100000        DT01  = 000002
AMAMS3= 000000        BELL  = 000007        CKLMTS  021332        DCKER   010546        DT02  = 000004
AMAMS4= 000000        BIT0  = 000001        CKSWR = 104407        DCKER1  010722        DT03  = 000010
AMSGAD= 000000        BIT00 = 000001        CK.CHR  033122        DCU   = 000040        DT04  = 000020
AMSGLG= 000000        BIT01 = 000002        CK.DEC  033074        DDISP = 177570        DT05  = 000040
AMSGTY= 000000        BIT02 = 000004        CK.DIG  033174        DDRVS   001544        DT06  = 000100
AMTYP1= 000000        BIT03 = 000010        CK.NUM  062614        DGE   = 000001        DT07  = 000200
AMTYP2= 000000        BIT04 = 000020        CK.OCT  033046        DH1     053751        DT08  = 000400
AMTYP3= 000000        BIT05 = 000040        CLKFLG  001310        DH14    054126        DT1     054424
AMTYP4= 000000        BIT06 = 000100        CLKOFF  024710        DH15    054225        DT14    054450
AOE   = 001000        BIT07 = 000200        CLR   = 000040        DH16    054324        DT15    054470
APASS = 000000        BIT08 = 000400        CLRDPB  030104        DH17    054404        DT16    054512
APRIOR= 000000        BIT09 = 001000        CLRQUE  045772        DH2     053756        DT17    054530
APTCSU= 000040        BIT1  = 000002        CMCNT   001366        DH3     054033        DT2     054430
APTENV= 000001        BIT10 = 002000        CMCYL   001370        DH4     054061        DT3     054434
APTSIZ= 000200        BIT11 = 004000        CMDAT   014406        DH6     054120        DT4     054440
APTSPO= 000100        BIT12 = 010000        CMHED   014316        DISPLA  001156        DT6     054444
ASGND   057623        BIT13 = 020000        CMPAR   014132        DISPLY= 104414        DVA   = 004000
ASGN1   027220        BIT14 = 040000        CMPARD  014136        DISPRE  000174        DVC   = 000200
ASGN2   027274        BIT15 = 100000        CMPLMT  001460        DLT   = 100000        ECBAD0  001412
ASGN3   027364        BIT2  = 000004        CMPRES  022200        DONE    010206        ECBAD1  001420
ASGN4   027530        BIT3  = 000010        CMPRT   015016        DPE   = 000010        ECBIT   001376
ASGN6   027532        BIT4  = 000020        CMPRX   015010        DPINT   040474        ECC     015534
```

```
ECCX    016350
ECC1    016146
ECC2    016344
ECGD    001410
ECGD1   001416
ECH   = 000100
ECI   = 004000
ECMSK0  001402
ECMSK1  001404
ECSEC   001400
ECWRD   001406
ECWRD1  001414
EMPTYQ  046050
EMTVEC= 000030
EM1     050744
EM10    051257
EM11    051322
EM12    051355
EM13    051406
EM14    051460
EM15    051503
EM2     051017
EM20    051537
EM21    051560
EM22    051611
EM23    051664
EM24    051743
EM25    052011
EM26    052072
EM27    052117
EM3     051055
EM30    052154
EM31    052206
EM32    052251
EM33    052304
EM34    052361
EM35    052423
EM36    052461
EM37    052512
EM4     051113
EM40    052564
EM41    052622
EM42    052666
EM43    052747
EM44    053043
EM45    053140
EM46    053226
EM47    053300
EM5     051150
EM50    053355
EM51    053413
EM52    053456
EM6     051204
EM60    053522
EM70    053545
EM71    053624
EM72    053702

ENDCMP  015376
ENDCON  001446
ENDING  001504
ENDPGM= 064330
ENDSEK  001452
ENTADR  060044
ENTCOM  060001
ENTLMT  060022
ENTPR   005556
EQUAL   056571
ERCTR   001362
ERPRC1  007636
ERPROC  007622
ERR   = 040000
ERROR = 104000
ERRVEC= 000004
EWN   = 000002
EWNERR  013432
FACTOR  017510
FAIRNS  001326
FALPAR  007776
FALPR1  010012
FEONLY  060451
FER   = 000020
FE1   = 000156
FILBUF  020102
FILLZ   032546
FILLO   032654
FMTER   012750
FMTRK = 000163
FMT16 = 010000
FRSTER  001352
F0    = 000002
F1    = 000004
F2    = 000010
F3    = 000020
F4    = 000040
GENDPB  050654
GENPAR  020612
GENREG  050674
GETBUF  017512
GETID   031010
GETLMT  030706
GETPAT  021272
GETREG= 000141
GETREM  032022
GETREQ  046144
GO    = 000001
GODRIV  020160
GTSWR = 104406
HCE   = 000200
HCEER   013026
HCI   = 002000
HCRC  = 000400
HCRCER  011624
HELPTX  064440
HERTZ   001312

HOUR    001340
HT    = 000011
IAE   = 002000
IAEER   012670
IBSAVE  035330
IDLE    007234
IE    = 000100
ILF   = 000001
ILR   = 000002
ILV   = 000004
INCHRD  026026
INCMIS  026076
INCSKI  026052
INCSOF  026002
INCTOT  026122
INTRVL  001470
INVLD   057756
IOTVEC= 000020
IR    = 000100
ISR     043174
ITCNT   022174
IXU   = 000100
KSR     026454
KSR1    026462
KWSVR   026272
LBC   = 002000
LBT   = 002000
LCE   = 001000
LF    = 000012
LIMIT   001364
LINA3   054742
LINB3   055010
LINB5   055153
LINB6   055265
LINCA3  054771
LINC6   055320
LINDA3  055001
LINDEC  024340
LIND5   055135
LINEN3  054726
LINEO5  055253
LINEP5  055243
LINE1   022214
LINE2   022262
LINE2A  022432
LINE2B  022450
LINE3   022716
LINE3A  022724
LINE3B  022732
LINE3C  022744
LINE3D  022754
LINE3E  023022
LINE3F  023110
LINE4   023366
LINE5   023456
LINE5A  023666
LINE5B  023734

LINE6   023776
LINE6A  024010
LINE6C  024016
LINE6D  024024
LINE7   024056
LINE7A  024176
LINE8   024274
LING6   055355
LINM3   054633
LINM4   055060
LINN3   054651
LINOCT  024306
LINP3   054672
LINP5   055173
LINR6   055373
LINSS3  055044
LINST3  055030
LINS3   054712
LINS4   055076
LINS5   055210
LINT3   054761
LINU06  055405
LINW3   055017
LINX4   055112
LINX5   056533
LIN10A  056065
LIN10B  056121
LIN10C  056161
LIN10H  056265
LIN11   056466
LIN11A  056507
LIN11H  056413
LIN2C   054536
LIN2P   054556
LIN2S   054577
LIN3.1  023162
LIN3.3  023270
LIN3.4  023322
LIN6.2  024032
LIN7M   055432
LIN7P   055455
LIN7R   055553
LIN7S   055475
LIN7T   055514
LIN7X   055535
LIN8M   055570
LIN9B   055613
LIN9E   056010
LIN9G   056037
LIN9H   055642
LIN9I   055735
LKPAR   005246
LODEV   056761
LODPAR  021662
LSTAD   001330
MAIN    006340
MAINDA  006364

MAIN1   006506
MAIN2   006644
MASK    001322
MATCH   015444
MAXCYL= 000134
MAXER   001456
MAXSEC= 000144
MAXTRK= 000140
MCPE  = 02000U
MDPE  = 000400
MESFE   060226
MINCYL= 000136
MINSEC= 000146
MINTRK= 000142
MINUTE  001342
MNTBL   002124
MOH   = 020000
MOL   = 010000
MREAD   060526
MRPCS1  062576
MRPVEC  062605
MSGCON  057513
MSGDRP  057357
MSGEOP  057371
MSGEOT  057417
MSGON   057616
MSGPG   057052
MSGPWR  040022
MSGREP  057107
MSGSUM  057345
MSGX10  057552
MSHELP  064330
MSHW1   057055
MSHW2   057065
MSPASS  057532
MSPRM   060164
MSTOTL  057542
MSWAIT  040176
MSWR0   057713
MXF   = 001000
MXWNDW  040570
M.DPID  032170
M.DP40  032226
M.DP41  032262
M.DP42  032272
M.DP44  032324
M.DP50  032336
N       057705
NED   = 010000
NEDCLK  057634
NEM   = 004000
NEWASN  030030
NEWUNT  001566
NINLEV  056776
NODFLT  057017
NODRVS  060124
NOMTCH  013554
```

SYMBOL TABLE

```
NONE    060076      PIRQ   = 177772     RECALT  016630      SAVER5  001360      SW00   = 000001
NOOP    = 000101    PIRQVE= 000240      RECALO  016720      SAVPOS  001354      SW01   = 000002
NOTAVL  056732      POPQUE  046166      REDAPK  030040      SAVREG= 104412      SW02   = 000004
NOTPRS  056715      POSER   012406      RELBUF  017646      SC      043550      SW03   = 000010
NOTRP   056700      PROCES  007472      RELSE  = 000113     SCMND   027726      SW04   = 000020
NOTSAF  056751      PRTBAD  016356      REPLZ   032552      SCOPE  = 000004     SW05   = 000040
NSA     = 100000    PRTIM   010150      RESREG= 104413      SC04   = 000400     SW06   = 000100
OFFDIR= 000200      PR0     = 000000    RESVEC= 000010      SC1    = 000100     SW07   = 000200
OFFON  = 000001     PR1     = 000040    RETRY   001324      SC10   = 001000     SW08   = 000400
OFLIN   010110      PR2     = 000100    REV     001432      SC100  = 010000     SW09   = 001000
ONES    003262      PR3     = 000140    RHEXT   040566      SC11    044022      SW1    = 000002
ONESEC  001346      PR4     = 000200    RMR    = 000004     SC12    044120      SW10   = 002000
ONESUM  025042      PR5     = 000240    RPADR   040560      SC13    044204      SW11   = 004000
OPI     = 020000    PR6     = 000300    RPAS   = 000016     SC2    = 000200     SW12   = 010000
OPIER   012460      PR7     = 000340    RPBA   = 000004     SC20   = 002000     SW13   = 020000
OPIER1  012522      PS      = 177776    RPBAE  = 000050     SC3     043616      SW14   = 040000
OPT     041542      PSEL    = 002000    RPCC   = 000036     SC4     043622      SW15   = 100000
OPTBL   002104      PSW     = 177776    RPCS1  = 000000     SC40   = 004000     SW2    = 000004
OR      = 000200    PUNSAF  007720      RPCS2  = 000010     SC5     043634      SW3    = 000010
ORDERQ  001520      PWRFLG  040020      RPCS3  = 000052     SC6     043744      SW4    = 000020
OVRWRT  060307      PWRUP   040044      RPDA   = 000006     SC8     043772      SW5    = 000040
PACK    030102      PWRVEC= 000024      RPDB   = 000022     SEARCH= 000131      SW6    = 000100
PAR     = 000010    QCNT    045500      RPDC   = 000034     SECLMT= 000152      SW7    = 000200
PARENT  031110      QDRV0   045572      RPDS   = 000012     SECOND  001344      SW8    = 000400
PARER   012576      QDRV1   045612      RPDT   = 000026     SEEK   = 000105     SW9    = 001000
PARLST  060604      QDRV2   045632      RPEC1  = 000044     SEEKFG  040524      T       054646
PAR1    060742      QDRV3   045652      RPEC2  = 000046     SELDRV= 000145      TAB     056577
PAR11   061224      QDRV4   045672      RPER1  = 000014     SEQPAR  020250      TABLE   061604
PAR12   061271      QDRV5   045712      RPER2  = 000040     SETFMT= 000143      TABLE0  061624
PAR14   061354      QDRV6   045732      RPER3  = 000042     SETVEC  005604      TABLE1  061672
PAR15   061407      QDRV7   045752      RPINIT  040572      SET.IE  045426      TABLE2  061740
PAR16   061451      QINPT   045510      RPLA   = 000020     SIZE70  004742      TABLE3  062006
PAR19   061515      QOUTPT  045530      RPMR1  = 000024     SIZMEM  005112      TABLE4  062054
PAR2    061001      QSTART  045550      RPOF   = 000032     SKI    = 040000     TABLE5  062122
PAR21   061537      QSTOP   045552      RPSN   = 000030     SKIER   013204      TABLE6  062170
PAR3    061061      QTERP  = 045772     RPSTU0  040344      SLASH   060702      TABLE7  062236
PAR4    061136      QUES    056567      RPSTU1  040354      SRCHWT  040516      TAB.XY= 001114
PAR5    061147      RANCYL  021002      RPSTU2  040364      STA     006074      TAP    = 040000
PAR6    061160      RANDOM  001510      RPSTU3  040374      STACK  = 001100     TBITVE= 000014
PAR7    061171      RANDWC  001500      RPSTU4  040404      START   003522      TCF    = 000400
PAR8    061202      RANPAT  021242      RPSTU5  040414      START1  003532      TD      043236
PAR9    061213      RANSEC  021072      RPSTU6  040424      START2  003550      THEAD   020716
PASSES  001474      RANSIZ  021150      RPSTU7  040434      STATIN  001314      TIMER   040526
PAT     = 000020    RANTRK  021036      RPTMR   044322      STATIS  017210      TKVEC  = 000060
PATCH   062724      RANXIT  021262      RPVEC   040562      STATPR  024740      TPE    = 000002
PATTER  001476      RATIO   001502      RPWC   = 000002     STKLMT= 177774      TPVEC  = 000064
PERIOD  057711      RDCHR  = 104410     RPO7    041304      STNDAT  002314      TRAPVE= 000034
PERM    043460      RDDAT  = 000171     RTC    = 000117     STO     044412      TRE    = 040000
PFECH   035510      RDHD   = 000173     RTURN   031770      SUPRS   032362      TRFER   013104
PFECH1  035520      RDLIN  = 104411     RWU1   = 002000     SUPRSL  032346      TRKLMT= 000154
PFECH2  035602      RDONLY  001424      RWU2   = 004000     SUPR1   032374      TRMREP  057214
PFECH3  035634      RDY    = 000200     RWU3   = 010000     SUPR2   032436      TRNSWT  040514
PFECH4  035644      RD.RP   045036      R6     =%000006     SVRHXX  045262      TRTVEC= 000014
PFTSTN  035650      READDR  024364      R7     =%000007     SWR     001154      TSTANY  001422
PGE     = 100000    READHD  016746      S       054667      SWREG   000176      TST1    003540
PGM     = 001000    READIN= 000121      SAVEFG  040522      SWTIM   010052      TYDRV   032764
PIP     = 020000    RECAL  = 000107     SAVER1  001356      SW0    = 000001     TYPDRV  032770
```

SYMBOL TABLE

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TYPDS = 104405
TYPE  = 104401
TYPOC = 104402
TYPON = 104404
TYPOS = 104403
TYPSUM  025070
UCPAR   007760
UNS   = 040000
UNSAF   013340
UNTASN  056652
UNTNOT  056630
UNTOFF  056607
UNTON   056620
UPE   = 020000
US1   = 000001
US2   = 000002
US4   = 000004
VV    = 000100
WAIT    001632
WATPAK  030064
WCE   = 040000
WCF   = 000040
WCFER   013242
WCHKX = 040344
WCKD  = 000151
WCKER   011234
WCKHD = 000153
WC.MK   043462
WLE   = 004000
WLEER   012722
WOR   = 001000
WRDCNT  001466
WRDPOS  001374
WRL   = 004000
WRTCHK  001506
WRTDAT= 000161
WRT.RP  045130
WRYUNS= 000400
XXDP    001430
Y       057707
ZEROS   002360
ZROIND  001350
$APTHD  001100
$ATYC   036704
$ATY1   036660
$ATY3   036666
$ATY4   036676
$AUTOB  001150
$BASE   001262
$BDADR  001136
$BDDAT  001142
$BELL   001176
$BUF  = 000006
$CDW1   001266
$CDW2   001270
$CHARC  036202
$CKSWR  033730
$CMTAG  001114
$CM3  = 000000
$CM4  = 000001
$CNTLC  034635
$CNTLG  034647
$CNTLU  034642
$CODE = 000024
$COMND= 000002
$CPUOP  001234
$CRLF   001203
$CYL  = 000012
$DBDIV  032114
$DBLK   036650
$DB2D   037324
$DB2O   037520
$DECVL  037504
$DEVCT  001216
$DEVM   001264
$DIV    032046
$DOAGN  031764
$DRVSN= 000160
$DSPLY  033020
$DTBL   036640
$ENDAD  031754
$ENDCT  031740
$ENV    001226
$ENVM   001227
$EOP    031420
$EOPCT  031732
$ERFLG  001117
$ERMAX  001131
$ERROR  034742
$ERRPC  001132
$ERRTB  003360
$ERRTY  035332
$ERTTL  001126
$ETABL  001226
$ETEND  001272
$FAIR = 000116
$FATAL  001210
$FFLG   037124
$FILLC  001172
$FILLS  001171
$FILLZ  032656
$FIRST= 000132
$FMT  = 000001
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$GDDAT  001140
$GET42  031744
$GTSWR  034020
$HARD = 000106
$HD   = 000000
$HIBTS  001100
$HINUM  037224
$HLDWC= 000120
$ICNT   001120
$ILLUP  040012
$INTAG  001151
$ITEMB  001130
$LF     001204
$LFLG   037123
$LKCSB  001300
$LKCSR  001276
$LKS    001304
$LLVEC  001306
$LONUM  037226
$LPADR  001122
$LPERR  001124
$LPVEC  001302
$LSTAD  062434
$MADR1  001240
$MADR2  001244
$MADR3  001250
$MADR4  001254
$MAIL   001206
$MAMS1  001236
$MAMS2  001242
$MAMS3  001246
$MAMS4  001252
$MBADR  001102
$MFLG   037122
$MISPO= 000112
$MNEW   034665
$MSGAD  001222
$MSGLG  001224
$MSGTY  001206
$MSWR   034654
$MTYP1  001237
$MTYP2  001243
$MTYP3  001247
$MTYP4  001253
$NCODE= 000122
$NCYL = 000126
$NEXT = 000130
$NPATC= 000123
$NSEC = 000124
$NTRK = 000125
$NULL   001170
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$OCNT   036430
$OCTVL  037622
$OMODE  036432
$OPERC= 000052
$PACK = 000026
$PASS   001214
$PASSC= 000114
$PASTM  001106
$PATTC= 000030
$PREVA= 000032
$PREVO= 000027
$PSEL = 000003
$PWRAD  040006
$PWRDN  037640
$PWRMG  040002
$PWRUP  037712
$QUES   001202
$RAND   037126
$RDCHR  034272
$RDLIN  034362
$RDPAS= 000036
$RDSZ = 000017
$REG  = 000014
$REPLZ  032662
$RESRE  037266
$RETRY  017040
$RPADR  001272
$RPAS = 000204
$RPBA = 000172
$RPBAE= 000236
$RPCC = 000224
$RPCS1= 000166
$RPCS2= 000176
$RPCS3= 000240
$RPDA = 000174
$RPDB = 000210
$RPDC = 000222
$RPDS = 000200
$RPDT = 000214
$RPEC1= 000232
$RPEC2= 000234
$RPER1= 000202
$RPER2= 000226
$RPER3= 000230
$RPLA = 000206
$RPMR1= 000212
$RPOF = 000220
$RPSN = 000216
$RPVEC  001274
$RPWC = 000170
$RP07   057075
$RP07P  057102
$RTNAD  031766
$RTOTL= 000066
$SAVRE  037230
$SAVR6  040016
$SB2D   033332
$SB2O   033362
$SEC  = 000010
$SEEKS= 000046
$SETUP= 000156
$SIZE   062304
$SKI  = 000110
$SOFT = 000104
$SSEC = 000022
$STCTL= 000076
$STUP = 177777
$SUPRL  032446
$SUPRS  032462
$SUPR1  032474
$SUPR2  032536
$SVPC = 000210
$SWR  = 122000
$SWREG  001230
$TATUS= 000016
$TERM = 000032
$TESTN  001212
$TIME   026146
$TKB    001162
$TKCNT  033412
$TKINT  033430
$TKQEN= 033427
$TKQIN  033414
$TKQOU  033416
$TKQSR  033420
$TKS    001160
$TKSRV  033500
$TMPO   001174
$TN   = 000002
$TNPWR  037434
$TOTAL= 000102
$TPB    001166
$TPFLG  001173
$TPS    001164
$TRAP   040256
$TRAP2  040300
$TRK  = 000011
$TRP  = 000015
$TRPAD  040312
$TSTM   001104
$TSTNM  001116
$TTYIN  034616
$TYPDS  036434
$TYPE   035652
$TYPEC  036064
$TYPEX  036204
$TYPOC  036232
$TYPON  036246
$TYPOS  036206
$UNIT   001220
$UNITM  001110
$USWR   001232
$VECT1  001256
$VECT2  001260
$WCNT = 000004
$WRDL = 000020
$WTOTL= 000056
$WTPAS= 000042
$XOFF = 000023
$XON  = 000021
$$GET4= 000000
$OFILL  036431
.$X   = 001100
```

SYMBOL TABLE

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. ABS.  070345     000
        000000     001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  62464 WORDS  ( 244 PAGES)
DYNAMIC MEMORY AVAILABLE FOR  70 PAGES
CZRJOA.BIC,CZRJOA/C=[20,12]CZRJOA.DOC,CZRJOA.MIS,CZRJOA,[20,0]SYSMAC/M
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$$$BAD 15-3 15-140 15-212 15-263 15-308 15-352 15-379
$$$EOP 38-1
$$$EOT 38-1
$$$IT 64-16 64-48
$$$MFG 1-3 1-11 4-3 5-53 5-82 8-0 8-0 11-99 11-200 11-282 11-314 13-215 14-4 14-37
14-133 15-557 15-636 16-140 16-152 17-155 21-60 22-8 28-51 29-61 32-16 32-63 32-77 34-64
34-113 63-80 68-43 69-50 69-68 69-69
$$$ODT 6-4
$$GET4 38-1 38-1#
$OFILL 46-1 46-1# 46-1• 46-1•
$40CAT 43-1
$APTHD 6-11 6-11#
$ASTAT 48-1 48-1
$ATY1 48-1#
$ATY3 45-1 48-1#
$ATY4 43-1 48-1#
$ATYC 48-1 48-1#
$AUTOB 7-0# 11-31• 11-77 11-112 11-187 11-205 11-283 12-16 13-87 28-31 34-78 38-1 38-1 42-1
42-1 42-1
$BASE 7-0# 11-72 11-74
$BDADR 7-0#
$BDDAT 7-0#
$BELL 7-0# 27-8 42-1 42-1 42-1 43-1 43-1 43-1
$BUF 13-104• 13-142• 15-625 16-10 19-10 20-59 20-65 20-70 20-74 20-116 27-95 27-240 27-247 55-200
58-10#
$CDW1 7-0#
$CDW2 7-0#
$CHARC 45-1 45-1# 45-1• 45-1• 45-1•
$CKSWR 42-1# 54-1 54-1
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$CM4 7-0 7-0 7-0# 7-0#
$CMTAG 7-0# 11-25 11-25 11-25
$CNTLC 42-1 42-1 42-1 42-1 42-1#
$CNTLG 42-1 42-1#
$CNTLU 42-1 42-1 42-1#
$CODE 16-5 16-31 16-98 17-56 18-20 18-26 19-14 19-16 19-37 20-114 21-35• 21-57• 21-63• 26-30•
26-34• 26-42• 26-48 34-33• 34-43 57-534• 58-21#
$COMND 18-65• 18-85• 18-122• 21-58• 21-67• 26-28 26-31• 26-36• 26-37 26-41• 34-14 34-35• 55-197 57-525
57-535• 58-7#
$CPUOP 7-0# 11-141• 11-169• 27-83 27-258 27-280 57-901
$CRLF 7-0# 11-51 11-326 11-377 13-39 13-62 14-78 14-79 14-85 14-86 15-572 15-587 16-189 16-214
16-242 17-133 17-153 18-24 18-37 18-51 18-53 18-54 27-11 27-12 27-29 27-63 27-65 27-99
27-113 27-132 27-152 27-171 27-186 27-208 27-231 27-250 27-290 27-304 27-317 27-324 27-362 27-394
27-424 29-22 29-28 29-168 32-20 32-173 33-44 37-7 37-30 37-36 38-1 38-1 38-1 38-1
38-1 42-1 42-1 42-1 42-1 43-1 43-1 43-1 43-1 43-1 44-1 44-1 44-1 44-1
45-1 45-1 45-1 53-21 67-21
$CVL 16-16 18-75• 18-120• 20-144 21-24 21-26• 21-34• 26-15 26-46• 27-159 34-14 34-123• 55-203 57-532
58-13#
$DB2D 27-383 27-390 27-415 29-97 29-103 29-113 29-119 29-129 29-135 41-248 51-1#
$DB2O 41-265 52-1#
$DBDIV 19-26 19-47 38-88#
$DBLK 47-1 47-1 47-1#
$DECVL 51-1 51-1#
$DEVCT 7-0# 38-1• 38-1•
$DEVM 7-0#
$DIV 17-51 18-13 27-275 38-21 38-49#

CROSS REFERENCE TABLE (CREF V04.00)

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$DDAGN  38-1     38-1     38-1#
$DRVSN  34-25    34-27    35-25*   41-104   58-72#   58-76
$DSPLY  41-116#  54-2
$DTBL   47-1     47-1#
$ENDAD   6-8     38-1#
$ENDCT  38-1#
$ENV     7-0#    11-31    11-67    12-11    43-1     45-1     48-1     48-1
$ENVM    7-0#    11-25    45-1     45-1     48-1
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$EOPCT  38-1     38-1#
$ERFLG   7-0#    43-1     43-1     43-1*
$ERMAX   7-0#
$ERROR  11-25    43-1#
$ERRPC   7-0#    43-1     43-1     43-1     43-1*    43-1*    44-1     44-1
$ERRTB  10-0#    44-1
$ERRTY  43-1     44-1#
$ERTTL   7-0#    43-1     43-1     43-1*
$ETABL   7-0#
$ETEND   6-11     7-0#
$FAIR   13-107*  13-146*  13-155*  13-156   58-41#
$FATAL   7-0#    48-1*
$FFLG   48-1     48-1#    48-1*    48-1*    48-1*
$FILLC   7-0#    45-1     45-1     45-1
$FILLS   7-0#    45-1     45-1
$FILLZ  41-53#
$FIRST  11-98*   11-98*   11-98*   11-98*   11-98*   11-98*   11-98*   11-98*   12-39*   34-25    34-59*   58-52#
$FMT    55-196   58-6#    58-7     58-8     58-9     58-10    58-11    58-12    58-13    58-14    58-15    58-19
$GDADR   7-0#
$GDDAT   7-0#
$GET42  13-97    28-33    38-1#
$GTSWR  42-1#    54-1     54-1
$HARD   29-153   29-165   30-17    30-17*   58-37#
$HD      5-85     5-85     5-85
$HIBTS   6-11#
$HINUM  11-25*   38-19    49-1     49-1     49-1#    49-1*
$HLDWC  20-57    20-66    20-71    20-75    21-51*   26-52*   58-42#
$ICNT    7-0#
$ILLUP  53-1     53-1     53-1#
$INTAG   7-0#    42-1     42-1     42-1     42-1     42-1*
$ITEMB   7-0#    43-1     43-1     43-1     43-1     43-1     43-1*    43-1*    44-1
$LF      7-0#    42-1     42-1     42-1     43-1     43-1     45-1     45-1
$LFLG   48-1#    48-1*
$LKCSB   8-0#    28-13*
$LKCSR   8-0#    28-8     28-14*   28-47*
$LKS     8-0#    28-20    28-25*   28-49*
$LLVEC   8-0#    28-22
$LONUM  11-25*   22-21    38-18    49-1     49-1     49-1#    49-1*
$LPADR   7-0#
$LPERR   7-0#
$LPVEC   8-0#    28-10
$LSTAD  11-177   66-1#    66-1*
$MADR1   7-0#
$MADR2   7-0#
$MADR3   7-0#
$MADR4   7-0#
$MAIL    6-11     6-11     7-0#     11-19    11-25    11-31    43-1     45-1
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CROSS REFERENCE TABLE (CREF V04.00)

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$MAMS3   7-0#
$MAMS4   7-0#
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$MSGLG    7-0#    48-1•
$MSGTY    7-0#    48-1     48-1     48-1•    48-1•
$MSWR    32-24    42-1     42-1#
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$MTYP2    7-0#
$MTYP3    7-0#
$MTYP4    7-0#
$NCODE   22-25•   23-59    23-68    26-13    26-34    26-35    58-46#   58-47    58-48    58-49    58-50    58-51    58-52    58-56
$NCYL    22-27•   22-41•   23-10•   26-46    58-50#
$NEXT    13-106•  13-130   13-145•  21-70•   21-74•   23-72•   34-20    58-51#
$NPATC   23-71•   26-44    58-47#
$NSEC    22-26•   22-36    22-39•   23-32•   23-36    23-55    26-45    58-48#
$NTRK    22-40•   23-21•   58-49#
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$NWTST   11-19#
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$OCTVL   52-1     52-1#
$OMODE   46-1     46-1#    46-1•    46-1•    46-1•    46-1•
$OPERC   20-142•  20-143•  21-14    21-16    22-31    22-33    38-1     58-29#
$PACK    12-40•   13-132   13-185   13-187   21-36    21-55    21-73•   26-9     32-182•  58-22#
$PASS     7-0#    11-25•   38-1     38-1     38-1•    38-1•    38-1•    38-1•
$PASSC   29-83    34-42•   38-1     38-1•    58-40#
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$PATTC   20-118   21-69•   26-44•   34-36•   34-37•   58-24#
$PREVA   18-72•   18-73•   18-74•   20-144   21-23•   21-24•   26-15•   26-16•   26-19•   26-20•   26-21•   27-198   27-202   27-206
         27-214   57-532•  57-533•  58-25#
$PREVO   18-64•   21-22•   26-11•   26-12•   26-39    27-39    57-531•  58-23#
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$PWRAD   53-1#
$PWRDN   11-25    53-1     53-1#
$PWRMG   53-1#
$PWRUP   53-1     53-1#
$QUES     7-0#    42-1     42-1     42-1     42-1     43-1     43-1     45-1     45-1
$R2A     54-1
$RAND    22-7     23-39    23-52    23-82    49-1#
$RDCHR   42-1#    54-1     54-1
$RDDEC   54-1
$RDLIN   42-1#    54-1     54-1
$RDOCT   54-1
$RDPAS   13-191   13-194   19-39•   19-40•   29-112   38-1     38-1     58-26#
$RDSZ    42-1     42-1#
$REG     55-204   55-14#   58-106   58-106   58-106   58-106   58-106   58-106   58-106   58-106   58-106   58-106   58-106   58-106
         58-106   58-106   58-106   58-106
$REPLZ   15-581   16-227   17-121   17-141   41-55#
$RESRE   50-1#    54-1
$RETRY   15-31    15-131   15-233   15-282   15-327   15-368   15-400   15-469   15-499   15-516   15-544   18-142#  18-168
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CROSS REFERENCE TABLE (CREF V04.00)

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$RPADR   8-0#   11-74•  11-80   11-144  11-158  61-5    67-23   67-47
$RPAS   58-83#  61-8
$RPBA   15-626  17-43   17-79   17-101  18-5    18-44   19-9    27-96   27-147  27-246  27-257•  27-262•  27-265•  27-266
        58-78#  61-8
$RPBAE  58-96#  61-10
$RPCC   58-91#  61-9
$RPCS1  14-9    14-11   14-157  15-598  18-64   21-22   26-11   27-33   57-531  58-76#  58-77    58-78    58-79    58-80
        58-81   58-82   58-83   58-84   58-85   58-86   58-87   58-88   58-89   58-90   58-91    58-92    58-93    58-94
        58-95   58-96   58-97   58-106  58-106  58-106  58-106  58-106  58-106  58-106  58-106   61-7
$RPCS2  14-153  15-47   15-226  15-274  15-319  15-434  15-449  15-465  15-600  27-278  58-80#   61-7
$RPCS3  27-263  27-285  34-27   58-97#  58-106  58-106  58-106  58-106  58-106  58-106  58-106   58-106   61-10
$RPDA   21-25   22-26   27-180  27-229  27-483  27-484  58-79#  61-8
$RPDB   27-269  58-85#  61-8
$RPDC   15-302  21-26   22-27   27-184  27-217  27-485  58-90#  61-9
$RPDS   11-370  12-33   14-13   14-149  14-195  18-160  32-169  58-81#  61-7
$RPDT   58-87#  61-9
$RPEC1  15-11   15-17   15-19   15-154  15-158  15-160  17-62   27-311  58-94#  61-7
$RPEC2  15-21   15-162  17-83   27-315  58-95#  61-8
$RPER1  14-145  14-161  14-165  14-169  14-173  14-177  14-181  14-185  14-189  14-193  14-199   14-203   15-8     15-51
        15-53   15-74   15-76   15-121  15-151  15-190  15-254  15-293  15-602  18-154  18-164   58-82#   61-7
$RPER2  15-607  58-92#  61-7
$RPER3  14-207  14-209  15-530  15-534  15-604  58-93#  61-7
$RPLA   58-84#  61-8
$RPMR1  58-86#  61-8
$RPOF   58-89#  61-9
$RPSN   35-14   58-88#  61-9
$RPVEC   8-0#   11-71•  11-81   67-35
$RPWC   15-621  16-12   17-44   18-7    27-93   27-150  27-271  58-77#  61-8
$RTNAD  38-1#
$RTOTL  19-41•  19-42•  19-43   19-44   19-50•  19-51•  19-52•  19-53•  27-388  29-118  58-32#
$SAVR6  53-1    53-1#   53-1•   53-1•   53-1•
$SAVRE  50-1#   54-1    54-1
$SB2D   15-580  16-226  17-74   17-120  17-140  27-460  29-84   31-14   31-19   31-24   36-17    41-246#
$SB2O   27-444  41-263#
$SEC    16-18   18-76•  18-119• 21-18   21-23   21-25•  21-28   21-32•  21-43   26-16   26-45•   27-169   34-128•  55-201
        57-533  58-11#
$SEEKS  13-198  13-201  20-146• 20-147• 29-128  58-28#
$SETUP   5-310   5-310   5-310   5-310   5-310   5-310#  5-310#  5-310#  5-310#  5-310#  5-310#   11-25    11-25    11-25
        11-25   11-25   11-25   11-25   11-25   11-25   11-25   11-25   11-25   11-31   11-31    11-31    38-1     38-1
        42-1    42-1    42-1    42-1    42-1    43-1    43-1    43-1    43-1
$SIZE   11-176  66-1#
$SKI    27-422  29-156  29-165  30-18   30-18•  58-38#
$SOFT   29-150  29-165  30-16   30-16•  58-36#
$SSEC   16-24   16-29   16-30   17-50   18-12   21-53•  26-47•  26-50•  27-274  34-41•  34-45•   58-20#
$STOTL  20-148• 20-149• 27-413  29-134  58-34#
$STUP    5-310   5-310   5-310   5-310   5-310   5-310#  5-310#  5-310#  5-310#  5-310#  5-310#   5-310#   5-310#   5-310#
        5-310#
$SUPR1  40-19   40-24#
$SUPR2  40-18•  40-23•  40-33   40-35•  40-37#
$SUPRL  17-75   27-384  27-391  27-416  27-461  40-16#
$SUPRS  40-21#
$SVPC    6-8     6-8#
$SWR     5-73#   5-85    5-87    5-87    5-87    5-87    5-87    5-87    5-87    5-87    7-0      7-0      7-0      11-19
        11-25   38-1    38-1    38-1    38-1    38-1    43-1    43-1    43-1    43-1    43-1     43-1     43-1     43-1
        43-1    43-1    43-1    53-1
```

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$SWREG   7-0#   11-25
$TATUS  13-176  14-7    14-36   14-51   14-53   14-55   14-57   14-59   14-61   14-141  15-65   15-68   15-180  18-69
        18-89   18-127  18-143  18-150  19-7    27-90   27-237  34-20   55-205  57-530* 58-15#  61-9
$TERM   54-3#
$TESTN   7-0#   11-19*  38-5*   44-1    44-1
$TIME   13-40   27-13   29-29   31-4#   32-21   38-1    43-1    53-20
$TKB     7-0#   32-97   42-1    42-1    42-1    42-1    42-1    42-1    42-1    45-1    45-1
$TKCNT  42-1    42-1    42-1#   42-1*   42-1*   42-1*   42-6*
$TKINT  11-66   12-3    32-26   38-6    42-1    42-1    42-1#   53-18
$TKQEN  42-1    42-1    42-1#   42-9
$TKQIN  42-1    42-1    42-1#   42-1*   42-1*   42-1*   42-1*   42-7*   42-8*   42-9    42-11*
$TKQOU  42-1    42-1    42-1#   42-1*   42-1*   42-1*
$TKQSR  42-1    42-1    42-1    42-1#   42-11
$TKS     7-0#   32-98*  42-1    42-1    42-1    42-1    42-1    42-1*   42-1*   42-1*   42-1*   42-1*   42-1*   45-1
        45-1
$TKSRV  42-1    42-1#
$TMPO    7-0#
$TN      5-74#   5-85    11-19   11-19   11-19   11-19#
$TNPWR  51-1    51-1    51-1#
$TOTAL  27-378  29-162  30-20   30-20*  37-43   58-35#
$TPB     7-0#   45-1    45-1    45-1*
$TPFLG   7-0#   45-1    45-1    45-1
$TPS     7-0#   45-1    45-1    45-1
$TRAP   11-25   54-1#
$TRAP2  54-1    54-1#
$TRK    18-118* 21-33*  27-164  34-127* 55-202  58-12#
$TRP    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1
        54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1
        54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1
        54-1    54-1    54-1#   54-1#   54-1#   54-1#   54-1#   54-1#   54-1#   54-1#   54-1#   54-1#   54-1#   54-1#
        54-2    54-2    54-2    54-2    54-2#
$TRPAD  54-1    54-1#   54-3
$TSTM    6-11#
$TSTNM   7-0#   43-1    43-1    43-1
$TTYIN  42-1    42-1    42-1    42-1    42-1    42-1#
$TYPBN  54-1
$TYPDS  47-1#   54-1    54-1
$TYPE   41-119  45-1#   48-1    54-1    54-1
$TYPEC  42-1    45-1    45-1    45-1    45-1#
$TYPEX  45-1    45-1    45-1#
$TYPOC  46-1#   54-1    54-1
$TYPON  46-1    46-1#   54-1
$TYPOS  46-1#   54-1
$UNIT    7-0#    8-0
$UNITM   6-11#
$USWR    7-0#
$VECT1   7-0#   11-69   11-71
$VECT2   7-0#
$WCNT   18-123* 21-50*  21-52*  26-51*  26-53*  34-39*  34-40*  55-199  58-9#
$WRDL   15-623  16-11   17-45   18-6    20-15   20-22   20-24*  20-25   20-26*  20-117  21-46*  21-47*  21-49*  21-50
        21-51   23-64*  26-51   26-52   27-92   27-243  27-272  34-38*  58-19#  58-20   58-21   58-22   58-23   58-24
        58-25   58-26   58-27   58-28   58-29   58-30   58-32   58-34   58-35   58-36   58-37   58-38   58-39   58-40
        58-41   58-42   58-46
$WTOTL  19-20*  19-21*  19-22   19-23   19-29*  19-30*  19-31*  19-32*  27-381  29-102  58-30#
$WTPAS  19-18*  19-19*  29-96   58-27#
$XOFF   45-1    45-1
```

CROSS REFERENCE TABLE (CREF V04.00)

```
$XON    42-1     45-1     45-1
.$ASTA  48-1     48-1
.$X      6-11     6-11#
A16      5-112#  11-162   11-167
A17      5-113#  11-162   11-167
ABASE    5-307#   7-0      7-0
ABNRML  13-183   37-41#
ACDW1    7-0      7-0
ACDW2    7-0      7-0
ACPUOP   7-0      7-0
ACTDRV  55-105#  57-101•  57-155•  57-456•  57-464•  57-684
ACTSTR  55-111#  57-686•  57-700•
ADDW0    7-0
ADDW1    7-0
ADDW10   7-0
ADDW11   7-0
ADDW12   7-0
ADDW13   7-0
ADDW14   7-0
ADDW15   7-0
ADDW2    7-0
ADDW3    7-0
ADDW4    7-0
ADDW5    7-0
ADDW6    7-0
ADDW7    7-0
ADDW8    7-0
ADDW9    7-0
ADEVCT   7-0      7-0
ADEVM    7-0      7-0
AENV     7-0      7-0
AENVM    7-0      7-0
AFATAL   7-0      7-0
AIR      5-264#
AMADR1   7-0      7-0
AMADR2   7-0      7-0
AMADR3   7-0      7-0
AMADR4   7-0      7-0
AMAMS1   7-0      7-0
AMAMS2   7-0      7-0
AMAMS3   7-0      7-0
AMAMS4   7-0      7-0
AMSGAD   7-0      7-0
AMSGLG   7-0      7-0
AMSGTY   7-0      7-0
AMTYP1   7-0      7-0
AMTYP2   7-0      7-0
AMTYP3   7-0      7-0
AMTYP4   7-0      7-0
AOE      5-186#
APASS    7-0      7-0
APRIOR   7-0
APTCSU  45-1     48-1#
APTENV  43-1     45-1     48-1     48-1#
APTSIZ  11-25    48-1#
APTSPO  45-1     48-1     48-1#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
ASGN1    32-126#
ASGN2    32-124    32-139#
ASGN3    32-135    32-149    32-157#
ASGN4    32-158    32-184#
ASGN6    32-166    32-186#
ASGN7    32-165    32-189#
ASGN8    32-170    32-199#
ASGND    13-69     63-47#
ASKPAR   11-286    64-25#
ASMBLY    8-0
ASNERR   32-137    32-154    32-187    32-197    32-200    33-22     33-38     37-7#
ASNLST    8-0#     13-76*    13-85     13-222    29-8      29-26     32-34     32-133    32-147    32-157    33-10     33-12*    33-28     33-34*
         33-40     33-47*    37-26*    38-1      38-1      38-1*     53-23
ASNMSG   32-126*   32-131*   32-140*   32-145*   32-186*   32-192*   32-194*   32-196*   32-199*   33-21*    33-37*    37-12#
ASSIGN   32-104#   33-53     33-58     33-63     33-69
ASWREG    7-0       7-0
AT0       5-198#
AT1       5-199#
AT2       5-200#
AT3       5-201#
AT4       5-202#
AT5       5-203#
AT6       5-204#
AT7       5-205#
ATA       5-173#
ATABIT   13-76     29-26     32-133    32-147    32-157    33-10     33-12     33-13     33-32     33-34     37-26     37-27     38-1      38-1
         38-1      55-151#   57-67     57-168    57-300    57-490    57-513    57-587    57-611    57-619    57-620    57-650    57-759
ATESTN    7-0       7-0
ATTN      8-0#      43-1*     61-1
AUNIT     7-0       7-0
AUSWR     7-0       7-0
AUTLST   13-77*    33-13*    37-27*    38-1      38-1      38-1*     38-1*     38-10#
AVAIL     8-0#     13-22     13-70     13-74*    13-126    13-129    13-166    13-206
AVECT1    5-308#    7-0       7-0
AVECT2    7-0       7-0
BADENT   11-130    11-227    11-248    11-299    32-120    36-30     63-59#
BADSEC    8-0#     13-182*   27-61     30-16     30-17     30-18     30-19     30-20
BADTMO   11-3#     11-27
BAI       5-130#
BEGCOD    8-0#     34-33     34-34
BEGPAT    8-0#     34-36
BEGWC     8-0#     34-38     34-39
BELL     62-3      63-41     63-48     63-85     63-86     69-7      69-8
BIT0      5-104#
BIT00     5-104     5-104#    43-1      43-1
BIT01     5-104     5-104#    14-59     57-145    57-422
BIT02     5-104     5-104#
BIT03     5-104     5-104#    14-141    15-398
BIT04     5-104     5-104#    14-141    14-165
BIT05     5-104     5-104#    15-498    56-37     57-444    57-733
BIT06     5-104     5-104#    15-50     15-53     19-7      27-237    32-98     57-77     57-132    57-211    57-505    57-924
BIT07     5-104     5-104#    14-36     14-169    19-7      57-77     57-371    57-478    57-615    57-886
BIT08     5-104     5-104#    14-161    57-77     57-746
BIT09     5-104     5-104#    14-57     43-1      57-731
BIT1      5-104#    14-149    15-530    18-160
BIT10     5-104#    14-55     14-185    14-195    43-1      57-425
```

CROSS REFERENCE TABLE (CREF V04.00)

```
BIT11    5-104#  14-53   14-189  27-263  27-285  57-31   57-175  57-392  57-666
BIT12    5-104#  11-169  14-51   14-199  15-50   15-51   15-76   27-225  57-25   57-58   57-77   57-148  57-183  57-420
         57-818  57-856  57-925
BIT13    5-104#  11-169  14-173  15-366  15-465  41-116  43-1    57-820
BIT14    5-104#  14-11   14-13   14-59   14-145  14-153  14-157  14-207  15-147  15-226  15-274  15-319  15-434  15-449
         15-514  27-278  57-139  57-180  57-510  57-661  57-788  57-922
BIT15    5-104#  14-9    14-209  15-50   15-121  15-190  15-465  57-139  57-145  57-148  57-180  57-183  57-237  57-272
         57-392  57-422  57-425  57-505  57-661  57-731  57-746  57-788  57-796
BIT2     5-104#  14-61   15-534  57-796
BIT3     5-104#  14-177  57-860
BIT4     5-104#  15-280
BIT5     5-104#  14-181
BIT6     5-104#  15-76   27-90
BIT7     5-104#  15-68   15-325  18-150
BIT8     5-104#  15-231  15-254  15-259  15-293  15-298  15-465
BIT9     5-104#  14-193  15-465
BLKADR   8-0#    11-85   11-367  12-30   29-24   32-161  32-181  33-15   53-33
BLNKS1   13-66   18-34   18-46   27-14   29-70   29-72   29-80   32-23   32-177  36-20   36-22   62-67#
BLNKS2   11-355  15-584  16-211  16-230  17-124  17-129  17-129  17-144  17-149  17-149  18-43   27-69   27-110  27-161
         27-166  27-182  27-302  27-302  27-313  62-66#  67-27   67-39
BLNKS3   18-31   62-65#
BLNKS4   11-328  62-64#
BPE      5-266#
BPTVEC   5-104#
BSE      5-274#
BUFTBL   8-0#    11-178* 11-179* 11-180* 11-183* 11-184* 11-186* 11-189* 11-190  11-192  20-12   20-14   20-28*  20-54
         20-55   20-67*  20-72*  20-77   20-78   20-91*
BUSADR   11-79   67-13#
CFLAG    8-0#    11-95*  11-120  11-213* 11-217  11-232* 11-238  11-281* 11-289  12-50*  13-3    13-89*  15-555  15-574
         16-195  32-19*  32-32   32-105* 32-110  36-9*   36-25   36-35*  42-5*   53-22*  53-26   67-22*  67-30   67-42
CHGADR   8-0#    11-15*  11-18*  12-18   12-47*  34-80   53-30*  67-13   67-15*
CHKWC    21-45   23-56   25-16#
CI1      57-197  57-229#
CI2      57-261  57-270#  57-284  57-320
CI3      57-200  57-278#
CI4      57-190  57-303#
CI5      57-268  57-301   57-377#  57-387
CI6      57-321  57-332   57-335   57-337   57-383#
CI7      57-125  57-210   57-240   57-250   57-254   57-266  57-275  57-283  57-294  57-299  57-311  57-319  57-327  57-331
         57-342  57-346   57-357   57-369   57-386   57-389# 57-482  57-604  57-900
CI7B     57-394#  57-607
CI8      57-397  57-407#  57-544   57-779
CK.CHR   41-172#  41-209   41-217
CK.DEC   41-150#  41-178
CK.DIG   36-27   41-203#
CK.NUM   67-32   67-44    68-10#
CK.OCT   41-132#  41-180
CKBUS    14-19   15-621#
CKCLK    11-312  28-5#    32-38   38-7    53-19
CKCLK1   28-7    28-17#
CKCLK2   28-19   28-28#
CKCLK3   28-15   28-26    28-37#
CKERR    14-18   15-598#
CKFMT    14-167  15-254#
CKMCE    14-171  15-293#
CKLMTS   21-19   21-29    22-37   23-37   24-15#
```

```
CKSWR    43-1     43-1     54-1#
CLKFLG    8-0#    28-5*    28-9*    28-21*   28-44    31-4
CLKOFF   28-44#   32-27
CLR       5-132#  32-15
CLRDPB   12-31    32-167   34-9#
CLRQUE   56-17    57-443   57-755   57-993#
CMCNT     8-0#    16-11*   16-12*   16-24    16-26    16-27*   16-30*   16-100   16-103*  16-108   16-136*
CMCYL     8-0#    16-16*   16-17*   16-36    16-118*  16-119   16-125
CMDAT    16-32    16-47    16-56#   16-104   16-106
CMHED    16-36#
CMPAR    14-31    16-3#
CMPARD   15-110   16-5#
CMPLMT    8-0#    15-593   16-19
CMPRES   13-45    13-117   13-168   13-210   26-67#   26-70
CMPRT    16-51    16-71    16-83    16-95    16-157#
CMPRX    16-48    16-102   16-109   16-123   16-137   16-146#
CMPTIM    8-0#    11-94    11-94*   13-95    13-95*   14-22    14-24    14-24    14-26    14-28    14-30*   31-39*   64-5
CMSEC     8-0#    16-18*   16-110*  16-111   16-113*
CMSTR    16-21#
CMSTR2   16-41    16-45    16-50#   16-130   16-134
CMTRK     8-0#    16-114*  16-115   16-117*
COLON    31-17    31-22    63-57#
COMMA    13-65    29-79    32-22    32-176   63-5#
COMTBL    8-0#    26-36    34-35
CPSAVE   43-1     43-1     43-1     43-1     43-1     43-1#    43-1*    43-1*    44-1
CR        5-104#  45-1     45-1
CRLF      5-104#   8-0     11-6     11-31    11-31    11-45    11-56    11-62    29-93    29-109   29-125   29-148   29-149   45-1
          45-1    53-5     53-37    53-38    53-38    60-6     60-7     60-8     60-9     62-48    62-49    62-50    62-51    62-53
          62-55   62-56    62-58    62-59    62-60    62-61    62-62    62-63    63-19    63-20    63-26    63-28    63-30    63-37
          63-41   63-48    63-48    63-52    63-53    63-54    63-55    63-56    63-56    63-59    63-60    63-60    63-62    63-83
          63-84   63-85    63-86    63-88    63-88    63-89    63-89    64-25    69-6     69-9     69-10    69-11    69-12    69-13
          69-14   69-15    69-16    69-17    69-18    69-19    69-20    69-21    69-22    69-23    69-24    69-25    69-26    69-27
          69-28   69-29    69-30    69-31    69-32    69-33    69-34    69-35    69-36    69-37    69-38    69-39    69-40    69-41
          69-42   69-43    69-44    69-45    69-46    69-47    69-48    69-49    69-51    69-53    69-54    69-55    69-56    69-57
          69-58   69-59    69-60    69-61    69-62    69-63    69-64    69-65    69-66
CTRAP    42-1     42-1     42-5#
CYLLMT   16-121   34-61    34-85    34-86    34-121   34-141*  34-148*  58-65#   58-66    58-67    58-68    58-72
CYLNDR   15-300   15-301*  15-302   15-305*  15-342*  27-224   27-302   27-302   58-115   68-79#
DASH     29-71    63-6#
DASH13   29-50    33-43    38-1     38-1     63-32#
DASH5    13-41    29-30    38-1     63-31#
DATA0     9-0      9-0#
DATA1     9-0      9-0#
DATA10    9-0      9-0#
DATA11    9-0      9-0#
DATA12    9-0      9-0#
DATA13    9-0      9-0#
DATA14    9-0      9-0#
DATA15    9-0      9-0#
DATA2     9-0      9-0#
DATA3     9-0      9-0#
DATA4     9-0      9-0#
DATA5     9-0      9-0#
DATA6     9-0      9-0#
DATA7     9-0      9-0#
DATA8     9-0      9-0#
```

```
DATA9    9-0      9-0#
DATAPK   32-69    33-62#
DCK      5-192#
DCKER    14-205   15-6#
DCKER1   15-46#   15-388
DCU      5-267#
DDISP    5-104#   7-6      11-25
DDRVS    8-0#     13-14    33-15*   37-29*   38-1*
DEVOFF   37-21
DGE      5-262#
DH1      10-5     60-1#
DH14     27-66    60-6#
DH15     27-75    60-7#
DH16     27-79    60-8#
DH17     27-87    60-9#
DH2      10-12    10-33    60-2#
DH3      10-19    60-3#
DH4      10-26    60-4#
DH6      10-40    60-5#
DISPLA   7-0#     11-25*   11-25*   43-1*
DISPLY   14-68    14-101   14-112   14-123   15-14    15-24    15-27    15-43    15-71    15-114   15-124   15-169   15-221   15-245
         15-270   15-315   15-339   15-359   15-387   15-393   15-411   15-421   15-430   15-445   15-460   15-480   15-491   15-510
         15-532   15-536   15-538   15-566   15-571   15-572   15-573   15-583   15-584   15-587   15-611   15-629   16-182   16-188
         16-189   16-190   16-211   16-214   16-219   16-223   16-229   16-230   16-239   16-242   17-70    17-76    17-77    17-114
         17-123   17-124   17-129   17-129   17-133   17-143   17-144   17-149   17-149   17-152   17-153   18-24    18-25    18-28
         18-31    18-34    18-37    18-39    18-43    18-46    18-51    18-53    18-54    18-176   27-29    27-55    27-57    27-63
         27-64    27-65    27-66    27-69    27-75    27-79    27-87    27-98    27-99    27-110   27-113   27-119   27-125   27-132
         27-146   27-149   27-152   27-158   27-161   27-162   27-166   27-167   27-171   27-179   27-182   27-183   27-186   27-193
         27-195   27-197   27-200   27-204   27-208   27-213   27-216   27-223   27-227   27-231   27-239   27-242   27-245   27-250
         27-256   27-268   27-288   27-290   27-297   27-302   27-302   27-303   27-304   27-310   27-313   27-314   27-317   27-323
         27-324   27-330   27-336   27-342   27-361   27-362   27-377   27-380   27-385   27-386   27-387   27-392   27-393   27-394
         27-412   27-417   27-418   27-421   27-424   27-433   27-447   27-462   40-36    41-74    54-2#
DISPRE   6-1#     11-25
DLT      5-142#
DONE     14-45    14-139#
DPE      5-265#
DPINT    55-65#   57-16*   57-33    57-85*   57-651   57-653*  57-723   57-761   57-772   57-782*
DPR      5-166#
DPRQS    55-78#   57-114   57-169*  57-203*  57-399*  57-412   57-432*  57-565   57-725   57-763   57-774   57-792*
DRIVE    8-0#     61-2     61-3     61-4
DRIVE0   8-0      11-98*   58-106#  65-20    65-20    65-20    65-20    65-20    65-20
DRIVE1   8-0      11-98*   58-106#  65-20    65-20    65-20    65-20    65-20    65-20
DRIVE2   8-0      11-98*   58-106#  65-20    65-20    65-20    65-20    65-20    65-20
DRIVE3   8-0      11-98*   58-106#  65-20    65-20    65-20    65-20    65-20    65-20
DRIVE4   8-0      11-98*   58-106#  65-20    65-20    65-20    65-20    65-20    65-20
DRIVE5   8-0      11-98*   58-106#  65-20    65-20    65-20    65-20    65-20    65-20
DRIVE6   8-0      11-98*   58-106#  65-20    65-20    65-20    65-20    65-20    65-20
DRIVE7   8-0      11-98*   58-106#  65-20    65-20    65-20    65-20    65-20    65-20
DROP     14-74    14-118   15-521   15-549   37-20#   37-52
DROPD    32-55    33-4#
DROPNG   37-31    63-41#
DRQ      5-220#
DRSTAT   11-325   63-20#
DRVACT   55-23#   57-120   57-380*  57-400*  57-410   57-431*  57-471*  57-577   57-601   57-610*  57-734*  57-740   57-747*
DRVCLR   5-287#
DRVER    14-211   15-244#
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DRVINT   56-39    57-15#   57-109   57-638   57-654   57-737
DRVMSG   13-63    14-90    29-68    32-174   37-9     37-33    63-8#
DRVNO     8-0#    14-3*    14-91    27-67    43-1*
DRVPAR    8-0#    32-106*  32-122*  32-171   34-82
DRVPRM   12-36    32-180   34-56#
DRVQUE   57-117   57-128   57-527   57-:33#
DRVSN    41-101   63-61#
DRVSTA   11-329   12-28    32-164   55-37#   56-29*   56-30*   56-31*   56-32*   56-43*   57-21*   57-30*   57-73*   57-79*   57-107
         57-112   57-137   57-177   57-181   57-448*  57-569   57-575   57-581   57-656   57-783*
DRVTYP   11-333   11-357   29-74    32-189   34-145   55-52#   57-22*   57-41*   57-46*   57-51*   57-143   57-449*
DRY       5-165#
DSWR      5-104#   7-0      11-25
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      10-6      61-1#
DT14     27-70     61-7#
DT15     27-76     61-8#
DT16     27-80     61-9#
DT17     27-88     61-10#
DT2      10-13     10-34    61-2#
DT3      10-20     61-3#
DT4      10-27     61-4#
DT6      10-41     61-5#
DTE       5-189#
DTEER    14-201    15-385#
DTUW     32-10     55-145#  56-24    57-193   57-267*  57-404*  57-415   57-433   57-435*  57-441*  57-459   57-472*  57-728   57-743
         57-753*   57-765
DVA       5-157#
DVC       5-269#
ECBAD0    8-0#     17-91*   17-129
ECBAD1    8-0#     17-108*  17-149
ECBIT     8-0#     17-62*   17-63*   17-64    17-65*   17-85*
ECC      15-101    17-43#
ECC1     17-106    17-114#
ECC2     17-81     17-104   17-152#
ECCX     17-132    17-150   17-153#
ECGD      8-0#
ECGD1     8-0#
ECH       5-183#   15-8     15-151
ECI       5-242#
ECMSK0    8-0#     17-83*   17-87*   17-92    17-94    17-103
ECMSK1    8-0#     17-84*   17-88*   17-97    17-109   17-111
ECSEC     8-0#     17-43*   17-55*   17-58*   17-60*   17-78
ECWRD     8-0#     17-64*   17-66*   17-67*   17-68*   17-69*   17-71    17-78*   17-79    17-91    17-93    17-94*   17-95*   17-99
         17-118    17-129
ECWRD1    8-0#     17-99*   17-100*  17-101   17-105*  17-108   17-110   17-111*  17-112*  17-131   17-137   17-149
EM1      10-4      59-3#
EM10     14-80     59-9#
EM11     14-87     59-10#
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EM12      14-68     59-11#
EM13      14-101    59-12#
EM14      14-112    59-13#
EM15      14-123    59-14#
EM2       10-11     59-4#
EM20      15-221    59-15#
EM21      15-43     59-16#
EM22      15-146    59-17#
EM23      15-124    59-18#
EM24      15-270    59-19#
EM25      15-315    59-20#
EM26      15-430    59-21#
EM27      15-445    59-22#
EM3       10-18     59-5#
EM30      15-245    59-23#
EM31      15-359    59-24#
EM32      15-387    59-25#
EM33      15-393    59-26#
EM34      15-491    59-27#
EM35      15-411    59-28#
EM36      15-421    59-29#
EM37      15-149    59-30#
EM4       10-25     59-6#
EM40      15-460    59-31#
EM41      15-629    59-32#
EM42      16-182    59-33#
EM43      15-566    15-571    59-34#
EM44      15-611    59-35#
EM45      15-27     15-166    59-36#
EM46      27-98     59-37#
EM47      15-24     15-164    59-38#
EM5       10-32     59-7#
EM50      15-480    59-39#
EM51      15-339    59-40#
EM52      15-14     15-153    59-41#
EM6       10-39     59-8#
EM60      15-510    59-42#
EM70      15-532    59-43#
EM71      15-536    59-44#
EM72      15-538    59-45#
EMPTYQ    57-398    57-447    57-506    57-797    57-:18#
EMTVEC     5-104#   11-25*    11-25*
ENDCMP    16-146    16-235#
ENDCON     8-0#     12-4*     12-5*     12-8*     12-9*     12-13*    12-14*    13-191    13-194
ENDING     8-0#     13-189    64-10
ENDPGM    11-179    11-184    68-80#
ENDSEK     8-0#     13-198    13-201
ENTADR    63-56#
ENTCOM    32-28     63-54#
ENTLMT    34-91     63-55#
ENTPR     11-296    11-303#
EQUAL     63-4#
ERCTR      8-0#     16-9*     16-50*    16-67     16-82*    16-237    16-240
ERPRC1    14-44     14-50#    15-72     18-177
ERPROC    14-8      14-12     14-14     14-36#
ERR        5-172#
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CROSS REFERENCE TABLE (CREF V04.00)

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ERROR    5-104#
ERRVEC   5-104#  11-25   11-25*  11-25*  11-27*  11-28*  11-142  11-143*  11-170*  28-6    28-7*   28-19*  28-37*  43-1
         43-1*   43-1*   66-1    66-1    66-1*   66-1*   66-1*   66-1*
EWN      5-162#
EWNERR   14-151  15-528#
F0       5-152#
F1       5-153#
F2       5-154#
F3       5-155#
F4       5-156#
FACTOR   19-9*   19-10*  19-12*  19-18   19-20   19-39   19-41   19-59#
FAIRNS   8-0#
FALPAR   14-56   14-85#
FALPR1   14-81   14-89#
FE1      24-43   25-46   34-67   34-116  34-118  34-119  34-140*  34-147*  57-270  58-68#
FEONLY   11-254  63-88#
FER      5-181#
FILBUF   13-109  13-144  20-113#
FILLO    41-11*  41-15   41-36*  41-39#  41-53*  41-57   41-78*
FILLZ    31-15   31-20   31-25   41-11#
FMT16    5-243#
FMTER    15-261  15-429#
FMTRK    5-303#
FRSTER   8-0#    15-109* 15-111  15-563  15-592* 16-3*   16-86   16-177   16-192*  16-235
GENDPB   18-85*  18-87   18-89   18-118* 18-119* 18-120* 18-121* 18-122*  18-123*  18-125  18-127  32-159*  58-110#
GENPAR   13-137  22-7#
GENREG   15-259  15-298  58-119  58-122#
GETBUF   13-103  13-141  20-9#
GETID    12-32   32-168  35-10#
GETLMT   34-58   34-138#
GETPAT   21-68   23-70   23-77#  23-85
GETREG   5-296#
GETREM   22-15   23-8    23-19   23-30   23-49   23-83   38-18#
GETREQ   57-170  57-417  57-494  57-571  57-597  57-603  57-660  57-730  57-745  57-785  57-793  57-:55#
GNS      6-1     6-1     11-6    11-31   11-45   11-56   11-62   29-82   29-93   29-109  29-125  29-148  29-149  29-152
         29-155  29-158  29-161  54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1
         54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-1    54-2    54-2
GO       5-151#
GODRIV   13-110  13-148  15-64   15-179  18-142  20-136#
GTSWR    11-31   54-1#
HCE      5-184#
HCEER    15-306  15-444#
HCI      5-241#
HCRC     5-185#
HCRCER   14-163  15-217#  15-256  15-295
HELPTX   11-134  69-10#
HERTZ    8-0#    11-89   13-90   31-33   31-49
HOUR     8-0#    11-90*  13-91*  31-7    31-44*  31-45   31-47*
HT       5-104#  45-1    45-1
IAE      5-187#
IAEER    14-187  15-410#
IBSAVE   43-1    43-1    43-1    43-1    43-1    43-1#   43-1*   43-1*   43-1*
IDLE     13-7    13-123  13-128  13-173#
IE       5-110#
ILF      5-177#
ILR      5-178#
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ILV 5-163# 11-370 12-33 32-169
INCHRD 15-92 15-205 30-17#
INCMIS 15-344 30-19#
INCSKI 15-484 30-18#
INCSOF 15-100 15-108 15-202 15-229 15-278 15-323 15-363 30-16#
INCTOT 14-72 14-92 14-105 14-116 14-127 15-29 15-70 15-93 15-113 15-129 15-206 15-230 15-248 15-279
15-324 15-345 15-365 15-397 15-414 15-423 15-438 15-453 15-464 15-483 15-495 15-513 15-541 15-615
15-633 16-243 30-20#
INTRVL 8-0# 11-93• 13-94• 31-38• 31-53 31-55 31-55 31-58• 53-17• 53-28 64-4
INVLD 32-94 63-53#
IOTVEC 5-10[illegible]#
IR 5-13[illegible]#
ISR 56-34 57-456#
ITCNT 26-23• 26-25 26-25• 26-57#
IXU 5-268#
KIPARO 66-1
KSR 13-8 32-10# 32-11
KSR1 32-12#
KWSVR 28-11 28-23 31-31#
LBC 5-272#
LBT 5-168#
LCE 5-271#
LF 5-104# 11-6 45-1 45-1 53-5 63-26 63-60
LIMIT 8-0# 15-593• 16-19• 16-20• 16-197 16-199•
LIN10A 17-70 62-54#
LIN10B 17-77 62-55#
LIN10C 17-152 62-56#
LIN10H 17-114 62-58#
LIN11 18-28 62-62#
LIN11A 18-39 62-63#
LIN11H 18-25 62-61#
LIN2C 27-32 62-4#
LIN2P 27-38 62-5#
LIN2S 27-64 62-6#
LIN3.1 27-120 27-126 27-191#
LIN3.3 27-131 27-138 27-213#
LIN3.4 27-139 27-223#
LIN6.2 27-331 27-337 27-343 27-358#
LIN7M 27-418 62-36#
LIN7P 27-412 62-40#
LIN7R 27-387 62-44#
LIN7S 27-421 62-41#
LIN7T 27-377 62-42#
LIN7X 27-380 62-43#
LIN8M 15-71 18-176 27-433 62-46#
LIN9B 16-188 62-47#
LIN9E 16-239 62-52#
LIN9G 15-114 62-53#
LIN9H 16-190 62-48#
LIN9I 15-573 62-50#
LINA3 27-223 62-14#
LINB3 27-146 62-18#
LINB5 27-268 62-26#
LINB6 27-323 62-31#
LINC6 27-330 62-32#
LINCA3 27-183 62-16#

CROSS REFERENCE TABLE (CREF V04.00)

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LIND5   27-256  62-25#
LINDA3  27-179  62-17#
LINDEC  16-241  27-160  27-165  27-170  27-192  27-194  27-196  27-199  27-203  27-207  27-215  27-218  27-226  27-230
        27-244  27-249  27-289  27-360  27-379  27-420  27-423  27-459#
LINE1   14-67   14-100  14-111  14-122  15-13   15-23   15-26   15-42   15-123  15-145  15-220  15-244  15-268  15-313
        15-338  15-357  15-385  15-392  15-410  15-420  15-429  15-444  15-459  15-479  15-490  15-509  15-528  15-565
        15-610  15-628  16-181  27-6#
LINE2   14-69   14-102  14-113  14-126  15-28   15-46   15-128  15-173  15-222  15-246  15-271  15-316  15-340  15-360
        15-394  15-412  15-422  15-431  15-446  15-461  15-481  15-492  15-511  15-539  15-567  15-612  15-630  16-183
        27-28#  27-434
LINE2A  27-37   27-42   27-61#
LINE2B  27-62   27-65#
LINE3   14-70   14-103  14-114  14-126  15-47   15-128  15-173  15-223  15-247  15-272  15-317  15-361  15-432  15-447
        15-462  15-512  15-540  15-613  27-119#
LINE3A  15-493  15-568  16-184  27-125#
LINE3B  15-482  27-131#
LINE3C  15-341  27-138#
LINE3D  15-631  27-100  27-144#
LINE3E  15-395  27-158#
LINE3F  15-413  27-177#
LINE4   14-71   14-104  14-115  14-126  15-48   15-128  15-173  15-224  15-273  15-318  15-362  15-396  15-433  15-448
        15-463  15-494  15-569  15-614  15-632  16-185  27-101  27-237#
LINE5   15-128  15-173  15-228  15-276  15-321  15-436  15-451  27-256#
LINE5A  15-225  15-277  15-322  15-343  15-437  15-452  27-296#
LINE5B  15-99   27-310#
LINE6   15-57   15-98   27-323#
LINE6A  15-107  27-330#
LINE6C  15-33   15-134  15-184  15-235  15-284  15-329  15-370  15-402  15-471  15-501  15-518  15-546  27-336#
LINE6D  15-36   15-104  15-137  15-238  15-287  15-332  15-373  15-405  15-473  15-504  15-520  15-548  27-342#
LINE7   14-73   14-106  14-117  14-128  15-37   15-94   15-115  15-207  15-236  15-239  15-249  15-285  15-288  15-330
        15-333  15-371  15-374  15-403  15-415  15-424  15-439  15-454  15-474  15-502  15-523  15-616  15-634  16-244
        18-172  27-377#
LINE7A  15-346  15-485  27-412#
LINE8   15-91   15-200  18-171  27-433#
LINEN3  27-216  62-13#
LINEO5  27-314  62-30#
LINEP5  27-310  62-29#
LING6   27-336  62-33#
LINM3   27-119  62-7#
LINM4   27-239  62-22#
LINN3   27-125  62-9#
LINOCT  15-577  15-586  16-207  16-210  16-213  17-118  17-129  17-129  17-137  17-149  17-149  18-30   18-33   18-36
        18-42   18-48   27-68   27-108  27-148  27-151  27-181  27-185  27-241  27-267  27-270  27-302  27-302  27-312
        27-316  27-443#
LINP3   27-197  62-11#
LINP5   27-288  62-27#
LINR6   27-361  62-34#
LINS3   27-158  27-213  62-12#
LINS4   27-242  62-23#
LINS5   27-297  62-28#
LINSS3  27-167  62-21#
LINST3  27-162  62-20#
LINT3   27-227  62-15#
LINU06  27-342  62-35#
LINW3   27-149  62-19#
LINX4   27-245  62-24#
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CROSS REFERENCE TABLE (CREF V04.00)

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LINKS   27-303  62-68#
LKPAR   11-198# 11-218  11-228  11-239
LODEV   11-352  32-131  32-145  63-17#
LODPAR  13-138  26-8#
LSTAD    8-0#   11-177• 11-180  11-181
M.DP40  38-127# 38-148
M.DP41  38-132  38-139#
M.DP42  38-138  38-143#
M.DP44  38-150  38-155#
M.DP50  38-125  38-159#
M.DPID  38-56   38-95   38-116#
MAIN    13-3#   13-228  21-76   38-8
MAIN1   13-20   13-50#
MAIN2   13-60   13-84#
MAINDA  13-13#
MASK     8-0#   15-50•  15-74   15-125• 15-231• 15-280• 15-325• 15-366• 15-398• 15-468• 15-498• 15-514• 15-542• 18-152
        18-158  18-164
MATCH   16-57   17-16#
MAXCYL  23-3    24-38   25-28   34-61•  34-95   34-98•  34-119  34-121• 58-56#  58-57   58-58   58-59   58-60   58-61
        58-65   65-20   65-20   65-20   65-20   65-20   65-20   65-20   65-20
MAXER    8-0#   37-43
MAXSEC  23-25   24-29   25-19   25-34   34-63•  34-107  34-110• 58-60#  65-20   65-20   65-20   65-20   65-20   65-20
        65-20   65-20
MAXTRK  23-14   24-33   25-23   25-30   34-62•  34-101  34-104• 58-58#  65-20   65-20   65-20   65-20   65-20   65-20
        65-20   65-20
MCPE     5-115#
MDPE     5-135#
MESFE   11-214  63-83#
MINCYL  21-34   22-41   23-4    23-6    23-9    24-16   24-18   34-67•  34-69•  34-94   34-99•  34-116  34-118• 34-123
        58-57#  65-20   65-20   65-20   65-20   65-20   65-20   65-20   65-20
MINSEC  21-32   22-39   23-26   23-28   23-31   24-22   24-24   24-31   24-35   25-17   34-71•  34-106  34-111• 34-128
        58-61#  65-20   65-20   65-20   65-20   65-20   65-20   65-20   65-20
MINTRK  21-33   22-40   23-15   23-17   23-20   24-19   24-21   24-36   25-21   34-70•  34-100  34-105• 34-127  58-59#
        65-20   65-20   65-20   65-20   65-20   65-20   65-20   65-20
MINUTE   8-0#   11-91•  13-92•  31-18   31-40•  31-41   31-43•
MNTBL    8-0#   27-53
MOM      5-221#
MOL      5-170#
MREAD   11-258  63-89#
MRPCS1  67-24   67-53#
MRPVEC  67-36   67-54#
MSGCON  33-45   63-37#
MSGDRP  13-42   63-34#
MSGEOP  38-1    63-35#
MSGEOT  38-1    63-36#
MSGON   14-89   37-32   63-42#
MSGPG   41-102  63-21#
MSGPWR  53-1    53-5#
MSGREP  13-224  63-26#
MSGSUM  29-31   38-1    63-33#
MSGX10  27-386  27-393  29-106  29-122  63-40#
MSHELP  11-117  69-6#
MSHW1   16-219  63-22#
MSHW2   16-223  63-23#
MSPASS  29-94   29-110  29-126  63-38#
MSPRM   32-107  63-62#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
MSTOTL  29-100  29-116  29-132  63-39#
MSWAIT  53-25   53-37#
MSWRO   32-92   63-52#
MXF      5-156#
MXWNDW  55-169#  57-287
N       63-49#
NED      5-139#
NEDCLK  28-30   63-48#
NEM      5-138#
NEWASN  32-51   33-52#
NEWUNT   8-0#   12-35•  13-54   13-67   13-74   13-75•  32-181•
NINLEV  11-372  32-199  63-18#
NODFLT  11-132  11-250  63-19#
NODRVS  13-96   63-60#
NOMTCH  15-555#  16-59
NONE    63-58#
NOOP     5-284#
NOTAVL  63-15#
NOTPRS  11-339  32-194  63-14#
NOTRP   11-336  32-192  63-13#
NOTSAF  11-345  32-186  63-16#
NSA      5-223#
OFFDIR   5-240#
OFFON    5-161#
OFFSET   8-0     8-0     8-0     15-60   15-81   18-92   27-344
OFLIN   14-60   14-111#
ONES     9-0     9-0#
ONESEC   8-0#   11-89•  13-90•  31-31•  31-33•
ONESUM  13-43   29-45#  38-1
OPI      5-190#
OPIER   14-175  15-357#
OPIER1  15-367#
OPT     57-122  57-166#  57-500  57-624  57-676
OPTBL    8-0#   27-44   27-46
OR       5-134#
ORDERQ   8-0#   11-83   13-5    13-111  13-122  13-149  13-173  53-31
OVRWRT  11-233  63-84#
PACK    32-182  33-52•  33-57•  33-62•  33-68•  33-71#
PAR      5-180#
PAR1    64-3    64-26#
PAR11   64-8    64-38#
PAR12   64-5    64-39#
PAR14   64-9    64-40#
PAR15   64-11   64-41#
PAR16   64-10   64-42#
PAR19   64-6    64-43#
PAR2    64-4    64-27#
PAR21   64-15   64-47#
PAR3    64-7    64-28#
PAR4    64-29#  65-20   65-20   65-20   65-20   65-20   65-20   65-20   65-20
PAR5    64-30#  65-20   65-20   65-20   65-20   65-20   65-20   65-20   65-20
PAR6    64-31#  65-20   65-20   65-20   65-20   65-20   65-20   65-20   65-20
PAR7    64-32#  65-20   65-20   65-20   65-20   65-20   65-20   65-20   65-20
PAR8    64-33#  65-20   65-20   65-20   65-20   65-20   65-20   65-20   65-20
PAR9    64-34#  65-20   65-20   65-20   65-20   65-20   65-20   65-20   65-20
PARENT  11-304  34-92   36-8#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
PARER   14-179   15-392#
PARLST  11-193*  11-503   64-3#
PASPAR   8-0     37-45
PASSES   8-0#    38-1     64-6
PAT      5-131#
PATCH   68-72#
PATTER   8-0#    17-21    23-78    23-80    64-7
PERIOD  15-583   16-229   17-76    17-123   17-143   27-385   27-392   27-417   27-462   29-87    29-99    29-105   29-115   29-121
        29-131   29-137   29-151   29-154   29-157   29-160   29-167   41-107   63-51#
PERM    57-20*   57-469*  57-512*  57-519#
PFECH   44-1     44-1#
PFECH1  44-1     44-1#
PFECH2  44-1     44-1#
PFECH3  44-1     44-1#
PFECH4  44-1     44-1#
PFTSTN  44-1     44-1#    44-1*
PGE      5-137#   5-258#
PGM      5-167#
PIP      5-171#
PIRQ     5-104#
PIRQVE   5-104#
POPQUE  57-179   57-229   57-370   57-614   57-663   57-:71#
POSER   15-304   15-338#
PR0      5-104#
PR1      5-104#
PR2      5-104#
PR3      5-104#
PR4      5-104#  32-13
PR5      5-104#
PR6      5-104#  11-28    28-12    28-24
PR7      5-104#
PROCES  13-181   14-3#
PRTBAD  15-49    15-95    15-496   18-3#
PRTIM   14-62    14-122#
PS       5-104    5-104#  11-88*   32-13*   32-99*   38-3*    41-118*  53-14*   56-15    56-16*   56-47*   57-99    57-100*  57-156*
        57-167   57-214*
PSEL     5-114#
PSW      5-104#
PUNSAF  14-52    14-67#
PWRFLG  11-198   11-320   12-37    12-51*   34-10    53-1*    53-3#
PWRUP   53-1     53-11#
PWRVEC   5-104#  11-25*   11-25*   53-1*    53-1*    53-1*    53-1*    53-1*    53-1*
QCNT    57-935#  57-994   57-:18*  57-:33   57-:35*  57-:56   57-:71*
QDRV0   57-946   57-957   57-966   57-978#
QDRV1   57-947   57-958   57-967   57-979#
QDRV2   57-948   57-959   57-968   57-980#
QDRV3   57-949   57-960   57-969   57-981#
QDRV4   57-950   57-961   57-970   57-982#
QDRV5   57-951   57-962   57-971   57-983#
QDRV6   57-952   57-963   57-972   57-984#
QDRV7   57-953   57-964   57-973   57-985#
QINPT   57-946#  57-:20   57-:37*  57-:38*  57-:39   57-:41*
QOUTPT  57-957#  57-:20*  57-:59   57-:73   57-:74*  57-:75*  57-:76   57-:78*
QSTART  57-966#  57-:00   57-:05   57-:41   57-:78
QSTOP   57-967#  57-:39   57-:76
QTERP   57-974   57-986#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
QUES     36-21    37-8     63-3#
R6        5-104#  11-25    11-25•   11-25•
R7        5-104#
RANCYL   22-30    23-3#    23-40
RANDOM    8-0#    22-29    64-15
RANDWC    8-0#    23-46    64-8
RANPAT   23-68#
RANSEC   23-25#
RANSIZ   22-43    23-45#   23-53
RANTRK   23-14#
RANXIT   23-69    23-72#
RATIO     8-0#    22-16    64-9
RD.RP    57-37    57-62    57-68    57-325   57-340   57-355   57-480   57-542   57-718   57-767   57-812#  57-891
RDCHR    42-1     54-1#
RDDAT     5-304#   8-0     21-58    26-41
RDHD      5-305#   8-0     18-122
RDLIN    11-118   11-215   11-236   11-287   32-30    32-108   36-23    54-1#    67-28    67-40
RDONLY    8-0#    11-103•  11-106•  11-229   11-256   21-61    22-9     32-64    32-78
RDY       5-111#
READDR   15-217   15-257   15-296   18-71    26-18    27-191   27-479#
READHD   15-219   15-258   15-297   18-118#
READIN    5-293#
RECAL     5-286#  18-65    18-85
RECALO   18-85#   32-162
RECALT   15-347   18-63#
REDAPK   32-73    33-57#
RELBUF   13-211   20-49#
RELSE     5-288#
REPLZ    29-85    41-13#
RESREG   20-127   32-96    38-59    38-99    51-1     52-1     54-1#    56-48    57-149   57-153   57-215   57-451   57-463   57-699
         57-908   57-:09
RESVEC    5-104#
RETRY     8-0#    15-30•   15-59•   15-78•   15-79    15-79    15-130•  15-144•  15-167•  15-183•  15-187•  15-188   15-188   15-232•
         15-281•  15-326•  15-367•  15-399•  15-467•  15-497•  15-515•  15-543•  18-146•  18-166•  18-167   18-167   27-359
REV       8-0#    11-30
RHEXT    11-140•  11-149•  11-153•  11-159   55-165#  57-905
RMR       5-179#
RP07     18-66    18-86    18-124   20-138   57-99#
RPADR    11-80•   32-14    55-163#  56-36    57-106   57-232   57-278   57-303   57-458   57-716   57-813   57-816   57-820   57-845
         57-847   57-852   57-854   57-858   57-879   57-919   67-48
RPAS     55-180#  57-67•   57-490•  57-513•  57-540   57-587•  57-619•  57-650•  57-758
RPBA     55-175#
RPBAE    55-193#
RPCC     55-188#  57-131•  57-207•
RPCS1    55-173#  57-24•   57-31    57-56    57-174•  57-175   57-265   57-298   57-356   57-368   57-385   57-396   57-481   57-543
         57-585   57-666   57-768
RPCS2    32-15•   55-177#  56-37•   57-23•   57-25    57-116•  57-173•  57-233•  57-279•  57-304•  57-420   57-444•  57-479•  57-598•
         57-627•  57-649•  57-717•  57-733•  57-817   57-855   57-880•  57-886   57-920•  57-925
RPCS3    55-194#
RPDA     55-176#  57-249   57-293   57-310
RPDB     55-182#  57-884
RPDC     55-187#  57-253   57-282   57-318
RPDS     55-178#  57-63    57-510   57-631   57-719
RPDT     55-184#  57-38
RPEC1    55-191#
RPEC2    55-192#  57-895
```

RPER1 15-259 15-298 55-179# 57-69 57-632 57-859
RPER2 55-189# 57-633
RPER3 55-190# 57-634
RPINIT 11-313 56-14#
RPLA 55-181#
RPMR1 55-183# 57-239 57-274
RPOF 55-186# 57-60 57-326 57-330 57-341 57-345
RPSN 55-185#
RPSTU0 55-16# 56-18 57-631* 57-632* 57-633* 57-634*
RPSTU1 55-16#
RPSTU2 55-16#
RPSTU3 55-16#
RPSTU4 55-16#
RPSTU5 55-16#
RPSTU6 55-16#
RPSTU7 55-16#
RPTMR 31-52 57-684#
RPVEC 11-81* 55-164# 56-33 56-35 57-100
RPWC 55-174#
RTC 5-292#
RTURN 38-1 38-3#
RWU1 5-255#
RWU2 5-256#
RWU3 5-257#
S 27-195 27-204 62-10#
SAVEFG 11-317* 55-119# 57-372 57-485 57-616
SAVER1 8-0# 16-22* 16-89* 16-160 16-166 16-171*
SAVER5 8-0# 16-23* 16-90* 16-167 16-172*
SAVPOS 8-0# 16-91* 16-168
SAVREG 20-113 32-12 38-49 38-88 51-1 52-1 54-1# 56-14 57-102 57-166 57-407 57-457 57-687 57-876
57-993
SC 57-462 57-540#
SC04 5-229#
SC1 5-227#
SC10 5-230#
SC100 5-233#
SC11 57-599 57-610#
SC12 57-573 57-579 57-627#
SC13 57-567 57-649#
SC2 5-228#
SC20 5-231#
SC3 57-557# 57-561
SC4 57-559# 57-592 57-608 57-625 57-677
SC40 5-232#
SC5 57-558 57-565#
SC6 57-578 57-594#
SC8 57-586 57-601# 57-642
SCMND 32-59 33-28#
SCOPE 5-104#
SEARCH 5-294#
SECLMT 16-111 25-19 27-492 27-497 34-63 34-89 34-90 34-143* 34-150* 58-66#
SECOND 8-0# 11-92* 13-93* 31-23 31-34* 31-35 31-37* 53-16*
SEEK 5-285#
SEEKFG 55-127# 56-19 57-195
SELDRV 5-298#
SEQPAR 12-41 13-134 21-14#

CROSS REFERENCE TABLE (CREF V04.00)

```
SET.IE  57-27    57-134   57-213   57-450   57-550   57-673   57-918#
SETFMT   5-297#
SETVEC  11-199   11-284   11-292   11-298   11-306   11-312#
SIZE70  11-140#
SIZMEM  11-174#  53-35
SKI      5-273#
SKIER   14-213   15-479#
SLASH   64-24#
SRCHWT  55-99#   57-168*  57-300*  57-611   57-620*
STA     12-3#
STACK    5-104#  11-25    11-87    38-4     53-15
START    6-3     11-15#   28-35    32-36
START1   6-1     11-11    11-18#
START2  11-16    11-21#
STATIN   8-0#    11-82*   13-219   13-221*  31-57*
STATIS  13-180   19-7#
STATPR  13-225   29-7#    33-42
STKLMT   5-104#
STNDAT   9-0#    17-29    17-35    20-119
STO     57-694   57-714#
SUPR1   39-15    39-20#
SUPR2   39-14*   39-19*   39-29    39-31*   39-33#
SUPRS   29-98    29-104   29-114   29-120   29-130   29-136   39-17#
SUPRSL  36-18    39-12#
SVRHXX  11-369   35-12    57-374   57-487   57-507   57-572   57-618   57-662   57-732   57-798   57-876#
SW0      5-104#  11-104   22-12    32-67    32-81
SW00     5-104    5-104#
SW01     5-104    5-104#  14-20
SW02     5-104    5-104#  11-210   11-322   13-213
SW03     5-104    5-104#
SW04     5-104    5-104#  21-39    37-41    38-1
SW05     5-104    5-104#  27-73    27-144
SW06     5-104    5-104#  26-26
SW07     5-104    5-104#  16-201
SW08     5-104    5-104#  38-1
SW09     5-104    5-104#
SW1      5-104#
SW10     5-104#  27-6
SW11     5-104#
SW12     5-104#
SW13     5-104#  27-9     43-1
SW14     5-104#
SW15     5-104#  14-93    27-395   27-425
SW2      5-104#
SW3      5-104#  16-69    18-3
SW4      5-104#
SW5      5-104#  27-177
SW6      5-104#
SW7      5-104#
SW8      5-104#
SW9      5-104#  12-6
SWR      7-0#    11-25    11-25    11-25•   11-25•   11-25•   11-31    11-104   11-210   11-322   12-6     13-213   14-20    14-93
        16-69    16-201   18-3     21-39    22-12    26-26    27-6     27-9     27-73    27-144   27-177   27-395   27-425   32-25
        32-67    32-81    37-41    38-1     38-1     41-116   42-1     42-1     42-1•    43-1     43-1     43-1     43-1     43-1
        53-1     53-1•
SWREG    6-1#    11-25    11-31    42-1     42-1     42-1
```

CROSS REFERENCE TABLE (CREF V04.00)

```
SWTIM   14-58    14-100#
T       27-193   27-200   62-8#
TAB     63-7#
TAB.XY   6-12#    7-0
TABLE   34-84    65-5#
TABLE0  65-5     65-20#
TABLE1  65-8     65-20#
TABLE2  65-8     65-20#
TABLE3  65-8     65-20#
TABLE4  65-8     65-20#
TABLE5  65-8     65-20#
TABLE6  65-8     65-20#
TABLE7  65-8     65-20#
TAP      5-222#
TBITVE   5-104#
TCF      5-270#
TD      57-461   57-469#
THEAD   22-29#
TIMER   55-132#  57-18*   57-83*   57-206*  57-378*  57-426*  57-474*  57-595*  57-622*  57-690   57-692*  57-748*  57-776*  57-784*
        57-791*
TKVEC    5-104#  42-1*    42-1*
TPE      5-263#
TPVEC    5-104#
TRAPVE   5-104#  11-25*   11-25*
TRE      5-116#
TRFER   14-159   15-459#
TRKLMT  16-115   24-47    25-23    25-50    27-498   34-62    34-87    34-88    34-142*  34-149*  58-67#
TRMREP  13-226   63-28#
TRNSWT  55-91#   57-230*  57-401   57-403*  57-414   57-436*  57-442*  57-476   57-477*  57-727   57-742   57-754*
TRTVEC   5-104#
TST1    11-19#
TSTANY   8-0#    11-202*  11-252*  34-65    34-114
TYDRV   29-81    41-101#
TYPDRV  13-68    32-178   41-102#
TYPDS   29-150   29-153   29-156   29-159   29-166   54-1#
TYPE    11-6     11-30    11-31    11-45    11-51    11-56    11-62    11-117   11-130   11-132   11-134   11-214   11-227   11-233
        11-248   11-250   11-254   11-258   11-286   11-299   11-325   11-326   11-328   11-336   11-339   11-342   11-345   11-352
        11-354   11-355   11-363   11-372   11-377   13-39    13-41    13-42    13-62    13-63    13-65    13-66    13-69    13-96
        13-224   13-226   14-78    14-79    14-80    14-85    14-86    14-87    14-89    14-90    27-8     27-11    27-12    27-14
        28-30    29-22    29-28    29-30    29-31    29-50    29-68    29-70    29-71    29-72    29-77    29-79    29-80    29-82
        29-87    29-93    29-94    29-99    29-100   29-105   29-106   29-109   29-110   29-115   29-116   29-121   29-122   29-125
        29-126   29-131   29-132   29-137   29-148   29-149   29-151   29-152   29-154   29-155   29-157   29-158   29-160   29-161
        29-167   29-168   31-17    31-22    32-20    32-22    32-23    32-24    32-28    32-92    32-94    32-107   32-120   32-173
        32-174   32-176   32-177   33-43    33-44    33-45    34-91    36-12    36-20    36-21    36-22    36-30    37-7     37-8
        37-9     37-11    37-30    37-31    37-32    37-33    37-36    38-1     38-1     38-1     38-1     38-1     38-1     38-1
        38-1     38-1     38-1     38-1     39-32    41-32    41-101   41-102   41-105   41-107   42-1     42-1     42-1     42-1
        42-1     42-1     42-1     42-1     42-1     42-1     42-1     42-1     42-1     42-1     42-1     42-1     42-1     42-1
        43-1     43-1     43-1     43-1     44-1     44-1     44-1     44-1     44-1     44-1     44-1     45-1     46-1     47-1
        53-1     53-21    53-25    54-1#    67-21    67-24    67-27    67-36    67-39
TYPOC   11-8     32-25    42-1     44-1     44-1     54-1#    67-26    67-38
TYPON   54-1#
TYPOS   11-48    11-59    11-327   13-64    14-91    29-69    32-175   37-10    37-35    54-1#
TYPRI4  41-81
TYPSUM  29-32    29-49    29-64#
UCPAR   14-54    14-78#
UNS      5-191#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
UNSAF    14-143   14-147   15-509#
UNTASN   32-126   32-140   63-12#
UNTNOT   33-21    33-37    63-11#
UNTOFF   11-342   32-196   63-9#
UNTON    11-354   63-10#
UPE       5-140#
US1       5-127#
US2       5-128#
US4       5-129#
VV        5-164#
WAIT      8-0#    13-30    13-99    13-101   13-115   13-158
WATPAK   32-90    33-67#
WC.HK    57-493   57-523#
WCE       5-141#
WCF       5-182#
WCFER    14-183   15-490#
WCHKX    55-2#    57-492
WCKD      5-300#   8-0      26-28    26-37    57-535
WCKER    14-155   15-121#
WCKHD     5-301#
WLE       5-188#
WLEER    14-191   15-420#
WOR       5-254#
WRDCNT    8-0#    11-190   11-192*  11-193   11-305   11-307*  21-44    23-45    64-3
WRDPOS    8-0#    15-578*  15-579   15-588   16-40*   16-44*   16-56*   16-64*   16-91    16-129*  16-133*  16-165   16-168*  16-173*
         16-217   16-221   16-225   17-73*   17-119   17-138
WRL       5-169#
WRT.RP   57-55    57-59    57-238   57-248   57-252   57-264   57-273   57-281   57-292   57-297   57-309   57-317   57-329   57-344
         57-367   57-384   57-395   57-584   57-840#
WRTCHK    8-0#    57-523   64-11
WRTDAT    5-302#   8-0      21-67    26-31    57-525
WRYUNS    5-253#
XXDP      8-0#    11-36*   11-39*   11-40    11-42*   11-47    11-58    11-348   11-350   12-24    12-26    32-127   32-129   32-141
         32-143
Y        63-50#
ZEROS     9-0      9-0#
ZROIND    8-0#    16-21*   16-81*   16-88*   16-93
```

CROSS REFERENCE TABLE (CREF V04.00)

```
$$CMRE    6-599#
$$CMTM    6-599#    7-0
$$ESCA    5-104#
$$NEWT    5-104#   11-19
$$SET    54-1      54-1      54-1      54-1      54-1      54-1      54-1      54-1      54-1      54-1      54-1      54-1#     54-2
$$SETM   11-25     11-25#
$$SKIP    5-104#
.$ACT1    5-76#     6-8
.$APTB    5-79#     7-0       7-0#
.$APTH    5-79#     6-11
.$APTY    5-79#    48-1
.$CATC    5-77#     6-1
.$CMTA    5-77#     6-599
.$DB2D    5-78#    51-1
.$DB2O    5-78#    52-1
.$EOP     5-79#    38-1
.$ERRO    5-77#    43-1
.$ERRT    5-77#    44-1
.$POWE    5-79#    53-1
.$RAND    5-78#    49-1
.$READ    5-76#    42-1
.$SAVE    5-78#    50-1
.$SIZE    5-78#    66-1
.$TRAP    5-78#    54-1
.$TYPD    5-77#    47-1
.$TYPE    5-76#    45-1
.$TYPO    5-77#    46-1
.EQUAT    5-76#     5-104
.HEADE    5-76#     5-85
.SETUP    5-76#     5-310
.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        30-2#     30-16     30-17     30-18     30-19     30-20
CKCHR     5-17#    41-209    41-217
CKDIG     5-27#    36-27
CKNUM     5-40#
COMMEN    5-104#
ENDCOM    5-104#
ERENTR   42-13#    43-1
ERROR     5-104#   57-549
ESCAPE    5-104#
GETPRI    5-104#   66-1
GETSWR    5-104#   11-31     11-31#
MORETA    6-14#     7-0
MULT      5-104#
NEWTST    5-104#   11-19
POP       5-104#   15-305    15-342    16-173    27-102    29-36     33-47     34-46     34-129    34-151    35-29     41-34     41-76     47-1
         48-1      48-1      49-1      50-1      53-1      53-1
PUSH      5-104#   15-300    16-165    27-28     28-6      29-7      33-28     34-9      34-138    35-10     47-1      48-1      48-1      48-1
         49-1      50-1      53-1      53-1
REPORT    5-104#
SETPRI    5-104#   42-1
SETTRA   54-1      54-1      54-1      54-1      54-1      54-1      54-1      54-1      54-1      54-1      54-1      54-1#     54-2
SETUP     5-104#   11-25
SKIP      5-104#
SLASH     5-104#
```

CROSS REFERENCE TABLE (CREF V04.00)

```
STARS    5-104#  6-8     6-11    6-11    6-11    7-0     7-0     7-0     11-19   38-1    39-4    40-4    42-1    42-1
        42-1    42-1    42-1    43-1    44-1    45-1    46-1    47-1    48-1    49-1    50-1    51-1    52-1    53-1
        53-1    54-1    66-1
SWRSU    5-104#  11-25   11-25#
TRMTRP  54-1#   54-3
TYPBIN   5-104#
TYPDEC   5-104#  29-150  29-153  29-156  29-159
TYPI     5-104#  11-31
TYPN     5-104#
TYPO     5-104#  11-327  13-64   14-91   29-69   32-175  37-10   37-35
TYPOC    5-104#  32-25   42-1    44-1    44-1
TYPTXT   5-104#  11-6    11-45   11-56   11-62   29-82   29-93   29-109  29-125  29-148  29-149  29-152  29-155  29-158
        29-161
UPCODE   2-2#    53-1
XXEP     7-65#   38-1
```