RP04

EXERCISER PROGRAM

MD-11-DERPN-B

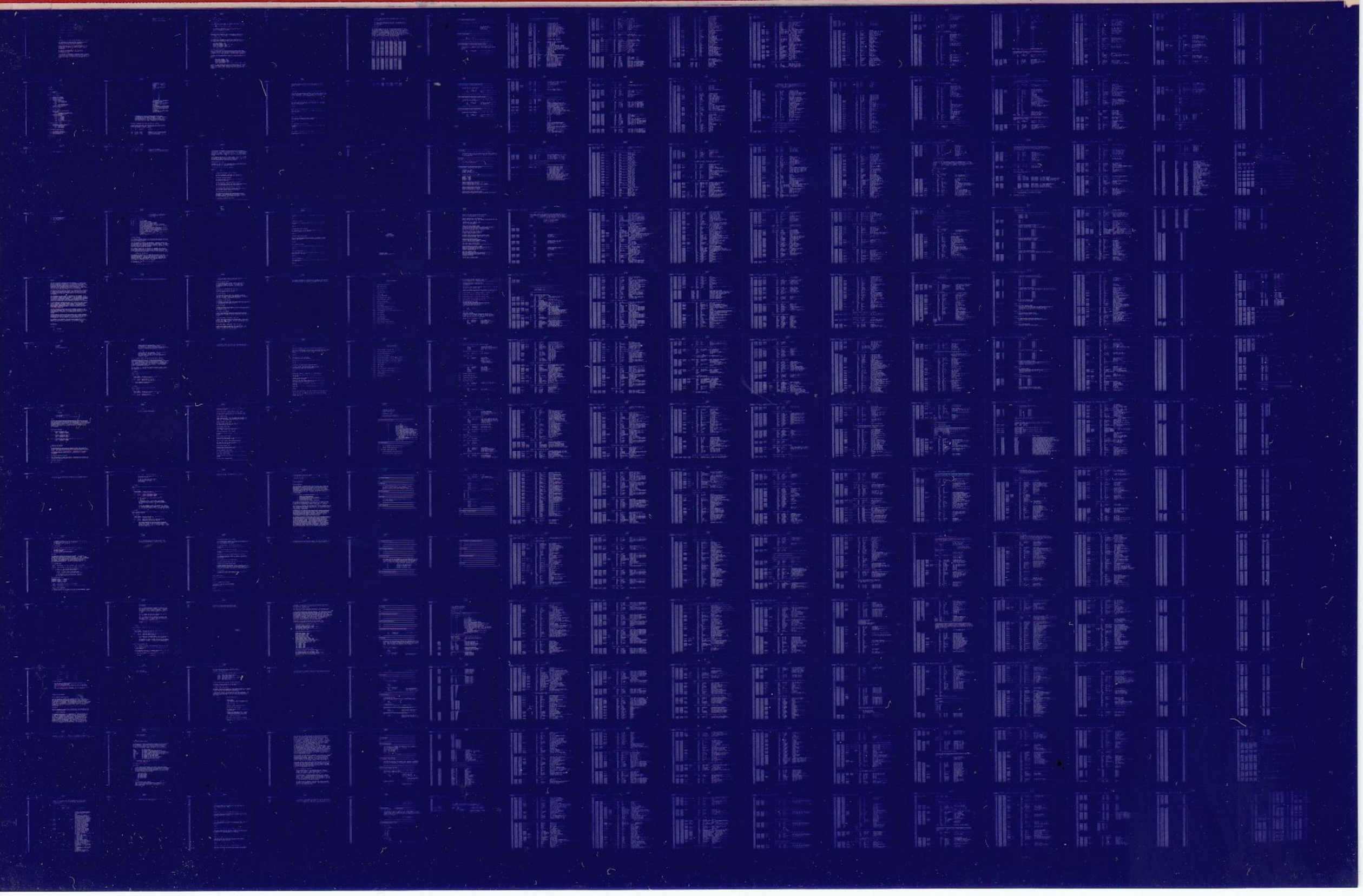
EP-DERPN-B-DL-A

FICHE 1 OF 2

NOV 1976

digital

MADE IN USA



RP04

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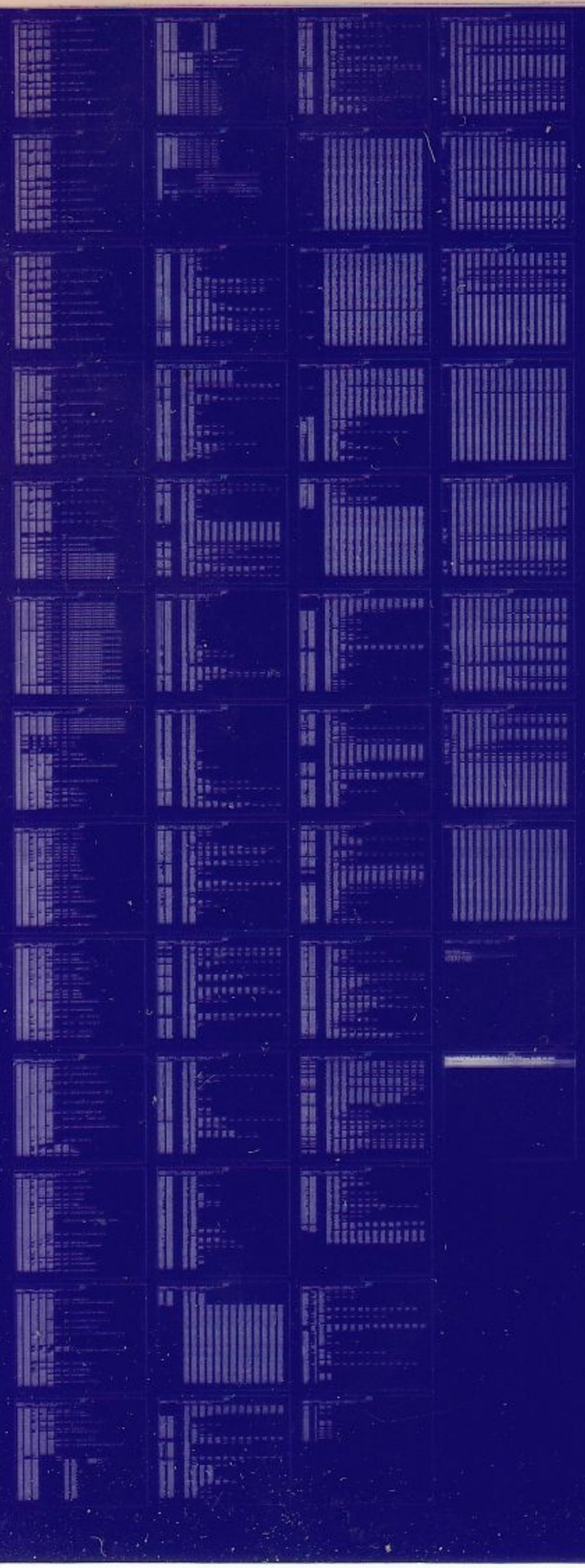

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I D E N T I F I C A T I O N

PRODUCT CODE: MAINDEC-11-DERPN-B-D

PRODUCT NAME: RP04 MULTI-DRIVE EXERCISER PROGRAM

DATE CREATED: FEBRUARY 21, 1975

MAINTAINER: DIAGNOSTIC GROUP

AUTHOR: CHARLES HESS

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1. ABSTRACT

THE RP04 MULTIDRIVE EXERCISER PROGRAM EXERCISES 1 TO 8 RP04 DISK DRIVES ATTACHED TO THE SAME RH70. IF 2 OR MORE RP04 DISK DRIVES ARE BEING EXERCISED, OPERATIONS ON THE DRIVES ARE OVERLAPPED (OTHER DRIVES ARE PERFORMING SEEK/SEARCH OPERATIONS WHILE ONE RP04 IS PERFORMING A DATA TRANSFER OR WRITE CHECK OPERATION). OPERATIONS AMONG THE RP04'S ARE OPTIMIZED SO THAT A HIGH SUBSYSTEM DATA TRANSFER RATE OR A HIGH POSITIONING OPERATION RATE IS MAINTAINED.

THE RP04 MULTIDRIVE EXERCISER PROGRAM WILL EXERCISE RP04'S CONNECTED AS EITHER SINGLE OR DUAL PORT UNITS. DUAL PORT RP04'S ARE TESTED BY LOADING AND RUNNING THE PROGRAM FROM BOTH CONTROLLING SYSTEMS. THE PROGRAM WILL EXERCISE A MIXED SYSTEM OF DUAL PORT AND NON DUAL PORT RP04'S.

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 ARE USED (I.E., WRITE DATA, WRITE HEADER & DATA, READ DATA, AND READ HEADER & DATA) AS WELL AS WRITE CHECK DATA AND WRITE CHECK HEADER & DATA COMMANDS. RECALIBRATE AND READ-IN PRESET COMMANDS ARE USED AT STARTUP AND DRIVE INITIALIZATION. RECALIBRATE, OFFSET, AND RETURN-TO-CENTERLINE COMMANDS ARE USED DURING ERROR PROCESSING.

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.

PROGRAM/OPERATOR COMMUNICATIONS ARE THROUGH THE TELETYPE; PROGRAM OPTIONS ARE SELECTED BY SWITCH REGISTER SETTINGS. ERROR ARE NORMALLY REPORTED ON THE TELETYPE; HOWEVER, IF A LINE PRINTER IS AVAILABLE THE PROGRAM WILL USE THE PRINTER FOR ERROR MESSAGE DISPLAY.

ALL COMMANDS, DATA PATTERNS, AND DATA BUFFER SIZES ARE SELECTED RANDOMLY BY THE PROGRAM. ADDITIONALLY THE ADDRESSES (EG, CYLINDER, TRACK, AND SECTOR) FOR EACH OPERATION ARE SELECTED RANDOMLY.

2. REQUIREMENTS

2.1 EQUIPMENT

REQUIRED

PDP-11 PROCESSOR

```
                                                        16K MEMORY
                                                        TELETYPE
                                                        PROGRAM LOADING DEVICE
                                                        KW11-L OR KW11-P CLOCK
```

RH70 WITH 1 RP04

OPTIONAL

4K TO 12K ADDITIONAL MEMORY
LINE PRINTER
1 TO 7 ADDITIONAL RP04'S ON THE SAME RH70

2.2 MEDIA

THE RP04 MULTIDRIVE EXERCISER PROGRAM REQUIRES FORMATTED DISK PACKS WHICH CONTAIN RANDOM OR PATTERNED DATA RECOGNIZED BY THE EXERCISER. DISK PACKS USED BY THE PROGRAM MAY BE GENERATED BY THE RP04 FORMATTER PROGRAM (MAINDEC-11-DERPL) OR BY THE 'W' COMMAND OF THE RP04 MULTIDRIVE EXERCISER (SEE SECTION 4.4). THE PACKS MUST BE FORMATTED IN 22 SECTOR (16 BIT) MODE; THE ALTERNATE (20 SECTOR - 18 BIT) MODE IS NOT SUPPORTED.

2.3 PRELIMINARY PROGRAMS

RP04 DISKLESS CONTROLLER TEST
PART 1 (MAINDEC-11-DERPS)
PART 2 (MAINDEC-11-DERPT)

RP04 FUNCTIONAL CONTROLLER TEST
PART 1 (MAINDEC-11-DERPU)
PART 2 (MAINDEC-11-DERPV)

RP04 DUAL CONTROLLER LOGIC TEST (FOR DUAL PORT DRIVE TESTING)
PART 1 (MAINDEC-11-DERPP)
PART 2 (MAINDEC-11-DERPQ)

3. OPERATING THE PROGRAM

3.1 THE PROGRAM MAY BE LOADED WITH THE ABSOLUTE PAPER TAPE LOADER OR IT MAY BE LOADED FROM THE APPROPRIATE MEDIA USING THE ASSOCIATED 'XXDP' LOADER. THE PROGRAM CAN BE INSTRUCTED TO PRESERVE EITHER LOADER TYPE.

3.2 THE PROGRAM STARTS AT LOCATION 200(8). PARAMETERS NOT INCLUDED IN THE TELETYPE DIAGLOGUE GROUP MUST BE CHANGED BEFORE THE PROGRAM IS STARTED.

3.3 THE RESTART LOCATION IS 204(8)

3.4 ONCE THE PROGRAM IS LOADED AND STARTED, OPERATIONS ARE INITIATED AND CONTROLLED BY KEYBOARD COMMANDS AND SWITCH REGISTER SWITCH SETTINGS.

3.5 PASS/TEST TERMINATION

3.5.1 PASS TERMINATION

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                        END OF PASS MAY BE DETERMINED BY EITHER OF THE FOLLOWING CONDITIONS.
                        THE END OF PASS CONDITION USED IS DETERMINED BY PARAMETER 'ENDET'.
```

A. IF PARAMETER 'ENDET' IS 1, END OF PASS OCCURS WHEN THE DRIVE HAS READ 1.875 X 10↑8 WORDS (3 X 10↑9 BITS).
B. IF PARAMETER 'ENDET' IS 0, END OF PASS OCCURS WHEN THE DRIVE HAS PERFORMED 3 X 10↑6 SEEKS.

3.5.2 TEST TERMINATION

THE TEST FOR A DRIVE IS TERMINATED (SW<04> = 0) WHEN:

A. THE DRIVE HAS COMPLETED THE NUMBER OF PASSES SPECIFIED IN PARAMETER 'PASCNT'.
B. THE TOTAL ERRORS ACCUMULATED EXCEED 100.
C. A FATAL ERROR OCCURS: EM12 OR EM14.

3.6 RUN TIME

THE EXERCISER PROGRAM MAY BE RUN IN TWO MODES. THE MODE IS DETERMINED BY THE VALUE IN PARAMETER 'MAXDL'. IF 'MAXDL' IS ONE SECTOR, THE PROGRAM RUNS IN A SEEK HEAVY MODE; IF 'MAXDL' APPROACHES ONE TRACK IN SIZE (5720 DECIMAL) THE PROGRAM RUNS IN A DATA TRANSFER HEAVY MODE. THE PROGRAM RUN TIME VARIES GREATLY DEPENDING ON THE OPERATION MODE SELECTED, THE MEMORY AVAILABLE OVER 16K, THE READ/WRITE RATIO PARAMETER - 'RATIO', AND BY SWITCHES 0, 1, & 2.

3.6.1 DATA TRANSFER MODE

1 DRIVE - APPROXIMATELY 2.5 HRS (TO REACH 1.875 X 10↑8 WORDS)
TO
8 DRIVES - APPROXIMATELY 11 HRS (FOR ALL DRIVES TO REACH 1.875 X 10↑8 WORDS)

NOTE: IF SW<01> = 1 (NO SOFTWARE DATA COMPARSIONS), THE TUN TIMES ARE THE FOLLOWING VALUES, APPROXIMATELY:

1 DRIVE - 1.7 HRS (1.875 X 10↑8 WORDS READ)
ADD 1/2 HOUR FOR EACH ADDITIONAL DRIVE TESTED.

IF THE PROGRAM IS RUN WITH BOTH SW<00> AND SW<01> SET, THE RUN TIMES SHOULD BE ABOUT 20% FASTER.

3.6.2 SEEK VERIFICATION MODE

PARAMETER 'MAXDL' = 1 SECTOR (256 WORDS)
PARAMETER 'MAXTRK' = 'MINTRK'
PARAMETER 'MAXSEC' = 'MINSEC'
SW<00> = 1 (READ ONLY MODE)

1 DRIVE - APPROXIMATELY 25 HRS (3 X 10↑6 SEEKS)
TO
8 DRIVES - APPROXIMATELY 40 HRS (3 X 10↑6 SEEKS FOR ALL DRIVES)

3.7 UNIBUS & VECTOR ADDRESSES

THE PROGRAM ASSUMES THE FOLLOWING UNIBUS AND VECTOR ADDRESSES. (REFER TO SECTION 4.2.2 FOR THE LOCATIONS AT WHICH TO CHANGE THESE ADDRESSES.)

	UNIBUS	VECTOR

	UNIT	ADDRESS	ADDRESS
	RH70/RP04	176700	254

TTY PRINTER	177564	NOT USED
TTY KEYBOARD	177560	60
KW11-L	177546	100
KW11-P	172542	104
LINE PRINTER	177514	NOT USED

3.8 DUAL PORT STARTUP

A. LOAD THE RP04 MULTIDRIVE EXERCISER PROGRAM (REVISION B OR LATER) INTO BOTH PROCESSORS.
B. SWITCH THE 'CONTROLLER SELECT' SWITCH TO 'A/B' ON EACH RP04 WHICH IS TO BE TESTED AS A DUAL PORT DRIVE; CYCLE THE DRIVES UP.
C. START THE PROGRAM IN EACH PROCESSOR. RUN THE PROGRAM AS THROUGH EACH PROCESSOR WERE RUNNING INDEPENDENTLY OF THE OTHER.

4. CONTROLLING THE PROGRAM

4.1 DATE & OPERATOR IDENTIFICATION

WHEN THE PROGRAM IS STARTED FROM LOCATION 200, THE PROGRAM WILL ASK FOR A DATE ENTRY AND FOR AN OPERATOR I.D. ENTRY. THESE ENTRIES ARE OPTIONAL AND MAY BE BYPASSED BY ENTERING A 'CARRIAGE RETURN' IN RESPONSE TO THE REQUEST. THE PROGRAM DOES NOT EDIT OR CHECK EITHER ENTRY. UP TO 8 CHARACTERS OF DATE INFORMATION AND UP TO 6 CHARACTERS OF OPERATION IDENTIFICATION MAY BE ENTERED. BOTH THE DATE AND THE OPERATOR I.D. WILL BE TYPED WHEN THE 'SA' COMMAND IS PERFORMED (SEE SECTION 4.4.3).

4.2 PARAMETERS

WHEN THE PROGRAM IS STARTED FROM LOCATION 200, THE OPERATOR WILL BE ASKED TO ENTER PARAMETERS. THE FOLLOWING MESSAGE WILL BE DISPLAYED:

ENTER PARAMETERS:

THE OPERATOR MUST ENTER A 'Y' TERMINATED BY A CARRIAGE RETURN <CR> IF PARAMETER ENTRIES ARE TO BE MADE OR AN 'N' IF NO ENTRIES WILL BE MADE. THE PROGRAM WILL IDENTIFY THE PARAMETER BY THE NAME GIVEN BELOW, DISPLAY THE CURRENT VALUE OF THE PARAMETER AND THE BASE OF THE PARAMETER (OCTAL OR DECIMAL), AND WAIT FOR THE ENTRY. IF ONLY A CARRIAGE RETURN IS ENTERED, THE PROGRAM WILL USE THE PRESENT VALUE OF THE PARAMETER. THE RUBOUT KEY WILL ALLOW THE OPERATOR TO DELETE AN INCORRECT ENTRY; 'CONTROL U' WILL ALLOW AN ENTIRE ENTRY TO BE DELETED AND REENTERED. THE PROGRAM WILL TYPE A '?' IF AN ALPHABETIC OR INCORRECT NUMBER (FOR THE BASE OF THE

```
                        PARAMETER) IS ENTERED.  IF 'CONTROL C' IS ENTERED, THE PROGRAM WILL
                        USE THE PRESENT VALUES OF THE REMAINING PARAMETERS AS DEFAULT VALUES.

                        (NOTE:  A PARAMETER ENTRY MUST BE TERMINATED BY A 'CARRIAGE
```

RETURN' TO BE ACCEPTED. IF THE PARAMETER ENTRY IS FOLLOWED BY A
'CONTROL C' INSTEAD OF A 'CARRIAGE RETURN', THE PROGRAM WILL
RECOGNIZE ONLY THE 'CONTROL C' AND THE NEW PARAMETER VALUE WILL
NOT BE ACCEPTED.)

4.2.1 KEYBOARD ENTRY PARAMETERS

NAME	BASE	DEFAULT VALUE	VALUE RANGE	FUNCTION
MAXDL	10	(SEE NOTE)		CONTROLS THE MAXIMUM BUFFER SIZE USED FOR DATA TRANSFERS
PASCNT	10	1	1 - 999	NUMBER OF PASSES TO END OF TEST.
INTRVL	10	5	0 - 256	DETERMINES THE INTERVAL (IN MINUTES) BETWEEN AUTOMATIC PERFORMANCE SUMMARY TYPEOUTS ERRORS PRINTED OUT IF SW<07>=0
CMPLMT	10	3	0 - 'MAXDL'	THE NUMBER OF DATA COMPARSION
MAXCYL	10	410	0 - 410	THE MAXIMUM CYLINDER ADDRESS
MINCYL	10	0	0 - 410	THE MINIMUM CYLINDER ADDRESS. VALUE MUST NOT BE GREATER THAN VALUE IN 'MAXCYL'
MAXTRK	10	18	0 - 18	THE MAXIMUM TRACK ADDRESS
MINTRK	10	0	0 - 18	THE MINIMUM TRACK ADDRESS THE MINIMUM TRACK ADDRESS MUST NOT BE GREATER THAN THE VALUE IN 'MAXTRK'
MAXSEC	10	21	0 - 21	THE MAXIMUM SECTOR ADDRESS
MINSEC	10	0	0 - 21	THE MINIMUM SECTOR ADDRESS THE MINIMUM SECTOR ADDRESS MUST NOT BE GREATER THAN THE VALUE IN 'MAXSEC'
BEGCOD	10	5	0 - 5	THE INITIAL COMMAND FOR EACH DRIVE EXERCISED. 0 = WRITE CHECK DATA 1 = WRITE CHECK HEADER & DATA 2 = WRITE DATA 3 = WRITE HEADER & DATA 4 = READ DATA 5 = READ HEADER & DATA
BEGPAT	10	8	1 - 15	THE CODE FOR THE STARTING PATTERN. (IF A WRITE ORDER OR A WRITE CHECK ORDER IS SPECIFIED IN 'BEGCOD')
ENDET	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.
FORMAT	8	000001	0 OR 1	IF PARAMETER = 0; DO NOT PERFORM WRITE HEADER & DATA ORDERS; IF PARAMETER > 0,

```
                                                                PERFORM WRITE HEADER & DATA
                                                                ORDERS
                        $RPADR    8     176700        N/A       THE RH70 UNIBUS ADDRESS
                        $RPVEC    8        254        N/A       THE RH70 VECTOR ADDRESS
```

SHVLOD	8	000001	0 OR 1	IF PARAMETER = 0, DO NOT PRESERVE THE LOADER; IF PARAMETER ≠ 0, PRESERVE THE LOADER
RATIO	8	3	0 - 7	CONTROLS THE APPROXIMATE RATIO OF READ TO WRITE ORDERS.

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

AUTOCK	8	000001	0 OR 1

IF PARAMETER = 1, THE PROGRAM PERFORM WRITE CHECKS AFTER EACH WRITE COMMAND.
IF PARAMETER = 0, THE PROGRAM WILL PERFORM WRITE CHECKS RANDOMLY.

NOTPRT	8	000001	0 OR 1

IF PARAMETER = 1, DO NOT PRINT ERROR MESSAGES FOR DATA ERRORS OCCURING AT LOCATIONS DEFINED BY THE OPERATOR AS BAD PACK LOCATION.
IF PARAMETER = 0, PRINT ERROR MESSAGES ASSOCIATED WITH BAD PACK LOCATIONS.

NOTE: THE PROGRAM WILL SELECT A MAXIMUM BUFFER SIZE WHICH IS DETERMINED BY THE MEMORY AVAILABLE. THE MAXIMUM BUFFER SIZE ASSIGNED BY THE PROGRAM IS 5980 (10) WORDS. THE OPERATOR MAY SPECIFIY ANY OTHER MAXIMUM SIZE AS LONG AS THE VALUE SPECIFIED IS AT LEAST 4 WORDS BUT NO LARGER THAN THE INITIAL VALUE OF 'MAXDL' DETERMINED BY THE PROGRAM.

4.2.2 PERIPHERAL ADDRESSES AND OTHER LOCATIONS OF INTEREST

TO ALTER THESE LOCATIONS, THE OPERATOR MUST MAKE MANUAL ENTRIES BEFORE THE PROGRAM IS STARTED. THE KEYBOARD ENTRY ROUTINE DOES NOT PROVIDE ACCESS TO THESE LOCATIONS.

LOC	TAG	CONTENTS	FUNCTION
1166	$LKCSR	172540	ADDRESS OF KW11-P STATUS REGISTER
1170	$LKCSB	172542	ADDRESS OF KW11-P COUNTER BUFFER
1172	$LPVEC	104	KW11-P VECTOR ADDRESS
1174	$LKS	177546	ADDRESS OF KW11-L STATUS REGISTER

```
  469                                   1176    $LLVEC     100          KW11-L VECTOR ADDRESS
  470                                   1206    $LSCS   177514          ADDRESS OF LINE PRINTER STATUS REGISTER
  471                                   1210    $LSDB   177516          ADDRESS OF LINE PRINTER DATA BUFFER
  472                                   1214    HZ          74          74 (60 DECIMAL) IF SYSTEM IS 60 HZ;
```

```
                                1216    LA30        0       62 (50 DECIMAL) IF SYSTEM IS 50 HZ.
                                                            0 IF AN LA30 IS ON THE SYSTEM;
                                                            177777 IF MOD 33 OR MOD 35 TTY
                                                            ON THE SYSTEM

                        4.3     SWITCH REGISTER SETTINGS

                                SW <15> = 1     HALT ON ERROR
                                SW <13> = 1     INHIBIT ERROR TYPEOUT
                                SW <10> = 1     RING THE TELETYPE BELL IF ERROR
                                SW <7>  = 1     DISPLAY ALL DATA COMPARE ERRORS
                                SW <6>  = 1     DO NOT ALTER THE CURRENT OPERATION PARAMETERS
                                SW <5>  = 1     PARTIAL REGISTER DISPLAY IF ERROR; DO NOT DISPLAY
                                                ECC CORRECTION RESULTS
                                SW <4>  = 1     INHIBIT MAXIMUM ERROR COUNT CHECK; DO NOT DEASSIGN
                                                DRIVES WHEN NORMAL END OF TEST REACHED.
                                SW <3>  = 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<7> SET, DISPLAY REST
                                                OF BUFFER
                                SW <1>  = 1     INHIBIT DATA COMPARSION AFTER READ ORDERS
                                SW <0>  = 1     READ ONLY MODE


                        4.4     KEYBOARD COMMANDS

                                THE KEYBOARD COMMANDS CONTROL THE ASSIGNMENT/DEASSIGNMENT OF DRIVES,
                                ALLOW THE OPERATOR TO REQUEST DRIVE PERFORMANCE SUMMARIES, AND ALLOW
                                DATA PACKS TO BE WRITTEN

                                WHEN THE PROGRAM IS STARTED (OR RESTARTED), KEYBOARD COMMANDS ARE
                                NOT RECOGNIZED UNTIL THE PROGRAM HAS INITIALIZED ITSELF.  THE OPERATOR
                                MUST WAIT UNTIL THE 'PROGRAM INITIALIZE COMPLETE' MESSAGE IS TYPED
                                BEFORE ATTEMPTING TO USE THE COMMANDS.  AFTER INITIALIZATION HAS BEEN
                                COMPLETED, THESE COMMANDS MAY BE USED.

                                EACH COMMAND, EXCEPT THE 'S' AND THE 'D' COMMANDS, WILL ASK FOR
                                A DRIVE IDENTIFICATION ENTRY AND FOR THE ADDRESSES OF ANY BAD SPOTS
                                ON THE PACK BEING USED ON THE DRIVE WHICH IS BEING ASSIGNED.  THE
                                DRIVE IDENTIFICATION ENTRY REQUEST IS MADE BY THE FOLLOWING MESSAGE:

                                        'ENTER I.D. FOR DRV #N:'

                                THE OPERATOR MAY ENTER AN I.D. NUMBER FOR THE DRIVE OF UP TO 6
                                CHARACTERS IN LENGTH.  THIS I.D. WILL BE DISPLAYED, ALONG WITH THE
                                DATE AND OPERATOR I.D. ENTRIES (SEE SECTION 4.1), WHEN THE 'SA'
                                COMMAND IS EXECUTED.  THE OPERATOR MAY ENTER ANY CHARACTER STRING,
                                TERMINATED BY A 'CARRIAGE RETURN', OR A 'CARRIAGE RETURN' ONLY
                                (NULL ENTRY) IN RESPONSE TO THE I.D. REQUEST.

                                THE PROGRAM WILL THEN ASK FOR THE ADDRESSES OF KNOWN BAD SPOTS ON
                                THE DISK PACK USED:

                                        'BAD TRK/SEC ADRS FOR DRV #N ?'
```

```
529                                     THE OPERATOR MAY SPECIFY UP TO 8 BAD LOCATIONS FOR THE PACK BEING
530                                     USED.  THE FORMAT FOR THE BAD SPOT ADDRESS ENTRY IS AS FOLLOWS:
531:
532                                     FORMAT 1:       C,T,S<CR>
```

A. LEADING ZEROS ARE NOT REQUIRED. THE ENTRY MUST BE TERMINATED BY A 'CARRIAGE RETURN' (<CR>).
B. THE PROGRAM WILL INHIBIT DATA ERROR MESSAGES OR WILL IDENTIFY DATA ERRORS WHICH OCCUR AT THE SPECIFIED ADDRESS, DEPENDING ON THE VALUE OF PARAMETER 'NOTPRT'.

FORMAT 2: C,T<CR>

A. LEADING ZEROS ARE NOT REQUIRED. THE ENTRY MUST BE TERMINATED BY A 'CARRIAGE RETURN' (<CR>).
B. WHEN THIS FORMAT IS USED, THE ENTIRE TRACK WILL BE CONSIDERED BAD; DATA ERRORS WILL BE HANDLED AS IN 'FORMAT 1', ABOVE.

NOTE: CYLINDER, TRACK, AND SECTOR ENTRIES ARE IN DECIMAL.

THE OPERATOR MAY BYPASS ALL OF THE BAD TRACK/SECTOR ADDRESS ENTRIES BY ENTERING A 'CONTROL C' INSTEAD OF AN ADDRESS. THE ADDRESS ENTRY MAY BE TERMINATED AT ANY POINT BY ENTERING A 'CONTROL C7, ALSO. NOTE THAT AN ENTRY MUST BE TERMINATED BY A 'CARRIAGE RETURN' TO BE ACCEPTED BY THE SYSTEM. THE 'CONTROL C' MUST BE ENTERED IN PLACE OF AN ADDRESS ENTRY AND NOT IN PLACE OF THE 'CARRIAGE RETURN' TERMINATOR FOR AN ENTFY.

FOR BOTH DRIVE I.D. AND BAD TRACK/SECTOR ADDRESS ENTRIES, 'RUBOUT' AND 'CONTROL U' MAY BE USED TO CORRECT MIS-TYPED CHARACTERS AND MIS-TYPED LINES.

4.4.1 'T' COMMAND

USED TO ASSIGN A DRIVE(S) FOR TEST

FORMAT: TN<CR>

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

EXAMPLE: T0<CR> - ASSIGN DRIVE 0 FOR TEST
TA<CR> - ASSIGN ALL AVAILABLE DRIVES FOR TEST

NOTE: DRIVE OPERATION BEGINS IMMEDIATELY AFTER COMMAND IS ENTERED.

4.4.2 '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: D0<CR> - DEASSIGN DRIVE 0
DA<CR> - DEASSIGN ALL DRIVES BEING

```
                                                        TESTED.

                                                NOTES:  1. IF THE 'D' COMMAND REFERENCES A
                                                           DRIVE NOT ASSIGNED THE PROGRAM
```

WILL TYPEOUT '?DRIVE NOT ASSIGNED'

2. THE DRIVES WILL BE DEASSIGNED AS THEIR OPERATIONS COMPLETE.

3. IF 'DA' IS USED, ONLY DRIVES BEING TESTED WILL BE DEASSIGNED - THE ERROR MESSAGE IN (1) ABOVE WILL NOT BE DISPLAYED.

4.4.3 'S' COMMAND

USED TO REQUEST A PERFORMANCE SUMMARY TYPEOUT FOR THE REFERENCED DRIVE(S).

FORMAT: SN<CR>

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

EXAMPLE: S0<CR> - TYPEOUT PERFORMANCE SUMMARY FOR DRIVE 0
SA<CR> - TYPEOUT PERFORMANCE SUMMARY FOR ALL DRIVES BEING TESTED.

NOTES: 1. IF 'SA' IS USED ONLY DRIVES BEING TESTED WILL BE DISPLAYED.

2. IF PARAMETER 'INTRVL' IS NOT ZERO, THE PROGRAM WILL AUTOMATICALLY DISPLAY A PERFORMANCE SUMMARY FOR EACH DRIVE BEING TESTED AT A RATE DETERMINED BY 'INTRVL'.

3. IF THE 'SA' COMMAND IS USED, THE PROGRAM WILL TYPEOUT THE OPERATOR ENTERED DATE, OPERATOR I.D., AND THE DRIVE I.D. FOR EACH DRIVE BEING TESTED. THE DATE AND OPERATOR I.D. WILL NOT BE TYPED OUT IF NO DRIVES ARE BEING TESTED.

4.4.4 'W' COMMAND

USED TO WRITE A DATA PACK WITH DATA ACCEPTABLE TO THE RP04 MULTI-DRIVE 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: WA<CR> - WRITE DATA PACKS ON ALL AVAILABLE DRIVES.
W0<CR> - GENERATE A DATA PACK ON DRIVE 0.

NOTES: 1. DATA PACKS GENERATED BY THE RP04 FORMATTER PROGRAM (MD-11-DERPL) OR BY THE RP04 MECHANICAL & READ/WRITE PROGRAM (MD-11-DERPK), TEST 15, ARE ACCEPTABLE. (PACKS WRITTEN BY TESTS 13, 14 OR 16 OF 'DERPK' CANNOT BE USED AND MUST BE REWRITTEN.)

```
649
650                                     2.  THE 'W' COMMAND SHOULD NOT BE USED UNLESS 'MAXDL'
651                                         PARAMETER IS APPROXIMATELY 1 TRACK IN SIZE - 5000 (10).
652                                         IF THE BUFFER SIZE IS MUCH LESS THAN 1 TRACK, THE
```

TIME REQUIRED TO WRITE A DATA PACK IS TOO GREAT TO BE PRACTICAL.

3. THE 'W' COMMAND PERFORMS A SEQUENTIAL WRITE OF THE PACK USING A 'WRITE DATA' COMMAND. THE DATA PATTERN USED FOR EACH WRITE IS SELECTED RANDOMLY. HOWEVER, THE OPERATION OF THE COMMAND IS SEQUENTIAL, BEGINNING AT 'MINCYL', 'MINTRK' AND CONTINUING TO 'MAXCYL', 'MAXTRK'.

4. THE 'W' COMMAND DOES NOT WRITE HEADERS AND ASSUMES THAT THE FORMAT OF THE PACK IS GOOD.

5. THE 'W' COMMAND CANNOT BE STARTED IF SWITCH 0 (READ ONLY MODE) IS SET. IF SWITCH 0 SET SET DURING THE OPERATION OF THE 'W' COMMAND, THE DRIVE PERFORMING THE 'W' COMMAND WILL IGNORE THE SWITCH.

6. THE DATA WRITTEN IS VERIFIED BY A 'WRITE CHECK DATA' COMMAND.

4.4.5 'R' COMMAND

USED TO PERFORM A SEQUENTIAL READ OF THE PACK.

FORMAT: RN<CR>

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

EXAMPLE: RA<CR> - READ THE PACKS ON ALL OF THE ONLINE DRIVES.
R0<CR> - READ THE PACK ON DRIVE 0.

NOTES: 1. THE PROGRAM WILL PERFORMA NORMAL CHECK OF ALL DATA READ. HOWEVER, ALL OPERATIONS WILL BE SEQUENTIAL.

2. THE PROGRAM WILL READ THE PACK STARTING AT THE ADDRESS SPECIFIED BY 'MINCYL', 'MINTRK' TO THE ADDRESS SPECIFIED BY 'MAXCYL', 'MAXTRK'. THE READ WILL BE SEQUENTIAL.

4.4.6 GENERAL COMMAND INFORMATION

A. WHEN A COMMAND IS ENTERED, THE PROGRAM WILL TYPE OUT THE TIME

B. IF THE COMMAND ENTERED IS NOT VALID, THE PROGRAM WILL TYPE 'INVALID COMMAND'.

C. DRIVES ASSIGNED (WITH THE 'T' COMMAND) OR DEASSIGNED (WITH THE 'D' COMMAND) MAY BE ENTERED IN ANY SEQUENCE.

D. THE ERROR RESPONSES FROM THE PROGRAM ARE AS FOLLOWS

RESPONSE	COMMAND(S)

```
709
710                                     ?UNIT N OFFLINE             T, W, R
711                                     ?UNIT N NOT ASSIGNED        D, S
712                                     ?UNIT N ALREADY ASSIGNED    T, W, R
```

```
                                        ?UNIT N NOT PRESENT          T, W, R
                                        ?UNIT N UNSAFE               T, W, R
                                        ?UNIT N NOT AN RP04          T, W, R



5.      PERFORMANCE SUMMARY TYPEOUT
        ---------------------------

5.1     THE PROGRAM WILL DISPLAY A PERFORMANCE SUMMARY FOR THE DRIVES
        BEING EXERCISED.  THIS SUMMARY WILL BE DISPLAYED AUTOMATICALLY
        IF THE PARAMETER 'INTRVL' IS NOT ZERO OR CAN BE DISPLAYED ON
        REQUEST BY THE OPERATOR THROUGH THE USE OF THE 'S' COMMAND.
        THE PERFORMANCE SUMMARY TYPEOUT CONTAINS THE FOLLOWING FIELDS:

        'DRV'           THE DRIVE NUMBER
        'PASS'          THE PRESENT PASS COUNT FOR THE DRIVE
        'ORDERS'        THE NUMBER OF ORDERS PERFORMED BY THE DRIVE
        'SEEKS'         THE NUMBER OF SEEK OPERATIONS THE DRIVE PERFORMED
        'WRDS XFER'     THE TOTAL NUMBER OF WORDS WRITTEN AND READ BY THE DRIVE
        'WRDS READ'     THE TOTAL NUMBER OF WORDS READ BY THE DRIVE
        'SOFT'          THE NUMBER OF SOFT DATA ERRORS
        'HARD'          THE NUMBER OF HARD DATA ERRORS
        'SKI'           THE NUMBER OF 'SKI' OR 'OCYL' ERRORS
        'MISP'          THE NUMBER OF POSITIONING ERRORS
        'OTHER'         THE TOTAL ERRORS OF OTHER TYPES

        NOTE:  ERRORS EM1, EM2, EM3, EM4, & 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 CORRECTED OR BECOMES CORRECTABLE AFTER THE PROGRAM
            HAS PERFORMED THE COMPLETE RETRY SEQUENCE ON THE BAD SECTOR.
            THE RETRY SEQUENCE IS 15 RE-READS AT TRACK CENTER AND 2 ATTEMPTS
            AT EACH OF THE FOLLOWING OFFSETS:

                +400 MICRO-INCHES
                -400 MICRO-INCHES
                +800 MICRO-INCHES
                -800 MICRO-INCHES
               +1200 MICRO-INCHES
               -1200 MICRO-INCHES

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 ORDERS.
```

```
769                                     D.  'DTE' ERRORS WHICH ARE CORRECTED OR WHICH BECOME ECC CORRECTABLE
770                                         'DCK' ERROR DURING THE RETRY SEQUENCE.
771
772
```

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 ORDER TERMINATED WITH NO ERROR.

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

AFTER EACH WRITE OPERATION, THE DATA WRITTEN IS CHECKED WITH THE APPROPRIATE WRITE CHECK COMMAND - IF PARAMETER 'AUTOCK' IS 1. (IF 'AUTOCK' IS 0, WRITE CHECKS WILL BE PERFORMED RANDOMLY.)

6.3 SECTOR REFORMATTING

THE PROGRAM WILL REFORMAT AN UNCORRECTABLE ERROR SECTOR IN THE FOLLOWING CASES (PARAMETER 'FORMAT' MUST BE SET AND SW<00> = 0). THIS PREVENTS THE SAME ERROR FROM BEING CONTINUOUSLY REPORTED.

A. DATA CHECK ERRORS - EM21
B. HEADER READ ERRORS - EM20, EM24, EM25, EM26, EM27
C. DRIVE TIMING ERRORS - EM31
D. OPERATION INCOMPLETE ERRORS - EM32
E. WRITE CHECK ERRORS - EM22, EM23

6.4 BAD TRACK/SECTOR FLAGGING

SINCE THE RP04 SUBSYSTEM DOES NOT HAVE AN AUTOMATIC BAD TRACK HANDLING CAPABILTIY, THE MULTIDRIVE EXERCISER ALLOWS THE OPERATOR TO IDENTIFY UP TO 8 BAD TRACK/SECTOR LOCATIONS WHEN THE DRIVE IS ASSIGNED FOR TEST. (SEE SECTION 4.1 FOR ADDITIONAL INFORMATION.)

IF ONE OF THE FOLLOWING ERRORS OCCURS AT A LOCATION IDENTIFIED BY THE OPERATOR, THE PROGRAM WILL INHIBIT THE ERROR REPORT FOR THAT ERROR.

DATA CHECK ERRORS ('DCK')
WRITE CHECK ERRORS ('WCE')
OPERATION INCOMPLETE ERRORS ('OPI')
DRIVE TIMING ERRORS ('DTE')
HEADER READ ERRORS ('FER' & 'HCRC', 'HCE' & 'HCRC', 'HCRC')

OPTIONALLY, THE OPERATOR MAY REQUEST AN ERROR REPORT FOR FLAGGED AREAS. (PARAMETER 'NOTPRT' MUST BE SET TO 0 AT STARTUP.) THE PROGRAM WILL IDENTIFY ERROR MESSAGES ASSOCIATED WITH THE PACK; THESE ERRORS WILL NOT BE ADDED TO THE ERROR TOTALS MAINTAINED BY THE PROGRAM.

```
829
830
831
832                                 7.      ERROR MESSAGES
```

```
                                        ----------

                                        DRIVE ERRORS ARE REPORTED ON THE TELETYPE OR (IF AVAILABLE) A
                                        LINE PRINTER.  ALL ERROR CONDITIONS ARE REPORTED IN ERROR MESSAGES;
                                        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 OCCURED OR A CENTRAL PROCESSOR FAILURE HAS
                                        OCCURED.

                                        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

                                        MESSAGES EM1, EM2, EM3, EM4, EM5, EM10, EM11, & EM12 ARE ALWAYS
                                        DISPLAYED ON THE TTY.  THE OTHER MESSAGES ARE DISPLAYED ON EITHER
                                        THE LINE PRINTER (IF AVAILABLE) OR THE TTY.

                                        (THE MESSAGE TAGS ARE GIVEN FOR REFERENCE.)

                                        MESSAGE
                                        TAG             TEXT
                                        ---             ----

                                        EM1     ILLEGAL RH70 INTERRUPT (SC=0 OR RHAS=0)

                                                THE RH70 INTERRUPTED AND EITHER 'SC' FOR NOT SET OR
                                                RHAS WAS ZERO AND NO RH70 ERROR WAS INDICATED.

                                        EM2     UNEXPECTED ATTENTION DETECTED

                                                THE INDICATED DRIVE INTERRUPTED BUT THE DRIVE WAS NOT
                                                PERFORMING AN OPERATION.

                                        EM3     CONTROL BUS PARITY ERROR DETECTED BY THE RH70

                                                THE RH70 DETECTED A CONTROL BUS PARITY ERROR WHEN READING
                                                THE INDICATED REGISTER FROM THE INDICATED DRIVE.

                                        EM4     CONTROL BUS PARITY ERROR DETECTED BY THE RP04

                                                THE INDICATED RP04 DETECTED A CONTROL BUS PARITY ERROR
                                                WHEN THE RH70 LOADED THE SPECIFIED REGISTER.

                                        EM5     ATTENTION FROM AN OFFLINE DRIVE

                                                THE ATTENTION BIT WAS SET FOR A DRIVE WHICH WAS NOT
                                                AVAILABLE.  THIS MESSAGE DOES NOT NECESSARILY INDICATE
                                                AN ERROR CONDITION.  THIS MESSAGE WILL OCCUR IF DRIVES
                                                NOT BEING EXERCISED ARE CYCYLED UP OR DOWN.

                                        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 OCCURED WHEN THE RH70 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.

                                EM13    OPERATION NOT COMPLETED WITHIN TIME LIMIT

                                        THE DRIVE DID NOT COMPLETE THE OPERATION WITHIN 1 SECOND
                                        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 10 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 OCCURED 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 OCCURED 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
```

```
949
950                                     A WRITE DATA, WRITE CHECK DATA, OR A READ DATA WAS BEING
951                                     PERFORMED AND A 'FMT' ERROR OCCURED.  THE PROGRAM RE-READ THE
952                                     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 OCCURED.  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:
                        'IXE', 'AOE', 'RMR', 'ILF', OR 'ILR'

                EM31    OPERATION INCOMPLETE ('OPI') ERROR

                        AN OPERATION INCOMPLETE ERROR OCCURED AT THE INDICATED
                        SECTOR.

                EM32    DRIVE TIMING ('DTE') ERROR

                        DRIVE TIMING ERROR OCCURED 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 OCCURED DURING THE OPERATION.  THE
                        OPERATION WILL BE RETRIED 3 TIMES.

                EM35    INVALID ADDRESS ('IAE') ERROR

                        AN INVALID ADDRESS ERROR OCCURED DURING THE OPERATION.

                EM36    WRITE LOCK ('WLE') ERROR

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

                EM40    RH70 OR UNIBUS TRANSFER ERROR

                        'TRE' IS SET IN THE RH70 CONTROL REGISTER AND NO DRIVE
```

```
1009                                    ERROR HAS OCCURED.  THE OPERATION WILL BE RETRIED 3
1010                                    TIMES IF THE ERROR WAS CAUSED BY 'DLT', 'LPE', 'MXF',
1011                                    OR 'MDPE'.
1012
```

EM41 BUS ADDRESS OR WORD COUNT INCORRECT

NO RH70/RP04 ERROR OCCURED 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 RP04 ERROR DETECTED

NO RP04 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 RH70

THE OPERATION COMPLETED NORMALLY; HOWEVER, THE PROGRAM FOUND EITHER ERROR BITS IN THE RP04 SET OR ERROR BITS IN THE RH70 SET.

EM50 SEEK INCOMPLETE OR OFF CYLINDER ERROR

THE DRIVE SIGNALED EITHER 'SKI' OR 'OCYL' ERROR BITS.

EM51 PROGRAM DETECTED POSITIONING ERROR

A HEADER COMPARE ERROR OCCURED ('HCE'); HOWEVER, WHEN THE PROGRAM EXAMINED THE HEADER OF THE SECTOR IN ERROR, IT FOUND THAT THE CYLINDER FIELD DID NOT AGREE WITH THE CONTENTS OF 'RHCC' OF THE DRIVE. THE DRIVE WILL BE RECALIBRATED.

EM60 DEVICE UNSAFE

THE INDICATED DRIVE UNSAFE ERROR OCCURED; 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

TT:TT:TT (DESCRIPTION OF ERROR)

'TT:TT:TT' IS THE TIME SINCE THE PROGRAM WAS STARTED. TT:TT:TT IS GIVEN IN HOURS: MINUTES: SECONDS.

LINE 2

'PRESENT ORDER = XXXX PREVIOUS ORDER = YYYY'

```
1069
1070                                    ;DISPLAY OF THE RH70/RP04 REGISTERS IN TWO
1071                                    ;GROUPS: RHCS1,RHCS2,RHDS1,RHER1,RHER2,RHER3
1072                                    ;RHEC1, & RHEC2 FORM THE FIRST GROUP OF REGISTERS;
```

ALL THE OTHER REGISTERS ARE IN THE SECOND GROUP.
IF SW<05> IS SET, ONLY THE REGISTERS IN THE FIRST
GROUP WILL BE DISPLAYED.)

MNEMONICS USED FOR THE DATA TRANSFER ORDERS ARE DEFINED BELOW:

        WCKD - WRITE CHECK DATA (OCTAL 51)
        WCKHD - WRITE CHECK HEADER & DATA (OCTAL 53)
        WRTDAT - WRITE DATA (OCTAL 61)
        WRTHD - WRITE CHECK HEADER & DATA (OCTAL 63)
        RDDAT - READ DATA (OCTAL 7)
        RDHD - READ HEADER & DATA (OCTAL 73)

'ERROR OCCURED DURING NON-DATA TRANSFER OPERATION'

THE ABOVE LINE WILL BE PRINTED IF THE ERROR OCCURED 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 PACK 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 RP04 REGISTERS. THE
CONTENTS OF THIS WORD IDENTIFY HOW THE ERROR WAS PROCESSED BY THE
RP04 DRIVE HANDLER ROUTINE. THE BITS IN THIS WORD ARE ENCODED
AS FOLLOWS:

BIT #	MEANING IF BIT IS '1'
15	ERROR OCCURED DONE (BIT07=0), BITS 14-9 SPECIFY TYPE DONE (BIT07=1), BITS 6-3 SPECIFY TYPE
14	DRIVE IS OFFLINE
12	PERSISTENT UNSAFE CONDITION EXISTS
11	UNCORRECTABLE ERROR OCCURED
10	FATAL PARITY ERROR OCCURED. MASSBUS CLEAR WAS PERFORMED
9	OPERATION NOT COMPLETED WITHIN 1 SECOND MASSBUS CLEAR PERFORMED. ALL OTHER OUTSTANDING OPERATIONS WERE RESTARTED.
7	DONE - OPERATION COMPLETED
6	DATA ERROR OCCURED DURING THE TRANSFER
5	ERROR OCCURED WHILE SEARCHING FOR THE 'TRANSFER' SECTOR

```
1129
1130                                        4           CORRECTABLE UNSAFE CONDITION OCCURED
1131
1132                                        3           DRIVE ERROR OCCURED THAT CAUSED AN AUTOMATIC
```

RECALIBRATE SEQUENCE

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

PRESENT 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

RHBA = XXXX RHWC = YYYY

THIS LINE GIVES THE CONTENTS OF THE RH70 BUFFER ADDRESS
REGISTER AND THE RH70 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

```
1189                                    -------
1190
1191                                    RHDA = XXXX  RHCA = YYYY
1192
```

```
                        THIS LINE GIVES THE CONTENTS OF THE SPO4 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  SIZE = YYYY  ACTUAL NUMBR WRDS XFRD = ZZZZ

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

                        LINE 11
                        -------

                        GOOD DATA = XXXX  BAD DATA = YYYY  SECT POS = ZZZ

                        THIS LINE GIVES THE GOOD DATA, THE ACTUAL DATA FROM THE DISK,
                        AND THE LOCATION IN THE SECTOR OF THE ACTUAL DATA.  THE SECTOR
                        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
                        -------

                        RHEC1 = XXXX  RHEC2 = YYYY

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

                        LINE 14
                        -------

                        ECC CORRECTABLE WITHOUT OFFSET

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

                        LINE 15
                        -------

                        READ CORRECTLY AT OFFSET  X  MICRO-INCHES

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

```
1249
1250                                    LINE 16
1251                                    -------
1252
                                        ECC CORRECTABLE AT OFFSET  x  MICRO-INCHES
```

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 COUNT 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 OCCURED. IF THIS LINE IS PRINTED, THE RH70/RP04 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

```
1309
1310                                    THE PROGRAM PERFORMED ECC CORRECTION AND THE RESULTS ARE REPORTED.
1311                                    THE ADDRESS IN MEMORY OF THE WORD(S) IN ERROR ARE GIVEN, THE WORD(S)
1312                                    BEFORE CORRECTION AND THE WORD(S) AFTER CORRECTION ARE PRINTED.
```

```
1313
1314                                    LINE 24
1315                                    -------
1316
1317                                    ERROR BURST BEGINS AT WORD XXX IN DATA FIELD OF ERROR SECTOR
1318
1319                                    THIS IS AN INFORMATIONAL LINE WHICH WILL BE PRINTED FOR 'DCK' ERRORS
1320                                    WHICH ARE ECC CORRECTABLE OR WHICH BECOME ECC CORRECTABLE DURING
1321                                    RETRY.  'XXX' IS THE WORD OFFSET VALUE FROM 'RHEC1' AND IS IN
1322                                    DECIMAL.
1323
1324                                    LINE 25
1325                                    --------
1326
1327                                    ERROR WAS NOT IN THE DATA READ -
1328                                    ECC CORRECTION CAN'T BE PERFORMED
1329
1330                                    THE DATA ERROR WAS NOT IN DATA TRANSFERED TO MEMORY.
1331
1332                                    LINE 26
1333                                    -------
1334
1335                                    CONTENTS OF THE ERROR SECTOR (REPORTED ABOVE)
1336
1337                                    IF SW<03> IS SET, THE SECTOR WHICH GAVE THE 'DCK', 'DTE' OR,
1338                                    'WCF' ERROR OR 'HARD' DATA CHECK ERROR IS PRINTED.  THE
1339                                    CONTENTS OF THE SECTOR FOLLOW THIS LINE.
1340
1341                                    LINE 27
1342                                    ------
1343
1344                                    ORDERS: WWW  ERRORS: X  WRDS XFR: YYYY  WRDS READ: ZZZZ
1345
1346                                    THIS IS THE LAST LINE PRINTED FOR ALL NON-POSITIONING
1347                                    TYPE ERRORS.
1348
1349                                    'ORDERS' IS THE TOTAL NUMBER OF COMMANDS GIVEN TO THE DRIVE
1350                                    WHICH REPORTED THE ERROR.
1351
1352                                    'ERRORS IS THE TOTAL ERROR COUNT FOR THE DRIVE AND INCLUDES
1353                                    EVERY ERROR DETECTED, REGARDLESS OF TYPE.
1354
1355                                    'WRDS XFR' IS THE TOTAL NUMBER OF WORDS WRITTEN AND READ BY
1356                                    THE DRIVE.
1357
1358                                    'WRDS READ' IS THE TOTAL NUMBER OF WORD READ BY THE DRIVE.
1359
1360                                    LINE 28
1361                                    -------
1362
1363                                    ORDERS: WWWW TOTAL SEEKS: XXX TOTAL POS ERR = YYY TOTAL SKI, OCYL ERR = Z
1364
1365                                    THIS IS THE LAST LINE PRINTED FOR ALL POSITIONING TYPE ERRORS.
1366
1367                                    'ORDERS' IS THE TOTAL NUMBER OF ORDERS GIVEN TO THE DRIVE WHICH
1368                                    REPORTED THE ERROR.
```

```
1369
1370                    'TOTAL SEEKS' IS THE TOTAL NUMBER OF SEEK OPERATIONS PERFORMED
1371                    BY THE DRIVE.
1372
```

'TOTAL POS ERR' IS THE TOTAL NUMBER OF POSITIONING ERRORS WHICH
THE PROGRAM DETECTED FOR THE DRIVE.

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

8. PROGRAM DESCRIPTION

8.1 PROGRAM OPERATION

WHEN THE PROGRAM IS STARTED FROM LOCATION 200(8), ALL TABLES AND
PARAMETERS ARE CLEARED OR INITIALIZED. THE PARAMETERS WHICH ARE
UNDER OPERATOR TTY ENTRY CONTROL ARE CHECKED FOR VALIDITY AND
CONSISTENCY. RH70 INTERRUPT ENABLE ('IE') IS SET, TTY KEYBOARD
INTERRUPT ENABLE IS SET, AND THE KW11-L OR KW11-P CLOCK IS STARTED.
WHEN THESE ACTIONS HAVE BEEN COMPLETED, THE PROGRAM TYPES OUT
'PROGRAM INTIALIZE COMPLETE'. 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 SUMMARY 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 RP04, AND IS ONLINE. THE ASSIGNMENT ROUTINE
THEN ISSUES A 'READIN PRESET' INSTRUCTION, SETS 'FMT22', 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 ORDER, THE ASSIGNED BUFFER
WILL BE FILLED WITH THE SELECTED PATTERN. (WRITE CHECK ORDERS ARE
ISSUED AFTER EACH WRITE ORDER. THE WRITE CHECK ORDER USES THE
PARAMETERS SELECTED FOR THE PRECEEDING WRITE ORDER.) 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
PERFORM THE OPERATION, THE PROGRAM ISSUES A SEARCH INSTURCTION
TO THE DRIVE WITH A 'TARGET' SECTOR WHICH IS 8 SECTORS 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 READS
THE LOOK AHEAD REGISTER (RHLA) OF THE INTERRUPTING DRIVE AND
COMPARES THE POSITION OF THE DISK WITH THAT OF THE DESIRED SECTOR.

```
1429
1430                    IF OTHER DRIVES ARE WAITING ON CYLINDER, THEY ARE ALSO CHECKED.  THE
1431                    PROGRAM THEN ISSUES THE REQUESTED ORDER TO THE DRIVE NEAREST ITS
1432                    TRANSFER SECTOR.  THE DRIVES NOT SELECTED WILL HAVE ANOTHER SEARCH
```

INITIATED. IF A DRIVE IS NOT SELECTED FOR TRANSFER AFTER THREE
REVOLUTIONS OF ITS DISK, IT IS GIVEN PRIORITY OVER DRIVES WHICH HAVE
NOTE BEEN ON CYLINDER AS LONG.

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 RH70 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 ORDER WAS A READ ORDER, 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.

    PERSISTENT UNSAFE CONDITION - EM12
    UNCORRECTABLE MASSBUS PARITY ERROR - EM10
    FATAL MASSBUS PARITY ERROR - EM11
    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 OR OFF CYLINDER ERROR - EM50
    WRITE CHECK WITHOUT 'DCK' SET - EM23
    RH70 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 RP04 ERROR DETECTED - EM42
    CAN'T MATCH DATA READ WITH A PATTERN - EM43
    ERROR BIT(S) SET, BUT NO ERROR SIGNALED BY THE RH70 - EM44

8.2 DUAL PORT OPERATION

```
1489
1490                    DUAL PORT OPERATION IS NEARLY IDENTICAL TO THE OPERATION DESCRIBED
1491                    IN SECTION 8.1.  THE DIFFERENCES ARE IN COMMAND SEQUENCE INITIATION
1492                    AND ORDER TERMINATION.
```

WHEN THE DUAL PORT HANDLER ROUTINE IN THE MULTIDRIVE PROGRAM RECEIVES
A REQUEST FOR A DRIVE, THE PROGRAM VERIFIES THAT THE DRIVE IS
ONLINE. THE DRIVE IS SELECTED AND 0'S ARE WRITTEN INTO 'RHDS1':
IF THE DRIVE IS IN NEUTRAL, THIS WILL SEIZE THE DRIVE. IF THE
DRIVE IS SEIZED BY THE OTHER PORT, WRITING INTO 'RHDS1' WILL SET
'PORT REQUEST'. THE PROGRAM CHECKS 'DVA' IN 'RHCS1'. 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 10 SECOND TIMER FOR THE DRIVE. IF THE DRIVE HAS
NOT SWITCHED TO THE REQUESTING SYSTEM WITHIN THE 10 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 RP04 BEING TESTED; HOWEVER, UNDER CERTAIN CONDITIONS
(E.G. MASSBUS PARITY ERRORS BEING REPORTED ON THE OTHER SYSTEM
ON A MOD33 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 THE RP04 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. NOTE THAT THIS CAN BE AN
EXTENDED INTERVAL IN THE CASE OF A DRIVE UNSAFE WHICH CAUSES THE
DRIVE TO CYCLE DOWN BUT WHICH IS CLEARED BY THE 'DRIVE CLEAR'.

SINGLE PORT DRIVES, DRIVES WHICH ARE LOCKED ON PORT, OR 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 ORDER 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'.

B. THE BUFFER SIZE IS RANDOM SELECTED BETWEEN 4 (10) - AND THE
VALUE IN 'MAXDL'. THE SIZE SELECTED IS WEIGHTED TO ENSURE
THAT AT LEAST 4 WORDS ARE WRITTEN IN THE DATA AREA OF THE LAST
SECTOR. 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.

C. THE DATA WRITTEN IS RANDOMLY SELECTED AMONG THE 15 STANDARD
PATTERNS. THE KEYWORDS IN THE HEADER (WHEN PERFORMING A WRITE
HEADER & DATA ORDER) ARE ZERO FILLED. THE PROGRAM EXPECTS TO
FIND THAT THE KEYWORDS ARE ZERO.

D. THE ORDERS ARE SELECTED RANDOMLY. WRITE CHECK DATA AND WRITE

```
1549                                    CHECK HEADER & DATA ORDERS ARE PERFORMED ONLY IF THE PREVIOUS
1550                                    ORDER WAS THE APPROPRIATE DATA ORDER.  IF THE 'FORMAT' PARAMETER
1551                                    IS ZERO, THE PROGRAM WILL NOT SELECT WRITE HEADER & DATA (AND
1552                                    WRITE CHECK HEADER & DATA) ORDERS.  WHEN THE PROGRAM SELECTS
```

A WRITE HEADER & DATA ORDER, THE BUFFER SIZE IS FORCED TO 260 (10); THE PROGRAM WILL NOT PERFORM A MULTI-SECTOR FORMAT WRITE OPERATION.

E. THE FIRST ORDER PERFORMED AFTER A UNIT IS ASSIGNED WITH A 'T' COMMAND IS NOT RANDOMLY SELECTED. THE PARAMETERS FOR THE FIRST OPERATION ARE THE MINIMUM OR STARTING VALUES OF THE VARIABLES.

8.4 DATA PATTERNS

THE PROGRAM SELECTS ONE OF THE FOLLOWING DATA PATTERNS TO WRITE WHEN A WRITE ORDER 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: FROM THE FIRST 4 DATA WORDS OF EACH SECTOR, THE PROGRAM MATCHES THE DATA TO ONE OF THE FOLLOWING PATTERNS. TO MANTAIN COMPATIABILITY WITH PACKS WRITTEN BY THE FORMAT PROGRAM (MAINDEC-11-DERPL), THE PROGRAM WILL ACCEPT ALL ZERO'S AND AND ALL ONE'S PATTERNS; HOWEVER, ALL ZERO'S AND ALL ONE'S PATTERNS ARE NOT WRITTEN BY THE EXERCISER PROGRAM.

PATTERN '8' IS DEFINED AS THE 'WORST CASE' PATTERN.

PAT 1	PAT 2	PAT 3	PAT 4	PAT 5	PAT 6	PAT 7	PAT 8
000001	177776	000000	000000	052525	007417	026455	165555
000003	177774	000000	010421	052525	007417	026455	133333
000007	177770	000000	021042	052525	007417	026455	165555
000017	177760	177777	031463	125252	170360	151322	133333
000037	177740	177777	042104	125252	170360	151322	165555
000077	177700	177777	052525	125252	170360	151322	133333
000177	177600	000000	063146	052525	007417	026455	165555
000377	177400	000000	073567	052525	007417	026455	133333
000777	177000	177777	104210	125252	170360	151322	165555
001777	176000	177777	114631	125252	170360	151322	133333
003777	174000	000000	125252	052525	007417	026455	165555
007777	170000	177777	135673	125252	170360	151322	133333
017777	160000	000000	146314	052525	007417	026455	165555
037777	140000	177777	156735	125252	170360	151322	133333
077777	100000	000000	167356	052525	007417	026455	165555
177777	000000	177777	177777	125252	170360	151322	133333

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

```
1609                                    010200  167777  172666  177767  153333  177777  000000
1610                                    020000  157777  155555  177773  066667  177777  000000
1611                                    040000  137777  172666  177775  153333  177777  000000
1612                                    100000  077777  155555  177776  066667  177777  000000
```

1613
1614
1615
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9. PROGRAM LISTING

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1622
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1641
1642
1643                                    DOCUMENT
1644                                    **********
1645                                MAINDEC-11-DERPN-B
1646                                    **********
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                                                PROGRAM BY C. HESS

                                                THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                                PACKAGE (MAINDEC-11-DZQAC-A2).


                                        ;*****************************************************************
                                    13  ;OPERATIONAL SWITCH SETTINGS
                                        ;*****************************************************************

                                        14
                                                        SWITCH          USE
                                                        ------          ---
                                                          15            HALT ON ERROR
                                                          13            INHIBIT ERROR TYPEOUTS
                                                          10            BELL ON ERROR
                                                           7            DISPLAY ALL DATA COMPARE ERRORS
                                                           6            DON'T CHANGE PARAMETERS (LOOP ON PRESENT
                                                           5            PARTIAL REGISTER DISPLAY IF ERROR
                                                           5            NO ECC CORRECTION RESULTS DISPLAYED IF E
                                                           4            DO NOT CHECK FOR MAXIMUM ERROR COUNTS
                                                           4              DO NOT DROP UNIT WHEN NORMAL END OF TE
                                                           3            DISPLAY ERROR SECTOR IF 'DCK', 'DTE', OR
                                                           3              DISPLAY SECTOR IF 'DCK' ERR'UNCORRECTA
                                                           3                  28TH RETRY
                                                           3              IF DATA COMPARE ERROR & SW7 SET, DISPL
                                                           3                  REMAINDER OF BUFFER
                                                           1            INHIBIT DATA COMPARSION AFTER READ ORDER
                                                           0            READ ONLY MODE

                                        ;*****************************************************************
                                    34  ;BASIC DEFINITIONS
                                        ;*****************************************************************

                                        36      INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***

                                        47      GENERAL PURPOSE REGISTER DEFINITIONS

                                        59      PRIORITY LEVEL DEFINITIONS

                                        69      "SWITCH REGISTER" SWITCH DEFINITIONS

                                        97      DATA BIT DEFINITIONS (BIT00 TO BIT15)

                                        125     BASIC "CPU" TRAP VECTOR ADDRESSES
```

```
1805
1806                                    139     ;*******************************************************************
1807
1808                                    ;*******************************************************************
1809                            141     ;RP04 DRIVER COMMANDS
1810                                    ;*******************************************************************
1811
1812                                    143     ;*******************************************************************
1813
1814                                    ;*******************************************************************
1815                            167     ;TRAP CATCHER
1816                                    ;*******************************************************************
1817
1818                                    170     ;ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
1819                                    ;       SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
1820                                    ;       LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
1821
1822                                    ;*******************************************************************
1823                            174     ;STARTING ADDRESS(ES)
1824                                    ;*******************************************************************
1825
1826                                    180     ;*******************************************************************
1827
1828                                    ;*******************************************************************
1829                            182     ;COMMON TAGS
1830                                    ;*******************************************************************
1831
1832                                    184     ;THIS TABLE CONTAINS VARIOUS COMMON STORAGE LOCATIONS
1833                                    ;       USED IN THE PROGRAM.
1834
1835                                    244     ;*******************************************************************
1836
1837                                    ;*******************************************************************
1838                            246     ;CONTROL PARAMETERS
1839                                    ;*******************************************************************
1840
1841                                    248     ;*******************************************************************
1842
1843                                    289     ;*******************************************************************
1844
```

```
                                        ;*******************************************************************
                                        ;RP04 ADDRESS LIMIT VALUES
                                        ;*******************************************************************

                                        ;*******************************************************************

                                        ;*******************************************************************

                                        ;*******************************************************************
                                        ;VALUES FOR FIRST OPERATION
                                        ;*******************************************************************

                                        ;*******************************************************************

                                        ;*******************************************************************

                                        ;*******************************************************************
                                        ;ERROR POINTER TABLE
                                        ;*******************************************************************

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

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

                                        ;*******************************************************************

                                        ;*******************************************************************
                                        ;SETUP AND INITIALIZATION ROUTINE
                                        ;*******************************************************************

                                        ;*******************************************************************

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

```
                        ;*****************************************************************
                        ;MAIN PROGRAM
                        ;*****************************************************************

                        ;*****************************************************************

                        ;*****************************************************************

                        ;*****************************************************************
                        ;ERROR MESSAGE GENERATION ROUTINES
                        ;*****************************************************************

                        ;*****************************************************************

                        ;*****************************************************************
                        ;GENERAL SUPPORT SUBROUTINES
                        ;*****************************************************************

                        ;*****************************************************************

                        ;*****************************************************************
                        ;TYPE NUMERICAL ASCIZ STRING SUPPRESS LEADING ZEROS
                        ;*****************************************************************

                        ;
                        ;CALL
                        ;       MOV     #NUMADR,-(SP)           ;FIRST ADDRESS OF ASCIZ
                        ;       JSR     PC,@#$SUPRS
                        ;

                        ;*****************************************************************

                        ;*****************************************************************
                        ;TYPE ROUTINE
                        ;*****************************************************************

                        ;ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 B
                        ;THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE
                        ;NOTE1:  $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CH
                        ;NOTE2:  $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED
                        ;NOTE3:  $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                        ;
                        ;CALL:
                        ;1) USING A TRAP INSTRUCTION
                        ;       TYPE    ,MESADR                 ;MESADR IS FIRST ADDRESS
                        ;OR
                        ;       TYPE
                        ;       MESADR
                        ;
                        ;2) USING A JSR INSTRUCTION
                        ;       MOV     PS,-(SP)                ;PUSH PROCESSOR STATUS W
                        ;       JSR     PC,$TYPE                ;CALL TYPE ROUTINE
```

```
                                        MESADDR                         ;FIRST ADRESS OF MESSAGE

                                3954    ;*****************************************************************

                                        ;*****************************************************************
                        3956    ;PRINT ROUTINE
                                ;*****************************************************************

                                3958    ;ROUTINE TO PRINT ASCIZ MESSAGE.  MESSAGE MUST TERMINATE WITH A 0

                                        ;CALL:
                                        ;1) USING A TRAP INSTRUCTION
                                        ;       DISPLY  ,MESADR         ;MESADR IS FIRST ADDRESS OF AN A

                                        ;OR
                                        ;       PRINT
                                        ;       MESADR

                                        ;2) USING A JSR INSTRUCTION
                                        ;       MOV     PS,-(SP)                ;PUSH PROCESSOR STATUS W
                                        ;       JSR     PC,$PRINT               ;CALL PRINT ROUTINE
                                        ;       MESADDR                         ;FIRST ADRESS OF MESSAGE

                                4002    ;*****************************************************************

                                        ;*****************************************************************
                        4004    ;TTY INPUT ROUTINE
                                ;*****************************************************************

                                4006    ;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

                                4022    ;TK SERVICE ROUTINE
                                        ;THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT

                                4057    ;*****************************************************************
                                        ;THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                        ;CALL:
                                        ;       RDCHR                   ;INPUT A SINGLE CHARACTER FROM T
                                        ;       RETURN HERE             ;CHARACTER IS ON THE STACK

                                4072    ;*****************************************************************
                                        ;THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                                        ;CALL:
                                        ;       RDLIN                   ;INPUT A STRING FROM THE TTY
                                        ;       RETURN HERE             ;ADDRESS OF FIRST CHARACTER WILL
                                        ;                               ;TERMINATOR WILL BE A BYTE OF AL
```

```
                                4134    ;*****************************************************************
                                        ;*****************************************************************
                        4136    ;MACRO ROUTINES
                                ;*****************************************************************
                                4138    ;*****************************************************************
                                        ;*****************************************************************
                        4140    ;ERROR HANDLER ROUTINE
                                ;*****************************************************************
                                4142    ;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 $ERRTYP ON ERROR
                                        ;THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                        ;SW15=1  HALT ON ERROR
                                        ;SW13=1  INHIBIT ERROR TYPEOUTS
                                        ;SW10=1  BELL ON ERROR
                                        ;CALL
                                        ;       ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
                                4173    ;*****************************************************************
                                        ;*****************************************************************
                        4175    ;ERROR MESSAGE TYPEOUT ROUTINE
                                ;*****************************************************************
                                4177    ;THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE
                                        ;ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE "ERROR TABLE"
                                        ;AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.
                                4230    ;*****************************************************************
                                        ;*****************************************************************
                        4232    ;BINARY TO OCTAL (ASCII) AND TYPE
                                ;*****************************************************************
                                4234    ;THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIG
                                        ;OCTAL (ASCII) NUMBER AND TYPE IT.
                                        ;$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS
                                        ;CALL:
                                        ;       MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                        ;       TYPOS                   ;;CALL FOR TYPEOUT
                                        ;       .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS
                                        ;       .BYTE   M               ;;M=1 OR 0
                                        ;                               ;;1=TYPE LEADING ZEROS
                                        ;                               ;;0=SUPPRESS LEADING ZER
                                        ;$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE
                                        ;$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

                      4308         *****************************************************************

                      ********************************************************************
        4310          CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
                      ********************************************************************

                      4312    THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIG
                              SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER
                              NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE T
                              BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS
                              REPLACED WITH SPACES.
                              CALL:
                                        MOV     NUM,-(SP)        ;;PUT THE BINARY NUMBER ON THE S
                                        TYPDS                    ;;GO TO THE ROUTINE

                      4376    *****************************************************************

                      ********************************************************************
        4378          SAVE AND RESTORE R0-R5 ROUTINES
                      ********************************************************************

                      4380    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

                      4407    RESTORE R0-R5
                              CALL:
                                        RESREG

                      4422    *****************************************************************
```

```
                        ;*****************************************************************
                        ;RANDOM NUMBER GENERATOR ROUTINE
                        ;*****************************************************************

                        ;THIS ROUTINE IS A DOUBLE PRECISION PSEUDO RANDOM NUMBER GENERATO
                        ;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

                        ;*****************************************************************

                        ;*****************************************************************
                        ;ROUTINE TO SIZE MEMORY
                        ;*****************************************************************

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

                        ;*****************************************************************

                        ;*****************************************************************
                        ;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
                                JSR     PC,@#$DB2D
                                RETURN                  ;;THE FIRST ADDRESS OF ASCIZ

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

```
                        ;*****************************************************************
4562                    ;SINGLE LENGTH BINARY TO DECIMAL ASCIZ ROUTINE
                        ;*****************************************************************

                        ;4564    THIS ROUTINE WILL CONVERT A 16-BIT UNSIGNED BINARY NUMBER TO AN
                        ;        UNSIGNED DECIMAL ASCIZ NUMBER.
                        ;        CALL
                        ;                MOV     NUMBER,-(SP)    ;;PUT BINARY NUMBER ON THE STACK
                        ;                JSR     PC,@#$B2D       ;;CALL
                        ;                RETURN                  ;;ADDRESS OF THE 1ST ASCIZ CHAR.

                        ;4578    *****************************************************************

                        ;*****************************************************************
4580                    ;DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT ROUTINE
                        ;*****************************************************************

                        ;4582    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
                        ;                JSR     PC,@#$DB2O      ;;CALL THE ROUTINE
                        ;                RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ

                        ;4618    *****************************************************************

                        ;*****************************************************************
4620                    ;SINGLE LENGTH BINARY TO OCTAL ASCIZ ROUTINE
                        ;*****************************************************************

                        ;4622    THIS ROUTINE WILL CONVERT A 16-BIT UNSIGNED BINARY NUMBER TO AN
                        ;        UNSIGNED OCTAL ASCIZ NUMBER.
                        ;        CALL
                        ;                MOV     NUMBER,-(SP)    ;;PUT BINARY NUMBER ON THE STACK
                        ;                JSR     PC,@#$$B2O      ;;CALL
                        ;                RETURN                  ;;ADDRESS OF 1ST ASCIZ CHAR. IS

                        ;4635    *****************************************************************
```

```
                        ;*******************************************************************
                        ;TRAP DECODER
                        ;*******************************************************************

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

                        ;*******************************************************************
                        ;TRAP TABLE
                        ;*******************************************************************

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

                        ;*******************************************************************

                        ;*******************************************************************
                        ;RH11/RP04 DRIVER - SINGLE/DUAL PORT VERSION
                        ;*******************************************************************

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                        ;DIGITAL EQUIPMENT CORP.
                        ;MAYNARD, MA 01754
                        ;AUTHOR: JIM LACEY/CHUCK HESS

                        ;*******************************************************************

                        ;STORAGE FOR RHDS1, RHER1, RHER2, AND RHER3 ON AN ERROR "2" OR "5
                        ;RPERRS   = RHDS1
                        ;RPERRS+2 = RHER1
                        ;RPERRS+4 = RHER2
                        ;RPERRS+6 = RHER3

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

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

                        ;TABLE OF DRIVE TYPES (DRVTYP=8 WORDS)
                        ;DRVTYP WILL CONTAIN THE DRIVE TYPE OF ALL ONLINE, OFFLINE, AND
                        ;UNSAFE DRIVES. IF A DRIVE IS NONEXISTENT DRVTYP WILL BE ZERO.
```

```
2231
2232                                    4740    TABLE OF DUAL PORT INITIALIZATION INDICATORS
2233                                            DPINT=0 IF INITIALIZATION IS NOT ACTIVE ON THE DRIVE
2234                                            DPINT<0 IF INITIALIZATION IS IN PROGRESS
2235
2236                                    4753    TABLE OF PENDING DUAL PORT REQUESTS
2237                                            DPRQS=0 IMPLIES THAT A DUAL PORT REQUEST IS NOT PENDING FOR THAT
2238                                            DPRQS<0 IMPLIES THAT A DUAL PORT REQUEST IS PENDING FOR THAT DRI
2239
2240                                    4766    TRANSFER WAIT FLAG (TRNSWT=1 WORD)
2241                                            THIS IS A ONE WORD QUEUE. IT WILL CONTAIN THE ADDRESS OF
2242                                            "DPB" OF THE I/O OPERATION.
2243
2244                                    4772    SEARCH WAIT KEYS (SRCHWT=1 WORD)
2245                                            THIS IS A ONE WORD QUEUE THAT WILL CONTAIN A KEY FOR EACH OF
2246                                            THE DRIVES THAT ARE PERFORMING A SEARCH COMMAND FOR THE I/O
2247                                            REQUEST THAT IS AT THE TOP OF THEIR REQUEST QUEUE.
2248                                            EACH DRIVE IS ASSIGNED ONE BIT, STARTING AT BIT00 FOR DRIVE C.
2249
2250                                    4780    RP04 DRIVER ACTIVE FLAG (ACTDRV=1 BYTE)
2251                                            ACTDRV=0 IMPLIES DRIVER IS INACTIVE
2252                                            ACTDRV>0 IMPLIES DRIVER IS ACTIVE
2253
2254                                    4786    SOFTWARE TIMER ROUTINE ACTIVE FLAG (ACTSTR=1 BYTE)
2255                                            ACTSTR=0 IMPLIES SOFTWARE TIMER ROUTINE IS INACTIVE
2256                                            ACTSTR>0 IMPLIES SOFTWARE TIMER ROUTINE IS ACTIVE
2257
2258                                    4792    UNLOAD FLAG (ULDFLG=8 BYTES)
2259                                            ULDFLG=0 IMPLIES NO UNLOAD COMMAND
2260                                            ULDFLG>0 IMPLIES UNLOAD COMMAND IN PROGRESS
2261                                            ULDFLG<0 IMPLIES UNLOAD COMMAND IN WAIT QUEUE
2262
2263                                    4806    LOOK AHEAD COUNT (LACNT=8 BYTES)
2264                                            LACNT WILL INDICATE THE NUMBER OF LOOK AHEADS PERFORMED
2265
2266                                    4818    SAVE REGISTERS FLAG (SAVEFG =1 WORD)
2267                                            SAVEFG <0 IMPLIES SAVE THE RH11/RP04 REGISTERS WHEN THE
2268                                            OPERATION IS COMPLETED AS PER (DPB+14).
2269                                            SAVEFG=0 IMPLIES SAVE THE RH11/RP04 REGISTERS, AS PER
2270                                            (DPB+14), AFTER AN ERROR.
2271
2272                                    4826    SEEK FLAG (SEEKFG=1 WORD)
2273                                            SEEKFG=0 IMPLIES WHEN THE DISK ADDRESS ISN'T IN THE WINDOW
2274                                            FOR A DATA TRANSFER START A SEARCH COMMAND
2275                                            SEEKFG<0 IMPLIES DATA TRANSFER WILL DO IMPLIED SEEKS,
2276                                            DISREGARD THE WINDOW
2277
2278                                    4834    TIMEOUT TABLE (TIMER=8 WORDS)
2279                                            THIS TABLE CONTAINS THE TIME ALLOWED FOR AN OPERATION
2280
```

```
                                4846    DATA TRANSFER UNDERWAY INDICATOR (DTUW=1 WORD)
                                        DTUW<0 IMPLIES NO DATA TRANSFER UNDERWAY
                                        DTUW=+N (WHERE N=0 TO 7) IMPLIES DATA TRANSFER UNDERWAY ON DRIVE

                                4852    ATTENTION BITS TABLE (ATABIT=8 BYTES)
                                        THIS TABLE CONTAINS THE CORRESPONDING BIT TO EACH DRIVES
                                        ATTENTION BIT

                                4965    RP04 TO RH11 "MASS CONTROL BUS PARITY ERRORS" (MCPE) ALLOWED BEF
                                        CALLING IT FATAL (MCPEMX=1 WORD)

                                4870    STORAGE FOR RPADR (THE FIRST ADDRESS (776700) OF THE RH11/RP04),
                                        RPVEC (THE VECTOR ADDRESS (254)), AND RPVEC+2 (THE BR LEVEL (5))

                                4875    MAXIMUM NUMBER OF LOOK AHEADS ALLOWED IS 4 (MXLACT=1 WORD)

                                4877    MAXIMUM DELTA DELAY IS 8 SECTORS (MXDLTA=1 WORD)

                                4879    MINIMUM DELTA DELAY IS 2 SECTORS (MNDLTA=1 WORD)

                                4881    MAXIMUM SEARCH FOR I/O WINDOW IS 5 SECTORS (MXWNDW=1 WORD)

                                4884    DEFINITIONS OF THE RH11/RP04 ADDRESS INDEXES

                                4907    RH11/RP04 DRIVER INIT. CODE
                                        THIS ROUTINE WILL DETERMINE WHICH RP04 DRIVES ARE
                                        AVAILABLE FOR TESTING AND SET THE DRVSTA INDICATOR
                                        TO THE PROPER STATE FOR EACH DRIVE.
                                        NOTE: THIS ROUTINE CALLS DRVINT
                                        CALL

                                4915            JSR     PC,RPINIT
                                                RETURN

                                        NOTE: THE 'P' OR 'L' CLOCK MUST BE STARTED

                                4963    DRIVE INIT. ROUTINE
                                        THIS ROUTINE DETERMINES IF A DRIVE EXIST AND IF IT IS
                                        AN RP04. 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,

                                4968    DRVSTA IS SET TO THE PROPER CONDITION.
                                        CALL
                                                MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
                                                MOV     RPADR,R4        ;UNIBUS ADDRESS OF RH11/RP04 (RH
                                                JSR     R0,DRVINT       ;CALLED BY A JSR
                                                RETURN1                 ;ERROR OCCURRED (PARITY)
                                                RETURN2                 ;NORMAL RETURN
```

```
                                5032    REQUEST PRE-PROCESSOR-HANDLES SUBSYSTEM REQUEST
                                        CALL
                                                JSR     R0,@#RP04       ;CALL THE RP04 DRIVER
                                                PNTADR                  ;ADDRESS OF POINTER OF DRIVES PA
                                                RETURN1                 ;RETURN HERE IF QUEUE IS FULL
                                                RETURN2                 ;RETURN HERE IF REQUEST IS IN QU

                                5096    OPTIMIZER-CALLED FOR A PARTICULAR DRIV
                                        CALL
                                                MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
                                                JSR     PC,OPT          ;SETUP A COMMAND

                                5143    COMMAND INITIATOR
                                        CALL
                                                MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                                MOV     #DPB,R2         ;ADDRESS OF DPB
                                                JSR     PC,CI?          ;CI?= CI1,CI3, OR CI4
                                                                        ;WHERE:
                                                                        ;CI1=DATA TRANSFER
                                                                        ;CI2=SEARCH REQUESTED BY DATA XF
                                                                        ;CI4=NOT DATA TRANSFER

                                5330    LOOK AHEAD ROUTINE
                                        CALL
                                                MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                                MOV     #DPB,R2         ;POINT TO DPB
                                                JSR     R0,LA           ;GO CHECK THE WINDOW
                                                RETURN1                 ;ERROR RETURN
                                                RETURN2                 ;START A SEARCH
                                                RETURN3                 ;START A DATA TRANSFER

                                5373    INTERRUPT SERVICE ROUTINE

                                5387    TRANSFER DONE ROUTINE

                                5421    FORCED WRITE CHECK ROUTINE

                                5440    SPECIAL CONDITION ROUTINE

                                5643    RP04 TIMER ROUTINE
                                        CALL
                                                MOV     #TIME,-(SP)     ;ELASPED TIME IN MILLISECONDS ON
                                                JSR     R0,RP.TMR       ;CALL RP04 TIME ROUTINE

                                5669    SOFTWARE TIMEOUT ROUTINE

                                5670
                                        CALL:   STO
                                                MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                                JSR     R0,STO          ;CALL--DRVACT MUST BE NONZERO
                                                RETURN
```

```
                                5754    ROUTINE TO READ A RH11/RP04 REGISTER
                                        CALL
                                                JSR     R0,RD.RP        ;GO READ A REGISTER
                                                INDEX                   ;REG. INDEX FROM BASE
                                                ERRADR                  ;ERROR ADDRESS--PROCESS ERROR ST
                                                                        ;AT THIS ADDRESS
                                                RETURN                  ;CONTENTS OF REG. IS ON THE STAC

                                5906    ROUTINE TO WRITE A RH11/RP04 REGISTER
                                        CALL
                                                MOV     DATA,-(SP)      ;DATA TO BE LOADED ON THE STACK
                                                JSR     R0,WRT.RP       ;CALL THE ROUTINE TO LOAD(WRITE)
                                                INDEX                   ;INDEX OF THE REGISTER TO BE LOA
                                                ERRADR                  ;ADDRESS TO RETURN TO ON AN ERRO
                                                RETURN                  ;ERROR FREE RETURN

                                5950    ROUTINE TO SAVE THE RH11/RP04 REGISTERS AS PER DPB+14
                                        CALL
                                                MOV     #DPBNUM,R2      ;DPB POINTER TO R2
                                                JSR     PC,SVRH11       ;SAVE THE DRIVES REG'S

                                5980    ROUTINE TO SET THE INTERRUPT WITHOUT GETTING A "TRE"
                                        CALL
                                                MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
                                                JSR     PC,SET.IE       ;SET "IE"
                                                RETURN

                                5901    QUEUE COUNT

                                5955    ROUTINE TO CLEAR ALL OF THE REQUEST QUEUES
                                        CALL
                                                JSR     PC,CLRQUE

                                5979    EMPTY THE QUEUE SPECIFIED BY R1
                                        CALL
                                                MOV     DRVNUM,R1       ;DRIVE NUMBER TO R1
                                                JSR     PC,EMPTYQ

                                5991    ROUTINE TO PUT A REQUEST IN QUEUE
                                        CALL

                                5994            MOV     #DRVNUM,R1      ;DRIVE NUMBER
                                                MOV     #DPB,R2         ;ADDRESS OF PARAMETER BLOCK
                                                JSR     R0,DRVQUE       ;GO PUT REQUEST IN QUEUE
                                                RETURN1                 ;RETURN HERE IF QUEUE IS FULL
                                                RETURN2                 ;RETURN HERE IF REQUEST IS IN QU

                                6013    ROUTINE TO GET THE "DPB" ADDRESS OF NEXT REQUEST IN QUEUE
                                        CALL
                                                MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
                                                JSR     PC,GETREQ       ;GO GET THE REQUEST
                                                RETURN                  ;R2="DPB" ADDRESS OF THE REQUEST
                                                                        ;R2=0 IF NO REQUEST IN QUEUE
```

```
                                6029    ROUTINE TO "POP" THE REQUEST FROM QUEUE
                                        CALL
                                                MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
                                                JSR     PC,POPQUE       ;CALL TO REMOVE REQUEST
                                                RETURN                  ;R2=ADDRESS OF DPB REMOVED

                                6046    ROUTINES TO SAVE R0-R5 AND R1-R5


                                6048    CALL:   SAVR05
                                                JSR     R0,SAVR05
                                                RETURN                  ;R0-R5 IS ON THE STACK

                                        CALL:   SAVR15
                                                JSR     R0,SAVR15
                                                RETURN                  ;R1-R5 IS ON THE STACK

                                        UPON RETURN FROM SAVR05 AND SAVR15 THE STACK WILL LOOK LIKE:

                                        +12     R0
                                        +10     R1
                                        +06     R2
                                        +04     R3
                                        +02     R4
                                        TOP     R5

                                6074    ROUTINES TO RESTORE R0-R5 AND R1-R5

                                        CALL:   GETR05
                                                JSR     R0,GETR05
                                                RETURN                  ;R0-R5 HAVE BEEN RESTORED

                                        CALL:   GETR15
                                                JSR     R0,GETR15
                                                RETURN                  ;R1-R5 HAVE BEEN RESTORED

                                6093    ;*****************************************************************

                                        ;*****************************************************************
                        6095    DATA, CONTROL, & STATUS BLOCKS
                                        ;*****************************************************************

                                6097    ;*****************************************************************

                                6826    ;*****************************************************************
```

```
                                ;*****************************************************************
                                ;TABLES, CONSTANTS, AND VARIABLE LOCATIONS
                                ;*****************************************************************

                                ;*****************************************************************

                                ;*****************************************************************

                                ;*****************************************************************
                                ;DATA PATTERNS
                                ;*****************************************************************

                                ;*****************************************************************

                                ;*****************************************************************
                                ;PRINTER/TELETYPE MESSAGES
                                ;*****************************************************************

                                ;*****************************************************************

                                ;*****************************************************************
                                ;PATCH AREA
                                ;*****************************************************************

                                ;*****************************************************************

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

```
                                    !
                                    
                                    .TITLE  MAINDEC-11-DERPN-B
                                    ;*COPYRIGHT (C) 1974,1975
                                    ;*DIGITAL EQUIPMENT CORP.
                                    ;*MAYNARD, MASS. 01754
                                    ;*
                                    ;*PROGRAM BY C. HESS
                                    ;*
                                    ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                    ;*PACKAGE (MAINDEC-11-DZQAC-C2), SEPT 14, 1976.
                                    ;*
                                    .SBTTL  OPERATIONAL SWITCH SETTINGS
                                    ;*
                                    ;*      SWITCH                  USE
                                    ;*      ------          --------------------
                                    ;*        15            HALT ON ERROR
                                    ;*        13            INHIBIT ERROR TYPEOUTS
                                    ;*        10            BELL ON ERROR
                                    ;*         7            DISPLAY ALL DATA COMPARE ERRORS
                                    ;*         6            DON'T CHANGE PARAMETERS (LOOP ON PRESENT VALUES)
                                    ;*         5            PARTIAL REGISTER DISPLAY IF ERROR
                                    ;*         5            NO ECC CORRECTION RESULTS DISPLAYED IF ERROR
                                    ;*         4            DO NOT CHECK FOR MAXIMUM ERROR COUNTS
                                    ;*         4              DO NOT DROP UNIT WHEN NORMAL END OF TEST REACHED
                                    ;*         3            DISPLAY ERROR SECTOR IF 'DCK', 'DTE', OR 'WCF' ERROR
                                    ;*         3              DISPLAY SECTOR IF 'DCK' ERR UNCORRECTABLE AFTER
                                    ;*                           28TH RETRY
                                    ;*         3              IF DATA COMPARE ERROR & SW7 SET, DISPLAY
                                    ;*         3                REMAINDER OF BUFFER
                                    ;*         1            INHIBIT DATA COMPARSION AFTER READ ORDERS
                                    ;*         0            READ ONLY MODE
                                    .SBTTL  BASIC DEFINITIONS
                                    
                                    ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100                              STACK=  1100
                                    .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
                                    .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL
                                    
                                    ;*MISCELLANEOUS DEFINITIONS
000011                              HT=     11              ;;CODE FOR HORIZONTAL TAB
000012                              LF=     12              ;;CODE FOR LINE FEED
000015                              CR=     15              ;;CODE FOR CARRIAGE RETURN
000200                              CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
177776                              PS=     177776          ;;PROCESSOR STATUS WORD
                                    .EQUIV  PS,PSW
177774                              STKLMT= 177774          ;;STACK LIMIT REGISTER
177772                              PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
177570                              DSWR=   177570          ;;HARDWARE SWITCH REGISTER
177570                              DDISP=  177570          ;;HARDWARE DISPLAY REGISTER
                                    
                                    ;*GENERAL PURPOSE REGISTER DEFINITIONS
000000                              R0=     %0              ;;GENERAL REGISTER
000001                              R1=     %1              ;;GENERAL REGISTER
000002                              R2=     %2              ;;GENERAL REGISTER
000003                              R3=     %3              ;;GENERAL REGISTER
```

```
                                R4=     %4              ;;GENERAL REGISTER
                                R5=     %5              ;;GENERAL REGISTER
                                R6=     %6              ;;GENERAL REGISTER
                                R7=     %7              ;;GENERAL REGISTER
                                SP=     %6              ;;STACK POINTER
                                PC=     %7              ;;PROGRAM COUNTER

                                ;*PRIORITY LEVEL DEFINITIONS
                                PR0=    0               ;;PRIORITY LEVEL 0
                                PR1=    40              ;;PRIORITY LEVEL 1
                                PR2=    100             ;;PRIORITY LEVEL 2
                                PR3=    140             ;;PRIORITY LEVEL 3
                                PR4=    200             ;;PRIORITY LEVEL 4
                                PR5=    240             ;;PRIORITY LEVEL 5
                                PR6=    300             ;;PRIORITY LEVEL 6
                                PR7=    340             ;;PRIORITY LEVEL 7

                                ;*"SWITCH REGISTER" SWITCH DEFINITIONS
                                SW15=   100000
                                SW14=   40000
                                SW13=   20000
                                SW12=   10000
                                SW11=   4000
                                SW10=   2000
                                SW09=   1000
                                SW08=   400
                                SW07=   200
                                SW06=   100
                                SW05=   40
                                SW04=   20
                                SW03=   10
                                SW02=   4
                                SW01=   2
                                SW00=   1
                                .EQUIV  SW09,SW9
                                .EQUIV  SW08,SW8
                                .EQUIV  SW07,SW7
                                .EQUIV  SW06,SW6
                                .EQUIV  SW05,SW5
                                .EQUIV  SW04,SW4
                                .EQUIV  SW03,SW3
                                .EQUIV  SW02,SW2
                                .EQUIV  SW01,SW1
                                .EQUIV  SW00,SW0

                                ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
                                BIT15=  100000
                                BIT14=  40000
                                BIT13=  20000
                                BIT12=  10000
                                BIT11=  4000
                                BIT10=  2000
                                BIT09=  1000
                                BIT08=  400
                                BIT07=  200
                                BIT06=  100
```

```
        000040                  BIT05=  40
        000020                  BIT04=  20
        000010                  BIT03=  10
        000004                  BIT02=  4
        000002                  BIT01=  2
        000001                  BIT00=  1
                                .EQUIV  BIT09,BIT9
                                .EQUIV  BIT08,BIT8
                                .EQUIV  BIT07,BIT7
                                .EQUIV  BIT06,BIT6
                                .EQUIV  BIT05,BIT5
                                .EQUIV  BIT04,BIT4
                                .EQUIV  BIT03,BIT3
                                .EQUIV  BIT02,BIT2
                                .EQUIV  BIT01,BIT1
                                .EQUIV  BIT00,BIT0

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

                                ;;***************************************************************

                                .SBTTL  RP04 DRIVER COMMANDS

                                ;;***************************************************************

        000101                  RNOP=   101             ;NO OPERATION
        000103                  UNLOAD= 103             ;UNLOAD
        000105                  SEEK=   105             ;SEEK
        000107                  RECAL=  107             ;RECALIBRATE
        000111                  DRVCLR= 111             ;DRIVE CLEAR
        000113                  REL=    113             ;RELEASE
        000115                  OFFSET= 115             ;OFFSET
        000117                  RTC=    117             ;RETURN TO CENTER LINE
        000121                  PRESET= 121             ;READ IN PRESET
        000123                  ACK=    123             ;PACK ACKNOWLEDGE
        000131                  SEARCH= 131             ;SEARCH
        000141                  GETREG= 141             ;GET REGISTERS
        000143                  SETFMT= 143             ;SET FORMAT (& ECI OR HCI)
        000145                  SELDRV= 145             ;SELECT DRIVE
        000151                  WCKD=   151             ;WRITE CHECK DATA
        000153                  WCKHD=  153             ;WRITE CHECK HEADER & DATA
        000161                  WRTDAT= 161             ;WRITE DATA
        000163                  WRTHD=  163             ;WRITE HEADER & DATA
        000171                  RDDAT=  171             ;READ DATA
```

```
  2687            000173                  RDHD=   173             ;READ HEADER & DATA
  2688
  2689                                    .SBTTL  TRAP CATCHER
  2690
  2691            000000                          .=0
  2692                                    ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
  2693                                    ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
  2694                                    ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
  2695            000174                          .=174
  2696  000174   000000                  DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
  2697  000176   000000                  SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER
  2698                                    .SBTTL  STARTING ADDRESS(ES)
  2699  000200   000137  001436                  JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM
  2700  000204   000137  001436                  JMP     @#START         ;ADDRESS IS CHANGED TO 'RSTART' BY PROGRAM
  2701                                                                    ;AFTER INITIAL START
```

```
                                .SBTTL  COMMON TAGS

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

                        001100          .=1100
001100                  $CMTAG:                         ;;START OF COMMON TAGS
001100  000000          $PASS:  .WORD   0               ;;CONTAINS PASS COUNT
001102  000             $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
001103  000             $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
001104  000000          $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000          $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
001110  000000          $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000          $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
001114  000             $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
001115  001             $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
001116  000000          $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120  000000          $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
001122  000000          $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
001124  000000          $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
001126  000000          $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
001130  000000                  .WORD   0               ;;RESERVED--NOT TO BE USED
001132  000000                  .WORD   0
001134  000             $AUTOB: .BYTE   0               ;;AUTOMATIC MODE INDICATOR
001135  000             $INTAG: .BYTE   0               ;;INTERRUPT MODE INDICATOR
001136  000000                  .WORD   0
001140  177570          SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
001142  177570          DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
001144  177560          $TKS:   177560                  ;;TTY KBD STATUS
001146  177562          $TKB:   177562                  ;;TTY KBD BUFFER
001150  177564          $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
001152  177566          $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
001154  000             $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001155  002             $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001156  012             $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001157  000             $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001160  177607  000377  $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
001164  077             $QUES:  .ASCII  /?/             ;;QUESTION MARK
001165  015             $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001166  000012          $LF:    .ASCIZ  <12>            ;;LINE FEED
                        ;;*****************************************************************
001170  176700          $RPADR: .WORD   176700          ;FIRST ADDRESS OF RH11/RP04 REGISTERS
001172  000254          $RPVEC: .WORD   254             ;RP04 VECTOR ADDRESS
001174  172540          $LKCSR: .WORD   172540          ;ADDR OF KW11-P STATUS REGISTER
001176  172542          $LKCSB: .WORD   172542          ;ADDR OF KW11-P COUNTER BUFFER
001200  000104          $LPVEC: .WORD   104             ;ADDR OF KW11-P VECTOR
001202  177546          $LKS:   .WORD   177546          ;ADDR OF KW11-L STATUS REGISTER
001204  000100          $LLVEC: .WORD   100             ;ADDR OF KW11-L VECTOR
001206  177777          PCLOCK: .WORD   -1              ;'0' IF KW11-P IS ON SYSTEM
001210  177777          CLKFLG: .WORD   -1              ;'0' IF A CLOCK IS AVAILABLE
001212  177777          $PRFLG: .WORD   -1              ;PRINTER AVAILABILITY FLAG
001214  177514          $LSCS:  .WORD   177514          ;PRINTER STATUS WORD ADDRESS
001216  177516          $LSDB:  .WORD   177516          ;PRINTER DATA BUFFER ADDRESS
001220  000000          $PRTER: .WORD   0               ;PRINTER ERROR FLAG
001222  000074          HZ:     .WORD   74              ;74 (8) IF 60 HZ SYSTEM; 62 (8) IF 50 HZ SYSTEM
```

```
2758  001224  000000                  LA30:   .WORD   0               ;0 IF LA30, 1'S IF MOD 33 OR MOD 35 TTY ON SYSTEM
2759  001226  001100                  STACK1: .WORD   STACK           ;CONSTANT USED TO CHECK STACK POINTER
2760  001230  000000                  STATIN: .WORD   0               ;ERROR RATE DATA DISPLAY INDICATOR
2761  001232  000000                  PACK:   .WORD   0               ;'W ' COMMAND INDICATOR
2762  001234  000000  000000  000000  DATE:   .WORD   0,0,0,0,0       ;OPERATOR ENTERED DATE
2763  001242  000000  000000
2764  001246  000000  000000  000000  OPERID: .WORD   0,0,0,0         ;OPERATOR ID
2765  001254  000000
2766  001256  000000                  DRIVE:  .WORD   0               ;DRIVE # STORAGE: ERRORS 1-5 & 10
2767  001260  000000                  ATTN:   .WORD   0               ;ATTN REG STORAGE: ERRORS 1-5 & 10
2768  001262      040     060     000 UNIT:   .BYTE   40,60,0         ;DRIVE # STORAGE FOR PRINTOUT
2769          001266                  .EVEN
2770
2771                                  ;;**********************************************************************
2772
2773                                  .SBTTL  CONTROL PARAMETERS
2774
2775                                  ;;**********************************************************************
2776
2777  001266  002740                  ENDCON: .WORD   002740          ;1.875X10↑8 WORDS (10) [3X10↑9 BITS]
2778  001270  005455                  .WORD   005455                  ;MSW
2779  001272  143300                  ENDSEK: .WORD   143300          ;3 X 10↑6 SEEKS  (LSW)
2780  001274  000055                  .WORD   55                      ;MSW
2781  001276  000001                  PASCNT: .WORD   1               ;NUMBER OF PASSES TO END OF TEST
2782  001300  000000                  MAXDL:  .WORD   0               ;MAXIMUM DATA TRANFER SIZE IN WORDS
2783                                                                  ;(FILLED BY PROGRAM AT STARTUP OR BY OPERATOR
2784                                                                  ;DURING PARAMETER ENTRY DIALOG.)
2785  001302  000144                  MAXER:  .WORD   100.            ;MAXIMUM ERRORS - 100(10)
2786  001304  000005                  INTRVL: .WORD   5               ;LOW BYTE IS PERFORMANCE TYPEOUT INTERVAL
2787                                                                  ;COUNTER.  UPPER BYTE IS VALUE.
2788  001306  000004                  CMPLMT: .WORD   4               ;NUMBER OF COMPARE ERRORS TYPED OUT
2789  001310  000001                  FORMAT: .WORD   1               ;IF EQ 1, ALLOW WRITE HEADER & DATA ORDERS
2790                                                                  ;IF EQ 0, DO NOT ALLOW WRITE HEADER & DATA ORDERS
2791  001312  000001                  SAVLOD: .WORD   1               ;IF EQ 1, SAVE THE LOADER
2792                                                                  ;IF EQ 0, DO NOT SAVE THE LOADER
2793  001314  000003                  RATIO:  .WORD   3               ;READ/WRITE RATIO [RANGE 0 - 7]
2794                                                                  ;0 - 15/1       (READ/WRITE)
2795                                                                  ;1 - 7/1
2796                                                                  ;2 - 6/2
2797                                                                  ;3 - 5/3
2798                                                                  ;4 - 4/4
2799                                                                  ;5 - 3/5
2800                                                                  ;6 - 2/6
2801                                                                  ;7 - 1/7
2802  001316  000001                  AUTOCK: .WORD   1               ;IF EQ 1, DO AN APPROPRITE WRITE
2803                                                                  ;CHECK AFTER EACH WRITE ORDER.
2804                                                                  ;IF EQ 0, SELECT WRITE CHECK ORDERS
2805                                                                  ;RANDOMLY.
2806  001320  000001                  NOTPRT: .WORD   1               ;IF EQ 1, DO NOT PRINT DATA ERROR MESSAGES
2807                                                                  ;ASSOCIATED WITH OPERATOR SPECIFIED
2808                                                                  ;BAD PACK AREAS.
2809                                                                  ;IF EQ 1, PRINT ERROR MESSAGES RELATING TO
2810                                                                  ;THESE AREAS.
2811  001322  000001                  ENDET:  .WORD   1               ;IF EQ 1, END OF PASS DETERMINED
2812                                                                  ;BY THE 'WORDS READ' COUNT.
2813                                                                  ;IF EQ 0, END OF PASS DETERMINED
```

```
                                                        ;BY THE SEEK COUNT.
                                ;;**************************************************************
                                .SBTTL  RP04 ADDRESS LIMIT VALUES
                                ;;**************************************************************
001324  000632                MAXCYL: .WORD   632             ;MAX CYLINDER [RANGE 0 - 632 (OCTAL)]
001326  000000                MINCYL: .WORD   0               ;MINIMUM CYLINDER [RANGE 0 - <= MAXCYL]
001330  000022                MAXTRK: .WORD   22              ;MAX TRACK [RANGE 0 - 22 (OCTAL)]
001332  000000                MINTRK: .WORD   0               ;MIN TRACK [RANGE 0 TO <= MAXTRK]
001334  000025                MAXSEC: .WORD   25              ;MAX SECTOR [RANGE 0 - 25 (OCTAL)]
001336  000000                MINSEC: .WORD   0               ;MIN SECTOR [RANGE 0 TO <= MAXSEC]
                                ;;**************************************************************
                                .SBTTL  VALUES FOR FIRST OPERATION
                                ;;**************************************************************
001340  000010                BEGPAT: .WORD   10              ;STARTING PATTERN CODE [RANGE 1 - 17 (OCTAL)]
001342  000005                BEGCOD: .WORD   5               ;STARTING COMMAND CODE [RANGE 0 - 5]
                                                        ;0 = WRITE CHECK DATA ('WCKD')
                                                        ;1 = WRITE CHECK HEADER & DATA ('WCHKHD')
                                                        ;2 = WRITE DATA ('WRTDAT')
                                                        ;3 = WRITE HEADER & DATA ('WRTHD')
                                                        ;4 = READ DATA ('RDDAT')
                                                        ;5 = READ HEADER & DATA ('RDHD')
001344  000404                BEGSIZ: .WORD   404             ;STARTING RECORD SIZE [RANGE 4 - MAXMEM]
                                                        ;NOTE:  THE SIZE MUST BE AT LEAST 4 IF
                                                        ;WRITE DATA OR READ DATA; THE SIZE MUST
                                                        ;BE AT LEAST 8 IF WRITE HEADER AND
                                                        ;DATA OR READ HEADER AND DATA.
                                                        ;IF THE SIZE IS GREATER THAN 1 SECTOR, THE
                                                        ;SIZE MUST ALLOW FOR OVERLAPPING 4 OR 8
                                                        ;WORDS INTO THE LAST SECTOR USED.
```

```
                                .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


001346                          $ERRTB:
                                ;ERROR 1

001346  043712                         EM1                     ;ILLEGAL RH11 INTERRUPT
001350  000000                         0
001352  000000                         0
001354  000000                         0

                                ;ERROR 2

001356  043762                         EM2                     ;UNEXPECTED ATTENTION DETECTED
001360  046073                         DH2                     ;DRV RHAS
001362  046512                         DT2                     ;DATA POINTER
001364  047352                         DF2                     ;DRV-DEC, REG=OCTAL

                                ;ERROR 3

001366  044007                         EM3                     ;MASSBUS CONTROL BUS PARITY ERROR (SEEN BY THE RH11)
001370  046150                         DH3                     ;DRV ADDR OF REG CONTENTS
001372  046530                         DT3                     ;DATA POINTER
001374  047360                         DF3                     ;ALL OCTAL EXCEPT DRV

                                ;ERROR 4

001376  044065                         EM4                     ;CONTROL BUS PARITY ERROR (SEEN BY THE RP04)
001400  046176                         DH4                     ;DRV REG ADDR WRITTEN READ
001402  046540                         DT4                     ;DATA POINTER
001404  047363                         DF4                     ;OCTAL EXCEPT DRV

                                ;ERROR 5

001406  044143                         EM5                     ;ATTEN FROM AN OFFLINE OR UNAVAIL DRIVE
001410  046073                         DH2                     ;DRV RHAS
001412  046512                         DT2                     ;DATA POINTER
001414  047352                         DF2                     ;OCTAL

                                ;ERROR 6

001416  000000                         0                       ;RESERVED
001420  000000                         0
001422  000000                         0
001424  000000                         0
```

```
                                        :ERROR 7
001426  000000                                  0                       ;RESERVED
001430  000000                                  0
001432  000000                                  0
001434  000000                                  0

                                        ;;**********************************************************************

                                        .SBTTL  SETUP AND INITIALIZATION ROUTINE

                                        ;       START ADDRESS = 200
                                        ;       RESTART ADDRESS = 204

                                        ;;**********************************************************************

001436                                  START:
                                        .SBTTL  INITIALIZE THE COMMON TAGS
                                        ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
001436  012706  001100                          MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
001442  005026                          1$:     CLR     (R6)+           ;;CLEAR MEMORY LOCATION
001444  022706  001140                          CMP     #SWR,R6 ;;DONE?
001450  001374                                  BNE     .-6             ;;LOOP BACK IF NO
001452  012706  001100                          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                        ;;INITIALIZE A FEW VECTORS
001456  012737  026602  000030                  MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
001464  012737  000340  000032                  MOV     #340,@#EMTVEC+2 ;;LEVEL 7
001472  012737  030442  000034                  MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
001500  012737  000340  000036                  MOV     #340,@#TRAPVEC+2;LEVEL 7
                                        ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                        ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
001506  013746  000004                          MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
001512  012737  001546  000004                  MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
001520  012737  177570  001140                  MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
001526  012737  177570  001142                  MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
001534  022777  177777  177376                  CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
001542  001012                                  BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                        ;;AND  THE HARDWARE SWR IS NOT = -1
001544  000403                                  BR      65$             ;;BRANCH IF NO TIMEOUT
001546  012716  001554                  64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
001552  000002                                  RTI
001554  012737  000176  001140          65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
001562  012737  000174  001142                  MOV     #DISPREG,DISPLAY
001570  012637  000004                  66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

001574  104401  052100                  1$:     TYPE    ,TITLE          ;TYPE THE PROGRAM NAME AND MAINDEC NUMBER
001600  012737  001165  001576                  MOV     #$CRLF,1$+2     ;CHANGE 'TITLE' TO CR-LF
001606  012737  000240  000032                  MOV     #240,@#EMTVEC+2   ;CHANGE EMT PRIORITY TO 5
001614  012737  000240  000036                  MOV     #240,@#TRAPVEC+2  ;CHANGE TRAP PRIORITY TO 5
001622  012737  002302  000206                  MOV     #RSTART,206     ;SETUP RESTART ADDRESS
001630  005037  001230                          CLR     STATIN          ;CLEAR ERROR RATE DATA TYPE INDICATOR
001634  105037  001157                          CLRB    $TPFLG          ;SET TTY AVAILABILITY FLAG
001640  012705  041616                          MOV     #ORDERQ,R5      ;START OF AREA TO CLEAR
001644  005025                                  CLR     (R5)+
```

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2963  001646  022705  042124                    CMP     #BLKADR,R5      ;LOOK FOR END OF CLEAR AREA
2964  001652  001374                            BNE     .-6             ;BR IF NOT FINISHED
2965  001654  013737  001222  021720            MOV     HZ,SIXTEE       ;1/60 TH OR 1/50 TH SECOND COUNTER VALUE
2966  001662  005437  021720                    NEG     SIXTEE          ;CONVERT TO 2'S COMP
2967  001666  012737  030060  021702            MOV     #30060,HOUR     ;ASCII '00' TO HOUR COUNTER
2968  001674  012737  030060  021706            MOV     #30060,MINUTE   ;ASCII '00' TO MINUTES COUNTER
2969  001702  012737  030060  021712            MOV     #30060,SECOND   ;ASCII '00' TO SECONDS COUNTER
2970  001710  105037  001305                    CLRB    INTRVL+1        ;CLEAR INTERVAL COUNTER
2971  001714  104401  052427                    TYPE    ,ENTDAT         ;'ENTER DATE'
2972  001720  104407                            RDLIN                   ;READ THE ENTRY
2973  001722  012605                            MOV     (SP)+,R5        ;PUT THE ENTRY ADDRESS INTO R5
2974  001724  012537  001234                    MOV     (R5)+,DATE      ;STORE THE DATE
2975  001730  012537  001236                    MOV     (R5)+,DATE+2    ;STORE THE DATE
2976  001734  012537  001240                    MOV     (R5)+,DATE+4    ;STORE THE DATE
2977  001740  012537  001242                    MOV     (R5)+,DATE+6    ;STORE THE DATE
2978  001744  104401  052446                    TYPE    ,ENTID          ;'ENTER OPERATOR I.D.'
2979  001750  104407                            RDLIN                   ;READ THE ENTRY
2980  001752  012605                            MOV     (SP)+,R5        ;ENTRY ADDRESS
2981  001754  012537  001246                    MOV     (R5)+,OPERID    ;STORE THE I.D.
2982  001760  012537  001250                    MOV     (R5)+,OPERID+2  ;STORE THE I.D.
2983  001764  012537  001252                    MOV     (R5)+,OPERID+4  ;STORE THE I.D.
2984
2985                                    ;ROUTINE TO DETERMINE BUFFER AREA SIZE
2986
2987  001770  004737  027740            SIZMEM: JSR     PC,$SIZE        ;SEE HOW MUCH MEMORY ON SYSTEM
2988  001774  022737  053654  030034            CMP     #ENDPGM,$LSTAD  ;SEE IF ENOUGH MEMORY FOR PROGRAM
2989  002002  103402                            BLO     1$              ;BR IF MEMORY
2990  002004  000137  020102                    JMP     MEMERR          ;REPORT NOT ENOUGH MEMORY
2991  002010  012737  000001  042002  1$:       MOV     #1,BUFTBL       ;LOAD NUMBER OF BUFFERS
2992  002016  012737  053654  042004            MOV     #ENDPGM,BUFTBL+2  ;STARTING ADDRESS OF BUFFER
2993  002024  013737  030034  042006            MOV     $LSTAD,BUFTBL+4 ;LAST ADDR TO BUFFER ALLOCATION TABLE
2994  002032  162737  053654  042006            SUB     #ENDPGM,BUFTBL+4  ;SUBTRACT PROGRAM SPACE
2995  002040  000241                            CLC                     ;CLEAR THE 'C' BIT
2996  002042  006037  042006                    ROR     BUFTBL+4        ;CONVERT TO WORD COUNT
2997  002046  105737  000041                    TSTB    41              ;SEE WHO LOADED THE PROGRAM
2998  002052  001004                            BNE     2$              ;BR IF LOADED BY 'XXDP'
2999  002054  162737  000140  042006            SUB     #96.,BUFTBL+4   ;SUBTRACT 'ABS' LOADED SIZE
3000  002062  000403                            BR      3$              ;CONTINUE WITH BUFFER SPACE SETUP
3001  002064  162737  002002  042006  2$:       SUB     #1026.,BUFTBL+4  ;SUBTRACT 'XXDP' LOADER SIZE
3002  002072  005737  001300            3$:     TST     MAXDL           ;VALUE IN 'MAXDL' ?
3003  002076  001012                            BNE     LKPAR           ;BR IF VALUE IS
3004  002100  012737  013534  001300            MOV     #5980.,MAXDL    ;ASSUME FULL TRACK + 1 SEC MAXIMUM
3005  002106  023737  001300  042006            CMP     MAXDL,BUFTBL+4  ;IS THAT TOO LARGE ?
3006  002114  103403                            BLO     LKPAR           ;BR IF NOT
3007  002116  013737  042006  001300            MOV     BUFTBL+4,MAXDL  ;USE MAX AVAIL MEMORY AS MAX BUFFER SIZE
3008
3009                                    ;SEE IF THE OPERATOR WANTS TO CHANGE ANY PARAMETERS
3010
3011  002124  104401  053062            LKPAR:  TYPE    ,ASKPAR         ;ASK FOR PARMETERS
3012  002130  104407                            RDLIN                   ;READ THE ENTRY
3013  002132  012605                            MOV     (SP)+,R5        ;ADDRESS OF ENTRY TO R5
3014  002134  122715  000131                    CMPB    #'Y,(R5)        ;WAS ENTRY A 'Y' (YES)
3015  002140  001404                            BEQ     ENTPAR          ;BR IF A 'Y'
3016  002142  122715  000116                    CMPB    #'N,(R5)        ;WAS ENTRY A 'N' (NO)
3017  002146  001455                            BEQ     RSTART          ;BR IF AN 'N'
3018  002150  000765                            BR      LKPAR           ;NOT A VALID RESPONSE - RETRY
```

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3019
3020                                    ;PARAMETER ENTRY ROUTINE
3021
3022  002152  104401  001165  ENTPAR:   TYPE    ,$CRLF          ;CR-LF
3023  002156  005003                    CLR     R3              ;CLEAR OCTAL PARAMETER INDICATOR
3024  002160  012704  052736            MOV     #PARLST,R4      ;ENTRY PARAMETER LIST TO R4
3025  002164  012437  002202  1$:       MOV     (R4)+,3$        ;ADDRESS OF PARAMETER NAME
3026  002170  001427                    BEQ     ENTPR           ;BR IF AT END OF TABLE
3027  002172  100002                    BPL     2$              ;BR IF NOT DECIMAL-OCTAL SEPARATOR
3028  002174  005203                    INC     R3              ;SET OCTAL PARAMETER INDICATOR
3029  002176  000772                    BR      1$              ;CONTINUE WITH PARAMETER REQUESTS
3030  002200  104401            2$:     TYPE                    ;TYPE THE PARAMETER NAME
3031  002202  000000            3$:     .WORD   0               ;ADDRESS OF PARAMETER NAME TEXT
3032  002204  012405                    MOV     (R4)+,R5        ;ADDRESS OF PARAMETER LOCATION
3033  002206  011546                    MOV     (R5),-(SP)      ;CONTENTS OF PARAMETER LOCATION
3034  002210  005703                    TST     R3              ;SEE IF OCTAL OR DECIMAL PARAMETER
3035  002212  001007                    BNE     4$              ;BR IF OCTAL
3036  002214  104405                    TYPDS                   ;TYPE THE CURRENT VALUE OF THE PARAMETER
3037  002216  104401  053175            TYPE    ,DEC10          ;TYPE DECIMAL INDICATOR
3038  002222  004737  025442            JSR     PC,GETDEC       ;GET THE DECIMAL ENTRY
3039  002226  012615                    MOV     (SP)+,(R5)      ;MOVE NEW VALUE TO LOCATION
3040  002230  000755                    BR      1$              ;GET MORE PARAMETERS
3041  002232  104402            4$:     TYPOC                   ;TYPE THE CURRENT VALUE
3042  002234  104401  053166            TYPE    ,OCT8           ;TYPE OCTAL INDICATOR
3043  002240  004737  025304            JSR     PC,GETOCT       ;GET THE OCTAL PARAMTER
3044  002244  012615                    MOV     (SP)+,(R5)      ;MOVE NEW VALUE TO PARAMETER LOCATION
3045  002246  000746                    BR      1$              ;GET MORE PARAMETERS
3046  002250  005737  001312  ENTPR:   TST     SAVLOD          ;SAVE THE LOADER ?
3047  002254  001012                    BNE     RSTART          ;BR IF LOADER TO BE SAVED
3048  002256  105737  000041            TSTB    41              ;SEE WHO LOADED THE PROGRAM
3049  002262  001004                    BNE     1$              ;BR IF 'ACT' OR 'XXDP'
3050  002264  062737  000140  042006    ADD     #96.,BUFTBL+4   ;'ABS' LOADER SIZE
3051  002272  000403                    BR      RSTART          ;CONTINUE
3052  002274  062737  002002  042006  1$:       ADD     #1026.,BUFTBL+4  ;'XXDP' LOADER SIZE
3053
3054                                    ;RESTART (START FROM LOC 204) ENTERS HERE
3055
3056  002302  012706  001100  RSTART:  MOV     #STACK,SP       ;RESTORE STACK POINTER FOR RESTART
3057  002306  005037  177776            CLR     @#PS            ;CLEAR PROCESSOR STATUS
3058  002312  005037  001232            CLR     PACK            ;'R' OR 'W' COMMAND INDICATOR
3059  002316  012737  123456  027736    MOV     #123456,$LONUM  ;INITIALIZE LOW RANDOM NUMBER
3060  002324  012737  176543  027734    MOV     #176543,$HINUM  ;INITIALIZE HIGH RANDOM NUMBER
3061  002332  113737  001304  001305    MOVB    INTRVL,INTRVL+1  ;RESTORE STATISTICS TYPEOUT INTERVAL
3062  002340  042737  170000  001302    BIC     #170000,MAXER   ;MAKE SURE LIMITS ARE NOT TOO LARGE
3063
3064                                    ;CHECK THE PARAMETERS FOR VALIDITY
3065
3066  002346  023737  001300  042006  CKADR:   CMP     MAXDL,BUFTBL+4  ;REQUESTED TRANSFER SIZE TOO LARGE ?
3067  002354  101004                    BHI     1$              ;BR IF REQUESTED MAXIMUM TOO LARGE
3068  002356  022737  000004  001300    CMP     #4,MAXDL        ;SEE IF MAXIMUM TRANSFER SIZE TOO SMALL
3069  002364  101404                    BLOS    2$              ;BR IF NOT TOO SMALL
3070  002366  012746  053204  1$:       MOV     #PAR1,-(SP)     ;ADDR OF PARAMETER NAME
3071  002372  000137  002710            JMP     BADPAR          ;REPORT THE PARAMETER ERROR
3072  002376  023737  001300  001344  2$:       CMP     MAXDL,BEGSIZ    ;IS MAX RECORD LENGTH SMALLER THAN 1 SECTOR ?
3073  002404  103003                    BHIS    CKPAR           ;BR IF NOT
3074  002406  013737  001300  001344    MOV     MAXDL,BEGSIZ    ;USE MAX RECORD SIZE AS STARTING SIZE
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3075  002414  022737  000632  001324  CKPAR:  CMP     #410.,MAXCYL    ;MAXIMUM CYLINDER ADDR TOO LARGE
3076  002422  103004                          BHIS    1$              ;BR IF NOT
3077  002424  012746  053234                  MOV     #PAR4,-(SP)     ;ADDR OF PARAMETER NAME
3078  002430  000137  002710                  JMP     BADPAR          ;REPORT PARAMETER ERROR
3079  002434  023737  001324  001326  1$:     CMP     MAXCYL,MINCYL   ;MAX CYLINDER LARGER THAN MIN CYLINDER
3080  002442  103004                          BHIS    2$              ;BR IF IT IS
3081  002444  012746  053244                  MOV     #PAR5,-(SP)     ;ADDR OF PARAMETER NAME
3082  002450  000137  002710                  JMP     BADPAR          ;REPORT PARAMETER ERROR
3083  002454  022737  000022  001330  2$:     CMP     #18.,MAXTRK     ;MAXIMUM TRACK ADDRESS TOO LARGE
3084  002462  103004                          BHIS    3$              ;BR IF NOT
3085  002464  012746  053254                  MOV     #PAR6,-(SP)     ;ADDRESS OF PARAMETER NAME
3086  002470  000137  002710                  JMP     BADPAR          ;REPORT PARAMETER ERROR
3087  002474  023737  001330  001332  3$:     CMP     MAXTRK,MINTRK   ;SEE IF MAX TRACK EQ OR LARGER THAN MIN TRACK
3088  002502  103004                          BHIS    4$              ;BR IF IT IS
3089  002504  012746  053264                  MOV     #PAR7,-(SP)     ;ADDRESS OF PARAMETER NAME
3090  002510  000137  002710                  JMP     BADPAR          ;REPORT PARAMETER ERROR
3091  002514  022737  000025  001334  4$:     CMP     #21.,MAXSEC     ;SEE IF MAX SECTOR TOO LARGE
3092  002522  103004                          BHIS    5$              ;BR IF MAX SECTOR OK
3093  002524  012746  053274                  MOV     #PAR8,-(SP)     ;ADDRESS OF PARAMETER NAME
3094  002530  000137  002710                  JMP     BADPAR          ;REPORT PARAMETER ERROR
3095  002534  023737  001334  001336  5$:     CMP     MAXSEC,MINSEC   ;MINIMUM SECTOR ADDRESS TOO LARGE
3096  002542  103004                          BHIS    6$              ;BR IF NOT
3097  002544  012746  053304                  MOV     #PAR9,-(SP)     ;ADDRESS OF PARAMETER NAME
3098  002550  000137  002710                  JMP     BADPAR          ;REPORT PARAMETER ERROR
3099  002554  022737  000007  001314  6$:     CMP     #7,RATIO        ;SEE IF R/W RATIO TOO LARGE
3100  002562  103004                          BHIS    7$              ;BR IF NOT
3101  002564  012746  053354                  MOV     #PAR14,-(SP)    ;ADDRESS OF PARAMETER NAME
3102  002570  000137  002710                  JMP     BADPAR          ;REPORT PARAMETER ERROR
3103  002574  022737  000017  001340  7$:     CMP     #15.,BEGPAT     ;SEE IF VALID PATTERN SELECTED
3104  002602  103004                          BHIS    8$              ;BR IF PATTERN CODE VALID
3105  002604  012746  053414                  MOV     #PAR18,-(SP)    ;ADDRESS OF PARAMETER NAME
3106  002610  000137  002710                  JMP     BADPAR          ;REPORT PARAMETER ERROR
3107  002614  005737  001342          8$:     TST     BEGCOD          ;IS STARTING CODE OK
3108  002620  001447                          BEQ     SETVEC          ;BR IF OK
3109  002622  022737  000001  001342          CMP     #1,BEGCOD       ;IS STARTING CODE OK ?
3110  002630  001443                          BEQ     SETVEC          ;BR IF OK
3111  002632  022737  000002  001342          CMP     #2,BEGCOD       ;IS STARTING CODE OK ?
3112  002640  001437                          BEQ     SETVEC          ;BR IF OK
3113  002642  022737  000004  001342          CMP     #4,BEGCOD       ;IS STARTING CODE OK ?
3114  002650  001433                          BEQ     SETVEC          ;BR IF OK
3115  002652  022737  000005  001342          CMP     #5,BEGCOD       ;IS STARTING CODE OK ?
3116  002660  001427                          BEQ     SETVEC          ;BR IF OK
3117  002662  022737  000003  001342          CMP     #3,BEGCOD       ;IS STARTING CODE WRITE HEADER & DATA ?
3118  002670  001003                          BNE     9$              ;BR IF NOT
3119  002672  005737  001310                  TST     FORMAT          ;FORMAT ORDERS ALLOWED ?
3120  002676  001020                          BNE     SETVEC          ;BR IF THEY ARE
3121  002700  012746  053404          9$:     MOV     #PAR17,-(SP)    ;ADDRESS OF PARAMETER NAME
3122  002704  000137  002710                  JMP     BADPAR          ;REPORT PARAMETER ERROR
3123
3124                                  ;REPORT THE BAD PARAMETER
3125
3126  002710  012637  002722          BADPAR: MOV     (SP)+,1$        ;MOVE PARAMETER NAME
3127  002714  104401  053106                  TYPE    ,NGPAR          ;'BAD PARAMETER'
3128  002720  104401                          TYPE
3129  002722  000000          1$:     .WORD   0               ;PARAMETER NAME
3130  002724  104401  053136                  TYPE    ,REPAR          ;'REENTER PARAMETERS
```

```
3131  002730  105037  001305                  CLRB    INTRVL+1        ;CLEAR PERFORMANCE TYPEOUT INTERVAL COUNTER
3132  002734  000137  002152                  JMP     ENTPAR          ;GO THROUGH PARAMETER ENTRY ROUTINE AGAIN
3133
3134                                  ;DISPLAY DRIVE STATUS AND SET UP THE OTHER UNITS THE
3135                                  ;       PROGRAM WILL USE
3136
3137  002740  004737  020212          SETVEC: JSR     PC,CKPTR        ;SEE IF PRINTER ON SYSTEM
3138  002744  013737  001170  030714          MOV     $RPADR,RPADR    ;RP04 ADDRESS
3139  002752  013737  001172  030716          MOV     $RPVEC,RPVEC    ;RP04 VECTOR ADDRESS
3140  002760  004737  020260                  JSR     PC,CKCLK        ;SEE IF CLOCK ON SYSTEM
3141  002764  004737  030732                  JSR     PC,RPINIT       ;INITIALIZE THE RP04 DRIVER
3142  002770  012737  177777  030654          MOV     #-1,SAVEFG      ;SET THE SAVE REGISTERS FLAG
3143  002776  142737  000007  001263          BICB    #7,UNIT+1       ;CLEAR UNIT NUMBER
3144  003004  005004                          CLR     R4              ;DRIVE TABLE POINTER
3145  003006  012703  000010                  MOV     #8.,R3          ;ITERATION COUNTER
3146  003012  104401  001165                  TYPE    ,$CRLF          ;CR-LF
3147  003016  104401  051527                  TYPE    ,SYSTAT         ;TYPE STATUS HEADING
3148  003022  104401  001262          1$:     TYPE    ,UNIT           ;TYPE UNIT NUMBER
3149  003026  104401  051362                  TYPE    ,LIN4SP         ;SPACES
3150  003032  105764  030556                  TSTB    DRVSTA(R4)      ;SEE WHAT DRIVE'S STATUS IS
3151  003036  001405                          BEQ     2$              ;BR IF OFFLINE
3152  003040  100410                          BMI     3$              ;BR IF UNSAFE OR NONEXISTANT
3153  003042  012737  051405  003144          MOV     #UNTON,8$       ;MESSAGE ADDRESS
3154  003050  000434                          BR      7$              ;PRINT IT
3155  003052  012737  051374  003144  2$:     MOV     #UNTOFF,8$      ;OFFLINE MESSAGE ADDRESS
3156  003060  000430                          BR      7$              ;PRINT IT
3157  003062  006304                  3$:     ASL     R4              ;SETUP TO ADDRESS WORDS
3158  003064  005764  030566                  TST     DRVTYP(R4)      ;SEE IF UNIT PRESENT
3159  003070  001414                          BEQ     4$              ;BR IF NOT PRESENT
3160  003072  022764  020020  030566          CMP     #20020,DRVTYP(R4)  ;SEE IF SINLE PORT RP04
3161  003100  001414                          BEQ     5$              ;BR IF IT IS
3162  003102  022764  024020  030566          CMP     #24020,DRVTYP(R4)  ;SEE IF DUAL PORT RP04
3163  003110  001410                          BEQ     5$              ;BR IF IT IS
3164  003112  012737  051465  003144          MOV     #NOTRP,8$       ;UNIT IS NOT AN RP04
3165  003120  000407                          BR      6$              ;PRINT IT
3166  003122  012737  051502  003144  4$:     MOV     #NOTPRS,8$      ;UNIT NOT PRESENT
3167  003130  000403                          BR      6$              ;PRINT IT
3168  003132  012737  051517  003144  5$:     MOV     #NOTSAF,8$      ;UNIT UNSAFE
3169  003140  006204                  6$:     ASR     R4              ;RESTORE R4
3170  003142  104401                  7$:     TYPE                    ;TYPE THE IDENTIFYING MESSAGE
3171  003144  000000                  8$:     .WORD   0               ;MESSAGE ADDRESS HERE
3172  003146  104401  001165                  TYPE    ,$CRLF          ;CR-LF
3173  003152  005303                          DEC     R3              ;DECREMENT THE ITERATION COUNTER
3174  003154  001404                          BEQ     9$              ;BR IF END
3175  003156  105237  001263                  INCB    UNIT+1          ;INCREMENT THE UNIT NUMBER
3176  003162  005204                          INC     R4              ;INCREMENT TABLE POINTER
3177  003164  000716                          BR      1$              ;CONTINUE
3178  003166  104401  001165          9$:     TYPE    ,$CRLF          ;CR-LF
3179  003172  004737  026066                  JSR     PC,$TKINT       ;INITIALIZE THE KEYBOARD INTERRUPT HANDLER
3180  003176  104401  052670                  TYPE    ,INTDON         ;TYPE 'INITIALIZE COMPLETE'
3181  003202  000137  003206                  JMP     MAIN            ;START THE PROGRAM
3182
3183                                  ;;*****************************************************************
3184
3185                                  .SBTTL  MAIN PROGRAM
3186
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                                        ;;*****************************************************************
                                        
003206  023706  001226          MAIN:   CMP     @#STACK1,SP     ;CHECK STACK POINTER
003212  001401                          BEQ     .+4             ;BR IF OK
003214  000000                          HALT                    ;***************
003216  005737  001230                  TST     STATIN          ;TYPE ERROR RATE STATISTICS ?
003222  001404                          BEQ     .+12            ;-->    BR IF NOT
003224  005037  001230                  CLR     STATIN          ;  I    CLEAR THE INDICATOR
003230  004737  020450                  JSR     PC,STATPR       ;  I    TYPE THE STATISTICS
003234  012703  000010                  MOV     #8.,R3          ;<--    UNIT COUNTER
003240  012705  041650                  MOV     #DUNIT,R5       ;ADDRESS OF 'DROP UNIT' TABLE
003244  005715                  1$:     TST     (R5)            ;SEE IF ENTRY AT PRESENT POSITION
003246  001005                          BNE     3$              ;BR IF THERE IS ONE
003250  062705  000002          2$:     ADD     #2,R5           ;INCREMENT TO NEXT TABLE POSITION
003254  005303                          DEC     R3              ;DECREMENT UNIT COUNTER
003256  001372                          BNE     1$              ;BR IF MORE TO CHECK
003260  000434                          BR      MAIN1           ;FINISHED HERE, GO TRY TO ASSIGN UNITS
003262  012701  041714          3$:     MOV     #AVAIL,R1       ;ADDRESS OF 'AVAILABLE' UNITS TABLE
003266  005711                  4$:     TST     (R1)            ;SEE IF AT END OF TABLE
003270  001405                          BEQ     5$              ;BR IF AT END: GO CHECK 'WAIT' TABLE
003272  021115                          CMP     (R1),(R5)       ;IS UNIT IN 'AVAIL' THE ONE TO BE DROPPED
003274  001414                          BEQ     7$              ;BR IF YES
003276  062701  000002                  ADD     #2,R1           ;INCREMENT 'AVAIL' TABLE ADDRESS
003302  000771                          BR      4$              ;CONTINUE LOOKING
003304  012701  041736          5$:     MOV     #WAIT,R1        ;MOVE THE ADDRESS OF THE BUFFER WAIT TABLE
003310  005711                  6$:     TST     (R1)            ;AT THE END OF THE 'WAIT' TABLE ?
003312  001756                          BEQ     2$              ;BR IF YES: SEE IF ANY MORE 'DROP' REQUESTS
003314  021115                          CMP     (R1),(R5)       ;UNIT IN THE 'WAIT' TABLE ?
003316  001403                          BEQ     7$              ;BR IF IT IS
003320  062701  000002                  ADD     #2,R1           ;INCREMENT 'WAIT' TABLE ADDRESS
003324  000771                          BR      6$              ;CONTINUE LOOK THROUGH THE 'WAIT' TABLE
003326  011100                  7$:     MOV     (R1),R0         ;PUT THE UNIT'S BLOCK ADDRESS IN R0
003330  104401  052015                  TYPE    ,DEASSG         ;TYPE 'UNIT DEASSIGNED'
003334  004737  021176                  JSR     PC,TYPEST       ;TYPE THE UNIT'S ERROR RATE DATA
003340  005015                          CLR     (R5)            ;CLEAR THE 'DROP UNIT' TABLE ENTRY
003342  005011                          CLR     (R1)            ;REMOVE THE UNIT FROM THE 'AVAIL' OR 'WAIT' TABLE
003344  004737  015322                  JSR     PC,CMPRES       ;COMPRESS THE RESPECTIVE TABLE
003350  000737                          BR      2$              ;SEE IF ANY MORE UNITS

                                        ;LOOK FOR DRIVES TO BE ASSIGNED

003352  012703  000010          MAIN1:  MOV     #8.,R3          ;UNIT COUNT
003356  005002                          CLR     R2              ;'AVAIL' INDEX
003360  005004                          CLR     R4              ;ASSIGN LIST INDEX
003362  005005                          CLR     R5              ;NEW UNIT INDEX
003364  005765  041672          1$:     TST     NEWUNT(R5)      ;NEW UNIT IN THIS POSITION
003370  001006                          BNE     3$              ;BR IF THERE IS
003372  062705  000002          2$:     ADD     #2,R5           ;INCREMENT R5
003376  005204                          INC     R4              ;INCREMENT ASSIGN INDEX
003400  005303                          DEC     R3              ;DECREMENT UNIT COUNT
003402  001370                          BNE     1$              ;BR IF MORE UNITS
003404  000506                          BR      MAIN2           ;START OPERATIONS FOR THE AVAILABLE UNITS
003406  142737  000007  001263  3$:     BICB    #7,UNIT+1       ;CLEAR PREVIOUS UNIT NUMBER
003414  150437  001263                  BISB    R4,UNIT+1       ;PRESENT UNIT NUMBER
003420  104401  051367                  TYPE    ,UNTMSG         ;'UNIT'
003424  104401  001262                  TYPE    ,UNIT           ;UNIT NUMBER
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3243  003430  104401  052065                      TYPE    ,ASGND          ;'ASSIGNED'
3244  003434  005762  041714          4$:         TST     AVAIL(R2)       ;AT END OF AVAILABLE TABLE
3245  003440  001403                              BEQ     5$              ;BR IF YES
3246  003442  062702  000002                      ADD     #2,R2           ;INCREMENT AVAILABLE TABLE INDEX
3247  003446  000772                              BR      4$              ;CONTINUE LOOKING FOR END OF TABLE
3248  003450  016562  041672  041714  5$:         MOV     NEWUNT(R5),AVAIL(R2)  ;MOVE ADDR OF UNIL INTO AVAIL LST
3249  003456  005065  041672                      CLR     NEWUNT(R5)      ;TAKE UNIT OUT OF NEW UNIT TABLE
3250  003462  112764  177777  041640              MOVB    #-1,ASNLST(R4)  ;SET UNIT ASSIGNED INDICATOR
3251  003470  016200  041714                      MOV     AVAIL(R2),R0    ;PUT STARTING ADDRESS OF BLOCK IN R0
3252  003474  113760  001336  000010              MOVB    MINSEC,$SEC(R0)  ;INITIAL SECTOR VALUE
3253  003502  113760  001332  000011              MOVB    MINTRK,$TRK(R0)  ;INITIAL TRACK VALUE
3254  003510  013760  001326  000012              MOV     MINCYL,$CYL(R0)  ;INITIAL CYLINDER VALUE
3255  003516  113760  001342  000030              MOVB    BEGCOD,$CODE(R0)  ;INITIAL COMMAND CODE
3256  003524  013701  001342                      MOV     BEGCOD,R1       ;GET THE ACTUAL OP CODE
3257  003530  116160  042144  000002              MOVB    COMTBL(R1),$COMND(R0)  ;OPERATION CODE
3258  003536  113760  001340  000034              MOVB    BEGPAT,$PATTC(R0)  ;PATTERN CODE
3259  003544  106360  000034                      ASLB    $PATTC(R0)      ;CONVERT CODE TO A TABLE INDEX
3260  003550  013760  001344  000020              MOV     BEGSIZ,$WRDL(R0)  ;BEGINNING RECORD SIZE
3261  003556  013760  001344  000004              MOV     BEGSIZ,$WRDM(R0)  ;VALUE FOR DATA TRANSFER
3262  003564  005460  000004                      NEG     $WRDM(R0)       ;MAKE IT INTO 2'S COMPLEMENT
3263  003570  012760  000400  000026              MOV     #256.,$SSEC(R0)  ;INITIAL VALUE OF SECTOR SIZE
3264  003576  132760  000001  000030              BITB    #1,$CODE(R0)    ;HEADER ORDER ?
3265  003604  001403                              BEQ     6$              ;BR IF NOT
3266  003606  062760  000004  000026              ADD     #4,$SSEC(R0)    ;ADD HEADER SIZE TO SECTOR SIZE
3267  003614  062702  000002          6$:         ADD     #2,R2           ;INCREMENT AVAILABLE TABLE POINTER
3268  003620  000664                              BR      2$              ;LOOK FOR MORE UNITS
3269
3270                                  ;GET PARAMETERS, BUFFER SPACE, AND START ORDERS FOR DRIVES IN
3271                                  ;       THE 'AVAILABLE' QUEUE
3272
3273  003622  005737  041736          MAIN2:  TST     WAIT            ;OUTSTANDING BUFFER REQUESTS
3274  003626  001110                          BNE     MAIN3           ;BR IF THERE ARE
3275  003630  005737  041714                  TST     AVAIL           ;ANY UNITS WAITING FOR PARAMETERS
3276  003634  001545                          BEQ     IDLE            ;BRANCH IF NONE
3277  003636  013700  041714                  MOV     AVAIL,R0        ;CONTROL BLOCK ADDR IN R0
3278  003642  005760  000112                  TST     $NEXT(R0)       ;PARAMETERS BEEN SELECTED ?
3279  003646  001021                          BNE     2$              ;BR IF THEY HAVE
3280  003650  105760  000031                  TSTB    $PACK(R0)       ;'R' OR 'W' COMMAND FOR THE DRIVE ?
3281  003654  001403                          BEQ     1$              ;BR IF NOT
3282  003656  004737  015340                  JSR     PC,WRTPK        ;GET DATA PACK PARAMETERS
3283  003662  000415                          BR      3$              ;GET THE BUFFER
3284  003664  012701  041760          1$:     MOV     #PARQ,R1        ;ADDRESS OF THE PARAMETER QUEUE
3285  003670  020011                  7$:     CMP     R0,(R1)         ;IS CURRENT UNIT IN THE QUEUE
3286  003672  001403                          BEQ     8$              ;BR IF IT IS
3287  003674  005721                          TST     (R1)+           ;AT END OF THE QUEUE
3288  003676  001403                          BEQ     9$              ;BR IF AT END
3289  003700  000773                          BR      7$              ;CONTINUE LOOKING
3290  003702  004737  015322          8$:     JSR     PC,CMPRES       ;COMPRESS THE TABLE
3291  003706  004737  014416          9$:     JSR     PC,SELPAR       ;SELECT THE PARAMETERS
3292  003712  004737  015124          2$:     JSR     PC,GETPAR       ;LOAD NEW PARAMETERS
3293  003716  005046                  3$:     CLR     -(SP)           ;MAKE ROOM ON THE STACK FOR THE BUFFER ADDR
3294  003720  004737  013504                  JSR     PC,GETBUF       ;GET BUFFER
3295  003724  012660  000006                  MOV     (SP)+,$BUF(R0)  ;MOVE BUFFER ADDR TO DPB
3296  003730  001426                          BEQ     5$              ;BR IF '0' ADDR (NO BUFFER)
3297  003732  004737  014072                  JSR     PC,FILBUF       ;FILL THE BUFFER
3298  003736  004737  014340                  JSR     PC,GODRIV       ;PUT CURRENT DPB IN DRIVER
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3299  003742  012705  041616          MOV     #ORDERQ,R5      ;ADDRESS OF ORDER QUEUE IN R5
3300  003746  005725                  TST     (R5)+           ;END OF QUEUE ?
3301  003750  001376                  BNE     .-2             ;BR IF NOT
3302  003752  010045                  MOV     R0,-(R5)        ;PUT BLOCK ADDRESS INTO QUEUE
3303  003754  105760  000031          TSTB    $PACK(R0)       ;'R' OR 'W' COMMAND FOR DRIVE ?
3304  003760  001005                  BNE     10$             ;BR IF EITHER
3305  003762  012705  041760          MOV     #PARQ,R5        ;PUT BLOCK INTO THE PARAMETER QUEUE
3306  003766  005725          4$:     TST     (R5)+           ;FIND THE END OF THE QUEUE
3307  003770  001376                  BNE     4$              ;BR IF NOT AT END OF QUEUE
3308  003772  010045                  MOV     R0,-(R5)        ;PUT BLOCK ADDRESS INTO THE QUEUE
3309  003774  012701  041714  10$:     MOV     #AVAIL,R1       ;R1 CONTAINS THE TABLE ADDRESS
3310  004000  004737  015322          JSR     PC,CMPRES       ;COMPRESS THE AVAILABILITY TABLE
3311  004004  000706                  BR      MAIN2           ;CONTINUE PROCESSING
3312  004006  005005          5$:     CLR     R5              ;R5 USED AS 'WAIT' POINTER
3313  004010  000240                  NOP                     ;DEBUGGING AID
3314  004012  005765  041736          TST     WAIT(R5)        ;AT END OF TABLE
3315  004016  001403                  BEQ     6$              ;BR IF YES
3316  004020  062705  000002          ADD     #2,R5           ;INCREMENT R5
3317  004024  000770                  BR      5$              ;CONTINUE SEARCHING
3318  004026  013765  041714  041736  6$:     MOV     AVAIL,WAIT(R5)  ;MOVE ENTRY FROM AVAILABLE TO WAIT
3319  004034  012701  041714          MOV     #AVAIL,R1       ;TABLE TO COMPRESS
3320  004040  004737  015322          JSR     PC,CMPRES       ;COMPRESS THE INDICATED TABLE
3321  004044  000137  004150          JMP     IDLE            ;WAIT FOR A UNIT TO BECOME READY
3322
3323                                  ;GET BUFFER ASSIGNMENTS FOR DRIVES INT THE 'BUFFER WAIT' QUEUE
3324
3325  004050  013700  041736  MAIN3:  MOV     WAIT,R0         ;MOVE THE 'WAIT' ENTRY TO R0
3326  004054  005046                  CLR     -(SP)           ;MAKE ROOM ON THE STACK FOR THE BUFFER ADDR
3327  004056  004737  013504          JSR     PC,GETBUF       ;TRY TO GET A BUFFER
3328  004062  012660  000006          MOV     (SP)+,$BUF(R0)  ;MOVE THE BUFFER ADDR TO THE DPB
3329  004066  001002                  BNE     1$              ;BR IF A BUFFER WAS ASSIGNED
3330  004070  000137  004150          JMP     IDLE            ;NO BUFFER AVAILABLE YET
3331  004074  004737  014072  1$:     JSR     PC,FILBUF       ;FILL THE BUFFER
3332  004100  004737  014340          JSR     PC,GODRIV       ;PUT THE ENTRY IN THE DRIVER
3333  004104  012705  041616          MOV     #ORDERQ,R5      ;ADDRESS OF ORDER QUEUE IN R5
3334  004110  005725                  TST     (R5)+           ;AT END OF THE QUEUE
3335  004112  001376                  BNE     .-2             ;BR IF NOT
3336  004114  010045                  MOV     R0,-(R5)        ;PUT BLOCK ADDRESS IN QUEUE
3337  004116  105760  000031          TSTB    $PACK(R0)       ;'R' OR 'W' COMMAND FOR DRIVE ?
3338  004122  001005                  BNE     3$              ;BR IF YES, DON'T PUT BLOCK INTO 'PARQ'
3339  004124  012705  041760          MOV     #PARQ,R5        ;FIND THE END OF THE PARAMETER QUEUE
3340  004130  005725          2$:     TST     (R5)+           ;OPEN SLOT IN THE QUEUE ?
3341  004132  001376                  BNE     2$              ;BR IF NOT
3342  004134  010045                  MOV     R0,-(R5)        ;PUT BLOCK ADDRESS INTO THE QUEUE
3343  004136  012701  041736  3$:     MOV     #WAIT,R1        ;ADDRESS OF TABLE TO TO COMPRESS
3344  004142  004737  015322          JSR     PC,CMPRES       ;COMPRESS THE WAIT TABLE
3345  004146  000625                  BR      MAIN2           ;LOOK FOR MORE ENTRIES
3346
3347                                  ;WAIT FOR AN ORDER TO FINISH
3348
3349  004150  023706  001226  IDLE:   CMP     @#STACK1,SP     ;CHECK STACK POINTER
3350  004154  001401                  BEQ     .+4             ;BR IF OK
3351  004156  000000                  HALT                    ;STACK POINTER NOT 1100 ***************
3352  004160  012701  041616          MOV     #ORDERQ,R1      ;ADDRESS OF THE ORDER QUEUE IN R1
3353  004164  012100  1$:     MOV     (R1)+,R0        ;PUT BLOCK ADDRESS INTO R0
3354  004166  001433                  BEQ     IDLE1           ;BR IF END OF QUEUE
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3355  004170  005760  000016                  TST     $STATUS(R0)       ;SEE IF UNIT FINISHED
3356  004174  001773                          BEQ     1$                ;BR IF UNIT NOT FINISHED
3357  004176  162701  000002                  SUB     #2,R1             ;CORRECT THE QUEUE POINTER
3358  004202  010146                          MOV     R1,-(SP)          ;SAVE THE QUEUE ADDRESS
3359  004204  004737  013350                  JSR     PC,STATIS         ;ACCUMULATE STATISTICS FOR UNIT IN R0
3360  004210  000240                          NOP                       ;DEBUGGING AID
3361  004212  004737  004460                  JSR     PC,PROCES         ;PROCESS END OF ORDER
3362  004216  005037  016416                  CLR     PRT2B             ;CLEAR THE BAD TRK/SEC ERROR INDICATOR
3363  004222  004737  023704                  JSR     PC,ABNRML         ;SEE IF ANY UNITS HAVE TOO MANY ERRORS
3364  004226  004737  023726                  JSR     PC,NRML           ;SEE IF ANY UNIT HAS XFERED 3X10↑9 BITS
3365  004232  012601                          MOV     (SP)+,R1          ;RESTORE THE ORDER TABLE INDEX
3366  004234  012705  041714                  MOV     #AVAIL,R5         ;FIND THE END OF THE 'AVAILABLE' TABLE
3367  004240  005725                  2$:     TST     (R5)+             ;END OF THE TABLE ?
3368  004242  001376                          BNE     2$                ;BR IF NOT AT END OF LIST
3369  004244  011145                          MOV     (R1),-(R5)        ;MOV THE BLOCK ADDRESS INTO THE TABLE
3370  004246  004737  015322                  JSR     PC,CMPRES         ;COMPRESS THE ORDER QUEUE
3371  004252  004737  013644                  JSR     PC,RELBUF         ;RESTORE BUFFER
3372  004256  005737  041760          IDLE1:  TST     PARQ              ;ENTRY IN THE PARAMETER QUEUE ?
3373  004262  001410                          BEQ     1$                ;BR IF NOT
3374  004264  013700  041760                  MOV     PARQ,R0           ;PUT THE BLOCK ADDRESS INTO R0
3375  004270  004737  014416                  JSR     PC,SELPAR         ;GET THE PARAMETERS FOR NEXT OPERATION
3376  004274  012701  041760                  MOV     #PARQ,R1          ;SETUP TO COMPRESS THE TABLE
3377  004300  004737  015322                  JSR     PC,CMPRES         ;COMPRESS THE PARAMETER QUEUE
3378  004304  000137  003206          1$:     JMP     MAIN              ;CONTINUE THE LOOP
3379
3380                                  ;SETUP TO REFORMAT AN ERROR SECTOR
3381
3382  004310  032737  000001  001140  REFMT:  BIT     #SW0,SWR          ;READ ONLY SWITCH SET ?
3383  004316  001057                          BNE     REFMTX            ;BR IF IT IS
3384  004320  032737  000200  001140          BIT     #SW7,SWR          ;SWITCH 7 SET ?
3385  004326  001053                          BNE     REFMTX            ;BR IF IT IS
3386  004330  005737  001310                  TST     FORMAT            ;WRITE HEADER & DATA ORDERS ALLOWED ?
3387  004334  001450                          BEQ     REFMTX            ;BR IF NOT
3388  004336  016060  000222  000106          MOV     $RHCC(R0),$NCYL(R0)  ;USE PRESENT CYLINDER
3389  004344  005046                          CLR     -(SP)             ;CLEAR STACK
3390  004346  005046                          CLR     -(SP)             ;FOR SECTOR & TRACK
3391  004350  004737  020124                  JSR     PC,READDR         ;GET CORRECTED SECTOR-TRACK ADDRESSES
3392  004354  112660  000105                  MOVB    (SP)+,$NTRK(R0)   ;TRACK ADDR TO DPB
3393  004360  112660  000104                  MOVB    (SP)+,$NSEC(R0)   ;SECTOR ADDR TO DPB
3394  004364  012760  000404  000110          MOV     #260.,$NWRDL(R0)  ;WORD COUNT FOR FORMAT
3395  004372  023727  001300  000404          CMP     MAXDL,#260.       ;CAN A FULL SECTOR BE WRITTEN ?
3396  004400  103003                          BHIS    1$                ;BR IF IT CAN
3397  004402  013760  001300  000110          MOV     MAXDL,$NWRDL(R0)  ;PUT TRANSFER SIZE INTO THE DPB
3398  004410  112760  000003  000102  1$:     MOVB    #3,$NCODE(R0)     ;COMMAND CODE
3399  004416  004737  015076                  JSR     PC,GETPAT         ;GET A PATTERN
3400  004422  110560  000103                  MOVB    R5,$NPATC(R0)     ;PATTERN CODE TO CONTROL BLOCK
3401  004426  012760  177777  000112          MOV     #-1,$NEXT(R0)     ;SET PARAMETERS SELECTED INDICATOR
3402  004434  012701  041760                  MOV     #PARQ,R1          ;SET UP TO SEE IF BLOCK IN THE PARAMETER QUEUE
3403  004440  005711                  2$:     TST     (R1)              ;SEE IF AT END OF TABLE
3404  004442  001405                          BEQ     REFMTX            ;BR IF AT END
3405  004444  020021                          CMP     R0,(R1)+          ;SEE IF BLOCK AT PRESENT POSITION
3406  004446  001374                          BNE     2$                ;BR IF NOT
3407  004450  005041                          CLR     -(R1)             ;CLEAR THE ENTRY
3408  004452  004737  015322                  JSR     PC,CMPRES         ;COMPRESS THE TABLE
3409  004456  000207                  REFMTX: RTS     PC                ;RETURN
3410
```

```
                                        ;PROCESS THE ORDER TERMINATION
                                        ;
004460  005760  000016        PROCES: TST     $STATUS(R0)         ;SEE IF DRIVER SIGNALED AN ERROR
004464  100427                        BMI     ERPROC              ;BR IF ERROR
004466  032760  100000  000164        BIT     #BIT15,$RHCS1(R0)   ;SEE IF 'SC' SET
004474  001410                        BEQ     1$                  ;BR IF NOT SET
004476  032760  040000  000164        BIT     #BIT14,$RHCS1(R0)   ;SEE IF 'TRE' SET
004504  001017                        BNE     ERPROC              ;BR IF SET
004506  032760  040000  000176        BIT     #BIT14,$RHDS1(R0)   ;SEE IF 'ERR' SET
004514  001013                        BNE     ERPROC              ;BR IF SET
004516  004737  010474        1$:     JSR     PC,CKERR            ;NO ERROR, CHECK ERROR BITS ANYWAY
004522  004737  010574                JSR     PC,CKBUS            ;NO ERROR, CHECK BUS ADDR & WC
004526  032737  000004  001140        BIT     #SW02,SWR           ;NORMAL DATA COMPARE ?
004534  001002                        BNE     2$                  ;BR IF NOT
004536  004737  010660                JSR     PC,CMPAR            ;NO ERROR, COMPARE DATA
004542  000207                2$:     RTS     PC                  ;RETURN
                                        ;
                                        ;ORDER TERMINATED WITH AN ERROR - PROCESS THE ERROR
                                        ;
004544  032760  000200  000016  ERPROC: BIT     #BIT07,$STATUS(R0) ;DONE BIT SET ?
004552  001402                        BEQ     ERPRC1              ;BR IF ORDER DIDN'T COMPLETE NORMALLY
004554  000137  005202                JMP     DONE                ;PROCESS ERROR WITH 'DONE' BIT SET
                                        ;
                                        ;PROCESS ORDER COMPLETION WITH 'ERROR' & 'DONE NOT' BITS
                                        ;
004560  142737  000007  001263  ERPRC1: BICB    #7,UNIT+1          ;CLEAR OLD UNIT NUMBER
004566  151037  001263                BISB    (R0),UNIT+1         ;SET PRESENT UNIT NUMBER
004572  032760  010000  000016        BIT     #BIT12,$STATUS(R0) ;SEE IF DRIVE WAS UNSAFE
004600  001025                        BNE     PUNSAF              ;BR IF YES
004602  032760  004000  000016        BIT     #BIT11,$STATUS(R0) ;PARITY ERROR OCCURRED
004610  001053                        BNE     UCPAR               ;BR IF IT DID
004612  032760  002000  000016        BIT     #BIT10,$STATUS(R0) ;FATAL PARITY ERROR?
004620  001054                        BNE     FALPAR              ;BR IF THERE IS ONE
004622  032760  001000  000016        BIT     #BIT09,$STATUS(R0) ;TIMEOUT?
004630  001072                        BNE     SWTIM               ;BR IF YES
004632  032760  040000  000016        BIT     #BIT14,$STATUS(R0)  ;UNIT WENT OFFLINE ?
004640  001107                        BNE     OFLIN               ;BR IF IT DID
004642  032760  000004  000016        BIT     #BIT2,$STATUS(R0)   ;PORT REQUEST TIME OUT ?
004650  001135                        BNE     PRTIM               ;BR IF IT DID
004652  000207                        RTS     PC                  ;ERROR. RETURN
                                        ;
                                        ;DRIVE IS PERSISTENTLY UNSAFE
                                        ;
004654  104401  001165        PUNSAF: TYPE    ,$CRLF              ;CR-LF
004660  104401  044300                TYPE    ,EM12               ;'DRIVE UNSAFE' MESSAGE
004664  104401  052040                TYPE    ,DRNUM              ;DRIVE NUMBER
004670  104401  001262                TYPE    ,UNIT               ;TYPE THE DRIVE NUMBER
004674  104401  001165                TYPE    ,$CRLF              ;CR-LF
004700  004737  016002                JSR     PC,LINE1            ;PRINT LINE 1 OF ERROR MESSAGE
004704  104412  044300                DISPLY  ,EM12               ;PERSISTENT DEVICE UNSAFE MESSAGE
004710  004737  016046                JSR     PC,LINE2            ;PRINT LINE 2 OF ERROR MESSAGE
004714  004737  016420                JSR     PC,LINE3            ;PRINT LINE 3 OF ERROR MESSAGE
004720  004737  017156                JSR     PC,LINE4            ;PRINT LINE 4 OF THE ERROR MESSAGE
004724  004737  021356                JSR     PC,INCTOT           ;INCREMENT TOTAL ERROR COUNT
004730  004737  017622                JSR     PC,LINE7            ;PRINT LINE 7 OF ERROR MESSAGE
004734  000137  023622                JMP     DROP                ;DROP THE UNIT
```

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                                        ;UNCORRECTABLE MASSBUS PARITY ERROR OCCURED

004740  104401  001165        UCPAR:  TYPE    ,$CRLF          ;CR-LF
004744  104401  044202                TYPE    ,EM10           ;'UNCORRECTABLE PARITY ERROR' MESSAGE
004750  000404                        BR      FALPR1          ;FINISH PROCESSING THE ERROR

                                        ;'FATAL' MASSBUS PARITY ERROR OCCURED

004752  104401  001165        FALPAR: TYPE    ,$CRLF          ;CR-LF
004756  104401  044245                TYPE    ,EM11           ;'FATAL PARITY ERROR' MESSAGE
004762  104401  052040        FALPR1: TYPE    ,DRNUM          ;DRIVE NUMBER
004766  104401  001262                TYPE    ,UNIT           ;TYPE THE DRIVE NUMBER
004772  104401  001165                TYPE    ,$CRLF          ;CR-LF
004776  004737  021356                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
005002  032737  100000  001140        BIT     #SW15,SWR       ;HALT ON ERROR ?
005010  001401                        BEQ     .+4             ;BR IF NOT
005012  000000                        HALT                    ;ERROR HALT
005014  000207                        RTS     PC

                                        ;SOFTWARE TIMEOUT OCCURED

005016  004737  016002        SWTIM:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
005022  104412  044331                DISPLY  ,EM13           ;PRINT THE TIME OUT MESSAGE
005026  004737  016046                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
005032  004737  016420                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
005036  004737  017156                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
005042  004737  021356                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
005046  004737  017622                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
005052  000240                        NOP
005054  000240                        NOP
005056  000207                        RTS     PC              ;RETURN

                                        ;DRIVE WENT OFFLINE

005060  104401  001165        OFLIN:  TYPE    ,$CRLF          ;CR-LF
005064  104401  044403                TYPE    ,EM14           ;'DRIVE WENT OFFLINE' MESSAGE
005070  104401  052040                TYPE    ,DRNUM          ;DRIVE NUMBER
005074  104401  001262                TYPE    ,UNIT           ;TYPE THE DRIVE NUMBER
005100  104401  001165                TYPE    ,$CRLF          ;CR-LF
005104  004737  016002                JSR     PC,LINE1        ;PRINT LINE 1 OF THE ERROR MESSAGE
005110  104412  044403                DISPLY  ,EM14           ;PRINT OFFLINE MESSAGE
005114  004737  016046                JSR     PC,LINE2        ;PRINT LINE 2 OF THE ERROR MESSAGE
005120  004737  016420                JSR     PC,LINE3        ;PRINT LINE 3 OF THE ERROR MESSAGE
005124  004737  017156                JSR     PC,LINE4        ;PRINT LINE 4 OF THE ERROR MESSAGE
005130  004737  021356                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
005134  004737  017622                JSR     PC,LINE7        ;PRINT LINE 7 OF THE ERROR MESSAGE
005140  000137  023522                JMP     DROP            ;DROP THE UNIT

                                        ;PORT REQUEST TIMEOUT ERROR

005144  004737  016002        PRTIM:  JSR     PC,LINE1        ;TYPE LINE 1 OF THE ERROR MESSAGE
005150  104412  044425                DISPLY  ,EM15           ;PRINT PORT TIME OUT MESSAGE
005154  004737  016046                JSR     PC,LINE2        ;TYPE LINE 2 OF THE ERROR MESSAGE
005160  004737  016420                JSR     PC,LINE3        ;TYPE LINE 3 OF THE ERROR MESSAGE
005164  004737  017156                JSR     PC,LINE4        ;TYPE LINE 4 OF THE ERROR MESSAGE
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3523  005170  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3524  005174  004737  017622                  JSR     PC,LINE7        ;TYPE LINE 7 OF THE ERROR MESSAGE
3525  005200  000207                          RTS     PC              ;RETURN
3526
3527                                  ;PROCESS ORDER COMPLETION WITH 'ERROR' & 'DONE' BITS SET
3528
3529  005202  032760  000030  000016  DONE:   BIT     #BIT04!BIT03,$TATUS(R0) ;UNSAFE OCCURRED
3530  005210  001402                          BEQ     .+6             ;BR IF NOT
3531  005212  000137  010230                  JMP     UNSAF           ;REPORT UNSAFE
3532  005216  032760  040000  000174          BIT     #BIT14,$RHCS2(R0)  ;IS 'WCE' SET ?
3533  005224  001402                          BEQ     .+6             ;BR IF NOT
3534  005226  000137  006146                  JMP     WCKER           ;REPORT 'WCE'
3535  005232  032760  040000  000176          BIT     #BIT14,$RHDS1(R0) ;CHECK 'ERR'
3536  005240  001002                          BNE     .+6             ;BR IF SET
3537  005242  000137  007774                  JMP     TRFER           ;PROCESS 'TRE'
3538  005246  032760  000020  000200          BIT     #BIT04,$RHER1(R0) ;'FMT' SET?
3539  005254  001402                          BEQ     .+6             ;BR IF NOT SET
3540  005256  000137  006624                  JMP     CKFMT           ;CHECK FORMAT ERROR
3541  005262  032760  000200  000200          BIT     #BIT07,$RHER1(R0) ;'HCE' SET?
3542  005270  001402                          BEQ     .+6             ;BR IF NOT SET
3543  005272  000137  007024                  JMP     CKHCE           ;CHECK 'HCE' ERROR
3544  005276  032760  000100  000200          BIT     #BIT08,$RHER1(R0) ;'HCRC' SET?
3545  005304  001402                          BEQ     .+6             ;BR IF NOT
3546  005306  000137  006442                  JMP     HCRCER          ;PROCESS 'HCRC'
3547  005312  032760  020000  000200          BIT     #BIT13,$RHER1(R0) ;'OPI' SET?
3548  005320  001402                          BEQ     .+6             ;BR IF NOT SET
3549  005322  000137  007330                  JMP     OPIER           ;REPORT 'OPI'
3550  005326  032760  000010  000200          BIT     #BIT3,$RHER1(R0) ;'PAR' SET?
3551  005334  001402                          BEQ     .+6             ;BR IF NOT SET
3552  005336  000137  007462                  JMP     PARER           ;REPORT 'PAR'
3553  005342  032760  000040  000200          BIT     #BIT5,$RHER1(R0) ;'WCF' SET?
3554  005350  001402                          BEQ     .+6             ;BR IF NOT SET
3555  005352  000137  010132                  JMP     WCFER           ;REPORT 'WCF'
3556  005356  032760  002000  000200          BIT     #BIT10,$RHER1(R0) ;'IAE' SET?
3557  005364  001402                          BEQ     .+6             ;BR IF NOT SET
3558  005366  000137  007554                  JMP     IAEER           ;REPORT 'IAE'
3559  005372  032760  004000  000200          BIT     #BIT11,$RHER1(R0) ;'WLE' SET?
3560  005400  001402                          BEQ     .+6             ;BR IF NOT SET
3561  005402  000137  007606                  JMP     WLEER           ;REPORT 'WLE'
3562  005406  032760  001000  000200          BIT     #BIT9,$RHER1(R0) ;'AOE' SET?
3563  005414  001405                          BEQ     1$              ;BR IF NOT SET
3564  005416  032760  002000  000176          BIT     #BIT10,$RHDS1(R0) ;'LST' SET?
3565  005424  001401                          BEQ     1$              ;BR IF NOT SET
3566  005426  000207                          RTS     PC              ;'AOE' & 'LST' SET, EXIT
3567  005430  032760  010000  000200  1$:     BIT     #BIT12,$RHER1(R0)  ;SEE IF 'DTE' SET
3568  005436  001402                          BEQ     .+6             ;BR IF NOT
3569  005440  000137  007440                  JMP     DTEER           ;REPORT 'DTE' ERROR
3570  005444  005760  000200                  TST     $RHER1(R0)      ;SEE IF 'DCK' SET
3571  005450  100002                          BPL     .+6             ;BR IF NOT
3572  005452  000137  005476                  JMP     DCKER           ;PROCESS 'DCK'
3573  005456  032760  140000  000226          BIT     #BIT15!BIT14,$RHER3(R0) ;'SKI' OR 'OCYL' SET
3574  005464  001402                          BEQ     .+6             ;BR IF NOT SET
3575  005466  000137  010074                  JMP     SKIER           ;REPORT ERROR
3576  005472  000137  006572                  JMP     DRVER           ;REPORT DRIVE ERROR
3577
3578                                  ;PROCESS DATA ('DCK') CHECK ERROR
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3579                                            
3580  005476  004737  015646          DCKER:  JSR     PC,SPOTCK       ;SEE IF ERROR AT A BAD SPOT ON THE PACK
3581  005502  000207                          RTS     PC              ;IT IS, DON'T REPORT IT
3582  005504  004737  016002                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3583  005510  104412  044502                  DISPLY  .EM21           ;DATA CHECK ERROR
3584  005514  004737  016046          DCKER1: JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3585  005520  004737  016420                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
3586  005524  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
3587  005530  004737  012610                  JSR     PC,PRTBAD       ;SEE IF BAD SECTOR TO BE PRINTED
3588  005534  012760  110100  000024          MOV     #BIT15!BIT12!BIT06,$MASK(R0)  ;LOAD ERROR MASK
3589  005542  032760  010100  000200          BIT     #BIT12!BIT06,$RHER1(R0)  ;CHECK 'DTE' & 'ECH'
3590  005550  001003                          BNE     1$              ;BR IF SET
3591  005552  004737  017512                  JSR     PC,LINE6        ;PRINT LINE 6 OF ERROR MESSAGE
3592  005556  000530                          BR      8$              ;FINISH THE ERROR REPORT
3593  005560  012760  010000  000022  1$:     MOV     #10000,$RETRY(R0)  ;RETRY COUNT
3594  005566  005001                          CLR     R1              ;R1 IS OFFSET CODE POINTER
3595  005570  004737  013644                  JSR     PC,RELBUF       ;RELEASE THE BUFFER
3596  005574  005046                          CLR     -(SP)           ;MAKE ROOM FOR THE SECTOR ADDRESS
3597  005576  005046                          CLR     -(SP)           ;MAKE ROOM FOR THE TRACK ADDRESS
3598  005600  004737  020124                  JSR     PC,READDR       ;GET THE ADDRESS OF THE ERROR SECTOR
3599  005604  112660  000011                  MOVB    (SP)+,$TRK(R0)  ;TRACK ADDRESS OF ERROR SECTOR
3600  005610  112660  000010                  MOVB    (SP)+,$SEC(R0)  ;SECTOR ADDRESS OF ERROR SECTOR
3601  005614  016060  000222  000012          MOV     $RHCC(R0),$CYL(R0)  ;PRESENT CYLINDER
3602  005622  026060  000026  000020          CMP     $SSEC(R0),$WRDL(R0)  ;SEE IF TRANSFER LENGTH LESS THAN 1 SECTOR
3603  005630  103010                          BHIS    15$             ;BR IF IT IS; USE PRESENT TRANSFER LENGTH
3604  005632  016060  000026  000020          MOV     $SSEC(R0),$WRDL(R0)  ;CHANGE TRANSFER SIZE TO 1 SECTOR
3605  005640  016060  000020  000004          MOV     $WRDL(R0),$WRDM(R0)  ;SETUP WORD COUNT FOR OPERATION
3606  005646  005460  000004                  NEG     $WRDM(R0)       ;CHANGE COUNT TO 2'S COMP
3607  005652  005046                  15$:    CLR     -(SP)           ;SPACE FOR NEW BUFFER ADDRESS
3608  005654  004737  013504                  JSR     PC,GETBUF       ;GET A BUFFER
3609  005660  012660  000006                  MOV     (SP)+,$BUF(R0)  ;NEW BUFFER ADDRESS TO DPB
3610  005664  004737  014340          2$:     JSR     PC,GODRIV       ;RETRY
3611  005670  005760  000016          3$:     TST     $STATUS(R0)     ;TEST FOR DONE
3612  005674  001775                          BEQ     3$              ;BR IF NOT DONE
3613  005676  100070                          BPL     10$             ;BR IF NOT ERROR
3614  005700  032760  000200  000016          BIT     #BIT7,$STATUS(R0)  ;SEE IF ORDER TERMINIATED NORMALLY
3615  005706  001511                          BEQ     14$             ;BR IF NOT
3616  005710  036060  000024  000200          BIT     $MASK(R0),$RHER1(R0)  ;LOOK AT CURRENT ERROR
3617  005716  001427                          BEQ     5$              ;BR IF DIFFERENT ERROR
3618  005720  032760  010100  000200          BIT     #BIT12!BIT6,$RHER1(R0)  ;'ECH' OR 'DTE' STILL SET ?
3619  005726  001440                          BEQ     7$              ;BR IF NEITHER SET
3620  005730  105260  000022                  INCB    $RETRY(R0)      ;INCREMENT RETRY COUNT
3621  005734  105360  000023                  DECB    $RETRY+1(R0)    ;DECREMENT RETRY LIMIT
3622  005740  001351                          BNE     2$              ;BR IF MORE RETRY TO GO
3623  005742  005201                          INC     R1              ;INCREMENT TABLE INDEX
3624  005744  116137  042232  041527          MOVB    OFFCOD(R1),GENDPB+$FMT  ;OFFSET CODE
3625  005752  001437                          BEQ     9$              ;BR IF END OF OFFSET TABLE
3626  005754  112760  000002  000023          MOVB    #2,$RETRY+1(R0)  ;NEW RETRY LIMIT
3627  005762  004737  013040                  JSR     PC,OFFST        ;OFFSET
3628  005766  005737  041544          4$:     TST     GENDPB+$STATUS  ;SEE IF FINISHED WITH OFFSET
3629  005772  001775                          BEQ     4$              ;BR IF NOT
3630  005774  100333                          BPL     2$              ;BR IF OFFSET OK
3631  005776  004737  020070          5$:     JSR     PC,LINE8        ;PRINT LINE 8 OF ERROR MESSAGE
3632  006002  004737  021262          6$:     JSR     PC,INCHRD       ;INCREMENT 'HARD' ERROR COUNT
3633  006006  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3634  006012  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
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 3635  006016  004737  012610                  JSR     PC,PRTBAD       ;PRINT THE BAD SECTOR
 3636  006022  004737  004310                  JSR     PC,REFMT        ;REFORMAT THE ERROR SECTOR
 3637  006026  000207                          RTS     PC              ;RETURN
 3638  006030  004737  017552          7$:     JSR     PC,LINE6B       ;PRINT LINE 6B OF ERROR MESSAGE
 3639  006034  004737  017450                  JSR     PC,LINE5B       ;PRINT LINE 5B OF THE ERROR MESSAGE
 3640  006040  004737  021236          8$:     JSR     PC,INCSOF       ;INCREMENT 'SOFT' ERROR COUNT
 3641  006044  004737  012024                  JSR     PC,ECC          ;CORRECT THE ERROR USING ECC AND CHECK IT
 3642  006050  000407                          BR      11$             ;COMPARE THE BUFFER
 3643  006052  004737  017612          9$:     JSR     PC,LINE6D       ;PRINT LINE 6D OF ERROR MESSAGE
 3644  006056  000751                          BR      6$              ;INCREMENT ERROR COUNT
 3645  006060  004737  017524          10$:    JSR     PC,LINE6A       ;PRINT LINE 6A OF ERROR MESSAGE
 3646  006064  004737  021236                  JSR     PC,INCSOF       ;INCREMENT 'SOFT' ERROR COUNT
 3647  006070  112737  000001  011407  11$:    MOVB    #1,FRSTER       ;SET 'DCKER' INDICATOR
 3648  006076  004737  010710                  JSR     PC,CMPARD       ;COMPARE THE BUFFER
 3649  006102  005737  011414                  TST     ERCTR           ;SEE IF COMPARE ERROR DETECTED
 3650  006106  001006                          BNE     13$             ;BR IF ONE DID
 3651  006110  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
 3652  006114  104412  050751                  DISPLY  ,LIN9G          ;'DATA COMPARE OK' MESSAGE
 3653  006120  004737  017622          12$:    JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
 3654  006124  004737  004310          13$:    JSR     PC,REFMT        ;REFORMAT THE ERROR SECTOR
 3655  006130  000207                          RTS     PC              ;RETURN
 3656  006132  004737  021356          14$:    JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
 3657  006136  104412  050537                  DISPLY  ,LIN8M          ;'DIFFERENT ERROR DURING RETRY'
 3658  006142  000137  004560                  JMP     ERPRC1          ;SEE WHICH ERROR
 3659
 3660                                  ;WRITE CHECK ERROR PROCESSING
 3661
 3662  006146  004737  016002          WCKER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
 3663  006152  032760  100000  000200          BIT     #BIT15,$RHER1(R0)  ;SEE IF 'DCK' SET ALSO
 3664  006160  001032                          BNE     2$              ;BR IF IT IS
 3665  006162  104412  044606                  DISPLY  ,EM23           ;PRINT WCE & DCK NOT
 3666  006166  005060  000024                  CLR     $MASK(R0)       ;CLEAR ERROR MASK
 3667  006172  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
 3668  006176  004737  016420                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
 3669  006202  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
 3670  006206  004737  017256                  JSR     PC,LINE5        ;PRINT LINE 5 OF ERROR MESSAGE
 3671  006212  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
 3672  006216  012760  001400  000022          MOV     #1400,$RETRY(R0)  ;RETRY LIMIT
 3673  006224  004737  013146                  JSR     PC,RETRY        ;RETRY THE OPERATION
 3674  006230  000403                          BR      1$              ;RETRY UNSUCESSFUL
 3675  006232  004737  017562                  JSR     PC,LINE6C       ;PRINT LINE 6C OF ERROR MESSAGE
 3676  006236  000465                          BR      8$              ;FINISH PROCESSING THE ERROR
 3677  006240  004737  017612          1$:     JSR     PC,LINE6D       ;PRINT LINE 6D OF ERROR MESSAGE
 3678  006244  000471                          BR      10$             ;FINISH PROCESSING THE ERROR
 3679  006246  004737  015646          2$:     JSR     PC,SPOTCK       ;SEE IF ERROR AT BAD SPOT ON THE PACK
 3680  006252  000207                          RTS     PC              ;BR IF IT IS
 3681  006254  104412  044533                  DISPLY  ,EM22           ;WCK & DCK ERRS
 3682  006260  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
 3683  006264  004737  016420                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
 3684  006270  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
 3685  006274  004737  017256                  JSR     PC,LINE5        ;PRINT LINE 5 OF ERROR MESSAGE
 3686  006300  032760  000100  000200          BIT     #BIT06,$RHER1(R0)  ;ECH SET ALSO ?
 3687  006306  001441                          BEQ     8$              ;FINISH PROCESSING THE ERROR
 3688  006310  012760  010000  000022  3$:     MOV     #10000,$RETRY(R0)  ;RETRY LIMIT - 16 (10)
 3689  006316  004737  014340          4$:     JSR     PC,GODRIV       ;RETRY THE ORDER
 3690  006322  005760  000016          5$:     TST     $STATUS(R0)     ;ORDER FINISHED ?
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3691  006326  001775                          BEQ     5$              ;BR IF NOT
3692  006330  100405                          BMI     6$              ;BR IF ERROR ON ORDER
3693  006332  105260  000022                  INCB    $RETRY(R0)      ;INCREMENT RETRY COUNT
3694  006336  004737  017562                  JSR     PC,LINE6C       ;PRINT LINE 6C OF ERROR MESSAGE
3695  006342  000430                          BR      9$              ;FINISH ERROR PROCESSING
3696  006344  105260  000022          6$:     INCB    $RETRY(R0)      ;INCREMENT RETRY COUNT
3697  006350  105360  000023                  DECB    $RETRY+1(R0)    ;DECREMENT RETRY LIMIT
3698  006354  001731                          BEQ     1$              ;BR IF AT RETRY LIMIT
3699  006356  032760  100000  000200          BIT     #BIT15,$RHER1(R0)  ;'DCK' SET
3700  006364  001407                          BEQ     7$              ;BR IF NOT - DIFFERENT ERROR
3701  006366  032760  000100  000200          BIT     #BIT06,$RHER1(R0)  ;'ECH' ALSO SET ?
3702  006374  001350                          BNE     4$              ;BR IF IT IS; RETRY ORDER
3703  006376  004737  017562                  JSR     PC,LINE6C       ;PRINT LINE 6C OF ERROR MESSAGE
3704  006402  000403                          BR      8$              ;FINISH PROCESSING ERROR
3705  006404  004737  020070          7$:     JSR     PC,LINE8        ;PRINT LINE 8 - 'DIFFERENT ERROR '
3706  006410  000405                          BR      9$              ;FINISH PROCESSING ERROR
3707  006412  004737  021356          8$:     JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3708  006416  004737  017622                  JSR     PC,LINE7        ;FINISH THE ERROR MESSAGE
3709  006422  000207                          RTS     PC              ;RETURN
3710  006424  004737  021356          9$:     JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3711  006430  004737  017622          10$:    JSR     PC,LINE7        ;FINISH THE ERROR MESSAGE
3712  006434  004737  004310                  JSR     PC,REFMT        ;REFORMAT THE SECTOR IN ERROR
3713  006440  000207                          RTS     PC              ;RETURN
3714
3715                                  ;REPORT 'HCRC' ERROR
3716
3717  006442  004737  015646          HCRCER: JSR     PC,SPOTCK       ;SEE IF ERROR AT PACK BAD SPOT
3718  006446  000207                          RTS     PC              ;RETURN IF IT IS
3719  006450  004737  016002                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3720  006454  104412  044461                  DISPLY  ,EM20           ;REPORT 'HCRC'
3721  006460  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3722  006464  004737  016420                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
3723  006470  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
3724  006474  032760  040000  000174          BIT     #BIT14,$RHCS2(R0)  ;'WCE' ERROR ALSO ?
3725  006502  001402                          BEQ     .+6             ;BR IF NOT
3726  006504  004737  017256                  JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
3727  006510  004737  021236                  JSR     PC,INCSOF       ;INCREMENT 'SOFT' ERROR COUNT
3728  006514  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3729  006520  012760  000400  000024          MOV     #BIT8,$MASK(R0) ;SET ERROR MASK
3730  006526  012760  001400  000022          MOV     #1400,$RETRY(R0)  ;RETRY LIMIT
3731  006534  004737  013146                  JSR     PC,RETRY        ;RETRY ORDER
3732  006540  000405                          BR      1$              ;RETRY NOT SUCESSFUL
3733  006542  004737  017562                  JSR     PC,LINE6C       ;PRINT LINE 6C OF ERROR MESSAGE
3734  006546  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3735  006552  000207                          RTS     PC              ;RETURN
3736  006554  004737  017612          1$:     JSR     PC,LINE6D       ;PRINT LINE 6D OF ERROR MESSAGE
3737  006560  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3738  006564  004737  004310                  JSR     PC,REFMT        ;REFORMAT THE ERROR SECTOR
3739  006570  000207                          RTS     PC              ;RETURN
3740
3741                                  ;REPORT DRIVE ERROR
3742
3743  006572  004737  016002          DRVER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3744  006576  104412  045076                  DISPLY  ,EM30           ;REPORT DRIVE ERROR
3745  006602  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3746  006606  004737  016420                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
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3747  006612  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3748  006616  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3749  006622  000207                          RTS     PC              ;RETURN
3750
3751                                  ;PROCESS FORMAT ('FMT') ERROR
3752
3753  006624  032760  000400  000016  CKFMT:  BIT     #BIT8,$STATUS(R0) ;'HCRC' SET ON ORIGINAL ERROR ?
3754  006632  001402                          BEQ     .+6             ;BR IF NOT SET
3755  006634  000137  006442                  JMP     HCRCER          ;REPORT HCRC ERROR
3756  006640  005046                          CLR     -(SP)           ;CLEAR STACK FOR DECREMENTED
3757  006642  005046                          CLR     -(SP)           ;SECTOR AND TRACK
3758  006644  004737  020124                  JSR     PC,READDR       ;GET CORRECTED TRACK & SECTOR ADDRSSES
3759  006650  004737  013064                  JSR     PC,READHD       ;READ HEADER
3760  006654  032737  000400  041562          BIT     #BIT8,GENREG+RHER1 ;'HCRC' SET WHEN HEADER READ?
3761  006662  001002                          BNE     .+6             ;BR IF 'HCRC' SET
3762  006664  000137  007634                  JMP     FMTER           ;NO, ERROR IS 'FMT' ONLY
3763  006670  004737  015646          1$:     JSR     PC,SPOTCK       ;SEE IF ERROR AT BAD SPOT ON THE PACK
3764  006674  000207                          RTS     PC              ;RETURN IF IT IS
3765  006676  004737  016002                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3766  006702  104412  044665                  DISPLY  ,EM24           ;HEADER READ ERROR - FMT BIT DROPPED UP
3767  006706  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3768  006712  004737  016420                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
3769  006716  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
3770  006722  032760  040000  000174          BIT     #BIT14,$RHCS2(R0)  ;'WCE' ERROR ALSO ?
3771  006730  001402                          BEQ     .+6             ;BR IF NOT
3772  006732  004737  017256                  JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
3773  006736  004737  017356                  JSR     PC,LINE5A       ;DISPLAY HEADER
3774  006742  004737  021236                  JSR     PC,INCSOF       ;INCREMENT SOFT ERROR COUNT
3775  006746  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3776  006752  012760  000020  000024          MOV     #BIT4,$MASK(R0) ;SET ERROR MASK
3777  006760  012760  001400  000022          MOV     #1400,$RETRY(R0)  ;RETRY LIMIT
3778  006766  004737  013146                  JSR     PC,RETRY        ;RETRY THE ORDER
3779  006772  000405                          BR      2$              ;RETRY NOT SUCESSFUL
3780  006774  004737  017562                  JSR     PC,LINE6C       ;PRINT LINE 6C OF ERROR MESSAGE
3781  007000  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3782  007004  000207                          RTS     PC              ;RETURN
3783  007006  004737  017612          2$:     JSR     PC,LINE6D       ;PRINT LINE 6D OF ERROR MESSAGE
3784  007012  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3785  007016  004737  004310                  JSR     PC,REFMT        ;REFORMAT THE ERROR SECTOR
3786  007022  000207                          RTS     PC              ;RETURN
3787
3788                                  ;PROCESS HEADER COMPARE ('HCE') ERROR
3789
3790  007024  032760  000400  000200  CKHCE:  BIT     #BIT8,$RHER1(R0) ;HCRC SET ON ORIGINAL ERROR ?
3791  007032  001402                          BEQ     .+6             ;BR IF NOT SET
3792  007034  000137  006442                  JMP     HCRCER          ;REPORT HEADER CRC ERRCR
3793  007040  005046          1$:     CLR     -(SP)           ;CLEAR STACK
3794  007042  005046                          CLR     -(SP)           ;CLEAR STACK
3795  007044  004737  020124                  JSR     PC,READDR       ;GET CURRENT SECTOR & TRACK ADDRS
3796  007050  004737  013064                  JSR     PC,READHD       ;READ HEADER OF CURRENT SECTOR
3797  007054  032737  000400  041562          BIT     #BIT8,GENREG+RHER1 ;'HCRC' SET
3798  007062  001016                          BNE     2$              ;BR IF SET
3799  007064  042737  010000  053644          BIC     #BIT12,CYLDER   ;CLEAR FORMAT BIT FROM HEADER
3800  007072  026037  000222  053644          CMP     $RHCC(R0),CYLDER  ;CORRECT CYLINDER ?
3801  007100  001402                          BEQ     .+6             ;BR IF IT IS
3802  007102  000137  007254                  JMP     POSER           ;REPORT POSITIONING ERROR
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3803  007106  052737  010000  053644          BIS     #BIT12,CYLDER   ;RESTORE THE FORMAT BIT
3804  007114  000137  007712                  JMP     HCEER           ;REPORT 'HCE' ERROR
3805  007120  004737  015646          2$:     JSR     PC,SPOTCK       ;SEE IF ERROR AT BAD SPOT
3806  007124  000207                          RTS     PC              ;RETURN IF IT IS
3807  007126  004737  016002                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3808  007132  104412  044733                  DISPLY  ,EM25           ;HEADER READ ERROR - 'HCE' SET
3809  007136  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3810  007142  004737  016420                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
3811  007146  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
3812  007152  032760  040000  000174          BIT     #BIT14,$RHCS2(R0)  ;'WCE' ERROR ALSO ?
3813  007160  001402                          BEQ     .+6             ;BR IF NOT
3814  007162  004737  017256                  JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
3815  007166  004737  017356                  JSR     PC,LINE5A       ;PRINT LINE 5 OF ERROR MESSAGE
3816  007172  004737  021236                  JSR     PC,INCSOF       ;INCREMENT SOFT ERROR COUNT
3817  007176  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3818  007202  012760  000200  000024          MOV     #BIT7,$MASK(R0) ;SET ERROR MASK
3819  007210  012760  001400  000022          MOV     #1400,$RETRY(R0)  ;RETRY LIMIT
3820  007216  004737  013146                  JSR     PC,RETRY        ;RETRY THE ORDER
3821  007222  000405                          BR      3$              ;RETRY NOT SUCESSFUL
3822  007224  004737  017562                  JSR     PC,LINE6C       ;PRINT LINE 6C OF ERROR MESSAGE
3823  007230  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3824  007234  000207                          RTS     PC              ;RETURN
3825  007236  004737  017612          3$:     JSR     PC,LINE6D       ;PRINT LINE 6D OF ERROR MESSAGE
3826  007242  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3827  007246  004737  004310                  JSR     PC,REFMT        ;REFORMAT THE ERROR SECTOR
3828  007252  000207                          RTS     PC              ;RETURN
3829
3830                                  ;REPORT POSSIBLE POSITIONING ERROR
3831
3832  007254  004737  013006          POSER:  JSR     PC,RECALT       ;RECALIBRATE
3833  007260  004737  016002                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3834  007264  104412  046012                  DISPLY  ,EM51           ;PROGRAM DETECTED POSITIONING ERROR
3835  007270  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3836  007274  004737  016612                  JSR     PC,LINE3C       ;PRINT LINE 3C OF ERROR MESSAGE
3837  007300  052737  010000  053644          BIS     #BIT12,CYLDER   ;RESTORE THE FORMAT BIT
3838  007306  004737  017356                  JSR     PC,LINE5A       ;PRINT LINE 5A OF THE ERROR MESSAGE
3839  007312  004737  021332                  JSR     PC,INCMIS       ;INCREMENT MISPOSITIONING COUNT
3840  007316  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3841  007322  004737  017750                  JSR     PC,LINE7A       ;PRINT LINE 7A OF ERROR MESSAGE
3842  007326  000207                          RTS     PC              ;EXIT
3843
3844                                  ;REPORT 'OPI' ERROR
3845
3846  007330  004737  015646          OPIER:  JSR     PC,SPOTCK       ;SEE IF ERROR AT BAD SPOT
3847  007334  000207                          RTS     PC              ;RETURN IF IT IS
3848  007336  004737  016002                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3849  007342  104412  045130                  DISPLY  ,EM31           ;'OPI' ERROR
3850  007346  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3851  007352  004737  016420                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
3852  007356  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
3853  007362  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3854  007366  012760  020000  000024          MOV     #BIT13,$MASK(R0) ;ERROR MASK
3855  007374  012760  001400  000022  OPIER1: MOV     #1400,$RETRY(R0) ;RETRY LIMIT
3856  007402  004737  013146                  JSR     PC,RETRY        ;RETRY THE ORDER
3857  007406  000405                          BR      1$              ;RETRY UNSUCESSFUL
3858  007410  004737  017562                  JSR     PC,LINE6C       ;PRINT LINE 6C OF ERROR MESSAGE
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 3859  007414  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
 3860  007420  000207                          RTS     PC              ;EXIT
 3861  007422  004737  017612          1$:     JSR     PC,LINE6D       ;PRINT LINE 6D OF ERROR MESSAGE
 3862  007426  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
 3863  007432  004737  004310                  JSR     PC,REFMT        ;REFORMAT THE ERROR SECTOR
 3864  007436  000207                          RTS     PC              ;RETURN
 3865
 3866                                  ;REPORT 'DTE' ERROR
 3867
 3868  007440  004737  015646          DTEER:  JSR     PC,SPOTCK       ;SEE IF ERROR AT BAD SPOT
 3869  007444  000207                          RTS     PC              ;RETURN IF IT IS
 3870  007446  004737  016002                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
 3871  007452  104412  045173                  DISPLY  ,EM32           ;'DTE' ERROR
 3872  007456  000137  005514                  JMP     @CKER1          ;FINISH PROCESSING THE 'DTE' ERROR
 3873
 3874                                  ;REPORT 'PAR' ERROR
 3875
 3876  007462  004737  016002          PARER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
 3877  007466  104412  045226                  DISPLY  ,EM33           ;REPORT 'PAR'
 3878  007472  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
 3879  007476  004737  017002                  JSR     PC,LINE3E       ;PRINT LINE 3E OF ERROR MESSAGE
 3880  007502  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
 3881  007506  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
 3882  007512  012760  000010  000024          MOV     #BIT03,$MASK(R0) ;ERROR MASK
 3883  007520  012760  001400  000022          MOV     #1400,$RETRY(R0) ;RETRY LIMIT
 3884  007526  004737  013146                  JSR     PC,RETRY        ;RETRY ORDER
 3885  007532  000405                          BR      2$              ;RETRY UNSUCESSFUL
 3886  007534  004737  017562                  JSR     PC,LINE6C       ;RETRY SUCESSFUL
 3887  007540  004737  017622          1$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
 3888  007544  000207                          RTS     PC              ;EXIT
 3889  007546  004737  017612          2$:     JSR     PC,LINE6D       ;PRINT LINE 6D OF ERROR MESSAGE
 3890  007552  000772                          BR      1$              ;FINISH ERROR MESSAGE
 3891
 3892                                  ;REPORT 'IAE' ERROR
 3893
 3894  007554  004737  016002          IAEER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
 3895  007560  104412  045345                  DISPLY  ,EM35           ;REPORT 'IAE'
 3896  007564  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
 3897  007570  004737  017104                  JSR     PC,LINE3F       ;PRINT LINE 3F OF ERROR MESSAGE
 3898  007574  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
 3899  007600  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
 3900  007604  000207                          RTS     PC              ;RETURN
 3901
 3902                                  ;REPORT 'WLE' ERROR
 3903
 3904  007606  004737  016002          WLEER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
 3905  007612  104412  045403                  DISPLY  ,EM36           ;REPORT 'WLE'
 3906  007616  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
 3907  007622  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
 3908  007626  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
 3909  007632  000207                          RTS     PC              ;RETURN
 3910
 3911                                  ;REPORT FORMAT ERROR
 3912
 3913  007634  004737  016002          FMTER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
 3914  007640  104412  045014                  DISPLY  ,EM26           ;FORMAT ERROR
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3915  007644  004737  016046                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3916  007650  004737  016420                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
3917  007654  004737  017156                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
3918  007660  032760  040000  000174        BIT     #BIT14,$RHCS2(R0)  ;'WCE' ERROR ALSO ?
3919  007666  001402                        BEQ     .+6             ;BR IF NOT
3920  007670  004737  017256                JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
3921  007674  004737  017356                JSR     PC,LINE5A       ;PRINT LINE 5A OF ERROR MESSAGE
3922  007700  004737  021356                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3923  007704  004737  017622                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3924  007710  000207                        RTS     PC
3925
3926                                  ;REPORT HEADER COMPARE ERROR
3927
3928  007712  004737  016002        HCEER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3929  007716  104412  045041                DISPLY  ,EM27           ;HEADER COMPARE ERROR
3930  007722  004737  016046                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3931  007726  004737  016420                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
3932  007732  004737  017156                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
3933  007736  032760  040000  000174        BIT     #BIT14,$RHCS2(R0)  ;'WCE' ERROR ALSO ?
3934  007744  001402                        BEQ     .+6             ;BR IF NOT
3935  007746  004737  017256                JSR     PC,LINE5        ;DISPLAY WORDS WHICH CAUSED 'WCE'
3936  007752  004737  017356                JSR     PC,LINE5A       ;PRINT LINE 5A OF ERROR MESSAGE
3937  007756  004737  021356                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3938  007762  004737  017622                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3939  007766  004737  004310                JSR     PC,REFMT        ;REFORMAT THE ERROR SECTOR
3940  007772  000207                        RTS     PC              ;RETURN
3941
3942                                  ;PROCESS CONTROL/INTERFACE TRANSFER ERROR
3943
3944  007774  004737  016002        TRFER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3945  010000  104412  045434                DISPLY  ,EM40           ;RH11 OR UNIBUS TRANSFER ERROR
3946  010004  004737  016046                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3947  010010  004737  016420                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
3948  010014  004737  017156                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
3949  010020  004737  021356                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3950  010024  032760  121400  000174        BIT     #BIT15!BIT13!BIT9!BIT8,$RHCS2(R0)  ;'DLT','UPE','MXF', 'MDPE' SET ?
3951  010032  001415                        BEQ     2$              ;BR IF NONE SET
3952  010034  012760  001400  000022        MOV     #1400,$RETRY(R0)  ;RETRY LIMIT
3953  010042  005060  000024                CLR     $MASK(R0)       ;CLEAR ERROR MASK
3954  010046  004737  013146                JSR     PC,RETRY        ;RETRY THE OPERATION
3955  010052  000403                        BR      1$              ;RETURN HERE IF RETRY UNSUCESSFUL
3956  010054  004737  017562                JSR     PC,LINE6C       ;PRINT LINE 6C OF ERROR MESSAGE
3957  010060  000402                        BR      2$              ;FINISH THE ERROR REPORT
3958  010062  004737  017612        1$:     JSR     PC,LINE6D       ;PRINT LINE 6D OF ERROR MESSAGE
3959  010066  004737  017622        2$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3960  010072  000207                        RTS     PC
3961
3962                                  ;PROCESS 'SKI' OR 'OCYL' ERRORS
3963
3964  010074  004737  016002        SKIER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3965  010100  104412  045744                DISPLY  ,EM50           ;'SKI' OR 'OCYL' ERROR
3966  010104  004737  016046                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3967  010110  004737  016600                JSR     PC,LINE3B       ;PRINT LINE 3B OF ERROR MESSAGE
3968  010114  004737  021356                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3969  010120  004737  021306                JSR     PC,INCSKI       ;INCREMENT 'SKI' OR 'OCYL' ERROR COUNT
3970  010124  004737  017750                JSR     PC,LINE7A       ;PRINT LINE 7A OF ERROR MESSAGE
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3971  010130  000207                          RTS     PC
3972
3973                                  ;REPORT WRITE CLOCK FAILURE ('WCF')
3974
3975  010132  004737  016002          WCFER:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3976  010136  104412  045303                  DISPLY  ,EM34           ;REPORT WRITE CLOCK FAILURE
3977  010142  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3978  010146  004737  016426                  JSR     PC,LINE3A       ;PRINT LINE 3A OF ERROR MESSAGE
3979  010152  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
3980  010156  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3981  010162  004737  012610                  JSR     PC,PRTBAD       ;SEE IF BAD SECTOR TO BE PRINTED
3982  010166  012760  001400  000022          MOV     #1400,$RETRY(R0)  ;RETRY COUNT
3983  010174  012760  000040  000024          MOV     #BIT05,$MASK(R0)  ;ERROR MASK
3984  010202  004737  013146                  JSR     PC,RETRY        ;RETRY THE ORDER
3985  010206  000405                          BR      2$              ;RETURN HERE IF RETRY UNSUCESSFUL
3986  010210  004737  017562                  JSR     PC,LINE6C       ;PRINT LINE 6C OF ERROR MESSAGE
3987  010214  004737  017622          1$:     JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
3988  010220  000207                          RTS     PC
3989  010222  004737  017612          2$:     JSR     PC,LINE6D       ;PRINT LINE 6D OF ERROR MESSAGE
3990  010226  000772                          BR      1$
3991
3992                                  ;PROCESS DRIVE UNSAFE ERROR
3993
3994  010230  004737  016002          UNSAF:  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
3995  010234  104412  046055                  DISPLY  ,EM60           ;REPORT DRIVE UNSAFE
3996  010240  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
3997  010244  004737  016420                  JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
3998  010250  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
3999  010254  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
4000  010260  000207                          RTS     PC
4001
4002                                  ;REPORT AN 'UNKNOWN' DATA PATTERN
4003
4004  010262  105737  011407          NOMTCH: TSTB    FRSTER          ;FIRST ERROR IN THE SECTOR ?
4005  010266  001013                          BNE     1$              ;BR IF NOT OR IF PROCESSING 'DCKER'
4006  010270  004737  016002                  JSR     PC,LINE1        ;TYPE LINE 1 OF ERROR MESSAGE
4007  010274  104412  045613                  DISPLY  ,EM43           ;'CAN'T MATCH DATA WITH PATTERN'
4008  010300  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
4009  010304  004737  016426                  JSR     PC,LINE3A       ;PRINT LINE 3A OF ERROR MESSAGE
4010  010310  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
4011  010314  000404                          BR      2$              ;CONTINUE PROCESSING ERROR
4012  010316  104412  045613          1$:     DISPLY  ,EM43           ;'CAN'T MATCH DATA WITH PATTERN'
4013  010322  104412  001165                  DISPLY  ,$CRLF          ;CR-LF
4014  010326  104412  050701          2$:     DISPLY  ,LIN9I          ;HEADER FOR DATA PRINTOUT
4015  010332  010146                          MOV     R1,-(SP)        ;ADDRESS OF WORD 1
4016  010334  004737  024740                  JSR     PC,PRTOCT       ;PRINT IT
4017  010340  104412  051364                  DISPLY  ,LINSP          ;SPACES
4018  010344  012146                          MOV     (R1)+,-(SP)     ;WORD 1
4019  010346  004737  024740                  JSR     PC,PRTOCT       ;PRINT IT
4020  010352  104412  001165                  DISPLY  ,$CRLF          ;CR-LF
4021  010356  010146                          MOV     R1,-(SP)        ;ADDRESS OF WORD 2
4022  010360  004737  024740                  JSR     PC,PRTOCT       ;PRINT IT
4023  010364  104412  051364                  DISPLY  ,LINSP          ;SPACES
4024  010370  012146                          MOV     (R1)+,-(SP)     ;WORD 2
4025  010372  004737  024740                  JSR     PC,PRTOCT       ;PRINT IT
4026  010376  104412  001165                  DISPLY  ,$CRLF          ;CR-LF
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4027  010402  010146                        MOV     R1,-(SP)        ;ADDRESS OF WORD 3
4028  010404  004737  024740                JSR     PC,PRTOCT       ;PRINT IT
4029  010410  104412  051364                DISPLY  ,LINSP          ;SPACES
4030  010414  012146                        MOV     (R1)+,-(SP)     ;WORD 3
4031  010416  004737  024740                JSR     PC,PRTOCT       ;PRINT IT
4032  010422  104412  001165                DISPLY  ,$CRLF          ;CR-LF
4033  010426  010146                        MOV     R1,-(SP)        ;ADDRESS OF WORD 4
4034  010430  004737  024740                JSR     PC,PRTOCT       ;PRINT IT
4035  010434  104412  051364                DISPLY  ,LINSP          ;SPACES
4036  010440  012146                        MOV     (R1)+,-(SP)     ;WORD 4
4037  010442  004737  024740                JSR     PC,PRTOCT       ;PRINT IT
4038  010446  104412  001165                DISPLY  ,$CRLF          ;CR-LF
4039  010452  062701  000770                ADD     #770,R1         ;INCREMENT BUFFER POINTER
4040  010456  060237  011414                ADD     R2,ERCTR        ;ADD SECTOR (OR LESS) COUNT TO THE
4041                                                                 ;COMPARSION ERROR COUNT
4042  010462  005002                        CLR     R2              ;CLEAR 'WORDS TO COMPARE' COUNT IN R2
4043  010464  112737  177777  011407        MOVB    #-1,FRSTER      ;SET 'NOT FIRST ERROR' INDICATOR
4044  010472  000207                        RTS     PC              ;RETURN
4045
4046                                ;CHECK ERROR BITS IN THE RH11 & RP04 REGISTERS
4047
4048  010474  032760  060000  000164  CKERR: BIT     #60000,$RHCS1(R0)  ;SEE IF 'TRE' OR 'MCPE' SET
4049  010502  001015                        BNE     1$              ;BR IT EITHER SET
4050  010504  032760  177400  000174        BIT     #177400,$RHCS2(R0)  ;SEE IF ERROR BITS IN CS2 SET
4051  010512  001011                        BNE     1$              ;BR IF ANY SET
4052  010514  005760  000200                TST     $RHEP1(R0)      ;ANY BITS SET IN ER1
4053  010520  001006                        BNE     1$              ;BR IF ANY SET
4054  010522  005760  000224                TST     $RHER2(R0)      ;ANY BITS SET IN ER2 ?
4055  010526  001003                        BNE     1$              ;BR IF ANY SET
4056  010530  005760  000226                TST     $RHER3(R0)      ;ANY BITS SET IN ER3 ?
4057  010534  001416                        BEQ     2$              ;BR IF NONE SET
4058  010536  004737  016002        1$:     JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
4059  010542  104412  045660                DISPLY  ,EM44           ;ERROR BITS SET, BUT 'SC' OR 'TRE' NOT SET
4060  010546  004737  016046                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
4061  010552  004737  016420                JSR     PC,LINE3        ;PRINT LINE 3 OF ERROR MESSAGE
4062  010556  004737  017156                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
4063  010562  004737  021356                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
4064  010566  004737  017622                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
4065  010572  000207                2$:     RTS     PC              ;RETURN
4066
4067                                ;CHECK BUS ADDRESS REGISTER & WORD COUNT REGISTER
4068
4069  010574  005760  000166        CKBUS:  TST     $RHWC(R0)       ;CHECK WORD COUNT
4070  010600  001010                        BNE     1$              ;BR IF NOT ZERO
4071  010602  016046  000020                MOV     $WRDL(R0),-(SP) ;WORD LENGTH
4072  010606  006316                        ASL     (SP)            ;CHANGE INTO BYTE COUNT
4073  010610  066016  000005                ADD     $BUF(R0),(SP)   ;ADD THE STARTING LOCATION
4074  010614  022660  000170                CMP     (SP)+,$RHBA(R0) ;BUFFER ADDRESS PROPER ?
4075  010620  001416                        BEQ     2$              ;BR IF OK
4076  010622  004737  016002        1$:     JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
4077  010626  104412  045472                DISPLY  ,EM41           ;BUS ADDRESS OR WORD COUNT INCORRECT
4078  010632  004737  016046                JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
4079  010636  004737  016734                JSR     PC,LINE3D       ;PRINT LINE 3D OF ERROR MESSAGE
4080  010642  004737  017156                JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
4081  010646  004737  021356                JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
4082  010652  004737  017622                JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
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4083  010656  000207                    2$:     RTS     PC
4084
4085                                    ;COMPARE THE BUFFER
4086
4087  010660  132760  000004  000030  CMPAR:  BITB    #BIT02,$CODE(R0)  ;SEE IF READ ORDER
4088  010666  001001                    BNE     .+4             ;BR IF IT IS
4089  010670  000207                    RTS     PC              ;RETURN
4090  010672  032737  000002  001140    BIT     #SW01,SWR       ;IS SWITCH 1 SET?
4091  010700  001401                    BEQ     .+4             ;BR IF NOT
4092  010702  000207                    RTS     PC              ;YES, DON'T COMPARE
4093  010704  105037  011407            CLRB    FRSTER          ;CLEAR 'FIRST ERROR' INDICATOR
4094  010710  005037  011414    CMPARD: CLR     ERCTR           ;CLEAR THE ERROR COUNTER
4095  010714  016001  000006            MOV     $BUF(R0),R1     ;BUFFER ADDRESS
4096  010720  016037  000020  011420    MOV     $WRDL(R0),CMCNT  ;WORD COUNT TO WORKING LOCATION
4097  010726  066037  000166  011420    ADD     $RHWC(R0),CMCNT  ;CALCULATE ACTUAL WORDS TRANSFERED
4098  010734  016037  000012  011422    MOV     $CYL(R0),CMCYL  ;CYLINDER ADDRESS WORKING LOCATION
4099  010742  052737  010000  011422    BIS     #BIT12,CMCYL    ;SET FORMAT BIT
4100  010750  016037  000010  011424    MOV     $SEC(R0),CMSEC  ;SECTOR & TRACK ADDRESSES TO WORKING LOCNS
4101  010756  013737  001306  011416    MOV     CMPLMT,LIMIT    ;DISPLAY LIMIT
4102  010764  005237  011416            INC     LIMIT           ;CONVERT PARAMETER INTO LIMIT VALUE
4103  010770  112737  177777  011406  CMSTR:  MOVB    #-1,ZROIND      ;CLEAR THE 'ZERO'S' INDICATOR
4104  010776  005037  011410            CLR     SAVER1          ;CLEAR THE R1 SAVE WORD
4105  011002  005037  011412            CLR     SAVER5          ;CLEAR THE R5 SAVE WORD
4106  011006  023760  011420  000026    CMP     CMCNT,$SSEC(R0)  ;IS BUFFER SIZE GREATER THAN ONE SECTOR ?
4107  011014  101003                    BHI     .+10            ;-->  BR IF IT IS
4108  011016  013702  011420            MOV     CMCNT,R2        ;  I  LESS THAN, USE REMAINING BUFFER
4109  011022  000402                    BR      .+6             ;--I->
4110  011024  016002  000026            MOV     $SSEC(R0),R2    ;<-- I  COMPARE SECTOR
4111  011030  166037  000026  011420    SUB     $SSEC(R0),CMCNT ;<----  DECREMENT WORD COUNT
4112  011036  126027  000030  000005    CMPB    $CODE(R0),#5    ;READ HEADER & DATA?
4113  011044  001036                    BNE     CMDAT           ;BR IF NOT
4114  011046  023721  011422    CM4ED:  CMP     CMCYL,(R1)+     ;CHECK CYLINDER
4115  011052  001402                    BEQ     .+6             ;BR IF COMPARE OK
4116  011054  004737  011130            JSR     PC,1$           ;REPORT ERROR
4117  011060  023721  011424            CMP     CMSEC,(R1)+     ;COMPARE SECTOR & TRACK
4118  011064  001402                    BEQ     .+6             ;BR IF EQ
4119  011066  004737  011130            JSR     PC,1$           ;REPORT ERROR
4120  011072  005721                    TST     (R1)+           ;1ST KEY WORD ZERO?
4121  011074  001402                    BEQ     .+6             ;BR IF IT IS
4122  011076  004737  011130            JSR     PC,1$           ;REPORT ERROR
4123  011102  005721                    TST     (R1)+           ;CHECK 2ND KEY WORD
4124  011104  001402                    BEQ     .+6             ;BR IF ZERO
4125  011106  004737  011130            JSR     PC,1$           ;REPORT THE ERROR
4126  011112  162702  000004            SUB     #4,R2           ;SUBTRACT HEADER LENGTH FROM SIZE
4127  011116  003530                    BLE     CMPRX           ;BR IF FINISHED
4128  011120  022702  000004            CMP     #4,R2           ;SEE IF AT LEAST 4 MORE WORDS TO CHECK
4129  011124  101125                    BHI     CMPRX           ;BR IF NOT
4130  011126  000405                    BR      CMDAT           ;COMPARE THE DATA PORTION
4131  011130  005237  011414    1$:     INC     ERCTR           ;INCREMENT THE ERROR COUNT
4132  011134  004737  011426            JSR     PC,CMPRT        ;REPORT THE COMPARISON ERROR
4133  011140  000207                    RTS     PC              ;CHECK THE REST OF THE HEADER
4134  011142  004737  011746    CMDAT:  JSR     PC,MATCH        ;FIND THE PATTERN
4135  011146  000403                    BR      2$              ;FOUND A PATTERN
4136  011150  004737  010262            JSR     PC,NOMTCH       ;RETURN HERE IF NO MATCH WITH PATTERN MADE
4137  011154  000456                    BR      8$              ;BYPASS COMPARE ROUTINE
4138  011156  011405            2$:     MOV     (R4),R5         ;ADDRESS OF PATTERN ADDRESS IN R4
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4139  011160  012703  000020            MOV     #20,R3          ;R3 IS PATTERN POS COUNTER
4140  011164  022125                3$:  CMP     (R1)+,(R5)+     ;COMPARE BUFFER WITH PATTERN
4141  011166  001016                     BNE     5$              ;BR IF NOT EQUAL
4142  011170  005737  011414            TST     ERCTR           ;ERRORS DETECTED ?
4143  011174  001406                     BEQ     4$              ;BR IF NO ERRORS
4144  011176  032737  000010  001140    BIT     #SW3,SWR        ;SWITCH 3 SET ?
4145  011204  001402                     BEQ     4$              ;BR IF NOT SET
4146  011206  004737  011426            JSR     PC,CMPRT        ;DISPLAY THE WORD
4147  011212  005302                4$:  DEC     R2              ;DECREMENT SIZE COUNT
4148  011214  001436                     BEQ     8$              ;BR WHEN AT END
4149  011216  005303                     DEC     R3              ;DECREMENT PATT POS COUNT
4150  011220  001361                     BNE     3$              ;BR IF NOT AT END OF PATT
4151  011222  000755                     BR      2$              ;RESTART THE PATTERN
4152  011224  005761  177776        5$:  TST     -2(R1)          ;IS MISCOMPARED CHARACTER=0
4153  011230  001410                     BEQ     6$              ;BR IF YES
4154  011232  112737  177777  011406    MOVB    #-1,ZROIND      ;SET NON-ZERO MISCOMPARED IND
4155  011240  005237  011414            INC     ERCTR           ;INCREMENT THE ERROR COUNTER
4156  011244  004737  011426            JSR     PC,CMPRT        ;REPORT ERROR
4157  011250  000760                     BR      4$              ;CONTINUE COMPARE
4158  011252  105737  011407        6$: TSTB    FRSTER          ;FIRST ERROR?
4159  011256  100407                     BMI     7$              ;BR IF NOT
4160  011260  105037  011406            CLRB    ZROIND          ;SET THE ZERO INDICATOR
4161  011264  010137  011410            MOV     R1,SAVER1       ;SAVE CURRENT R1
4162  011270  010537  011412            MOV     R5,SAVER5       ;SAVE CURRENT R5
4163  011274  000746                     BR      4$              ;CONTINUE COMPARE
4164  011276  105737  011406        7$: TSTB    ZROIND          ;ANY MISCOMPARIONS NOT ZEROS ?
4165  011302  001743                     BEQ     4$              ;BR IF NONE-ALL ERRORS=ZERO
4166  011304  004737  011426            JSR     PC,CMPRT        ;REPORT ERROR
4167  011310  000740                     BR      4$              ;CONTINUE COMPARING
4168  011312  005737  011420        8$: TST     CMCNT           ;AT END OF BUFFER
4169  011316  003430                     BLE     CMPRX           ;BR IF AT END
4170  011320  126027  000030  000005    CMPB    $CODE(R0),#5    ;SEE IF READ HEADER & DATA
4171  011326  001220                     BNE     CMSTR           ;BR IF NOT
4172  011330  105237  011424            INCB    CMSEC           ;INCREMENT SECTOR
4173  011334  123727  011424  000026    CMPB    CMSEC,#22.      ;SECTOR GREATER THAN MAX ?
4174  011342  103612                     BLO     CMSTR           ;BR IF NOT GREATER THAN MAX
4175  011344  105037  011424            CLRB    CMSEC           ;CLEAR SECTOR ADDRESS
4176  011350  105237  011425            INCB    CMTRK           ;INCREMENT TRACK
4177  011354  123727  011425  000023    CMPB    CMTRK,#19.      ;TRACK GREATER THAN MAX ?
4178  011362  103602                     BLO     CMSTR           ;BR IF NOT GREATER
4179  011364  105037  011425            CLRB    CMTRK           ;RESET TRACK ADDRESS
4180  011370  005237  011422            INC     CMCYL           ;INCREMENT CYLINDER ADDRESS
4181  011374  000137  010770            JMP     CMSTR           ;CONTINUE WITH COMPARE
4182  011400  004737  011702  CMPRX:    JSR     PC,ENDCMP       ;PRINT LAST LINE IF ERRORS
4183  011404  000207                     RTS     PC
4184
4185  011406     377  ZROIND: .BYTE   -1              ;ZERO INDICATOR
4186  011407     000  FRSTER: .BYTE   0               ;FIRST ERROR INDICATOR
4187                                                  ;IF > 0, PROCESSING 'DCKER'
4188                                                  ;IF < 0, MISCOMPARSION FOUND
4189  011410  000000  SAVER1: .WORD   0               ;SAVE R1 HERE
4190  011412  000000  SAVER5: .WORD   0               ;SAVE R5 HERE
4191  011414  000000  ERCTR:  .WORD   0               ;NUMBER OF ERRORS
4192  011416  000000  LIMIT:  .WORD   0               ;DISPLAY LIMIT
4193  011420  000000  CMCNT:  .WORD   0               ;WORD COUNT
4194  011422  000000  CMCYL:  .WORD   0               ;CYLINDER ADDRESS
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4195  011424  000                       CMSEC:  .BYTE   0               ;SECTOR ADDRESS
4196  011425  000                       CMTRK:  .BYTE   0               ;TRACK ADDRESS
4197
4198                                    ;TYPE DATA COMPARE ERRORS
4199
4200  011426  005737  011410          CMPRT:  TST     SAVER1          ;PRINT SAVED VALUES ?
4201  011432  001010                          BNE     2$              ;BR IF NOT
4202  011434  105737  011407                  TSTB    FRSTER          ;FIRST ERROR?
4203  011440  100402                          BMI     1$              ;BR IF NOT
4204  011442  004737  011522                  JSR     PC,4$           ;PRINT INITIAL MESSAGE INFO
4205  011446  004737  011604          1$:     JSR     PC,8$           ;PRINT REMAINDER OF MESSAGE
4206  011452  000422                          BR      3$              ;EXIT
4207  011454                          2$:
4208  011454  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
4209  011456  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
4210  011460  013701  011410                  MOV     SAVER1,R1       ;DISPLAY SAVED R1
4211  011464  013705  011412                  MOV     SAVER5,R5       ;DISPLAY SAVED R5
4212  011470  004737  011522                  JSR     PC,4$           ;PRINT INITIAL MESSAGE INFO
4213  011474  004737  011604                  JSR     PC,8$           ;PRINT SAVED VALUES
4214  011500  005037  011410                  CLR     SAVER1          ;CLEAR SAVED REGISTER INDICATORS
4215  011504  005037  011412                  CLR     SAVER5          ;CLEAR THE OTHER ONE
4216  011510  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
4217  011512  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
4218  011514  004737  011604                  JSR     PC,8$           ;PRINT REMAINDER OF MESSAGE
4219  011520  000207                  3$:     RTS     PC              ;RETURN
4220  011522  105737  011407          4$:     TSTB    FRSTER          ;FIRST ERROR ?
4221  011526  100425                          BMI     7$              ;BR IF NOT
4222  011530  001013                          BNE     5$              ;BR IF FIRST ERROR AND PROCESSING 'DCK' ERROR
4223  011532  004737  016002                  JSR     PC,LINE1        ;PRINT LINE 1 OF ERROR MESSAGE
4224  011536  104412  045536                  DISPLY  ,EM42           ;DATA COMPARE ERROR
4225  011542  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
4226  011546  004737  016426                  JSR     PC,LINE3A       ;PRINT LINE 3A OF ERROR MESSAGE
4227  011552  004737  017156                  JSR     PC,LINE4        ;PRINT LINE 4 OF ERROR MESSAGE
4228  011556  000404                          BR      6$
4229  011560  104412  050574          5$:     DISPLY  ,LIN9B          ;HEADER MESSAGE OF PROCESSING 'DCK' ERROR
4230  011564  104412  001165                  DISPLY  ,$CRLF
4231  011570  104412  050623          6$:     DISPLY  ,LIN9H          ;DISPLAY HEADER
4232  011574  112737  177777  011407          MOVB    #-1,FRSTER      ;SET FIRST ERROR INDICATOR
4233  011602  000207                  7$:     RTS     PC              ;RETURN
4234  011604  005737  011416          8$:     TST     LIMIT           ;TYPEOUT LIMIT REACHED ?
4235  011610  001403                          BEQ     9$              ;BR IF IT HAS
4236  011612  005337  011416                  DEC     LIMIT           ;DECREMENT LIMIT COUNTER
4237  011616  001005                          BNE     10$             ;BR IF NOT AT LIMIT
4238  011620  032737  000200  001140  9$:     BIT     #SW07,SWR       ;PRINT ALL DATA COMPARE ERRORS ?
4239  011626  001001                          BNE     10$             ;BR IF YES
4240  011630  000207                          RTS     PC              ;RETURN
4241  011632  010146                  10$:    MOV     R1,-(SP)        ;BUFFER ADDRESS
4242  011634  162716  000002                  SUB     #2,(SP)         ;ADJUST ADDRESS
4243  011640  004737  024740                  JSR     PC,PRTOCT       ;PRINT IT
4244  011644  104412  051364                  DISPLY  ,LINSP          ;2 SPACES
4245  011650  016546  177776                  MOV     -2(R5),-(SP)    ;GOOD DATA
4246  011654  004737  024740                  JSR     PC,PRTOCT       ;PRINT IT
4247  011660  104412  051364                  DISPLY  ,LINSP          ;2 SPACES
4248  011664  016146  177776                  MOV     -2(R1),-(SP)    ;BAD DATA
4249  011670  004737  024740                  JSR     PC,PRTOCT       ;PRINT IT
4250  011674  104412  001165                  DISPLY  ,$CRLF          ;CR-LF
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4251  011700  000207                        RTS     PC              ;RETURN
4252
4253                                  ;LAST LINE OF COMPARE ERROR REPORTING
4254
4255  011702  005737  011414          ENDCMP: TST     ERCTR           ;SEE IF ANY ERRORS
4256  011706  001416                          BEQ     1$              ;BR IF NOT
4257  011710  104412  050721                  DISPLY  ,LIN9E          ;'NUMBER OF ERRORS='
4258  011714  013746  011414                  MOV     ERCTR,-(SP)     ;NUMBER OF ERRORS
4259  011720  004737  030232                  JSR     PC,$S82D        ;CONVERT IT
4260  011724  004737  025576                  JSR     PC,$SUPRS       ;PRINT IT
4261  011730  104412  001165                  DISPLY  ,$CRLF          ;CR-LF
4262  011734  004737  021356                  JSR     PC,INCTOT       ;INCREMENT TOTAL ERROR COUNT
4263  011740  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7 OF ERROR MESSAGE
4264  011744  000207                  1$:     RTS     PC
4265
4266
4267                                  ;FIND THE CORRECT PATTERN - RETURN WITH ADDRESS OF PATTERN IN R4
4268                                  ;       RETURN +2 IF PATTERN CAN'T BE FOUND
4269
4270  011746  010146                  MATCH:  MOV     R1,-(SP)        ;SAVE R1 ON THE STACK
4271  011750  012704  000044                  MOV     #44,R4          ;PATTERN TABLE INDEX
4272  011754  011601                  1$:     MOV     (SP),R1         ;RELOAD R1
4273  011756  162704  000002                  SUB     #2,R4           ;DECREMENT INDEX
4274  011762  016405  042646                  MOV     STNDAT(R4),R5   ;ADDRESS OF PATTERN ADDRESS
4275  011766  001411                          BEQ     3$              ;BR IF ALL PATTERNS CHECKED AND NO MATCH
4276                                                                  ;FOUND
4277  011770  012703  000004                  MOV     #4,R3           ;NUMBER OF LOCATIONS TO CHECK
4278  011774  022125                  2$:     CMP     (R1)+,(R5)+     ;COMPARE THE BUFFER AGAINST THE PATTERN
4279  011776  001366                          BNE     1$              ;BR IF NOT EQUAL, TRY NEXT PATTERN
4280  012000  005303                          DEC     R3              ;FINISHED CHECKING?
4281  012002  001374                          BNE     2$              ;BR IF NOT FINISHED
4282  012004  062704  042646                  ADD     #STNDAT,R4      ;MAKE PATTERN ADDRESS ABSOLUTE
4283  012010  000403                          BR      4$              ;EXIT
4284  012012  062766  000002  000002  3$:     ADD     #2,2(SP)        ;INCREMENT RETURN ADDRESS
4285  012020  012601                  4$:     MOV     (SP)+,R1        ;RESTORE R1
4286  012022  000207                          RTS     PC              ;RETURN
4287
4288                                  ;USE ECC TO CORRECT THE DATA ERROR
4289
4290  012024  016037  000170  012566  ECC:    MOV     $RHBA(R0),ECSEC ;ADDRESS OF LAST LOCN XFERED
4291  012032  016046  000166                  MOV     $RHWC(R0),-(SP) ;ACT WORDS XFERED (2'S COMP)
4292  012036  066016  000020                  ADD     $WRDL(R0),(SP)  ;ADD WORDS REQUESTED
4293  012042  005046                          CLR     -(SP)           ;CLEAR NEXT STACK LOCN
4294  012044  016046  000026                  MOV     $SSEC(R0),-(SP) ;SECTOR SIZE
4295  012050  004737  024224                  JSR     PC,LINKDV       ;DIVIDE WORDS XFERED BY SECTOR SIZE
4296  012054  005716                          TST     (SP)            ;PARTIAL SECTOR XFERED ?
4297  012056  001413                          BEQ     1$              ;BR IF NOT
4298  012060  006316                          ASL     (SP)            ;CONVERT INTO NUMBER OF BYTES
4299  012062  161637  012566                  SUB     (SP),ECSEC      ;SUBTRACT SECTOR RESIDUE
4300  012066  126027  000030  000005          CMPB    $CODE(R0),#5    ;WAS OP READ HEAD & DATA
4301  012074  001007                          BNE     2$              ;BR IF NOT
4302  012076  062737  000010  012566          ADD     #8.,ECSEC       ;ADD HEADER SIZE (IN BYTES) BACK IN
4303  012104  000403                          BR      2$              ;GO ADJUST THE STACK POINTER
4304  012106  162737  001000  012566  1$:     SUB     #1000,ECSEC     ;SUBTRACT SECTOR DATA FIELD SIZE (IN BYTES)
4305  012114  062706  000004          2$:     ADD     #4,SP           ;ADJUST THE STACK POINTER
4306  012120  016037  000230  012564          MOV     $RHEC1(R0),ECBIT  ;ECC POSITION COUNT
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 4307  012126  005337  012564                    DEC     ECBIT           ;ADJUST THE POSITION COUNT
 4308  012132  013737  012564  012574            MOV     ECBIT,ECWRD     ;LOAD THE WORD COUNT LOCATION
 4309  012140  042737  177760  012564            BIC     #^C17,ECBIT     ;SAVE THE BIT OFFSET COUNT
 4310  012146  042737  000017  012574            BIC     #17,ECWRD       ;CLEAR THE BIT OFFSET
 4311  012154  006237  012574                    ASR     ECWRD           ;CHANGE TO BYTE COUNT
 4312  012160  006237  012574                    ASR     ECWRD           ;CHANGE TO BYTE COUNT
 4313  012164  006237  012574                    ASR     ECWRD           ;CHANGE TO BYTE COUNT
 4314  012170  104412  051000                    DISPLY  ,LIN10A         ;'ERROR BURST BEGINS AT '
 4315  012174  013746  012574                    MOV     ECWRD,-(SP)     ;PUT THE WORD COUNT ON THE STACK
 4316  012200  006216                            ASR     (SP)            ;CONVERT TO WORD COUNT FOR MESSAGE
 4317  012202  004737  030232                    JSR     PC,$SB2D        ;CONVERT THE WORD COUNT
 4318  012206  004737  025576                    JSR     PC,$SUPRS       ;PRINT IT
 4319  012212  104412  051034                    DISPLY  ,LIN10B         ;' IN DATA FIELD OF ERROR SECTOR'
 4320  012216  063737  012566  012574            ADD     ECSEC,ECWRD     ;FIND THE BEGINNING OF THE ERROR BURST
 4321  012224  026037  000170  012574            CMP     $RHBA(R0),ECWRD  ;SEE IF BURST WAS IN DATA READ
 4322  012232  101002                            BHI     .+6             ;BR IF IN DATA READ
 4323  012234  000137  012552                    JMP     ECC2            ;NOT IN DATA READ - REPORT IT
 4324  012240  016037  000232  012570            MOV     $RHEC2(R0),ECMSK0  ;GET THE ERROR MASK
 4325  012246  005037  012572                    CLR     ECMSK1          ;CLEAR THE UPPER MASK WORD
 4326  012252  005737  012564          3$:       TST     ECBIT           ;BIT OFFSET EQUAL ZERO
 4327  012256  001407                            BEQ     4$              ;BR IF IT IS
 4328  012260  005337  012564                    DEC     ECBIT           ;DECREMENT THE BIT OFFSET COUNT
 4329  012264  006337  012570                    ASL     ECMSK0          ;SHIFT THE ERROR MASK
 4330  012270  006137  012572                    ROL     ECMSK1          ;SHIFT THE LOWER INTO THE UPPER
 4331  012274  000766                            BR      3$              ;CONTINUE THE SHIFT
 4332  012276  017737  000272  012600  4$:       MOV     @ECWRD,ECBAD0   ;SAVE THE INCORRECT WORD
 4333  012304  005037  012602                    CLR     ECWRD1          ;CLEAR SECOND INCORRECT WORD ADDRESS
 4334  012310  013746  012570                    MOV     ECMSK0,-(SP)    ;PUT LOWER MASK ON STACK
 4335  012314  047716  000254                    BIC     @ECWRD,(SP)     ;CLEAR ERRONEOUS ONE BITS FROM MASK
 4336  012320  043777  012570  000246            BIC     ECMSK0,@ECWRD   ;CLEAR ERRONEOUS ONE BITS FROM BAD WORD
 4337  012326  052677  000242                    BIS     (SP)+,@ECWRD    ;SET DROPPED BITS
 4338  012332  005737  012572                    TST     ECMSK1          ;DOES BURST GO INTO NEXT WORD ?
 4339  012336  001431                            BEQ     ECC1            ;BR IF BURST ONLY IN ONE WORD
 4340  012340  013737  012574  012602            MOV     ECWRD,ECWRD1    ;DUPLICATE ADDRESS
 4341  012346  062737  000002  012602            ADD     #2,ECWRD1       ;INCREMENT ERROR ADDRESS
 4342  012354  026037  000170  012602            CMP     $RHBA(R0),ECWRD1  ;IS NEXT WORD IN THE BUFFER
 4343  012362  101003                            BHI     5$              ;BR IF IT IS
 4344  012364  005037  012602                    CLR     ECWRD1          ;CLEAR 2ND WORD ADDRESS
 4345  012370  000414                            BR      ECC1            ;PRINT WORD CORRECTED
 4346  012372  017737  000204  012606  5$:       MOV     @ECWRD1,ECBAD1  ;SAVE THE SECOND BAD WORD
 4347  012400  013746  012572                    MOV     ECMSK1,-(SP)    ;PUT THE UPPER MASK ON THE STACK
 4348  012404  047716  000172                    BIC     @ECWRD1,(SP)    ;CLEAR ERRONEOUS ONE BITS FROM UPPER MASK
 4349  012410  043777  012572  000164            BIC     ECMSK1,@ECWRD1  ;CLEAR ERRONEOUS ONE BITS FROM DATA WORD
 4350  012416  052677  000160                    BIS     (SP)+,@ECWRD1   ;SET DROPPED BITS
 4351  012422  104412  051202          ECC1:     DISPLY  ,LIN10H         ;HEADER
 4352  012426  013746  012574                    MOV     ECWRD,-(SP)     ;PUT ECWRD ON THE STACK
 4353  012432  004737  024740                    JSR     PC,PRTOCT       ;PRINT ECWRD
 4354  012436  104412  051364                    DISPLY  ,LINSP          ;SPACES
 4355  012442  013746  012600                    MOV     ECBAD0,-(SP)    ;PUT ECBAD0 ON THE STACK
 4356  012446  004737  024740                    JSR     PC,PRTOCT       ;PRINT ECBAD0
 4357  012452  104412  051364                    DISPLY  ,LINSP          ;SPACES
 4358  012456  017746  000112                    MOV     @ECWRD,-(SP)    ;PUT @ECWRD ON THE STACK
 4359  012462  004737  024740                    JSR     PC,PRTOCT       ;PRINT @ECWRD
 4360  012466  104412  051364                    DISPLY  ,LINSP          ;SPACES
 4361  012472  005737  012602                    TST     ECWRD1          ;PRINT THE NEXT WORD ?
 4362  012476  001427                            BEQ     ECCX            ;BR IF NOT
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 4363  012500  104412  001165                DISPLY  $CRLF           ;CR-LF
 4364  012504  013746  012602                MOV     ECWRD1,-(SP)    ;PUT ECWRD1 ON THE STACK
 4365  012510  004737  024740                JSR     PC,PRTOCT       ;PRINT ECWRD1
 4366  012514  104412  051364                DISPLY  ,LINSP          ;SPACES
 4367  012520  013746  012606                MOV     ECBAD1,-(SP)    ;PUT ECBAD1 ON THE STACK
 4368  012524  004737  024740                JSR     PC,PRTOCT       ;PRINT ECBAD1
 4369  012530  104412  051364                DISPLY  ,LINSP          ;SPACES
 4370  012534  017746  000042                MOV     @ECWRD1,-(SP)   ;PUT @ECWRD1 ON THE STACK
 4371  012540  004737  024740                JSR     PC,PRTOCT       ;PRINT @ECWRD1
 4372  012544  104412  051364                DISPLY  ,LINSP          ;SPACES
 4373  012550  000402                        BR      ECCX            ;EXIT
 4374  012552  104412  051075        ECC2:   DISPLY  ,LIN10C         ;ERROR BURST WAS NOT TRANSFERED TO MEMORY
 4375  012556  104412  001165        ECCX:   DISPLY  $CRLF           ;CR-LF
 4376  012562  000207                        RTS     PC              ;RETURN
 4377
 4378  012564  000000                ECBIT:  .WORD   0               ;ERROR BURST BIT OFFSET
 4379  012566  000000                ECSEC:  .WORD   0               ;ERROR BURST WORD OFFSET (RELATIVE TO SECTOR)
 4380  012570  000000                ECMSK0: .WORD   0               ;CORRECTION MASK FOR FIRST ERROR WORD
 4381  012572  000000                ECMSK1: .WORD   0               ;CORRECTION MASK FOR SECOND ERROR WORD
 4382  012574  000000                ECWRD:  .WORD   0               ;LOCATION OF FIRST ERROR WORD
 4383  012576  000000                ECGD:   .WORD   0               ;GOOD DATA, FIRST WORD
 4384  012600  000000                ECBAD0: .WORD   0               ;BAD DATA, FIRST WORD
 4385  012602  000000                ECWRD1: .WORD   0               ;LOCATION OF SECOND ERROR WORD
 4386  012604  000000                ECGD1:  .WORD   0               ;GOOD DATA, SECOND WORD
 4387  012606  000000                ECBAD1: .WORD   0               ;BAD DATA, ECOND WORD
 4388
 4389                                ;ROUTINE TO DISPLAY THE SECTOR WHICH GAVE THE HARD ERROR
 4390
 4391  012610  032737  000010  001140  PRTBAD: BIT     #SW3,SWR        ;PRINT THE BAD SECTOR ?
 4392  012616  001460                        BEQ     6$              ;BR IF NOT
 4393  012620  016001  000170                MOV     $RHBA(R0),R1    ;PUT THE END ADDRESS INTO R1
 4394  012624  016046  000020                MOV     $WRDL(R0),-(SP) ;FIND THE BEGINNING OF THE SECTOR
 4395  012630  066016  000166                ADD     $RHWC(R0),(SP)  ;SUBTRACT THE WORDS NOT TRANSFERED
 4396  012634  005046                        CLR     -(SP)           ;MAKE THE UPPER DIVIDEND 0
 4397  012636  016046  000026                MOV     $SSEC(R0),-(SP)  ;DIVDE THE WORDS TRANSFERED BY THE SECTOR SIZE
 4398  012642  004737  024224                JSR     PC,LINKDV       ;DIVIDE
 4399  012646  005716                        TST     (SP)            ;REMANDER = 0 ?
 4400  012650  001403                        BEQ     1$              ;BR IF IT IS - COMPLETE SECTOR TRANSFERED
 4401  012652  006316                        ASL     (SP)            ;CONVERT THE RESIDUAL SECTOR SIZE INTO BYTE COUNT
 4402  012654  161601                        SUB     (SP),R1         ;SUBTRACT IT FROM THE END ADDRESS
 4403  012656  000410                        BR      2$              ;FINISH THE SIZING
 4404  012660  162701  001000          1$:   SUB     #1000,R1        ;SUBTRACT FULL SECTOR SIZE FROM END ADDR
 4405  012664  126027  000030  000005        CMPB    $CODE(R0),#5    ;WAS OPERATION READ HEADER & DATA ?
 4406  012672  001002                        BNE     2$              ;BR IF NOT
 4407  012674  162701  000010                SUB     #10,R1          ;SUBTRACK HEADER SIZE FROM ADDR
 4408  012700  062706  000004          2$:   ADD     #4,SP           ;RESTORE THE STACK POINTER
 4409  012704  104412  051267                DISPLY  ,LIN11H ;PRINT THE HEADER
 4410  012710  012702  000007          3$:   MOV     #7,R2           ;R2 CONTAINS THE WORDS/LINE COUNT
 4411  012714  010146                        MOV     R1,-(SP)        ;PUT THE ADDRESS ON THE STACK
 4412  012716  004737  024740                JSR     PC,PRTOCT       ;PRINT IT
 4413  012722  020160  000170          4$:   CMP     R1,$RHBA(R0)    ;PRINTED ALL THE SECTOR ?
 4414  012726  001412                        BEQ     5$              ;BR IF ALL PRINTED
 4415  012730  104412  051364                DISPLY  ,LINSP          ;SPACES
 4416  012734  012146                        MOV     (R1)+,-(SP)     ;PUT THE DATA ON THE STACK
 4417  012736  004737  024740                JSR     PC,PRTOCT       ;PRINT IT
 4418  012742  005302                        DEC     R2              ;DECREMENT THE HORIZONTAL COUNT
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                                        BNE     4$              ;BR IF NOT AT THE END OF THE LINE
                                        DISPLY  ,$CRLF          ;CR-LF
                                        BR      3$              ;RESTORE THE WORDS/LINE COUNT
                                5$:     DISPLY  ,$CRLF          ;PRINT WHAT REMAINS IN THE BUFFER
                                6$:     RTS     PC              ;RETURN

                                ;ROUTINE TO DO AN RTC - UNIT SELECTED IN R0

                                RTNCTR: MOVB    (R0),GENDPB     ;MOVE THE UNIT # TO THE GENERAL DPB
                                        MOVB    #RTC,GENDPB+$COMND  ;COMMAND CODE
                                        JSR     R0,RP04         ;DRIVER ENTRANCE
                                        GENDPB                  ;DPB ADDRESS FOR ORDER
                                        HALT                    ;DRIVER DIDN'T ACCEPT ORDER
                                        RTS     PC              ;RETURN

                                ;ROUTINE TO DO A RECALIBRATE - UNIT SELECTED IN R0
                                        ;ENTER AT 'RECAL0' IF UNIT NUMBER ALREADY LOADED
                                        ;INTO 'GENDPB'

                                RECALT: MOVB    (R0),GENDPB     ;MOVE THE UNIT # TO THE GENERAL DPB
                                RECAL0: MOVB    #RECAL,GENDPB+$COMND  ;RELCALIBRATE COMMAND
                                        JSR     R0,RP04         ;DRIVER ENTRANCE
                                        GENDPB                  ;DPB ADDRESS FOR ORDER
                                        HALT                    ;DRIVER DIDN'T ACCEPT THE ORDER
                                1$:     TST     GENDPB+$STATUS          ;SEE IF FINISHED
                                        BEQ     1$              ;BR IF NOT FINISHED
                                        RTS     PC              ;RETURN

                                ;OFFSET THE UNIT IN R0 (OFFSET CODE PRELOADED)

                                OFFST:  MOVB    (R0),GENDPB     ;UNIT # TO GENERAL DPB
                                        MOVB    #OFFSET,GENDPB+$COMND ;COMMAND
                                        JSR     R0,RP04         ;DRIVER ENTRANCE
                                        GENDPB                  ;DPB ADDRESS FOR ORDER
                                        HALT                    ;DRIVER DIDN'T ACCEPT ORDER
                                        RTS     PC

                                ;UTILITY READ HEADER ROUTINE
                                ;       ENTER WITH TRACK AND SECTOR ADDRS ON THE STACK

                                READHD: MOVB    2(SP),GENDPB+$TRK ;TRACK ADDRESS
                                        MOVB    4(SP),GENDPB+$SEC ;SECTOR ADDRESS
                                        MOVB    (R0),GENDPB     ;DRIVE NUMBER
                                        MOV     $RHCC(R0),GENDPB+$CYL ;CYLINDER ADDRESS
                                        MOVB    #RDHD,GENDPB+$COMND ;COMMAND
                                        JSR     R0,RP04         ;DRIVER ENTRANCE
                                        GENDPB                  ;DPB ADDRESS FOR ORDER
                                        HALT                    ;DRIVER DIDN'T ACCEPT COMMAND
                                1$:     TST     GENDPB+$STATUS  ;FINISHED?
                                        BEQ     1$              ;BR IF NOT
                                        MOV     (SP)+,2(SP)     ;ADJUST STACK FOR RETURN
                                        TST     (SP)+
                                        RTS     PC              ;RETURN

                                ;RETRY THE PRESENT OPERATION
                                ;       RETURN IF RETRY UNSUCESSFUL
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                                        ;       RETURN+2 IF RETRY SUCESSFUL
                                        ;       RETURN TO MAIN PROGRAM IF DIFFERENT ERROR OCCURS
                                        
013146  004737  014340          RETRY:  JSR     PC,GODRIV       ;RE-START ORDER
013152  005760  000016          1$:     TST     $STATUS(R0)     ;ORDER FINISHED?
013156  001775                          BEQ     1$              ;BR IF NOT
013160  100405                          BMI     2$              ;BR IF ERROR
013162  105260  000022                  INCB    $RETRY(R0)      ;INCREMENT RETRY COUNT
013166  062716  000002                  ADD     #2,(SP)         ;INCREMENT RETURN
013172  000424                          BR      5$              ;GO TO EXIT
013174  032760  000200  000016  2$:     BIT     #BIT7,$STATUS(R0)  ;DID ORDER TERMINATE NORMALLY ?
013202  001427                          BEQ     7$              ;BR IF NOT
013204  005760  000024                  TST     $MASK(R0)       ;IS ERROR MASK 0 ?
013210  001004                          BNE     3$              ;BR IF NOT
013212  005760  000200                  TST     $RHER1(R0)      ;MAKE SURE THAT THE DRIVE ERROR REG IS CLEAR
013216  001013                          BNE     6$              ;BR IF NOT
013220  000404                          BR      4$              ;CONTINUE RETRY
013222  036060  000024  000200  3$:     BIT     $MASK(R0),$RHER1(R0) ;SAME ERROR?
013230  001406                          BEQ     6$              ;BR IF NOT
013232  105260  000022          4$:     INCB    $RETRY(R0)      ;INCREMENT RETRY COUNT
013236  105360  000023                  DECB    $RETRY+1(R0)    ;DECREMENT RETRY LIMIT
013242  001341                          BNE     RETRY           ;BR IF NOT DONE
013244  000207                  5$:     RTS     PC              ;RETURN
013246  004737  020070          6$:     JSR     PC,LINE8        ;REPORT DIFFERENT ERROR
013252  004737  017622                  JSR     PC,LINE7        ;PRINT LINE 7
013256  005726                          TST     (SP)+           ;ADJUST STACK POINTER FOR DIRECT RETURN
013260  000207                          RTS     PC              ;RETURN
013262  104412  050537          7$:     DISPLY  ,LIN8M          ;'DIFFERENT ERROR DURING RETRY'
013266  000137  004560                  JMP     ERPRC1          ;REPORT THE ERROR

                                        ;ROUTINE TO CLEAR THE DPB FOR THE ASSIGNED UNIT

013272                          CLRDPB:
013272  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
013274  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
013276  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
013300  010004                          MOV     R0,R4           ;GET THE DPB ADDRESS
013302  062704  000002                  ADD     #2,R4           ;ADDRESS OF FIRST LOCN TO BE CLEARED
013306  012703  000005                  MOV     #5,R3           ;NUMBER OF LOCNS TO BE CLEARED
013312  005024                          CLR     (R4)+           ;CLEAR THE LOCN
013314  005303                          DEC     R3              ;DECREMENT THE LOCN COUNTER
013316  001375                          BNE     .-4             ;BR IF NOT FINISHED
013320  062704  000002                  ADD     #2,R4           ;MOVE THE ADDRESS PAST THE 'REG' ADDR
013324  012703  000220                  MOV     #$RHEC2+2-$REG,R3  ;NUMBER OF LOCNS TO BE CLEARED
013330  005024                          CLR     (R4)+           ;CLEAR
013332  162703  000002                  SUB     #2,R3           ;DECREMENT THE LOCN COUNTER
013336  001374                          BNE     .-6             ;BR IF NOT FINISHED
013340  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
013342  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
013344  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
013346  000207                          RTS     PC

                                        ;ROUTINE TO UPDATE THE GENERAL STATISTICS FOR THE DRIVE IN R0

013350  016037  000170  013502  STATIS: MOV     $RHBA(R0),FACTOR  ;STORE THE FINAL BUFFER ADDRESS
013356  166037  000006  013502          SUB     $BUF(R0),FACTOR ;SUBTRACT THE INITIAL ADDRESS
```

```
4531  013364  001434                        BEQ     2$              ;BR IF NO DATA TRANSFER
4532  013366  006237  013502                ASR     FACTOR          ;CONVERT TO A WORD COUNT
4533  013372  063760  013502  000052        ADD     FACTOR,$TRANS(R0)  ;UPDATE WORD COUNT
4534  013400  005560  000054                ADC     $TRANS+2(R0)
4535  013404  132760  000002  000030        BITB    #BIT01,$CODE(R0)  ;SEE IF ORDER READ OR WRITE
4536  013412  001021                        BNE     2$              ;BRANCH IF ORDER WRITE
4537  013414  005737  001316                TST     AUTOCK          ;AUTO WRITE CHECKS BEING PERFORMED
4538  013420  001411                        BEQ     1$              ;BR IF NOT
4539  013422  126027  000030  000001        CMPB    $CODE(R0),#1    ;PRESENT OPERATION AN AUTOMATIC WRITE CHECK ?
4540  013430  101005                        BHI     1$              ;BR IF NOT
4541  013432  066060  000020  000052        ADD     $WRDL(R0),$TRANS(R0)  ;ADD WORDS WRITTEN
4542  013440  005560  000054                ADC     $TRANS+2(R0)    ;ADD A CARRY
4543  013444  063760  013502  000056  1$:   ADD     FACTOR,$READ(R0)  ;UPDATE THE READ WORD COUNT
4544  013452  005560  000060                ADC     $READ+2(R0)
4545  013456  026060  000012  000220  2$:   CMP     $CYL(R0),$RHCA(R0)  ;DID MID-TRANSFER SEEK OCCUR
4546  013464  001405                        BEQ     3$              ;BR IF NOT
4547  013466  062760  000001  000046        ADD     #1,$POSIT(R0)   ;INCREMENT SEEK COUNT
4548  013474  005560  000050                ADC     $POSIT+2(R0)    ;ADD CARRY TO UPPER WORD
4549  013500  000207                3$:     RTS     PC
4550
4551  013502  000000                FACTOR: .WORD   0               ;USED FOR WORDS TRANSFERED
4552
4553                                ;ROUTINE TO GET A BUFFER
4554
4555  013504  010146                GETBUF: MOV     R1,-(SP)        ;SAVE R1
4556  013506  022737  000002  042002        CMP     #2,BUFTBL       ;SEE HOW MANY BUFFER BLOCKS ARE IN TABLE
4557  013514  103001                        BHIS    .+4             ;BR IF NOT MORE THAN 2
4558  013516  000240                        NOP                     ;CHANGE TO HALT FOR DEBUGGING
4559  013520  013702  042002                MOV     BUFTBL,R2       ;NUMBER OF SEPARATE BUFFERS
4560  013524  001413                        BEQ     5$              ;BR IF NONE AVAILABLE
4561  013526  012701  042004                MOV     #BUFTBL+2,R1    ;FIRST ADDRESS OF ALLOCATION TABLE
4562  013532  026061  000020  000002  1$:   CMP     $WRDL(R0),2(R1) ;SEE IF THERE IS A BLOCK LARGE ENOUGH
4563  013540  101407                        BLOS    3$              ;BRANCH IF IT IS
4564  013542  005302                        DEC     R2              ;DECREMENT TABLE COUNT
4565  013544  001403                        BEQ     5$              ;BR IF THROUGH TABLE
4566  013546  062701  000004                ADD     #4,R1           ;INCREMENT TABLE POINTER
4567  013552  000767                        BR      1$              ;CONTINUE LOOKING
4568  013554  012601                5$:     MOV     (SP)+,R1        ;RESTORE R1
4569  013556  000207                        RTS     PC              ;RETURN
4570  013560  011166  000004        3$:     MOV     (R1),4(SP)      ;BUFFER ADDRESS TO STACK
4571  013564  166061  000020  000002        SUB     $WRDL(R0),2(R1) ;ADJUST BUFFER SIZE
4572  013572  001407                        BEQ     4$              ;BR IF DIFFERENCE IS ZERO
4573  013574  006360  000020                ASL     $WRDL(R0)       ;CONVERT # WORDS TO BYTES
4574  013600  066011  000020                ADD     $WRDL(R0),(R1)  ;MAKE NEW STARTING ADDRESS
4575  013604  006260  000020                ASR     $WRDL(R0)       ;RETURN # BYTES TO WORDS
4576  013610  000761                        BR      5$              ;RETURN
4577  013612  005337  042002        4$:     DEC     BUFTBL          ;DECREMENT ENTRIES COUNT
4578  013616  001756                        BEQ     5$              ;BR IF ALLOCATION TABLE EMPTY
4579  013620  005302                        DEC     R2              ;DECREMENT TABLE COUNT
4580  013622  001754                        BEQ     5$              ;BR IF ITEM WERE LAST ENTRY
4581  013624  010103                        MOV     R1,R3           ;MOVE TABLE POINTER
4582  013626  062703  000004                ADD     #4,R3           ;POINT TO NEXT ENTRY
4583  013632  012321                6$:     MOV     (R3)+,(R1)+     ;MOVE ITEMS
4584  013634  012321                        MOV     (R3)+,(R1)+
4585  013636  005302                        DEC     R2              ;DECREMENT TABLE COUNT
4586  013640  001374                        BNE     6$              ;CONTINUE IF NOT AT END OF TABLE
```

```
4587  013642  000744                          BR      5$              ;RETURN
4588
4589
4590                                  ;ROUTINE TO PUT BUFFER BACK IN TABLE
4591
4592  013644  010146                  RELBUF: MOV     R1,-(SP)        ;SAVE R1
4593  013646  012701  042004                  MOV     #BUFTBL+2,R1    ;BEGINNING OF TABLE
4594  013652  013702  042002                  MOV     BUFTBL,R2       ;ENTRY COUNT
4595  013656  001424                          BEQ     2$              ;BR IF EMPTY TABLE
4596  013660  016003  000020                  MOV     $WRDL(R0),R3    ;TRIAL ADDRESS
4597  013664  006303                          ASL     R3              ;CHANGE TO BYTE COUNT
4598  013666  066003  000006                  ADD     $BUF(R0),R3     ;ADDRESS OF HIGHER ADJACENT BLOCK
4599  013672  021103                  1$:     CMP     (R1),R3         ;UPPER ADJACENT BLOCK
4600  013674  001432                          BEQ     4$              ;BR IF YES
4601  013676  062701  000004                  ADD     #4,R1           ;INCREMENT POINTER
4602  013702  005302                          DEC     R2              ;DECREMENT ENTRY COUNT
4603  013704  001372                          BNE     1$              ;CONTINUE SEARCHING
4604  013706  016011  000006                  MOV     $BUF(R0),(R1)   ;PUT THE BUFFER BLOCK INTO THE TABLE
4605  013712  016061  000020  000002          MOV     $WRDL(R0),2(R1)  ;BLOCK SIZE
4606  013720  005237  042002                  INC     BUFTBL          ;INCREMENT ENTRY COUNT
4607  013724  005202                          INC     R2              ;INCREMENT R2 FOR USE LATER
4608  013726  000422                          BR      5$              ;SEE IF A LOWER ADJACENT BLOCK IS IN THE TABLE
4609  013730  016021  000006          2$:     MOV     $BUF(R0),(R1)+  ;BLOCK ADDRESS TO TABLE
4610  013734  016021  000020                  MOV     $WRDL(R0),(R1)+ ;SIZE TO TABLE
4611  013740  005237  042002                  INC     BUFTBL          ;INCREMENT ENTRY COUNT
4612  013744  022737  000002  042002  3$:     CMP     #2,BUFTBL       ;SEE HOW MANY BLOCKS ARE IN TABLE
4613  013752  103001                          BHIS    .+4             ;BR IF NOT MORE THAN 2
4614  013754  000240                          NOP                     ;DEBUGGING AID
4615  013756  012601                          MOV     (SP)+,R1        ;RESTORE R1
4616  013760  000207                          RTS     PC              ;RETURN
4617  013762  016011  000006          4$:     MOV     $BUF(R0),(R1)   ;RELEASED BUFFER IS LOWER ADJACENT
4618  013766  066061  000020  000002          ADD     $WRDL(R0),2(R1) ;INCREMENTED SIZE
4619  013774  010246                  5$:     MOV     R2,-(SP)        ;SAVE R2
4620  013776  013702  042002                  MOV     BUFTBL,R2       ;ENTRY COUNT
4621  014002  012705  042004                  MOV     #BUFTBL+2,R5    ;BEGINNING OF TABLE
4622  014006  016504  000002          6$:     MOV     2(R5),R4        ;BLOCK SIZE (IN WORDS)
4623  014012  006304                          ASL     R4              ;CHANGE TO BYTE COUNT
4624  014014  061504                          ADD     (R5),R4         ;ADD BLOCK BEGINNING ADDRESS
4625  014016  020411                          CMP     R4,(R1)         ;R1 STILL POINTS TO INSERTED ENTRY
4626  014020  001406                          BEQ     8$              ;LOWER ADJACENT IN TABLE
4627  014022  062705  000004                  ADD     #4,R5           ;INCREMENT POINTER
4628  014026  005302                          DEC     R2              ;DECREMENT ENTRY COUNT
4629  014030  001366                          BNE     6$              ;CONTINUE LOOKING
4630  014032  005726                          TST     (SP)+           ;RESTORE STACK POINTER
4631  014034  000743                          BR      3$              ;END
4632  014036  012602                  8$:     MOV     (SP)+,R2        ;RESTORE R2
4633  014040  066165  000002  000002          ADD     2(R1),2(R5)     ;INCREMENT LOWER BLOCK LENGTH
4634  014046  005337  042002                  DEC     BUFTBL          ;DECREMENT ENTRY COUNT
4635  014052  010105                          MOV     R1,R5           ;GET READY TO COMPRESS
4636  014054  062705  000004                  ADD     #4,R5           ;INCREMENT TO NEXT ENTRY
4637  014060  012521                  9$:     MOV     (R5)+,(R1)+     ;COMPRESS TABLE
4638  014062  012521                          MOV     (R5)+,(R1)+     ;MOVE SIZE FIELD DOWN
4639  014064  005302                          DEC     R2              ;DECREMENT ENTRY COUNT
4640  014066  001374                          BNE     9$              ;BR IF NOT FINISHED
4641  014070  000725                          BR      3$              ;FINISHED
4642
```

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4643
4644                                    ;FILL THE ASSIGNED BUFFER (IF WRITE OR WRITE CHECK ORDER)
4645
4646  014072  026027  000006  053654  FILBUF: CMP     $BUF(R0),#ENDPGM  ;MAKE SURE BUFFER IS ABOVE PROGRAM
4647  014100  103002                          BHIS    .+6               ;BP IF IT IS
4648  014102  000000                          HALT                      ;BUFFER ADDRESS WITHIN PROGRAM, ILLEGAL
4649  014104  000776                          BR      .-2               ;INTERLOCK THE HALT
4650  014106  023760  001300  000020          CMP     MAXDL,$WRDL(R0)   ;SEE IF WORD LENGTH DOESN'T EXCEED MAXIMUM
4651  014114  103002                          BHIS    .+6               ;BR IF IT DOESN'T
4652  014116  000000                          HALT                      ;WORD LENGTH FOR OPERATION GREATER THAN AVAIL MEM
4653  014120  000776                          BR      .-2               ;INTERLOCK THE HALT
4654  014122  132760  000004  000030          BITB    #BIT02,$CODE(R0)  ;SEE IF READ ORDER
4655  014130  001401                          BEQ     1$                ;BR IF WRITE
4656  014132  000207                          RTS     PC                ;RETURN
4657  014134  016001  000006          1$:     MOV     $BUF(R0),R1       ;BUFFER ADDRESS
4658  014140  016002  000020                  MOV     $WRDL(R0),R2      ;POSITIVE WORD COUNT
4659  014144  132760  000001  000030          BITB    #BIT00,$CODE(R0)  ;SEE IF WRITE HEADER TYPE ORDER
4660  014152  001413                          BEQ     2$                ;BR IF NOT
4661  014154  016011  000012                  MOV     $CYL(R0),(R1)     ;CYLINDER ADDRESS
4662  014160  052721  010000                  BIS     #BIT12,(R1)+      ;SET FMT22 BIT
4663  014164  016021  000010                  MOV     $SEC(R0),(R1)+    ;MOVE SECTOR & TRACK
4664  014170  005021                          CLR     (R1)+             ;CLEAR FIRST KEY WORD
4665  014172  005021                          CLR     (R1)+             ;CLEAR THE SECOND
4666  014174  162702  000004                  SUB     #4,R2             ;ADJUST THE WORD COUNT
4667  014200  003422                          BLE     4$                ;BR IF END OF PATTERN
4668  014202  005004                  2$:     CLR     R4                ;CLEAR R4
4669  014204  116004  000034                  MOVB    $PATTC(R0),R4     ;RELATIVE PATTERN ADDRESS
4670  014210  001417                          BEQ     5$                ;BR IF RANDOM DATA
4671  014212  016405  042646                  MOV     STNDAT(R4),R5     ;PATTERN ADDRESS
4672  014216  012703  000020                  MOV     #20,R3            ;PATTERN COUNT
4673  014222  012521                  3$:     MOV     (R5)+,(R1)+       ;MOVE THE PATTERN INTO THE BUFFER
4674  014224  005302                          DEC     R2                ;DECREMENT THE WORD COUNT
4675  014226  001407                          BEQ     4$                ;BR IF DONE (WORD COUNT = 0)
4676  014230  005303                          DEC     R3                ;DECREMENT THE PATTERN COUNT
4677  014232  001373                          BNE     3$                ;BR IF MORE PATTERN
4678  014234  012703  000020                  MOV     #20,R3            ;RESTORE PATTERN COUNT
4679  014240  016405  042646                  MOV     STNDAT(R4),R5     ;RESTORE THE ADDRESS
4680  014244  000766                          BR      3$                ;CONTINUE DISTRIBUTING THE PATTERN
4681  014246  000207                  4$:     RTS     PC                ;RETURN
4682  014250  132760  000002  000030  5$:     BITB    #BIT01,$CODE(R0)  ;WRITE CHECK ORDER ?
4683  014256  001007                          BNE     6$                ;BR IF NOT
4684  014260  016037  000076  027736          MOV     $RSAV(R0),$LONUM  ;RESTORE THE RANDOM NUMBERS
4685  014266  016037  000100  027734          MOV     $RSAV+2(R0),$HINUM  ;TO RECREATE THE WRITE CHECK BUFFER
4686  014274  000410                          BR      7$                ;FILL THE WRITE CHECK BUFFER
4687  014276  004737  027636          6$:     JSR     PC,$RAND          ;GET TWO RANDOM NUMBERS
4688  014302  013760  027736  000076          MOV     $LONUM,$RSAV(R0)  ;SAVE THE RANDOM NUMBERS
4689  014310  013760  027734  000100          MOV     $HINUM,$RSAV+2(R0)
4690  014316  013721  027736          7$:     MOV     $LONUM,(R1)+      ;PUT FIRST WORD IN BUFFER
4691  014322  005302                          DEC     R2
4692  014324  001750                          BEQ     4$                ;BR IF DONE
4693  014326  013721  027734                  MOV     $HINUM,(R1)+      ;PUT SECOND WORD IN BUFFER
4694  014332  005302                          DEC     R2                ;DEC WORD COUNT
4695  014334  001744                          BEQ     4$                ;BR IF DONE
4696  014336  000757                          BR      6$
4697
4698                                    ;START THE ORDER FOR THE DPB IN R0
```

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4699
4700  014340  010046                  GCDRIV: MOV     R0,-(SP)        ;SAVE R0
4701  014342  010037  014352                  MOV     R0,1$           ;CURRENT DPB ADDRESS
4702  014346  004037  031442                  JSR     R0,RP04
4703  014352  000000                  1$:     0                       ;DPB ADDR GOES HERE
4704  014354  000000                          HALT                    ;DRIVER REJECTED REQUEST
4705  014356  012600                          MOV     (SP)+,R0        ;RESTORE R0
4706  014360  062760  000001  000042          ADD     #1,$OPERC(R0)   ;INCREMENT THE OPERATION COUNT
4707  014366  005560  000044                  ADC     $OPERC+2(R0)
4708  014372  026060  000040  000012          CMP     $PREVA+2(R0),$CYL(R0)  ;DID ORDER REQUIRE A CYLINDER CHANGE
4709  014400  001405                          BEQ     2$              ;BR IF NOT
4710  014402  062760  000001  000046          ADD     #1,$POSIT(R0)   ;INCREMENT SEEK COUNT
4711  014410  005560  000050                  ADC     $POSIT+2(R0)    ;ADD ANY CARRY
4712  014414  000207                  2$:     RTS     PC
4713
4714                                  ;GENERATE PARAMETERS FOR THE OPERATION
4715
4716  014416  004737  027636          SELPAR: JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
4717  014422  032737  000001  001140          BIT     #SWO,SWR        ;SEE IF SWO SET
4718  014430  001012                          BNE     2$              ;BR IF SET - READ ONLY
4719  014432  012705  000010          1$:     MOV     #10,R5          ;READ/WRITE SELECTION DIVISOR
4720  014436  004737  024176                  JSR     PC,GETREM       ;GET SELECTION VALUE
4721  014442  020537  001314                  CMP     R5,RATIO        ;DETERMINE IF READ OR WRITE
4722  014446  003003                          BGT     2$              ;BR IF READ
4723  014450  004737  014772                  JSR     PC,RANWRT       ;SELECT A WRITE ORDER
4724  014454  000406                          BR      3$              ;CONTINUE WITH THE SELECTION
4725  014456  013705  027736          2$:     MOV     $LONUM,R5       ;SELECT READ OPERATION CODE
4726  014462  042705  177776                  BIC     #^C1,R5         ;MASK OUT ALL BUT BIT 0
4727  014466  062705  000004                  ADD     #4,R5           ;TABLE OFFSET FOR READ CODE
4728  014472  110560  000102          3$:     MOVB    R5,$NCODE(R0)   ;ORDER SELECTION CODE TO CONTROL BLOCK
4729
4730                                  ;GENERATE A RANDOM SECTOR ADDRESS BETWEEN VALUES 'MINSEC' & 'MAXSEC'
4731
4732  014476  013705  001334                  MOV     MAXSEC,R5       ;GET MAXIMUM SECTOR ADDRESS
4733  014502  163705  001336                  SUB     MINSEC,R5       ;SUBTRACT MINIMUM SECTOR ADDRESS
4734  014506  001403                          BEQ     4$              ;BR IF MIN & MAX THE SAME
4735  014510  005205                          INC     R5              ;INCREMENT DIFFERENCE TO USE AS DIVISOR
4736  014512  004737  024176                  JSR     PC,GETREM       ;GET THE RANDOM AUGMENT
4737  014516  063705  001336          4$:     ADD     MINSEC,R5       ;CONVERT TO ADDRESS
4738  014522  110560  000104                  MOVB    R5,$NSEC(R0)    ;STORE SECTOR ADDRESS IN DPB
4739
4740                                  ;GENERATE A RANDOM TRACK ADDRESS BETWEEN VALUES 'MINTRK' & 'MAXTRK'
4741
4742  014526  013705  001330                  MOV     MAXTRK,R5       ;GET MAXIMUM TRACK ADDRESS
4743  014532  163705  001332                  SUB     MINTRK,R5       ;SUBTRACT MINIMUM TRACK ADDRESS
4744  014536  001403                          BEQ     5$              ;BR IF MIN & MAX THE SAME
4745  014540  005205                          INC     R5              ;INCREMENT DIFFERENCE TO USE AS DIVISOR
4746  014542  004737  024176                  JSR     PC,GETREM       ;GET THE RANDOM TRACK AUGMENT
4747  014546  063705  001332          5$:     ADD     MINTRK,R5       ;CONVERT AUGMENT TO AN ADDRESS
4748  014552  110560  000105                  MOVB    R5,$NTRK(R0)    ;STORE TRACK ADDRESS IN DPB
4749
4750                                  ;GENERATE A RANDOM CYLINDER ADDRESS BETWEEN VALUES 'MINCYL' & 'MAXCYL'
4751
4752  014556  013705  001324                  MOV     MAXCYL,R5       ;GET MAXIMUM CYLINDER ADDRESS
4753  014562  163705  001326                  SUB     MINCYL,R5       ;SUBTRACT MINIMUM CYLINDER ADDRESS
4754  014566  001403                          BEQ     6$              ;BR IF MIN & MAX THE SAME
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 4755  014570  005205                          INC     R5              ;INCREMENT DIFFERENCE TO USE AS DIVISOR
 4756  014572  004737  024176                  JSR     PC,GETREM       ;GET THE RANDOM AUGMENT
 4757  014576  063705  001326          6$:     ADD     MINCYL,R5       ;CONVERT AUGMENT TO AN ADDRESS
 4758  014602  010560  000106                  MOV     R5,$NCYL(R0)    ;;STORE CYLINDER ADDRESS IN DPB
 4759  014606  122760  000003  000102          CMPB    #3,$NCODE(R0)   ;WRITE HEADER & DATA ?
 4760  014614  001444                          BEQ     10$             ;BR IF IT IS
 4761
 4762                                  ;GENERATE A RANDOM BUFFER LENGTH BETWEEN 4 & THE VALUE IN 'MAXDL'
 4763
 4764  014616  013705  001300          7$:     MOV     MAXDL,R5        ;GET BUFFER SIZE
 4765  014622  005205                          INC     R5              ;INCREMENT THE MAXIMUM SIZE
 4766  014624  004737  024176                  JSR     PC,GETREM       ;DIVIDE BY MAX VALUE
 4767  014630  005705                          TST     R5              ;IS THE REMAINDER 0 ?
 4768  014632  001003                          BNE     8$              ;NOT 0, CONTINUE
 4769  014634  004737  027636                  JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
 4770  014640  000766                          BR      7$              ;TRY AGAIN
 4771  014642  010560  000110          8$:     MOV     R5,$NWRDL(R0)   ;WORD LENGTH TO CONTROL BLOCK
 4772  014646  010546                          MOV     R5,-(SP)        ;NEW WORD LENGTH ON STACK FOR CHECK
 4773  014650  005046                          CLR     -(SP)           ;MAKE UPPER DIVIDEND ZERO
 4774  014652  012746  000400                  MOV     #256.,-(SP)     ;SECTOR SIZE IS THE DIVISOR
 4775  014656  132760  000001  000102          BITB    #1,$NCODE(R0)   ;SEE IF NEXT ORDER IS A HEADER ORDER
 4776  014664  001402                          BEQ     .+6             ;BR IF NOT
 4777  014666  062716  000004                  ADD     #4,(SP)         ;ADD HEADER SIZE TO SECTOR SIZE
 4778  014672  004737  024224                  JSR     PC,LINKDV       ;DIVIDE BUFFER SIZE BY SECTOR SIZE
 4779  014676  012616                          MOV     (SP)+,(SP)      ;MOV REMAINDER UP THE STACK
 4780  014700  022627  000004                  CMP     (SP)+,#4        ;SEE IF REMAINDER LESS THAN 4
 4781  014704  103003                          BHIS    9$              ;BR IF NOT
 4782  014706  004737  027636                  JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
 4783  014712  000741                          BR      7$              ;TRY AGAIN
 4784  014714  122760  000002  000102  9$:     CMPB    #2,$NCODE(R0)   ;SEE IF WRITE DATA
 4785  014722  001017                          BNE     12$             ;BR IF NOT WRITE DATA
 4786  014724  000412                          BR      11$             ;GET PATTERN
 4787
 4788                                  ;SETUP BUFFER SIZE FOR A WRITE HEADER AND DATA ORDER
 4789
 4790  014726  012760  000404  000110  10$:     MOV     #260.,$NWRDL(R0)  ;CHANGE WORD LENGTH TO 260 FOR WRTHD ORDER
 4791  014734  023727  001300  000404          CMP     MAXDL,#260.     ;CAN A FULL SECTOR BE WRITTEN ?
 4792  014742  103003                          BHIS    11$             ;BR IF IT CAN
 4793  014744  013760  001300  000110          MOV     MAXDL,$NWRDL(R0)  ;CHANGE TRANSFER SIZE
 4794  014752  004737  015076          11$:    JSR     PC,GETPAT       ;GET PATTERN CODE
 4795  014756  110560  000103                  MOVB    R5,$NPATC(R0)   ;MOVE PATTERN CODE TO CONTROL BLOCK
 4796  014762  012760  177777  000112  12$:     MOV     #-1,$NEXT(R0)  ;SET PARAMETERS SELECTED INDICATOR
 4797  014770  000207                          RTS     PC              ;RETURN
 4798
 4799                                  ;ROUTINE TO SELECT A WRITE (OR WRITE CHECK) OPERATION
 4800
 4801  014772  012705  000004          RANWRT: MOV     #4,R5           ;WRITE OPERATION SELECTION DIVISOR
 4802  014776  004737  024176                  JSR     PC,GETREM       ;GET SELECTION CODE
 4803  015002  005737  001316                  TST     AUTOCK          ;ARE WRITE CHECK ORDERS TO BE SELECTED
 4804                                                                  ;RANDOMLY ?
 4805  015006  001403                          BEQ     1$              ;BR IF THEY ARE
 4806  015010  152705  000002                  BISB    #2,R5           ;SET CODE TO EXCLUDE WRITE CHECK ORDERS
 4807  015014  000420                          BR      3$              ;COMPLETE SELECTION
 4808  015016  020527  000001          1$:     CMP     R5,#1           ;WRITE CHECK SELECTED ?
 4809  015022  101015                          BHI     3$              ;BR IF NOT
 4810  015024  132760  000002  000030          BITB    #2,$CODE(R0)    ;PREVIOUS WRITE OPERATION ?
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 4811  015032  001407                          BEQ     2$                ;BR IF PREVIOUS WAS READ OR WRITE CHECK
 4812  015034  116060  000030  000102          MOVB    $CODE(R0),$NCODE(R0)  ;MOVE CODE TO 'NEXT CODE'
 4813  015042  142760  000002  000102          BICB    #2,$NCODE(R0)     ;CHANGE WRITE TO WRITE CHECK
 4814  015050  000411                          BR      5$                ;EXIT
 4815  015052  052705  000002          2$:     BIS     #2,R5             ;CHANGE WRITE CHECK TO WRITE
 4816  015056  005737  001310          3$:     TST     FORMAT            ;WRITE HEADER ORDERS ALLOWED ?
 4817  015062  001002                          BNE     4$                ;BR IF THEY ARE
 4818  015064  042705  000001                  BIC     #1,R5             ;ALTER POSSIBLE WRITE HEADER
 4819  015070  110560  000102          4$:     MOVB    R5,$NCODE(R0)     ;SETUP 'NEXT' CODE
 4820  015074  000207                  5$:     RTS     PC                ;RETURN
 4821
 4822                                  ;ROUTINE TO SELECT A PATTERN
 4823
 4824  015076  012705  000020          GETPAT: MOV     #20,R5            ;SELECT PATTERN
 4825  015102  004737  024176                  JSR     PC,GETREM         ;GET CODE
 4826  015106  005705                          TST     R5                ;WAS PATTERN ZERO SELECTED ?
 4827  015110  001003                          BNE     1$                ;BR IF NOT ZERO
 4828  015112  004737  027636                  JSR     PC,$RAND          ;CYCLE THE RANDOM NUMBER GENERATOR
 4829  015116  000767                          BR      GETPAT            ;TRY AGAIN
 4830  015120  006305                  1$:     ASL     R5                ;MAKE CODE INTO TABLE INDEX
 4831  015122  000207                          RTS     PC
 4832
 4833                                  ;ROUTINE TO GET THE PREVIOUSLY SELECTED PARAMETER VALUES
 4834
 4835  015124  010546                  GETPAR: MOV     R5,-(SP)          ;SAVE R5
 4836  015126  116060  000030  000032          MOVB    $CODE(R0),$PREVO(R0)  ;SAVE CURRENT PARAMETERS
 4837  015134  032760  000006  000102          BIT     #6,$NCODE(R0)     ;SEE IF NEXT OPERATION IS READ OR WRITE
 4838  015142  001007                          BNE     1$                ;BR IF EITHER
 4839  015144  016060  000012  000040          MOV     $CYL(R0),$PREVA+2(R0)  ;SAVE STARTING CYLINDER
 4840  015152  016060  000010  000036          MOV     $SEC(R0),$PREVA(R0)  ;SAVE STARTING SECTOR AND TRACK
 4841  015160  000405                          BR      2$
 4842  015162  004737  015624          1$:     JSR     PC,PREVST         ;SAVE CURRENT SECTOR & TRACK
 4843  015166  016060  000222  000040          MOV     $RHCC(R0),$PREVA+2(R0)  ;CURRENT CYLINDER
 4844  015174  032737  000100  001140  2$:     BIT     #SW06,SWR         ;SWITCH 6 SET ?
 4845  015202  001043                          BNE     3$                ;BR IF SET
 4846  015204  116060  000102  000030          MOVB    $NCODE(R0),$CODE(R0)  ;LOGICAL CODE FOR OPERATION
 4847  015212  116005  000102                  MOVB    $NCODE(R0),R5     ;LOAD R5 FOR USE AS TABLE INDEX
 4848  015216  116560  042144  000002          MOVB    COMTBL(R5),$COMND(R0)  ;RP04 COMMAND CODE
 4849  015224  116060  000103  000034          MOVB    $NPATC(R0),$PATTC(R0)  ;PATTERN CODE
 4850  015232  016060  000104  000010          MOV     $NSEC(R0),$SEC(R0)  ;TRACK AND SECTOR ADDRESSES
 4851  015240  016060  000106  000012          MOV     $NCYL(R0),$CYL(R0)  ;CYLINDER ADDRESS
 4852  015246  016060  000110  000020          MOV     $NWRDL(R0),$WRDL(R0)  ;BUFFER SIZE
 4853  015254  016060  000110  000004          MOV     $NWRDL(R0),$WRDM(R0)  ;WORD COUNT FOR THE RH11
 4854  015262  005460  000004                  NEG     $WRDM(R0)         ;COMPLEMENT IT
 4855  015266  012760  000400  000026          MOV     #256.,$SSEC(R0)   ;INITIAL VALUE OF SECTOR SIZE
 4856  015274  032760  000001  000030          BIT     #1,$CODE(R0)      ;HEADER OPERATION ?
 4857  015302  001403                          BEQ     3$                ;BR IF NOT
 4858  015304  062760  000004  000026          ADD     #4,$SSEC(R0)      ;ADD HEADER SIZE
 4859  015312  005060  000112          3$:     CLR     $NEXT(R0)         ;RESET 'PARAMETERS LOADED' INDICATOR
 4860  015316  012605                          MOV     (SP)+,R5          ;RESTORE R5
 4861  015320  000207                          RTS     PC                ;RETURN
 4862
 4863                                  ;ROUTINE TO COMPRESS THE TABLE IN R1
 4864
 4865  015322  016111  000002          CMPRES: MOV     2(R1),(R1)        ;COMPRESS THE TABLE IN R1
 4866  015326  001403                          BEQ     1$                ;BR WHEN ZERO FOUND
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 4867  015330  062701  000002                  ADD     #2,R1           ;INCREMENT R1
 4868  015334  000772                          BR      CMPRES          ;CONTINUE COMPRESSING TABLE
 4869  015336  000207                  1$:     RTS     PC              ;RETURN
 4870
 4871                                  ;ROUTINE TO SETUP PARAMETERS FOR A SEQUENTIAL READ OR WRITE OF THE DISK
 4872
 4873  015340  004737  027536          WRTPK:  JSR     PC,$RAND        ;CYCLE THE RANDOM NUMBER GENERATOR
 4874  015344  005760  000044                  TST     $OPERC+2(R0)    ;SEE IF FIRST OPERATION
 4875  015350  001007                          BNE     WRTPK1          ;BR IF UPPER WORD OF COUNTER NOT ZERO
 4876  015352  005760  000042                  TST     $OPERC(R0)      ;LOWER WORD ZERO ?
 4877  015356  001004                          BNE     WRTPK1          ;BR IF NOT 1ST OPERATION
 4878  015360  105760  000031                  TSTB    $PACK(R0)       ;SEE WHICH - 'R' OR 'W'
 4879  015364  100477                          BMI     WRTPK3          ;BR IF 'W'
 4880  015366  000464                          BR      WRTPK2          ;'R' OPERATION
 4881  015370  116060  000030  000032  WRTPK1: MOVB    $CODE(R0),$PREVO(R0)  ;SAVE CURRENT PARAMETERS
 4882  015376  004737  015624                  JSR     PC,PREVST       ;SAVE CURRENT SECTOR & TRACK
 4883  015402  016060  000222  000040          MOV     $RHCC(R0),$PREVA+2(R0)  ;CURRENT CYLINDER
 4884  015410  016060  000172  000010          MOV     $RHDA(R0),$SEC(R0)  ;NEW SECTOR & TRACK ADDRESS
 4885  015416  016060  000220  000012          MOV     $RHCA(R0),$CYL(R0)  ;NEW CYLINDER ADDRESS
 4886  015424  026037  000012  001324          CMP     $CYL(R0),MAXCYL  ;SEE IF AT END
 4887  015432  103427                          BLO     2$              ;BR IF LESS THAN 'MAXCYL'
 4888  015434  101004                          BHI     1$              ;BR IF GREATER THAN 'MAXCYL'
 4889  015436  126037  000011  001330          CMPB    $TRK(R0),MAXTRK  ;SEE IF AT MAX TRACK
 4890  015444  101422                          BLOS    2$              ;BR IF NOT GREATER
 4891  015446  113760  001332  000011  1$:     MOVB    MINTRK,$TRK(R0)  ;RESET TRACK ADDRESS
 4892  015454  113760  001336  000010          MOVB    MINSEC,$SEC(R0)  ;RESET SECTOR ADDRESS
 4893  015462  013760  001326  000012          MOV     MINCYL,$CYL(R0)  ;RESET CYLINDER ADDRESS
 4894  015470  004737  024002                  JSR     PC,NRML2        ;DROP THE UNIT (NORMAL TERMINATION)
 4895  015474  032737  000020  001140          BIT     #SW04,SWR       ;IS SWITCH 4 SET ?
 4896  015502  001003                          BNE     2$              ;BR IF SET
 4897  015504  005726                          TST     (SP)+           ;INCREMENT THE STACK POINTER
 4898  015506  000137  003206                  JMP     MAIN            ;RETURN DIRECTLY TO 'MAIN'
 4899  015512  013760  001300  000020  2$:     MOV     MAXDL,$WRDL(R0)  ;BUFFER SIZE IS MAXIMUM
 4900  015520  013760  001300  000004          MOV     MAXDL,$WRDM(R0)  ;WORD COUNT
 4901  015526  005460  000004                  NEG     $WRDM(R0)       ;CHANGE WORD COUNT TO 2'S COMPLEMENT
 4902  015532  105760  000031                  TSTB    $PACK(R0)       ;READ OR WRITE ?
 4903  015536  100412                          BMI     WRTPK3          ;BR IF WRITE
 4904  015540  012760  000404  000026  WRTPK2: MOV     #260.,$SSEC(R0)  ;SECTOR SIZE FOR READ
 4905  015546  112760  000005  000030          MOVB    #5,$CODE(R0)    ;CODE FOR READ HEADER & DATA
 4906  015554  112760  000173  000002          MOVB    #RDHD,$COMND(R0)  ;DRIVE CODE FOR OPERATION
 4907  015562  000415                          BR      WRTPK4          ;SET UP FOR EXIT
 4908  015564  012760  000400  000026  WRTPK3: MOV     #256.,$SSEC(R0) ;SECTOR SIZE
 4909  015572  112760  000002  000030          MOVB    #2,$CODE(R0)    ;CODE FOR WRTDAT
 4910  015600  112760  000161  000002          MOVB    #WRTDAT,$COMND(R0)  ;OP CODE
 4911  015606  004737  015076                  JSR     PC,GETPAT       ;GET PATTERN CODE
 4912  015612  110560  000034                  MOVB    R5,$PATTC(R0)   ;PATTERN CODE
 4913  015616  005060  000112          WRTPK4: CLR     $NEXT(R0)       ;CLEAR 'PARAMETER SELECTED' INDICATOR
 4914  015622  000207                          RTS     PC              ;RETURN
 4915
 4916                                  ;DECREMENT AND SAVE CURRENT SECTOR & TRACK ADDRESS
 4917
 4918  015624  005046                  PREVST: CLR     -(SP)           ;MAKE ROOM ON THE STACK
 4919  015626  005046                          CLR     -(SP)           ;MAKE ROOM ON THE STACK
 4920  015630  004737  020124                  JSR     PC,READDR       ;DECREMENT SECTOR-TRACK ADDRESS
 4921  015634  112660  000037                  MOVB    (SP)+,$PREVA+1(R0)  ;SAVE CURRENT TRACK
 4922  015640  112660  000036                  MOVB    (SP)+,$PREVA(R0)  ;SAVE CURRENT SECTOR
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 4923  015644  000207                        RTS     PC              ;RETURN
 4924
 4925
 4926                                ;ROUTINE TO DETERMINE OF ERROR IS AT A LOCATION ON THE PACK DEFINED
 4927                                ;       IN THE BAD TRACK/SECTOR TABLE FOR THE DRIVE.
 4928                                ;       RETURN IF ERROR IS AT AN ADDRESS WHICH IS IN THE TABLE
 4929                                ;       RETURN+2 IS THE ERROR ADDRESS IS NOT CONTAINED IN THE TABLE
 4930                                ;       OR IF THE PARAMETER 'NOTPRT' IS 0
 4931
 4932  015646                        SPOTCK:
 4933  015646  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
 4934  015650  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
 4935  015652  012701  000114                MOV     #$BDSEC,R1      ;INCREMENT FOR BAD SECTOR TABLE
 4936  015656  060C01                        ADD     R0,R1           ;ADD THE BLOCK'S STARTING ADDRESS
 4937  015660  012702  000010                MOV     #8.,R2          ;BAD SECTOR TABLE SIZE COUNT
 4938  015664  021160  000222        1$:     CMP     (R1),$RHCC(R0)  ;IS CYLINDER IN THE TABLE ?
 4939  015670  001021                        BNE     4$              ;BR IF NOT
 4940  015672  005046                        CLR     -(SP)           ;MAKE ROOM ON THE STACK
 4941  015674  005046                        CLR     -(SP)           ;MAKE ROOM ON THE STACK
 4942  015676  004737  020124                JSR     PC,READDR       ;DECREMENT THE SECTOR/TRACK ADDRESS
 4943  015702  122661  000003                CMPB    (SP)+,3(R1)     ;COMPARE THE TRACK ADDRESS
 4944  015706  0C1011                        BNE     3$              ;BR IF IT IS NOT EQUAL
 4945  015710  105761  000002                TSTB    2(R1)           ;IS A SECTOR ADDRESS IN THE TABLE ?
 4946  015714  100002                        BPL     2$              ;BR IF ONE IS
 4947  015716  005726                        TST     (SP)+           ;INCREMENT THE STACK POINTER
 4948  015720  000414                        BR      5$              ;DISPLAY THE MESSAGE
 4949  015722  122661  000002        2$:     CMPB    (SP)+,2(R1)     ;COMPARE THE SECTOR ADDRESS
 4950  015726  001002                        BNE     4$              ;BR IF NOT EQUAL
 4951  015730  000410                        BR      5$              ;CHECK 'NOTPRT'
 4952  015732  005726                3$:     TST     (SP)+           ;INCREMENT THE STACK POINTER
 4953  015734  062701  000004        4$:     ADD     #4,R1           ;GO TO THE NEXT LOCATION IN THE TABLE
 4954  015740  005711                        TST     (R1)            ;PAST THE TABLE ENTRIES ?
 4955  015742  100411                        BMI     6$              ;BR IF PAST
 4956  015744  005302                        DEC     R2              ;DECREMENT THE MAXIMUM ENTRY COUNT
 4957  015746  001346                        BNE     1$              ;BR IF MORE TO CHECK
 4958  015750  000406                        BR      6$              ;END, EXIT
 4959  015752  005737  001320        5$:     TST     NOTPRT          ;PRINT THE ERROR ANYWAY ?
 4960  015756  001006                        BNE     7$              ;BR IF NOT
 4961  015760  012737  177777  016416        MOV     #-1,PRT2B       ;SET THE INDICATOR FOR THE IDENTIFICATION LINE
 4962  015766  062766  000002  000004  6$:   ADD     #2,4(SP)        ;INCREMENT THE RETURN
 4963  015774                        7$:
 4964  015774  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
 4965  015776  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
 4966  016000  000207                        RTS     PC              ;RETURN
 4967
 4968                                ;;**************************************************************
 4969
 4970                                .SBTTL  ERROR MESSAGE GENERATION ROUTINES
 4971
 4972                                ;;**************************************************************
 4973
 4974                                ;PRINT LINE 1 OF ERROR MESSAGE
 4975
 4976  016002  032737  002000  001140  LINE1:  BIT     #SW10,SWR       ;SWITCH 10 SET ?
 4977  016010  001402                        BEQ     .+6             ;BR IF NOT
 4978  016012  104401  001160                TYPE    ,$BELL          ;RING THE BELL
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                                        DISPLY  ,$CRLF          ;CR-LF
                                        TST     CLKFLG          ;CLOCK ON THE SYSTEM ?
                                        BNE     1$              ;BR IF NONE IS
                                        DISPLY  ,HOUR           ;TYPE THE HOURS
                                        DISPLY  ,MINUTE         ;TYPE THE MINUTES
                                        DISPLY  ,SECOND         ;TYPE THE SECONDS
                                1$:     RTS     PC              ;RETURN 3 TYPE DESCRIPTION

                                ;PRINT LINE 2 OF ERROR MESSAGE

                                LINE2:  DISPLY  ,$CRLF          ;CR-LF
                                        DISPLY  ,LIN2C          ;'PRESENT ORDER = '
                                        CLR     2$              ;CLEAR LOCN FOR ORDER CODE
                                        MOVB    $CODE(R0),2$    ;ORDER CODE
                                        JSR     PC,1$           ;PRINT THE MNEMONIC OF THE ORDER
                                        DISPLY  ,LIN2P          ;'PREVIOUS ORDER = '
                                        CLR     2$              ;CLEAR FOR PREVIOUS ORDER CODE
                                        MOVB    $PREVO(R0),2$   ;PREVIOUS ORDER CODE
                                        JSR     PC,1$           ;PRINT THE MNEMONIC
                                        BIT     #BIT5,STATUS(R0)  ;DID ERROR OCCUR DURING NON-DATA TRANSFER
                                        BEQ     LINE2A          ;BR IF NOT
                                        DISPLY  ,$CRLF          ;CR-LF
                                        DISPLY  ,LIN2M          ;'ERROR OCCURED DURING NON-DATA TRANSFER'
                                        JMP     LINE2A          ;PRINT THE REST OF THE ERROR LINE
                                1$:     ASL     2$              ;CONVERT CODE INTO A TABLE INDEX
                                        ASL     2$              ;CONVERT CODE INTO A TABLE INDEX
                                        ASL     2$              ;CONVERT CODE INTO A TABLE INDEX
                                        ADD     #OPMNEM,2$      ;ADD THE TABLE BASE ADDRESS
                                        DISPLY                  ;PRINT THE MNEMONIC
                                2$:     .WORD   0
                                        RTS     PC              ;RETURN
                                LINE2A: TST     PRT2B           ;PRINT THE BAD SECTOR LINE ?
                                        BEQ     LINE2B          ;BR IF NOT
                                        DISPLY  ,$CRLF          ;CR-LF
                                        DISPLY  ,LIN2S          ;ERROR ADDRESS DEFINED AS BAD AREA
                                LINE2B: MOV     R5,-(SP)        ;SAVE R5
                                        CLR     R5              ;CLEAR R5 FOR DRIVE ADDRESS
                                        MOVB    (R0),R5         ;MOVE DRIVE# FROM CURRENT BLOCK
                                        BICB    #7,UNIT+1       ;CLEAR UNIT NUMBER
                                        BISB    R5,UNIT+1       ;LOAD UNIT NUMBER
                                        ASL     R5              ;MAKE DRIVE NUMBER INTO A TABLE INDEX
                                        MOV     DT14.T(R5),$LINAD  ;ADDRESS OF LOCATIONS TO PRINT
                                        MOV     DT15.T(R5),$LINAD+2  ;OPTIONAL REGISTERS
                                        MOV     DT16.T(R5),$LINAD+4  ;MORE OPTIONAL REGISTERS
                                        DISPLY  ,$CRLF          ;CR-LF
                                        DISPLY  ,DH14           ;STANDARD RP04 REGISTER HEADER
                                        DISPLY  ,UNIT           ;PRINT THE UNIT ADDRESS
                                        DISPLY  ,LINSP          ;SPACES
                                        JSR     PC,2$           ;PRINT THE REGISTERS
                                        BIT     #SW05,SWR       ;PRINT THE OPTIONAL REGISTERS ?
                                        BNE     1$              ;BR IF NOT
                                        DISPLY  ,DH15
                                        MOV     $LINAD+2,$LINAD  ;SHIFT ADDRESSES
                                        MOV     $LINAD+4,$LINAD+2  ;FINISH SHIFT
                                        JSR     PC,2$           ;PRINT THEM
                                        DISPLY  ,DH16
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5035  016340  013737  016412  016410          MOV     $LINAD+2,$LINAD  ;FINISH SHIFTING THE ADDRESSES
5036  016346  004737  016356                  JSR     PC,2$            ;PRINT THE REGISTERS
5037  016352  012605                  1$:     MOV     (SP)+,R5         ;RESTORE R5
5038  016354  000207                          RTS     PC
5039  016356  013705  016410          2$:     MOV     $LINAD,R5        ;ADDRESS OF REGISTERS
5040  016362  005715                  3$:     TST     (R5)             ;AT END OF LINE ?
5041  016364  001406                          BEQ     4$               ;BR IF YES
5042  016366  013546                          MOV     @(R5)+,-(SP)     ;PUT THE CONTENTS ON THE STACK
5043  016370  004737  024740                  JSR     PC,PRTOCT        ;PRINT THE NUMBER
5044  016374  104412  051364                  DISPLY  ,LINSP           ;PRINT 2 SPACES
5045  016400  000770                          BR      3$               ;CONTINUE PRINTING
5046  016402  104412  001165          4$:     DISPLY  ,$CRLF           ;CR-LF
5047  016406  000207                          RTS     PC
5048
5049  016410  000000  000000  000000  $LINAD: .WORD   0,0,0            ;ADDRESS OF REGISTERS
5050  016416  000000                  PRT2B:  .WORD   0                ;BAD SECTOR LINE INDICATOR
5051
5052                                  ;PRINT LINES 3 & 3A OF ERROR MESSAGE
5053
5054  016420  104412  047552          LINE3:  DISPLY  ,LINM3           ;LINE 3 ENTRANCE
5055  016424  000402                          BR      LIN3.1           ;FINISH PRINTOUT
5056  016426  104412  047570          LINE3A: DISPLY  ,LINN3           ;LINE 3A ENTRANCE
5057  016432  016046  000222          LIN3.1: MOV     $RHCC(R0),-(SP)  ;PUT CYLINDER ADDR ON STACK
5058  016436  004737  030232                  JSR     PC,$SB2D         ;CONVERT TO DECIMAL
5059  016442  004737  025576                  JSR     PC,$SUPRS        ;PRINT CYL ADDR
5060  016446  104412  047565                  DISPLY  ,T               ;PRINT ' T'
5061  016452  005046                          CLR     -(SP)            ;CLEAR STACK FOR SECTOR ADDR
5062  016454  005046                          CLR     -(SP)            ;CLEAR STACK FOR TRACK ADDR
5063  016456  004737  020124                  JSR     PC,READDR        ;SET DECREMENTED ADDRESS
5064  016462  004737  030232                  JSR     PC,$SB2D         ;NOW CONVEPT TRACK
5065  016466  004737  025576                  JSR     PC,$SUPRS        ;PRINT TRACK VALUE
5066  016472  004737  030232                  JSR     PC,$SB2D         ;CONVERT SECTOR
5067  016476  104412  047611                  DISPLY  ,S               ;PRINT ' S'
5068  016502  004737  025576                  JSR     PC,$SUPRS        ;PRINT SECTOR
5069  016506  104412  047614                  DISPLY  ,LINP3           ;PRINT 'PREV ADDR'
5070  016512  016046  000040                  MOV     $PREVA+2(R0),-(SP) ;PREVIOUS CYLINDER
5071  016516  004737  030232                  JSR     PC,$SB2D         ;CONVERT CYLINDER
5072  016522  004737  025576                  JSR     PC,$SUPRS        ;PRINT CYLINDER
5073  016526  104412  047565                  DISPLY  ,T               ;PRINT ' T'
5074  016532  005046                          CLR     -(SP)            ;MAKE ROOM ON THE STACK
5075  016534  116016  000037                  MOVB    $PREVA+1(R0),(SP)  ;PREVIOUS TRACK ADDRESS
5076  016540  004737  030232                  JSR     PC,$SB2D         ;CONVERT TRACK
5077  016544  004737  025576                  JSR     PC,$SUPRS        ;PRINT TRACK
5078  016550  104412  047611                  DISPLY  ,S               ;PRINT ' S'
5079  016554  005046                          CLR     -(SP)            ;MAKE ROOM ON THE STACK
5080  016556  116016  000036                  MOVB    $PREVA(R0),(SP)  ;PREVIOUS SECTOR DDRESS
5081  016562  004737  030232                  JSR     PC,$SB2D         ;CONVERT SECTOR
5082  016566  004737  025576                  JSR     PC,$SUPRS        ;PRINT SECTOR
5083  016572  104412  001165                  DISPLY  ,$CRLF
5084  016576  000207                          RTS     PC
5085
5086                                  ;PRINT LINES 3B & 3C OF ERROR MESSAGE
5087
5088  016600  004737  016622          LINE3B: JSR     PC,LIN3.3        ;LINE 3B ENTRANCE
5089  016604  104412  001165                  DISPLY  ,$CRLF
5090  016610  000207                          RTS     PC
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5091  016612  004737  016622          LINE3C: JSR     PC,LIN3.3       ;LINE 3C ENTRANCE
5092  016616  000137  016654                  JMP     LIN3.4          ;FINISH MESSAGE
5093
5094  016622  104412  047635          LIN3.3: DISPLY  ,LINS3          ;LINE '3B & 3C' ENTRANCE
5095  016626  016046  000040                  MOV     $PREVA+2(R0),-(SP) ;PREVIOUS CYLINDER
5096  016632  004737  016714                  JSR     PC,LIN3.2       ;CONVERT & TYPE
5097  016636  104412  047652                  DISPLY  ,LINEN3         ;PRINT 'END CYL'
5098  016642  016046  000222                  MOV     $RHCC(R0),-(SP) ;PRESENT CYLINDER
5099  016646  004737  016714                  JSR     PC,LIN3.2       ;CONVERT & TYPE
5100  016652  000207                          RTS     PC
5101
5102  016654  104412  047667          LIN3.4: DISPLY  ,LINA3          ;PRINT 'ACTUAL'
5103  016660  013746  053644                  MOV     CYLDER,-(SP)    ;ACTUAL CYLINDER
5104  016664  004737  016714                  JSR     PC,LIN3.2       ;CONVERT & TYPE
5105  016670  104412  047707                  DISPLY  ,LINT3          ;PRINT TRACK
5106  016674  005046                          CLR     -(SP)           ;CLEAR STACK WORD
5107  016676  116016  000173                  MOVB    $RHDA+1(R0),(SP) ;PUT TRACK ON STACK
5108  016702  004737  016714                  JSR     PC,LIN3.2       ;CONVERT & TYPE
5109  016706  104412  001165                  DISPLY  ,$CRLF
5110  016712  000207                          RTS     PC
5111
5112  016714  016646  000002          LIN3.2: MOV     2(SP),-(SP)     ;SET UP STACK FOR CONVERT
5113  016720  004737  030232                  JSR     PC,$SB2D        ;CONVERT
5114  016724  004737  025576                  JSR     PC,$SUPRS       ;TYPE
5115  016730  012616                          MOV     (SP)+,(SP)      ;RESTORE STACK POINTER
5116  016732  000207                          RTS     PC
5117
5118                                  ;PRINT LINE 3D OF ERROR MESSAGE
5119
5120  016734  032737  000040  001140  LINE3D: BIT     #SWD5,SWR       ;SWITCH 5 SET ?
5121  016742  001416                          BEQ     1$              ;BR IF IT IS
5122  016744  104412  047741                  DISPLY  ,LINB3          ;'RHBA = '
5123  016750  016046  000170                  MOV     $RHBA(R0),-(SP) ;BUFFER ADDR REG CONTENTS
5124  016754  004737  017236                  JSR     PC,LIN4.1       ;CONVERT & PRINT IT
5125  016760  104412  047751                  DISPLY  ,LINW3          ;'   RHWC = '
5126  016764  016046  000166                  MOV     $RHWC(R0),-(SP) ;WORD COUNT REGISTER CONTENTS
5127  016770  004737  017236                  JSR     PC,LIN4.1       ;CONVERT IT & PRINT IT
5128  016774  104412  001165                  DISPLY  ,$CRLF
5129  017000  000207                  1$:     RTS     PC
5130
5131                                  ;PRINT LINE 3E OF ERROR MESSAGE
5132
5133  017002  104412  047635          LINE3E: DISPLY  ,LINS3          ;'START CYL = '
5134  017006  016046  000012                  MOV     $CYL(R0),-(SP)  ;MOVE CYL TO STACK
5135  017012  004737  030232                  JSR     PC,$SB2D        ;CONVERT IT
5136  017016  004737  025576                  JSR     PC,$SUPRS       ;PRINT IT
5137  017022  104412  051364                  DISPLY  ,LINSP          ;SPACES
5138  017026  104412  047763                  DISPLY  ,LINST3         ;'START TRK = '
5139  017032  005046                          CLR     -(SP)           ;CLEAR STACK
5140  017034  116016  000011                  MOVB    $TRK(R0),(SP)   ;TRACK TO STACK
5141  017040  004737  030232                  JSR     PC,$SB2D        ;CONVERT IT
5142  017044  004737  025576                  JSR     PC,$SUPRS       ;PRINT IT
5143  017050  104412  051364                  DISPLY  ,LINSP          ;SPACES
5144  017054  104412  050000                  DISPLY  ,LINSS3         ;'START SEC = '
5145  017060  005046                          CLR     -(SP)           ;CLEAR STACK
5146  017062  116016  000010                  MOVB    $SEC(R0),(SP)   ;SECTOR ADDR TO STACK
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                                        JSR     PC,$SB2D        ;CONVERT IT
                                        JSR     PC,$SUPRS       ;PRINT IT
                                        DISPLY  ,$CRLF
                                        RTS     PC

                                ;PRINT LINE 3F OF ERROR MESSAGE

001140  LINE3F:                  BIT     #SW5,SWR        ;SWITCH 5 SET ?
                                BEQ     1$              ;BR IF NOT
                                DISPLY  ,LINDA3         ;'RHDA = '
                                MOV     $RHDA(R0),-(SP) ;DESIRED ADDRESS ON STACK
                                JSR     PC,PRTOCT       ;PRINT IT
                                DISPLY  ,LINSP          ;SPACES
                                DISPLY  ,LINCA3         ;' RHCA = '
                                MOV     $RHCA(R0),-(SP) ;DESIRED CYLINDER ADDRESS
                                JSR     PC,PRTOCT       ;PRINT IT
                                DISPLY  ,$CRLF
                        1$:     RTS     PC

                                ;PRINT LINE 4 OF ERROR MESSAGE

                        LINE4:  DISPLY  ,LINM4          ;'PRINT BUFFER'
                                MOV     $BUF(R0),-(SP)  ;BUFFER ADDR ON STACK
                                JSR     PC,LIN4.1       ;CONVERT TO OCTAL & PRINT
                                DISPLY  ,LINS4          ;PRINT 'SIZE'
                                MOV     $WRDL(R0),-(SP) ;BUFFER SIZE
                                JSR     PC,LIN3.2       ;CONVERT TO DEC & PRINT
                                DISPLY  ,LINX4          ;'ACTUAL NMBR WRDS XFRD = '
                                MOV     $RHBA(R0),-(SP)  ;VALUE IN BUFFER ADDR REGISTER
                                SUB     $BUF(R0),(SP)   ;SUBTRACT STARTING ADDRESS
                                ASR     (SP)            ;CONVERT INTO A WORD COUNT
                                JSR     PC,LIN3.2       ;CONVERT TO DEC & PRINT
                                DISPLY  ,$CRLF
                                RTS     PC

                        LIN4.1: MOV     2(SP),-(SP)     ;PUT VALUE IN PROPER LOCN ON STACK
                                JSR     PC,$SB20        ;CONVERT TO OCTAL
                                JSR     PC,$SUPRS       ;PRINT IT
                                MOV     (SP)+,(SP)      ;RESTORE STACK POINTER
                                RTS     PC

                                ;PRINT LINE 5 OF ERROR MESSAGE

000170  LINE5:                  DISPLY  ,LIND5          ;PRINT 'GOOD DATA'
                                SUB     #2,$RHBA(R0)    ;BACK THE ADDRESS UP
                                MOV     @$RHBA(R0),-(SP)        ;'GOOD' DATA - AT THE RHBA LOCATION
                                JSR     PC,PRTOCT       ;PRINT IT
                                DISPLY  ,LINB5          ;PRINT 'BAD DATA'
                                MOV     $RHDB(R0),-(SP) ;GET BAD CHAR FROM BUFFER
                                JSR     PC,PRTOCT       ;PRINT IT
                                MOV     $RHWC(R0),-(SP) ;WORD LENGTH ON STACK
                                ADD     $WRDL(R0),(SP)  ;MAKE INTO A POSITIVE NUMBER
                                CLR     -(SP)           ;UPPER DIVIDEND TO ZERO
                                MOV     $SSEC(R0),-(SP)  ;SECTOR SIZE ON THE STACK
                                JSR     PC,LINKDV       ;DIVIDE WORDS XFERED BY SECTOR SIZE
                                MOV     (SP)+,(SP)      ;MOVE REMAINDER UP THE STACK
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```
5203  017340  104412  050134                  DISPLY  ,LINP5          ;PRINT 'SECT POS'
5204  017344  004737  016714                  JSR     PC,LIN3.2       ;CONVERT & PRINT IT
5205  017350  104412  001165                  DISPLY  ,$CRLF
5206  017354  000207                          RTS     PC
5207
5208                                  ;PRINT LINE 5A OF THE ERROR MESSAGE
5209
5210  017356  104412  050152          LINE5A: DISPLY  ,LIN5S          ;'HEADER CONTENTS OF ERROR SECTOR'
5211  017362  013746  053644                  MOV     CYLDER,-(SP)    ;HEADER POSITION TO STACK
5212  017366  004737  024740                  JSR     PC,PRTOCT       ;PRINT HEADER POSITION+
5213  017372  104412  051364                  DISPLY  ,LINSP          ;SPACES
5214  017376  013746  053646                  MOV     CYLDER+2,-(SP)  ;HEADER POSITION+2 TO STACK
5215  017402  004737  024740                  JSR     PC,PRTOCT       ;PRINT HEADER POSITION++2
5216  017406  104412  051364                  DISPLY  ,LINSP          ;SPACES
5217  017412  013746  053650                  MOV     CYLDER+4,-(SP)  ;HEADER POSITION+4 TO STACK
5218  017416  004737  024740                  JSR     PC,PRTOCT       ;PRINT HEADER POSITION++4
5219  017422  104412  051364                  DISPLY  ,LINSP          ;SPACES
5220  017426  013746  053652                  MOV     CYLDER+6,-(SP)  ;HEADER POSITION+6 TO STACK
5221  017432  004737  024740                  JSR     PC,PRTOCT       ;PRINT HEADER POSITION++6
5222  017436  104412  051364                  DISPLY  ,LINSP          ;SPACES
5223  017442  104412  001165                  DISPLY  ,$CRLF
5224  017446  000207                          RTS     PC
5225
5226                                  ;PRINT LINE 5B OF ERROR MESSAGE
5227
5228  017450  104412  050206          LINE5B: DISPLY  ,LINEP5         ;'RHEC1 = '
5229  017454  016046  000230                  MOV     $RHEC1(R0),-(SP) ;ECC POSITION REGISTER ON STACK
5230  017460  004737  024740                  JSR     PC,PRTOCT       ;PRINT IT
5231  017464  104412  051364                  DISPLY  ,LINSP          ;SPACES
5232  017470  104412  050217                  DISPLY  ,LINE05         ;' RHEC2 = '
5233  017474  016046  000232                  MOV     $RHEC2(R0),-(SP) ;ECC PATTERN REGISTER ON STACK
5234  017500  004737  024740                  JSR     PC,PRTOCT       ;PRINT IT
5235  017504  104412  001165                  DISPLY  ,$CRLF
5236  017510  000207                          RTS     PC              ;RETURN
5237
5238                                  ;PRINT LINE 6 OF ERROR MESSAGE
5239
5240  017512  104412  050231          LINE6:  DISPLY  ,LIN86          ;ECC CORRECTABLE
5241  017516  104412  001165                  DISPLY  ,$CRLF
5242  017522  000207                          RTS     PC
5243
5244                                  ;PRINT LINE 6A OF THE ERROR MESSAGE
5245
5246  017524  104412  050264          LINE6A: DISPLY  ,LINC6          ;PRINT 'READ CORRECTLY AT OFFSET N'
5247  017530  006301                  LIN6.1: ASL     R1              ;DOUBLE THE OFFSET TABLE INDEX
5248  017532  016137  042242  017542          MOV     OFMTBL(R1),1$   ;ADDRESS OF OFFSET POSITION MESSAGE
5249  017540  104412                          DISPLY
5250  017542  000000                  1$:     .WORD   0               ;OFFSET VALUE
5251  017544  104412  001165                  DISPLY  ,$CRLF
5252  017550  000207                          RTS     PC
5253
5254                                  ;PRINT LINE 6B OF THE ERROR MESSAGE
5255
5256  017552  104412  050231          LINE6B: DISPLY  ,LIN86          ;PRINT 'SECTOR IS ECC CORRECTABLE '
5257  017556  000137  017530                  JMP     LIN6.1
5258
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                                        ;PRINT LINE 6C OF THE ERROR MESSAGE

017562  104412  050313        LINE6C: DISPLY  ,LING6          ;'CORRECTED ON NTH RETRY'
017566  005046                LIN6.2: CLR     -(SP)           ;CLEAR STACK
017570  116016  000022                MOVB    $RETRY(R0),(SP) ;RETRY COUNT
017574  004737  016714                JSR     PC,LIN3.2       ;CONVERT & PRINT IT
017600  104412  050331                DISPLY  ,LINR6          ;'RETRY'
017604  104412  001165                DISPLY  ,$CRLF
017610  000207                      RTS     PC

                                        ;PRINT LINE 6D OF THE ERROR MESSAGE

017612  104412  050342        LINE6D: DISPLY  ,LINU06         ;'UNCORRECTABLE AFTER N RETRIES'
017616  000137  017566                JMP     LIN6.2          ;FINISH

                                        ;PRINT LINE 7 OF THE ERROR MESSAGE

017622  104412  050415        LINE7:  DISPLY  ,LIN70          ;PRINT ORDER COUNT
017626  012746  000042                MOV     #$OPERC,-(SP)   ;TO STACK
017632  060016                        ADD     R0,(SP)         ;ADD THE BASE ADDRESS
017634  004737  030036                JSR     PC,$DB2D        ;CONVERT IT
017640  004737  025576                JSR     PC,$SUPRS       ;PRINT IT
017644  104412  050474                DISPLY  ,LIN7T          ;TOTAL ERRORS
017650  016046  000062                MOV     $TOTAL(R0),-(SP)        ;TO STACK
017654  004737  016714                JSR     PC,LIN3.2       ;CONVERT & PRINT
017660  104412  050506                DISPLY  ,LIN7X          ;PRINT 'WRDS XFR'
017664  012746  000052                MOV     #$TRANS,-(SP)   ;ADDRESS OF LOW WORD ON STACK
017670  060016                        ADD     R0,(SP)
017672  004737  030036                JSR     PC,$DB2D        ;CONVERT
017676  004737  025576                JSR     PC,$SUPRS       ;PRINT
017702  104412  050522                DISPLY  ,LIN7R          ;'BITS READ'
017706  012746  000056                MOV     #$READ,-(SP)    ;LOW WORD ADDRESS
017712  060016                        ADD     R0,(SP)
017714  004737  030036                JSR     PC,$DB2D        ;CONVERT
017720  004737  025576                JSR     PC,$SUPRS       ;PRINT
017724  104412  001165                DISPLY  ,$CRLF
017730  104412  001165                DISPLY  ,$CRLF
017734  032737  100000  001140        BIT     #SW15,SWR       ;SEE IF 'HALT ON ERROR' - SWITCH 15
017742  001401                      BEQ     .+4             ;BR IF NOT
017744  000000                      HALT                    ;SWITCH 15 HALT
017746  000207                      RTS     PC

                                ;PRINT LINE 7A OF ERROR MESSAGE

017750  104412  050415        LINE7A: DISPLY  ,LIN70          ;'ORDERS = '
017754  012746  000042                MOV     #$OPERC,-(SP)   ;ORDER COUNT INCREMENT
017760  060016                        ADD     R0,(SP)         ;ADD BASE ADDRESS
017762  004737  030036                JSR     PC,$DB2D        ;CONVERT THE COUNT
017766  004737  025576                JSR     PC,$SUPRS       ;PRINT IT
017772  104412  050425                DISPLY  ,LIN7P          ;'TOTAL SEEKS = '
017776  012746  000046                MOV     #$POSIT,-(SP)   ;TOTAL SEEKS
020002  060016                        ADD     R0,(SP)         ;DEVICE TABLE ADDRESS
020004  004737  030036                JSR     PC,$DB2D        ;CONVERT THE SEEK COUNT
020010  004737  025576                JSR     PC,$SUPRS       ;PRINT IT
020014  104412  050367                DISPLY  ,LIN7M          ;'  TOTAL MISPOS ERR = '
020020  016046  000072                MOV     $MISPO(R0),-(SP)  ;TOTAL ERRORS
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5315  020024  004737  016714                  JSR     PC,LIN3.2       ;CONVERT & PRINT IT
5316  020030  104412  050445                  DISPLY  ,LIN7S          ;'  TOTAL SKI,OCYL ERR = '
5317  020034  016046  000070                  MOV     $SKI(R0),-(SP)  ;CONVERT & PRINT IT
5318  020040  004737  016714                  JSR     PC,LIN3.2       ;CONVERT AND PRINT IT
5319  020044  104412  001165                  DISPLY  ,$CRLF
5320  020050  104412  001165                  DISPLY  ,$CRLF
5321  020054  032737  100000  001140          BIT     #SW15,SWR       ;SEE IF HALT ON ERROR - SWITCH 15 SET
5322  020062  001401                          BEQ     .+4             ;BR IF NOT
5323  020064  000000                          HALT                    ;SWITCH 13 HALT
5324  020066  000207                          RTS     PC
5325
5326                                  ;PRINT LINE 8 OF THE ERROR MESSAGE
5327
5328  020070  104412  050537          LINE8:  DISPLY  ,LIN8M
5329  020074  004737  016046                  JSR     PC,LINE2        ;PRINT LINE 2 OF ERROR MESSAGE
5330  020100  000207                          RTS     PC
5331
5332                                  ;;*****************************************************************
5333
5334                                  .SBTTL  GENERAL SUPPORT SUBROUTINES
5335
5336                                  ;;*****************************************************************
5337
5338                                  ;ROUTINE TO INDICATE MEMORY SIZE ERROR AT STARTUP
5339
5340  020102  104401  001165          MEMERR: TYPE    ,$CRLF          ;CR-LF
5341  020106  104401  052230                  TYPE    ,NOTNUF         ;TYPE 'NOT ENOUGH MEMORY'
5342  020112  104401  001165                  TYPE    ,$CRLF          ;CR-LF
5343  020116  000000                          HALT
5344  020120  000137  001436                  JMP     START           ;TRY IT AGAIN
5345
5346                                  ;DECREMENT THE SECTOR-TRACK ADDRESS
5347
5348  020124  005066  000004          READDR: CLR     4(SP)           ;CLEAR STACK FOR SECTOR
5349  020130  116066  000172  000004        MOVB    $RHDA(R0),4(SP)  ;INCREMENTED SECTOR ON STACK
5350  020136  105366  000004                DECB    4(SP)           ;DECREMENT THE SECTOR ADDRESS
5351  020142  100017                        BPL     1$              ;BR IF SECTOR GREATER THAN 0
5352  020144  012766  000025  000004        MOV     #25,4(SP)       ;JAM SECTOR ADDRESS TO 21(10)
5353  020152  005066  000002                CLR     2(SP)           ;CLEAR STACK FOR TRACK
5354  020156  116066  000173  000002        MOVB    $RHDA+1(R0),2(SP)  ;TRACK ADDRESS
5355  020164  105366  000002                DECB    2(SP)           ;DECREMENT TRACK ADDRESS
5356  020170  100007                        BPL     2$              ;BR IF IT DIDN'T GO NEG
5357  020172  012766  000022  000002        MOV     #22,2(SP)       ;RESET TRACK TO 18(10)
5358  020200  000403                        BR      2$
5359  020202  116066  000173  000002  1$:   MOVB    $RHDA+1(R0),2(SP)  ;TRACK ADDRESS
5360  020210  000207                2$:     RTS     PC              ;RETURN
5361
5362                                  ;ROUTINE TO CHECK FOR A PRINTER
5363
5364  020212  012737  177777  001212  CKPTR:  MOV     #-1,$PRFLG      ;CLEAR PRINTER AVAILABILITY FLAG
5365  020220  012737  020244  000004          MOV     #CKPTR1,@#ERRVEC  ;RETURN ADDR IF NO PRINTER
5366  020226  005037  000006                 CLR     @#ERRVEC+2      ;NEW PSW
5367  020232  005777  160756                 TST     @$LSCS          ;READ PRINTER STATUS REG
5368  020236  005037  001212                 CLR     $PRFLG          ;SET THE PRINTER AVAILABILITY FLAG
5369  020242  000402                        BR      CKPTR2          ;FINISHED
5370  020244  062706  000004          CKPTR1: ADD     #4,SP           ;RESTORE THE STACK POINTER
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5371  020250  012737  000006  000004  CKPTR2: MOV     #6,@#ERRVEC     ;RESET ERROR VECTOR TO HALT
5372  020256  000207                          RTS     PC
5373
5374                                  ;ROUTINE TO CHECK FOR KW11-L OR KW11-P CLOCKS
5375
5376  020260  012737  177777  001210  CKCLK:  MOV     #-1,CLKFLG      ;CLEAR CLOCK AVAILABILITY FLAG
5377  020266  012737  177777  001206          MOV     #-1,PCLOCK      ;CLEAR KW11-P CLOCK AVAILABILITY FLAG
5378  020274  012737  020354  000004          MOV     #CKCLK1,@#ERRVEC  ;SET UP VECTOR FOR CLOCK CHECK
5379  020302  005037  000006                  CLR     @#ERRVEC+2      ;NEW PSW
5380  020306  005777  160662                  TST     @$LKCSR         ;CHECK FOR KW11-P
5381  020312  005037  001210                  CLR     CLKFLG          ;SET CLOCK AVAILABILITY FLAG
5382  020316  005037  001206                  CLR     PCLOCK          ;SET KW11-P CLOCK FLAG
5383  020322  013701  001200                  MOV     $LPVEC,R1       ;KW11-P VECTOR ADDRESS
5384  020326  012721  021432                  MOV     #CLOCK,(R1)+    ;SET UP KW11-P VECTOR
5385  020332  012711  000300                  MOV     #300,(R1)       ;PSW - PRI 6
5386  020336  012777  177777  160632          MOV     #-1,@$LKCSB     ;LOAD COUNTER BUFFER WITH 1'S
5387  020344  012777  000135  160622          MOV     #135,@$LKCSR    ;SET CLOCK - CNT UP, 16MS, CONT INT
5388  020352  000432                          BR      CKCLK3
5389  020354  062706  000004          CKCLK1: ADD     #4,SP           ;RESTORE THE STACK POINTER
5390  020360  012737  020422  000004          MOV     #CKCLK2,@#ERRVEC  ;CHANGE ERROR VECTOR TO CHECK FOR KW11-L
5391  020366  005777  160610                  TST     @$LKS           ;LOOK FOR KW11-L
5392  020372  005037  001210                  CLR     CLKFLG          ;SET CLOCK FLAG
5393  020376  013701  001204                  MOV     $LLVEC,R1       ;KW11-L VECTOR ADDRESS
5394  020402  012721  021432                  MOV     #CLOCK,(R1)+    ;SET UP KW11-L VECTOR
5395  020406  012711  000300                  MOV     #300,(R1)       ;PSW - PRI 6
5396  020412  012777  000100  160562          MOV     #100,@$LKS      ;SET KW11-L INTERRUPT
5397  020420  000407                          BR      CKCLK3
5398  020422  062706  000004          CKCLK2: ADD     #4,SP           ;RESTORE THE STACK POINTER
5399  020426  104401  052255                  TYPE    ,NEDCLK         ;'P OR L CLOCK MUST BE ON SYSTEM'
5400  020432  000000                          HALT                    ;HALT
5401  020434  000137  001436                  JMP     START           ;TRY AGAIN
5402  020440  012737  000006  000004  CKCLK3: MOV     #6,@#ERRVEC     ;RESTORE THE ERROR VECTOR
5403  020446  000207                          RTS     PC
5404
5405                                  ;ROUTINE TO DISPLAY STATISTICS FOR ALL DRIVES ASSIGNED
5406
5407  020450                          STATPR:
5408  020450  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
5409  020452  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
5410  020454  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
5411  020456  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
5412  020460  005004                          CLR     R4              ;R4 CONTAINS THE UNIT POINTER
5413  020462  012703  000010                  MOV     #8.,R3          ;R3 CONTAINS THE UNIT COUNTER
5414  020466  012700  037146                  MOV     #BLK0,R0        ;ADDR OF FIRST COUNTER
5415  020472  105764  041640          1$:     TSTB    ASNLST(R4)      ;SEE IF DRIVE ASSIGNED
5416  020476  001006                          BNE     2$              ;BR IF IT IS
5417  020500  005204                          INC     R4              ;INCREMENT THE UNIT POINTER
5418  020502  062700  000236                  ADD     #$RHEC2+4,R0    ;INCREMENT THE BLOCK ADDRESS
5419  020506  005303                          DEC     R3              ;FINISHED ?
5420  020510  001370                          BNE     1$              ;BR IF NOT
5421  020512  000422                          BR      6$              ;YES, EXIT
5422  020514  004737  020572          2$:     JSR     PC,SHDTYP       ;TYPE THE HEADING
5423  020520  105764  041640          3$:     TSTB    ASNLST(R4)      ;IS THE UNIT ASSIGNED
5424  020524  001003                          BNE     4$              ;BR IF NOT
5425  020526  062700  000236                  ADD     #$RHEC2+4,R0    ;ADD TABLE SIZE TO ADDRESS
5426  020532  000407                          BR      5$
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5427  020534  010002                  4$:     MOV     R0,R2           ;PUT BLOCK ADDRESS IN R2
5428  020536  062702  000042                  ADD     #$OPERC,R2      ;FIRST COUNTER TO DISPLAY
5429  020542  004737  020644                  JSR     PC,SDETAL       ;TYPE THE STATISTICS
5430  020546  062700  000236                  ADD     #$RHEC2+4,R0    ;INCREMENT BLOCK ADDRESS
5431  020552  005204                  5$:     INC     R4              ;INCREMENT UNIT NUMBER
5432  020554  005303                          DEC     R3              ;DECREMENT UNIT COUNTER
5433  020556  001360                          BNE     3$              ;BR IF NOT FINISHED
5434  020560                          6$:
5435  020560  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
5436  020562  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
5437  020564  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
5438  020566  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
5439  020570  000207                          RTS     PC
5440
5441                                  ;TYPE THE HEADER FOR THE DRIVE PERFORMANCE SUMMARY TYPEOUT
5442
5443  020572  004737  021402          SHDTYP: JSR     PC,$TIME        ;TYPE THE TIME OF DAY
5444  020576  004537  025134                  JSR     R5,TYPRI4       ;TYPE AT PRIORITY 4
5445  020602  001165                          $CRLF                   ;CR-LF
5446  020604  004537  025134                  JSR     R5,TYPRI4       ;TYPE THE HEADER
5447  020610  051547                          STATHD                  ;HEADER
5448  020612  005737  001224                  TST     LA30            ;LA30 ON THE SYSTEM ?
5449  020616  001406                          BEQ     1$              ;BR IF ONE IS
5450  020620  004537  025134                  JSR     R5,TYPRI4       ;SPLIT THE HEADER LINE
5451  020624  001165                          $CRLF                   ;CR-LF
5452  020626  004537  025134                  JSR     R5,TYPRI4       ;TYPE SPACES
5453  020632  051362                          LIN4SP                  ;4 SPACES
5454  020634  004537  025134          1$:     JSR     R5,TYPRI4       ;FINISH THE HEADER LINE
5455  020640  051662                          STAHD1                  ;REST OF THE HEADER LINE
5456  020642  000207                          RTS     PC
5457
5458                                  ;TYPE THE ERROR RATE DATA LINE
5459
5460  020644  142737  000007  001263  SDETAL: BICB    #7,UNIT+1       ;CLEAR THE UNIT NUMBER
5461  020652  150437  001263                  BISB    R4,UNIT+1       ;SET THE UNIT NUMBER
5462  020656  104401  001262                  TYPE    ,UNIT           ;TYPE IT
5463  020662  104401  051364                  TYPE    ,LINSP          ;SPACES
5464  020666  016046  000074                  MOV     $PASSC(R0),-(SP)  ;PUT THE PASS COUNT ON THE STACK
5465  020672  004737  030232                  JSR     PC,$SB2D        ;CONVERT IT
5466  020676  004737  024636                  JSR     PC,$RPZR5       ;TYPE IT
5467  020702  104401  051364                  TYPE    ,LINSP          ;SPACES
5468  020706  010246                          MOV     R2,-(SP)        ;PUT $OPERC ON THE STACK
5469  020710  004737  030036                  JSR     PC,$DB2D        ;CONVERT IT
5470  020714  004737  024616                  JSR     PC,$RPZR8       ;TYPE $OPERC
5471  020720  104401  051364                  TYPE    ,LINSP          ;SPACES
5472  020724  062702  000004                  ADD     #4,R2           ;INCREMENT R2
5473  020730  010246                          MOV     R2,-(SP)        ;PUT $POSIT ON THE STACK
5474  020732  004737  030036                  JSR     PC,$DB2D        ;CONVERT IT
5475  020736  004737  024616                  JSR     PC,$RPZR8       ;TYPE $POSIT
5476  020742  104401  051364                  TYPE    ,LINSP          ;SPACES
5477  020746  062702  000004                  ADD     #4,R2           ;INCREMENT R2
5478  020752  010246                          MOV     R2,-(SP)        ;PUT $TRANS ON THE STACK
5479  020754  004737  030036                  JSR     PC,$DB2D        ;CONVERT $TRANS
5480  020760  004737  024646                  JSR     PC,$RPZR0       ;TYPE IT
5481  020764  104401  051364                  TYPE    ,LINSP          ;SPACES
5482  020770  062702  000004                  ADD     #4,R2           ;INCREMENT R2
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5483  020774  010246                        MOV     R2,-(SP)        ;PUT $READ ON THE STACK
5484  020776  004737  030036                JSR     PC,$DB2D        ;CONVERT $READ
5485  021002  004737  024646                JSR     PC,$RPZRO       ;TYPE IT
5486  021006  104401  051365                TYPE    ,LINSPO         ;1 SPACE
5487  021012  062702  000004                ADD     #4,R2           ;INCREMENT R2
5488  021016  005737  001224                TST     LA30            ;LA30 ON THE SYSTEM ?
5489  021022  001406                        BEQ     1$              ;BR IF ONE IS
5490  021024  104401  001165                TYPE    ,$CRLF          ;SPLIT THE LINE
5491  021030  104401  051362                TYPE    ,LIN4SP         ;4 SPACES
5492  021034  104401  051364                TYPE    ,LINSP          ;2 SPACES
5493  021040  062702  000002        1$:     ADD     #2,R2           ;INCREMENT R2 AGAIN
5494  021044  012246                        MOV     (R2)+,-(SP)     ;PUT $SOFT ON THE STACK
5495  021046  004737  030232                JSR     PC,$SB2D        ;CONVERT $SOFT
5496  021052  004737  024626                JSR     PC,$RPZR4       ;TYPEOUT $SOFT
5497  021056  104401  051365                TYPE    ,LINSPO         ;SPACES
5498  021062  012246                        MOV     (R2)+,-(SP)     ;PUT $HARD ON THE STACK
5499  021064  004737  030232                JSR     PC,$SB2D        ;CONVERT $HARD
5500  021070  004737  024626                JSR     PC,$RPZR4       ;TYPEOUT $HARD
5501  021074  104401  051365                TYPE    ,LINSPO         ;SPACES
5502  021100  012246                        MOV     (R2)+,-(SP)     ;PUT $SKI ON THE STACK
5503  021102  004737  030232                JSR     PC,$SB2D        ;CONVERT $SKI
5504  021106  004737  024626                JSR     PC,$RPZR4       ;TYPEOUT $SKI
5505  021112  104401  051365                TYPE    ,LINSPO         ;SPACES
5506  021116  012246                        MOV     (R2)+,-(SP)     ;PUT $MISPO ON THE STACK
5507  021120  004737  030232                JSR     PC,$SB2D        ;CONVERT $MISPO
5508  021124  004737  024626                JSR     PC,$RPZR4       ;TYPEOUT $MISPO
5509  021130  104401  051365                TYPE    ,LINSPO         ;SPACES
5510  021134  016046  000062                MOV     $TOTAL(R0),-(SP)  ;CALCULATE NUMBER OF OTHER ERRORS
5511  021140  166016  000064                SUB     $SOFT(R0),(SP)  ;SUBTRACT $SOFT FROM $TOTAL
5512  021144  166016  000066                SUB     $HARD(R0),(SP)  ;SUBTRACT $HARD FROM $TOTAL
5513  021150  166016  000070                SUB     $SKI(R0),(SP)   ;SUBTRACT $SKI FROM $TOTAL
5514  021154  166016  000072                SUB     $MISPO(R0),(SP) ;SUBTRACT $MISPO FROM $TOTAL
5515  021160  004737  030232                JSR     PC,$SB2D        ;CONVERT 'OTHER' COUNT
5516  021164  004737  024626                JSR     PC,$RPZR4       ;TYPE IT
5517  021170  104401  001165                TYPE    ,$CRLF
5518  021174  000207                        RTS     PC
5519
5520                                  ;ROUTINE TO TYPE STATISTICS FOR THE DRIVE IN R0
5521
5522  021176                          TYPEST:
5523  021176  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
5524  021200  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
5525  021202  010446                        MOV     R4,-(SP)        ;;PUSH R4 ON STACK
5526  021204  004737  020572                JSR     PC,SHDTYP       ;TYPE THE HEADING
5527  021210  005004                        CLR     R4              ;CLEAR R4 FOR DRIVE NUMBER
5528  021212  111004                        MOVB    (R0),R4         ;DRIVE NUMBER
5529  021214  010002                        MOV     R0,R2           ;PUT BLOCK ADDRESS IN R2
5530  021216  062702  000042                ADD     #$OPERC,R2      ;ADDRESS OF '$OPERC' IN PRESENT CLOCK
5531  021222  004737  020644                JSR     PC,SDETAL       ;TYPE THE STATISTICS
5532  021226  012604                        MOV     (SP)+,R4        ;;POP STACK INTO R4
5533  021230  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
5534  021232  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
5535  021234  000207                        RTS     PC              ;RETURN
5536
5537
5538                                  ;ROUTINE TO INCREMENT $SOFT
```

```
                                        ;
                                        ;NOTE:  $SOFT WILL NOT BE INCREMENTED BEYOND 9999 (10)
                                        ;
021236  005737  016416          INCSOF: TST     PRT2B           ;SEE IF BAD TRK/SEC INDICATOR SET
021242  001006                          BNE     1$              ;BR IF IT'S SET, DON'T INCREMENT COUNT
021244  026027  000064  023417          CMP     $SOFT(R0),#9999.  ;IS $SOFT ALREADY AT MAXIMUM ?
021252  103002                          BHIS    1$              ;BR IF IT IS
021254  005260  000064                  INC     $SOFT(R0)               ;INCREMENT $SOFT
021260  000207                  1$:     RTS     PC              ;RETURN


                                        ;ROUTINE TO INCREMENT $HARD
                                        ;
                                        ;NOTE:  $HARD WILL NOT BE INCREMENTED BEYOND 9999 (10)

021262  005737  016416          INCHRD: TST     PRT2B           ;SEE IF BAD TRK/SEC INDICATOR SET
021266  001006                          BNE     1$              ;BR IF IT'S SET, DON'T INCREMENT COUNT
021270  026027  000066  023417          CMP     $HARD(R0),#9999.  ;IS $HARD ALREADY AT MAXIMUM ?
021276  103002                          BHIS    1$              ;BR IF IT IS
021300  005260  000066                  INC     $HARD(R0)               ;INCREMENT $HARD
021304  000207                  1$:     RTS     PC              ;RETURN


                                        ;ROUTINE TO INCREMENT $SKI
                                        ;
                                        ;NOTE:  $SKI WILL NOT BE INCREMENTED BEYOND 9999 (10)

021306  005737  016416          INCSKI: TST     PRT2B           ;SEE IF BAD TRK/SEC INDICATOR SET
021312  001006                          BNE     1$              ;BR IF IT'S SET, DON'T INCREMENT COUNT
021314  026027  000070  023417          CMP     $SKI(R0),#9999.  ;IS $SKI ALREADY AT MAXIMUM ?
021322  103002                          BHIS    1$              ;BR IF IT IS
021324  005260  000070                  INC     $SKI(R0)                ;INCREMENT $SKI
021330  000207                  1$:     RTS     PC              ;RETURN


                                        ;ROUTINE TO INCREMENT $MISPO
                                        ;
                                        ;NOTE:  $MISPO WILL NOT BE INCREMENTED BEYOND 9999 (10)

021332  005737  016416          INCMIS: TST     PRT2B           ;SEE IF BAD TRK/SEC INDICATOR SET
021336  001006                          BNE     1$              ;BR IF IT'S SET, DON'T INCREMENT COUNT
021340  026027  000072  023417          CMP     $MISPO(R0),#9999.  ;IS $MISPO ALREADY AT MAXIMUM ?
021346  103002                          BHIS    1$              ;BR IF IT IS
021350  005260  000072                  INC     $MISPO(R0)              ;INCREMENT $MISPO
021354  000207                  1$:     RTS     PC              ;RETURN


                                        ;ROUTINE TO INCREMENT $TOTAL
                                        ;
                                        ;NOTE:  $TOTAL WILL NOT BE INCREMENTED BEYOND 9999 (10)

021356  005737  016416          INCTOT: TST     PRT2B           ;SEE IF BAD TRK/SEC INDICATOR SET
021362  001006                          BNE     1$              ;BR IF IT'S SET, DON'T INCREMENT COUNT
021364  026027  000062  023417          CMP     $TOTAL(R0),#9999.  ;IS $TOTAL ALREADY AT MAXIMUM ?
021372  103002                          BHIS    1$              ;BR IF IT IS
021374  005260  000062                  INC     $TOTAL(R0)              ;INCREMENT $TOTAL
```

```
                                        ;RETURN
                                ;ROUTINE TO TYPE THE TIME
021400  000207          1$:     RTS     PC
021402  005737  001210  STIME:  TST     CLKFLG          ;CLOCK ON THE SYSTEM ?
021406  001010                  BNE     1$              ;BR IF NOT
021410  104401  001165          TYPE    ,$CRLF
021414  104401  021702          TYPE    ,HOUR           ;TYPE THE HOURS
021420  104401  021706          TYPE    ,MINUTE         ;TYPE THE MINUTES
021424  104401  021712          TYPE    ,SECOND         ;TYPE THE SECONDS
021430  000207          1$:     RTS     PC
                                ;CLOCK HANDLER ROUTINE
021432  010046  CLOCK:  MOV     R0,-(SP)        ;SAVE R0
021434  005237  021720          INC     SIXTEE          ;INCREMENT THE 1/60 SECOND COUNTER
021440  001076                  BNE     1$              ;BR IF A SECOND NOT COUNTED
021442  013737  001222  021720  MOV     HZ,SIXTEE       ;RESTORE THE VALUE
021450  005437  021720          NEG     SIXTEE          ;MAKE IT INTO 2'S COMP
021454  105237  021713          INCB    SECOND+1        ;INCREMENT THE SECONDS
021460  122737  000072  021713  CMPB    #72,SECOND+1    ;SEE IF COUNTER AT MAX
021466  001063                  BNE     1$              ;BR IF NOT
021470  112737  000060  021713  MOVB    #60,SECOND+1    ;RESTORE VALUE
021476  105237  021712          INCB    SECOND          ;INCREMENT UPPER
021502  122737  000066  021712  CMPB    #66,SECOND      ;UPPER AT MAX
021510  001052                  BNE     1$              ;BR IF NOT
021512  112737  000060  021712  MOVB    #60,SECOND      ;RESET UPPER
021520  105337  001305          DECB    INTRVL+1        ;DECREMENT STATISTICS TYPEOUT INTERVAL
021524  105237  021707          INCB    MINUTE+1        ;INCREMENT MINUTE
021530  122737  000072  021707  CMPB    #72,MINUTE+1    ;AT MAX ?
021536  001037                  BNE     1$              ;BR IF NOT
021540  112737  000060  021707  MOVB    #60,MINUTE+1    ;RESET LOWER
021546  105237  021706          INCB    MINUTE          ;INCREMENT UPPER HALF
021552  122737  000066  021706  CMPB    #66,MINUTE      ;AT MAX ?
021560  001026                  BNE     1$              ;BR IF NOT
021562  112737  000060  021706  MOVB    #60,MINUTE      ;RESET UPPER
021570  105237  021703          INCB    HOUR+1          ;INCREMENT HOURS
021574  022737  035071  021702  CMP     #35071,HOUR     ;AT MAX (99) ?
021602  001412                  BEQ     2$              ;BR IF IT IS
021604  122737  000072  021703  CMPB    #72,HOUR+1      ;AT MAX ?
021612  001011                  BNE     1$              ;BR IF NOT
021614  112737  000060  021703  MOVB    #60,HOUR+1      ;RESET VALUE
021622  105237  021702          INCB    HOUR            ;INCREMENT UPPER
021626  000403                  BR      1$
021630  012737  030060  021702  2$:     MOV     #30060,HOUR     ;RESET HOUR FIELD
021636  012746  000021          1$:     MOV     #21,-(SP)       ;17 MS ON THE STACK
021642  004037  035126          JSR     R0,RPTMR        ;DRIVER TIMER ROUTINE
021646  105737  001304          TSTB    INTRVL          ;DISPLAY THE PERFORMANCE SUMMARY ?
021652  001411                  BEQ     3$              ;BR IF NOT
021654  105737  001305          TSTB    INTRVL+1        ;DISPLAY INTERVAL FINISHED ?
021660  001006                  BNE     3$              ;BR IF NOT
021662  113737  001304  001305  MOVB    INTRVL,INTRVL+1 ;RESTORE THE INTERVAL
021670  012737  177777  001230  MOV     #-1,STATIN      ;SET ERROR RATE DATA DISPLAY FLAG
021676  012600          3$:     MOV     (SP)+,R0        ;RESTORE R0
021700  000002                  RTI
```

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5651
5652  021702  060          060          HOUR:   .BYTE   60,60          ;HOURS
5653  021704  072          000                  .BYTE   72,0           ;':' & TERMINATOR
5654  021706  060          060          MINUTE: .BYTE   60,60          ;MINUTES
5655  021710  072          000                  .BYTE   72,0           ;':' & TERMINATOR
5656  021712  060          060          SECOND: .BYTE   60,60          ;SECONDS
5657  021714  040          040                  .BYTE   40,40          ;SPACES
5658  021716  000                               .BYTE   0              ;TERMINATOR
5659          021720                            .EVEN
5660
5661  021720  000000                    SIXTEE: .WORD   0              ;1/60TH OR 1/50TH OF A SECOND COUNTER
5662
5663                                    ;COMMAND DECODE ROUTINE
5664
5665  021722                            KSR:
5666  021722  010046                            MOV     R0,-(SP)       ;;PUSH R0 ON STACK
5667  021724  010146                            MOV     R1,-(SP)       ;;PUSH R1 ON STACK
5668  021726  010246                            MOV     R2,-(SP)       ;;PUSH R2 ON STACK
5669  021730  010346                            MOV     R3,-(SP)       ;;PUSH R3 ON STACK
5670  021732  010446                            MOV     R4,-(SP)       ;;PUSH R4 ON STACK
5671  021734  010546                            MOV     R5,-(SP)       ;;PUSH R5 ON STACK
5672  021736  012705  026265                    MOV     #$TKQSRT+1,R5  ;ADDR OF INPUT
5673  021742  104401  001165                    TYPE    ,$CRLF         ;CR-LF
5674  021746  122715  000101                    CMPB    #101,(R5)      ;EQ TO AN 'A'
5675  021752  001410                            BEQ     1$             ;BR IF IT IS
5676  021754  121527  000075                    CMPB    (R5),#75       ;UNIT NUMBER GREATER THAN AN ASCII 7 ?
5677  021760  103054                            BHIS    6$             ;BR IF IT IS
5678  021762  121527  000060                    CMPB    (R5),#60       ;UNIT NUMBER LESS THAN AN ASCII 0 ?
5679  021766  103451                            BLO     6$             ;BR IF IT IS
5680  021770  142715  177770                    BICB    #^C7,(R5)      ;LEAVE ONLY LOWER 3 BITS IF CHAR NOT 'A'
5681  021774  122765  000124  177777  1$:       CMPB    #'T,-1(R5)     ;EQ TO 'T'
5682  022002  001003                            BNE     2$             ;BR IF NOT EQ
5683  022004  004737  022134                    JSR     PC,NEWASN      ;ASSIGN UNIT FOR TEST
5684  022010  000442                            BR      7$             ;EXIT
5685  022012  122765  000104  177777  2$:       CMPB    #'D,-1(R5)     ;EQ TO 'D' ?
5686  022020  001003                            BNE     3$             ;BR IF NOT EQ
5687  022022  004737  022452                    JSR     PC,DEASGN      ;DEASSIGN UNIT
5688  022026  000433                            BR      7$             ;EXIT
5689  022030  122765  000123  177777  3$:       CMPB    #'S,-1(R5)     ;EQ TO 'S'
5690  022036  001003                            BNE     4$             ;BR IF NOT EQ
5691  022040  004737  022554                    JSR     PC,SCMND       ;TYPE STATISTICS
5692  022044  000424                            BR      7$             ;EXIT
5693  022046  122765  000127  177777  4$:       CMPB    #'W,-1(R5)     ;EQ TO 'W'
5694  022054  001007                            BNE     5$             ;BR IF NOT EQ
5695  022056  032737  000001  001140            BIT     #SWD,SWR       ;IS SWITCH 0 SET ?
5696  022064  001012                            BNE     6$             ;BR IF SET, CAN'T DO 'W' COMMAND
5697  022066  004737  023026                    JSR     PC,DATAPK      ;WRITE A DATA PACK
5698  022072  000411                            BR      7$             ;EXIT
5699  022074  122765  000122  177777  5$:       CMPB    #'R,-1(R5)     ;EQ TO 'R' ?
5700  022102  001003                            BNE     6$             ;BR IF NOT EQ
5701  022104  004737  023040                    JSR     PC,REDAPK      ;READ A DATA PACK
5702  022110  000402                            BR      7$             ;EXIT
5703  022112  104401  052405            6$:     TYPE    ,INVLD         ;TYPE 'INVALID COMMAND' MESSAGE
5704  022116                            7$:
5705  022116  012605                    MOV     (SP)+,R5               ;;POP STACK INTO R5
5706  022120  012604                    MOV     (SP)+,R4               ;;POP STACK INTO R4
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5707  022122  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
5708  022124  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
5709  022126  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
5710  022130  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
5711  022132  000207                          RTS     PC
5712
5713                                  ;ROUTINE TO ASSIGN A DRIVE ('T' COMMAND)
5714
5715  022134  005037  001232          NEWASN: CLR     PACK            ;CLEAR 'W' COMMAND INDICATOR
5716  022140  005004                  ASGN0:  CLR     R4              ;R4 IS TABLE INDEX
5717  022142  012703  000010                  MOV     #8.,R3          ;SET INITIAL COUNT TO 8
5718  022146  122715  000101                  CMPB    #'01,(R5)       ;ASSIGN ALL UNITS?
5719  022152  001416                          BEQ     ASGN2           ;BR IF ALL UNITS
5720  022154  111504                  ASGN1:  MOVB    (R5),R4         ;PUT UNIT # IN R4
5721  022156  012737  051437  023612          MOV     #UNTASN,ASNMSG  ;'UNIT ASSIGNED' MESSAGE ADDR
5722  022164  012703  000001                  MOV     #1,R3           ;RELOAD R3 FOR 1 UNIT
5723  022170  105764  041640                  TSTB    ASNLST(R4)      ;UNIT ALREADY ASSIGNED
5724  022174  001002                          BNE     1$              ;BR IF IT IS
5725  022176  004737  022232                  JSR     PC,ASGN3        ;SEE IF UNIT ON THE SYSTEM
5726  022202  000137  023562          1$:     JMP     ASNERR          ;RETURN HERE IF DRIVE NOT AVAIL
5727  022206  000207                          RTS     PC              ;EXIT
5728  022210  004737  022232          ASGN2:  JSR     PC,ASGN3        ;ASSIGN ALL UNASSIGNED, AVAIL UNITS
5729  022214  000137  022222                  JMP     1$              ;UNIT NOT ON SYSTEM
5730  022220  000207                          RTS     PC              ;EXIT
5731  022222  012746  022214          1$:     MOV     #ASGN2+4,-(SP)  ;PUT RETURN ADDRESS ON THE STACK
5732  022226  000137  022342                  JMP     ASGN4           ;LOOK FOR MORE UNITS
5733  022232  105764  041640          ASGN3:  TSTB    ASNLST(R4)      ;UNIT ALREADY ASSIGNED?
5734  022236  001041                          BNE     ASGN4           ;BR IF IT IS
5735  022240  005737  030700          1$:     TST     DTUW            ;DATA TRANSFER UNDER WAY ?
5736  022244  100375                          BPL     1$              ;BR IF IT IS
5737  022246  110437  041526                  MOVB    R4,GENDPB       ;DRIVE NUMBER
5738  022252  004737  013012                  JSR     PC,RECALO       ;RECALIBRATE DRIVE
5739  022256  105764  030556                  TSTB    DRVSTA(R4)      ;DRIVE AVAILABLE?
5740  022262  001436                          BEQ     ASGN6           ;BR IF DRIVE OFFLINE
5741  022264  100441                          BMI     ASGN7           ;BR DRIVE NOT AVAILABLE
5742  022266  006304                          ASL     R4              ;MAKE R4 INTO WORD INDEX
5743  022270  016464  042124  041672          MOV     BLKADR(R4),NEWUNT(R4) ;DPB ADDRESS
5744  022276  016400  042124                  MOV     BLKADR(R4),R0   ;PUT BLOCK'S ADDR INTO R0
5745  022302  004737  013272                  JSR     PC,CLRDPB       ;CLEAR BLOCK FOR UNIT JUST ASSIGNED
5746  022306  004737  023052                  JSR     PC,GETID        ;GET DRIVE I.D.
5747  022312  004737  023132                  JSR     PC,GETADR       ;GET BAD SECTOR ADDRESSES
5748  022316  012760  000001  000074          MOV     #1,$PASSC(R0)   ;PRESET PASS COUNT TO 1
5749  022324  005737  001232                  TST     PACK            ;WRITE DATA PACK ?
5750  022330  001403                          BEQ     2$              ;BR IF NOT
5751  022332  113760  001232  000031          MOVB    PACK,$PACK(R0)  ;SET READ/WRITE DATA PACK INDICATOR
5752  022340  006204                  2$:     ASR     R4              ;RESTORE UNIT ADDRESS
5753  022342  005303                  ASGN4:  DEC     R3              ;DEC UNIT COUNT
5754  022344  001402                          BEQ     ASGN5           ;BR IF FINISHED
5755  022346  005204                          INC     R4              ;INCREMENT UNIT NUMBER
5756  022350  000730                          BR      ASGN3           ;CONTINUE
5757  022352  062716  000004          ASGN5:  ADD     #4,(SP)         ;INCREMENT RETURN
5758  022356  000207                          RTS     PC              ;RETURN
5759  022360  012737  051374  023612  ASGN6:  MOV     #UNTOFF,ASNMSG  ;'OFFLINE' MESSAGE ADDRESS
5760  022366  000207                          RTS     PC              ;RETURN
5761  022370  006304                  ASGN7:  ASL     R4              ;R4 INTO WORD INDEX
5762  022372  005764  030566                  TST     DRVTYP(R4)      ;UNIT PRESENT?
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5763  022376  001414                          BEQ     1$                  ;BR IF NOT
5764  022400  022764  020020  030566          CMP     #20020,DRVTYP(R4)   ;UNIT RP04?
5765  022406  001414                          BEQ     2$                  ;BR IF SINGLE PORT RP04
5766  022410  022764  024020  030566          CMP     #24020,DRVTYP(R4)   ;UNIT DUAL PORT RP04?
5767  022416  001410                          BEQ     2$                  ;BR IF DUAL PORT RP04
5768  022420  012737  051465  023612          MOV     #NOTRP,ASNMSG       ;ADDRESS OF 'NOT RP04' MSG
5769  022426  000407                          BR      3$                  ;EXIT
5770  022430  012737  051502  023612  1$:     MOV     #NOTPRS,ASNMSG      ;ADDRESS OF 'NOT PRESENT' MSG
5771  022436  000403                          BR      3$                  ;EXIT
5772  022440  012737  051517  023612  2$:     MOV     #NOTSAF,ASNMSG      ;ADDR OF 'UNIT UNSAFE' MESSAGE
5773  022446  006204                  3$:     ASR     R4                  ;RESTORE R4
5774  022450  000207                          RTS     PC                  ;ERROR RETURN
5775
5776                                  ;ROUTINE TO DEASSIGN A UNIT ('D' COMMAND)
5777
5778  022452  005004                  DEASGN: CLR     R4
5779  022454  122715  000101                  CMPB    #101,(R5)           ;DEASSIGN ALL UNITS ?
5780  022460  001432                          BEQ     5$                  ;BR IF YES
5781  022462  012703  000001                  MOV     #BIT00,R3           ;SET R3 FOR ONE UNIT
5782  022466  111504                          MOVB    (R5),R4             ;GET UNIT NUMBER
5783  022470  105764  041640          1$:     TSTB    ASNLST(R4)          ;UNIT ASSIGNED ?
5784  022474  001413                          BEQ     3$                  ;BR IF NOT
5785  022476  105064  041640                  CLRB    ASNLST(R4)          ;DELETE THE UNIT FROM THE ASSIGNED LIST
5786  022502  006304                          ASL     R4                  ;MAKE ADDR INTO A WORD INDEX
5787  022504  016464  042124  041650          MOV     BLKADR(R4),DUNIT(R4)  ;PUT ADDRESS IN DEASSIGN LIST
5788  022512  006204                          ASR     R4
5789  022514  005303                  2$:     DEC     R3                  ;ANY MORE UNITS ?
5790  022516  001412                          BEQ     4$                  ;BR IF NOT
5791  022520  005204                          INC     R4
5792  022522  000762                          BR      1$
5793  022524  122715  000101          3$:     CMPB    #101,(R5)           ;DEASSIGN ALL UNITS ?
5794  022530  001771                          BEQ     2$                  ;BR IF YES
5795  022532  012737  051415  023612          MOV     #UNTNOT,ASNMSG      ;ADDR OF 'NOT ASSIGNED' MESSAGE
5796  022540  004737  023562                  JSR     PC,ASNERR           ;REPORT IT
5797  022544  000207                  4$:     RTS     PC
5798  022546  012703  000010          5$:     MOV     #8.,R3              ;SET UNIT COUNT TO 8
5799  022552  000746                          BR      1$
5800
5801                                  ;ROUTINE TO TYPE UNIT PERFORMANCE SUMMARY  ('S' COMMAND)
5802
5803  022554  005004                  SCMND:  CLR     R4
5804  022556  122715  000101                  CMPB    #101,(R5)           ;ALL STATISTICS ?
5805  022562  001420                          BEQ     2$                  ;BR IF YES
5806  022564  111504                          MOVB    (R5),R4             ;GET UNIT #
5807  022566  105764  041640                  TSTB    ASNLST(R4)          ;SEE IF UNIT ASSIGNED
5808  022572  001406                          BEQ     1$                  ;BR IF NOT
5809  022574  006304                          ASL     R4                  ;MAKE UNIT ADDR INTO WORD INDEX
5810  022576  016400  042124                  MOV     BLKADR(R4),R0       ;ADDR OF BLOCK
5811  022602  004737  021176                  JSR     PC,TYPEST           ;TYPE DRIVE STATISTICS
5812  022606  000506                          BR      9$                  ;EXIT
5813  022610  012737  051415  023612  1$:     MOV     #UNTNOT,ASNMSG      ;ADDR OF 'NOT ASSIGNED' MSG
5814  022616  004737  023562                  JSR     PC,ASNERR           ;TYPE ERROR MESSAGE
5815  022622  000500                          BR      9$                  ;EXIT
5816  022624  012703  000010          2$:     MOV     #8.,R3              ;UNIT COUNT
5817  022630  105764  041640          3$:     TSTB    ASNLST(R4)          ;SEE IF ANY UNIT ASSIGNED
5818  022634  001004                          BNE     4$
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5819  022636  005204                          INC     R4              ;INCREMENT UNIT ADDRESS
5820  022640  005303                          DEC     R3              ;DECREMENT COUNTER
5821  022642  001372                          BNE     3$              ;MORE TO CHECK
5822  022644  000467                          BR      9$              ;NONE ASSINGED, RETURN
5823  022646  004737  020450          4$:     JSR     PC,STATPR       ;TYPE ALL STATISTICS
5824  022652  105737  001234                  TSTB    DATE            ;SEE IF 'DATE' ENTERED
5825  022656  001404                          BEQ     11$             ;BR IF NOT
5826  022660  104401  052526                  TYPE    ,DATEIS         ;'DATE: '
5827  022664  104401  001234                  TYPE    ,DATE           ;THE OPERATOR ENTERED DATE
5828  022670  105737  001246          11$:    TSTB    OPERID          ;SEE IF OPERATOR I.D. ENTERED
5829  022674  001404                          BEQ     12$             ;BR IF NOT
5830  022676  104401  052537                  TYPE    ,IDIS           ;'OPERATOR I.D.: '
5831  022702  104401  001246                  TYPE    ,OPERID         ;THE OPERATOR I.D.
5832  022706  104401  052561          12$:    TYPE    ,HEDLIN         ;HEADER LINE
5833  022712  012737  037322  022774          MOV     #BLK0+$DRVID,6$ ;DRIVE I.D. FIELD ADDRESS
5834  022720  005004                          CLR     R4              ;DRIVE ADDRESS
5835  022722  012703  000010                  MOV     #8.,R3          ;COUNTER
5836  022726  105764  041640          5$:     TSTB    ASNLST(R4)      ;SEE IF DRIVE ASSIGNED
5837  022732  001423                          BEQ     7$              ;BR IF NOT ASSIGNED
5838  022734  142737  000007  001263          BICB    #7,UNIT+1       ;CLEAR OLD DRIVE NUMBER
5839  022742  150437  001263                  BISB    R4,UNIT+1       ;LOAD NEW DRIVE NUMBER
5840  022746  104401  001262                  TYPE    ,UNIT           ;TYPE THE DRIVE NUMBER
5841  022752  104401  051362                  TYPE    ,LIN4SP         ;4 SPACES
5842  022756  105777  000012                  TSTB    @6$             ;SEE IF DRIVE I.D. ENTERED
5843  022762  001003                          BNE     10$             ;BR IF DRIVE I.D. PRESENT
5844  022764  104401  052604                  TYPE    ,NONE           ;TYPE 'NONE'
5845  022770  000404                          BR      7$              ;CONTINUE
5846  022772  104401                  10$:    TYPE                    ;TYPE THE DRIVE I.D.
5847  022774  000000                  6$:     .WORD   0               ;ADDRESS OF DRIVE I.D. FIELD HERE
5848  022776  104401  001165                  TYPE    ,$CRLF          ;CR-LF
5849  023002  005303                  7$:     DEC     R3              ;DECREMENT THE COUNTER
5850  023004  001405                          BEQ     8$              ;BR IF AT END
5851  023006  062737  000236  022774          ADD     #$RHEC2+4,6$    ;INCREMENT THE MESSAGE FIELD ADDRESS
5852  023014  005204                          INC     R4              ;INCREMENT DRIVE ADDRESS
5853  023016  000743                          BR      5$              ;CONTINUE
5854  023020  104401  001165          8$:     TYPE    ,$CRLF          ;CR-LF
5855  023024  000207                  9$:     RTS     PC
5856
5857                                  ;ROUTINE TO WRITE A DATA PACK ('W' COMMAND)
5858
5859  023026  012737  177777  001232  DATAPK: MOV     #-1,PACK        ;SET THE 'W' COMMAND INDICATOR
5860  023034  000137  022140                  JMP     ASGNO           ;ASSIGN REQUESTED UNIT
5861
5862
5863                                  ;ROUTINE TO READ A DATA PACK ('R' COMMAND)
5864
5865  023040  012737  000001  001232  REDAPK: MOV     #1,PACK         ;SET THE 'READ' INDICATOR
5866  023046  000137  022140                  JMP     ASGNO           ;ASSIGN THE REQUESTED UNIT
5867
5868                                  ;ROUTINE TO GET THE DRIVE ID NUMBER FROM THE OPERATOR
5869
5870  023052  010546                  GETID:  MOV     R5,-(SP)        ;SAVE R5
5871  023054  104401  052474                  TYPE    ,ENTDRV         ;'ENTER DRV I.D.: '
5872  023060  142737  000007  001263          BICB    #7,UNIT+1       ;CLEAR OLD UNIT NUMBER
5873  023066  010446                          MOV     R4,-(SP)        ;CONVERT INDEX TO DRIVE NUMBER
5874  023070  006216                          ASR     (SP)            ;SHIFT IT
```

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5875  023072  152637  001263                  BISB    (SP)+,UNIT+1    ;LOAD NEW UNIT NUMBER
5876  023076  104401  001262                  TYPE    ,UNIT           ;TYPE THE DRIVE NUMBER
5877  023102  104401  052523                  TYPE    ,COLON          ;TYPE A COLON ':'
5878  023106  104407                          RDLIN                   ;READ THE ENTRY
5879  023110  012605                          MOV     (SP)+,R5        ;GET THE ENTRY ADDRESS
5880  023112  012560  000154                  MOV     (R5)+,$DRVID(R0)  ;STORE THE I.D.
5881  023116  012560  000156                  MOV     (R5)+,$DRVID+2(R0)  ;STORE THE I.D.
5882  023122  012560  000160                  MOV     (R5)+,$DRVID+4(R0)  ;STORE THE I.D.
5883  023126  012605                          MOV     (SP)+,R5        ;RESTORE R5
5884  023130  000207                          RTS     PC              ;RETURN
5885
5886                                  ;ROUTINE TO GET THE ADDRESSES OF ANY BAD SECTORS (UP TO A MAX OF 8)
5887
5888  023132                          GETADR:
5889  023132  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
5890  023134  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
5891  023136  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
5892  023140  104401  052613                  TYPE    ,ENTADR         ;ENTER SECTOR ADDRESSES
5893  023144  104401  001262                  TYPE    ,UNIT           ;TYPE THE UNIT NUMBER
5894  023150  104401  051365                  TYPE    ,LINSPO         ;1 SPACE
5895  023154  104401  001164                  TYPE    ,$QUES          ;QUESTION MARK
5896  023160  012703  000020                  MOV     #16.,R3         ;NUMBER OF LOCATIONS IN THE TABLE TO PRESET
5897  023164  012701  000114                  MOV     #$BDSEC,R1      ;TABLE INCREMENT
5898  023170  060001                          ADD     R0,R1           ;BLOCK STARTING ADDRESS
5899  023172  012721  177777          1$:     MOV     #-1,(R1)+       ;SET LOCATION TO 1'S
5900  023176  005303                          DEC     R3              ;DECREMENT TABLE SIZE COUNT
5901  023200  001374                          BNE     1$              ;BR IF NOT FINISHED WITH TABLE
5902  023202  162701  000040                  SUB     #32.,R1         ;SET POINTER TO BEGINNING OF TABLE
5903  023206  012703  000010                  MOV     #8.,R3          ;NUMBER OF ADDRESSES IN TABLE
5904  023212  104407                  2$:     RDLIN                   ;GET ADDRESS FROM OPERATOR
5905  023214  012602                          MOV     (SP)+,R2        ;TEXT POINTER
5906  023216  121227  000003                  CMPB    (R2),#3         ;'CONTROL C' ENTERED ?
5907  023222  001476                          BEQ     4$              ;BR IF IT WAS
5908  023224  012737  000054  023560          MOV     #',,SEPART      ;COMMA IS THE SEPARATOR
5909  023232  004537  023432                  JSR     R5,CONVEA       ;GET THE CYLINDER ADDRESS
5910  023236  000460                          BR      3$              ;TERMINATOR FOUND (INVALID)
5911  023240  005737  023556                  TST     HOLD            ;SEE IF INVALID TEXT ENTERED
5912  023244  100455                          BMI     3$              ;BR IF ANY CYLINDER TEXT INVALID
5913  023246  023727  023556  000632          CMP     HOLD,#410.      ;IS CYLINDER VALUE OK ?
5914  023254  101051                          BHI     3$              ;BR IF NOT
5915  023256  013711  023556                  MOV     HOLD,(R1)       ;MOVE CYLINDER VALUE TO THE TABLE
5916  023262  005037  023430                  CLR     6$              ;CLEAR THE TRACK 'CR' INDICATOR
5917  023266  004537  023432                  JSR     R5,CONVEA       ;GET THE TRACK ADDRESS
5918  023272  000402                          BR      .+6             ;'CR' ENTERED; ENTIRE TRACK SPECIFIED
5919  023274  005237  023430                  INC     6$              ;SET THE 'SECTOR' SWITCH
5920  023300  005737  023556                  TST     HOLD            ;SEE IF INVALID CHARACTERS ENTERED
5921  023304  100435                          BMI     3$              ;BR IF ANY WERE
5922  023306  023727  023556  000022          CMP     HOLD,#18.       ;SEE IF TRACK ADDRESS TOO LARGE
5923  023314  101031                          BHI     3$              ;BR IF IT IS
5924  023316  113761  023556  000003          MOVB    HOLD,3(R1)      ;PUT TRACK ADDRESS INTO TABLE
5925  023324  005737  023430                  TST     6$              ;SEE IF <CR> ENTERED
5926  023330  001416                          BEQ     5$              ;GET OUT IF IT WAS
5927  023332  004537  023432                  JSR     R5,CONVEA       ;GET SECTOR ADDRESS
5928  023336  000401                          BR      .+4             ;<CR> MUST BE ENTERED
5929  023340  000417                          BR      3$              ;INVALID, SEPARATOR USED
5930  023342  005737  023556                  TST     HOLD            ;SEE IF INVALID CHARACTER ENTERED
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 5931  023346  100414                          BMI     3$              ;BR IF ONE WAS
 5932  023350  023727  023556  000025          CMP     HOLD,#21.       ;SEE IF SECTOR ADDRESS TOO LARGE
 5933  023356  101010                          BHI     3$              ;BR IF IT IS
 5934  023360  113761  023556  000002          MOVB    HOLD,2(R1)      ;PUT SECTOR ADDRESS INTO TABLE
 5935  023366  005303                  5$:     DEC     R3              ;MORE ENTRIES ?
 5936  023370  001413                          BEQ     4$              ;BR IF NOT
 5937  023372  062701  000004                  ADD     #4,R1           ;INCREMENT THE TABLE POINTER
 5938  023376  000705                          BR      2$              ;CONTINUE
 5939  023400  012711  177777          3$:     MOV     #-1,(R1)        ;CLEAR PRESENT TABLE ENTRY
 5940  023404  012761  177777  000002          MOV     #-1,2(R1)       ;CLEAR PRESENT TABLE ENTRY
 5941  023412  104401  052646                  TYPE    ,BADENT         ;'INVALID ENTRY'
 5942  023416  000675                          BR      2$              ;TRY AGAIN
 5943  023420                          4$:
 5944  023420  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
 5945  023422  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
 5946  023424  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 5947  023426  000207                          RTS     PC              ;RETURN
 5948
 5949  023430  000000                  6$:     .WORD   0               ;TRACK <CR> INDICATOR
 5950
 5951                                  ;ROUTINE TO CONVERT INPUT DECIMAL ASCII NUMBERS TO BINARY
 5952                                  ;       RETURN IF TERMINATOR (CR); RETURN +2 IF SEPARATOR (,).
 5953                                  ;       R2 CONTAINS ADDRESS OF ASCII STRING
 5954
 5955  023432  005037  023556  CONVEA: CLR     HOLD            ;CLEAR WORKING LOCATION
 5956  023436  105712          1$:     TSTB    (R2)            ;SEE IF TERMINATOR
 5957  023440  001445                  BEQ     5$              ;BR IF TERMINATOR
 5958  023442  121237  023560          CMPB    (R2),SEPART     ;LOOK FOR THE SEPARATOR
 5959  023446  001437                  BEQ     4$              ;BR IF SEPARATOR
 5960  023450  121227  000060          CMPB    (R2),#'0        ;CHARATER GREATER OR EQUAL TO 0 ?
 5961  023454  103430                  BLO     3$              ;BR IF NOT
 5962  023456  121227  000072          CMPB    (R2),#':        ;IF CHARACTER GREATER THAN 9 ?
 5963  023462  103025                  BHIS    3$              ;BR IF IT IS
 5964  023464  005737  023556          TST     HOLD            ;VALUE IN WORKING LOCATION
 5965  023470  001412                  BEQ     2$              ;BR IF NONE
 5966  023472  006337  023556          ASL     HOLD            ;MULTIPLY 'HOLD' BY 2
 5967  023476  013746  023556          MOV     HOLD,-(SP)      ;THE THE '2 TIMES' VALUE
 5968  023502  006337  023556          ASL     HOLD            ;MULTIPLY 'HOLD' BY 2 AGAIN
 5969  023506  006337  023556          ASL     HOLD            ;MULTIPLY 'HOLD' BY 2 AGAIN
 5970  023512  062637  023556          ADD     (SP)+,HOLD      ;ADD THE '2 TIMES' VALUE
 5971  023516  005046          2$:     CLR     -(SP)           ;CLEAR THE STACK
 5972  023520  111216                  MOVB    (R2),(SP)       ;PUT THE CHARACTER ON THE STACK
 5973  023522  005202                  INC     R2              ;INCREMENT THE POINTER
 5974  023524  142716  000060          BICB    #60,(SP)        ;CLEAR THE UPPER BITS
 5975  023530  062637  023556          ADD     (SP)+,HOLD      ;ADD THE NEW CHARACTER
 5976  023534  000740                  BR      1$              ;GET THE NEXT CHARACTER
 5977  023536  012737  177777  023556  3$:     MOV     #-1,HOLD        ;SET BAD CHARACTER INDICATOR
 5978  023544  000403                  BR      5$              ;EXIT
 5979  023546  062705  000002          4$:     ADD     #2,R5           ;INCREMENT THE RETURN
 5980  023552  005202                  INC     R2              ;INCREMENT THE POINTER FOR SEPARATOR THEI
 5981  023554  000205                  5$:     RTS     R5              ;RETURN
 5982
 5983  023556  000000          HOLD:   .WORD   0               ;WORKING LOCATION FOR THE CONVERSION
 5984  023560  000000          SEPART: .WORD                   ;SEPARATOR CHARACTER (IN ASCII) GOES HERE
 5985
 5986                                  ;TYPEOUT ASSIGN/DEASSIGN ERROR MESSAGE
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 5987
 5988  023562  142737  000007  001263  ASNERR: BICB    #7,UNIT+1       ;CLEAR PREVIOUS DRIVE NUMBER
 5989  023570  150437  001263          BISB    R4,UNIT+1       ;PRESENT DRIVE NUMBER
 5990  023574  104401  052331          TYPE    ,QUES           ;QUESTION MARK
 5991  023600  104401  051367          TYPE    ,UNTMSG         ;TYPE 'UNIT'
 5992  023604  104401  001262          TYPE    ,UNIT           ;UNIT NUMBER
 5993  023610  104401                  TYPE                    ;TYPE SPECIFIC MESSAGE
 5994  023612  000000          ASNMSG: .WORD   0               ;MESSAGE ADDRESS
 5995  023614  104401  001165          TYPE    ,$CRLF
 5996  023620  000207                  RTS     PC
 5997
 5998                                  ;DEASSIGN A UNIT IF A FATAL ERROR OCCURS
 5999
 6000  023622  005004          DROP:   CLR     R4              ;CLEAR R4 FOR UNIT NUMBER
 6001  023624  111004                  MOVB    (R0),R4         ;MOVE UNIT NUMBER TO R4
 6002  023626  105064  041640          CLRB    ASNLST(R4)      ;REMOVE UNIT FROM ASSIGNED LIST
 6003  023632  006304                  ASL     R4              ;MAKE UNIT NUMBER INTO A TABLE INDEX
 6004  023634  010064  041650          MOV     R0,DUNIT(R4)    ;PUT UNIT IN DROP LIST
 6005  023640  104401  001165          TYPE    ,$CRLF
 6006  023644  104401  001165          TYPE    ,$CRLF
 6007  023650  104401  051727          TYPE    ,DROPNG         ;TYPE 'DROPPING UNIT'
 6008  023654  104401  052040          TYPE    ,DRNUM          ;'DRIVE #'
 6009  023660  142737  000007  001263  BICB    #7,UNIT+1       ;CLEAR THE UNIT NUMBER
 6010  023666  151037  001263          BISB    (R0),UNIT+1     ;SET THE UNIT NUMBER
 6011  023672  104401  001262          TYPE    ,UNIT           ;TYPE THE UNIT NUMBER
 6012  023676  104401  001165          TYPE    ,$CRLF
 6013  023702  000207                  RTS     PC
 6014
 6015                                  ;ROUTINE TO DEASSIGN A UNIT IF ERRORS BECOMES EXCESSIVE
 6016
 6017  023704  032737  000020  001140  ABNRML: BIT     #SW04,SWR       ;SEE IF SWITCH 4 SET
 6018  023712  001004                  BNE     1$              ;BR IF IT'S SET
 6019  023714  C23760  001302  000062          CMP     MAXER,$TOTAL(R0)  ;CHECK TOTAL ERROR VALUE
 6020  023722  001737                  BEQ     DROP            ;DROP THE UNIT IF IT EXCEEDS MAX
 6021  023724  000207          1$:     RTS     PC              ;RETURN
 6022
 6023                                  ;ROUTINE TO CHECK FOR END OF PASS AND END OF TEST
 6024
 6025  023726  005737  001322          NRML:   TST     ENDET           ;END OF PASS DETERMINED BY SEEKS OR WORDS ?
 6026  023732  001412                  BEQ     NRML1           ;BR IF SEEKS
 6027  023734  026037  000060  001270          CMP     $READ+2(R0),ENDCON+2  ;CHECK MSW OF WORDS READ COUNT
 6028  023742  101017                  BHI     NRML2           ;BR IF MSW GREATER THAN LIMIT
 6029  023744  103405                  BLO     NRML1           ;BR IF MSW LESS THAN LIMIT
 6030  023746  026037  000056  001266          CMP     $READ(R0),ENDCON  ;CHECK LSW AGAINST LIMIT
 6031  023754  103012                  BHIS    NRML2           ;BR IF EQUAL OR GREATER
 6032  023756  000506                  BR      NRMLX           ;EXIT
 6033  023760  026037  000050  001274  NRML1:  CMP     $POSIT+2(R0),ENDSEK+2  ;CHECK MSW OF SEEK COUNT
 6034  023766  101005                  BHI     NRML2           ;BR IF MSW GREATER THAN LIMIT
 6035  023770  103501                  BLO     NRMLX           ;EXIT IF MSW LESS THAN LIMIT
 6036  023772  026037  000046  001272          CMP     $POSIT(R0),ENDSEK  ;CHECK LSW OF SEEK COUNT
 6037  024000  103475                  BLO     NRMLX           ;EXIT IF LSW LESS THAN LIMIT
 6038  024002  104401  001165  NRML2:  TYPE    ,$CRLF          ;CR-LF
 6039  024006  104401  051763          TYPE    ,ENDPAS         ;END OF PASS FOR THE UNIT
 6040  024012  016046  000074          MOV     $PASSC(R0),-(SP)  ;PUT PASS COUNT ON THE STACK
 6041  024016  104405                  TYPDS                   ;CONVERT PASS COUNT TO DECIMAL AND TYPE IT
 6042  024020  142737  000007  001263  BICB    #7,UNIT+1       ;CLEAR THE UNIT NUMBER
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6043  024026  151037  001263                    BISB    (R0),UNIT+1     ;SET THE UNIT NUMBER
6044  024032  032737  000020  001140            BIT     #SW04,SWR       ;SWITCH 4 SET ?
6045  024040  001015                            BNE     1$              ;BR IF SET
6046  024042  026037  C00074  001276            CMP     $PASSC(R0),PASCNT  ;SEE IF AT END OF TEST
6047  024050  103411                            BLO     1$              ;BR IF NOT
6048  024052  104401  051777                    TYPE    ,ENDTST         ;TYPE 'END OF TEST'
6049  024056  104401  052040                    TYPE    ,DRNUM          ;'DRIVE #'
6050  024062  104401  001262                    TYPE    ,UNIT           ;DRIVE NUMBER
6051  024066  104401  001165                    TYPE    ,$CRLF          ;CR-LF
6052  024072  000427                            BR      3$              ;DEASSIGN THE DRIVE
6053  024074  104401  052040            1$:     TYPE    ,DRNUM          ;'DRIVE #'
6054  024100  104401  001262                    TYPE    ,UNIT           ;DRIVE NUMBER
6055  024104  104401  001165                    TYPE    ,$CRLF          ;CR-LF
6056  024110  004737  021176                    JSR     PC,TYPEST       ;TYPE THE UNIT'S STATISTICS
6057  024114  010346                            MOV     R3,-(SP)        ;SAVE R3
6058  024116  010446                            MOV     R4,-(SP)        ;SAVE R4
6059  024120  010004                            MOV     R0,R4           ;UNIT'S BLOCK ADDRESS
6060  024122  062704  000042                    ADD     #$OPERC,R4      ;ADD THE STARTING ADDR OF SECTIONS TO CLEAR
6061  024126  012703  000010                    MOV     #8.,R3          ;NUMBER OF LOCNS TO BE CLEARED
6062                                                                    ;(ERROR COUNTERS NOT CLEARED)
6063  024132  005024                    2$:     CLR     (R4)+           ;CLEAR THE LOCN
6064  024134  005303                            DEC     R3              ;DECREMENT THE LOCATION COUNTER
6065  024136  001375                            BNE     2$              ;BR IF MORE TO GO
6066  024140  012604                            MOV     (SP)+,R4        ;RESTORE R4
6067  024142  012603                            MOV     (SP)+,R3        ;RESTORE R3
6068  024144  005260  000074                    INC     $PASSC(R0)      ;INCREMENT THE PASS COUNT
6069  024150  000411                            BR      NRMLX           ;EXIT
6070  024152  104401  001165            3$:     TYPE    ,$CRLF
6071  024156  005004                            CLR     R4              ;CLEAR R4 FOR DRIVE NUMBER
6072  024160  111004                            MOVB    (R0),R4         ;MOVE DRIVE NUMBER
6073  024162  105064  041640                    CLRB    ASNLST(R4)      ;DELETE DRIVE FROM ASSIGNED LIST
6074  024166  006304                            ASL     R4              ;MAKE DRIVE NUMBER INTO TABLE INDEX
6075  024170  010064  041650                    MOV     R0,DUNIT(R4)    ;PUT BLOCK ADDRESS INTO DROP LIST
6076  024174  000207                    NRMLX:  RTS     PC              ;RETURN
6077
6078                                            ;ROUTINE TO GET THE REMAINDER OF THE RANDOM NUMBER
6079
6080  024176  013746  027736            GETREM: MOV     $LONUM,-(SP)    ;STORE RANDOM NUMBER ON THE STACK FOR DIVIDE
6081  024202  013746  027734                    MOV     $HINUM,-(SP)    ;UPPER PART
6082  024206  010546                            MOV     R5,-(SP)        ;PUT THE DIVISOR ONTO THE STACK
6083  024210  004737  024224                    JSR     PC,LINKDV       ;DIVIDE THE RANDOM NUMBERS
6084  024214  012605                            MOV     (SP)+,R5        ;PUT THE REMAINDER INTO R5
6085  024216  005726                            TST     (SP)+           ;ADJUST THE STACK POINTER
6086  024220  000240                            NOP                     ;FOR DEBUGGING HALT
6087  024222  000207                            RTS     PC
6088
6089                                            ;LINK ROUTINE TO THE DIVISION UTILITY SUBROUTINE
6090                                            ;       THIS ROUTINE ALLOWS THE 'SYSMAC' DIVIDE ROUTINE
6091                                            ;       CALLING SEQUENCE TO BE USED
6092
6093  024224                            LINKDV:
6094  024224  010546                            MOV     R5,-(SP)        ;;PUSH R5 ON STACK
6095  024226  010446                            MOV     R4,-(SP)        ;;PUSH R4 ON STACK
6096  024230  010346                            MOV     R3,-(SP)        ;;PUSH R3 ON STACK
6097  024232  010246                            MOV     R2,-(SP)        ;;PUSH R2 ON STACK
6098  024234  010146                            MOV     R1,-(SP)        ;;PUSH R1 ON STACK
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 6099  024236  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
 6100  024240  016605  000016                  MOV     16(SP),R5       ;DIVISOR
 6101  024244  005004                          CLR     R4              ;OTHER DIVISOR WORD
 6102  024246  016602  000020                  MOV     20(SP),R2       ;UPPER DIVIDEND WORD
 6103  024252  016603  000022                  MOV     22(SP),R3       ;LOWER DIVIDEND WORD
 6104  024256  005000                          CLR     R0              ;CLEAR OTHER DIVIDEND REGISTERS
 6105  024260  005001                          CLR     R1
 6106  024262  004737  024316                  JSR     PC,M.DPID       ;GO TO THE DIVIDE ROUTINE
 6107  024266  010166  000020                  MOV     R1,20(SP)       ;REMAINDER ON THE STACK
 6108  024272  010366  000022                  MOV     R3,22(SP)       ;QUOTIENT ON THE STACK
 6109  024276  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
 6110  024300  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
 6111  024302  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
 6112  024304  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
 6113  024306  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
 6114  024310  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
 6115  024312  012616                          MOV     (SP)+,(SP)      ;MOVE RETURN UP THE STACK
 6116  024314  000207                          RTS     PC
 6117
 6118                          ;               DIVISION UTILITY SUBROUTINE
 6119                          ;               R0-R1-R2-R3=DIVIDEND
 6120                          ;               R4-R5=DIVISOR
 6121                          ;               R0-R1=REMAINDER AFTER DIVISION
 6122                          ;               R2-R3=QUOTIENT AFTER DIVISION
 6123                          ;               ENTER WITH JSR  PC,M.DPID
 6124                          ;
 6125  024316  012746  000040  M.DPID: MOV     #40,-(SP)       ;COUNTER FOR DIVISION CYCLES
 6126  024322  010446                          MOV     R4,-(SP)        ;HIGH ORDER
 6127  024324  010546                          MOV     R5,-(SP)        ;LOW ORDER DIVISOR TO THE STACK
 6128  024326  005466  000002                  NEG     2(SP)           ;FORM NEGATIVE
 6129  024332  005416                          NEG     @SP             ;VERSION OF THE DIVISOR
 6130  024334  005666  000002                  SBC     2(SP)
 6131  024340  061601                          ADD     @SP,R1
 6132  024342  005500                          ADC     R0              ;PERFORM THE INITIAL SUBTRACTION
 6133  024344  066600  000002                  ADD     2(SP),R0
 6134  024350  103445                          BCS     M.DP50          ;IF CARRY THEN OVERFLOW HAS OCCURRED
 6135  024352  005046                          CLR     -(SP)           ;THIS IS A LONGER LASTING CARRY BIT
 6136  024354  006103          M.DP40: ROL     R3
 6137  024356  006102                          ROL     R2
 6138  024360  006101                          ROL     R1
 6139  024362  006100                          ROL     R0
 6140  024364  005716                          TST     @SP             ;TEST "CARRY" INDICATOR
 6141  024366  001410                          BEQ     M.DP41          ;IF NO "CARRY" THEN ADD ELSE SUBTRACT
 6142  024370  005016                          CLR     @SP             ;CLEAR UP FOR NEXT TIME
 6143  024372  066601  000002                  ADD     2(SP),R1
 6144  024376  005500                          ADC     R0              ;ADD -(DIVISOR)
 6145  024400  005516                          ADC     @SP     ;  I    ;SET "CARRY"
 6146  024402  066600  000004                  ADD     4(SP),R0;<-
 6147  024406  000404                          BR      M.DP42
 6148  024410  060501          M.DP41: ADD     R5,R1
 6149  024412  005500                          ADC     R0              ;ADD +(DIVISOR)
 6150  024414  005516                          ADC     @SP     ;  I    ;SET "CARRY"
 6151  024416  060400                          ADD     R4,R0   ;<-
 6152  024420  005516          M.DP42: ADC     @SP             ;SET "CARRY"
 6153  024422  005716                          TST     @SP             ;TEST THE UPDATE INDICATOR
 6154  024424  001401                          BEQ     .+4     ;->     ;IF ZERO FORGET IT
```

```
6155  024426  005203                          INC     R3      ; _I    ;NO CARRY POSSIBLE HERE
6156  024430  005366  000006                  DEC     6(SP)   ;<-     ;DECREMENT COUNTER
6157  024434  003347                          BGT     M.DP40          ;BRANCH IF MORE TO DO
6158  024436  006003                          ROR     R3
6159  024440  103404                          BCS     M.DP44
6160  024442  060501                          ADD     R5,R1
6161  024444  005500                          ADC     R0
6162  024446  060400                          ADD     R4,R0
6163  024450  000241                          CLC
6164  024452  006103              M.DP44:     ROL     R3
6165  024454  062706  000010                  ADD     #10,SP          ;ADJUST STACK BY 4 WORDS
6166  024460  000242                          CLV
6167  024462  000207                          RTS     PC
6168  024464  062706  000006      M.DP50:     ADD     #6,SP
6169  024470  000262                          SEV
6170  024472  000207                          RTS     PC
6171
6172
6173
6174                                ;LINK SUBROUTINE TO MULTIPLY ROUTINE 'M.DPIM'
6175
6176  024474                        LINKML:
6177  024474  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
6178  024476  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
6179  024500  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
6180  024502  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
6181  024504  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
6182  024506  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
6183  024510  005002                          CLR     R2              ;PUT MULTIPLIER IN R2 & R3
6184  024512  016603  000020                  MOV     20(SP),R3
6185  024516  005004                          CLR     R4              ;PUT MULTIPLICAND IN R4 & R5
6186  024520  016605  000016                  MOV     16(SP),R5
6187  024524  004737  024556                  JSR     PC,M.DPIM       ;MULTIPLY R0 & R1 BY R2 & R3
6188  024530  010266  000016                  MOV     R2,16(SP)       ;HIGH ORDER PRODUCT
6189  024534  010366  000020                  MOV     R3,20(SP)       ;LOW ORDER PRODUCT
6190  024540  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
6191  024542  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
6192  024544  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
6193  024546  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
6194  024550  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
6195  024552  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
6196  024554  000207                          RTS     PC
6197
6198                                ;       SUBROUTINE TO MULTIPLY TWO DOUBLE PRECISION INTEGERS
6199                                ;       USES ALL REGISTERS (R0-R5)
6200                                ;
6201                                ;       ENTER WITH JSR  PC,M.DPIM
6202                                ;               MULTIPLIER IN R2-R3
6203                                ;               MULTIPLICAND IN R4-R5
6204                                ;               RESULT RETURNED IN R0-R1-R2-R3
6205                                ;
6206  024556  005000                M.DPIM: CLR     R0              ;CLEAR HIGH ORDER WORDS
6207  024560  005001                          CLR     R1
6208  024562  012746  000041                  MOV     #41,-(SP)       ;MOVE 33 DEC TO COUNTER
6209  024566  006000                M.DP01: ROR     R0
6210  024570  006001                          ROR     R1
```

```
6211  024572  006002                        ROR     R2              ;SHIFT TO ADD
6212  024574  006003                        ROR     R3
6213  024576  103003                        BCC     M.DP02          ;NO CARRY NO ADD
6214  024600  060501                        ADD     R5,R1
6215  024602  005500                        ADC     R0              ;ADD DOUBLE PRECISION TO OBTAIN NEW PARTIAL
6216  024604  060400                        ADD     R4,R0           ;PRODUCT
6217  024606  005316              M.DP02:   DEC     @SP             ;DECREMENT COUNTER
6218  024610  001366                        BNE     M.DP01
6219  024612  005726                        TST     (SP)+           ;REMOVE THE COUNTER
6220  024614  000207                        RTS     PC
6221
6222                                ;ROUTINE TO REPLACE LEADING ZEROS IN A NUMERIC STRING WITH SPACES
6223
6224  024616  012737  000004  024736  $RPZR8: MOV     #4,RPZRC        ;SETUP TO TYPE 8 SIGNIFICANT DIGITS
6225  024624  000412                        BR      RPZERO          ;TYPE THE VALUE
6226  024626  012737  000006  024736  $RPZR4: MOV     #6,RPZRC        ;SETUP TO TYPE 4 SIGNIFICANT DIGITS
6227  024634  000406                        BR      RPZERO          ;TYPE THE VALUE
6228  024636  012737  000007  024736  $RPZR5: MOV     #7,RPZRC        ;SETUP TO TYPE 3 SIGNIFICANT DIGITS
6229  024644  000402                        BR      RPZERO          ;TYPE THE VALUE
6230  024646  005037  024736          $RPZR0: CLR     RPZRC           ;SETUP TO TYPE 10 SIGNIFICANT DIGITS
6231  024652  010046                RPZERO: MOV     R0,-(SP)        ;SAVE R0
6232  024654  016600  000004                MOV     4(SP),R0        ;ADDRESS OF NUMBER TO R0
6233  024660  122710  000060          1$:   CMPB    #'0,(R0)        ;BYTE EQUAL TO ASCII '0' ?
6234  024664  001004                        BNE     2$              ;BR IF NOT
6235  024666  112710  000040                MOVB    #40,(R0)        ;REPLACE THE ZERO WITH A SPACE
6236  024672  005200                        INC     R0              ;INCREMENT THE BYTE ADDRESS
6237  024674  000771                        BR      1$              ;GO BACK AND LOOK FOR MORE LEADING ZEROS
6238  024676  105710                2$:     TSTB    (R0)            ;SEE IF ZERO BYTE TERMINATOR
6239  024700  001003                        BNE     3$              ;BR IF NOT
6240  024702  005300                        DEC     R0              ;BACKUP STRING POINTER
6241  024704  112710  000060                MOVB    #'0,(R0)        ;PUT A ZERO BACK IN
6242  024710  016637  000004  024726  3$:   MOV     4(SP),4$        ;PUT ADDRESS IN LOCATION FOR TYPEOUT
6243  024716  063737  024736  024726        ADD     RPZRC,4$        ;BEGINNING OF SIGNIFICANT DIGITS
6244  024724  104401                        TYPE                    ;TYPE THE NUMBER
6245  024726  000000                4$:     .WORD   0               ;ADDRESS OF NUMBER
6246  024730  012600                        MOV     (SP)+,R0        ;RESTORE R0
6247  024732  012616                        MOV     (SP)+,(SP)      ;MOVE RETURN ADDRESS
6248  024734  000207                        RTS     PC              ;RETURN
6249
6250  024736  000000                RPZRC:  .WORD   0               ;OFFSET FOR CONVERTED DIGITS HERE
6251
6252                                ;CONVERT AN OCTAL NUMBER TO ASCII AND PRINT IT
6253                                ;       (ROUTINE ADAPTED FROM '$TYPOC')
6254
6255  024740  112737  000001  025131  PRTOCT: MOVB    #1,FILLO        ;SET THE ZERO FILL SWITCH
6256  024746  112737  000006  025133        MOVB    #6,OMODE+1      ;SET FOR SIX(6) DIGITS
6257  024754  112737  000005  025130        MOVB    #5,OCNT         ;SET THE ITERATION COUNT
6258  024762  010346                        MOV     R3,-(SP)        ;SAVE R3
6259  024764  010446                        MOV     R4,-(SP)        ;SAVE R4
6260  024766  010546                        MOV     R5,-(SP)        ;SAVE R5
6261  024770  113704  025133                MOVB    OMODE+1,R4      ;GET THE NUMBER OF DIGITS TO TYPE
6262  024774  005404                        NEG     R4
6263  024776  062704  000006                ADD     #6,R4           ;SUBTRACT IT FOR MAX. ALLOWED
6264  025002  110437  025132                MOVB    R4,OMODE        ;SAVE IT FOR USE
6265  025006  113704  025131                MOVB    FILLO,R4        ;GET THE ZERO FILL SWITCH
6266  025012  016605  000010                MOV     10(SP),R5       ;PICKUP THE INPUT NUMBER
```

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6267  025016  005003                    CLR     R3              ;CLEAR THE OUTPUT WORD
6268  025020  006105          1$:       ROL     R5              ;ROTATE MSB INTO "C"
6269  025022  000404                    BR      3$              ;GO DO MSB
6270  025024  006105          2$:       ROL     R5              ;FORM THIS DIGIT
6271  025026  006105                    ROL     R5
6272  025030  006105                    ROL     R5
6273  025032  010503                    MOV     R5,R3
6274  025034  006103          3$:       ROL     R3              ;GET LSB OF THIS DIGIT
6275  025036  105337  025132            DECB    OMODE           ;TYPE THIS DIGIT?
6276  025042  100016                    BPL     7$              ;BR IF NO
6277  025044  042703  177770            BIC     #177770,R3      ;GET RID OF JUNK
6278  025050  001002                    BNE     4$              ;TEST FOR 0
6279  025052  005704                    TST     R4              ;SUPPRESS THIS 0?
6280  025054  001403                    BEQ     5$              ;BR IF YES
6281  025056  005204          4$:       INC     R4              ;DON'T SUPPRESS ANYMORE 0'S
6282  025060  052703  000060            BIS     #'0,R3          ;MAKE THIS DIGIT ASCII
6283  025064  052703  000040  5$:       BIS     #' ,R3          ;MAKE ASCII IF NOT ALREADY
6284  025070  110337  025126            MOVB    R3,8$           ;SAVE FOR TYPING
6285  025074  104412  025126            DISPLY  ,8$             ;GO PRINT THIS DIGIT
6286  025100  105337  025130  7$:       DECB    OCNT            ;COUNT BY 1
6287  025104  003347                    BGT     2$              ;BR IF MORE TO DO
6288  025106  002402                    BLT     6$              ;BR IF DONE
6289  025110  005204                    INC     R4              ;INSURE LAST DIGIT ISN'T A BLANK
6290  025112  000744                    BR      2$              ;GO DO THE LAST DIGIT
6291  025114  012605          6$:       MOV     (SP)+,R5        ;RESTORE R5
6292  025116  012604                    MOV     (SP)+,R4        ;RESTORE R4
6293  025120  012603                    MOV     (SP)+,R3        ;RESTORE R3
6294  025122  012616                    MOV     (SP)+,(SP)      ;SET UP THE STACK FOR RETURNING
6295  025124  000207                    RTS     PC              ;RETURN
6296  025126     000          8$:       .BYTE   0               ;STORAGE FOR ASCII DIGIT
6297  025127     000                    .BYTE   0               ;TERMINATOR FOR TYPE ROUTINE
6298  025130     000          OCNT:     .BYTE   0               ;OCTAL DIGIT COUNTER
6299  025131     000          FILLO:    .BYTE   0               ;ZERO FILL SWITCH
6300  025132  000000          OMODE:    0                       ;NUMBER OF DIGITS TO TYPE
6301
6302                          ;ROUTINE TO TYPE AT PRIORITY 4
6303
6304  025134  013746  177776  TYPRI4:   MOV     @#PS,-(SP)      ;SAVE THE PRESENT STATUS
6305  025140  012737  000200  177776    MOV     #200,@#PS       ;CHANGE THE PRIORITY TO 4
6306  025146  012537  025156            MOV     (R5)+,1$        ;MESSAGE ADDRESS
6307  025152  004737  025636            JSR     PC,$TYPE        ;TYPE THE MESSAGE
6308  025156  000000          1$:       .WORD   0               ;MESSAGE ADDRESS GOES HERE
6309  025160  000205                    RTS     R5              ;RETURN
6310
6311                          ;ROUTINE TO ROUTE MESSAGES TO EITHER THE PRINTER (IF AVAILABLE) OR
6312                          ;       THE TELETYPE
6313                          ;NOTE:  $DSPLY MUST BE DEFINED BY 'SETTRAP'
6314
6315  025162  032737  020000  001140  $DSPLY:  BIT     #SW13,SWR       ;INHIBIT TYPEOUTS
6316  025170  001027                    BNE     5$              ;BR IF SET
6317  025172  012737  000200  177776  1$:       MOV     #200,@#PS       ;CHANGE THE PRIORITY TO 4
6318  025200  005737  001212                    TST     $PRFLG          ;PRINTER ON THE SYSTEM ?
6319  025204  100411                    BMI     3$              ;BR IF NOT
6320  025206  017637  000000  025224            MOV     @(SP),2$        ;GET THE MESSAGE ADDRESS
6321  025214  013746  177776                    MOV     @#PS,-(SP)      ;PUT THE PROC STATUS ON THE STACK
6322  025220  004737  025744                    JSR     PC,$PRINT       ;PRINT THE MESSAGE
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6323  025224  000000                    2$:     .WORD   0               ;MESSAGE ADDRESS GOES HERE
6324  025226  000410                            BR      5$              ;EXIT
6325  025230  017637  000000  025246    3$:     MOV     @(SP),4$        ;SET UP TO TYPE THE MESSAGE
6326  025236  013746  177776                    MOV     @#PS,-(SP)      ;PUT THE PROC STATUS ON THE STACK
6327  025242  004737  025636                    JSR     PC,$TYPE        ;TYPE THE MESSAGE
6328  025246  000000                    4$:     .WORD   0               ;MESSAGE ADDRESS GOES HERE
6329  025250  062716  000002            5$:     ADD     #2,(SP)         ;RETURN ADDRESS
6330  025254  000002                            RTI
6331
6332                                    ;SAVE THE REGISTERS IF A DRIVER ERROR CALL
6333
6334  025256  010537  001260            ERENTR: MOV     R5,ATTN         ;SAVE THE ATTENTION REGISTER CONTENTS
6335  025262  010137  001256                    MOV     R1,DRIVE        ;DRIVE NUMBER
6336  025266  032737  020000  001140            BIT     #SW13,SWR       ;INHIBIT PRINTOUTS ?
6337  025274  001002                            BNE     1$              ;BR IF YES
6338  025276  004737  021402                    JSR     PC,$TIME        ;TYPE THE TIME
6339  025302  000207                    1$:     RTS     PC
6340
6341                                    ;ROUTINE TO GET AN OCTAL PARAMETER
6342                                            ;RETURN +2 IF CARRIAGE RETURN ENTERED
6343
6344  025304  011646                    GETOCT: MOV     (SP),-(SP)      ;PROVIDE SPACE FOR THE
6345  025306  104407                    1$:     RDLIN                   ;READ AN ASCIZ LINE
6346  025310  012600                            MOV     (SP)+,R0        ;GET ADDRESS OF 1ST CHARACTER
6347  025312  010037  025416                    MOV     R0,5$           ;AND SAVE IT
6348  025316  105710                            TSTB    (R0)            ;FIRST CHARACTER A 'CR'
6349  025320  001442                            BEQ     6$              ;BR IF IT IS
6350  025322  122710  000003                    CMPB    #3,(R0)         ;CONTROL C ?
6351  025326  001443                            BEQ     8$              ;BR IF IT IS
6352  025330  005001                            CLR     R1              ;CLEAR DATA WORD
6353  025332  005002                            CLR     R2
6354  025334  112046                    2$:     MOVB    (R0)+,-(SP)     ;PICKUP THIS CHARACTER
6355  025336  001420                            BEQ     3$              ;IF ZERO GET OUT
6356  025340  122716  000060                    CMPB    #'0,(SP)        ;MAKE SURE THIS CHARACTER
6357  025344  003021                            BGT     4$              ;IS AN OCTAL DIGIT
6358  025346  122716  000067                    CMPB    #'7,(SP)
6359  025352  002416                            BLT     4$
6360  025354  006301                            ASL     R1              ;*2
6361  025356  006102                            ROL     R2
6362  025360  006301                            ASL     R1              ;*4
6363  025362  006102                            ROL     R2
6364  025364  006301                            ASL     R1              ;*8
6365  025366  006102                            ROL     R2
6366  025370  042716  177770                    BIC     #^C7,(SP)       ;STRIP THE ASCII JUNK
6367  025374  062601                            ADD     (SP)+,R1        ;ADD IN THIS DIGIT
6368  025376  000756                            BR      2$              ;LOOP
6369  025400  005726                    3$:     TST     (SP)+           ;CLEAN TERMINATOR FROM STACK
6370  025402  010166  000002                    MOV     R1,2(SP)        ;SAVE THE RESULT
6371  025406  000412                            BR      7$              ;EXIT
6372  025410  005726                    4$:     TST     (SP)+           ;CLEAN PARTIAL FROM STACK
6373  025412  105010                            CLRB    (R0)            ;SET A TERMINATOR
6374  025414  104401                            TYPE                    ;TYPE UP THRU THE BAD CHAR.
6375  025416  000000                    5$:     .WORD   0
6376  025420  104401  001164                    TYPE    ,$QUES          ;"?" "CR" & "LF"
6377  025424  000730                            BR      1$              ;TRY AGAIN
6378  025426  012616                    6$:     MOV     (SP)+,(SP)      ;RESTORE THE PC
```

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6379  025430  062716  000002            ADD     #2,(SP)         ;INCREMENT RETURN
6380  025434  000207            7$:     RTS     PC              ;RETURN
6381  025436  000137  002250    8$:     JMP     ENTPR           ;CONTROL C ENTERED
6382
6383                              ;ROUTINE TO GET DECIMAL PARAMETERS
6384                              ;RETURN +2 IF CARRIAGE RETURN ENTERED
6385
6386  025442  011646            GETDEC: MOV     (SP),-(SP)      ;PROVIDE SPACE FOR
6387  025444  104407            1$:     RDLIN                   ;READ AN ASCIZ LINE
6388  025446  012600                    MOV     (SP)+,R0        ;ADDRESS OF 1ST CHAR.
6389  025450  010037  025552            MOV     R0,6$           ;SAVE IN CASE OF BAD INPUT
6390  025454  105710                    TSTB    (R0)            ;FIRST CHARACTER A 'CR' ?
6391  025456  001441                    BEQ     7$              ;BR IF IT IS
6392  025460  122710  000003            CMPB    #3,(R0)         ;CONTROL C ?
6393  025464  001442                    BEQ     9$              ;BR IF IT IS
6394  025466  005046                    CLR     -(SP)           ;CLEAR DATA WORD
6395  025470  112001            2$:     MOVB    (R0)+,R1        ;PICKUP THIS CHARACTER
6396  025472  001421                    BEQ     4$              ;GET OUT IF ZERO
6397  025474  122701  000060            CMPB    #'0,R1          ;MAKE SURE THIS CHARACTER
6398  025500  003021                    BGT     5$              ;IS A DIGIT BETWEEN 0 & 9
6399  025502  122701  000071            CMPB    #'9,R1
6400  025506  002416                    BLT     5$
6401  025510  006316                    ASL     (SP)            ;*2
6402  025512  011646                    MOV     (SP),-(SP)      ;SAVE FOR LATER
6403  025514  006316                    ASL     (SP)            ;*4
6404  025516  006316                    ASL     (SP)            ;*8.
6405  025520  062616                    ADD     (SP)+,(SP)      ;*10.
6406  025522  102410                    BVS     5$              ;OVERFLOW ISN'T ALLOWED
6407  025524  162701  000060            SUB     #'0,R1          ;STRIP AWAY THE ASCII JUNK
6408  025530  060116                    ADD     R1,(SP)         ;ADD IN THIS DIGIT
6409  025532  102404                    BVS     5$              ;OVERFLOW ISN'T ALLOWED
6410  025534  000755                    BR      2$              ;LOOP
6411  025536  012666  000002    4$:     MOV     (SP)+,2(SP)     ;SAVE THE RESULT
6412  025542  000412                    BR      8$              ;EXIT
6413  025544  005726            5$:     TST     (SP)+           ;CLEAN PARTIAL NUMBER FROM STACK
6414  025546  105010                    CLRB    (R0)            ;SET A TERMINATOR
6415  025550  104401                    TYPE                    ;TYPE THE INPUT UP TO BAD CHAR.
6416  025552  000000            6$:     .WORD   0               ;POINTER GOES HERE
6417  025554  104401  001164            TYPE    ,$QUES          ;"?" "CR" &"LF"
6418  025560  000731                    BR      1$              ;TRY AGAIN
6419  025562  012616            7$:     MOV     (SP)+,(SP)      ;RESTORE THE PC
6420  025564  062716  000002            ADD     #2,(SP)         ;INCREMENT THE RETURN
6421  025570  000207            8$:     RTS     PC              ;RETURN
6422  025572  000137  002250    9$:     JMP     ENTPR           ;CONTROL C ENTERED
6423
6424                              ;;*****************************************************************
6425
6426                              .SBTTL  TYPE NUMERICAL ASCIZ STRING SUPPRESS LEADING ZEROS
6427
6428                              ;*CALL
6429                              ;*      MOV     #NUMADR,-(SP)           ;FIRST ADDRESS OF ASCIZ STRING
6430                              ;*      JSR     PC,@#$SUPRS
6431                              ;
6432                              ;NOTE:  ROUTINE MODIFIED FROM THE 'SYSMAC' ROUTINE
6433
6434
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6435  025576  010046           $SJPRS: MOV     R0,-(SP)        ;SAVE R0
6436  025600  016600  000004           MOV     4(SP),R0        ;PICKUP THE POINTER
6437  025604  105710           1$:     TSTB    (R0)            ;TERMINATEOR?
6438  025606  001403                   BEQ     2$              ;BR IF YES
6439  025610  122720  000060           CMPB    #'0,(R0)+       ;IS THIS AN ASCII "0" ?
6440  025614  001773                   BEQ     1$              ;BR IF YES
6441  025616  005300           2$:     DEC     R0              ;BACKUP BY "1"
6442  025620  010037  025626           MOV     R0,3$           ;SAVE FOR TYPING
6443  025624  104412                   DISPLY                  ;GO PRINT
6444  025626  000000           3$:     .WORD   0               ;ASCIZ POINTER GOES HERE
6445  025630  012600                   MOV     (SP)+,R0        ;RESTORE R0
6446  025632  012616                   MOV     (SP)+,(SP)      ;RESTORE THE STACK
6447  025634  000207                   RTS     PC              ;RETURN
6448
6449                                   ;;**************************************************************
6450
6451                                   .SBTTL  TYPE ROUTINE
6452
6453                                   ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
6454                                   ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
6455                                   ;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
6456                                   ;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
6457                                   ;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
6458                                   ;*
6459                                   ;*CALL:
6460                                   ;*1) USING A TRAP INSTRUCTION
6461                                   ;*      TYPE    ,MESADR                 ;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
6462                                   ;*OR
6463                                   ;*      TYPE
6464                                   ;*      MESADR
6465                                   ;*
6466                                   ;*2) USING A JSR INSTRUCTION
6467                                   ;*      MOV     PS,-(SP)        ;PUSH PROCESSOR STATUS WORD ON THE STACK
6468                                   ;*      JSR     PC,$TYPE        ;CALL TYPE ROUTINE
6469                                   ;*      MESADDR                 ;FIRST ADRESS OF MESSAGE
6470
6471  025636  105737  001157           $TYPE:  TSTB    $TPFLG          ;IS THERE A TERMINAL?
6472  025642  100002                   BPL     1$              ;BR IF YES
6473  025644  000000                   HALT                    ;HALT HERE IF NO TERMINAL
6474  025646  000407                   BR      3$              ;LEAVE
6475  025650  010046           1$:     MOV     R0,-(SP)        ;SAVE R0
6476  025652  017600  000002           MOV     @2(SP),R0       ;GET ADDRESS OF ASCIZ STRING
6477  025656  112046           2$:     MOVB    (R0)+,-(SP)     ;PUSH CHARACTER TO BE TYPED ONTO STACK
6478  025660  001005                   BNE     4$              ;BR IF IT ISN'T THE TERMINATOR
6479  025662  005726                   TST     (SP)+           ;IF TERMINATOR POP IT OFF THE STACK
6480  025664  012600                   MOV     (SP)+,R0        ;RESTORE R0
6481  025666  062716  000002           ADD     #2,(SP)         ;ADJUST RETURN PC
6482  025672  000002                   RTI                     ;RETURN
6483  025674  004737  025726           JSR     PC,7$           ;GO TYPE THIS CHARACTER
6484  025700  123726  001156           CMPB    $FILLC,(SP)+    ;IS IT TIME FOR FILLER CHARS.?
6485  025704  001364                   BNE     2$              ;IF NO GO GET NEXT CHAR.
6486  025706  013746  001154           MOV     $NULL,-(SP)     ;GET # OF FILLER CHARS. NEEDED
6487                                                           ;AND THE NULL CHAR.
6488  025712  105366  000001           6$:     DECB    1(SP)           ;DOES A NULL NEED TO BE TYPED?
6489  025716  002770                   BLT     5$              ;BR IF NO--GO POP THE NULL OFF OF STACK
6490  025720  004737  025726           JSR     PC,7$           ;GO TYPE A NULL
```

```
 6491  025724  000772                        BR      6$                      ;LOOP
 6492  025726  105777  153216          7$:   TSTB    @$TPS                   ;WAIT UNTIL PRINTER IS READY
 6493  025732  100375                        BPL     7$
 6494  025734  116677  000002  153210        MOVB    2(SP),@$TPB             ;LOAD CHAR TO BE TYPED INTO DATA REG.
 6495  025742  000207                        RTS     PC
 6496
 6497                                  ;;*****************************************************************
 6498
 6499                                  .SBTTL  PRINT ROUTINE
 6500
 6501                                  ;*ROUTINE TO PRINT ASCIZ MESSAGE.  MESSAGE MUST TERMINATE WITH A 0 BYTE
 6502                                  ;*
 6503                                  ;*CALL:
 6504                                  ;*1) USING A TRAP INSTRUCTION
 6505                                  ;*      DISPLY  ,MESADR         ;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
 6506                                  ;*
 6507                                  ;*OR
 6508                                  ;*      PRINT
 6509                                  ;*      MESADR
 6510                                  ;*
 6511                                  ;*2) USING A JSR INSTRUCTION
 6512                                  ;*      MOV     PS,-(SP)                ;PUSH PROCESSOR STATUS WORD ON THE STACK
 6513                                  ;*      JSR     PC,$PRINT               ;CALL PRINT ROUTINE
 6514                                  ;*      MESADDR                         ;FIRST ADRESS OF MESSAGE
 6515
 6516  025744  005737  001212          $PRINT: TST     $PRFLG          ;IS THERE A PRINTER
 6517  025750  100002                        BPL     1$              ;BR IF YES
 6518  025752  000000                        HALT
 6519  025754  000412                        BR      7$              ;RETURN & TYPE INSTEAD
 6520  025756  005777  153232          1$:   TST     @$LSCS          ;PRINTER ERROR ?
 6521  025762  100012                        BPL     6$              ;BR IF NO ERROR
 6522  025764  005737  001220                TST     $PRTER          ;WAS ERROR SET BEFORE ?
 6523  025770  001004                        BNE     7$              ;BR IF YES, EXIT & TYPE INSTEAD
 6524  025772  005137  001220                COM     $PRTER          ;SET PRINTER ERROR FLAG
 6525  025776  104401  052333                TYPE    ,PRTATN         ;TYPE 'PRINTER ATTENTION'
 6526  026002  062716  000004          7$:   ADD     #4,(SP)         ;INCREMENT RETURN TO GO TO TYPE ROUTINE
 6527  026006  000002                        RTI                     ;RETURN
 6528  026010  005037  001220          6$:   CLR     $PRTER          ;CLEAR PRINTER ERROR FLAG
 6529  026014  010046                        MOV     R0,-(SP)        ;SAVE R0
 6530  026016  017600  000002                MOV     @2(SP),R0       ;GET ADDRESS OF ASCIZ STRING
 6531  026022  005746                        TST     -(SP)           ;MOVE THE STACK POINTER DOWN
 6532  026024  112016                2$:     MOVB    (R0)+,(SP)      ;PUSH CHARACTER TO BE TYPED ONTO THE STACK.
 6533  026026  001005                        BNE     4$              ;BR IF IT ISN'T THE TERMINATOR
 6534  026030  005726                        TST     (SP)+           ;IF TERMINATOR, POP IT OFF THE STACK
 6535  026032  012600                        MOV     (SP)+,R0        ;RESTORE R0
 6536  026034  062716  000002          3$:   ADD     #2,(SP)         ;ADJUST RETURN PC
 6537  026040  000002                        RTI                     ;RETURN
 6538  026042  004737  026050          4$:   JSR     PC,5$           ;PRINT THIS CHARACTER
 6539  026046  000766                        BR      2$              ;GET NEXT CHAR
 6540  026050  105777  153140          5$:   TSTB    @$LSCS          ;WAIT UNTIL PRINTER READY
 6541  026054  100375                        BPL     5$
 6542  026056  116677  000002  153132        MOVB    2(SP),@$LSDB    ;LOAD CHAR TO BE PRINTED INTO DATA REG
 6543  026064  000207                        RTS     PC
 6544
 6545                                  ;;*****************************************************************
 6546
```

```
                                        .SBTTL  TTY INPUT ROUTINE

                                        ;*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
                                        ;
026066  005037  026260          $TKINT: CLR     $TKCNT                  ;CLEAR COUNT OF ITEMS IN QUEUE
026072  012737  026264  026262          MOV     #$TKQSRT,$TKQIN         ;MOVE THE STARTING ADDRESS
026100  012737  026130  000060          MOV     #$TKSRV,@#TKVEC         ;INITIALIZE THE KEYBOARD VECTOR
026106  012737  000200  000062          MOV     #200,@#TKVEC+2          ;"BR" LEVEL 4
026114  005777  153026                  TST     @$TKB                   ;CLEAR DONE FLAG
026120  012777  000100  153016          MOV     #BIT06,@$TKS            ;ENABLE INTERRUPT
026126  000207                          RTS     PC                      ;RETURN TO CALLER
                                        ;
                                        ;*TK SERVICE ROUTINE
                                                ;*THIS ROUTINE WILL SERVICE THE TTY KEYBOARD INTERRUPT
                                        ;
026130  117746  153012          $TKSRV: MOVB    @$TKB,-(SP)             ;PICKUP THE CHARACTER
026134  042716  177600                  BIC     #^C177,(SP)             ;STRIP THE JUNK
026140  005737  026260                  TST     $TKCNT                  ;SEE IF FIRST CHARACTER
026144  001004                          BNE     1$                      ;BR IF NOT
026146  004737  021402                  JSR     PC,$TIME                ;TYPE THE TIME
026152  104401  001165                  TYPE    ,$CRLF                  ;CR-LF
026156  111637  026256          1$:     MOVB    (SP),5$                 ;ECHO THE CHARACTER
026162  104401  026256                  TYPE    ,5$
026166  022716  000015                  CMP     #15,(SP)                ;CARRIAGE RETURN ?
026172  001416                          BEQ     3$                      ;BR IF CR
026174  023727  026262  026266          CMP     $TKQIN,#$TKQEND         ;AT THE END ?
026202  001003                          BNE     2$                      ;BR IF NOT AT END
026204  104401  001160                  TYPE    ,$BELL                  ;RING THE TTY BELL
026210  000420                          BR      4$                      ;EXIT
026212  111677  000044          2$:     MOVB    (SP),@$TKQIN            ;PUT IN QUEUE
026216  005237  026260                  INC     $TKCNT                  ;COUNT THE CHARACTER
026222  005237  026262                  INC     $TKQIN                  ;UPDATE THE POINTER
026226  000411                          BR      4$                      ;EXIT
026230  004737  021722          3$:     JSR     PC,KSR                  ;PROCESS THE ENTRY
026234  005037  026260                  CLR     $TKCNT                  ;CLEAR THE CHARACTER COUNTER
026240  012737  026264  026262          MOV     #$TKQSRT,$TKQIN         ;RESET THE POINTER
026246  005037  026264                  CLR     $TKQSRT                 ;CLEAR THE BUFFER
026252  005726                  4$:     TST     (SP)+                   ;RESET THE STACK POINTER
026254  000002                          RTI                             ;RETURN
026256  000             5$:     .BYTE   0                               ;STORAGE FOR ASCII CHARACTER TO TYPE
026257  000                     .BYTE   0                               ;TERMINATOR
026260  000000          $TKCNT: .WORD   0                               ;NUMBER OF ITEMS IN THE QUEUE
026262  000000          $TKQIN: .WORD   0                               ;INPUT POINTER
026264  000002          $TKQSRT: .BLKB  2                               ;TTY KEYBOARD QUEUE
        026266          $TKQEND =       .
                                        .EVEN

                                        ;;*****************************************************************
                                        ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                        ;*CALL:
```

```
                                        ;*      RDCHR                   ;INPUT A SINGLE CHARACTER FROM THE TTY
                                        ;*      RETURN HERE             ;CHARACTER IS ON THE STACK
                                        ;
                                        $RDCHR: MOV     (SP),-(SP)      ;PUSH DOWN THE PC
026266  011646                                  MOV     4(SP),2(SP)     ;SAVE THE PS
026270  016666  000004  000002          1$:     TSTB    @$TKS           ;WAIT FOR
026276  105777  152642                          BPL     1$              ;A CHARACTER
026302  100375                                  MOVB    @$TKB,4(SP)     ;READ THE TTY
026304  117766  152636  000004                  BIC     #^C<177>,4(SP)  ;GET RID OF JUNK IF ANY
026312  042766  177600  000004                  RTI                     ;GO BACK TO USER
026320  000002

                                        ;;*****************************************************************
                                        ;*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

026322  010346                          $RDLIN: MOV     R3,-(SP)        ;SAVE R3
026324  005046                                  CLR     -(SP)           ;CLEAR THE RUBOUT KEY
026326  012703  026570                  1$:     MOV     #$TTYIN,R3      ;GET ADDRESS
026332  022703  026602                  2$:     CMP     #$TTYIN+10.,R3  ;BUFFER FULL?
026336  101450                                  BLOS    4$              ;BR IF YES
026340  104406                                  RDCHR                   ;GO READ ONE CHARACTER FROM THE TTY
026342  112613                                  MOVB    (SP)+,(R3)      ;GET CHARACTER
026344  122713  000177                          CMPB    #177,(R3)       ;IS IT A RUBOUT
026350  001022                                  BNE     5$              ;BR IF NO
026352  005716                                  TST     (SP)            ;IS THIS THE FIRST RUBOUT?
026354  001007                                  BNE     6$              ;BR IF NO
026356  112737  000134  026554                  MOVB    #'\,9$          ;TYPE A BACK SLASH
026364  104401  026554                          TYPE    ,9$
026370  012716  177777                          MOV     #-1,(SP)        ;SET THE RUBOUT KEY
026374  005303                          6$:     DEC     R3              ;BACKUP BY ONE
026376  020327  026570                          CMP     R3,#$TTYIN      ;STACK EMPTY?
026402  103426                                  BLO     4$              ;BR IF YES
026404  111337  026554                          MOVB    (R3),9$         ;SETUP TO TYPEOUT THE DELETED CHAR.
026410  104401  026554                          TYPE    ,9$             ;GO TYPE
026414  000746                                  BR      2$              ;GO READ ANOTHER CHAR.
026416  005716                          5$:     TST     (SP)            ;RUBOUT KEY SET?
026420  001406                                  BEQ     7$              ;BR IF NO
026422  112737  000134  026554                  MOVB    #'\,9$          ;TYPE A BACK SLASH
026430  104401  026554                          TYPE    ,9$
026434  005016                                  CLR     (SP)            ;CLEAR THE RUBOUT KEY
026436  122713  000003                  7$:     CMPB    #3,(R3) ;IS CHARACTER A CTRL C ?
026442  001425                                  BEQ     8$              ;BR IF IT IS
026444  122713  000025                          CMPB    #25,(R3)        ;IS CHARACTER A CTRL U?
026450  001006                                  BNE     3$              ;BR IF NO
026452  104401  026556                          TYPE    ,$CNTLU         ;TYPE A CONTROL "U"
026456  000723                                  BR      1$              ;GO START OVER
026460  104401  001164                  4$:     TYPE    ,$QUES          ;TYPE A '?'
026464  000720                                  BR      1$              ;CLEAR THE BUFFER AND LOOP
026466  111337  026554                  3$:     MOVB    (R3),9$         ;ECHO THE CHARACTER
026472  104401  026554                          TYPE    ,9$
026476  122723  000015                          CMPB    #15,(R3)+       ;CHECK FOR RETURN
026502  001313                                  BNE     2$              ;LOOP IF NOT RETURN
```

```
6659  026504  105063  177777                CLRB    -1(R3)          ;CLEAR RETURN (THE 15)
6660  026510  104401  001166                TYPE    $LF             ;TYPE A LINE FEED
6661  026514  000405                       BR      10$
6662  026516  104401  026563          8$:   TYPE    $CNTLC          ;TYPE A CONTROL C
6663  026522  112737  000003  026570       MOVB    #3,$TTYIN       ;FORCE 1ST CHARACTER IN BUF TO CTRL C
6664  026530  005726                 10$:   TST     (SP)+           ;CLEAN RUBOUT KEY FROM THE STACK
6665  026532  012603                       MOV     (SP)+,R3        ;RESTORE R3
6666  026534  011646                       MOV     (SP),-(SP)      ;ADJUST THE STACK AND PUT ADDRESS OF THE
6667  026536  016666  000004  000002       MOV     4(SP),2(SP)     ;       FIRST ASCII CHARACTER ON IT
6668  026544  012766  026570  000004       MOV     #$TTYIN,4(SP)
6669  026552  000002                       RTI                     ;RETURN
6670  026554     000                 9$:   .BYTE   0               ;STORAGE FOR ASCII CHAR. TO TYPE
6671  026555     000                       .BYTE   0               ;TERMINATOR
6672  026556  052536  005015     000  $CNTLU: .ASCIZ  /↑U/<15><12>  ;CONTROL "U"
6673  026563     136  006503  000012  $CNTLC: .ASCIZ  /↑C/<15><12>  ;CONTROL C
6674  026570  000012                 $TTYIN: .BLKB   10.            ;RESERVE 10. BYTES FOR TTY INPUT
6675                                 .EVEN
6676
6677                                 ;;*****************************************************************
6678
6679                                 .SBTTL  MACRO ROUTINES
6680
6681                                 .SBTTL  ERROR HANDLER ROUTINE
6682
6683                                 ;;*****************************************************************
6684                                 ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
6685                                 ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
6686                                 ;*AND GO TO $ERRTYP ON ERROR
6687                                 ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
6688                                 ;*SW15=1         HALT ON ERROR
6689                                 ;*SW13=1         INHIBIT ERROR TYPEOUTS
6690                                 ;*SW10=1         BELL ON ERROR
6691                                 ;*CALL
6692                                 ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
6693
6694  026602                         $ERROR:
6695  026602  004737  025256                JSR     PC,ERENTR
6696  026606  105237  001103          7$:   INCB    $ERFLG          ;;SET THE ERROR FLAG
6697  026612  001775                       BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
6698  026614  013777  001102  152320       MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
6699  026622  032777  002000  152310       BIT     #BIT10,@SWR     ;;BELL ON ERROR?
6700  026630  001402                       BEQ     1$              ;;NO - SKIP
6701  026632  104401  001160                TYPE    ,$BELL          ;;RING BELL
6702  026636  005237  001112          1$:   INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
6703  026642  011637  001116                MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
6704  026646  162737  000002  001116       SUB     #2,$ERRPC
6705  026654  117737  152236  001114       MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
6706  026662  032777  020000  152250       BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
6707  026670  001004                       BNE     20$             ;;SKIP TYPEOUTS
6708  026672  004737  026714                JSR     PC,$ERRTYP      ;;GO TO USER ERROR ROUTINE
6709  026676  104401  001165                TYPE    ,$CRLF
6710  026702                         20$:
6711  026702  005777  152232          2$:   TST     @SWR            ;;HALT ON ERROR
6712  026706  100001                       BPL     3$              ;;SKIP IF CONTINUE
6713  026710  000000                       HALT                    ;;HALT ON ERROR!
6714  026712                         3$:
```

```
                                        RTI                             ;;RETURN
                                .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

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

                                $ERRTYP:
026714  104401  001165                TYPE    ,$CRLF                  ;;"CARRIAGE RETURN" & "LINE FEED"
026720  010046                        MOV     R0,-(SP)                ;;SAVE R0
026722  005000                        CLR     R0                      ;;PICKUP THE ITEM INDEX
026724  153700  001114                BISB    @#$ITEMB,R0
026730  001004                        BNE     1$                      ;;IF ITEM NUMBER IS ZERO, JUST
                                                                        ;;TYPE THE PC OF THE ERROR
026732  013746  001116                MOV     $ERRPC,-(SP)            ;;SAVE $ERRPC FOR TYPEOUT
                                                                        ;;ERROR ADDRESS
026736  104402                        TYPOC                           ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
026740  000445                        BR      10$                     ;;GET OUT
026742  005300                1$:     DEC     R0                      ;;ADJUST THE INDEX SO THAT IT WILL
026744  006300                        ASL     R0                      ;;      WORK FOR THE ERROR TABLE
026746  006300                        ASL     R0
026750  006300                        ASL     R0
026752  062700  001346                ADD     #$ERRTB,R0              ;;FORM TABLE POINTER
026756  012037  026766                MOV     (R0)+,2$                ;;PICKUP "ERROR MESSAGE" POINTER
026762  001404                        BEQ     3$                      ;;SKIP TYPEOUT IF NO POINTER
026764  104401                        TYPE                            ;;TYPE THE "ERROR MESSAGE"
026766  000000                2$:     .WORD   0                       ;;"ERROR MESSAGE" POINTER GOES HERE
026770  104401  001165                TYPE    ,$CRLF                  ;;"CARRIAGE RETURN" & "LINE FEED"
026774  012037  027004        3$:     MOV     (R0)+,4$                ;;PICKUP "DATA HEADER" POINTER
027000  001404                        BEQ     5$                      ;;SKIP TYPEOUT IF 0
027002  104401                        TYPE                            ;;TYPE THE "DATA HEADER"
027004  000000                4$:     .WORD   0                       ;;"DATA HEADER" POINTER GOES HERE
027006  104401  001165                TYPE    ,$CRLF                  ;;"CARRIAGE RETURN" & "LINE FEED"
027012  010146                5$:     MOV     R1,-(SP)                ;;SAVE R1
027014  012001                        MOV     (R0)+,R1                ;;PICKUP "DATA TABLE" POINTER
027016  001415                        BEQ     9$                      ;;BR IF NO DATA TO BE TYPED
027020  012000                        MOV     (R0)+,R0                ;;PICKUP "DATA FORMAT" POINTER
027022  105720                6$:     TSTB    (R0)+                   ;;"OCTAL" OR "DECIMAL"
027024  001003                        BNE     7$                      ;;BR IF DECIMAL
027026  013146                        MOV     @(R1)+,-(SP)            ;;SAVE @(R1)+ FOR TYPEOUT
027030  104402                        TYPOC                           ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
027032  000402                        BR      8$
027034                          7$:
027034  013146                        MOV     @(R1)+,-(SP)            ;;SAVE @(R1)+ FOR TYPEOUT
027036  104405                        TYPDS                           ;;GO TYPE--DECIMAL ASCII WITH SIGN
027040  005711                8$:     TST     (R1)                    ;;IS THERE ANOTHER NUMBER?
027042  001403                        BEQ     9$                      ;;BR IF NO
027044  104401  027064                TYPE    ,11$                    ;;TYPE TWO(2) SPACES
027050  000764                        BR      6$                      ;;LOOP

027052  012601                9$:     MOV     (SP)+,R1                ;;RESTORE R1
027054  012600                10$:    MOV     (SP)+,R0                ;;RESTORE R0
027056  104401  001165                TYPE    ,$CRLF                  ;;"CARRIAGE RETURN" & "LINE FEED"
027062  000207                        RTS     PC                      ;;RETURN
027064  020040      000       11$:    .ASCIZ  /  /                    ;;TWO(2) SPACES
```

```
                027070                          .EVEN
                                        .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

 027070  017646  000000         $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
 027074  116637  000001 027313          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
 027102  112637  027315                 MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
 027106  062716  000002                 ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
 027112  000406                         BR      $TYPON
 027114  112737  000001 027313 $TYPOC:  MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
 027122  112737  000006 027315          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
 027130  112737  000005 027312 $TYPON:  MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
 027136  010346                         MOV     R3,-(SP)        ;;SAVE R3
 027140  010446                         MOV     R4,-(SP)        ;;SAVE R4
 027142  010546                         MOV     R5,-(SP)        ;;SAVE R5
 027144  113704  027315                 MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
 027150  005404                         NEG     R4
 027152  062704  000006                 ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
 027156  110437  027314                 MOVB    R4,$OMODE       ;;SAVE IT FOR USE
 027162  113704  027313                 MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
 027166  016605  000012                 MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
 027172  005003                         CLR     R3              ;;CLEAR THE OUTPUT WORD
 027174  006105                 1$:     ROL     R5              ;;ROTATE MSB INTO "C"
 027176  000404                         BR      3$              ;;GO DO MSB
 027200  006105                 2$:     ROL     R5              ;;FORM THIS DIGIT
 027202  006105                         ROL     R5
 027204  006105                         ROL     R5
 027206  010503                         MOV     R5,R3
 027210  006103                 3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
 027212  105337  027314                 DECB    $OMODE          ;;TYPE THIS DIGIT?
 027216  100016                         BPL     7$              ;;BR IF NO
 027220  042703  177770                 BIC     #177770,R3      ;;GET RID OF JUNK
 027224  001002                         BNE     4$              ;;TEST FOR 0
 027226  005704                         TST     R4              ;;SUPPRESS THIS 0?
```

```
6827  027230  001403                          BEQ     5$              ;;BR IF YES
6828  027232  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
6829  027234  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
6830  027240  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
6831  027244  110337  027310                  MOVB    R3,8$           ;;SAVE FOR TYPING
6832  027250  104401  027310                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
6833  027254  105337  027312          7$:     DECB    $OCNT           ;;COUNT BY 1
6834  027260  003347                          BGT     2$              ;;BR IF MORE TO DO
6835  027262  002402                          BLT     6$              ;;BR IF DONE
6836  027264  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
6837  027266  000744                          BR      2$              ;;GO DO THE LAST DIGIT
6838  027270  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
6839  027272  012604                          MOV     (SP)+,R4        ;;RESTORE R4
6840  027274  012603                          MOV     (SP)+,R3        ;;RESTORE R3
6841  027276  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
6842  027304  012616                          MOV     (SP)+,(SP)
6843  027306  000002                          RTI                     ;;RETURN
6844  027310     000                  8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
6845  027311     000                          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
6846  027312     000                  $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
6847  027313     000                  $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
6848  027314  000000                  $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
6849                                  .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
6850
6851                                  ;;**************************************************************
6852                                  ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
6853                                  ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
6854                                  ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
6855                                  ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
6856                                  ;*REPLACED WITH SPACES.
6857                                  ;*CALL:
6858                                  ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
6859                                  ;*      TYPDS                   ;;GO TO THE ROUTINE
6860
6861  027316                          $TYPDS:
6862  027316  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
6863  027320  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
6864  027322  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
6865  027324  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
6866  027326  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
6867  027330  012746  020200                  MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
6868  027334  016605  000020                  MOV     20(SP),R5       ;;GET THE INPUT NUMBER
6869  027340  100004                          BPL     1$              ;;BR IF INPUT IS POS.
6870  027342  005405                          NEG     R5              ;;MAKE THE BINARY NUMBER POS.
6871  027344  112766  000055  000001          MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
6872  027352  005000                  1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
6873  027354  012703  027532                  MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
6874  027360  112723  000040                  MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
6875  027364  005002                  2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
6876  027366  016001  027522                  MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
6877  027372  160105                  3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
6878  027374  002402                          BLT     4$              ;;BR IF DONE
6879  027376  005202                          INC     R2              ;;INCREASE THE BCD DIGIT BY 1
6880  027400  000774                          BR      3$
6881  027402  060105                  4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
6882  027404  005702                          TST     R2              ;;CHECK IF BCD DIGIT=0
```

```
6883  027406  001002                        BNE     5$              ;;FALL THROUGH IF 0
6884  027410  105716                        TSTB    (SP)            ;;STILL DOING LEADING 0'S
6885  027412  100407                        BMI     7$              ;;BR IF YES
6886  027414  106316                5$:     ASLB    (SP)            ;;MSD?
6887  027416  103003                        BCC     6$              ;;BR IF NO
6888  027420  116663  000001  177777        MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
6889  027426  052702  000060          6$:   BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
6890  027432  052702  000040          7$:   BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
6891  027436  110223                        MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
6892  027440  005720                        TST     (R0)+           ;;JUST INCREMENTING
6893  027442  020027  000010                CMP     R0,#10          ;;CHECK THE TABLE INDEX
6894  027446  002746                        BLT     2$              ;;GO DO THE NEXT DIGIT
6895  027450  003002                        BGT     8$              ;;GO TO EXIT
6896  027452  010502                        MOV     R5,R2           ;;GET THE LSD
6897  027454  000764                        BR      6$              ;;GO CHANGE TO ASCII
6898  027456  105726                9$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
6899  027460  100003                        BPL     9$              ;;BR IF NO
6900  027462  116663  177777  177776        MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
6901  027470  105013                9$:     CLRB    (R3)            ;;SET THE TERMINATOR
6902  027472  012605                        MOV     (SP)+,R5        ;;POP STACK INTO R5
6903  027474  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
6904  027476  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
6905  027500  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
6906  027502  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
6907  027504  104401  027532                TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
6908  027510  016666  000002  000004        MOV     2(SP),4(SP)     ;;ADJUST THE STACK
6909  027516  012616                        MOV     (SP)+,(SP)
6910  027520  000002                        RTI                     ;;RETURN TO USER
6911  027522  023420                $DTBL:  10000.
6912  027524  001750                        1000.
6913  027526  000144                        100.
6914  027530  000012                        10.
6915  027532  000004                $DBLK:  .BLKW   4
6916                                .SBTTL  SAVE AND RESTORE R0-R5 ROUTINES
6917
6918                                ;;**************************************************************
6919                                ;*SAVE R0-R5
6920                                ;*CALL:
6921                                ;*      SAVREG
6922                                ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
6923                                ;*
6924                                ;*TOP---(+16)
6925                                ;* +2---(+18)
6926                                ;* +4---R5
6927                                ;* +6---R4
6928                                ;* +8---R3
6929                                ;*+10---R2
6930                                ;*+12---R1
6931                                ;*+14---R0
6932
6933  027542                        $SAVREG:
6934  027542  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
6935  027544  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
6936  027546  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
6937  027550  010346                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
6938  027552  010446                        MOV     R4,-(SP)        ;;PUSH R4 ON STACK
```

```
6939  027554  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
6940  027556  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
6941  027562  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
6942  027566  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
6943  027572  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
6944  027576  000002                          RTI
6945
6946                                  ;*RESTORE R0-R5
6947                                  ;*CALL:
6948                                  ;*      RESREG
6949  027600                          $RESREG:
6950  027600  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
6951  027604  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
6952  027610  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
6953  027614  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
6954  027620  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
6955  027622  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
6956  027624  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
6957  027626  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
6958  027630  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
6959  027632  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
6960  027634  000002                          RTI
6961                                  .SBTTL  RANDOM NUMBER GENERATOR ROUTINE
6962
6963                                  ;;*****************************************************************
6964                                  ;*THIS ROUTINE IS A DOUBLE PRECISION PSEUDO RANDOM NUMBER GENERATOR
6965                                  ;*WITH A RANGE OF 0 TO 2(+33)-1.
6966                                  ;*CALL:
6967                                  ;*      JSR     PC,$RAND        ;;CALL THE ROUTINE
6968                                  ;*      RETURN                  ;;RETURN HERE THE RANDOM
6969                                  ;*                              ;;NUMBER WILL BE IN
6970                                  ;*                              ;;$HINUM,$LONUM
6971
6972  027636                          $RAND:
6973  027636  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
6974  027640  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
6975  027642  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
6976  027644  013700  027736                  MOV     $LONUM,R0       ;;SET R0 WITH LOW
6977  027650  013701  027734                  MOV     $HINUM,R1       ;;SET R1 WITH HIGH
6978  027654  012702  177771                  MOV     #-7,R2          ;;SET SHIFT COUNT
6979  027660  006300                  1$:     ASL     R0              ;;SHIFT R0 LEFT AND
6980  027662  006101                          ROL     R1              ;;ROTATE CARRY INTO R1 AND
6981  027664  005202                          INC     R2              ;;CHECK FOR DONE
6982  027666  001374                          BNE     1$              ;;CONTINUE SHIFT LOOP
6983  027670  063700  027736                  ADD     $LONUM,R0       ;;ADD NUMBER TO MAKE X 129
6984  027674  005501                          ADC     R1              ;;PROPOGATE CARRY
6985  027676  063701  027734                  ADD     $HINUM,R1       ;;ADD NUMBER TO MAKE X 129
6986  027702  062700  001057                  ADD     #1057,R0        ;;ADD LOW CONSTANT
6987  027706  005501                          ADC     R1              ;;PROPOGATE CARRY
6988  027710  062701  047401                  ADD     #47401,R1       ;;ADD HIGH CONSTANT
6989  027714  010037  027736                  MOV     R0,$LONUM       ;;SAVE R0
6990  027720  010137  027734                  MOV     R1,$HINUM       ;;SAVE R1
6991  027724  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
6992  027726  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
6993  027730  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
6994  027732  000207                          RTS     PC              ;;RETURN
```

```
                                $HINUM: .WORD   176543
                                $LONUM: .WORD   123456
                                .SBTTL  ROUTINE TO SIZE MEMORY

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

                                $SIZE:  MOV     R0,-(SP)        ;;SAVE R0 ON THE STACK
                                        MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
                                        MOV     @#ERRVEC,-(SP)  ;;SAVE PRESENT ERROR VECTOR PS & PC
                                        MOV     @#ERRVEC+2,-(SP)
                                        MOV     SP,R0           ;;SAVE THE STACK POINTER
                                ;;SET THE ERRVEC PS TO THE PRESENT PS
                                        TRAP                    ;;PUSH OLD PSW AND PC ON STACK
                                        MOV     (SP)+,@#ERRVEC+2        ;;SAVE THE PSW IN @#ERRVEC+2
                                        MOV     #2$,@#ERRVEC    ;;SET FOR TIMEOUT
                                        MOV     #20000,R1       ;;FIRST ADDRESS
                                1$:     TST     (R1)            ;;TEST THIS ADDRESS
                                        TST     (R1)+           ;;STEP TO NEXT ADDRESS
                                        BR      1$              ;;TRY ANOTHER
                                2$:     SUB     #2,R1           ;;DROP BACK
                                        MOV     R0,SP           ;;RESTORE THE STACK
                                        MOV     (SP)+,@#ERRVEC+2 ;;RESTORE ERROR VECTOR
                                        MOV     (SP)+,@#ERRVEC
                                        MOV     R1,$LSTAD       ;;LAST ADDRESS
                                        MOV     (SP)+,R1        ;;RESTORE R1
                                        MOV     (SP)+,R0        ;;RESTORE R0
                                        RTS     PC
                                $LSTAD: .WORD   0               ;;CONTAINS THE LAST ADDRESS
                                .SBTTL  DOUBLE LENGTH BINARY TO DECIMAL ASCII CONVERT ROUTINE

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

                                $DB2D:  SAVREG                  ;;SAVE REGISTERS
                                        MOV     2(SP),R2        ;;PICKUP THE DATA POINTER
                                        MOV     #$DECVL,R0      ;;GET ADDRESS OF "$DECVL" STRING
                                        MOV     R0,2(SP)        ;;PUT ADDRESS OF ASCIZ STRING ON STACK
                                        MOV     (R2)+,R1        ;;PICKUP THE BINARY NUMBER
                                        MOV     (R2)+,R2
                                        MOV     #10.,4$         ;;SET UP TO DO 10 CONVERSIONS
                                        MOV     #$TNPWR,R4      ;;ADDRESS OF TEN POWER
                                        MOV     #$TNPWR+2,R5
                                1$:     CLR     R3              ;;CLEAR PARTIAL
                                2$:     SUB     (R4),R1         ;;SUBTRACT TEN POWER
```

```
                        030102  005602                  SBC     R2
                        030104  161502                  SUB     (R5),R2
                        030106  002402                  BLT     3$              ;;BR IF TEN POWER TO LARGE
                        030110  005203                  INC     R3              ;;ADD 1 TO PARTIAL
                        030112  000772                  BR      2$              ;;LOOP
                        030114  062401          3$:     ADD     -(R4)+,R1       ;;RESTORE SUBTRACTED VALUE
                        030116  005502                  ADC     R2
                        030120  062402                  ADD     (R4)+,R2
                        030122  022525                  CMP     (R5)+,(R5)+     ;;MOVE TO NEXT TEN POWER
                        030124  052703  000060          BIS     #'0,R3          ;;CHANGE PARTIAL TO ASCII
                        030130  110320                  MOVB    R3,(R0)+        ;;SAVE IT
                        030132  005327                  DEC     (PC)+           ;;DONE?
                        030134  000000          4$:     .WORD   0
                        030136  001357                  BNE     1$              ;;BR IF NO
                        030140  105020                  CLRB    (R0)+           ;;TERMINATOR
                        030142  104411                  RESREG                  ;;RESTORE REGISTERS
                        030144  000207                  RTS     PC              ;;RETURN
                        030146  145000          $TNPWR: 145000                  ;;1.0E09
                        030150  035632                  35632
                        030152  160400                  160400                  ;;1.0E08
                        030154  002765                  2765
                        030156  113200                  113200                  ;;1.0E07
                        030160  000230                  230
                        030162  041100                  041100                  ;;1.0E06
                        030164  000017                  17
                        030166  103240                  103240                  ;;1.0E05
                        030170  000001                  1
                        030172  023420                  23420                   ;;1.0E04
                        030174  000000                  0
                        030176  001750                  1750                    ;;1.0E03
                        030200  000000                  0
                        030202  000144                  144                     ;;1.0E02
                        030204  000000                  0
                        030206  000012                  12                      ;;1.0E01
                        030210  000000                  0
                        030212  000001                  1                       ;;1.0E00
                        030214  000000                  0
                        030216  000014          $DECVL: .BLKB   12.             ;;RESERVE STORAGE FOR ASCIZ STRING
                                                .SBTTL  SINGLE LENGTH BINARY TO DECIMAL ASCIZ ROUTINE

                                                ;;******************************************************************
                                                ;*THIS ROUTINE WILL CONVERT A 16-BIT UNSIGNED BINARY NUMBER TO AN
                                                ;*UNSIGNED DECIMAL ASCIZ NUMBER.
                                                ;*CALL
                                                ;*      MOV     NUMBER,-(SP)    ;;PUT BINARY NUMBER ON THE STACK
                                                ;*      JSR     PC,@#$$B2D      ;;CALL
                                                ;*      RETURN                  ;;ADDRESS OF THE 1ST ASCIZ CHAR.IS ON THE STACK

                        030232  016637  000002  030262  $$B2D:  MOV     2(SP),1$        ;;SAVE BINARY NUMBER
                        030240  012746  030262          MOV     #1$,-(SP)       ;;SET POINTER
                        030244  004737  030036          JSR     PC,@#$DB2D      ;;CALL DOUBLE LENGTH CONVERT
                        030250  062716  000005          ADD     #5,(SP)         ;;ONLY ALLOW FIVE CHARACTERS
                        030254  012666  000002          MOV     (SP)+,2(SP)     ;;PICKUP POINTER
                        030260  000207                  RTS     PC              ;;RETURN
                        030262  000000  000000  1$:     .WORD   0,0
```

```
                                        .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,@#$DB20      ;;CALL THE ROUTINE
                                        ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK
                                        ;*

030266  104410                  $DB20:  SAVREG                  ;;SAVE ALL REGISTERS
030270  016601  000002                  MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
030274  012705  030405                  MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
030300  012704  000014                  MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
030304  012703  177770                  MOV     #^C7,R3         ;;MASK
030310  012100                          MOV     (R1)+,R0        ;;LOWER WORD
030312  012101                          MOV     (R1)+,R1        ;;HIGH WORD
030314  005002                          CLR     R2              ;;TERMINATOR
030316  110245                  1$:     MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
030320  010002                          MOV     R0,R2           ;;GET THIS DIGIT
030322  005304                          DEC     R4              ;;COUNT THIS CHARACTER
030324  003007                          BGT     3$              ;;BR IF NOT THE LAST DIGIT
030326  001405                          BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
030330  005205                          INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
030332  010566  000002                  MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
030336  104411                          RESREG                  ;;RESTORE ALL REGISTERS
030340  000207                          RTS     PC              ;;RETURN TO USER
030342  006203                  2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
030344  006001                  3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
030346  006000                          ROR     R0              ;;      THE NEXT OCTAL DIGIT
030350  006001                          ROR     R1
030352  006000                          ROR     R0
030354  006001                          ROR     R1
030356  006000                          ROR     R0
030360  040302                          BIC     R3,R2           ;;MASK OUT ALL JUNK
030362  062702  000060                  ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
030366  000753                          BR      1$              ;;GO PUT IT IN THE DATA TABLE
030370  000016                  $OCTVL: .BLKB   14.             ;;RESERVE DATA TABLE
                                        .SBTTL  SINGLE LENGTH BINARY TO OCTAL ASCIZ ROUTINE

                                        ;;**********************************************************************
                                        ;*THIS ROUTINE WILL CONVERT A 16-BIT UNSIGNED BINARY NUMBER TO AN
                                        ;*UNSIGNED OCTAL ASCIZ NUMBER.
                                        ;*CALL
                                        ;*      MOV     NUMBER,-(SP)    ;;PUT BINARY NUMBER ON THE STACK
                                        ;*      JSR     PC,@#$SB20      ;;CALL
                                        ;*      RETURN                  ;;ADDRESS OF 1ST ASCIZ CHAR. IS ON THE STACK
                                        ;*

030406  016637  000002  030436   $SB20:  MOV     2(SP),1$        ;;SAVE THE BINARY NUMBER
030414  012746  030436                  MOV     #1$,-(SP)       ;;SET POINTER
030420  004737  030266                  JSR     PC,@#$DB20      ;;CALL DOUBLE LENGTH CONVERT ROUTINE
030424  062716  000005                  ADD     #5,(SP)         ;;ONLY ALLOW SIX CHARACTERS
030430  012666  000002                  MOV     (SP)+,2(SP)     ;;PICKUP POINTER
030434  000207                          RTS     PC              ;;RETURN
030436  000000  000000           1$:     .WORD   0,0
```

```
                                        .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.

030442  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
030444  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
030450  005740                          TST     -(R0)           ;;BACKUP BY 2
030452  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
030454  022700  000026                  CMP     #$TERM,R0       ;;CHECK FOR OUT OF BOUNDS
030460  003002                          BGT     .+6             ;;BR IF OK
030462  000000                          HALT                    ;;OUT OF BOUNDS
030464  000776                          BR      .-2             ;;HANGUP
030466  006300                          ASL     R0              ;;POSITION FOR INDEXING
030470  016000  030510                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
030474  000200                          RTS     R0              ;;GO TO ROUTINE

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

030476  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
030500  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
030506  000002                          RTI                     ;;RESTORE THE PSW

                                        .SBTTL  TRAP TABLE

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

                                        ;       ROUTINE
                                        ;       -------
030510  030476                  $TRPAD: .WORD   $TRAP2
030512  025636                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
030514  027114                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
030516  027070                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
030520  027130                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
030522  027316                          $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)

030524  026266                          $RDCHR  ;;CALL=RDCHR    TRAP+6(104406)  TTY TYPEIN CHARACTER ROUTINE
030526  026322                          $RDLIN  ;;CALL=RDLIN    TRAP+7(104407)  TTY TYPEIN STRING ROUTINE
030530  027542                          $SAVREG ;;CALL=SAVREG   TRAP+10(104410) SAVE R0-R5 ROUTINE
030532  027600                          $RESREG ;;CALL=RESREG   TRAP+11(104411) RESTORE R0-R5 ROUTINE
030534  025162                          $DSPLY  ;;CALL=DISPLY   TRAP+12(104412) PRINTER-TELETYPE MESSAGE ROUTING ROUTINE
        000026                  $TERM=.-$TRPAD

                                        ;;**********************************************************************

                                        .SBTTL  RH11/RP04 DRIVER - SINGLE/DUAL PORT VERSION
                                                ;(MODIFIED FROM REV. 0.3 FOR MD-11-DERPN-B)

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```
                                        ;*MAYNARD, MA 01754
                                        ;*AUTHOR: JIM LACEY/CHUCK HESS
                                        ;
                                        ;;*****************************************************************
                                        ;*STORAGE FOR RHDS1, RHER1, RHER2, AND RHER3 ON AN ERROR "2" OR "5"
                                                ;*RPERRS   = RHDS1
                                                ;*RPERRS+2 = RHER1
                                                ;*RPERRS+4 = RHER2
                                                ;*RPERRS+6 = RHER3
                                        
030536  000000                          RPERRS: .WORD   0
030540  000000                                  .WORD   0
030542  000000                                  .WORD   0
030544  000000                                  .WORD   0
                                        
                                        ;*TABLE OF DRIVE ACTIVE INDICATORS (DRVACT=8 BYTES)
                                                ;*DRVACT=0 IMPLIES DRIVE IS IDLE
                                                ;*DRVACT>0 IMPLIES DRIVE IS ACTIVE WITH A COMMAND
                                                ;*DRVACT<0 IMPLIES DRIVE IS ACTIVE WITH AN ERROR RECOVERY OPERATION
                                        
030546  000                             DRVACT: .BYTE   0               ;DRIVE 0
030547  000                                     .BYTE   0               ;DRIVE 1
030550  000                                     .BYTE   0               ;DRIVE 2
030551  000                                     .BYTE   0               ;DRIVE 3
030552  000                                     .BYTE   0               ;DRIVE 4
030553  000                                     .BYTE   0               ;DRIVE 5
030554  000                                     .BYTE   0               ;DRIVE 6
030555  000                                     .BYTE   0               ;DRIVE 7
                                        
                                        ;*TABLE OF DRIVE STATUS INDICATORS (DRVSTA=8 BYTES)
                                                ;*DRVSTA=0 IMPLIES DRIVE IS OFFLINE
                                                ;*DRVSTA>0 IMPLIES DRIVE IS ONLINE
                                                ;*DRVSTA<0 IMPLIES DRIVE IS UNSAFE OR NONEXISTENT
                                        
030556  000                             DRVSTA: .BYTE   0               ;DRIVE 0
030557  000                                     .BYTE   0               ;DRIVE 1
030560  000                                     .BYTE   0               ;DRIVE 2
030561  000                                     .BYTE   0               ;DRIVE 3
030562  000                                     .BYTE   0               ;DRIVE 4
030563  000                                     .BYTE   0               ;DRIVE 5
030564  000                                     .BYTE   0               ;DRIVE 6
030565  000                                     .BYTE   0               ;DRIVE 7
                                        
                                        ;*TABLE OF DRIVE TYPES (DRVTYP=8 WORDS)
                                                ;*DRVTYP WILL CONTAIN THE DRIVE TYPE OF ALL ONLINE, OFFLINE, AND
                                                ;*UNSAFE DRIVES. IF A DRIVE IS NONEXISTENT DRVTYP WILL BE ZERO.
                                        
030566  000000                          DRVTYP: .WORD   0               ;DRIVE 0
030570  000000                                  .WORD   0               ;DRIVE 1
030572  000000                                  .WORD   0               ;DRIVE 2
030574  000000                                  .WORD   0               ;DRIVE 3
030576  000000                                  .WORD   0               ;DRIVE 4
030600  000000                                  .WORD   0               ;DRIVE 5
030602  000000                                  .WORD   0               ;DRIVE 6
030604  000000                                  .WORD   0               ;DRIVE 7
```

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7275
7276                                    ;*TABLE OF DUAL PORT INITIALIZATION INDICATORS
7277                                    ;*DPINT=0 IF INITIALIZATION IS NOT ACTIVE ON THE DRIVE
7278                                    ;*DPINT<0 IF INITIALIZATION IS IN PROGRESS
7279
7280  030606  000                   DPINT:  .BYTE   0               ;DRIVE 0
7281  030607  000                           .BYTE   0               ;DRIVE 1
7282  030610  000                           .BYTE   0               ;DRIVE 2
7283  030611  000                           .BYTE   0               ;DRIVE 3
7284  030612  000                           .BYTE   0               ;DRIVE 4
7285  030613  000                           .BYTE   0               ;DRIVE 5
7286  030614  000                           .BYTE   0               ;DRIVE 6
7287  030615  000                           .BYTE   0               ;DRIVE 7
7288
7289                                    ;*TABLE OF PENDING DUAL PORT REQUESTS
7290                                    ;*DPRQS=0 IMPLIES THAT A DUAL PORT REQUEST IS NOT PENDING FOR THAT DRIVE
7291                                    ;*DPRQS<0 IMPLIES THAT A DUAL PORT REQUEST IS PENDING FOR THAT DRIVE
7292
7293  030616  000                   DPRQS:  .BYTE   0               ;DRIVE 0
7294  030617  000                           .BYTE   0               ;DRIVE 1
7295  030620  000                           .BYTE   0               ;DRIVE 2
7296  030621  000                           .BYTE   0               ;DRIVE 3
7297  030622  000                           .BYTE   0               ;DRIVE 4
7298  030623  000                           .BYTE   0               ;DRIVE 5
7299  030624  000                           .BYTE   0               ;DRIVE 6
7300  030625  000                           .BYTE   0               ;DRIVE 7
7301
7302                                    ;*TRANSFER WAIT FLAG (TRNSWT=1 WORD)
7303                                    ;*THIS IS A ONE WORD QUEUE. IT WILL CONTAIN THE ADDRESS OF
7304                                    ;*"DPB" OF THE I/O OPERATION.
7305
7306  030626  000000                TRNSWT: .WORD   0
7307
7308                                    ;*SEARCH WAIT KEYS (SRCHWT=1 WORD)
7309                                    ;*THIS IS A ONE WORD QUEUE THAT WILL CONTAIN A KEY FOR EACH OF
7310                                    ;*THE DRIVES THAT ARE PERFORMING A SEARCH COMMAND FOR THE I/O
7311                                    ;*REQUEST THAT IS AT THE TOP OF THEIR REQUEST QUEUE.
7312                                    ;*EACH DRIVE IS ASSIGNED ONE BIT, STARTING AT BIT00 FOR DRIVE 0.
7313
7314  030630  000000                SRCHWT: .WORD   0
7315
7316                                    ;*RP04 DRIVER ACTIVE FLAG (ACTDRV=1 BYTE)
7317                                    ;*ACTDRV=0 IMPLIES DRIVER IS INACTIVE
7318                                    ;*ACTDRV>0 IMPLIES DRIVER IS ACTIVE
7319
7320  030632  000                   ACTDRV: .BYTE   0
7321
7322                                    ;*SOFTWARE TIMER ROUTINE ACTIVE FLAG (ACTSTR=1 BYTE)
7323                                    ;*ACTSTR=0 IMPLIES SOFTWARE TIMER ROUTINE IS INACTIVE
7324                                    ;*ACTSTR>0 IMPLIES SOFTWARE TIMER ROUTINE IS ACTIVE
7325
7326  030633  000                   ACTSTR: .BYTE   0
7327
7328                                    ;*UNLOAD FLAG (ULDFLG=8 BYTES)
7329                                    ;*ULDFLG=0 IMPLIES NO UNLOAD COMMAND
7330                                    ;*ULDFLG>0 IMPLIES UNLOAD COMMAND IN PROGRESS
```

```
                                        ;*ULDFLG<0 IMPLIES UNLOAD COMMAND IN WAIT QUEUE

030634  000             ULDFLG: .BYTE   0               ;DRIVE 0
030635  000                     .BYTE   0               ;DRIVE 1
030636  000                     .BYTE   0               ;DRIVE 2
030637  000                     .BYTE   0               ;DRIVE 3
030640  000                     .BYTE   0               ;DRIVE 4
030641  000                     .BYTE   0               ;DRIVE 5
030642  000                     .BYTE   0               ;DRIVE 6
030643  000                     .BYTE   0               ;DRIVE 7

                        ;*LOOK AHEAD COUNT (LACNT=8 BYTES)
                                ;*LACNT WILL INDICATE THE NUMBER OF LOOK AHEADS PERFORMED

030644  000             LACNT:  .BYTE   0               ;DRIVE 0
030645  000                     .BYTE   0               ;DRIVE 1
030646  000                     .BYTE   0               ;DRIVE 2
030647  000                     .BYTE   0               ;DRIVE 3
030650  000                     .BYTE   0               ;DRIVE 4
030651  000                     .BYTE   0               ;DRIVE 5
030652  000                     .BYTE   0               ;DRIVE 6
030653  000                     .BYTE   0               ;DRIVE 7

                        ;*SAVE REGISTERS FLAG (SAVEFG =1 WORD)
                                ;*SAVEFG <0 IMPLIES SAVE THE RH11/RP04 REGISTERS WHEN THE
                                ;*OPERATION IS COMPLETED AS PER (DPB+14).
                                ;*SAVEFG=0 IMPLIES SAVE THE RH11/RP04 REGISTERS, AS PER
                                ;*(DPB+14), AFTER AN ERROR.

030654  000000          SAVEFG: .WORD   0

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

030656  000000          SEEKFG: .WORD   0

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

030660  177777          TIMER:  .WORD   -1      ;DRIVE 0
030662  177777                 .WORD   -1      ;DRIVE 1
030664  177777                 .WORD   -1      ;DRIVE 2
030666  177777                 .WORD   -1      ;DRIVE 3
030670  177777                 .WORD   -1      ;DRIVE 4
030672  177777                 .WORD   -1      ;DRIVE 5
030674  177777                 .WORD   -1      ;DRIVE 6
030676  177777                 .WORD   -1      ;DRIVE 7

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

030700  177777          DTUW:   .WORD   -1
```

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

030702      001                 ATABIT: .BYTE   1       ;DRIVE 0
030703      002                         .BYTE   2       ;DRIVE 1
030704      004                         .BYTE   4       ;DRIVE 2
030705      010                         .BYTE   10      ;DRIVE 3
030706      020                         .BYTE   20      ;DRIVE 4
030707      040                         .BYTE   40      ;DRIVE 5
030710      100                         .BYTE   100     ;DRIVE 6
030711      200                         .BYTE   200     ;DRIVE 7

                                        ;*RP04 TO RH11 "MASS CONTROL BUS PARITY ERRORS" (MCPE) ALLOWED BEFORE
                                        ;*CALLING IT FATAL (MCPEMX=1 WORD)

030712  000003                  MCPEMX: .WORD   3

                                        ;*STORAGE FOR RPADR (THE FIRST ADDRESS (776700) OF THE RH11/RP04),
                                        ;*RPVEC (THE VECTOR ADDRESS (254)), AND RPVEC+2 (THE BR LEVEL (5)).
030714  176700                  RPADR:  .WORD   176700
030716  000254  000240          RPVEC:  .WORD   254,5*32.

                                        ;*MAXIMUM NUMBER OF LOOK AHEADS ALLOWED IS 4 (MXLACT=1 WORD)
030722  000004                  MXLACT: .WORD   4
                                        ;*MAXIMUM DELTA DELAY IS 8 SECTORS (MXDLTA=1 WORD)
030724  001000                  MXDLTA: .WORD   8.*64.
                                        ;*MINIMUM DELTA DELAY IS 2 SECTORS (MNDLTA=1 WORD)
030726  000200                  MNDLTA: .WORD   2*64.
                                        ;*MAXIMUM SEARCH FOR I/O WINDOW IS 5 SECTORS (MXWNDW=1 WORD)
030730  000005                  MXWNDW: .WORD   5

                                        ;*DEFINITIONS OF THE RH11/RP04 ADDRESS INDEXES

            000000              RHCS1=0         ;CONTROL AND STATUS REGISTER #1 (DRIVE REG. 00)
            000002              RHWC=2          ;WORD COUNT REGISTER (NOT A DRIVE REG)
            000004              RHBA=4          ;UNIBUS ADDRESS REGISTER (NOT A DRIVE REG)
            000006              RHDA=6          ;DESIRED SECTOR/TRACK ADDRESS REGISTER (DRIVE REG. 05)
            000010              RHCS2=10        ;CONTROL AND STATUS REGISTER #2 (NOT A DRIVE REG)
            000012              RHDS1=12        ;DRIVE STATUS REGISTER (DRIVE REG 01)
            000014              RHER1=14        ;ERROR REGISTER #1 (DRIVE REG. 02)
            000016              RHAS=16         ;ATTENTION SUMMARY PSEUDO REGISTER (DRIVE REG. 04)
            000020              RHLA=20         ;LOOK AHEAD REGISTER (DRIVE REG. 07)
            000022              RHDB=22         ;DATA BUFFER REGISTER (NOT A DRIVE REG.)
            000024              RHMR=24         ;MAINTAINABILITY REGISTER (DRIVE REG. 03)
            000026              RHDT=26         ;DRIVE TYPE REGISTER (DRIVE REG. 06)
            000030              RHSN=30         ;SERIAL NUMBER REGISTER (DRIVE REG. 10)
            000032              RHOF=32         ;OFFSET REGISTER (DRIVE REG. 11)
            000034              RHCA=34         ;DESIRED CYLINDER ADDRESS REGISTER (DRIVE REG. 12)
            000036              RHCC=36         ;CURRENT CYLINDER ADDRESS REGISTER (DRIVE REG. 13)
            000040              RHER2=40        ;ERROR REGISTER #2 (DRIVE REG. 14)
            000042              R4ER3=42        ;ERROR REGISTER #3 (DRIVE REG. 15)
            000044              RHEC1=44        ;ECC POSITION REGISTER (DRIVE REG. 16)
            000046              RHEC2=46        ;ECC PATTERN REGISTER (DRIVE REG.  17)
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                                        ;*RH11/RP04 DRIVER INIT. CODE
                                        ;*THIS ROUTINE WILL DETERMINE WHICH RP04 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
                                        ;
030732  004037  037104          RPINIT: JSR     R0,SAVR15       ;GO SAVE R1-R5
030736  013746  177776                  MOV     @#PS,-(SP)      ;SAVE THE PRESENT PROCESSOR STATUS
030742  012737  000240  177776          MOV     #(5*32.),@#PS   ;CHANGE THE PRIORITY TO 5
030750  004737  036642                  JSR     PC,CLRQUE       ;CLEAR ALL REQUEST QUEUES
030754  012701  030536                  MOV     #RPERRS,R1      ;FIRST ADDRESS TO BE CLEARED
030760  012702  030656                  MOV     #SEEKFG,R2      ;LAST ADDRESS TO BE CLEARED
030764  005021                  1$:     CLR     (R1)+           ;CLEAR
030766  020102                          CMP     R1,R2           ;ARE WE DONE?
030770  101775                          BLOS    1$              ;BRANCH IF NO
030772  012702  030700                  MOV     #DTUW,R2        ;LAST ADDRESS
030776  012721  177777          2$:     MOV     #-1,(R1)+       ;INITIALIZE
031002  020102                          CMP     R1,R2           ;DONE?
031004  101774                          BLOS    2$              ;LOOP IF NO
031006  012737  177777  030556          MOV     #-1,DRVSTA      ;SET ALL DRIVES TO UNAVAILABLE
031014  012737  177777  030560          MOV     #-1,DRVSTA+2
031022  012737  177777  030562          MOV     #-1,DRVSTA+4
031030  012737  177777  030564          MOV     #-1,DRVSTA+6
031036  013703  030716                  MOV     RPVEC,R3        ;SETUP THE RH11/RP04 VECTOR
031042  012723  033364                  MOV     #ISR,(R3)+
031046  013713  030720                  MOV     RPVEC+2,(R3)
031052  013704  030714                  MOV     RPADR,R4        ;FIRST ADDRESS OF RH11/RP04
031056  012764  000040  000010          MOV     #BIT05,RHCS2(R4)  ;MASSBUS INIT
031064  005001                          CLR     R1              ;START WITH DRIVE 0
031066  004037  031160          3$:     JSR     R0,DRVINT       ;INIT THE DRIVE
031072  031152                          8$
031074  005201                  4$:     INC     R1              ;GO TO NEXT DRIVE
031076  042701  177770                  BIC     #^C7,R1         ;MASK OUT UNUSED BITS
031102  001371                          BNE     3$              ;BR IF MORE DRIVES TO GO
031104  012701  000007                  MOV     #7,R1           ;START WITH DRIVE 7
031110  005037  177776                  CLR     @#PS            ;CLEAR THE PROCESSOR STATUS
031114  105761  030606          5$:     TSTB    DPINT(R1)       ;WAITING FOR DRIVE TO SWITCH PORTS ?
031120  001405                          BEQ     7$              ;BR NOT WAITING
031122  004737  036276                  JSR     PC,SET.IE       ;SET INTERRUPT
031126  105761  030606          6$:     TSTB    DPINT(R1)       ;DRIVE SWITCHED PORTS ?
031132  001375                          BNE     6$              ;BR IF NOT
031134  005301                  7$:     DEC     R1              ;GO TO THE NEXT DRIVE
031136  100366                          BPL     5$              ;CHECK NEXT DRIVE
031140  012637  177776                  MOV     (SP)+,@#PS      ;RESTORE THE PROCESSOR STATUS
031144  004037  037124                  JSR     R0,GETR15       ;RESTORE R1-R5
031150  000207                          RTS     PC              ;BYE-BYE
031152  105060  030556          8$:     CLRB    DRVSTA(R0)      ;SET DRIVE STATUS TO OFFLINE
031156  000746                          BR      4$              ;CONTINUE WITH THE INIT
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 7499                                   ;*DRIVE INIT. ROUTINE
 7500                                   ;*THIS ROUTINE DETERMINES IF A DRIVE EXIST AND IF IT IS
 7501                                   ;*AN RP04. IF IT IS, A "READ-IN PRESET" IS ISSUED AND FMT22
 7502                                   ;*IS SET TO A "1". THEN MOL, DPR, DRY, AND VV ARE CHECKED TO
 7503                                   ;*INSURE THEY ARE ALL ON A "1". AND DEPENDING ON THEIR STATE,
 7504                                   ;*DRVSTA IS SET TO THE PROPER CONDITION.
 7505                                   ;*CALL
 7506                                   ;*      MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
 7507                                   ;*      MOV     RPADR,R4        ;UNIBUS ADDRESS OF RH11/RP04 (RHCS1)
 7508                                   ;*      JSR     R0,DRVINT       ;CALLED BY A JSR
 7509                                   ;*      RETURN1                 ;ERROR OCCURRED (PARITY)
 7510                                   ;*      RETURN2                 ;NORMAL RETURN
 7511                                   ;
 7512  031160  004037  037104           DRVINT: JSR     R0,SAVR15       ;SAVE R1-R5
 7513  031164  112761  177777  030556           MOVB    #-1,DRVSTA(R1)  ;START DRIVE STATUS AS NONEXISTENT
 7514  031172  010103                           MOV     R1,R3           ;COPY THE DRIVE NUMBER INTO
 7515  031174  006303                           ASL     R3              ;R3 AND POSITION IT FOR TABLE INDEXING
 7516  031176  005063  030566                   CLR     DRVTYP(R3)      ;CLEAR THE DRIVE TYPE INDICATOR
 7517  031202  010164  000010                   MOV     R1,RHCS2(R4)    ;SELECT A DRIVE
 7518  031206  112714  000111                   MOVB    #111,(R4)       ;DO A DRIVE CLEAR COMMAND (& SEIZE DRIVE)
 7519  031212  032764  010000  000010           BIT     #BIT12,RHCS2(R4) ;NONEXISTENT DRIVE?
 7520  031220  001403                           BEQ     1$              ;NO---BRANCH
 7521  031222  004737  036276                   JSR     PC,SET.IE       ;GO SET "IE" WITHOUT A "TRE"
 7522  031226  000465                           BR      6$              ;LEAVE THIS ROUTINE
 7523  031230  032714  004000           1$:     BIT     #BIT11,(R4)     ;SEE IF DRIVE AVAILABLE
 7524  031234  001466                           BEQ     8$              ;BR IF DRIVE NOT AVAILABLE
 7525  031236  004037  035700                   JSR     R0,RD.RP        ;READ THE DRIVE TYPE REG.
 7526  031242  000026                           RHDT
 7527  031244  031404                           7$                      ;ERROR RETURN ADDRESS
 7528  031246  012605                           MOV     (SP)+,R5        ;PUT DRIVE TYPE IN R5
 7529  031250  010563  030566                   MOV     R5,DRVTYP(R3)   ;SAVE THE DRIVE TYPE
 7530  031254  022705  020020                   CMP     #20020,R5       ;IS IT A SINGLE PORT RP04?
 7531  031260  001403                           BEQ     2$              ;BRANCH IF YES
 7532  031262  022705  024020                   CMP     #24020,R5       ;IS IT A DUAL PORT RP04?
 7533  031266  001045                           BNE     6$              ;BRANCH IF NOT
 7534  031270  012746  000121           2$:     MOV     #121,-(SP)      ;DO A "READ-IN PRESET"
 7535  031274  004037  036036                   JSR     R0,WRT.RP
 7536  031300  000000                           RHCS1
 7537  031302  031404                           7$
 7538  031304  012746  010000                   MOV     #BIT12,-(SP)    ;SET FMT22=1
 7539  031310  004037  036036                   JSR     R0,WRT.RP
 7540  031314  000032                           RHOF
 7541  031316  031404                           7$
 7542  031320  004037  035700                   JSR     R0,RD.RP        ;READ RHDS1
 7543  031324  000012                           RHDS1
 7544  031326  031404                           7$
 7545  031330  012605                           MOV     (SP)+,R5        ;AND SAVE IT IN R5
 7546  031332  100011                           BPL     4$              ;BRANCH IF ATA=0
 7547  031334  116164  030702  000016           MOVB    ATABIT(R1),RHAS(R4) ;CLEAR ATTENTION BIT
 7548  031342  004037  035700                   JSR     R0,RD.RP        ;FIND OUT WHY ATA=1
 7549  031346  000014                           RHER1
 7550  031350  031404                           7$
 7551  031352  006126                           ROL     (SP)+           ;IS IT UNSAFE?
 7552  031354  100412                           BMI     6$              ;BRANCH IF YES
 7553  031356  005105           4$:     COM     R5              ;CHECK MOL, DPR, DRY, AND VV
 7554  031360  042705  167077                   BIC     #^C<BIT12!BIT08!BIT07!BIT06>,R5
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7555  031364  001004                          BNE     5$              ;BRANCH IF MOL, DPR, DRY, OR /V IS CLEAR
7556  031366  112761  000001  030556          MOVB    #1,DRVSTA(R1)   ;SET DRIVE STATUS TO ONLINE
7557  031374  000402                          BR      6$
7558  031376  105061  030556          5$:     CLRB    DRVSTA(R1)      ;DRIVE STATUS = OFFLINE
7559  031402  005720                  6$:     TST     (R0)+           ;STEP OVER THE ERROR RETURN
7560  031404  004037  037124          7$:     JSR     R0,GETR15       ;RESTORE R1-R5
7561  031410  000200                          RTS     R0              ;RETURN
7562  031412  012763  003720  030660  8$:     MOV     #2000.,TIMER(R3)  ;START 2 SEC TIMER
7563  031420  012764  000000  000012          MOV     #0,RHDS1(R4)    ;SET PORT REQUEST
7564  031426  105061  030556                  CLRB    DRVSTA(R1)      ;SET DRIVE TO OFFLINE
7565  031432  112761  177777  030606          MOVB    #-1,DPINT(R1)   ;SET PORT INITIALIZE INIDICATOR
7566  031440  000760                          BR      6$              ;EXIT
7567
7568                                  ;*REQUEST PRE-PROCESSOR-HANDLES SUBSYSTEM REQUEST
7569                                  ;
7570                                  ;*CALL
7571                                  ;
7572                                  ;*      JSR     R0,@#RP04       ;CALL THE RP04 DRIVER
7573                                  ;*      PNTADR                  ;ADDRESS OF POINTER OF DRIVES PARAMETER BLOCK
7574                                  ;*      RETURN1                 ;RETURN HERE IF QUEUE IS FULL
7575                                  ;*      RETURN2                 ;RETURN HERE IF REQUEST IS IN QUEUE OR THERE
7576                                                                  ;IS AN ERROR CONDITION
7577
7578  031442  013746  177776          RP04:   MOV     @#PS,-(SP)      ;SAVE THE CALLING STATUS
7579  031446  013737  030720  177776          MOV     RPVEC+2,@#PS    ;DON'T ALLOW ANY RP04 INTERRUPTS
7580  031454  112737  000001  030632          MOVB    #1,ACTDRV       ;SET "ACTIVE DRIVER" FLAG
7581  031462  004037  037104                  JSR     R0,SAVR15       ;SAVE R1-R5
7582  031466  012002                          MOV     (R0)+,R2        ;PICKUP THE DRIVE PARAMETER BLOCK POINTER
7583  031470  005062  000016                  CLR     16(R2)          ;CLEAR THE STATUS/ERROR INDICATOR
7584  031474  111201                          MOVB    (R2),R1         ;PICKUP THE DRIVE NUMBER
7585  031476  013704  030714                  MOV     RPADR,R4        ;UNIBUS ADDRESS OF RHCS1
7586  031502  105761  030556                  TSTB    DRVSTA(R1)      ;CHECK DRIVES STATUS
7587  031506  003021                          BGT     1$              ;BRANCH IF ONLINE
7588  031510  105761  030634                  TSTB    ULDFLG(R1)      ;UNLOAD COMMAND IN QUEUE?
7589  031514  001043                          BNE     3$              ;BRANCH IF YES
7590  031516  105761  030606                  TSTB    DPINT(R1)       ;TRYING TO INIT THE DRIVE
7591  031522  001056                          BNE     7$              ;BR IF YES
7592  031524  013704  030714                  MOV     RPADR,R4        ;UNIBUS ADDRESS OF RHCS1
7593  031530  004037  031160                  JSR     R0,DRVINT       ;GO INIT. THE DRIVE
7594  031534  000446                          BR      6$              ;ERROR RETURN
7595  031536  105761  030606                  TSTB    DPINT(R1)       ;SEE IF PORT REQEST OUTSTANDING
7596  031542  001046                          BNE     7$              ;BR IF IT IS
7597  031544  105761  030556                  TSTB    DRVSTA(R1)      ;IS DRIVE STATUS ONLINE?
7598  031550  003454                          BLE     8$              ;BR IF NOT
7599  031552  105761  030616          1$:     TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
7600  031556  001040                          BNE     7$              ;BR IF YES
7601  031560  010164  000010                  MOV     R1,RHCS2(R4)    ;SELECT THE DRIVE
7602  031564  004037  036744                  JSR     R0,DRVQUE       ;PUT THIS REQUEST IN QUEUE
7603  031570  000421                          BR      5$              ;QUEUE IS FULL
7604  031572  122762  000103  000002          CMPB    #103,2(R2)      ;IS THIS REQ. FOR AN UNLOAD?
7605  031600  001003                          BNE     2$              ;BR IF NO
7606  031602  112761  177777  030634          MOVB    #-1,ULDFLG(R1)  ;SET THE "UNLOAD IN QUEUE" FLAG
7607  031610  105761  030546          2$:     TSTB    DRVACT(R1)      ;IS THIS DRIVE ACTIVE?
7608  031614  001006                          BNE     4$              ;BR IF YES
7609  031616  004737  031730                  JSR     PC,OPT          ;CALL THE OPTIMIZER
7610  031622  000403                          BR      4$
```

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7611  031624  052762  120000  000016  3$:     BIS     #BIT15!BIT13,16(R2)     ;SET THE "UNLOAD IN QUEUE" ERROR FLAG
7612  031632  005720                  4$:     TST     (R0)+
7613  031634  004037  037124          5$:     JSR     R0,GETR15               ;RESTORE R1-R5
7614  031640  105037  030632                  CLRB    ACTDRV                  ;CLEAR "ACTIVE DRIVER" FLAG
7615  031644  012637  177776                  MOV     (SP)+,@#PS              ;RETURN "PS" TO USER LEVEL
7616  031650  000200                          RTS     R0                      ;RETURN TO CALLER
7617  031652  004737  032770          6$:     JSR     PC,CI7                  ;GO HANDLE THE PARITY ERROR
7618  031656  000765                          BR      4$
7619  031660  004037  036744          7$:     JSR     R0,DRVQUE               ;PUT REQUEST IN QUEUE
7620  031664  000763                          BR      5$                      ;QUEUE IS FULL
7621  031666  032714  000100                  BIT     #BIT06,(R4)             ;IS 'IE' SET ALREADY ?
7622  031672  001357                          BNE     4$                      ;BR IF IT IS
7623  031674  004737  036276                  JSR     PC,SET.IE               ;SET INTERRUPT
7624  031700  000754                          BR      4$                      ;RETURN, REQUEST IN QUEUE
7625  031702  105761  030556          8$:     TSTB    DRVSTA(R1)              ;SEE IF DRIVE OFFLINE OR UNSAFE
7626  031706  002404                          BLT     9$                      ;BR IF UNSAFE
7627  031710  052762  140000  000016          BIS     #BIT15!BIT14,16(R2)     ;ERROR--DRIVE IS OFFLINE
7628  031716  000745                          BR      4$                      ;GO TO EXIT
7629  031720  052762  110000  000016  9$:     BIS     #BIT15!BIT12,16(R2)     ;ERROR--DRIVE IS UNSAFE
7630  031726  000741                          BR      4$                      ;GO TO EXIT
7631
7632                                  ;*OPTIMIZER-CALLED FOR A PARTICULAR DRIV
7633                                  ;
7634                                  ;*CALL
7635                                  ;*      MOV     #DRVNUM,R1              ;DRIVE NUMBER TO R1
7636                                  ;*      JSR     PC,OPT                  ;SETUP A COMMAND
7637                                  ;
7638  031730  004037  037104          OPT:    JSR     R0,SAVR15               ;SAVE R1-R5
7639  031734  013746  177776                  MOV     @#PS,-(SP)              ;SAVE PROC. STATUS
7640  031740  146137  030702  030630          BICB    ATABIT(R1),SRCHWT       ;CLEAR "SEARCH WAIT" KEY
7641  031746  004737  037020                  JSR     PC,GETREQ               ;GET "DPB" POINTER OF REQUEST
7642  031752  005702                          TST     R2                      ;IS THERE A REQUEST IN QUEUE?
7643  031754  001452                          BEQ     6$                      ;NO--BRANCH TO EXIT
7644  031756  105761  030556                  TSTB    DRVSTA(R1)              ;IS DRIVE ONLINE?
7645  031762  003006                          BGT     1$                      ;YES--BRANCH
7646  031764  004737  037042                  JSR     PC,POPQUE               ;NO--REMOVE REQUEST FROM QUEUE
7647  031770  052762  140000  000016          BIS     #BIT15!BIT14,16(R2)     ;SET ERROR BIT OF STATUS/ERROR INDICATOR
7648  031776  000434                          BR      5$                      ;BRANCH TO EXIT
7649  032000  012764  000000  000012  1$:     MOV     #0,RHDS1(R4)            ;SEIZE THE DRIVE OR SET REQUEST
7650  032006  032714  004000                  BIT     #BIT11,(R4)             ;DRIVE AVAILABLE ?
7651  032012  001441                          BEQ     7$                      ;BR IF NOT
7652  032014  122762  000150  000002          CMPB    #150,2(R2)              ;IS THE REQUEST FOR I/O?
7653  032022  002403                          BLT     2$                      ;YES--BRANCH
7654  032024  004737  032354                  JSR     PC,CI4                  ;CALL THE COMMAND INITIATOR
7655  032030  000417                          BR      5$                      ;BRANCH TO EXIT
7656  032032  005737  030700          2$:     TST     DTUW                    ;DATA TRANSFER UNDERWAY?
7657  032036  002012                          BGE     4$                      ;YES--GO START A SEARCH
7658  032040  005737  030656                  TST     SEEKFG                  ;DO IMPLIED SEEKS?
7659  032044  100404                          BMI     3$                      ;YES---BRANCH
7660  032046  004037  033226                  JSR     R0,LA                   ;NO--DO LOOK AHEAD
7661  032052  000406                          BR      5$                      ;RETURN HERE ON A PARITY ERROR
7662  032054  000403                          BR      4$                      ;GO START A SEARCH
7663  032056  004737  032140          3$:     JSR     PC,CI1                  ;START A DATA TRANSFER
7664  032062  000402                          BR      5$
7665  032064  004737  032246          4$:     JSR     PC,CI3                  ;START A SEARCH
7666  032070  012637  177776          5$:     MOV     (SP)+,@#PS              ;RESTORE PROC. STATUS
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 7667  032074  004037  037124                    JSR     R0,GETR15       ;RESTORE R1-R5
 7668  032100  000207                            RTS     PC
 7669  032102  032714  000100          6$:       BIT     #BIT06,(R4)     ;SEE IF 'IE' ALREADY SET
 7670  032106  001370                            BNE     5$              ;BR IF SET
 7671  032110  004737  036276                    JSR     PC,SET.IE       ;SET "IE" WITHOUT A "TRE"
 7672  032114  000765                            BR      5$              ;EXIT THE ROUTINE
 7673  032116  112761  177777  030616  7$:       MOVB    #-1,DPRQS(R1)   ;SET PORT REQUEST INDICATOR
 7674  032124  010103                            MOV     R1,R3           ;SET UP TO ADDRESS WORDS
 7675  032126  006303                            ASL     R3              ;CONVERT TO WORD INDEX
 7676  032130  012763  023420  030660            MOV     #10000.,TIMER(R3)  ;START 10 SEC TIMER
 7677  032136  000761                            BR      6$              ;SET 'IE'
 7678
 7679                                  ;*COMMAND INITIATOR
 7680                                  ;
 7681                                  ;*CALL
 7682                                  ;*      MOV     #DRVNUM,R1      ;DRIVE NUMBER
 7683                                  ;*      MOV     #DPB,R2         ;ADDRESS OF DPB
 7684                                  ;*      JSR     PC,CI?          ;CI?= CI1,CI3, OR CI4
 7685                                  ;*                              ;WHERE:
 7686                                  ;*                              ;CI1=DATA TRANSFER
 7687                                  ;*                              ;CI2=SEARCH REQUESTED BY DATA XFER
 7688                                  ;*                              ;CI4=NOT DATA TRANSFER
 7689
 7690  032140  004737  037042          CI1:      JSR     PC,POPQUE       ;REMOVE REQUEST FROM "DRIVES WAIT" QUEUE
 7691  032144  010237  030626                    MOV     R2,TRNSWT       ;PUT REQ. IN TRANSFER WAIT QUEUE
 7692  032150  010203                  CI2:      MOV     R2,R3           ;DPB ADDRESS TO R3
 7693  032152  013704  030714                    MOV     RPADR,R4        ;RHCS1 ADDRESS
 7694  032156  010164  000010                    MOV     R1,RHCS2(R4)    ;SELECT DRIVE
 7695  032162  062703  000004                    ADD     #4,R3           ;DESIRED WORD COUNT
 7696  032166  062704  000002                    ADD     #2,R4           ;RHWC ADDRESS
 7697  032172  012324                            MOV     (R3)+,(R4)+     ;LOAD WORD COUNT
 7698  032174  012324                            MOV     (R3)+,(R4)+     ;LOAD BUFFER ADDRESS
 7699  032176  012346                            MOV     (R3)+,-(SP)     ;LOAD SECTOR AND TRACK
 7700  032200  004037  036036                    JSR     R0,WRT.RP       ;CALL THE LOAD(WRITE) ROUTINE
 7701  032204  000006                            RHDA                    ;INDEX OF REGISTER TO LOAD
 7702  032206  032770                            CI7                     ;ERROR RETURN ADDRESS
 7703  032210  012346                            MOV     (R3)+,-(SP)     ;LOAD CYLINDER ADDRESS
 7704  032212  004037  036036                    JSR     R0,WRT.RP
 7705  032216  000034                            RHCA
 7706  032220  032770                            CI7
 7707  032222  016246  000002                    MOV     2(R2),-(SP)     ;LOAD "COMMAND+GO", "A17&A16", AND "PSEL"
 7708  032226  004037  036036                    JSR     R0,WRT.RP
 7709  032232  000000                            RHCS1
 7710  032234  032770                            CI7
 7711  032236  010137  030700                    MOV     R1,DTUW         ;SET "DATA TRANSFER UNDERWAY"
 7712  032242  000137  032732                    JMP     CI5
 7713  032246  013704  030714          CI3:      MOV     RPADR,R4        ;RHCS1 ADDRESS
 7714  032252  010164  000010                    MOV     R1,RHCS2(R4)    ;SELECT DRIVE
 7715  032256  016246  000012                    MOV     12(R2),-(SP)    ;DESIRED CYLINDER ADDRESS
 7716  032262  004037  036036                    JSR     R0,WRT.RP
 7717  032266  000034                            RHCA
 7718  032270  032770                            CI7
 7719  032272  116203  000010                    MOVB    10(R2),R3       ;PICKUP SECTOR ADDRESS
 7720  032276  163703  030730                    SUB     MXWNDW,R3       ;BACKUP BY MAX. SEARCH FOR I/O WINDOW
 7721  032302  002002                            BGE     1$
 7722  032304  062703  000026                    ADD     #22.,R3
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7723  032310  010346                      1$:   MOV   R3,-(SP)          ;COMBINE THE ADJUSTED SECTOR WITH
7724  032312  116266  000011  000001            MOVB  11(R2),1(SP)      ;THE DESIRED TRACK
7725  032320  004037  036036                    JSR   R0,WRT.RP         ;LOAD DESIRED TRACK & SECTOR
7726  032324  000006                            RHDA
7727  032326  032770                            CI7
7728  032330  012746  000131                    MOV   #131,-(SP)        ;START A SEARCH
7729  032334  004037  036036                    JSR   R0,WRT.RP
7730  032340  000000                            RHCS1
7731  032342  032770                            CI7
7732  032344  156137  030702  030630            BISB  ATABIT(R1),SRCHWT       ;SET "SEARCH WAIT" KEY
7733  032352  000567                            BR    CI5
7734  032354  013704  030714          CI4:      MOV   RPADR,R4          ;RHCS1 ADDRESS
7735  032360  010164  000010                    MOV   R1,RHCS2(R4)      ;SELECT DRIVE
7736  032364  116203  000002                    MOVB  2(R2),R3          ;PICKUP THE REQUESTED COMMAND
7737  032370  122703  000131                    CMPB  #131,R3           ;IS IT A SEARCH COMMAND?
7738  032374  001007                            BNE   1$                ;BRANCH IF NO
7739  032376  016246  000010                    MOV   10(R2),-(SP)      ;LOAD DESIRED TRACK & SECTOR
7740  032402  004037  036036                    JSR   R0,WRT.RP
7741  032406  000006                            RHDA
7742  032410  032770                            CI7
7743  032412  000403                            BR    2$                ;GO LOAD CYLINDER
7744  032414  122703  000105          1$:       CMPB  #105,R3           ;IS IT A SEEK COMMAND
7745  032420  001007                            BNE   3$                ;BRANCH IF NO
7746  032422  016246  000012          2$:       MOV   12(R2),-(SP)      ;LOAD DESIRED CYLINDER
7747  032426  004037  036036                    JSR   R0,WRT.RP
7748  032432  000034                            RHCA
7749  032434  032770                            CI7
7750  032436  000546                            BR    CI6
7751  032440  122703  000115          3$:       CMPB  #115,R3           ;IS IT AN "OFFSET" COMMAND?
7752  032444  001013                            BNE   4$                ;BR IF NO
7753  032446  004037  035700                    JSR   R0,RD.RP          ;MERGE THE OFFSET VALUE INTO RHOF
7754  032452  000032                            RHOF                    ;BUT DON'T CHANGE THE UPPER
7755  032454  032770                            CI7
7756  032456  116216  000001                    MOVB  1(R2),(SP)        ;BYTE WHEN LOADING THE
7757  032462  004037  036036                    JSR   R0,WRT.RP         ;REGISTER (RHOF)
7758  032466  000032                            RHOF
7759  032470  032770                            CI7
7760  032472  000530                            BR    CI6               ;GO START THE COMMAND
7761  032474  122703  000107          4$:       CMPB  #107,R3           ;IS IT A "RECALIBRATE" COMMAND?
7762  032500  001525                            BEQ   CI6               ;BRANCH IF YES
7763  032502  122703  000117                    CMPB  #117,R3           ;IS IT A RETURN TO CENTER?
7764  032506  001522                            BEQ   CI6               ;BRANCH IF YES
7765  032510  122703  000103                    CMPB  #103,R3           ;IS IT AN "UNLOAD" COMMAND?
7766  032514  001016                            BNE   5$                ;BRANCH IF NO
7767  032516  112761  000001  030546            MOVB  #1,DRVACT(R1)     ;SET THE DRIVE ACTIVE INDICATOR
7768  032524  105061  030556                    CLRB  DRVSTA(R1)        ;PUT DRIVE STATUS TO OFFLINE
7769  032530  112761  000001  030634            MOVB  #1,ULDFLG(R1)     ;SET "UNLOAD IN PROGRESS" FLAG
7770  032536  010346                            MOV   R3,-(SP)          ;START THE "UNLOAD" COMMAND
7771  032540  004037  036036                    JSR   R0,WRT.RP
7772  032544  000000                            RHCS1
7773  032546  032770                            CI7
7774  032550  000207                            RTS   PC                ;RETURN TO USER
7775  032552  122703  000143          5$:       CMPB  #143,R3           ;IS IT A "SET FORMAT" COMMAND?
7776  032556  001014                            BNE   6$                ;BRANCH IF NO
7777  032560  004037  035700                    JSR   R0,RD.RP          ;READ THE OFFSET REGISTER
7778  032564  000032                            RHOF
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7779  032566  032770                        CI7
7780  032570  116266  000001  000001        MOVB    1(R2),1(SP)     ;COMBINE "FMT22", "ECI", AND "HCI"
7781  032576  004037  036036                JSR     R0,WRT.RP       ;LOAD "FMT22", "ECI", AND/OR "HCI".
7782  032602  000032                        RHCF
7783  032604  032770                        CI7
7784  032606  000436                        BR      12$
7785  032610  122703  000141          6$:   CMPB    #141,R3         ;IS IT A "GET REGISTER" COMMAND?
7786  032614  001023                        BNE     10$             ;BRANCH IF NO
7787  032616  016203  000006          7$:   MOV     6(R2),R3        ;POINTS TO 1ST ADDRESS OF WHERE
7788                                                                ;TO PUT THE REGISTER(S)
7789  032622  116237  000010  032640        MOVB    10(R2),9$       ;INIT. THE INDEX FOR THE FIRST REG.
7790  032630  116205  000011                MOVB    11(R2),R5       ;INDEX OF LAST REG. TO MOVE
7791  032634  004037  035700          8$:   JSR     R0,RD.RP        ;READ RP04 REGISTER
7792  032640  000000          9$:   RHCS1                           ;INDEX OF REG. TO READ
7793  032642  032770                        CI7
7794  032644  012623                        MOV     (SP)+,(R3)+     ;GET THE CONTENTS OF RH11/RP04 REG.
7795  032646  023705  032640                CMP     9$,R5           ;LAST REG. BEEN READ?
7796  032652  001414                        BEQ     12$             ;GET OUT IF YES
7797  032654  062737  000002  032640        ADD     #2,9$           ;INCREASE THE INDEX BY 2
7798  032662  000764                        BR      8$              ;LOOP--MORE TO READ
7799  032664  122703  000145          10$:  CMPB    #145,R3         ;IS IT A "SELECT DRIVE" COMMAND?
7800  032670  001405                        BEQ     12$             ;BRANCH IF YES
7801  032672  010346                  11$:  MOV     R3,-(SP)        ;LOAD THE COMMAND
7802  032674  004037  036036                JSR     R0,WRT.RP
7803  032700  000000                        RHCS1
7804  032702  032770                        CI7
7805  032704  004737  037042          12$:  JSR     PC,POPQUE       ;REMOVE REQ. FROM QUEUE
7806  032710  052762  000200  000016        BIS     #BIT07,16(R2)   ;SET THE "DONE" BIT
7807  032716  005737  030654                TST     SAVEFG          ;SAVE THE RH11/RP04 REGISTERS?
7808  032722  100002                        BPL     13$             ;BRANCH IF NO
7809  032724  004737  036200                JSR     PC,SVRH11       ;YES--GO SAVE THE REGISTERS
7810  032730  000207                  13$:  RTS     PC              ;RETURN TO USER
7811  032732  006301                  CI5:  ASL     R1
7812  032734  012761  001750  030660        MOV     #1000.,TIMER(R1)        ;SET A ONE SECOND TIMER
7813  032742  006201                        ASR     R1
7814  032744  112761  000001  030546        MOVB    #1,DRVACT(R1)   ;SET THE DRIVE ACTIVE
7815  032752  000207                        RTS     PC              ;RETURN TO THE USER
7816  032754  010346                  CI6:  MOV     R3,-(SP)        ;LOAD THE COMMAND
7817  032756  004037  036036                JSR     R0,WRT.RP
7818  032762  000000                        RHCS1
7819  032764  032770                        CI7
7820  032766  000761                        BR      CI5
7821  032770  005702                  CI7:  TST     R2              ;ANYTHING IN QUEUE ?
7822  032772  001405                        BEQ     CI7B            ;BR IF NOT
7823  032774  012762  104000  000016        MOV     #BIT15!BIT11,16(R2)     ;SET "PARITY" ERROR INDICATOR
7824  033002  004737  036200                JSR     PC,SVRH11       ;GO SAVE THE RH11/RP04 REGISTERS
7825  033006  012746  000111          CI7B: MOV     #111,-(SP)      ;DO A "DRIVE CLEAR"
7826  033012  004037  036036                JSR     R0,WRT.RP
7827  033016  000000                        RHCS1
7828  033020  033060                        CI8
7829  033022  004737  036724                JSR     PC,EMPTYQ       ;EMPTY THE QUEUE
7830  033026  105061  030634                CLRB    ULDFLG(R1)      ;CLEAR THE UNLOAD IN QUEUE FLAG
7831  033032  105061  030546                CLRB    DRVACT(R1)      ;DRIVE IS IDLE
7832  033036  020137  030700                CMP     R1,DTUW         ;IF THIS DRIVE HAD AN I/O REQUEST
7833  033042  001005                        BNE     1$              ;IN PROGRESS CLEAR ALL OF THE FLAGS
7834  033044  005037  030626                CLR     TRNSWT
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7835  033050  012737  177777  030700          MOV     #-1,DTUW
7836  033056  000207                  1$:     RTS     PC
7837  033060  004037  037104          CI8:    JSR     R0,SAVR15       ;SAVE R1-R5
7838  033064  013704  030714                  MOV     RPADR,R4        ;PICKUP THE ADDRESS OF THE FIRST REGISTER
7839  033070  005001                          CLR     R1
7840  033072  005003                          CLR     R3
7841  033074  105761  030546          1$:     TSTB    DRVACT(R1)      ;DRIVE ACTIVE?
7842  033100  001423                          BEQ     4$              ;BRANCH IF NO
7843  033102  013702  030626                  MOV     TRNSWT,R2       ;GET THE "TRANSFER WAIT" QUEUE
7844  033106  020137  030700                  CMP     R1,DTUW         ;DID THIS DRIVE HAVE AN I/O IN PROGRESS?
7845  033112  001402                          BEQ     2$              ;BRANCH IF YES
7846  033114  004737  037020                  JSR     PC,GETREQ       ;GET THE DPB POINTER
7847  033120  005702                  2$:     TST     R2              ;QUEUE ENTRY FOR DRIVE ?
7848  033122  001405                          BEQ     3$              ;BR IF NOT
7849  033124  052762  102000  000016          BIS     #BIT15!BIT10,16(R2) ;SET "NON-CLEARABLE PARITY" ERROR INDICATOR
7850  033132  004737  036200                  JSR     PC,SVRH11       ;SAVE RH11/RP04 REGISTERS
7851  033136  012763  177777  030660  3$:     MOV     #-1,TIMER(R3)   ;STOP THE TIMER
7852  033144  105061  030546                  CLRB    DRVACT(R1)      ;SET "DRIVE ACTIVE" TO IDLE
7853  033150  105061  030634          4$:     CLRB    ULDFLG(R1)      ;CLEAR UNLOAD FLAG
7854  033154  005201                          INC     R1              ;MOVE TO THE NEXT DRIVE
7855  033156  062703  000002                  ADD     #2,R3
7856  033162  042701  177770                  BIC     #^C7,R1
7857  033166  001342                          BNE     1$              ;BRANCH IF MORE DRIVES
7858  033170  012737  177777  030700          MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
7859  033176  005037  030626                  CLR     TRNSWT          ;CLEAR THE "TRANSFER WAIT" QUEUE
7860  033202  004737  036642                  JSR     PC,CLRQUE       ;CLEAR ALL OF THE REQUEST QUEUES
7861  033206  012764  000040  000010          MOV     #BIT05,RHCS2(R4) ;DO A MASSBUS INIT.
7862  033214  004737  036276                  JSR     PC,SET.IE       ;SET "IE" WITHOUT "TRE"
7863  033220  004037  037124                  JSR     R0,GETR15       ;RESTORE THE REGISTERS
7864  033224  000207                          RTS     PC              ;RETURN
7865
7866                                  ;*LOOK AHEAD ROUTINE
7867                                  ;
7868                                  ;*CALL
7869                                  ;*      MOV     #DRVNUM,R1      ;DRIVE NUMBER
7870                                  ;*      MOV     #DPB,R2         ;POINT TO DPB
7871                                  ;*      JSR     R0,LA           ;GO CHECK THE WINDOW
7872                                  ;*      RETURN1                 ;ERROR RETURN
7873                                  ;*      RETURN2                 ;START A SEARCH
7874                                  ;*      RETURN3                 ;START A DATA TRANSFER
7875
7876  033226  013704  030714          LA:     MOV     RPADR,R4        ;GET RHCS1'S ADDRESS
7877  033232  010164  000010                  MOV     R1,RHCS2(R4)    ;SELECT DRIVE
7878  033236  004037  035700                  JSR     R0,RD.RP        ;READ CURRENT CYLINDER
7879  033242  000036                          RHCC
7880  033244  033356                          4$                      ;ERROR RETURN ADDRESS
7881  033246  022662  000012                  CMP     (SP)+,12(R2)    ;IS CURRENT CYLINDER=DESIRED
7882                                                                  ;CYLINDER?
7883  033252  001037                          BNE     3$              ;EXIT IF NO
7884  033254  105261  030644                  INCB    LACNT(R1)       ;INCREMENT THE LOOK AHEAD COUNT
7885  033260  126137  030644  030722          CMPB    LACNT(R1),MXLACT ;EXCEED MAX?
7886  033266  003026                          BGT     2$              ;BRANCH IF YES
7887  033270  116203  000010                  MOVB    10(R2),R3       ;GET DESIRED SECTOR ADDRESS AND
7888  033274  000303                          SWAB    R3              ;MULT. BY 64--ALIGN WITH
7889  033276  006203                          ASR     R3              ;LOOK AHEAD REGISTER
7890  033300  006203                          ASR     R3
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 7891  033302  012737  000340  177776          MOV     #340,@#PS       ;PRIORITY LEVEL "7"
 7892  033310  004037  035700                  JSR     R0,RD.RP        ;READ LOOK AHEAD REGISTER
 7893  033314  000020                          RHLA
 7894  033316  033356                          4$
 7895  033320  162603                          SUB     (SP)+,R3        ;CALCULATE THE DELTA
 7896  033322  002002                          BGE     1$
 7897  033324  062703  002600                  ADD     #<22.*64.>,R3   ;MAKE THE DELTA POSITIVE
 7898  033330  023703  030724          1$:     CMP     MXDLTA,R3       ;CHECK THE DELTA TO SEE
 7899  033334  002406                          BLT     3$              ;IF IT IS WITHIN THE
 7900  033336  023703  030726                  CMP     MNDLTA,R3       ;WINDOW---IF YES, ZERO
 7901  033342  002003                          BGE     3$              ;THE LOOK AHEAD COUNT
 7902  033344  105061  030644          2$:     CLRB    LACNT(R1)       ;AND TAKE THE I/O EXIT
 7903  033350  005720                          TST     (R0)+
 7904  033352  005720                  3$:     TST     (R0)+           ;ADJUST THE RETURN ADDRESS
 7905  033354  000200                          RTS     R0
 7906  033356  004737  032770          4$:     JSR     PC,CI7          ;PROCESS THE ERROR
 7907  033362  000200                          RTS     R0              ;TAKE ERROR RETURN
 7908
 7909                                  ;*INTERRUPT SERVICE ROUTINE
 7910
 7911  033364  112737  000001  030632  ISR:    MOVB    #1,ACTDRV       ;SET "ACTIVE DRIVER" FLAG
 7912  033372  004037  037104                  JSR     R0,SAVR15       ;SAVE R1-R5
 7913  033376  013704  030714                  MOV     RPADR,R4        ;ADDRESS OF RHSCS1
 7914  033402  013701  030700                  MOV     DTUW,R1         ;GET "DATA TRANSFER UNDERWAY" INDICATOR
 7915  033406  002403                          BLT     1$              ;BRANCH IF NO DATA TRANSFER UNDERWAY
 7916  033410  004737  033434                  JSR     PC,TD           ;CALL TRANSFER DONE
 7917  033414  000402                          BR      2$              ;EXIT
 7918  033416  004737  033716          1$:     JSR     PC,SC           ;CALL SPECIAL CONDITIONS
 7919  033422  004037  037124          2$:     JSR     R0,GETR15       ;RESTORE R1-R5
 7920  033426  105037  030632                  CLRB    ACTDRV          ;CLEAR "ACTIVE DRIVER" FLAG
 7921  033432  000002                          RTI                     ;RETURN
 7922
 7923                                  ;*TRANSFER DONE ROUTINE
 7924
 7925  033434  105061  030546          TD:     CLRB    DRVACT(R1)      ;SET DRIVE ACTIVE INDICATOR TO IDLE
 7926  033440  012737  177777  030700          MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
 7927  033446  006301                          ASL     R1
 7928  033450  012761  177777  030660          MOV     #-1,TIMER(R1)   ;CANCEL TIMEOUT
 7929  033456  006201                          ASR     R1
 7930  033460  013702  030626                  MOV     TRNSWT,R2       ;GET "DPB" ADDRESS FROM THE
 7931  033464  005037  030626                  CLR     TRNSWT          ;TRANSFER WAIT QUEUE--CLEAR QUEUE
 7932  033470  052762  000200  000016          BIS     #BIT07,16(R2)   ;SET DONE
 7933  033476  010164  000010                  MOV     R1,RHCS2(R4)    ;SELECT THE DRIVE
 7934  033502  004037  035700                  JSR     R0,RD.RP        ;TRANSFER ERROR(TRE=1)?
 7935  033506  000000                          RHCS1
 7936  033510  032770                          CI7
 7937  033512  006126                          ROL     (SP)+
 7938  033514  100421                          BMI     3$              ;BR IF YES
 7939  033516  005737  030654                  TST     SAVEFG          ;SAVE THE RH11/RP04 REGISTERS?
 7940  033522  100002                          BPL     1$              ;BRANCH IF NO
 7941  033524  004737  036200                  JSR     PC,SVRH11       ;YES--SAVE THE REGISTERS
 7942  033530  004737  033610          1$:     JSR     PC,WC           ;SEE IF WRITE CHECK TO BE PUT IN QUEUE
 7943  033534  004737  037020                  JSR     PC,GETREQ       ;GET DPB POINTER
 7944  033540  005702                          TST     R2              ;ENTRY FOR DRIVE ?
 7945  033542  001403                          BEQ     2$              ;BR IF NOT
 7946  033544  004737  031730                  JSR     PC,OPT          ;CALL OPTIMIZER
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 7947  033550  000520                        BR      SC2             ;SPECIAL CONDITION (ENTRY #2)
 7948  033552  012714  000113          2$:   MOV     #113,(R4)       ;RELEASE THE DRIVE
 7949  033556  000515                        BR      SC2
 7950  033560  052762  100100  000016  3$:   BIS     #BIT15!BIT06,16(R2) ;SET DATA ERROR FLAG
 7951  033566  004737  036724                JSR     PC,EMPTYQ       ;EMPTY THE "DRIVES WAIT" QUEUE
 7952  033572  004737  036200                JSR     PC,SVRH11       ;SAVE THE RH11/RP04 REGISTERS
 7953  033576  012714  040111                MOV     #40111,(R4)     ;ISSUE A "DRIVE CLEAR"
 7954  033602  012714  000113                MOV     #113,(R4)       ;ISSUE A RELEASE TO THE DRIVE
 7955  033606  000501                        BR      SC2             ;SPECIAL CONDITION (ENTRY #2)
 7956
 7957                                  ;*FORCED WRITE CHECK ROUTINE
 7958
 7959  033610  005737  001316          WC:   TST     AUTOCK          ;AUTOMATIC WRITE CHECKS ?
 7960  033614  001437                        BEQ     2$              ;BR IF NOT
 7961  033616  122762  000002  000030        CMPB    #2,$CODE(R2)    ;LAST OPERATION WRITE DATA ?
 7962  033624  001404                        BEQ     1$              ;BR IF IT WAS
 7963  033626  122762  000003  000030        CMPB    #3,$CODE(R2)    ;LAST OPERATION WRITE HEADER & DATA ?
 7964  033634  001027                        BNE     2$              ;BR IF NOT
 7965  033636  004037  036744          1$:   JSR     R0,DRVQUE       ;PUT THE OPERATION IN THE QUEUE
 7966  033642  000424                        BR      2$              ;QUEUE IS FULL
 7967  033644  005062  000016                CLR     16(R2)          ;CLEAR 'DONE' BIT IN DPB
 7968  033650  116262  000030  000032        MOVB    $CODE(R2),$PREVO(R2)    ;SAVE WRITE OPERATION CODE
 7969  033656  016262  000012  000040        MOV     $CYL(R2),$PREVA+2(R2)   ;SAVE CYLINDER
 7970  033664  016262  000010  000036        MOV     $SEC(R2),$PREVA(R2)     ;SAVE SECTOR AND TRACK ADDRESSES
 7971  033672  142762  000002  000030        BICB    #2,$CODE(R2)    ;CHANGE WRITE TO CHECK
 7972  033700  142762  000020  000002        BICB    #20,$COMND(R2)  ;CHANGE DRIVER CODE TO WRITE CHECK
 7973  033706  152762  000010  000002        BISB    #10,$COMND(R2)  ;FINISH CHANGING CODE TO WRITE CHECK
 7974  033714  000207                  2$:   RTS     PC              ;EXIT
 7975
 7976                                  ;*SPECIAL CONDITION ROUTINE
 7977
 7978  033716  005001                  SC:   CLR     R1              ;START WITH DRIVE 0
 7979  033720  012702  000001                MOV     #1,R2
 7980  033724  105761  030556          1$:   TSTB    DRVSTA(R1)      ;NONEXISTENT?
 7981  033730  002030                        BGE     SC2             ;NO--BRANCH
 7982  033732  105761  030606                TSTB    DPINT(R1)       ;TRYING TO INIT THE DRIVE ?
 7983  033736  001025                        BNE     SC2             ;YES--BRANCH
 7984  033740  005201                        INC     R1              ;YES--MOVE TO THE NEXT DRIVE
 7985  033742  106302                        ASLB    R2              ;MORE DRIVES?
 7986  033744  103367                        BCC     1$              ;YES--BRANCH
 7987  033746  012764  000040  000010        MOV     #BIT5,RHCS2(R4)  ;INIT THE SYSTEM
 7988  033754  000410                        BR      SC1A            ;TAKE ERROR EXIT
 7989  033756  012701  000010          SC1:  MOV     #8.,R1          ;DO EIGHT DRIVES
 7990  033762  005301                  1$:   DEC     R1              ;NEXT DRIVE
 7991  033764  002754                        BLT     SC              ;BRANCH IF OUT OF DRIVES
 7992  033766  105761  030546                TSTB    DRVACT(R1)      ;IS THIS DRIVE IDLE?
 7993  033772  001373                        BNE     1$              ;BRANCH IF NO
 7994  033774  104001                        ERROR   1               ;ILLEGAL INTERRUPT
 7995  033776  112764  177777  000016  SC1A: MOVB    #-1,RHAS(R4)    ;CLEAR ANY OUTSTANDING ATTN BITS
 7996  034004  004737  036276                JSR     PC,SET.IE       ;GO SET INTERRUPT ENABLE
 7997  034010  000207                        RTS     PC
 7998  034012  012701  000003          SC2:  MOV     #3,R1           ;READ RHAS UP TO THREE TIMES
 7999  034016  116403  000016          1$:   MOVB    RHAS(R4),R3     ;READ "RHAS"
 8000  034022  001011                        BNE     2$              ;BRANCH IF ANY ATA BITS = 1
 8001  034024  005301                        DEC     R1              ;COUNT THIS READ
 8002  034026  003373                        BGT     1$              ;LOOP IF MORE READS ALLOWED
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 8003  034030  004037  035700                  JSR     RD,RD.RP        ;READ CONTROL AND STATUS REGISTER
 8004  034034  000000                          RHCS1
 8005  034036  033060                          CI8
 8006  034040  106126                          ROLB    (SP)+           ;IS "IE"=1?
 8007  034042  100345                          BPL     SC1             ;NO--TAKE ERROR EXIT
 8008  034044  000207                          RTS     PC              ;YES--RETURN
 8009  034046  005046                  2$:     CLR     -(SP)           ;PROCESS ALL DRIVES THAT HAVE
 8010  034050  110316                          MOVB    R3,(SP)         ;AN "ATA"=1
 8011  034052  012703  000001                  MOV     #1,R3
 8012  034056  005001                          CLR     R1
 8013  034060  030316                  SC4:    BIT     R3,(SP)         ;ATA=1?
 8014  034062  001005                          BNE     SC5             ;YES--BRANCH
 8015  034064  005201                  SC3:    INC     R1              ;MOVE TO THE NEXT DRIVE
 8016  034066  106303                          ASLB    R3
 8017  034070  001373                          BNE     SC4             ;BRANCH IF MORE TO CHECK?
 8018  034072  005726                          TST     (SP)+           ;CLEAN OFF THE STACK
 8019  034074  000207                          RTS     PC              ;RETURN TO USER
 8020  034076  105761  030606          SC5:    TSTB    DPINT(R1)       ;INITIALIZING THE DRIVE ?
 8021  034102  001402                          BEQ     .+6             ;BR IF NOT
 8022  034104  000137  034766                  JMP     SC13            ;PROCESS THE DRIVE
 8023  034110  105761  030616                  TSTB    DPRQS(R1)       ;PORT REQUEST OUTSTANDING ?
 8024  034114  001402                          BEQ     .+6             ;BR IF NOT
 8025  034116  000137  034766                  JMP     SC13            ;START THE OUTSTANDING COMMAND
 8026  034122  023701  030700                  CMP     DTUW,R1         ;IS THIS DRIVE SETUP FOR I/O?
 8027  034126  001003                          BNE     1$              ;NO---BRANCH
 8028  034130  005726                          TST     (SP)+           ;YES---CLEAN OFF THE STACK (RHAS)
 8029  034132  000137  033434                  JMP     TD              ;JUMP TO 'TRANSFER DONE'
 8030  034136  105761  030556          1$:     TSTB    DRVSTA(R1)      ;CHECK THE DRIVE STATUS
 8031  034142  003041                          BGT     SC6             ;BRANCH IF ONLINE
 8032  034144  105761  030634                  TSTB    ULDFLG(R1)      ;UNLOAD IN PROGRESS?
 8033  034150  003422                          BLE     2$              ;BRANCH IF NO
 8034  034152  004737  037020                  JSR     PC,GETREQ       ;GET DPB POINTER
 8035  034156  004737  036200                  JSR     PC,SVRH11       ;SAVE THE RH11/RP04 REGISTERS
 8036  034162  004737  034716                  JSR     PC,SC12         ;SAVE RHDS1, RHER1, RHER2, AND RHER3
 8037                                                                  ;ALSO DO A DRIVE INIT (DRVINT)
 8038  034166  105761  030556                  TSTB    DRVSTA(R1)      ;DID DRIVE COME ONLINE?
 8039  034172  003413                          BLE     3$              ;NO---BRANCH
 8040  034174  032737  040000  030536          BIT     #BIT14,RPERRS   ;WAS THERE AN ERROR?
 8041  034202  001002                          BNE     .+6             ;BR IF ERROR
 8042  034204  000137  034626                  JMP     SC11            ;NO ERROR
 8043  034210  013705  030540                  MOV     RPERRS+2,R5     ;YES -- PICKUP RHER1 AND
 8044  034214  000463                          BR      SC6A            ;GO PROCESS THE ERROR
 8045  034216  004737  034716          2$:     JSR     PC,SC12         ;SAVE RHDS1, RHER1, RHER2, AND RHER3
 8046                                                                  ;ALSO DO A DRVINT
 8047  034222  116164  030702  000016  3$:     MOVB    ATABIT(R1),RHAS(R4)  ;CLEAR THE ATTENTION BIT
 8048  034230  012714  000111                  MOV     #111,(R4)       ;ISSUE A 'DRIVE CLEAR'
 8049  034234  012714  000113                  MOV     #113,(R4)       ;RELEASE THE DRIVE
 8050  034240  011605                          MOV     (SP),R5         ;PICKUP (RHAS) BEFORE THE ERROR CALL
 8051  034242  104005                          ERROR   5               ;REPORT THE ERROR
 8052  034244  000707                          BR      SC3             ;GO CHECK FOR MORE ATA'S
 8053  034246  105761  030546          SC6:    TSTB    DRVACT(R1)      ;CHECK THE DRIVE ACTIVE INDICATOR
 8054  034252  001552                          BEQ     SC10            ;BR IF IDLE
 8055  034254  006301                          ASL     R1
 8056  034256  012761  177777  030660          MOV     #-1,TIMER(R1)   ;STOP THE TIMER
 8057  034264  006201                          ASR     R1
 8058  034266  004737  037020                  JSR     PC,GETREQ       ;GET THE DPB POINTER FROM THE QUEUE
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 8059  034272  010164  000010                    MOV     R1,RHCS2(R4)    ;SELECT DRIVE
 8060  034276  004037  035700                    JSR     R0,RD.RP        ;READ THE RP04'S STATUS REG.
 8061  034302  000012                            RHDS1
 8062  034304  034554                            SCB
 8063  034306  011605                            MOV     (SP),R5         ;AND PUT IT IN R5
 8064  034310  006126                            ROL     (SP)+           ;WAS THERE AN ERROR?
 8065  034312  100407                            BMI     1$              ;BR IF ERROR
 8066  034314  105761  030546                    TSTB    DRVACT(R1)      ;CHECK DRIVE'S STATE
 8067  034320  003142                            BGT     SC11            ;BR IF DRIVE ACTIVE WITH ORDER
 8068  034322  052762  100210  000016            BIS     #BIT15!BIT07!BIT03,16(R2)  ;INFORM USER OF ERROR RECOVER COMPLETION
 8069  034330  000472                            BR      SC7
 8070  034332  004037  035700          1$:       JSR     R0,RD.RP        ;READ ERROR REGISTER #1
 8071  034336  000014                            RHER1
 8072  034340  034554                            SCB
 8073  034342  012605                            MOV     (SP)+,R5        ;AND SAVE IT IN R5
 8074  034344  004737  036200                    JSR     PC,SVRH11       ;SAVE RH11/RP04 REGISTERS
 8075  034350  012746  000111                    MOV     #111,-(SP)      ;ISSUE A DRIVE CLEAR
 8076  034354  004037  036036                    JSR     R0,WRT.RP
 8077  034360  000000                            RHCS1
 8078  034362  034554                            SCB
 8079  034364  006105                  SC6A:     ROL     R5              ;WAS "UNSAFE" CONDITION =1?
 8080  034366  100406                            BMI     1$              ;BRANCH IF YES
 8081  034370  005702                            TST     R2              ;ANYTHING IN QUEUE ?
 8082  034372  001403                            BEQ     .+10            ;BR IF NOT
 8083  034374  052762  100240  000016            BIS     #BIT15!BIT07!BIT05,16(R2)       ;INFORM USER OF ERROR
 8084  034402  000445                            BR      SC7
 8085  034404  004037  035700          1$:       JSR     R0,RD.RP        ;READ DRIVE STATUS REG. #1
 8086  034410  000012                            RHDS1
 8087  034412  034554                            SCB
 8088  034414  011605                            MOV     (SP),R5         ;SAVE RHDS1 IN R5
 8089  034416  006126                            ROL     (SP)+           ;"ERR"=1?
 8090  034420  100014                            BPL     2$              ;BR IF NO--UNSAFE CLEARED
 8091  034422  112761  177777  030556            MOVB    #-1,DRVSTA(R1)  ;DRIVE IS UNSAFE
 8092  034430  004737  036200                    JSR     PC,SVRH11       ;SAVE RH11/RP04 REGISTERS
 8093  034434  116164  030702  000016            MOVB    ATABIT(R1),RHAS(R4)  ;CLEAR ATTENTION BIT
 8094  034442  052762  110000  000016            BIS     #BIT15!BIT12,16(R2)     ;INFORM USER OF UNSAFE ERROR
 8095  034450  000422                            BR      SC7
 8096  034452  105705                  2$:       TSTB    R5              ;"DRY" =1?
 8097  034454  100415                            BMI     3$              ;BRANCH IF YES
 8098  034456  112761  177777  030546            MOVB    #-1,DRVACT(R1)  ;ACTIVE ERROR RECOVER
 8099  034464  112761  000001  030556            MOVB    #1,DRVSTA(R1)   ;ONLINE
 8100  034472  006301                            ASL     R1
 8101  034474  012761  072460  030660            MOV     #30000.,TIMER(R1) ;START 30 SECOND TIMER
 8102  034502  006201                            ASR     R1
 8103  034504  000137  034064                    JMP     SC3
 8104  034510  052762  100220  000016  3$:       BIS     #BIT15!BIT07!BIT04,16(R2)       ;INFORM USER OF ERROR
 8105  034516  105061  030546            SC7:    CLRB    DRVACT(R1)      ;DRIVE IS IDLE
 8106  034522  004737  036724                    JSR     PC,EMPTYQ       ;DUMP THE QUEUE
 8107  034526  012714  000113                    MOV     #113,(R4)       ;RELEASE THE DRIVE
 8108  034532  105761  030634                    TSTB    ULDFLG(R1)      ;UNLOAD IN PROGRESS OR QUEUE?
 8109  034536  001002                            BNE     .+6             ;BR IF NO
 8110  034540  000137  034064                    JMP     SC3             ;NO UNLOAD
 8111  034544  105061  030634                    CLRB    ULDFLG(R1)      ;CLEAR UNLOAD FLAG
 8112  034550  000137  034064                    JMP     SC3
 8113  034554  005726                  SC8:      TST     (SP)+           ;REMOVE (RHAS) FROM THE STACK
 8114  034556  105761  030546                    TSTB    DRVACT(R1)      ;IS DRIVE IDLE?
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 8115  034562  001404                          BEQ     1$                      ;YES--BRANCH
 8116  034564  004737  037020                  JSR     PC,GETREQ               ;GET DPB POINTER
 8117  034570  000137  032770                  JMP     CI7                     ;PROCESS THE PARITY ERROR
 8118  034574  000137  033006          1$:     JMP     CI7B                    ;PROCESS THE PARITY ERROR
 8119  034600  011605                  SC10:   MOV     (SP),R5 ;PUT (RHAS) IN R5
 8120  034602  004737  034716                  JSR     PC,SC12                 ;SAVE RHDS1, RHER1, RHER2, AND RHER3
 8121  034606  116164  030702  000016          MOVB    ATABIT(R1),RHAS(R4)     ;CLEAR ATTENTION BIT
 8122  034614  012714  000113                  MOV     #113,(R4)               ;ISSUE A RELEASE
 8123  034620  104002                          ERROR   2                       ;REPORT ILLEGAL DRIVE INTERRUPT
 8124  034622  000137  034064                  JMP     SC3                     ;GO CHECK FOR MORE ATA'S
 8125  034626  105761  030634          SC11:   TSTB    ULDFLG(R1)              ;"UNLOAD IN PROGRESS"?
 8126  034632  003402                          BLE     1$                      ;BRANCH IF NO
 8127  034634  105061  030634                  CLRB    ULDFLG(R1)              ;CLEAR UNLOAD FLAG
 8128  034640  105061  030546          1$:     CLRB    DRVACT(R1)              ;SET DRIVE IDLE
 8129  034644  136137  030702  030630          BITB    ATABIT(R1),SRCHWT               ;DOING A SEARCH OPERATION FOR
 8130                                                                          ;AN I/O COMMAND?
 8131  034652  001012                          BNE     2$                      ;BRANCH IF YES
 8132  034654  004737  037042                  JSR     PC,POPQUE               ;REMOVE REQUEST FROM QUEUE
 8133  034660  052762  000200  000016          BIS     #BIT07,16(R2)           ;SET "DONE" BIT
 8134  034666  005737  030654                  TST     SAVEFG                  ;SAVE THE RH11/RP04 REGISTERS?
 8135  034672  100002                          BPL     2$                      ;BRANCH IF NO
 8136  034674  004737  036200                  JSR     PC,SVRH11               ;YES--SAVE ALL OF THE RH11/RP04 REG'S
 8137  034700  116164  030702  000016  2$:     MOVB    ATABIT(R1),RHAS(R4)     ;CLEAR ATTENTION BIT
 8138  034706  004737  031730                  JSR     PC,OPT                  ;START A REQUEST
 8139  034712  000137  034064                  JMP     SC3
 8140  034716  010164  000010          SC12:   MOV     R1,RHCS2(R4)            ;SELECT DRIVE
 8141  034722  016437  000012  030536          MOV     RHDS1(R4),RPERRS        ;SAVE THE FOUR REGISTERS THAT
 8142  034730  016437  000014  030540          MOV     RHER1(R4),RPERRS+2      ;WILL TELL US SOMETHING
 8143  034736  016437  000040  030542          MOV     RHER2(R4),RPERRS+4
 8144  034744  016437  000042  030544          MOV     RHER3(R4),RPERRS+6
 8145  034752  004037  031160                  JSR     R0,DRVINT               ;INIT. THE STATE OF THE DRIVE
 8146  034756  000401                          BR      1$                      ;TAKE ERROR EXIT
 8147  034760  000207                          RTS     PC                      ;RETURN
 8148  034762  005726                  1$:     TST     (SP)+                   ;POP PC OFF OF THE STACK
 8149  034764  000673                          BR      SC8                     ;PROCESS THE PARITY ERROR
 8150  034766  006301                  SC13:   ASL     R1                      ;SETUP TO ADDRESS WORDS
 8151  034770  012761  177777  030660          MOV     #-1,TIMER(R1)           ;STOP THE TIMER
 8152  034776  006201                          ASR     R1
 8153  035000  010164  000010                  MOV     R1,RHCS2(R4)            ;SELECT THE DRIVE
 8154  035004  116164  030702  000016          MOVB    ATABIT(R1),RHAS(R4)     ;CLEAR THE ATTENTION BIT
 8155  035012  032714  004000                  BIT     #BIT11,(R4)             ;DRIVE AVAILABLE ?
 8156  035016  001006                          BNE     1$                      ;BR IF AVAILABLE
 8157  035020  006301                          ASL     R1
 8158  035022  012761  023420  030660          MOV     #10000.,TIMER(R1)       ;START 10 SEC TIMER AGAIN
 8159  035030  006201                          ASR     R1
 8160  035032  000433                          BR      3$                      ;EXIT
 8161  035034  105761  030606          1$:     TSTB    DPINT(R1)               ;INITIALIZING THE DRIVE ?
 8162  035040  001424                          BEQ     2$                      ;BR IF NOT
 8163  035042  105061  030606                  CLRB    DPINT(R1)               ;CLEAR THE INIT INDICATOR
 8164  035046  004037  031160                  JSR     R0,DRVINT               ;GO INIT THE DRIVE
 8165  035052  000240                          NOP                             ;DUMMY PARITY ERROR RETURN
 8166  035054  105761  030556                  TSTB    DRVSTA(R1)              ;DRIVE ONLINE ?
 8167  035060  003014                          BGT     2$                      ;BR IF YES -- START ORDER
 8168  035062  005702                          TST     R2                      ;QUEUE ENTRY FOR THE DRIVE
 8169  035064  001416                          BEQ     3$                      ;BR IF NOT
 8170  035066  004737  037020                  JSR     PC,GETREQ               ;GET DPB ADDRESS
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8171  035072  052762  140000  000016          BIS     #BIT15!BIT14,16(R2)  ;INFORM USER THAT DRIVE OFFLINE
8172  035100  004737  036200                  JSR     PC,SVRH11            ;SAVE THE REGISTERS
8173  035104  004737  036724                  JSR     PC,EMPTYQ            ;EMPTY THE REQUEST QUEUE
8174  035110  000404                          BR      3$
8175  035112  105061  030616          2$:     CLRB    DPRQS(R1)            ;CLEAR THE PORT REQUEST INDICATOR
8176  035116  004737  031730                  JSR     PC,OPT               ;START THE PENDING REQUEST
8177  035122  000137  034064          3$:     JMP     SC3                  ;PROCESS OTHER DRIVES
8178
8179                                  ;*RP04 TIMER ROUTINE
8180                                  ;*CALL
8181                                  ;*      MOV     #TIME,-(SP)          ;ELASPED TIME IN MILLISECONDS ON THE STACK
8182                                  ;*      JSR     R0,RPTMR             ;CALL RP04 TIME ROUTINE
8183
8184  035126  005737  030632          RPTMR:  TST     ACTDRV               ;CHECK "ACTDRV & ACTSTR"
8185  035132  001032                          BNE     4$                   ;IF NON ZERO EXIT
8186  035134  112737  000001  030633        MOVB    #1,ACTSTR            ;SET "ACTSTR"
8187  035142  004037  037104                  JSR     R0,SAVR15            ;SAVE R1-R5
8188  035146  005001                          CLR     R1                   ;START WITH DRIVE 0
8189  035150  005003                          CLR     R3
8190  035152  005763  030660          1$:     TST     TIMER(R3)            ;IS THE TIMER RUNNING?
8191  035156  002407                          BLT     2$                   ;BRANCH IF NO
8192  035160  166663  000016  030660        SUB     16(SP),TIMER(R3)     ;COUNT THE INTERVAL
8193  035166  003003                          BGT     2$                   ;BR IF NO SOFTWARE TIMEOUT
8194  035170  004037  035224                  JSR     R0,ST0               ;CALL SOFTWARE TIMEOUT ROUTINE
8195  035174  000405                          BR      3$                   ;GO TO THE EXIT
8196  035176  005201                  2$:     INC     R1                   ;MOVE TO NEXT DRIVE
8197  035200  005723                          TST     (R3)+
8198  035202  022701  000010                  CMP     #8.,R1               ;OUT OF DRIVES?
8199  035206  003361                          BGT     1$                   ;BRANCH IF NO
8200  035210  004037  037124          3$:     JSR     R0,GETR15            ;RESTORE R1-R5
8201  035214  105037  030633                  CLRB    ACTSTR               ;ZERO ACTIVE SOFTWARE TIMEOUT ROUTINE FLAG
8202  035220  012616                  4$:     MOV     (SP)+,(SP)           ;ADJUST THE STACK
8203  035222  000200                          RTS     R0                   ;RETURN
8204
8205                                  ;*SOFTWARE TIMEOUT ROUTINE
8206                                  ;*
8207                                  ;*CALL: ST0
8208                                  ;*      MOV     #DRVNUM,R1           ;DRIVE NUMBER
8209                                  ;*      JSR     R0,ST0               ;CALL--DRVACT MUST BE NONZERO
8210                                  ;*      RETURN
8211
8212  035224  013746  177776          ST0:    MOV     @#PS,-(SP)           ;SAVE THE PROCESSOR STATUS
8213  035230  013737  030720  177776          MOV     RPVEC+2,@#PS         ;SET THE "PS" TO RP04 BR LEVEL
8214  035236  004037  037104                  JSR     R0,SAVR15            ;SAVE R1-R5
8215  035242  013704  030714                  MOV     RPADR,R4             ;GET ADDRESS OF "RHCS1"
8216  035246  010164  000010                  MOV     R1,RHCS2(R4)         ;SELECT THE DRIVE
8217  035252  004037  035300                  JSR     R0,RD.RP             ;READ "DRIVE STATUS REG"
8218  035256  000012                          RHDS1
8219  035260  035572                          ST05
8220  035262  105726                          TSTB    (SP)+                ;IS "DRY"=1?
8221  035264  100477                          BMI     ST02                 ;BR IF YES
8222  035266  105761  030606          ST01:   TSTB    DPINT(R1)            ;TRYING TO INTIALIZE THE DRIVE ?
8223  035272  001074                          BNE     ST02                 ;BR IF YES
8224  035274  105761  030616                  TSTB    DPRQS(R1)            ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
8225  035300  001071                          BNE     ST02                 ;BR IF YES
8226  035302  013702  030626                  MOV     TRNSWT,R2            ;PICKUP TRANSFER WAIT QUEUE
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8227  035306  020137  030700                    CMP     R1,DTUW         ;TRANSFER UNDERWAY ON THIS DRIVE?
8228  035312  001402                            BEQ     1$              ;BRANCH IF YES
8229  035314  004737  037020                    JSR     PC,GETREQ       ;GET DPB ADDRESS
8230  035320  052762  101000  000016  1$:       BIS     #BIT15!BIT09,16(R2) ;SET THE ERROR FLAGS
8231  035326  004737  036200                    JSR     PC,SVRH11       ;SAVE RH11/RP04 REGISTERS
8232  035332  012764  000040  000010            MOV     #BIT05,RHCS2(R4) ;"INIT" THE MASS BUS
8233  035340  105061  030546                    CLRB    DRVACT(R1)      ;DRIVE IS IDLE
8234  035344  105061  030634                    CLRB    ULDFLG(R1)      ;CLEAR THE UNLOAD FLAG
8235  035350  005001                            CLR     R1              ;START WITH DRIVE 0
8236  035352  005003                            CLR     R3
8237  035354  004037  031160          2$:       JSR     R0,DRVINT       ;INIT. THIS DRIVE
8238  035360  000504                            BR      ST05            ;PARITY ERROR RETURN
8239  035362  105761  030546                    TSTB    DRVACT(R1)      ;DRIVE IDLE BEFORE THE INIT.?
8240  035366  001414                            BEQ     4$              ;YES--BRANCH
8241  035370  013702  030626                    MOV     TRNSWT,R2       ;GET TRANSFER WAIT QUEUE
8242  035374  023701  030700                    CMP     DTUW,R1         ;WAS THERE I/O ON THIS DRIVE?
8243  035400  001402                            BEQ     3$              ;YES--BRANCH
8244  035402  004737  037020                    JSR     PC,GETREQ       ;GET THE DPB POINTER FROM QUEUE
8245  035406  052762  100400  000016  3$:       BIS     #BIT15!BIT08,16(R2) ;INFORM USER OF INIT.
8246  035414  105061  030546                    CLRB    DRVACT(R1)      ;SET DRIVE ACTIVE TO IDLE
8247  035420  105061  030634          4$:       CLRB    ULDFLG(R1)      ;NO UNLOAD
8248  035424  012763  177777  030660            MOV     #-1,TIMER(R3)   ;STOP THE TIMER
8249  035432  005723                            TST     (R3)+           ;UPDATE THE INDEX
8250  035434  005201                            INC     R1              ;INCREMENT THE DRIVE NUMBER
8251  035436  022701  000010                    CMP     #8.,R1          ;LAST DRIVE BEEN CHECKED?
8252  035442  003344                            BGT     2$              ;NO--LOOP
8253  035444  012737  177777  030700            MOV     #-1,DTUW        ;NO DATA TRANSFERS UNDERWAY
8254  035452  005037  030626                    CLR     TRNSWT          ;CLEAR TRANSFER WAIT QUEUE
8255  035456  004737  036642                    JSR     PC,CLRQUE       ;CLEAR ALL REQUEST QUEUES
8256  035462  000436                            BR      ST04            ;EXIT
8257  035464  116405  000016          ST02:     MOVB    RHAS(R4),R5     ;READ ATTENTION REG
8258  035470  136105  030702                    BITB    ATABIT(R1),R5   ;IS ATTENTION FOR THIS DRIVE UP ?
8259  035474  001017                            BNE     ST03            ;YES--BRANCH
8260  035476  105761  030606                    TSTB    DPINT(R1)       ;TRYING TO INTIALIZE THE DRIVE ?
8261  035502  001036                            BNE     ST06            ;BR IF YES - DRIVE NOT ONLINE
8262  035504  105761  030616                    TSTB    DPRQS(R1)       ;OUTSTANDING PORT REQUEST FOR THE DRIVE ?
8263  035510  001052                            BNE     ST07            ;BR IF YES - NO RESPONSE TO REQUEST
8264  035512  020137  030700                    CMP     R1,DTUW         ;DATA TRANSFER UNDERWAY FOR THIS DRIVE
8265  035516  001263                            BNE     ST01            ;BR IF NO
8266  035520  004037  03570C                    JSR     R0,RD.RP        ;YES--CHECK "RDY"
8267  035524  000000                            RHCS1
8268  035526  035572                            ST05
8269  035530  105726                            TSTB    (SP)+
8270  035532  100255                            BPL     ST01            ;BR IF "RDY"=0
8271  035534  005720                  ST03:     TST     (R0)+           ;ADJUST FOR THE PROPER RETURN
8272  035536  105761  030606                    TSTB    DPINT(R1)       ;INITIALIZING THE DRIVE ?
8273  035542  001003                            BNE     1$              ;BR IF INIT PENDING
8274  035544  105761  030616                    TSTB    DPRQS(R1)       ;PORT REQUEST PENDING ?
8275  035550  001403                            BEQ     ST04            ;BR IF NOT
8276  035552  012763  177777  030660  1$:       MOV     #-1,TIMER(R3)   ;STOP THE TIMER
8277  035560  004037  037124          ST04:     JSR     R0,GETR15       ;RESTORE R1-R5
8278  035564  012637  177776                    MOV     (SP)+,@#PS      ;RESTORE PROCESSOR STATUS
8279  035570  000200                            RTS     R0              ;RETURN
8280  035572  004737  033060          ST05:     JSR     PC,CI8          ;GO HANDLE THE PARITY ERROR
8281  035576  000770                            BR      ST04
8282  035600  105061  030606          ST06:     CLRB    DPINT(R1)       ;CLEAR THE INITIALIZE INDICATOR
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8283  035604  105061  030556                  CLRB    DRVSTA(R1)          ;SET UNIT OFFLINE
8284  035610  012763  177777  030660          MOV     #-1,TIMER(R3)       ;STOP THE TIMER
8285  035616  004737  037020                  JSR     PC,GETREQ           ;GET THE DPB ADDRESS
8286  035622  005702                          TST     R2                  ;REQUEST IN QUEUE ?
8287  035624  001755                          BEQ     ST04                ;BR IF NOT
8288  035626  052762  140000  000016          BIS     #BIT15!BIT14,16(R2) ;INFORM THE USER DRIVE NOT AVAILABLE
8289  035634  000414                          BR      ST08                ;FINISH
8290  035636  012763  177777  030660  ST07:   MOV     #-1,TIMER(R3)       ;STOP THE TIMER
8291  035644  105061  030616                  CLRB    DPRQS(R1)           ;CLEAR PORT REQUEST INDICATOR
8292  035650  004737  037020                  JSR     PC,GETREQ           ;GET DPB ADDRESS
8293  035654  005702                          TST     R2                  ;QUEUE ENTRY FOR DRIVE ?
8294  035656  001403                          BEQ     ST08                ;BR IF NONE
8295  035660  052762  100004  000016          BIS     #BIT15!BIT2,16(R2)  ;INFORM USER OF PORT REQUEST ERROR
8296  035666  004737  036724          ST08:   JSR     PC,EMPTYQ           ;CLEAR THE QUEUE FOR THE DRIVE
8297  035672  004737  036200                  JSR     PC,SVRH11           ;SAVE THE REGISTERS
8298  035676  000730                          BR      ST04                ;RETURN
8299
8300                                  ;*ROUTINE TO READ A RH11/RP04 REGISTER
8301                                  ;
8302                                  ;*CALL
8303                                  ;*      JSR     R0,RD.RP            ;GO READ A REGISTER
8304                                  ;*      INDEX                       ;REG. INDEX FROM BASE
8305                                  ;*      ERRADR                      ;ERROR ADDRESS--PROCESS ERROR STARTING
8306                                  ;*                                  ;AT THIS ADDRESS
8307                                  ;*      RETURN                      ;CONTENTS OF REG. IS ON THE STACK
8308                                  ;
8309  035700  013737  030712  036024  RD.RP:   MOV     MCPEMX,RD.RP2       ;MAX. RETRYS ALLOWED
8310  035706  011646                          MOV     (SP),-(SP)          ;SAVE R0 FOR RETURN
8311  035710  013737  030714  035724          MOV     RPADR,RD.ADR        ;FORM THE DESIRED ADDRESS
8312  035716  062037  035724                  ADD     (R0)+,RD.ADR        ;USING THE BASE AND THE INDEX
8313  035722  013727                  RD.RP1: MOV     @(PC)+,(PC)+        ;READ THE DESIRED REGISTER OF THE RP04
8314  035724  000000                  RD.ADR: .WORD   0                   ;ADDRESS IS FORMED HERE
8315  035726  000000                  RD.WRD: .WORD   0                   ;REG. CONTENTS PUT HERE
8316  035730  013766  035726  000002          MOV     RD.WRD,2(SP)        ;RETURN IT TO THE USER
8317  035736  017746  172752                  MOV     @RPADR,-(SP)        ;READ RHCS1
8318  035742  032716  020000                  BIT     #BIT13,(SP)         ;DID MCPE SET?
8319  035746  001002                          BNE     1$                  ;BRANCH IF YES
8320  035750  022620                          CMP     (SP)+,(R0)+         ;ADJUST FOR RETURN
8321  035752  000200                          RTS     R0                  ;RETURN IF NO
8322  035754  104003                  1$:     ERROR   3                   ;REPORT "MCPE" ERROR
8323  035756  005737  030700                  TST     DTUW                ;DATA TRANSFER UNDERWAY?
8324  035762  100405                          BMI     2$                  ;NO--BRANCH
8325  035764  032716  040000                  BIT     #BIT14,(SP)         ;NO--"TRE"=1?
8326  035770  001402                          BEQ     2$                  ;NO--BRANCH
8327  035772  005726                          TST     (SP)+               ;YES--CLEAN OFF THE STACK AND
8328  035774  000415                          BR      RD.RP3              ;TAKE THE FATAL ERROR EXIT
8329  035776  052716  040000          2$:     BIS     #BIT14,(SP)         ;CLEAR "MCPE" BY SENDING A "1" TO "TRE"
8330  036002  000316                          SWAB    (SP)                ;POSITION BEFORE WRITING
8331  036004  013737  030714  036020          MOV     RPADR,3$            ;FORM ADDRESS OF HIGH BYTE
8332  036012  005237  036020                  INC     3$
8333  036016  112637                          MOVB    (SP)+,@(PC)+        ;WRITE THE HIGH BYTE OF RHCS1
8334  036020  000000                  3$:     .WORD   0                   ;ADDRESS STORAGE
8335  036022  005327                          DEC     (PC)+               ;EXCEEDED MAX. RETRYS
8336  036024  000003                  RD.RP2: .WORD   3
8337  036026  002335                          BGE     RD.RP1              ;BRANCH IF NO
8338  036030  011000                  RD.RP3: MOV     (R0),R0             ;FATAL ERROR EXIT
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8339  036032  012616                          MOV     (SP)+,(SP)
8340  036034  000200                          RTS     R0
8341
8342                                  ;*ROUTINE TO WRITE A RH11/RP04 REGISTER
8343                                  ;
8344                                  ;*CALL
8345                                  ;*      MOV     DATA,-(SP)      ;DATA TO BE LOADED ON THE STACK
8346                                  ;*      JSR     R0,WRT.RP       ;CALL THE ROUTINE TO LOAD(WRITE) THE REG.
8347                                  ;*      INDEX                   ;INDEX OF THE REGISTER TO BE LOADED
8348                                  ;*      ERRADR                  ;ADDRESS TO RETURN TO ON AN ERROR
8349                                  ;*      RETURN                  ;ERROR FREE RETURN
8350
8351  036036  016637  000002  036124  WRT.RP: MOV     2(SP),WRT.WD    ;SAVE THE WORD TO WRITE
8352  036044  012616                          MOV     (SP)+,(SP)      ;ADJUST THE STACK
8353  036046  012037  036126                  MOV     (R0)+,WRT.AD    ;GET INDEX OF REGISTER TO BE WRITTEN
8354  036052  001020                          BNE     2$              ;BRANCH IF NOT RHCS1
8355  036054  122737  000150  036124          CMPB    #150,WRT.WD     ;IS THE COMMAND FOR DATA TRANSFERS?
8356  036062  002414                          BLT     2$              ;YES--DON'T GET THE OLD A16&A17, & PSEL
8357  036064  004037  035700                  JSR     R0,RD.RP        ;NO---COMBINE A16&A17, & PSEL WITH
8358  036070  000000                          RHCS1                   ;THE COMMAND BEFORE SENDING IT TO
8359  036072  036110                          1$                      ;THE RH11/RP04
8360  036074  000316                          SWAB    (SP)
8361  036076  042716  177770                  BIC     #^C7,(SP)
8362  036102  112637  036125                  MOVB    (SP)+,WRT.WD+1
8363  036106  000402                          BR      2$
8364  036110  011000                  1$:     MOV     (R0),R0         ;TAKE THE ERROR EXIT
8365  036112  000200                          RTS     R0
8366  036114  063737  030714  036126  2$:     ADD     RPADR,WRT.AD    ;FORM THE ADDRESS OF THE DISK REG.
8367  036122  012737                          MOV     (PC)+,@(PC)+    ;LOAD THE DESIRED REG.
8368  036124  000000                  WRT.WD: .WORD   0               ;WORD TO WRITE GOES HERE
8369  036126  000000                  WRT.AD: .WORD   0               ;ADDRESS IS FORMED HERE
8370  036130  004037  035700                  JSR     R0,RD.RP        ;CHECK FOR PARITY ERROR ON WRITE
8371  036134  000014                          RHER1
8372  036136  036170                          2$
8373  036140  032726  000010                  BIT     #BIT03,(SP)+
8374  036144  001413                          BEQ     3$              ;BRANCH IF "PAR=0"
8375  036146  016037  177776  036160          MOV     -2(R0),1$       ;PICKUP THE INDEX
8376  036154  004037  035700                  JSR     R0,RD.RP        ;READ THE REG.
8377  036160  000000                  1$:     .WORD   0               ;       REG. INDEX
8378  036162  036170                          2$                      ;RETURN TO THIS ADDRESS ON ERROR
8379  036164  104004                          ERROR   4               ;REPORT THE PARITY ON WRITE ERROR
8380  036166  005726                          TST     (SP)+           ;CLEAN OFF THE STACK
8381  036170  011000                  2$:     MOV     (R0),R0         ;TAKE THE "PARITY ON WRITE" ERROR EXIT
8382  036172  000200                          RTS     R0
8383  036174  005720                  3$:     TST     (R0)+           ;ADJUST FOR ERROR FREE EXIT
8384  036176  000200                          RTS     R0
8385
8386                                  ;*ROUTINE TO SAVE THE RH11/RP04 REGISTERS AS PER DPB+14
8387                                  ;
8388                                  ;*CALL
8389  —                               ;*      MOV     #DPBNUM,R2      ;DPB POINTER TO R2
8390                                  ;*      JSR     PC,SVRH11       ;SAVE THE DRIVES REG'S
8391
8392  036200  004037  037104  SVRH11: JSR     R0,SAVR15       ;SAVE REG.'S R1-R5
8393  036204  005702                          TST     R2              ;QUEUE ENTRY FOR THE DRIVE ?
8394  036206  001430                          BEQ     4$              ;BR IF NONE
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8395  036210  013704  030714                  MOV     RPADR,R4
8396  036214  111264  000010                  MOVB    (R2),RHCS2(R4)  ;SELECT DRIVE
8397  036220  016202  000014                  MOV     14(R2),R2       ;GET THE ERROR TABLE POINTER
8398  036224  001421                          BEQ     4$              ;EXIT IF 0
8399  036226  005003                          CLR     R3              ;COUNTER & POINTER
8400  036230  012705  000022                  MOV     #RHDB,R5        ;PROBLEM REGISTER
8401  036234  020305                  1$:     CMP     R3,R5           ;REACHED RHDB?
8402  036236  001005                          BNE     2$              ;BR IF NO
8403  036240  105764  000010                  TSTB    RHCS2(R4)       ;CHECK "OR"
8404  036244  100402                          BMI     2$              ;BRANCH IF RHDB CAN BE READ
8405  036246  005022                          CLR     (R2)+           ;ELSE SAVE IT AS 0'S
8406  036250  000403                          BR      3$
8407  036252  010446                  2$:     MOV     R4,-(SP)        ;FORM RH11/RP04 ADDRESS THAT IS
8408  036254  060316                          ADD     R3,(SP)         ;TO BE READ
8409  036256  013622                          MOV     @(SP)+,(R2)+    ;AND READ IT
8410  036260  005723                  3$:     TST     (R3)+           ;MOVE TO NEXT REG INDEX
8411  036262  020327  000046                  CMP     R3,#RHEC2       ;DONE?
8412  036266  003762                          BLE     1$              ;BRANCH IF NO
8413  036270  004037  037124          4$:     JSR     R0,GETR15       ;GET REGISTERS R1-R5
8414  036274  000207                          RTS     PC              ;RETURN TO
8415
8416                                  ;*ROUTINE TO SET THE INTERRUPT WITHOUT GETTING A "TRE"
8417                                  ;*CALL
8418                                  ;*      MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
8419                                  ;*      JSR     PC,SET.IE       ;SET "IE"
8420                                  ;*      RETURN
8421
8422  036276  010446                  SET.IE: MOV     R4,-(SP)        ;SAVE R4
8423  036300  013704  030714                  MOV     RPADR,R4        ;PICKUP ADDRESS OF RHCS1
8424  036304  010164  000010                  MOV     R1,RHCS2(R4)    ;SELECT DRIVE
8425  036310  011446                          MOV     (R4),-(SP)      ;READ RHCS1
8426  036312  052716  040000                  BIS     #BIT14,(SP)     ;SET THE "TRE" BIT OF THE WORD READ
8427  036316  000316                          SWAB    (SP)            ;ADJUST FOR DATO
8428  036320  112714  000100                  MOVB    #BIT06,(R4)     ;SET "IE"
8429  036324  032764  010000  000010          BIT     #BIT12,RHCS2(R4) ;IS "NED"=1?
8430  036332  001002                          BNE     1$              ;YES--CLEAR "TRE"
8431  036334  005726                          TST     (SP)+           ;CLEAN OFF THE STACK
8432  036336  000402                          BR      2$
8433  036340  112664  000001          1$:     MOVB    (SP)+,1(R4)     ;CLEAR "TRE"
8434  036344  012604                  2$:     MOV     (SP)+,R4        ;RESTORE R4
8435  036346  000207                          RTS     PC              ;RETURN TO CALLER
8436
8437                                  ;*QUEUE COUNT
8438  036350      000                 QCNT:   .BYTE   0               ;DRIVE 0
8439  036351      000                         .BYTE   0               ;DRIVE 1
8440  036352      000                         .BYTE   0               ;DRIVE 2
8441  036353      000                         .BYTE   0               ;DRIVE 3
8442  036354      000                         .BYTE   0               ;DRIVE 4
8443  036355      000                         .BYTE   0               ;DRIVE 5
8444  036356      000                         .BYTE   0               ;DRIVE 6
8445  036357      000                         .BYTE   0               ;DRIVE 7
8446
8447                                  ;QUEUE INPUT POINTERS
8448
8449  036360  036442                  QINPT:  .WORD   QDRV0            ;DRIVE 0
8450  036362  036462                          .WORD   QDRV1           ;DRIVE 1
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 8451  036364  036502                        .WORD   QDRV2           ;DRIVE 2
 8452  036366  036522                        .WORD   QDRV3           ;DRIVE 3
 8453  036370  036542                        .WORD   QDRV4           ;DRIVE 4
 8454  036372  036562                        .WORD   QDRV5           ;DRIVE 5
 8455  036374  036602                        .WORD   QDRV6           ;DRIVE 6
 8456  036376  036622                        .WORD   QDRV7           ;DRIVE 7
 8457
 8458                                ;QUEUE OUTPUT POINTERS
 8459
 8460  036400  036442                QOUTPT: .WORD   QDRV0           ;DRIVE 0
 8461  036402  036462                        .WORD   QDRV1           ;DRIVE 1
 8462  036404  036502                        .WORD   QDRV2           ;DRIVE 2
 8463  036406  036522                        .WORD   QDRV3           ;DRIVE 3
 8464  036410  036542                        .WORD   QDRV4           ;DRIVE 4
 8465  036412  036562                        .WORD   QDRV5           ;DRIVE 5
 8466  036414  036602                        .WORD   QDRV6           ;DRIVE 6
 8467  036416  036622                        .WORD   QDRV7           ;DRIVE 7
 8468
 8469  036420  036442                QSTART: .WORD   QDRV0           ;DRIVE 0 START ADDRESS
 8470  036422  036462                QSTOP:  .WORD   QDRV1           ;DRIVE 0 STOP ADDRESS & DRIVE 1 START ADDRESS
 8471  036424  036502                        .WORD   QDRV2           ;STOP DRIVE 1--START DRIVE 2
 8472  036426  036522                        .WORD   QDRV3           ;STOP DRIVE 2--START DRIVE 3
 8473  036430  036542                        .WORD   QDRV4           ;STOP DRIVE 3--START DRIVE 4
 8474  036432  036562                        .WORD   QDRV5           ;STOP DRIVE 4--START DRIVE 5
 8475  036434  036602                        .WORD   QDRV6           ;STOP DRIVE 5--START DRIVE 6
 8476  036436  036622                        .WORD   QDRV7           ;STOP DRIVE 6--START DRIVE 7
 8477  036440  036642                        .WORD   QTERM           ;STOP DRIVE 7
 8478
 8479                                ;DRIVE REQUEST QUEUES
 8480
 8481  036442  000010                QDRV0:  .BLKW   10
 8482  036462  000010                QDRV1:  .BLKW   10
 8483  036502  000010                QDRV2:  .BLKW   10
 8484  036522  000010                QDRV3:  .BLKW   10
 8485  036542  000010                QDRV4:  .BLKW   10
 8486  036562  000010                QDRV5:  .BLKW   10
 8487  036602  000010                QDRV6:  .BLKW   10
 8488  036622  000010                QDRV7:  .BLKW   10
 8489          036642                QTERM=.
 8490
 8491                                ;*ROUTINE TO CLEAR ALL OF THE REQUEST QUEUES
 8492                                ;
 8493                                ;*CALL
 8494                                ;*      JSR     PC,CLRQUE
 8495
 8496  036642  004037  037104        CLRQUE: JSR     R0,SAVR15       ;SAVE R1-R5
 8497  036646  012702  036350                MOV     #QCNT,R2        ;ZERO THE QUEUE COUNTS
 8498  036652  005022                        CLR     (R2)+           ;DRIVES 0 & 1
 8499  036654  005022                        CLR     (R2)+           ;DRIVES 2 & 3
 8500  036656  005022                        CLR     (R2)+           ;DRIVES 4 & 5
 8501  036660  005022                        CLR     (R2)+           ;DRIVES 6 & 7
 8502  036662  012703  000010                MOV     #8.,R3          ;MOVE THE STARTING
 8503  036666  012701  036420                MOV     #QSTART,R1      ;ADDRESS OF THE QUEUE INTO
 8504  036672  012122                1$:     MOV     (R1)+,(R2)+     ;THE QUEUE INPUT POINTER
 8505  036674  005303                        DEC     R3
 8506  036676  001375                        BNE     1$
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 8507  036700  012703  000010              MOV     #8.,R3          ;MOVE THE STARTING ADDRESS
 8508  036704  012701  036420              MOV     #QSTART,R1      ;OF THE QUEUE INTO THE
 8509  036710  012122              2$:     MOV     (R1)+,(R2)+     ;QUEUE OUTPUT POINTER
 8510  036712  005303                      DEC     R3
 8511  036714  001375                      BNE     2$
 8512  036716  004037  037124              JSR     R0,GETR15       ;RESTORE R1-R5
 8513  036722  000207                      RTS     PC
 8514
 8515                                  ;*EMPTY THE QUEUE SPECIFIED BY R1
 8516                                  ;
 8517                                  ;*CALL
 8518                                  ;*      MOV     DRVNUM,R1       ;DRIVE NUMBER TO R1
 8519                                  ;*      JSR     PC,EMPTYQ
 8520
 8521  036724  105061  036353  EMPTYQ: CLRB    QCNT(R1)        ;CLEAR NUMBER OF ITEMS IN QUEUE
 8522  036730  006301                      ASL     R1
 8523  036732  016161  036360  036400      MOV     QINPT(R1),QOUTPT(R1) ;SET OUTPUT QUEUE POINTER=INPUT POINTER
 8524  036740  006201                      ASR     R1
 8525  036742  000207                      RTS     PC
 8526
 8527                                  ;*ROUTINE TO PUT A REQUEST IN QUEUE
 8528                                  ;
 8529                                  ;*CALL
 8530                                  ;*      MOV     #DRVNUM,R1      ;DRIVE NUMBER
 8531                                  ;*      MOV     #DPB,R2         ;ADDRESS OF PARAMETER BLOCK
 8532                                  ;*      JSR     R0,DRVQUE       ;GO PUT REQUEST IN QUEUE
 8533                                  ;*      RETURN1                 ;RETURN HERE IF QUEUE IS FULL
 8534                                  ;*      RETURN2                 ;RETURN HERE IF REQUEST IS IN QUEUE
 8535
 8536  036744  122761  000010  036350  DRVQUE: CMPB    #10,QCNT(R1)    ;IS QUEUE FULL?
 8537  036752  001421                      BEQ     2$              ;BR IF YES-TAKE RETURN1
 8538  036754  105261  036350              INCB    QCNT(R1)        ;INCREMENT QUEUE COUNT
 8539  036760  006301                      ASL     R1
 8540  036762  010271  036360              MOV     R2,@QINPT(R1)   ;PUT THIS REQUEST IN QUEUE
 8541  036766  062761  000002  036360      ADD     #2,QINPT(R1)    ;UPDATE THE QUEUE POINTER
 8542  036774  026161  036360  036422      CMP     QINPT(R1),QSTOP(R1) ;TIME TO RESET THE POINTER
 8543  037002  001003                      BNE     1$              ;BRANCH IF NO
 8544  037004  016161  036420  036360      MOV     QSTART(R1),QINPT(R1) ;YES--RESET POINTER
 8545  037012  006201              1$:     ASR     R1
 8546  037014  005720                      TST     (R0)+           ;TAKE RETURN 2
 8547  037016  000200              2$:     RTS     R0              ;RETURN TO USER
 8548
 8549                                  ;*ROUTINE TO GET THE "DPB" ADDRESS OF NEXT REQUEST IN QUELE
 8550                                  ;
 8551                                  ;*CALL
 8552                                  ;*      MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
 8553                                  ;*      JSR     PC,GETREQ       ;GO GET THE REQUEST
 8554                                  ;*      RETURN                  ;R2="DPB" ADDRESS OF THE REQUEST
 8555                                  ;*                              ;R2=0 IF NO REQUEST IN QUEUE
 8556
 8557  037020  005002              GETREQ: CLR     R2
 8558  037022  105761  036350              TSTB    QCNT(R1)        ;IS THERE ANY REQUEST IN QUEUE?
 8559  037026  001404                      BEQ     2$              ;NO---BRANCH
 8560  037030  006301              1$:     ASL     R1
 8561  037032  017102  036400              MOV     @QOUTPT(R1),R2  ;PICKUP "DPB" POINTER FOR THIS DRIVE
 8562  037036  006201                      ASR     R1
```

```
 8563  037040  000207                    2$:     RTS     PC              ;RETURN TO USER
 8564
 8565                                    ;*ROUTINE TO "POP" THE REQUEST FROM QUEUE
 8566                                    ;
 8567                                    ;*CALL
 8568                                    ;*      MOV     #DRVNUM,R1      ;DRIVE NUMBER TO R1
 8569                                    ;*      JSR     PC,POPQUE       ;CALL TO REMOVE REQUEST
 8570                                    ;*      RETURN                  ;R2=ADDRESS OF DPB REMOVED
 8571
 8572  037042  105361  036350            POPQUE: DECB    QCNT(R1)        ;DECREMENT QUEUE COUNT
 8573  037046  006301                            ASL     R1
 8574  037050  017102  036400                    MOV     @QOUTPT(R1),R2  ;GET THE "DPB" POINTER
 8575  037054  062761  000002  036400            ADD     #2,QOUTPT(R1)   ;UPDATE THE QUEUE POINTER
 8576  037062  026161  036400  036422            CMP     QOUTPT(R1),QSTOP(R1) ;TIME TO RESET THE POINTER?
 8577  037070  001003                            BNE     1$              ;NO--BRANCH TO EXIT
 8578  037072  016161  036420  036400            MOV     QSTART(R1),QOUTPT(R1) ;YES--RESET THE POINTER
 8579  037100  006201                    1$:     ASR     R1
 8580  037102  000207                            RTS     PC              ;RETURN TO USER
 8581
 8582                                    ;*ROUTINES TO SAVE R0-R5 AND R1-R5
 8583                                    ;*
 8584                                    ;*CALL: SAVR05
 8585                                    ;*      JSR     R0,SAVR05
 8586                                    ;*      RETURN                  ;R0-R5 IS ON THE STACK
 8587                                    ;*
 8588                                    ;*CALL: SAVR15
 8589                                    ;*      JSR     R0,SAVR15
 8590                                    ;*      RETURN                  ;R1-R5 IS ON THE STACK
 8591                                    ;*
 8592                                    ;*UPON RETURN FROM SAVR05 AND SAVR15 THE STACK WILL LOOK LIKE:
 8593                                    ;*
 8594                                    ;*+12   R0
 8595                                    ;*+10   R1
 8596                                    ;*+06   R2
 8597                                    ;*+04   R3
 8598                                    ;*+02   R4
 8599                                    ;*TOP   R5
 8600
 8601  037104                            SAVR05:                         ;SAVE R0 BY THE JSR INST.
 8602  037104  010146                    SAVR15: MOV     R1,-(SP)        ;SAVE R1
 8603  037106  010246                            MOV     R2,-(SP)        ;SAVE R2
 8604  037110  010346                            MOV     R3,-(SP)        ;SAVE R3
 8605  037112  010446                            MOV     R4,-(SP)        ;SAVE R4
 8606  037114  010546                            MOV     R5,-(SP)        ;SAVE R5
 8607  037116  016646  000012                    MOV     12(SP),-(SP)    ;GET R0
 8608  037122  000200                            RTS     R0
 8609
 8610                                    ;*ROUTINES TO RESTORE R0-R5 AND R1-R5
 8611                                    ;*
 8612                                    ;*CALL: GETR05
 8613                                    ;*      JSR     R0,GETR05
 8614                                    ;*      RETURN                  ;R0-R5 HAVE BEEN RESTORED
 8615                                    ;*
 8616                                    ;*CALL: GETR15
 8617                                    ;*      JSR     R0,GETR15
 8618                                    ;*      RETURN                  ;R1-R5 HAVE BEEN RESTORED
```

```
 8619
 8620  037124  011666  000014          ;
                         GETR15: MOV     (SP),14(SP)     ;POSITION R0
 8621  037130  005726                  GETR05: TST     (SP)+           ;POP R0 OF THE JSR OFF OF THE STACK
 8622  037132  012605                          MOV     (SP)+,R5        ;RESTORE R5
 8623  037134  012604                          MOV     (SP)+,R4        ;RESTORE R4
 8624  037136  012603                          MOV     (SP)+,R3        ;RESTORE R3
 8625  037140  012602                          MOV     (SP)+,R2        ;RESTORE R2
 8626  037142  012601                          MOV     (SP)+,R1        ;RESTORE R1
 8627  037144  000200                          RTS     R0              ;RESTORE R0
 8628
 8629                                 ;;*****************************************************************
 8630
 8631                                 .SBTTL  DATA, CONTROL, & STATUS BLOCKS
 8632
 8633                                 ;;*****************************************************************
 8634
 8635                                 ;BLOCK LOCATION EQUATE STATEMENTS
 8636
 8637          000001                 $FMT    =       1               ;FMT,HCI,ECI OR OFFSET CODE
 8638          000002                 $COMND  =       $FMT+1          ;OPERATION CODE
 8639          000003                 $PSEL   =       $COMND+1        ;PORT SELECT & BITS A16, A17
 8640          000004                 $WRDM   =       $PSEL+1         ;WORD COUNT (2'S COMP)
 8641          000006                 $BUF    =       $WRDM+2         ;BUFFER ADDR OR REGISTER TABLE POINTER
 8642          000010                 $SEC    =       $BUF+2          ;SECTOR ADDRESS OR 1ST REG ADDR
 8643          000011                 $TRK    =       $SEC+1          ;TRACK ADDRESS OF LAST REG ADDR
 8644          000012                 $CYL    =       $TRK+1          ;CYLINDER ADDR
 8645          000014                 $REG    =       $CYL+2          ;REGISTER STORAGE (IF ERROR)
 8646          000016                 $STATUS =       $REG+2          ;STATUS WORD (SET BY DRIVER)
 8647          000020                 $WRDL   =       $STATUS+2       ;WORD COUNT (NOT 2'S COMP)
 8648          000022                 $RETRY  =       $WRDL+2         ;LOWER BYTE = RETRY COUNT, UPPER BYTE = RETRY LIMIT
 8649          000024                 $MASK   =       $RETRY+2        ;ERROR CHECK MASK
 8650          000026                 $SSEC   =       $MASK+2         ;SECTOR SIZE FOR CURRENT OPERATION
 8651          000030                 $CODE   =       $SSEC+2         ;PRESENT COMMAND SELECTION CODE
 8652          000031                 $PACK   =       $CODE+1         ;WRITE DATA PACK INDICATOR
 8653          000032                 $PREVO  =       $PACK+1         ;PREVIOUS COMMAND SELECTION CODE
 8654          000034                 $PATTC  =       $PREVO+2        ;PATTERN CODE
 8655          000036                 $PREVA  =       $PATTC+2        ;PREVIOUS ADDRESS - TRACK, SECTOR, CYLINDER
 8656          000042                 $OPERC  =       $PREVA+4        ;OPERATION COUNT
 8657          000046                 $POSIT  =       $OPERC+4        ;SEEK COUNT
 8658          000052                 $TRANS  =       $POSIT+4        ;TOTAL BITS XFERED COUNT (R & W)
 8659          000056                 $READ   =       $TRANS+4        ;TOTAL BITS READ COUNT
 8660          000062                 $TOTAL  =       $READ+4         ;TOTAL ERRORS (ALL TYPES) COUNT
 8661          000064                 $SOFT   =       $TOTAL+2        ;'SOFT' ERROR COUNT
 8662          000066                 $HARD   =       $SOFT+2         ;'HARD' ERROR COUNT
 8663          000070                 $SKI    =       $HARD+2         ;'SKI' OR 'OCYL' ERROR COUNT
 8664          000072                 $MISPO  =       $SKI+2          ;PROG DETECTED MISPOSITIONING ERROR S COUNT
 8665          000074                 $PASSC  =       $MISPO+2        ;PASS COUNTER
 8666          000076                 $RSAV   =       $PASSC+2        ;STORE THE RANDOM NUMBERS HERE
 8667          000102                 $NCODE  =       $RSAV+4         ;NEXT OPERATION
 8668          000103                 $NPATC  =       $NCODE+1        ;NEXT PATTERN
 8669          000104                 $NSEC   =       $NPATC+1        ;NEXT SECTOR
 8670          000105                 $NTRK   =       $NSEC+1         ;NEXT TRACK
 8671          000106                 $NCYL   =       $NTRK+1         ;NEXT CYLINDER
 8672          000110                 $NWRDL  =       $NCYL+2         ;NEXT BUFFER SIZE
 8673          000112                 $NEXT   =       $NWRDL+2        ;PARAMETER SELECTION INDICATOR
 8674          000114                 $BDSEC  =       $NEXT+2         ;BAD SECTOR STORAGE TABLE
```

```
8675            000154                  $DRVID  =       $BDSEC+40       ;RP04 REGISTER STORAGE
8676            000164                  $RHCS1  =       $DRVID+10       ;RP04 REGISTER STORAGE
8677            000166                  $RHWC   =       $RHCS1+2
8678            000170                  $RHBA   =       $RHWC+2
8679            000172                  $RHDA   =       $RHBA+2
8680            000174                  $RHCS2  =       $RHDA+2
8681            000176                  $RHDS1  =       $RHCS2+2
8682            000200                  $RHER1  =       $RHDS1+2
8683            000202                  $RHAS   =       $RHER1+2
8684            000204                  $RHLA   =       $RHAS+2
8685            000206                  $RHDB   =       $RHLA+2
8686            000210                  $RHMR   =       $RHDB+2
8687            000212                  $RHDT   =       $RHMR+2
8688            000214                  $RHSN   =       $RHDT+2
8689            000216                  $RHOF   =       $RHSN+2
8690            000220                  $RHCA   =       $RHOF+2
8691            000222                  $RHCC   =       $RHCA+2
8692            000224                  $RHER2  =       $RHCC+2
8693            000226                  $RHER3  =       $RHER2+2
8694            000230                  $RHEC1  =       $RHER3+2
8695            000232                  $RHEC2  =       $RHEC1+2
8696
8697
8698                                    ;BLOCK FOR DRIVE 0
8699
8700  037146      000       000         BLK0:   .BYTE   0,0             ;DRIVE NUMBER
8701  037150    000000                        .WORD   0
8702  037152    000000                        .WORD   0
8703  037154    000000                        .WORD   0
8704  037156    000000                        .WORD   0
8705  037160    000000                        .WORD   0
8706  037162    037332                        .WORD   .+150
8707  037164    000000                        .WORD   0
8708  037166    000000                        .WORD   0
8709  037170    000000                        .WORD   0
8710  037172    000000                        .WORD   0
8711  037174    000000                        .WORD   0
8712  037176    000000                        .WORD   0
8713  037200    000000                        .WORD   0
8714  037202    000000                        .WORD   0
8715  037204    000000                        .WORD   0
8716  037206    000000                        .WORD   0
8717  037210    000000                        .WORD   0
8718  037212    000000                        .WORD   0
8719  037214    000000                        .WORD   0
8720  037216    000000                        .WORD   0
8721  037220    000000                        .WORD   0
8722  037222    000000                        .WORD   0
8723  037224    000000                        .WORD   0
8724  037226    000000                        .WORD   0
8725  037230    000000                        .WORD   0
8726  037232    000000                        .WORD   0
8727  037234    000000                        .WORD   0
8728  037236    000000                        .WORD   0
8729  037240    000000                        .WORD   0
8730  037242    000000                        .WORD   0
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 8731  037244  000000                          .WORD   0
 8732  037246  000000                          .WORD   0
 8733  037250  000000                          .WORD   0
 8734  037252  000000                          .WORD   0
 8735  037254  000000                          .WORD   0
 8736  037256  000000                          .WORD   0
 8737  037260  000000                          .WORD   0
 8738  037262  000000                          .WORD   0
 8739  037264  000000                          .WORD   0
 8740  037266  000000                          .WORD   0
 8741  037270  000000                          .WORD   0
 8742  037272  000000                          .WORD   0
 8743  037274  000000                          .WORD   0
 8744  037276  000000                          .WORD   0
 8745  037300  000000                          .WORD   0
 8746  037302  000000                          .WORD   0
 8747  037304  000000                          .WORD   0
 8748  037306  000000                          .WORD   0
 8749  037310  000000                          .WORD   0
 8750  037312  000000                          .WORD   0
 8751  037314  000000                          .WORD   0
 8752  037316  000000                          .WORD   0
 8753  037320  000000                          .WORD   0
 8754  037322  000000                          .WORD   0
 8755  037324  000000                          .WORD   0
 8756  037326  000000                          .WORD   0
 8757  037330  000000                          .WORD   0
 8758  037332  000000                          .WORD   0
 8759  037334  000000                          .WORD   0
 8760  037336  000000                          .WORD   0
 8761  037340  000000                          .WORD   0
 8762  037342  000000                          .WORD   0
 8763  037344  000000                          .WORD   0
 8764  037346  000000                          .WORD   0
 8765  037350  000000                          .WORD   0
 8766  037352  000000                          .WORD   0
 8767  037354  000000                          .WORD   0
 8768  037356  000000                          .WORD   0
 8769  037360  000000                          .WORD   0
 8770  037362  000000                          .WORD   0
 8771  037364  000000                          .WORD   0
 8772  037366  000000                          .WORD   0
 8773  037370  000000                          .WORD   0
 8774  037372  000000                          .WORD   0
 8775  037374  000000                          .WORD   0
 8776  037376  000000                          .WORD   0
 8777  037400  000000                          .WORD   0
 8778  037402  000000                          .WORD   0
 8779
 8780                                  ;BLOCK FOR DRIVE 1
 8781
 8782  037404     001     000          BLK1:   .BYTE   1,0             ;DRIVE NUMBER
 8783  037406  000000                          .WORD   0
 8784  037410  000000                          .WORD   0
 8785  037412  000000                          .WORD   0
 8786  037414  000000                          .WORD   0
```

```
 8787  037416  000000                    .WORD   0
 8788  037420  037570                    .WORD   .+150
 8789  037422  000000                    .WORD   0
 8790  037424  000000                    .WORD   0
 8791  037426  000000                    .WORD   0
 8792  037430  000000                    .WORD   0
 8793  037432  000000                    .WORD   0
 8794  037434  000000                    .WORD   0
 8795  037436  000000                    .WORD   0
 8796  037440  000000                    .WORD   0
 8797  037442  000000                    .WORD   0
 8798  037444  000000                    .WORD   0
 8799  037446  000000                    .WORD   0
 8800  037450  000000                    .WORD   0
 8801  037452  000000                    .WORD   0
 8802  037454  000000                    .WORD   0
 8803  037456  000000                    .WORD   0
 8804  037460  000000                    .WORD   0
 8805  037462  000000                    .WORD   0
 9806  037464  000000                    .WORD   0
 8807  037466  000000                    .WORD   0
 8808  037470  000000                    .WORD   0
 8809  037472  000000                    .WORD   0
 8810  037474  000000                    .WORD   0
 8811  037476  000000                    .WORD   0
 8812  037500  000000                    .WORD   0
 8813  037502  000000                    .WORD   0
 8814  037504  000000                    .WORD   0
 8815  037506  000000                    .WORD   0
 8816  037510  000000                    .WORD   0
 8817  037512  000000                    .WORD   0
 8818  037514  000000                    .WORD   0
 8819  037516  000000                    .WORD   0
 8820  037520  000000                    .WORD   0
 8821  037522  000000                    .WORD   0
 8822  037524  000000                    .WORD   0
 8823  037526  000000                    .WORD   0
 8824  037530  000000                    .WORD   0
 8825  037532  000000                    .WORD   0
 8826  037534  000000                    .WORD   0
 8827  037536  000000                    .WORD   0
 8828  037540  000000                    .WORD   0
 8829  037542  000000                    .WORD   0
 8830  037544  000000                    .WORD   0
 8831  037546  000000                    .WORD   0
 8832  037550  000000                    .WORD   0
 8833  037552  000000                    .WORD   0
 8834  037554  000000                    .WORD   0
 8835  037556  000000                    .WORD   0
 8836  037560  000000                    .WORD   0
 8837  037562  000000                    .WORD   0
 8838  037564  000000                    .WORD   0
 8839  037566  000000                    .WORD   0
 8840  037570  000000                    .WORD   0
 8841  037572  000000                    .WORD   0
 8842  037574  000000                    .WORD   0
```

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 8843  037576  000000                        .WORD   0
 8844  037600  000000                        .WORD   0
 8845  037602  000000                        .WORD   0
 8846  037604  000000                        .WORD   0
 8847  037606  000000                        .WORD   0
 8848  037610  000000                        .WORD   0
 8849  037612  000000                        .WORD   0
 8850  037614  000000                        .WORD   0
 8851  037616  000000                        .WORD   0
 8852  037620  000000                        .WORD   0
 8853  037622  000000                        .WORD   0
 8854  037624  000000                        .WORD   0
 8855  037626  000000                        .WORD   0
 8856  037630  000000                        .WORD   0
 8857  037632  000000                        .WORD   0
 8858  037634  000000                        .WORD   0
 8859  037636  000000                        .WORD   0
 8860  037640  000000                        .WORD   0
 8861
 8862                                ;BLOCK FOR DRIVE 2
 8863
 8864  037642     002     000      BLK2:    .BYTE   2,0             ;DRIVE NUMBER
 8865  037644  000000                        .WORD   0
 8866  037646  000000                        .WORD   0
 8867  037650  000000                        .WORD   0
 8868  037652  000000                        .WORD   0
 8869  037654  000000                        .WORD   0
 8870  037656  040026                        .WORD   .+150
 8871  037660  000000                        .WORD   0
 8872  037662  000000                        .WORD   0
 8873  037664  000000                        .WORD   0
 8874  037666  000000                        .WORD   0
 8875  037670  000000                        .WORD   0
 8876  037672  000000                        .WORD   0
 8877  037674  000000                        .WORD   0
 8878  037676  000000                        .WORD   0
 8879  037700  000000                        .WORD   0
 8880  037702  000000                        .WORD   0
 8881  037704  000000                        .WORD   0
 8882  037706  000000                        .WORD   0
 8883  037710  000000                        .WORD   0
 8884  037712  000000                        .WORD   0
 8885  037714  000000                        .WORD   0
 8886  037716  000000                        .WORD   0
 8887  037720  000000                        .WORD   0
 8888  037722  000000                        .WORD   0
 8889  037724  000000                        .WORD   0
 8890  037726  000000                        .WORD   0
 8891  037730  000000                        .WORD   0
 8892  037732  000000                        .WORD   0
 8893  037734  000000                        .WORD   0
 8894  037736  000000                        .WORD   0
 8895  037740  000000                        .WORD   0
 8896  037742  000000                        .WORD   0
 8897  037744  000000                        .WORD   0
 8898  037746  000000                        .WORD   0
```

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 8899  037750  000000                          .WORD   0
 8900  037752  000000                          .WORD   0
 8901  037754  000000                          .WORD   0
 8902  037756  000000                          .WORD   0
 8903  037760  000000                          .WORD   0
 8904  037762  000000                          .WORD   0
 8905  037764  000000                          .WORD   0
 8906  037766  000000                          .WORD   0
 8907  037770  000000                          .WORD   0
 8908  037772  000000                          .WORD   0
 8909  037774  000000                          .WORD   0
 8910  037776  000000                          .WORD   0
 8911  040000  000000                          .WORD   0
 8912  040002  000000                          .WORD   0
 8913  040004  000000                          .WORD   0
 8914  040006  000000                          .WORD   0
 8915  040010  000000                          .WORD   0
 8916  040012  000000                          .WORD   0
 8917  040014  000000                          .WORD   0
 8918  040016  000000                          .WORD   0
 8919  040020  000000                          .WORD   0
 8920  040022  000000                          .WORD   0
 8921  040024  000000                          .WORD   0
 8922  040026  000000                          .WORD   0
 8923  040030  000000                          .WORD   0
 8924  040032  000000                          .WORD   0
 8925  040034  000000                          .WORD   0
 8926  040036  000000                          .WORD   0
 8927  040040  000000                          .WORD   0
 8928  040042  000000                          .WORD   0
 8929  040044  000000                          .WORD   0
 8930  040046  000000                          .WORD   0
 8931  040050  000000                          .WORD   0
 8932  040052  000000                          .WORD   0
 8933  040054  000000                          .WORD   0
 8934  040056  000000                          .WORD   0
 8935  040060  000000                          .WORD   0
 8936  040062  000000                          .WORD   0
 8937  040064  000000                          .WORD   0
 8938  040066  000000                          .WORD   0
 8939  040070  000000                          .WORD   0
 8940  040072  000000                          .WORD   0
 8941  040074  000000                          .WORD   0
 8942  040076  000000                          .WORD   0
 8943
 8944                                  ;BLOCK FOR DRIVE 3
 8945
 8946  040100     003     000          BLK3:   .BYTE   3,0             ;DRIVE NUMBER
 8947  040102  000000                          .WORD   0
 8948  040104  000000                          .WORD   0
 8949  040106  000000                          .WORD   0
 8950  040110  000000                          .WORD   0
 8951  040112  000000                          .WORD   0
 8952  040114  040264                          .WORD   .+150
 8953  040116  000000                          .WORD   0
 8954  040120  000000                          .WORD   0
```

```
 8955  040122  000000                    .WORD   0
 8956  040124  000000                    .WORD   0
 8957  040126  000000                    .WORD   0
 8958  040130  000000                    .WORD   0
 8959  040132  000000                    .WORD   0
 8960  040134  000000                    .WORD   0
 8961  040136  000000                    .WORD   0
 8962  040140  000000                    .WORD   0
 8963  040142  000000                    .WORD   0
 8964  040144  000000                    .WORD   0
 8965  040146  000000                    .WORD   0
 8966  040150  000000                    .WORD   0
 8967  040152  000000                    .WORD   0
 8968  040154  000000                    .WORD   0
 8969  040156  000000                    .WORD   0
 8970  040160  000000                    .WORD   0
 8971  040162  000000                    .WORD   0
 8972  040164  000000                    .WORD   0
 8973  040166  000000                    .WORD   0
 8974  040170  000000                    .WORD   0
 8975  040172  000000                    .WORD   0
 8976  040174  000000                    .WORD   0
 8977  040176  000000                    .WORD   0
 8978  040200  000000                    .WORD   0
 8979  040202  000000                    .WORD   0
 8980  040204  000000                    .WORD   0
 8981  040206  000000                    .WORD   0
 8982  040210  000000                    .WORD   0
 8983  040212  000000                    .WORD   0
 8984  040214  000000                    .WORD   0
 8985  040216  000000                    .WORD   0
 8986  040220  000000                    .WORD   0
 8987  040222  000000                    .WORD   0
 8988  040224  000000                    .WORD   0
 8989  040226  000000                    .WORD   0
 8990  040230  000000                    .WORD   0
 8991  040232  000000                    .WORD   0
 8992  040234  000000                    .WORD   0
 8993  040236  000000                    .WORD   0
 8994  040240  000000                    .WORD   0
 8995  040242  000000                    .WORD   0
 8996  040244  000000                    .WORD   0
 8997  040246  000000                    .WORD   0
 8998  040250  000000                    .WORD   0
 8999  040252  000000                    .WORD   0
 9000  040254  000000                    .WORD   0
 9001  040256  000000                    .WORD   0
 9002  040260  000000                    .WORD   0
 9003  040262  000000                    .WORD   0
 9004  040264  000000                    .WORD   0
 9005  040266  000000                    .WORD   0
 9006  040270  000000                    .WORD   0
 9007  040272  000000                    .WORD   0
 9008  040274  000000                    .WORD   0
 9009  040276  000000                    .WORD   0
 9010  040300  000000                    .WORD   0
```

```
 9011  040302  000000                          .WORD   0
 9012  040304  000000                          .WORD   0
 9013  040306  000000                          .WORD   0
 9014  040310  000000                          .WORD   0
 9015  040312  000000                          .WORD   0
 9016  040314  000000                          .WORD   0
 9017  040316  000000                          .WORD   0
 9018  040320  000000                          .WORD   0
 9019  040322  000000                          .WORD   0
 9020  040324  000000                          .WORD   0
 9021  040326  000000                          .WORD   0
 9022  040330  000000                          .WORD   0
 9023  040332  000000                          .WORD   0
 9024  040334  000000                          .WORD   0
 9025
 9026                                  ;BLOCK FOR DRIVE 4
 9027
 9028  040336     004     000          BLK4:   .BYTE   4,0             ;DRIVE NUMBER
 9029  040340  000000                          .WORD   0
 9030  040342  000000                          .WORD   0
 9031  040344  000000                          .WORD   0
 9032  040346  000000                          .WORD   0
 9033  040350  000000                          .WORD   0
 9034  040352  040522                          .WORD   .+150
 9035  040354  000000                          .WORD   0
 9036  040356  000000                          .WORD   0
 9037  040360  000000                          .WORD   0
 9038  040362  000000                          .WORD   0
 9039  040364  000000                          .WORD   0
 9040  040366  000000                          .WORD   0
 9041  040370  000000                          .WORD   0
 9042  040372  000000                          .WORD   0
 9043  040374  000000                          .WORD   0
 9044  040376  000000                          .WORD   0
 9045  040400  000000                          .WORD   0
 9046  040402  000000                          .WORD   0
 9047  040404  000000                          .WORD   0
 9048  040406  000000                          .WORD   0
 9049  040410  000000                          .WORD   0
 9050  040412  000000                          .WORD   0
 9051  040414  000000                          .WORD   0
 9052  040416  000000                          .WORD   0
 9053  040420  000000                          .WORD   0
 9054  040422  000000                          .WORD   0
 9055  040424  000000                          .WORD   0
 9056  040426  000000                          .WORD   0
 9057  040430  000000                          .WORD   0
 9058  040432  000000                          .WORD   0
 9059  040434  000000                          .WORD   0
 9060  040436  000000                          .WORD   0
 9061  040440  000000                          .WORD   0
 9062  040442  000000                          .WORD   0
 9063  040444  000000                          .WORD   0
 9064  040446  000000                          .WORD   0
 9065  040450  000000                          .WORD   0
 9066  040452  000000                          .WORD   0
```

```
 9067  040454  000000                          .WORD   0
 9068  040456  000000                          .WORD   0
 9069  040460  000000                          .WORD   0
 9070  040462  000000                          .WORD   0
 9071  040464  000000                          .WORD   0
 9072  040466  000000                          .WORD   0
 9073  040470  000000                          .WORD   0
 9074  040472  000000                          .WORD   0
 9075  040474  000000                          .WORD   0
 9076  040476  000000                          .WORD   0
 9077  040500  000000                          .WORD   0
 9078  040502  000000                          .WORD   0
 9079  040504  000000                          .WORD   0
 9080  040506  000000                          .WORD   0
 9081  040510  000000                          .WORD   0
 9082  040512  000000                          .WORD   0
 9083  040514  000000                          .WORD   0
 9084  040516  000000                          .WORD   0
 9085  040520  000000                          .WORD   0
 9086  040522  000000                          .WORD   0
 9087  040524  000000                          .WORD   0
 9088  040526  000000                          .WORD   0
 9089  040530  000000                          .WORD   0
 9090  040532  000000                          .WORD   0
 9091  040534  000000                          .WORD   0
 9092  040536  000000                          .WORD   0
 9093  040540  000000                          .WORD   0
 9094  040542  000000                          .WORD   0
 9095  040544  000000                          .WORD   0
 9096  040546  000000                          .WORD   0
 9097  040550  000000                          .WORD   0
 9098  040552  000000                          .WORD   0
 9099  040554  000000                          .WORD   0
 9100  040556  000000                          .WORD   0
 9101  040560  000000                          .WORD   0
 9102  040562  000000                          .WORD   0
 9103  040564  000000                          .WORD   0
 9104  040566  000000                          .WORD   0
 9105  040570  000000                          .WORD   0
 9106  040572  000000                          .WORD   0
 9107
 9108                          ;BLOCK FOR DRIVE 5
 9109
 9110  040574     005     000  BLK5:   .BYTE   5,0             ;DRIVE NUMBER
 9111  040576  000000                          .WORD   0
 9112  040600  000000                          .WORD   0
 9113  040602  000000                          .WORD   0
 9114  040604  000000                          .WORD   0
 9115  040606  000000                          .WORD   0
 9116  040610  040760                          .WORD   .+150
 9117  040612  000000                          .WORD   0
 9118  040614  000000                          .WORD   0
 9119  040616  000000                          .WORD   0
 9120  040620  000000                          .WORD   0
 9121  040622  000000                          .WORD   0
 9122  040624  000000                          .WORD   0
```

```
 9123  040626  000000                    .WORD   0
 9124  040630  000000                    .WORD   0
 9125  040632  000000                    .WORD   0
 9126  040634  000000                    .WORD   0
 9127  040636  000000                    .WORD   0
 9128  040640  000000                    .WORD   0
 9129  040642  000000                    .WORD   0
 9130  040644  000000                    .WORD   0
 9131  040646  000000                    .WORD   0
 9132  040650  000000                    .WORD   0
 9133  040652  000000                    .WORD   0
 9134  040654  000000                    .WORD   0
 9135  040656  000000                    .WORD   0
 9136  040660  000000                    .WORD   0
 9137  040662  000000                    .WORD   0
 9138  040664  000000                    .WORD   0
 9139  040666  000000                    .WORD   0
 9140  040670  000000                    .WORD   0
 9141  040672  000000                    .WORD   0
 9142  040674  000000                    .WORD   0
 9143  040676  000000                    .WORD   0
 9144  040700  000000                    .WORD   0
 9145  040702  000000                    .WORD   0
 9146  040704  000000                    .WORD   0
 9147  040706  000000                    .WORD   0
 9148  040710  000000                    .WORD   0
 9149  040712  000000                    .WORD   0
 9150  040714  000000                    .WORD   0
 9151  040716  000000                    .WORD   0
 9152  040720  000000                    .WORD   0
 9153  040722  000000                    .WORD   0
 9154  040724  000000                    .WORD   0
 9155  040726  000000                    .WORD   0
 9156  040730  000000                    .WORD   0
 9157  040732  000000                    .WORD   0
 9158  040734  000000                    .WORD   0
 9159  040736  000000                    .WORD   0
 9160  040740  000000                    .WORD   0
 9161  040742  000000                    .WORD   0
 9162  040744  000000                    .WORD   0
 9163  040746  000000                    .WORD   0
 9164  040750  000000                    .WORD   0
 9165  040752  000000                    .WORD   0
 9166  040754  000000                    .WORD   0
 9167  040756  000000                    .WORD   0
 9168  040760  000000                    .WORD   0
 9169  040762  000000                    .WORD   0
 9170  040764  000000                    .WORD   0
 9171  040766  000000                    .WORD   0
 9172  040770  000000                    .WORD   0
 9173  040772  000000                    .WORD   0
 9174  040774  000000                    .WORD   0
 9175  040776  000000                    .WORD   0
 9176  041000  000000                    .WORD   0
 9177  041002  000000                    .WORD   0
 9178  041004  000000                    .WORD   0
```

```
 9179  041006  000000                        .WORD   0
 9180  041010  000000                        .WORD   0
 9181  041012  000000                        .WORD   0
 9182  041014  000000                        .WORD   0
 9183  041016  000000                        .WORD   0
 9184  041020  000000                        .WORD   0
 9185  041022  000000                        .WORD   0
 9186  041024  000000                        .WORD   0
 9187  041026  000000                        .WORD   0
 9188  041030  000000                        .WORD   0
 9189
 9190                                ;BLOCK FOR DRIVE 6
 9191
 9192  041032     006     000      BLK6:     .BYTE   6,0             ;DRIVE NUMBER
 9193  041034  000000                        .WORD   0
 9194  041036  000000                        .WORD   0
 9195  041040  000000                        .WORD   0
 9196  041042  000000                        .WORD   0
 9197  041044  000000                        .WORD   0
 9198  041046  041216                        .WORD   .+150
 9199  041050  000000                        .WORD   0
 9200  041052  000000                        .WORD   0
 9201  041054  000000                        .WORD   0
 9202  041056  000000                        .WORD   0
 9203  041060  000000                        .WORD   0
 9204  041062  000000                        .WORD   0
 9205  041064  000000                        .WORD   0
 9206  041066  000000                        .WORD   0
 9207  041070  000000                        .WORD   0
 9208  041072  000000                        .WORD   0
 9209  041074  000000                        .WORD   0
 9210  041076  000000                        .WORD   0
 9211  041100  000000                        .WORD   0
 9212  041102  000000                        .WORD   0
 9213  041104  000000                        .WORD   0
 9214  041106  000000                        .WORD   0
 9215  041110  000000                        .WORD   0
 9216  041112  000000                        .WORD   0
 9217  041114  000000                        .WORD   0
 9218  041116  000000                        .WORD   0
 9219  041120  000000                        .WORD   0
 9220  041122  000000                        .WORD   0
 9221  041124  000000                        .WORD   0
 9222  041126  000000                        .WORD   0
 9223  041130  000000                        .WORD   0
 9224  041132  000000                        .WORD   0
 9225  041134  000000                        .WORD   0
 9226  041136  000000                        .WORD   0
 9227  041140  000000                        .WORD   0
 9228  041142  000000                        .WORD   0
 9229  041144  000000                        .WORD   0
 9230  041146  000000                        .WORD   0
 9231  041150  000000                        .WORD   0
 9232  041152  000000                        .WORD   0
 9233  041154  000000                        .WORD   0
 9234  041156  000000                        .WORD   0
```

```
041160 000000                   .WORD   0
041162 000000                   .WORD   0
041164 000000                   .WORD   0
041166 000000                   .WORD   0
041170 000000                   .WORD   0
041172 000000                   .WORD   0
041174 000000                   .WORD   0
041176 000000                   .WORD   0
041200 000000                   .WORD   0
041202 000000                   .WORD   0
041204 000000                   .WORD   0
041206 000000                   .WORD   0
041210 000000                   .WORD   0
041212 000000                   .WORD   0
041214 000000                   .WORD   0
041216 000000                   .WORD   0
041220 000000                   .WORD   0
041222 000000                   .WORD   0
041224 000000                   .WORD   0
041226 000000                   .WORD   0
041230 000000                   .WORD   0
041232 000000                   .WORD   0
041234 000000                   .WORD   0
041236 000000                   .WORD   0
041240 000000                   .WORD   0
041242 000000                   .WORD   0
041244 000000                   .WORD   0
041246 000000                   .WORD   0
041250 000000                   .WORD   0
041252 000000                   .WORD   0
041254 000000                   .WORD   0
041256 000000                   .WORD   0
041260 000000                   .WORD   0
041262 000000                   .WORD   0
041264 000000                   .WORD   0
041266 000000                   .WORD   0

                        ;BLOCK FOR DRIVE 7

041270    007    000    BLK7:   .BYTE   7,0             ;DRIVE NUMBER
041272 000000                   .WORD   0
041274 000000                   .WORD   0
041276 000000                   .WORD   0
041300 000000                   .WORD   0
041302 000000                   .WORD   0
041304 041454                   .WORD   .+150
041306 000000                   .WORD   0
041310 000000                   .WORD   0
041312 000000                   .WORD   0
041314 000000                   .WORD   0
041316 000000                   .WORD   0
041320 000000                   .WORD   0
041322 000000                   .WORD   0
041324 000000                   .WORD   0
041326 000000                   .WORD   0
041330 000000                   .WORD   0
```

```
9291  041332  000000                    .WORD   0
9292  041334  000000                    .WORD   0
9293  041336  000000                    .WORD   0
9294  041340  000000                    .WORD   0
9295  041342  000000                    .WORD   0
9296  041344  000000                    .WORD   0
9297  041346  000000                    .WORD   0
9298  041350  000000                    .WORD   0
9299  041352  000000                    .WORD   0
9300  041354  000000                    .WORD   0
9301  041356  000000                    .WORD   0
9302  041360  000000                    .WORD   0
9303  041362  000000                    .WORD   0
9304  041364  000000                    .WORD   0
9305  041366  000000                    .WORD   0
9306  041370  000000                    .WORD   0
9307  041372  000000                    .WORD   0
9308  041374  000000                    .WORD   0
9309  041376  000000                    .WORD   0
9310  041400  000000                    .WORD   0
9311  041402  000000                    .WORD   0
9312  041404  000000                    .WORD   0
9313  041406  000000                    .WORD   0
9314  041410  000000                    .WORD   0
9315  041412  000000                    .WORD   0
9316  041414  000000                    .WORD   0
9317  041416  000000                    .WORD   0
9318  041420  000000                    .WORD   0
9319  041422  000000                    .WORD   0
9320  041424  000000                    .WORD   0
9321  041426  000000                    .WORD   0
9322  041430  000000                    .WORD   0
9323  041432  000000                    .WORD   0
9324  041434  000000                    .WORD   0
9325  041436  000000                    .WORD   0
9326  041440  000000                    .WORD   0
9327  041442  000000                    .WORD   0
9328  041444  000000                    .WORD   0
9329  041446  000000                    .WORD   0
9330  041450  000000                    .WORD   0
9331  041452  000000                    .WORD   0
9332  041454  000000                    .WORD   0
9333  041456  000000                    .WORD   0
9334  041460  000000                    .WORD   0
9335  041462  000000                    .WORD   0
9336  041464  000000                    .WORD   0
9337  041466  000000                    .WORD   0
9338  041470  000000                    .WORD   0
9339  041472  000000                    .WORD   0
9340  041474  000000                    .WORD   0
9341  041476  000000                    .WORD   0
9342  041500  000000                    .WORD   0
9343  041502  000000                    .WORD   0
9344  041504  000000                    .WORD   0
9345  041506  000000                    .WORD   0
9346  041510  000000                    .WORD   0
```

```
 9347  041512  000000                          .WORD   0
 9348  041514  000000                          .WORD   0
 9349  041516  000000                          .WORD   0
 9350  041520  000000                          .WORD   0
 9351  041522  000000                          .WORD   0
 9352  041524  000000                          .WORD   0
 9353
 9354                                  ;GENERAL PURPOSE DPB - USED BY 'READHD', 'RECALT', 'OFFSET',&'RTNCTR'
 9355
 9356  041526  000000  000000  177774  GENDPB: .WORD   0,0,-4,CYLDER
 9357  041534  053644
 9358  041536  000000  000000  041546          .WORD   0,0,GENREG,0
 9359  041544  000000
 9360  041546  000024                  GENREG: .BLKW   24              ;REGISTER STORAGE IF ERROR
 9361
 9362                                  ;;*****************************************************************
 9363
 9364                                  .SBTTL  TABLES, CONSTANTS, AND VARIABLE LOCATIONS
 9365
 9366                                  ;;*****************************************************************
 9367
 9368  041616  000000  000000  000000  ORDERQ: .WORD   0,0,0,0,0,0,0,0,0  ;LIST OF DRIVES PERFORMING COMMANDS
 9369  041624  000000  000000  000000
 9370  041632  000000  000000  000000
 9371
 9372  041640     000     000     000  ASNLST: .BYTE   0,0,0,0,0,0,0,0 ;-1 IS ASSIGNED UNIT
 9373  041643     000     000     000
 9374  041646     000     000
 9375
 9376  041650  000000  000000  000000  DUNIT:  .WORD   0,0,0,0,0,0,0,0,0       ;ADDRESSES OF UNIT TO BE DEASSIGNED
 9377  041656  000000  000000  000000
 9378  041664  000000  000000  000000
 9379
 9380  041672  000000  000000  000000  NEWUNT: .WORD   0,0,0,0,0,0,0,0,0       ;ADDRESSES OF NEWLY ASSIGNED UNITS
 9381  041700  000000  000000  000000
 9382  041706  000000  000000  000000
 9383
 9384  041714  000000  000000  000000  AVAIL:  .WORD   0,0,0,0,0,0,0,0,0  ;LIST OF UNITS WAITING FOR PARAMETERS
 9385  041722  000000  000000  000000
 9386  041730  000000  000000  000000
 9387
 9388  041736  000000  000000  000000  WAIT:   .WORD   0,0,0,0,0,0,0,0,0  ;LIST OF UNITS WAITING FOR BUFFERS
 9389  041744  000000  000000  000000
 9390  041752  000000  000000  000000
 9391  041760  000000  000000  000000  PARQ:   .WORD   0,0,0,0,0,0,0,0,0  ;LIST OF UNITS WAITING FOR PARAMETERS
 9392  041766  000000  000000  000000
 9393  041774  000000  000000  000000
 9394
 9395  042002  000000                  BUFTBL: .WORD   0               ;BUFFER ALLOCATION TABLE ENTRY COUNT
 9396  042004  000000  000000                  .WORD   0,0
 9397  042010  000000  000000                  .WORD   0,0
 9398  042014  000000  000000                  .WORD   0,0
 9399  042020  000000  000000                  .WORD   0,0
 9400  042024  000000  000000                  .WORD   0,0
 9401  042030  000000  000000                  .WORD   0,0
 9402  042034  000000  000000                  .WORD   0,0
```

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 9403  042040  000000  000000                    .WORD   0,0
 9404  042044  000000  000000                    .WORD   0,0
 9405  042050  000000  000000                    .WORD   0,0
 9406  042054  000000  000000                    .WORD   0,0
 9407  042060  000000  000000                    .WORD   0,0
 9408  042064  000000  000000                    .WORD   0,0
 9409  042070  000000  000000                    .WORD   0,0
 9410  042074  000000  000000                    .WORD   0,0
 9411  042100  000000  000000                    .WORD   0,0
 9412  042104  000000  000000                    .WORD   0,0
 9413  042110  000000  000000                    .WORD   0,0
 9414  042114  000000  000000                    .WORD   0,0
 9415  042120  000000  000000                    .WORD   0,0
 9416
 9417  042124                          BLKADR:                 ;ADDRESS OF EACH UNIT BLOCK START
 9418  042124  037146                          .WORD   BLK0
 9419  042126  037404                          .WORD   BLK1
 9420  042130  037642                          .WORD   BLK2
 9421  042132  040100                          .WORD   BLK3
 9422  042134  040336                          .WORD   BLK4
 9423  042136  040574                          .WORD   BLK5
 9424  042140  041032                          .WORD   BLK6
 9425  042142  041270                          .WORD   BLK7
 9426
```

```
 9427  042144      151                       COMTBL: .BYTE   WCKD            ;WRITE CHECK DATA
 9428  042145      153                               .BYTE   WCKHD           ;WRITE CHECK HEADER AND DATA
 9429  042146      161                               .BYTE   WRTDAT          ;WRITE DATA
 9430  042147      163                               .BYTE   WRTHD           ;WRITE HEADER AND DATA
 9431  042150      171                               .BYTE   RDDAT           ;READ DATA
 9432  042151      173                               .BYTE   RDHD            ;READ HEADER AND DATA
 9433
 9434  042152  041527  042113  020040  CMNEM:  .ASCIZ  /WCKD   /        ;WRITE CHECK DATA
 9435  042160  000040
 9436  042162  041527  044113  020104          .ASCIZ  /WCKHD  /        ;WRITE CHECK HEADER & DATA
 9437  042170  000040
 9438  042172  051127  042124  052101          .ASCIZ  /WRTDAT /        ;WRITE DATA
 9439  042200  000040
 9440  042202  051127  044124  020104          .ASCIZ  /WRTHD  /        ;WRITE HEADER & DATA
 9441  042210  000040
 9442  042212  042122  040504  020124          .ASCIZ  /RDDAT  /        ;READ DATA
 9443  042220  000040
 9444  042222  042122  042110  020040          .ASCIZ  /RDHD   /        ;READ HEADER & DATA
 9445  042230  000040
 9446
 9447  042232      000                       OFFCOD: .BYTE   0               ;OFFSET CODE TABLE
 9448  042233      020                               .BYTE   20              ;+400 U INCHES
 9449  042234      220                               .BYTE   220             ;-400 U INCHES
 9450  042235      040                               .BYTE   40              ;+800 U INCHES
 9451  042236      240                               .BYTE   240             ;-800 U INCHES
 9452  042237      060                               .BYTE   60              ;+1200 U INCHES
 9453  042240      260      000                      .BYTE   260,0           ;-1200 U INCHES, TERMINATOR
 9454
 9455  042242  042260                        OFMTBL: .WORD   OFMSG0           ;1ST OFFSET MESSAGE
 9456  042244  042313                                .WORD   OFMSG1           ;2ND OFFSET MESSAGE
 9457  042246  042347                                .WORD   OFMSG2           ;3RD OFFSET MESSAGE
 9458  042250  042403                                .WORD   OFMSG3           ;4TH OFFSET MESSAGE
 9459  042252  042437                                .WORD   OFMSG4           ;5TH OFFSET MESSAGE
 9460  042254  042473                                .WORD   OFMSG5           ;6TH OFFSET MESSAGE
 9461  042256  042530                                .WORD   OFMSG6           ;7TH OFFSET MESSAGE
 9462
 9463  042260  043101  042524  020122  OFMSG0: .ASCIZ  /AFTER RETRY WITHOUT OFFSET/
 9464  042266  042522  051124  020131
 9465  042274  044527  044124  052517
 9466  042302  020124  043117  051506
 9467  042310  052105      000
 9468  042313      101  020124  043117  OFMSG1: .ASCIZ  /AT OFFSET +400 MICRO-INCHES/
 9469  042320  051506  052105  025440
 9470  042326  030064  020060  044515
 9471  042334  051103  026517  047111
 9472  042342  044103  051505      000
 9473  042347      101  020124  043117  OFMSG2: .ASCIZ  /AT OFFSET -400 MICRO-INCHES/
 9474  042354  051506  052105  026440
 9475  042362  030064  020060  044515
 9476  042370  051103  026517  047111
 9477  042376  044103  051505      000
 9478  042403      101  020124  043117  OFMSG3: .ASCIZ  /AT OFFSET +800 MICRO-INCHES/
 9479  042410  051506  052105  025440
 9480  042416  030070  020060  044515
 9481  042424  051103  026517  047111
 9482  042432  044103  051505      000
```

```
 9483  042437     101  020124  043117  OFMSG4: .ASCIZ  /AT OFFSET -800 MICRO-INCHES/
 9484  042444  051506  052105  026440
 9485  042452  030070  020060  044515
 9486  042460  051103  026517  047111
 9487  042466  044103  051505     000
 9488  042473     101  020124  043117  OFMSG5: .ASCIZ  /AT OFFSET +1200 MICRO-INCHES/
 9489  042500  051506  052105  025440
 9490  042506  031061  030060  046440
 9491  042514  041511  047522  044455
 9492  042522  041516  042510  000123
 9493  042530  052101  047440  043106  OFMSG6: .ASCIZ  /AT OFFSET -1200 MICRO-INCHES/
 9494  042536  042523  020124  030455
 9495  042544  030062  020060  044515
 9496  042552  051103  026517  047111
 9497  042560  044103  051505     000
 9498
 9499          042566                          .EVEN
 9500
 9501                                  ;ERROR MESSAGE LINE 2 POINTER TABLE
 9502
 9503  042566  046552                  DT14.T: .WORD   DT14.0          ;DT14 ADDRESSES
 9504  042570  046574                          .WORD   DT14.1
 9505  042572  046616                          .WORD   DT14.2
 9506  042574  046640                          .WORD   DT14.3
 9507  042576  046662                          .WORD   DT14.4
 9508  042600  046704                          .WORD   DT14.5
 9509  042602  046726                          .WORD   DT14.6
 9510  042604  046750                          .WORD   DT14.7
 9511
 9512  042606  046772                  DT15.T: .WORD   DT15.0          ;DT15 ADDRESSES
 9513  042610  047014                          .WORD   DT15.1
 9514  042612  047036                          .WORD   DT15.2
 9515  042614  047060                          .WORD   DT15.3
 9516  042616  047102                          .WORD   DT15.4
 9517  042620  047124                          .WORD   DT15.5
 9518  042622  047146                          .WORD   DT15.6
 9519  042624  047170                          .WORD   DT15.7
 9520
 9521  042626  047212                  DT16.T: .WORD   DT16.0          ;DT16 ADDRESSES
 9522  042630  047226                          .WORD   DT16.1
 9523  042632  047242                          .WORD   DT16.2
 9524  042634  047256                          .WORD   DT16.3
 9525  042636  047272                          .WORD   DT16.4
 9526  042640  047306                          .WORD   DT16.5
 9527  042642  047322                          .WORD   DT16.6
 9528  042644  047336                          .WORD   DT16.7
 9529
 9530                                  ;;*****************************************************************
 9531
 9532                                  .SBTTL  DATA PATTERNS
 9533
 9534                                  ;;*****************************************************************
 9535
 9536  042646  000000                  STNDAT: .WORD   0               ;STANDARD DATA PATTERN POINTER TABLE
 9537  042650  042752                          .WORD   DATA1
 9538  042652  043012                          .WORD   DATA1+40
```

```
 9539  042654  043052                        .WORD   DATA1+100
 9540  042656  043112                        .WORD   DATA1+140
 9541  042660  043152                        .WORD   DATA1+200
 9542  042662  043212                        .WORD   DATA1+240
 9543  042664  043252                        .WORD   DATA1+300
 9544  042666  043312                        .WORD   DATA1+340
 9545  042670  043352                        .WORD   DATA1+400
 9546  042672  043412                        .WORD   DATA1+440
 9547  042674  043452                        .WORD   DATA1+500
 9548  042676  043512                        .WORD   DATA1+540
 9549  042700  043552                        .WORD   DATA1+600
 9550  042702  043612                        .WORD   DATA1+640
 9551  042704  043652                        .WORD   DATA1+700
 9552  042706  042712                        .WORD   DATA0           ;ZEROES
 9553  042710  043614                        .WORD   DATA1+642       ;ONES
 9554
 9555  042712  000000              DATA0:    .WORD   0               ;DUMMY DATA PATTERN
 9556  042714  000000                        .WORD   0
 9557  042716  000000                        .WORD   0
 9558  042720  000000                        .WORD   0
 9559  042722  000000                        .WORD   0
 9560  042724  000000                        .WORD   0
 9561  042726  000000                        .WORD   0
 9562  042730  000000                        .WORD   0
 9563  042732  000000                        .WORD   0
 9564  042734  000000                        .WORD   0
 9565  042736  000000                        .WORD   0
 9566  042740  000000                        .WORD   0
 9567  042742  000000                        .WORD   0
 9568  042744  000000                        .WORD   0
 9569  042746  000000                        .WORD   0
 9570  042750  000000                        .WORD   0
 9571
 9572  042752  000001              DATA1:    .WORD   000001  ;STANDARD PATTERN 1
 9573  042754  000003                        .WORD   000003
 9574  042756  000007                        .WORD   000007
 9575  042760  000017                        .WORD   000017
 9576  042762  000037                        .WORD   000037
 9577  042764  000077                        .WORD   000077
 9578  042766  000177                        .WORD   000177
 9579  042770  000377                        .WORD   000377
 9580  042772  000777                        .WORD   000777
 9581  042774  001777                        .WORD   001777
 9582  042776  003777                        .WORD   003777
 9583  043000  007777                        .WORD   007777
 9584  043002  017777                        .WORD   017777
 9585  043004  037777                        .WORD   037777
 9586  043006  077777                        .WORD   077777
 9587  043010  177777                        .WORD   177777
 9588
 9589  043012  177776                        .WORD   177776  ;STANDARD PATTERN 2
 9590  043014  177774                        .WORD   177774
 9591  043016  177770                        .WORD   177770
 9592  043020  177760                        .WORD   177760
 9593  043022  177740                        .WORD   177740
 9594  043024  177700                        .WORD   177700
```

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 9595  043026  177600                    .WORD   177600
 9596  043030  177400                    .WORD   177400
 9597  043032  177000                    .WORD   177000
 9598  043034  176000                    .WORD   176000
 9599  043036  174000                    .WORD   174000
 9600  043040  170000                    .WORD   170000
 9601  043042  160000                    .WORD   160000
 9602  043044  140000                    .WORD   140000
 9603  043046  100000                    .WORD   100000
 9604  043050  000000                    .WORD   000000
 9605
 9606  043052  000000                    .WORD   000000  ;STANDARD PATTERN 3
 9607  043054  000000                    .WORD   000000
 9608  043056  000000                    .WORD   000000
 9609  043060  177777                    .WORD   177777
 9610  043062  177777                    .WORD   177777
 9611  043064  177777                    .WORD   177777
 9612  043066  000000                    .WORD   000000
 9613  043070  000000                    .WORD   000000
 9614  043072  177777                    .WORD   177777
 9615  043074  177777                    .WORD   177777
 9616  043076  000000                    .WORD   000000
 9617  043100  177777                    .WORD   177777
 9618  043102  000000                    .WORD   000000
 9619  043104  177777                    .WORD   177777
 9620  043106  000000                    .WORD   000000
 9621  043110  177777                    .WORD   177777
 9622
 9623  043112  000000                    .WORD   000000  ;STANDARD PATTERN 4
 9624  043114  010421                    .WORD   010421
 9625  043116  021042                    .WORD   021042
 9626  043120  031463                    .WORD   031463
 9627  043122  042104                    .WORD   042104
 9628  043124  052525                    .WORD   052525
 9629  043126  063146                    .WORD   063146
 9630  043130  073567                    .WORD   073567
 9631  043132  104210                    .WORD   104210
 9632  043134  114631                    .WORD   114631
 9633  043136  125252                    .WORD   125252
 9634  043140  135673                    .WORD   135673
 9635  043142  146314                    .WORD   146314
 9636  043144  156735                    .WORD   156735
 9637  043146  167356                    .WORD   167356
 9638  043150  177777                    .WORD   177777
 9639
 9640  043152  052525                    .WORD   052525  ;STANDARD PATTERN 5
 9641  043154  052525                    .WORD   052525
 9642  043156  052525                    .WORD   052525
 9643  043160  125252                    .WORD   125252
 9644  043162  125252                    .WORD   125252
 9645  043164  125252                    .WORD   125252
 9646  043166  052525                    .WORD   052525
 9647  043170  052525                    .WORD   052525
 9648  043172  125252                    .WORD   125252
 9649  043174  125252                    .WORD   125252
 9650  043176  052525                    .WORD   052525
```

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 9651  043200  125252                          .WORD   125252
 9652  043202  052525                          .WORD   052525
 9653  043204  125252                          .WORD   125252
 9654  043206  052525                          .WORD   052525
 9655  043210  125252                          .WORD   125252
 9656
 9657  043212  007417                          .WORD   007417  ;STANDARD PATTERN 6
 9658  043214  007417                          .WORD   007417
 9659  043216  007417                          .WORD   007417
 9660  043220  170360                          .WORD   170360
 9661  043222  170360                          .WORD   170360
 9662  043224  170360                          .WORD   170360
 9663  043226  007417                          .WORD   007417
 9664  043230  007417                          .WORD   007417
 9665  043232  170360                          .WORD   170360
 9666  043234  170360                          .WORD   170360
 9667  043236  007417                          .WORD   007417
 9668  043240  170360                          .WORD   170360
 9669  043242  007417                          .WORD   007417
 9670  043244  170360                          .WORD   170360
 9671  043246  007417                          .WORD   007417
 9672  043250  170360                          .WORD   170360
 9673
 9674  043252  026455                          .WORD   026455  ;STANDARD PATTERN 7
 9675  043254  026455                          .WORD   026455
 9676  043256  026455                          .WORD   026455
 9677  043260  151322                          .WORD   151322
 9678  043262  151322                          .WORD   151322
 9679  043264  151322                          .WORD   151322
 9680  043266  026455                          .WORD   026455
 9681  043270  026455                          .WORD   026455
 9682  043272  151322                          .WORD   151322
 9683  043274  151322                          .WORD   151322
 9684  043276  026455                          .WORD   026455
 9685  043300  151322                          .WORD   151322
 9686  043302  026455                          .WORD   026455
 9687  043304  151322                          .WORD   151322
 9688  043306  026455                          .WORD   026455
 9689  043310  151322                          .WORD   151322
 9690
 9691  043312  165555                          .WORD   165555  ;STANDARD PATTERN 8
 9692  043314  133333                          .WORD   133333
 9693  043316  165555                          .WORD   165555
 9694  043320  133333                          .WORD   133333
 9695  043322  165555                          .WORD   165555
 9696  043324  133333                          .WORD   133333
 9697  043326  165555                          .WORD   165555
 9698  043330  133333                          .WORD   133333
 9699  043332  165555                          .WORD   165555
 9700  043334  133333                          .WORD   133333
 9701  043336  165555                          .WORD   165555
 9702  043340  133333                          .WORD   133333
 9703  043342  165555                          .WORD   165555
 9704  043344  133333                          .WORD   133333
 9705  043346  165555                          .WORD   165555
 9706  043350  133333                          .WORD   133333
```

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 9707
 9708  043352  000001                    .WORD   000001  ;STANDARD PATTERN 9
 9709  043354  000002                    .WORD   000002
 9710  043356  000004                    .WORD   000004
 9711  043360  000010                    .WORD   000010
 9712  043362  000020                    .WORD   000020
 9713  043364  000040                    .WORD   000040
 9714  043366  000100                    .WORD   000100
 9715  043370  000200                    .WORD   000200
 9716  043372  000400                    .WORD   000400
 9717  043374  001000                    .WORD   001000
 9718  043376  002000                    .WORD   002000
 9719  043400  004000                    .WORD   004000
 9720  043402  010000                    .WORD   010000
 9721  043404  020000                    .WORD   020000
 9722  043406  040000                    .WORD   040000
 9723  043410  100000                    .WORD   100000
 9724
 9725  043412  177776                    .WORD   177776  ;STANDARD PATTERN 10
 9726  043414  177775                    .WORD   177775
 9727  043416  177773                    .WORD   177773
 9728  043420  177767                    .WORD   177767
 9729  043422  177757                    .WORD   177757
 9730  043424  177737                    .WORD   177737
 9731  043426  177677                    .WORD   177677
 9732  043430  177577                    .WORD   177577
 9733  043432  177377                    .WORD   177377
 9734  043434  176777                    .WORD   176777
 9735  043436  175777                    .WORD   175777
 9736  043440  173777                    .WORD   173777
 9737  043442  167777                    .WORD   167777
 9738  043444  157777                    .WORD   157777
 9739  043446  137777                    .WORD   137777
 9740  043450  077777                    .WORD   077777
 9741
 9742  043452  172666                    .WORD   172666  ;STANDARD PATTERN 11
 9743  043454  155555                    .WORD   155555
 9744  043456  172666                    .WORD   172666
 9745  043460  155555                    .WORD   155555
 9746  043462  172666                    .WORD   172666
 9747  043464  155555                    .WORD   155555
 9748  043466  172666                    .WORD   172666
 9749  043470  155555                    .WORD   155555
 9750  043472  172666                    .WORD   172666
 9751  043474  155555                    .WORD   155555
 9752  043476  172666                    .WORD   172666
 9753  043500  155555                    .WORD   155555
 9754  043502  172666                    .WORD   172666
 9755  043504  155555                    .WORD   155555
 9756  043506  172666                    .WORD   172666
 9757  043510  155555                    .WORD   155555
 9758
 9759  043512  077777                    .WORD   077777  ;STANDARD PATTERN 12
 9760  043514  137777                    .WORD   137777
 9761  043516  157777                    .WORD   157777
 9762  043520  167777                    .WORD   167777
```

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 9763  043522  173777                    .WORD   173777
 9764  043524  175777                    .WORD   175777
 9765  043526  176777                    .WORD   176777
 9766  043530  177377                    .WORD   177377
 9767  043532  177577                    .WORD   177577
 9768  043534  177677                    .WORD   177677
 9769  043536  177737                    .WORD   177737
 9770  043540  177757                    .WORD   177757
 9771  043542  177767                    .WORD   177767
 9772  043544  177773                    .WORD   177773
 9773  043546  177775                    .WORD   177775
 9774  043550  177776                    .WORD   177776
 9775
 9776  043552  153333                    .WORD   153333  ;STANDARD PATTERN 13
 9777  043554  066667                    .WORD   066667
 9778  043556  153333                    .WORD   153333
 9779  043560  066667                    .WORD   066667
 9780  043562  153333                    .WORD   153333
 9781  043564  066667                    .WORD   066667
 9782  043566  153333                    .WORD   153333
 9783  043570  066667                    .WORD   066667
 9784  043572  153333                    .WORD   153333
 9785  043574  066667                    .WORD   066667
 9786  043576  153333                    .WORD   153333
 9787  043600  066667                    .WORD   066667
 9788  043602  153333                    .WORD   153333
 9789  043604  066667                    .WORD   066667
 9790  043606  153333                    .WORD   153333
 9791  043610  066667                    .WORD   066667
 9792
 9793  043612  000000                    .WORD   000000  ;STANDARD PATTERN 14
 9794  043614  177777                    .WORD   177777
 9795  043616  177777                    .WORD   177777
 9796  043620  177777                    .WORD   177777
 9797  043622  177777                    .WORD   177777
 9798  043624  177777                    .WORD   177777
 9799  043626  177777                    .WORD   177777
 9800  043630  177777                    .WORD   177777
 9801  043632  177777                    .WORD   177777
 9802  043634  177777                    .WORD   177777
 9803  043636  177777                    .WORD   177777
 9804  043640  177777                    .WORD   177777
 9805  043642  177777                    .WORD   177777
 9806  043644  177777                    .WORD   177777
 9807  043646  177777                    .WORD   177777
 9808  043650  177777                    .WORD   177777
 9809
 9810  043652  177777                    .WORD   177777  ;STANDARD PATTERN 15
 9811  043654  000000                    .WORD   000000
 9812  043656  000000                    .WORD   000000
 9813  043660  000000                    .WORD   000000
 9814  043662  000000                    .WORD   000000
 9815  043664  000000                    .WORD   000000
 9816  043666  000000                    .WORD   000000
 9817  043670  000000                    .WORD   000000
 9818  043672  000000                    .WORD   000000
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 9819  043674  000000                          .WORD   000000
 9820  043676  000000                          .WORD   000000
 9821  043700  000000                          .WORD   000000
 9822  043702  000000                          .WORD   000000
 9823  043704  000000                          .WORD   000000
 9824  043706  000000                          .WORD   000000
 9825  043710  000000                          .WORD   000000
 9826
 9827                                  ;;*****************************************************************
 9828
 9829                                  .SBTTL  PRINTER/TELETYPE MESSAGES
 9830
 9831                                  ;;*****************************************************************
 9832
 9833  043712  046111  042514  040507  EM1:    .ASCIZ  /ILLEGAL RH11 INTERRUPT (SC=0 OR RHAS=0)/
 9834  043720  020114  044122  030461
 9835  043726  044440  052116  051105
 9836  043734  052522  052120  024040
 9837  043742  041523  030075  047440
 9838  043750  020122  044122  051501
 9839  043756  030075  000051
 9840
 9841  043762  047125  054105  042520  EM2:    .ASCIZ  /UNEXPECTED ATTENTION/
 9842  043770  052103  042105  040440
 9843  043776  052124  047105  044524
 9844  044004  047117     000
 9845
 9846  044007     103  047117  051124  EM3:    .ASCIZ  /CONTROL BUS PARITY ERROR DETECTED BY THE RH11/
 9847  044014  046117  041040  051525
 9848  044022  050040  051101  052111
 9849  044030  020131  051105  047522
 9850  044036  020122  042504  042524
 9851  044044  052103  042105  041040
 9852  044052  020131  044124  020105
 9853  044060  044122  030461     000
 9854
 9855  044065     103  047117  051124  EM4:    .ASCIZ  /CONTROL BUS PARITY ERROR DETECTED BY THE RP04/
 9856  044072  046117  041040  051525
 9857  044100  050040  051101  052111
 9858  044106  020131  051105  047522
 9859  044114  020122  042504  042524
 9860  044122  052103  042105  041040
 9861  044130  020131  044124  020105
 9862  044136  050122  032060     000
 9863
 9864  044143     101  052124  047105  EM5:    .ASCIZ  /ATTENTION FROM AN OFFLINE UNIT/
 9865  044150  044524  047117  043040
 9866  044156  047522  020115  047101
 9867  044164  047440  043106  044514
 9868  044172  042516  052440  044516
 9869  044200  000124
 9870
 9871  044202  047125  047503  051122  EM10:   .ASCIZ  /UNCORRECTABLE MASSBUS PARITY ERROR/
 9872  044210  041505  040524  046102
 9873  044216  020105  040515  051523
 9874  044224  052502  020123  040520
```

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 9875  044232  044522  054524  042440
 9876  044240  051122  051117     000
 9877
 9878  044245     106  052101  046101  EM11:   .ASCIZ  /FATAL MASSBUS PARITY ERROR/
 9879  044252  046440  051501  041123
 9880  044260  051525  050040  051101
 9881  044266  052111  020131  051105
 9882  044274  047522  000122
 9883
 9884  044300  042520  051522  051511  EM12:   .ASCIZ  /PERSISTENT DEVICE UNSAFE/
 9885  044306  042524  052116  042040
 9886  044314  053105  041511  020105
 9887  044322  047125  040523  042506
 9888  044330     000
 9889
 9890  044331     117  042520  040522  EM13:   .ASCIZ  /OPERATION NOT COMPLETED WITHIN TIME LIMIT/
 9891  044336  044524  047117  047040
 9892  044344  052117  041440  046517
 9893  044352  046120  052105  042105
 9894  044360  053440  052111  044510
 9895  044366  020116  044524  042515
 9896  044374  046040  046511  052111
 9897  044402     000
 9898
 9899  044403     125  044516  020124  EM14:   .ASCIZ  /UNIT WENT OFFLINE/
 9900  044410  042527  052116  047440
 9901  044416  043106  044514  042516
 9902  044424     000
 9903
 9904  044425     116  020117  042522  EM15:   .ASCIZ  /NO RESPONSE TO PORT REQUEST/
 9905  044432  050123  047117  042523
 9906  044440  052040  020117  047520
 9907  044446  052122  051040  050505
 9908  044454  042525  052123     000
 9909
 9910  044461     110  040505  042504  EM20:   .ASCIZ  /HEADER CRC ERROR/
 9911  044466  020122  051103  020103
 9912  044474  051105  047522  000122
 9913
 9914  044502  040504  040524  041440  EM21:   .ASCIZ  /DATA CHECK ('DCK') ERROR/
 9915  044510  042510  045503  024040
 9916  044516  042047  045503  024447
 9917  044524  042440  051122  051117
 9918  044532     000
 9919
 9920  044533     127  044522  042524  EM22:   .ASCIZ  /WRITE CHECK ERROR - DATA CHECK ('DCK') SET/
 9921  044540  041440  042510  045503
 9922  044546  042440  051122  051117
 9923  044554  026440  042040  052101
 9924  044562  020101  044103  041505
 9925  044570  020113  023450  041504
 9926  044576  023513  020051  042523
 9927  044604  000124
 9928
 9929  044606  051127  052111  020105  EM23:   .ASCIZ  /WRITE CHECK ERROR - DATA CHECK ('DCK') NOT SET/
 9930  044614  044103  041505  020113
```

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 9931  044622  051105  047522  020122
 9932  044630  020055  040504  040524
 9933  044636  041440  042510  045503
 9934  044644  024040  042047  045503
 9935  044652  024447  047040  052117
 9936  044660  051440  052105     000
 9937
 9938  044665     110  040505  042504  EM24:   .ASCIZ  /HEADER READ ERROR - 'FMT' BIT DROPPED/
 9939  044672  020122  042522  042101
 9940  044700  042440  051122  051117
 9941  044706  026440  023440  046506
 9942  044714  023524  041040  052111
 9943  044722  042040  047522  050120
 9944  044730  042105     000
 9945
 9946  044733     110  040505  042504  EM25:   .ASCIZ  /HEADER READ ERROR - HEADER COMPARE ('HCE') ERROR/
 9947  044740  020122  042522  042101
 9948  044746  042440  051122  051117
 9949  044754  026440  044040  040505
 9950  044762  042504  020122  047503
 9951  044770  050115  051101  020105
 9952  044776  023450  041510  023505
 9953  045004  020051  051105  047522
 9954  045012  000122
 9955
 9956  045014  047506  046522  052101  EM2E   .ASCIZ  /FORMAT ERROR ('FER')/
 9957  045022  042440  051122  051117
 9958  045030  024040  043047  051105
 9959  045036  024447     000
 9960
 9961  045041     110  040505  042504  EM27:   .ASCIZ  /HEADER COMPARE ('HCE') ERROR/
 9962  045046  020122  047503  050115
 9963  045054  051101  020105  023450
 9964  045062  041510  023505  020051
 9965  045070  051105  047522  000122
 9966
 9967  045076  044515  041523  046105  EM30:   .ASCIZ  /MISCELLANEOUS DRIVE ERROR/
 9968  045104  040514  042516  052517
 9969  045112  020123  051104  053111
 9970  045120  020105  051105  047522
 9971  045126  000122
 9972
 9973  045130  050117  051105  052101  EM31:   .ASCIZ  /OPERATION INCOMPLETE ('OPI') ERROR/
 9974  045136  047511  020116  047111
 9975  045144  047503  050115  042514
 9976  045152  042524  024040  047447
 9977  045160  044520  024447  042440
 9978  045166  051122  051117     000
 9979
 9980  045173     104  044522  042526  EM32:   .ASCIZ  /DRIVE TIMING ('DTE') ERROR/
 9981  045200  052040  046511  047111
 9982  045206  020107  023450  052104
 9983  045214  023505  020051  051105
 9984  045222  047522  000122
 9985
 9986  045226  040520  044522  054524  EM33:   .ASCIZ  /PARITY ('PAR') ERROR AFTER OPERATION STARTED/
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  9987  045234  024040  050047  051101
  9988  045242  024447  042440  051123
  9989  045250  051117  040440  052105
  9990  045256  051105  047440  042520
  9991  045264  040522  044524  047117
  9992  045272  051440  040524  052122
  9993  045300  042105     000
  9994
  9995  045303     127  044522  042524  EM34:   .ASCIZ  /WRITE CLOCK FAILURE ('WCF') ERROR/
  9996  045310  041440  047514  045503
  9997  045316  043040  044501  052514
  9998  045324  042522  024040  053447
  9999  045332  043103  024447  042440
 10000  045340  051122  051117     000
 10001
 10002  045345     111  053116  046101  EM35:   .ASCIZ  /INVALID ADDRESS ('IAE') ERROR/
 10003  045352  042111  040440  042404
 10004  045360  042522  051523  024040
 10005  045366  044447  042501  024447
 10006  045374  042440  051122  051117
 10007  045402     000
 10008
 10009  045403     127  044522  042524  EM36:   .ASCIZ  /WRITE LOCK ('WLE') ERROR/
 10010  045410  046040  041517  020113
 10011  045416  023450  046127  023505
 10012  045424  020051  051105  047522
 10013  045432  000122
 10014
 10015  045434  044122  030461  047440  EM40:   .ASCIZ  /RH11 OR UNIBUS TRANSFER ERROR/
 10016  045442  020122  047125  041111
 10017  045450  051525  052040  040522
 10018  045456  051516  042506  020122
 10019  045464  051105  047522  000122
 10020
 10021  045472  052502  020123  042101  EM41:   .ASCIZ  /BUS ADDRESS OR WORD COUNT INCORRECT/
 10022  045500  051104  051505  020123
 10023  045506  051117  053440  051117
 10024  045514  020104  047503  047125
 10025  045522  020124  047111  047503
 10026  045530  051122  041505  000124
 10027
 10028  045536  040504  040524  041440  EM42:   .ASCIZ  /DATA COMPARE ERRORS - NO RP04 ERROR DETECTED/
 10029  045544  046517  040520  042522
 10030  045552  042440  051122  051117
 10031  045560  020123  020055  047516
 10032  045566  051040  030120  020064
 10033  045574  051105  047522  020122
 10034  045602  042504  042524  052103
 10035  045610  042105     000
 10036
 10037  045613     103  047101  052047  EM43:   .ASCIZ  /CAN'T MATCH DATA READ WITH A PATTERN/
 10038  045620  046440  052101  044103
 10039  045626  042040  052101  020101
 10040  045634  042522  042101  053440
 10041  045642  052111  020110  020101
 10042  045650  040520  052124  051105
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 10043  045656  000116
 10044
 10045  045660  051105  047522  020122  EM44:   .ASCIZ  /ERROR BIT(S) SET, BUT NO ERROR SIGNALED BY THE RH11/
 10046  045666  044502  024124  024523
 10047  045674  051440  052105  020054
 10048  045702  052502  020124  047516
 10049  045710  042440  051122  051117
 10050  045716  051440  043511  040516
 10051  045724  042514  020104  054502
 10052  045732  052040  042510  051040
 10053  045740  030510  000061
 10054  045744  042523  045505  044440  EM50:   .ASCIZ  /SEEK INCOMPLETE OR OFF CYLINDER ERROR/
 10055  045752  041516  046517  046120
 10056  045760  052105  020105  051117
 10057  045766  047440  043106  041440
 10058  045774  046131  047111  042504
 10059  046002  020122  051105  047522
 10060  046010  000122
 10061
 10062  046012  051120  043517  040522  EM51:   .ASCIZ  /PROGRAM DETECTED POSITIONING ERROR/
 10063  046020  020115  042504  042524
 10064  046026  052103  042105  050040
 10065  046034  051517  052111  047511
 10066  046042  044516  043516  042440
 10067  046050  051122  051117     000
 10068
 10069  046055     104  053105  041511  EM60:   .ASCIZ  /DEVICE UNSAFE/
 10070  046062  020105  047125  040523
 10071  046070  042506     000
 10072
 10073  046073     040  020040  042040  DH2:    .ASCIZ  /    DRV RHDS1   RHER1   RHER2   RHER3   RHAS/
 10074  046100  053122  051040  042110
 10075  046106  030523  020040  051040
 10076  046114  042510  030522  020040
 10077  046122  051040  042510  031122
 10078  046130  020040  051040  042510
 10079  046136  031522  020040  051040
 10080  046144  040510  000123
 10081
 10082  046150  020040  020040  051104  DH3:    .ASCIZ  /    DRV REG ADR  DATA/
 10083  046156  020126  042522  020107
 10084  046164  042101  020122  042040
 10085  046172  052101  000101
 10086
 10087  046176  020040  020040  051104  DH4:    .ASCIZ  /    DRV REG ADR    GOOD    BAD/
 10088  046204  020126  042522  020107
 10089  046212  042101  020122  020040
 10090  046220  043440  047517  020104
 10091  046226  020040  041040  042101
 10092  046234     000
 10093
 10094  046235     104  053122  051040  DH14:   .ASCII  /DRV RHCS1   RHCS2   RHDS1   RHER1   /
 10095  046242  041510  030523  020040
 10096  046250  051040  041510  031123
 10097  046256  020040  051040  042110
 10098  046264  030523  020040  051040
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10099  046272  042510  030522  020040
10100  046300     040
10101  046301     122  042510  031122          .ASCIZ  /RHER2   RHER3   RHEC1   RHEC2/<15><12>
10102  046306  020040  051040  042510
10103  046314  031522  020040  051040
10104  046322  042510  030503  020040
10105  046330  051040  042510  031103
10106  046336  005015     000
10107
10108  046341     122  053510  020103  DH15:   .ASCII  /RHWC    RHBA    RHDA    RHAS    RHLA    /
10109  046346  020040  051040  041110
10110  046354  020101  020040  051040
10111  046362  042110  020101  020040
10112  046370  051040  040510  020123
10113  046376  020040  051040  046110
10114  046404  020101  020040     040
10115  046411     122  042110  020102          .ASCIZ  /RHDB    RHMR    RHDT/<15><12>
10116  046416  020040  051040  046510
10117  046424  020122  020040  051040
10118  046432  042110  006524  000012
10119
10120  046440  044122  047123  020040  DH16:   .ASCIZ  /RHSN    RHOF    RHCA    RHCC    STATUS/<15><12>
10121  046446  020040  044122  043117
10122  046454  020040  020040  044122
10123  046462  040503  020040  020040
10124  046470  044122  041503  020040
10125  046476  020040  052123  052101
10126  046504  051525  005015     000
10127
10128          046512                          .EVEN
10129
10130  046512  001256  030536  030540  DT2:    .WORD   DRIVE,RPEFRS,RPERRS+2,RPERRS+4,RPERRS+6,ATTN,0
10131  046520  030542  030544  001260
10132  046526  000000
10133
10134  046530  001256  035724  035726  DT3:    .WORD   DRIVE,RD.ADR,RD.WRD,0
10135  046536  000000
10136
10137  046540  001256  036126  036124  DT4:    .WORD   DRIVE,WRT.AD,WRT.WD,RD.WRD,0
10138  046546  035726  000000
10139
10140  046552  037332  037342  037344  DT14.0: .WORD   BLK0+$RHCS1,BLK0+$RHCS2,BLK0+$RHDS1,BLK0+$RHER1
10141  046560  037346
10142  046562  037372  037374  037376          .WORD   BLK0+$RHER2,BLK0+$RHER3,BLK0+$RHEC1,BLK0+$RHEC2,0
10143  046570  037400  000000
10144  046574  037570  037600  037602  DT14.1: .WORD   BLK1+$RHCS1,BLK1+$RHCS2,BLK1+$RHDS1,BLK1+$RHER1
10145  046602  037604
10146  046604  037630  037632  037634          .WORD   BLK1+$RHER2,BLK1+$RHER3,BLK1+$RHEC1,BLK1+$RHEC2,0
10147  046612  037636  000000
10148  046616  040026  040036  040040  DT14.2: .WORD   BLK2+$RHCS1,BLK2+$RHCS2,BLK2+$RHDS1,BLK2+$RHER1
10149  046624  040042
10150  046626  040066  040070  040072          .WORD   BLK2+$RHER2,BLK2+$RHER3,BLK2+$RHEC1,BLK2+$RHEC2,0
10151  046634  040074  000000
10152  046640  040264  040274  040276  DT14.3: .WORD   BLK3+$RHCS1,BLK3+$RHCS2,BLK3+$RHDS1,BLK3+$RHER1
10153  046646  040300
10154  046650  040324  040326  040330          .WORD   BLK3+$RHER2,BLK3+$RHER3,BLK3+$RHEC1,BLK3+$RHEC2,0
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10155  046656  040332  000000
10156  046662  040522  040532  040534  DT14.4: .WORD   BLK4+$RHCS1,BLK4+$RHCS2,BLK4+$RHDS1,BLK4+$RHER1
10157  046670  040536
10158  046672  040562  040564  040566          .WORD   BLK4+$RHER2,BLK4+$RHER3,BLK4+$RHEC1,BLK4+$RHEC2,0
10159  046700  040570  000000
10160  046704  040760  040770  040772  DT14.5: .WORD   BLK5+$RHCS1,BLK5+$RHCS2,BLK5+$RHDS1,BLK5+$RHER1
10161  046712  040774
10162  046714  041020  041022  041024          .WORD   BLK5+$RHER2,BLK5+$RHER3,BLK5+$RHEC1,BLK5+$RHEC2,0
10163  046722  041026  000000
10164  046726  041216  041226  041230  DT14.6: .WORD   BLK6+$RHCS1,BLK6+$RHCS2,BLK6+$RHDS1,BLK6+$RHER1
10165  046734  041232
10166  046736  041256  041260  041262          .WORD   BLK6+$RHER2,BLK6+$RHER3,BLK6+$RHEC1,BLK6+$RHEC2,0
10167  046744  041264  000000
10168  046750  041454  041464  041466  DT14.7: .WORD   BLK7+$RHCS1,BLK7+$RHCS2,BLK7+$RHDS1,BLK7+$RHER1
10169  046756  041470
10170  046760  041514  041516  041520          .WORD   BLK7+$RHER2,BLK7+$RHER3,BLK7+$RHEC1,BLK7+$RHEC2,0
10171  046766  041522  000000
10172
10173  046772  037334  037336  037340  DT15.0: .WORD   BLK0+$RHWC,BLK0+$RHBA,BLK0+$RHDA,BLK0+$RHAS,BLK0+$RHLA
10174  047000  037350  037352
10175  047004  037354  037356  037360          .WORD   BLK0+$RHDB,BLK0+$RHMR,BLK0+$RHDT,0
10176  047012  000000
10177  047014  037572  037574  037576  DT15.1: .WORD   BLK1+$RHWC,BLK1+$RHBA,BLK1+$RHDA,BLK1+$RHAS,BLK1+$RHLA
10178  047022  037606  037610
10179  047026  037612  037614  037616          .WORD   BLK1+$RHDB,BLK1+$RHMR,BLK1+$RHDT,0
10180  047034  000000
10181  047036  040030  040032  040034  DT15.2: .WORD   BLK2+$RHWC,BLK2+$RHBA,BLK2+$RHDA,BLK2+$RHAS,BLK2+$RHLA
10182  047044  040044  040046
10183  047050  040050  040052  040054          .WORD   BLK2+$RHDB,BLK2+$RHMR,BLK2+$RHDT,0
10184  047056  000000
10185  047060  040266  040270  040272  DT15.3: .WORD   BLK3+$RHWC,BLK3+$RHBA,BLK3+$RHDA,BLK3+$RHAS,BLK3+$RHLA
10186  047066  040302  040304
10187  047072  040306  040310  040312          .WORD   BLK3+$RHDB,BLK3+$RHMR,BLK3+$RHDT,0
10188  047100  000000
10189  047102  040524  040526  040530  DT15.4: .WORD   BLK4+$RHWC,BLK4+$RHBA,BLK4+$RHDA,BLK4+$RHAS,BLK4+$RHLA
10190  047110  040540  040542
10191  047114  040544  040546  040550          .WORD   BLK4+$RHDB,BLK4+$RHMR,BLK4+$RHDT,0
10192  047122  000000
10193  047124  040762  040764  040766  DT15.5: .WORD   BLK5+$RHWC,BLK5+$RHBA,BLK5+$RHDA,BLK5+$RHAS,BLK5+$RHLA
10194  047132  040776  041000
10195  047136  041002  041004  041006          .WORD   BLK5+$RHDB,BLK5+$RHMR,BLK5+$RHDT,0
10196  047144  000000
10197  047146  041220  041222  041224  DT15.6: .WORD   BLK6+$RHWC,BLK6+$RHBA,BLK6+$RHDA,BLK6+$RHAS,BLK6+$RHLA
10198  047154  041234  041236
10199  047160  041240  041242  041244          .WORD   BLK6+$RHDB,BLK6+$RHMR,BLK6+$RHDT,0
10200  047166  000000
10201  047170  041456  041460  041462  DT15.7: .WORD   BLK7+$RHWC,BLK7+$RHBA,BLK7+$RHDA,BLK7+$RHAS,BLK7+$RHLA
10202  047176  041472  041474
10203  047202  041476  041500  041502          .WORD   BLK7+$RHDB,BLK7+$RHMR,BLK7+$RHDT,0
10204  047210  000000
10205
10206  047212  037362  037364  037366  DT16.0: .WORD   BLK0+$RHSN,BLK0+$RHOF,BLK0+$RHCA,BLK0+$RHCC,BLK0+$STATUS,0
10207  047220  037370  037164  000000
10208  047226  037620  037622  037624  DT16.1: .WORD   BLK1+$RHSN,BLK1+$RHOF,BLK1+$RHCA,BLK1+$RHCC,BLK1+$STATUS,0
10209  047234  037626  037422  000000
10210  047242  040056  040060  040062  DT16.2: .WORD   BLK2+$RHSN,BLK2+$RHOF,BLK2+$RHCA,BLK2+$RHCC,BLK2+$STATUS,0
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10211  047250  040064  037660  000000
10212  047256  040314  040316  040320  DT16.3: .WORD   BLK3+$RHSN,BLK3+$RHOF,BLK3+$RHCA,BLK3+$RHCC,BLK3+$STATUS,0
10213  047264  040322  040116  000000
10214  047272  040552  040554  040556  DT16.4: .WORD   BLK4+$RHSN,BLK4+$RHOF,BLK4+$RHCA,BLK4+$RHCC,BLK4+$STATUS,0
10215  047300  040560  040354  000000
10216  047306  041010  041012  041014  DT16.5: .WORD   BLK5+$RHSN,BLK5+$RHOF,BLK5+$RHCA,BLK5+$RHCC,BLK5+$STATUS,0
10217  047314  041016  040612  000000
10218  047322  041246  041250  041252  DT16.6: .WORD   BLK6+$RHSN,BLK6+$RHOF,BLK6+$RHCA,BLK6+$RHCC,BLK6+$STATUS,0
10219  047330  041254  041050  000000
10220  047336  041504  041506  041510  DT16.7: .WORD   BLK7+$RHSN,BLK7+$RHOF,BLK7+$RHCA,BLK7+$RHCC,BLK7+$STATUS,0
10221  047344  041512  041306  000000
10222
10223  047352     001     000     000  DF2:    .BYTE   1,0,0,0,0,0
10224  047355     000     000     000
10225
10226  047360     001     000     000  DF3:    .BYTE   1,0,0
10227
10228  047363     001     000     000  DF4:    .BYTE   1,0,0,0
10229  047366     000
10230
10231          047370                       .EVEN
10232
10233  047370  051120  051505  047105  LIN2C:  .ASCIZ  /PRESENT ORDER = /
10234  047376  020124  051117  042504
10235  047404  020122  020075     000
10236  047411     040  050040  042522  LIN2P:  .ASCIZ  /  PREVIOUS ORDER = /
10237  047416  044526  052517  020123
10238  047424  051117  042504  020122
10239  047432  020075     000
10240  047435     105  051122  051117  LIN2M:  .ASCIZ  /ERROR OCCURED DURING NON-DATA TRANSFER OPERATION/
10241  047442  047440  041503  051125
10242  047450  042105  042040  051125
10243  047456  047111  020107  047516
10244  047464  026516  040504  040524
10245  047472  052040  040522  051516
10246  047500  042506  020122  050117
10247  047506  051105  052101  047511
10248  047514  000116
10249  047516  020052  051105  047522  LIN2S:  .ASCIZ  @* ERROR AT BAD TRACK/SECTOR@
10250  047524  020122  052101  041040
10251  047532  042101  052040  040522
10252  047540  045503  051457  041505
10253  047546  047524  000122
10254  047552  051105  047522  020122  LINM3:  .ASCIZ  /ERROR AT C/
10255  047560  052101  041440     000
10256  047565     040  000124          T:      .ASCIZ  / T/
10257  047570  051120  051505  047105  LINN3:  .ASCIZ  /PRESENT ADDR = C/
10258  047576  020124  042101  051104
10259  047604  036440  041440     000
10260  047611     040  000123          S:      .ASCIZ  / S/
10261  047614  020040  050040  042522  LINP3:  .ASCIZ  /   PREV ADDR = C/
10262  047622  020126  042101  051104
10263  047630  036440  041440     000
10264  047635     123  040524  052122  LINS3:  .ASCIZ  /START CYL = /
10265  047642  041440  046131  036440
10266  047650  000040
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10267  047652  020040  047105  020104  LINEN3: .ASCIZ  /  END CYL = /
10268  047660  054503  020114  020075
10269  047666     000
10270  047667     040  040440  052103  LINA3:  .ASCIZ  /  ACTUAL CYL = /
10271  047674  040525  020114  054503
10272  047702  020114  020075     000
10273  047707     040  052040  045522  LINT3:  .ASCIZ  /  TRK = /
10274  047714  036440  000040
10275  047720  051040  041510  020101  LINCA3: .ASCIZ  / RHCA = /
10276  047726  020075     000
10277  047731     122  042110  020101  LINDA3: .ASCIZ  /RHDA = /
10278  047736  020075     000
10279  047741     122  041110  020101  LINB3:  .ASCIZ  /RHBA = /
10280  047746  020075     000
10281  047751     040  051040  053510  LINW3:  .ASCIZ  /  RHWC = /
10282  047756  020103  020075     000
10283  047763     123  040524  052122  LINST3: .ASCIZ  /START TRK = /
10284  047770  052040  045522  036440
10285  047776  000040
10286  050000  052123  051101  020124  LINSS3: .ASCIZ  /START SEC = /
10287  050006  042523  020103  020075
10288  050014     000
10289  050015     102  043125  042506  LINM4:  .ASCIZ  /BUFFER ADDR = /
10290  050022  020122  042101  051104
10291  050030  036440  000040
10292  050034  020040  044523  042532  LINS4:  .ASCIZ  /  SIZE = /
10293  050042  036440  000040
10294  050046  020040  041501  052524  LINX4:  .ASCIZ  /  ACTUAL NMBR WRDS XFRD = /
10295  050054  046101  047040  041115
10296  050062  020122  051127  051504
10297  050070  054040  051106  020104
10298  050076  020075     000
10299  050101     107  047517  020104  LIND5:  .ASCIZ  /GOOD DATA = /
10300  050106  040504  040524  036440
10301  050114  000040
10302  050116  020040  040502  020104  LINB5:  .ASCIZ  /  BAD DATA = /
10303  050124  040504  040524  036440
10304  050132  000040
10305  050134  020040  042523  052103  LINP5:  .ASCIZ  /  SECT POS = /
10306  050142  050040  051517  036440
10307  050150  000040
10308  050152  042510  042101  051105  LINS5:  .ASCIZ  /HEADER FROM ERROR SECTOR = /
10309  050160  043040  047522  020115
10310  050166  051105  047522  020122
10311  050174  042523  052103  051117
10312  050202  036440  000040
10313  050206  044122  041505  020061  LINEP5: .ASCIZ  /RHEC1 = /
10314  050214  020075     000
10315  050217     040  044122  041505  LINE05: .ASCIZ  / RHEC2 = /
10316  050224  020062  020075     000
10317  050231     123  041505  047524  LINB6:  .ASCIZ  /SECTOR IS ECC CORRECTABLE /
10318  050236  020122  051511  042440
10319  050244  041503  041440  051117
10320  050252  042522  052103  041101
10321  050260  042514  000040
10322  050264  042523  052103  051117  LINC6:  .ASCIZ  /SECTOR READ CORRECTLY /
```

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10323  050272  051040  040505  020104
10324  050300  047503  051122  041505
10325  050306  046124  020131     000
10326  050313     103  051117  042522  LING6:  .ASCIZ  /CORRECTED ON /
10327  050320  052103  042105  047440
10328  050326  020116     000
10329  050331     040  042522  051124  LINR6:  .ASCIZ  / RETRIES/
10330  050336  042511  000123
10331  050342  047125  047503  051122  LINU06: .ASCIZ  /UNCORRECTABLE AFTER /
10332  050350  041505  040524  046102
10333  050356  020105  043101  042524
10334  050364  020122     000
10335  050367     040  052040  052117  LIN7M:  .ASCIZ  /  TOTAL MISPOS ERR = /
10336  050374  046101  046440  051511
10337  050402  047520  020123  051105
10338  050410  020122  020075     000
10339  050415     117  042122  051105  LIN7O:  .ASCIZ  /ORDERS:/
10340  050422  035123     000
10341  050425     040  047524  040524  LIN7P:  .ASCIZ  / TOTAL SEEKS = /
10342  050432  020114  042523  045505
10343  050440  020123  020075     000
10344  050445     040  047524  040524  LIN7S:  .ASCIZ  / TOTAL SKI,OCYL ERR = /
10345  050452  020114  045523  026111
10346  050460  041517  046131  042440
10347  050466  051122  036440  000040
10348  050474  020040  051105  047522  LIN7T:  .ASCIZ  /  ERRORS:/
10349  050502  051522  000072
10350  050506  020040  051127  051504  LIN7X:  .ASCIZ  /  WRDS XFR:/
10351  050514  054040  051106  000072
10352  050522  020040  051127  051504  LIN7R:  .ASCIZ  /  WRDS READ:/
10353  050530  051040  040505  035104
10354  050536     000
10355  050537     104  043111  042506  LIN8M:  .ASCIZ  /DIFFERENT ERROR DURING RETRY/
10356  050544  042522  052116  042440
10357  050552  051122  051117  042040
10358  050560  051125  047111  020107
10359  050566  042522  051124  000131
10360  050574  040504  040524  041440  LIN9B:  .ASCIZ  /DATA COMPARISON ERRORS/
10361  050602  046517  040520  044522
10362  050610  047523  020116  051105
10363  050616  047522  051522     000
10364  050623     040  020040  020040  LIN9H:  .ASCII  /          GOOD    BAD/<15><12>
10365  050630  020040  020040  047507
10366  050636  042117  020040  020040
10367  050644  040502  006504     012
10368  050651     114  041517  020040          .ASCIZ  /LOC      DATA    DATA/<15><12>
10369  050656  020040  020040  040504
10370  050664  040524  020040  020040
10371  050672  040504  040524  005015
10372  050700     000
10373  050701     114  041517  020040  LIN9I:  .ASCIZ  /LOC      DATA/<15><12>
10374  050706  020040  020040  040504
10375  050714  040524  005015     000
10376  050721     124  052117  046101  LIN9E:  .ASCIZ  /TOTAL COMPARE ERRORS = /
10377  050726  041440  046517  040520
10378  050734  042522  042440  051122
```

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 10379  050742  051117  020123  020075
 10380  050750     000
 10381  050751     124  042510  042040  LIN9G:  .ASCIZ  /THE DATA COMPARED OK/<15><12>
 10382  050756  052101  020101  047503
 10383  050764  050115  051101  042105
 10384  050772  047440  006513  000012
 10385  051000  051105  047522  020122  LIN10A: .ASCIZ  /ERROR BURST BEGINS AT WORD /
 10386  051006  052502  051522  020124
 10387  051014  042502  044507  051516
 10388  051022  040440  020124  047527
 10389  051030  042122  000040
 10390  051034  044440  020116  040504  LIN10B: .ASCIZ  / IN DATA FIELD OF ERROR SECTOR/<15><12>
 10391  051042  040524  043040  042511
 10392  051050  042114  047440  020106
 10393  051056  051105  047522  020122
 10394  051064  042523  052103  051117
 10395  051072  005015     000
 10396  051075     105  051122  051117  LIN10C: .ASCII  /ERROR WAS NOT IN THE DATA READ - /<15><12>
 10397  051102  053440  051501  047040
 10398  051110  052117  044440  020116
 10399  051116  044124  020105  040504
 10400  051124  040524  051040  040505
 10401  051132  020104  020055  005015
 10402  051140  041505  020103  047503          .ASCIZ  /ECC CORRECTION CAN'T BE PERFORMED/
 10403  051146  051122  041505  044524
 10404  051154  047117  041440  047101
 10405  051162  052047  041040  020105
 10406  051170  042520  043122  051117
 10407  051176  042515  000104
 10408  051202  041505  020103  047503  LIN10H: .ASCII  /ECC CORRECTION RESULTS/<15><12>
 10409  051210  051122  041505  044524
 10410  051216  047117  051040  051505
 10411  051224  046125  051524  005015
 10412  051232  042101  051104  020040          .ASCIZ  /ADDR    BAD     CORRECTED /<15><12>
 10413  051240  020040  040502  020104
 10414  051246  020040  020040  047503
 10415  051254  051122  041505  042524
 10416  051262  020104  005015     000
 10417  051267     103  047117  042524  LIN11H: .ASCIZ  /CONTENTS OF ERROR SECTOR (REPORTED ABOVE)/<15><12>
 10418  051274  052116  020123  043117
 10419  051302  042440  051122  051117
 10420  051310  051440  041505  047524
 10421  051316  020122  051050  050105
 10422  051324  051117  042524  020104
 10423  051332  041101  053117  024505
 10424  051340  005015     000
 10425  051343     101  042104  020122          .ASCIZ  /ADDR    DATA/<15><12>
 10426  051350  020040  042040  052101
 10427  051356  006501  000012
 10428  051362  020040                  LIN4SP: .ASCII  /  /
 10429  051364     040                  LINSP:  .ASCII  / /
 10430  051365     040     000          LINSP0: .ASCIZ  / /
 10431  051367     125  044516  000124  UNTMSG: .ASCIZ  /UNIT/
 10432  051374  047440  043106  044514  UNTOFF: .ASCIZ  / OFFLINE/
 10433  051402  042516     000
 10434  051405     040  047117  044514  UNTON:  .ASCIZ  / ONLINE/
```

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10435  051412  042516     000
10436  051415     040  047516  020124  UNTNOT: .ASCIZ  / NOT BEING TESTED/
10437  051422  042502  047111  020107
10438  051430  042524  052123  042105
10439  051436     000
10440  051437     040  046101  042522  UNTASN: .ASCIZ  / ALREADY BEING TESTED/
10441  051444  042101  020131  042502
10442  051452  047111  020107  042524
10443  051460  052123  042105     000
10444  051465     040  047516  020124  NOTRP:  .ASCIZ  / NOT AN RP04/
10445  051472  047101  051040  030120
10446  051500  000064
10447  051502  047040  052117  050040  NOTPRS: .ASCIZ  / NOT PRESENT/
10448  051510  042522  042523  052116
10449  051516     000
10450  051517     040  047125  040523  NOTSAF: .ASCIZ  / UNSAFE/
10451  051524  042506     000
10452  051527     125  044516  020124  SYSTAT: .ASCIZ  /UNIT STATUS:/<15><12><12>
10453  051534  052123  052101  051125
10454  051542  006472  005012     000
10455  051547     104  044522  042526  STATHD: .ASCII  /DRIVE PERFORMANCE SUMMARY/<15><12>
10456  051554  050040  051105  047506
10457  051562  046522  047101  042503
10458  051570  051440  046525  040515
10459  051576  054522  005015
10460  051602  051104  020126  040520          .ASCIZ  /DRV PASS ORDERS   SEEKS   WRDS XFER   WRDS READ/
10461  051610  051523  047440  042122
10462  051616  051105  020123  020040
10463  051624  042523  045505  020123
10464  051632  020040  051127  051504
10465  051640  054040  042506  020122
10466  051646  020040  051127  051504
10467  051654  051040  040505  000104
10468  051662  051440  043117  [illegible]  STAHD1: .ASCIZ  / SOFT HARD  SKI MISP OTHER/<15><12>
10469  051670  040510  042122  [illegible]
10470  051676  045523  020111  [illegible]
10471  051704  050123  [illegible]
10472  051712  051105  005015     000
10473  051717     104  047117  006505  PDONE:  .ASCIZ  /DONE/<15><12><12>
10474  051724  005012     000
10475  051727     007  043077  052101  DROPNG: .ASCIZ  <07>/?FATAL OR EXCESSIVE ERRORS/
10476  051734  046101  047440  020122
10477  051742  054105  042503  051523
10478  051750  053111  020105  051105
10479  051756  047522  051522     000
10480  051763     105  042116  047440  ENDPAS: .ASCIZ  /END OF PASS/
10481  051770  020106  040520  051523
10482  051776     000
10483  051777     015  042412  042116  ENDTST: .ASCIZ  <15><12>/END OF TEST/
10484  052004  047440  020106  042524
10485  052012  052123     000
10486  052015     015  042012  044522  DEASSG: .ASCIZ  <15><12>/DRIVE DEASSIGNED/
10487  052022  042526  042040  040505
10488  052030  051523  043511  042516
10489  052036  000104
10490  052040  005015  025052  025052  DRNUM:  .ASCIZ  <15><12>/********** DRIVE #/
```

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10491  052046  025052  025052  025052
10492  052054  042040  044522  042526
10493  052062  021440     000
10494  052065     040  052123  051101  ASGND:  .ASCIZ  / STARTED/<15><12>
10495  052072  042524  006504  000012
10496  052100  005015  050122  032060  TITLE:  .ASCII  <15><12>/RP04 MULTI-DRIVE EXERCISER PROGRAM/
10497  052106  046440  046125  044524
10498  052114  042055  044522  042526
10499  052122  042440  042530  041522
10500  052130  051511  051105  050040
10501  052136  047522  051107  046501
10502  052144  005015  051450  047111          .ASCII  <15><12>@(SINGLE/DUAL PORT VERSION)@
10503  052152  046107  027505  052504
10504  052160  046101  050040  051117
10505  052166  020124  042526  051522
10506  052174  047511  024516
10507  052200  005015  040515  047111          .ASCIZ  <15><12>/MAINDEC-11-DERPN-B/<15><12><12>
10508  052206  042504  026503  030461
10509  052214  042055  051105  047120
10510  052222  041055  005015  000012
10511  052230  047077  052117  042440  NOTNUF: .ASCIZ  /?NOT ENOUGH MEMORY/<15><12>
10512  052236  047516  043525  020110
10513  052244  042515  047515  054522
10514  052252  005015     000
10515  052255     015  037412  023440  NEDCLK: .ASCIZ  <15><12>/? 'L' OR 'P' CLOCK REQUIRED ON SYSTEM/<15><12>
10516  052262  023514  047440  020122
10517  052270  050047  020047  046103
10518  052276  041517  020113  042522
10519  052304  052521  051111  042105
10520  052312  047440  020116  054523
10521  052320  052123  046505  005015
10522  052326     000
10523  052327     056     000          PERIOD: .ASCIZ  /./
10524  052331     077     000          QUES:   .ASCIZ  /?/
10525  052333     007  050077  [illegible]  PRTATN: .ASCIZ  <07>/?PRINTER REQUIRES MANUAL INTERVENTION/<15><12><12>
10526  052340  052116  051105  [illegible]040
10527  052346  050505  044525  042522
10528  052354  020123  040515  052516
10529  052362  046101  044440  [illegible]116
10530  052370  051105  042520  052116
10531  052376  047511  005516  005012
10532  052404     [illegible]
10533  052405     111  053116  046101  INVLD:  .ASCIZ  /INVALID COMMAND/<15><12>
10534  052412  042111  041440  046517
10535  052420  040515  042116  005015
10536  052426     000
10537  052427     015  042412  052116  ENTDAT: .ASCIZ  <15><12>/ENTER DATE: /
10538  052434  [illegible]105  042040  052101
10539  052442  035105  000040
10540  052446  047105  042524  020122  ENTID:  .ASCIZ  /ENTER OPERATOR I.D.: /
10541  052454  050117  051105  052101
10542  052462  051117  044440  042056
10543  052470  035056  000040
10544  052474  005015  047105  042524  ENTDRV: .ASCIZ  <15><12>/ENTER I.D. FOR DRV #/
10545  052502  020122  027111  027104
10546  052510  043040  051117  042040
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10547  052516  053122  021440     000
10548  052523     072  000040          COLON:  .ASCIZ  /: /
10549  052526  005015  040504  042524  DATEIS: .ASCIZ  <15><12>/DATE: /
10550  052534  020072     000
10551  052537     015  047412  042520  IDIS:   .ASCIZ  <15><12>/OPERATOR I.D.: /
10552  052544  040522  047524  020122
10553  052552  027111  027104  020072
10554  052560     000
10555  052561     015  005012  051104  HEDLIN: .ASCIZ  <15><12><12>/DRV  DRV I.D./<15><12>
10556  052566  020126  042040  053122
10557  052574  044440  042056  006456
10558  052602  000012
10559  052604  047516  042516  005015  NONE:   .ASCIZ  /NONE/<15><12>
10560  052612     000
10561  052613     102  042101  052040  ENTADR: .ASCIZ  @BAD TRK/SEC ADRS FOR DRV #@
10562  052620  045522  051457  041505
10563  052626  040440  051104  020123
10564  052634  047506  020122  051104
10565  052642  020126  000043
10566  052646  020077  047111  040526  BADENT: .ASCIZ  /? INVALID ENTRY/<15><12>
10567  052654  044514  020104  047105
10568  052662  051124  006531  000012
10569  052670  005015  051120  043517  INTDON: .ASCIZ  <15><12>/PROGRAM INITIALIZATION COMPLETE/<15><12><12>
10570  052676  040522  020115  047111
10571  052704  052111  040511  044514
10572  052712  040532  044524  047117
10573  052720  041440  046517  046120
10574  052726  052105  006505  005012
10575  052734     000
10576          052736          .EVEN
10577
10578  052736  053204  PARLST: .WORD   PAR1          ;PARAMETER ENTRY LIST
10579  052740  001300         .WORD   MAXDL         ;LOCATION
10580  052742  053214         .WORD   PAR2          ;PARAMETER NAME
10581  052744  001304         .WORD   INTRVL
10582  052746  053424         .WORD   PAR19
10583  052750  001276         .WORD   PASCNT
10584  052752  053224         .WORD   PAR3
10585  052754  001306         .WORD   CMPLMT
10586  052756  053234         .WORD   PAR4
10587  052760  001324         .WORD   MAXCYL
10588  052762  053244         .WORD   PAR5
10589  052764  001326         .WORD   MINCYL
10590  052766  053254         .WORD   PAR6
10591  052770  001330         .WORD   MAXTRK
10592  052772  053264         .WORD   PAR7
10593  052774  001332         .WORD   MINTRK
10594  052776  053274         .WORD   PAR8
10595  053000  001334         .WORD   MAXSEC
10596  053002  053304         .WORD   PAR9
10597  053004  001336         .WORD   MINSEC
10598  053006  053404         .WORD   PAR17
10599  053010  001342         .WORD   BEGCOD
10600  053012  053414         .WORD   PAR18
10601  053014  001340         .WORD   BEGPAT
10602  053016  177777         .WORD   -1
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10603  053020  053374                          .WORD   PAR16
10604  053022  001322                          .WORD   ENDET
10605  053024  053314                          .WORD   PAR10
10606  053026  001310                          .WORD   FORMAT
10607  053030  053324                          .WORD   PAR11
10608  053032  001170                          .WORD   $RPADR
10609  053034  053334                          .WORD   PAR12
10610  053036  001172                          .WORD   $RPVEC
10611  053040  053344                          .WORD   PAR13
10612  053042  001312                          .WORD   SAVLOD
10613  053044  053354                          .WORD   PAR14
10614  053046  001314                          .WORD   RATIO
10615  053050  053364                          .WORD   PAR15
10616  053052  001316                          .WORD   AUTOCK
10617  053054  053434                          .WORD   PAR20
10618  053056  001320                          .WORD   NOTPRT
10619  053060  000000                          .WORD   0               ;TABLE TERMINATOR
10620
10621  053062  047105  042524  020122  ASKPAR: .ASCIZ  /ENTER PARAMETERS:  /
10622  053070  040520  040522  042515
10623  053076  042524  051522  020072
10624  053104  000040
10625  053106  005015  051105  047522  NGPAR:  .ASCIZ  <15><12>/ERROR IN PARAMETER:  /
10626  053114  020122  047111  050040
10627  053122  051101  046501  052105
10628  053130  051105  020072  000040
10629  053136  020055  042522  042455  REPAR:  .ASCIZ  /- RE-ENTER PARAMETERS/<15><12>
10630  053144  052116  051105  050040
10631  053152  051101  046501  052105
10632  053160  051105  006523  000012
10633  053166  020040  034050  020051  OCT8:   .ASCIZ  /  (8) /
10634  053174     000
10635  053175     040  030450  024460  DEC10:  .ASCIZ  / (10) /
10636  053202  000040
10637
10638  053204  040515  042130  020114  PAR1:   .ASCIZ  /MAXDL  /
10639  053212  000040
10640  053214  047111  051124  046126  PAR2:   .ASCIZ  /INTRVL /
10641  053222  000040
10642  053224  046503  046120  052115  PAR3:   .ASCIZ  /CMPLMT /
10643  053232  000040
10644  053234  040515  041530  046131  PAR4:   .ASCIZ  /MAXCYL /
10645  053242  000040
10646  053244  044515  041516  046131  PAR5:   .ASCIZ  /MINCYL /
10647  053252  000040
10648  053254  040515  052130  045522  PAR6:   .ASCIZ  /MAXTRK /
10649  053262  000040
10650  053264  044515  052116  045522  PAR7:   .ASCIZ  /MINTRK /
10651  053272  000040
10652  053274  040515  051530  041505  PAR8:   .ASCIZ  /MAXSEC /
10653  053302  000040
10654  053304  044515  051516  041505  PAR9:   .ASCIZ  /MINSEC /
10655  053312  000040
10656  053314  047506  046522  052101  PAR10:  .ASCIZ  /FORMAT /
10657  053322  000040
10658  053324  051044  040520  051104  PAR11:  .ASCIZ  /$RPADR /
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 10659  053332  000040
 10660  053334  051044  053120  041505  PAR12:  .ASCIZ  /$RPVEC /
 10661  053342  000040
 10662  053344  040523  046126  042117  PAR13:  .ASCIZ  /SAVLOD /
 10663  053352  000040
 10664  053354  040522  044524  020117  PAR14:  .ASCIZ  /RATIO  /
 10665  053362  000040
 10666  053364  052501  047524  045503  PAR15:  .ASCIZ  /AUTOCK /
 10667  053372  000040
 10668  053374  047105  042504  020124  PAR16:  .ASCIZ  /ENDET  /
 10669  053402  000040
 10670  053404  042502  041507  042117  PAR17:  .ASCIZ  /BEGCOD /
 10671  053412  000040
 10672  053414  042502  050107  052101  PAR18:  .ASCIZ  /BEGPAT /
 10673  053422  000040
 10674  053424  040520  041523  052116  PAR19:  .ASCIZ  /PASCNT /
 10675  053432  000040
 10676  053434  047516  050124  052122  PAR20:  .ASCIZ  /NOTPRT /
 10677  053442  000040
 10678
 10679                                          .EVEN
 10680
 10681                                  ;;**************************************************************
 10682
 10683                                  .SBTTL  PATCH AREA
 10684
 10685                                  ;;**************************************************************
 10686
 10687  053444  000100                          .BLKW   100                     ;PATCH AREA
 10688
 10689                                  ;;**************************************************************
 10690
 10691  053644  000000  000000  000000  CYLDER: .WORD   0,0,0,0          ;HEADER BUFFER FOR 'READHD' ROUTINE
 10692  053652  000000
 10693
 10694          053654                  ENDPGM  =       .                       ;LAST LOCATION OF PROG + 2
 10695
 10696          000001                          .END
```

```
ABNRML  023704          3363    6017#
ACK   = 000123          2677#
ACTDRV  030632          7320#   7580*   7614*   7911*   7920*   8184
ACTSTR  030633          7326#   8186*   8201*
ASGND   052065          3243   10494#
ASGN0   022140          5716#   5860    5866
ASGN1   022154          5720#
ASGN2   022210          5719    5728#   5731
ASGN3   022232          5725    5728    5733#   5756
ASGN4   022342          5732    5734    5753#
ASGN5   022352          5754    5757#
ASGN6   022360          5740    5759#
ASGN7   022370          5741    5761#
ASKPAR  053062          3011   10621#
ASNERR  023562          5725    5796    5814    5988#
ASNLST  041640          3250*   5415    5423    5723    5733    5783    5785*   5807    5817    5836    6002*   6073*   9372#
ASNMSG  023612          5721*   5759*   5768*   5770*   5772*   5795*   5813*   5994#
ATABIT  030702          7332#   7547    7640    7732    8047    8093    8121    8129    8137    8154    8258
ATTN    001260          2767#   6334*  10130
AUTOCK  001316          2902#   4537    4803    7959   10616
AVAIL   041714          3204    3244    3248*   3251    3275    3277    3309    3318    3319    3366    9384#
BADENT  052646          5941   10566#
BADPAR  002710          3071    3078    3082    3086    3090    3094    3098    3102    3106    3122    3126#
BEGCOD  001342          2836#   3107    3109    3111    3113    3115    3117    3255    3256   10599
BEGPAT  001340          2835#   3103    3258   10601
BEGSIZ  001344          2843#   3072    3074*   3260    3261
BIT0  = 000001          2646#
BIT00 = 000001          2636#   2646    4659    5781
BIT01 = 000002          2635#   2645    4535    4682
BIT02 = 000004          2634#   2644    4087    4654
BIT03 = 000010          2633#   2643    3529    3882    8068    8373
BIT04 = 000020          2632#   2642    3529    3538    8104
BIT05 = 000040          2631#   2641    3983    7477    7861    8083    8232
BIT06 = 000100          2630#   2640    3588    3589    3686    3701    6562    7554    7621    7669    7950    8428
BIT07 = 000200          2629#   2639    3430    3541    7554    7806    7932    8068    8083    8104    8133
BIT08 = 000400          2628#   2638    3544    7554    8245
BIT09 = 001000          2627#   2637    3444    8230
BIT1  = 000002          2645#
BIT10 = 002000          2626#   3442    3556    3564    6699    7849
BIT11 = 004000          2625#   3440    3559    7523    7650    7823    8155
BIT12 = 010000          2624#   3438    3567    3588    3589    3618    3799    3803    3837    4099    4662    7519    7538
                        7554    7629    8094    8429
BIT13 = 020000          2623#   3547    3854    3950    6706    7611    8318
BIT14 = 040000          2622#   3417    3419    3446    3532    3535    3573    3724    3770    3812    3918    3933    7627
                        7647    8040    8171    8288    8325    8329    8426
BIT15 = 100000          2621#   3415    3573    3588    3663    3699    3950    7611    7627    7629    7647    7823    7849
                        7950    8068    8083    8094    8104    8171    8230    8245    8288    8295
BIT2  = 000004          2644#   3448    8295
BIT3  = 000010          2643#   3550
BIT4  = 000020          2642#   3776
BIT5  = 000040          2641#   3553    4998    7987
BIT6  = 000100          2640#   3618
BIT7  = 000200          2639#   3614    3818    4485
BIT8  = 000400          2638#   3729    3753    3760    3790    3797    3950
BIT9  = 001000          2637#   3562    3950
BLKADR  042124          2963    5743    5744    5787    5810    9417#
```

```
BLK0    037146          5414    5833    8700*   9418    10140   10142   10173   10175   10206
BLK1    037404          9782*   9419    10144   10146   10177   10179   10208
BLK2    037642          8864*   9420    10148   10150   10181   10183   10210
BLK3    040100          8946*   9421    10152   10154   10185   10187   10212
BLK4    040336          9026*   9422    10156   10158   10189   10191   10214
BLK5    040574          9110*   9423    10160   10162   10193   10195   10216
BLK6    041032          9192*   9424    10164   10166   10197   10199   10218
BLK7    041270          9274*   9425    10168   10170   10201   10203   10220
BPTVEC= 000014          2653*
BUFTBL  042002          2991*   2992*   2993*   2994*   2996*   2999*   3001*   3005    3007    3050*   3052*   3066    4556
                        4559    4561    4577*   4593    4594    4606*   4611*   4612    4620    4621    4634*   9395*
CI1     032140          7663    7690*
CI2     032150          7692*
CI3     032246          7665    7713*
CI4     032354          7654    7734*
CI5     032732          7712    7733    7811*   7820
CI6     032754          7750    7760    7762    7764    7816*
CI7     032770          7617    7702    7706    7710    7718    7727    7731    7742    7749    7755    7759    7773    7779
                        7783    7793    7804    7819    7821*   7906    7936    8117
CI78    033006          7822    7825*   8118
CI8     033060          7828    7837*   8005    8280
CKAOR   002346          3066*
CKBUS   010574          3422    4069*
CKCLK   020260          3140    5376*
CKCLK1  020354          5378    5389*
CKCLK2  020422          5390    5398*
CKCLK3  020440          5388    5397    5402*
CKERR   010474          3421    4048*
CKFMT   006624          3540    3753*
CKHCE   007024          3543    3790*
CKPAR   002414          3073    3075*
CKPTR   020212          3137    5364*
CKPTR1  020244          5365    5370*
CKPTR2  020250          5359    5371*
CLKFLG  00121C          2752*   4980    5376*   5381*   5392*   5600
CLOCK   021432          5384    5394    5610*
CLROPB  013272          4507*   5745
CLRQUE  036642          7459    7860    8255    8496*
CMCNT   011420          4096*   4097*   4106    4108    4111*   4168    4193*
CMCYL   011422          4098*   4099*   4114    4180*   4194*
CMDAT   011142          4113    4130    4134*
CMHED   011046          4114*
CMPAR   010660          3425    4087*
CMPARD  010710          3648    4094*
CMFLMT  001306          2788*   4101    10565
CMPRES  015322          3223    3290    3310    3320    3344    3370    3377    3408    4865*   4868
CMPRT   011426          4132    4146    4156    4166    4200*
CMPRX   011400          4127    4129    4169    4182*
CMSEC   011424          4100*   4117    4172*   4173    4175*   4195*
CMSTR   010770          4103*   4171    4174    4178    4181
CMTRK   011425          4176*   4177    4179*   4196*
COLON   052523          5877    10548*
COMTBL  042144          3257    4848    9427*
CONVEA  023432          5909    5917    5927    5955*
CR      = 000015        2561*
CRLF    = 000200        2562*
```

```
CYLDER  053644          3799*  3800   3803*  3837*  5103   5211   5214   5217   5220   9356   10691*
DATAPK  023026          5697   5859*
DATAO   042712          9552   9555*
DATAI   042752          9537   9538   9539   9540   9541   9542   9543   9544   9545   9546   9547   9548   9549
                        9550   9551   9553   9572*
DATE    001234          2762*  2974*  2975*  2976*  2977*  5824   5827
DATEIS  052526          5826   10549*
DCKER   005476          3572   3580*
DCKER1  005514          3584*  3872
DDISP = 177570          2568*  2730   2943
DERASGN 022452          5687   5778*
DERASSG 052015          3219   10486*
DEC10   053175          3037   10635*
DF2     047352          2878   2899   10223*
DF3     047360          2885   10226*
DF4     047363          2892   10228*
DH14    046235          5024   10094*
DH15    046341          5030   10108*
DH16    046440          5034   10120*
DH2     046073          2876   2897   10073*
DH3     046150          2883   10082*
DH4     046176          2890   10087*
DISPLA  001142          2730*  2943*  2951*  6698*
DISPLY= 104412          3460   3490   3508   3519   3583   3652   3657   3665   3681   3720   3744   3766   3808
                        3834   3849   3871   3877   3895   3905   3914   3929   3945   3965   3976   3995   4007
                        4012   4013   4014   4017   4020   4023   4026   4029   4032   4035   4038   4059   4077
                        4224   4229   4230   4231   4244   4247   4250   4257   4261   4314   4319   4351   4354
                        4357   4360   4363   4366   4369   4372   4374   4375   4409   4415   4420   4422   4502
                        4979   4982   4983   4984   4989   4990   4994   5000   5001   5007   5012   5013   5023
                        5024   5025   5026   5030   5034   5044   5046   5054   5056   5060   5067   5069   5073
                        5078   5083   5089   5094   5097   5102   5105   5109   5122   5125   5128   5133   5137
                        5138   5143   5144   5149   5156   5159   5160   5163   5168   5171   5174   5179   5190
                        5194   5203   5205   5210   5213   5216   5219   5222   5223   5228   5231   5232   5235
                        5240   5241   5246   5249   5251   5256   5261   5265   5266   5271   5276   5281   5284
                        5289   5234   5295   5303   5308   5313   5316   5319   5320   5328   6285   6443   7209*
DISPRE  000174          2696*  2951
DONE    005202          3432   3529*
DPINT   030606          7280*  7486   7489   7565*  7590   7595   7982   8020   8161   8163*  8222   8260   8272
                        8282*
DPRQS   030616          7293*  7599   7673*  8023   8175*  8224   8253   8274   8291*
DRIVE   001256          2766*  6335*  10130  10134  10137
DRNUM   052040          3456   3478   3504   6008   6049   6053   10490*
DROP    023622          3466   3514   6000*  6020
DROPNG  051727          6007   10475*
DRVACT  030546          7240*  7607   7767*  7814*  7831*  7841   7852*  7925*  7992   8053   8066   8098*  8105*
                        8114   8128*  8233*  8239   8246*
DRVCLR= 000111          2672*
DRVER   006572          3576   3743*
DRVINT  031160          7479   7512*  7593   8145   8164   8237
DRVQUE  036744          7602   7619   7965   8536*
DRVSTA  030556          3150   5739   7254*  7469*  7470*  7471*  7472*  7496*  7513*  7556*  7558*  7564*  7586
                        7597   7625   7644   7768*  7980   8030   8038   8091*  8099*  8166   8283*
DRVTYP  030566          3158   3160   3162   5762   5764   5766   7267*  7516*  7529*
DSWR  = 177570          2567*  2729   2942
DTEER   007440          3569   3868*
DTUM    030700          5735   7386*  7465   7656   7711*  7832   7835*  7844   7858*  7914   7926*  8026   8227
```

```
                        8242    8253*   8264    8323
DT14.T  042566          5020    9503#
DT14.0  046552          9503   10140#
DT14.1  046574          9504   10144#
DT14.2  046616          9505   10148#
DT14.3  046640          9506   10152#
DT14.4  046662          9507   10156#
DT14.5  046704          9508   10160#
DT14.6  046726          9509   10164#
DT14.7  046750          9510   10168#
DT15.T  042606          5021    9512#
DT15.0  046772          9512   10173#
DT15.1  047014          9513   10177#
DT15.2  047036          9514   10181#
DT15.3  047060          9515   10185#
DT15.4  047102          9516   10189#
DT15.5  047124          9517   10193#
DT15.6  047146          9518   10197#
DT15.7  047170          9519   10201#
DT16.T  042626          5022    9521#
DT16.0  047212          9521   10206#
DT16.1  047226          9522   10208#
DT16.2  047242          9523   10210#
DT16.3  047256          9524   10212#
DT16.4  047272          9525   10214#
DT16.5  047306          9526   10216#
DT16.6  047322          9527   10218#
DT16.7  047336          9528   10220#
DT2     046512          2877    2898   10130#
DT3     046530          2884   10134#
DT4     046540          2891   10137#
DUNIT   041650          3197    5787*   6004*   6075*   9376#
ECBAD0  012600          4332*   4355    4384#
ECBAD1  012606          4346*   4367    4387#
ECBIT   012564          4306*   4307*   4308    4309*   4326    4328*   4378#
ECC     012024          3641    4290#
ECCX    012556          4362    4373    4375#
ECC1    012422          4339    4345    4351#
ECC2    012552          4323    4374#
ECGD    012576          4383#
ECGD1   012604          4386#
ECMSK0  012570          4324*   4329*   4334    4336    4380#
ECMSK1  012572          4325*   4330*   4338    4347    4349    4381#
ECSEC   012566          4290*   4299*   4302*   4304*   4320    4379#
ECWRD   012574          4308*   4310*   4311*   4312*   4313*   4315    4320*   4321    4332    4335    4336*   4337*   4340
                        4352    4358    4382#
ECWRD1  012602          4333*   4340*   4341*   4342    4344*   4346    4348    4349*   4350*   4361    4364    4370    4385#
EMPTYQ  036724          7829    7951    8106    8173    8296    8521#
EMTVEC= 000030          2656#   2934*   2935*   2956*
EM1     043712          2868    9833#
EM10    044202          3471    9871#
EM11    044245          3477    9878#
EM12    044300          3455    3460    9884#
EM13    044331          3490    9890#
EM14    044403          3503    3508    9899#
EM15    044425          3519    9904#
```

DERPNB.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
EM2     043762          2875    9841#
EM20    044461          3720    9910#
EM21    044502          3583    9914#
EM22    044533          3681    9920#
EM23    044606          3665    9929#
EM24    044665          3766    9938#
EM25    044733          3808    9946#
EM26    045014          3914    9956#
EM27    045041          3929    9961#
EM3     044007          2882    9846#
EM30    045076          3744    9967#
EM31    045130          3849    9973#
EM32    045173          3871    9980#
EM33    045226          3877    9986#
EM34    045303          3976    9995#
EM35    045345          3895   10002#
EM36    045403          3905   10009#
EM4     044065          2889    9855#
EM40    045434          3945   10015#
EM41    045472          4077   10021#
EM42    045536          4224   10028#
EM43    045613          4007    4012   10037#
EM44    045660          4059   10045#
EM5     044143          2896    9864#
EM50    045744          3965   10054#
EM51    046012          3834   10062#
EM60    046055          3995   10069#
ENDCMP  011702          4182    4255#
ENDCON  001266          2777#   6027    6030
ENDET   001322          2811#   6025   10604
ENDPAS  051763          6039   10480#
ENDPGM= 053654          2988    2992    2994    4646   10694#
ENDSEK  001272          2779#   6033    6036
ENDTST  051777          6048   10483#
ENTAOR  052613          5892   10561#
ENTDAT  052427          2971   10537#
ENTDRV  052474          5871   10544#
ENTID   052446          2978   10540#
ENTPAR  002152          3015    3022#   3132
ENTPR   002250          3026    3046#   6381    6422
ERCTR   011414          3649    4040*   4094*   4131*   4142    4155*   4191#   4255    4258
ERENTR  025256          6334#   6695
ERPRC1  004560          3431    3436#   3658    4503
ERPROC  004544          3414    3418    3420    3430#
ERRVEC= 000004          2649#   2940    2941*   2952*   5365*   5366*   5371*   5378*   5379*   5390*   5402*   7007    7008
                        7012*   7013*   7020*   7021*
FACTOR  013502          4529*   4530*   4532*   4533    4543    4551#
FALPAR  004752          3443    3476#
FALPR1  004762          3472    3478#
FILBUF  014072          3297    3331    4646#
FILLO   025131          6255*   6265    6299#
FMTER   007634          3762    3913#
FORMAT  001310          2789#   3119    3386    4816   10606
FRSTER  011407          3647*   4004    4043*   4093*   4158    4186#   4202    4220    4232*
GENOPB  041526          3624*   3628    4427*   4428*   4430    4438*   4439*   4441    4443    4449*   4450*   4452    4459*
                        4460*   4461*   4462*   4463*   4465    4467    5737*   9356#
```

```
GENREG  041546          3760    3797    9358    9360#
GETADR  023132          5747    5889#
GETBUF  013504          3294    3327    3608    4555#
GETDEC  025442          3038    6386#
GETID   023052          5746    5870#
GETOCT  025304          3043    6344#
GETPAR  015124          3292    4835#
GETPAT  015076          3399    4794    4824#   4829    4911
GETREG= 000141          2679#
GETREM  024176          4720    4736    4746    4756    4766    4802    4825    6080#
GETREQ  037020          7641    7846    7943    8034    8058    8116    8170    8229    8244    8285    8292    8557#
GETROS  037130          8621#
GETRIS  037124          7494    7560    7613    7667    7863    7919    8200    8277    8413    8512    8620#
GNS   = ******  U       2695    7198    7199    7200    7201    7202    7205    7206    7207    7208    7209
GODRIV  014340          3298    3332    3610    3689    4478    4700#
HCEER   007712          3804    3928#
HCRCER  006442          3546    3717#   3755    3792
HEDLIN  052561          5832   10555#
HOLD    023556          5911    5913    5915    5920    5922    5924    5930    5932    5934    5955*   5964    5966*   5967
                        5968#   5969#   5970#   5975#   5977#   5983#
HOUR    021702          2967#   4982    5603    5632#   5633    5635    5637#   5638#   5640#   5652#
HT    = 000011          2559#
HZ      001222          2757#   2965    5613
IAEER   007554          3558    3894#
IDIS    052537          5830   10551#
IDLE    004150          3276    3321    3330    3349#
IDLE1   004256          3354    3372#
INCHRO  021262          3632    5554#
INCMIS  021332          3839    5578#
INCSKI  021306          3969    5566#
INCSOF  021236          3640    3646    3727    3774    3816    5542#
INCTOT  021356          3464    3481    3494    3512    3523    3633    3651    3656    3671    3707    3710    3728    3747
                        3775    3817    3840    3853    3881    3898    3907    3922    3937    3949    3968    3980    3998
                        4063    4081    4262    5590#
INTDON  052670          3180   10569#
INTRVL  001304          2786#   2970#   3061#   3131#   5623#   5643    5645    5647#   10581
INVLD   052405          5703   10533#
IOTVEC= 000020          2654#
ISR     033364          7474    7911#
KIPAR0= ******  U       7003
KSR     021722          5665#   6586
LA      033226          7660    7876#
LACNT   030644          7345#   7884#   7885    7902#
LA30    001224          2758#   5448    5488
LF    = 000012          2560#
LIMIT   011416          4101#   4102#   4192#   4234    4236#
LINA3   047667          5102   10270#
LINB3   047741          5122   10279#
LINB5   050116          5194   10302#
LINB6   050231          5240    5256   10317#
LINCA3  047720          5160   10275#
LINC6   050264          5246   10322#
LINDA3  047731          5156   10277#
LIND5   050101          5190   10299#
LINEN3  047652          5097   10267#
LINE05  050217          5232   10315#
```

```
LINEPS  050206          5228   10313#
LINE1   016002          3459    3489    3507    3518    3582    3662    3713    3743    3765    3807    3833    3848    3870
                        3876    3894    3904    3913    3928    3944    3964    3975    3994    4006    4058    4076    4223
                        4976#
LINE2   016046          3461    3491    3509    3520    3584    3667    3682    3721    3745    3767    3809    3835    3850
                        3878    3896    3906    3915    3930    3946    3966    3977    3996    4008    4060    4078    4225
                        4989#   5329
LINE2A  016172          4999    5002    5010#
LINE2B  016210          5011    5014#
LINE3   016420          3462    3492    3510    3521    3585    3668    3683    3722    3746    3768    3810    3851    3916
                        3931    3947    3997    4061    5054#
LINE3A  016426          3978    4009    4226    5056#
LINE3B  016600          3967    5088#
LINE3C  016612          3836    5091#
LINE3D  016734          4079    5120#
LINE3E  017002          3879    5133#
LINE3F  017104          3897    5154#
LINE4   017156          3463    3493    3511    3522    3586    3669    3684    3723    3769    3811    3852    3880    3917
                        3932    3948    3979    4010    4062    4080    4227    5168#
LINE5   017256          3670    3685    3726    3772    3814    3920    3935    5190#
LINE5A  017356          3773    3815    3838    3921    3936    5210#
LINE5B  017450          3639    5228#
LINE6   017512          3591    5240#
LINE6A  017524          3645    5246#
LINE6B  017552          3638    5256#
LINE6C  017562          3675    3694    3703    3733    3780    3822    3858    3886    3956    3986    5261#
LINE6D  017612          3643    3677    3736    3783    3825    3861    3889    3958    3989    5271#
LINE7   017622          3465    3495    3513    3524    3634    3653    3708    3711    3734    3737    3748    3781    3784
                        3823    3826    3859    3862    3887    3899    3908    3923    3938    3959    3987    3999    4064
                        4082    4263    4499    5276#
LINE7A  017750          3841    3970    5303#
LINE8   020070          3631    3705    4498    5328#
LING6   050313          5261   10326#
_INKDV  024224          4295    4398    4778    5201    6083    6093#
LINKML  024474          6176#
LINM3   047552          5054   10254#
LINM4   050015          5168   10289#
LINN3   047570          5056   10257#
LINP3   047614          5069   10261#
LINPS   050134          5203   10305#
LINR6   050331          5265   10329#
LINSP   051364          4017    4023    4029    4035    4244    4247    4354    4357    4360    4366    4369    4372    4415
                        5026    5044    5137    5143    5159    5213    5216    5219    5222    5231    5463    5467    5471
                        5476    5481    5492   10429#
LINSP0  051365          5486    5497    5501    5505    5509    5894   10430#
LINSS3  050000          5144   10286#
LINST3  047763          5138   10283#
LINS3   047635          5094    5133   10264#
LINS4   050034          5171   10292#
LINS5   050152          5210   10308#
LINT3   047707          5105   10273#
LINU06  050342          5271   10331#
LINW3   047751          5125   10281#
LINX4   050046          5174   10294#
LIN10A  051000          4314   10385#
LIN10B  051034          4313   10390#
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LIN1OC  051075          4374   10396#
LIN1OH  051202          4351   10408#
LIN11H  051267          4409   10417#
LIN2C   047370          4990   10233#
LIN2M   047435          5001   10240#
LIN2P   047411          4994   10236#
LIN2S   047516          5013   10249#
LIN3.1  016432          5055    5057#
LIN3.2  016714          5096    5099    5104    5108    5112#   5173    5178    5204    5264    5283    5315    5318
LIN3.3  016622          5088    5091    5094#
LIN3.4  016654          5092    5102#
LIN4SP  051362          3149    5453    5491    5841   10428#
LIN4.1  017236          5124    5127    5170    5182#
LIN6.1  017530          5247#   5257
LIN6.2  017566          5262#   5272
LIN7M   050367          5313   10335#
LIN7O   050415          5276    5303   10339#
LIN7P   050425          5308   10341#
LIN7R   050522          5289   10352#
LIN7S   050445          5316   10344#
LIN7T   050474          5281   10348#
LIN7X   050506          5284   10350#
LIN8M   050537          3657    4502    5328   10355#
LIN9B   050574          4229   10360#
LIN9E   050721          4257   10376#
LIN9G   050751          3652   10381#
LIN9H   050623          4231   10364#
LIN9I   050701          4014   10373#
LKPAR   002124          3003    3006    3011#   3018
MAIN    003206          3181    3189#   3378    4898
MAIN1   003352          3203    3228#
MAIN2   003622          3238    3273#   3311    3345
MAIN3   004050          3274    3325#
MATCH   011746          4134    4270#
MAXCYL  001324          2822#   3075    3079    4752    4886   10587
MAXDL   001300          2782#   3002    3004*   3005    3007*   3066    3068    3072    3074    3395    3397    4650    4764
                        4791    4793    4899    4900   10579
MAXER   001302          2785#   3062*   6019
MAXSEC  001334          2826#   3091    3095    4732   10595
MAXTRK  001330          2824#   3083    3087    4742    4889   10591
MCPEMX  030712          7404#   8309
MEMERR  020102          2990    5340#
MINCYL  001326          2823#   3079    3254    4753    4757    4893   10589
MINSEC  001336          2827#   3095    3252    4733    4737    4892   10597
MINTRK  001332          2825#   3087    3253    4743    4747    4891   10593
MINUTE  021706          2968#   4983    5604    5624*   5625    5627*   5628*   5629    5631*   5654#
MNDLTA  030726          7416#   7900
MXDLTA  030724          7414#   7898
MXLACT  030722          7412#   7885
MXWNDW  030730          7418#   7720
M.DPID  024316          6106    6125#
M.DPIM  024556          6187    6206#
M.DP01  024566          6209#   6218
M.DP02  024606          6213    6217#
M.DP40  024354          6136#   6157
M.DP41  024410          6141    6148#
```

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M.DP42  024420          6147   6152#
M.DP44  024452          6159   6164#
M.DP50  024464          6134   6168#
NEDCLK  052255          5399  10515#
NEWASN  022134          5683   5715#
NEWUNT  041672          3232   3248   3249#  5743#  9380#
NGPAR   053106          3127  10625#
NOMTCH  010262          4004#  4136
NONE    052604          5844  10559#
NOTNUF  052230          5341  10511#
NOTPRS  051502          3166   5770  10447#
NOTPRT  001320          2806#  4959  10618
NOTRP   051465          3164   5768  10447#
NOTSAF  051517          3168   5772  10450#
NRML    023726          3364   6025#
NRMLX   024174          6032   6035   6037   6069   6076#
NRML1   023760          6026   6029   6033#
NRML2   024002          4894   6028   6031   6034   6038#
OCNT    025130          6257#  6286#  6298#
OCT8    053166          3042  10633#
OFFCOD  042232          3624   9447#
OFFSET= 000115          2674#  4450
OFFST   013040          3627   4449#
OFLIN   005060          3447   3502#
OFMSG0  042260          9455   9463#
OFMSG1  042313          9456   9468#
OFMSG2  042347          9457   9473#
OFMSG3  042403          9458   9478#
OFMSG4  042437          9459   9483#
OFMSG5  042473          9460   9488#
OFMSG6  042530          9461   9493#
OFMTBL  042242          5248   9455#
OMODE   025132          6256#  6261   6264#  6275#  6300#
OPERID  001246          2764#  2981#  2982#  2983#  5828   5831
OPIER   007330          3549   3846#
OPIER1  007374          3855#
OPMNEM  042152          5006   9434#
OPT     031730          7609   7638#  7946   8138   8176
ORDERQ  041616          2961   3299   3333   3352   9368#
PACK    001232          2761#  3058#  5715#  5749   5751   5859#  5865#
PARER   007462          3552   3876#
PARLST  052736          3024  10578#
PARQ    041760          3284   3305   3339   3372   3374   3376   3402   9391#
PAR1    053204          3070  10578  10638#
PAR10   053314         10605  10656#
PAR11   053324         10607  10658#
PAR12   053334         10609  10660#
PAR13   053344         10611  10662#
PAR14   053354          3101  10613  10664#
PAR15   053364         10615  10666#
PAR16   053374         10603  10668#
PAR17   053404          3121  10598  10670#
PAR18   053414          3105  10600  10672#
PAR19   053424         10582  10674#
PAR2    053214         10580  10640#
PAR20   053434         10617  10676#
```

DERPNB.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

```
FAR3     053224          10584   10642#
PAR4     053234           3077   10586   10644#
PAR5     053244           3081   10588   10646#
PAR6     053254           3085   10590   10648#
PAR7     053264           3089   10592   10650#
PAR8     053274           3093   10594   10652#
PAR9     053304           3097   10596   10654#
PASCNT   001276           2781#   6046   10583
PC     =%000007           2580#   2987*   3038*   3043*   3137*   3140*   3141*   3179*   3195*   3220*   3223*   3282*   3290*
                          3291*   3292*   3294*   3297*   3298*   3310*   3320*   3327*   3331*   3332*   3344*   3359*   3361*
                          3363*   3364*   3370*   3371*   3375*   3377*   3391*   3399*   3408*   3409*   3421*   3422*   3425*
                          3426*   3450*   3459*   3461*   3462*   3463*   3464*   3465*   3481*   3485*   3489*   3491*   3492*
                          3493*   3494*   3495*   3498*   3507*   3509*   3510*   3511*   3512*   3513*   3518*   3520*   3521*
                          3522*   3523*   3524*   3525*   3566*   3580*   3581*   3582*   3584*   3585*   3586*   3587*   3591*
                          3595*   3598*   3608*   3610*   3627*   3631*   3632*   3633*   3634*   3635*   3636*   3637*   3638*
                          3639*   3640*   3641*   3643*   3645*   3646*   3648*   3651*   3653*   3654*   3655*   3656*   3662*
                          3667*   3668*   3669*   3670*   3671*   3673*   3675*   3677*   3679*   3680*   3682*   3663*   3684*
                          3685*   3689*   3694*   3703*   3705*   3707*   3708*   3709*   3710*   3711*   3712*   3713*   3717*
                          3718*   3719*   3721*   3722*   3723*   3726*   3727*   3728*   3731*   3733*   3734*   3735*   3736*
                          3737*   3738*   3739*   3743*   3745*   3746*   3747*   3748*   3749*   3758*   3759*   3763*   3764*
                          3765*   3767*   3768*   3769*   3772*   3773*   3774*   3775*   3778*   3780*   3781*   3782*   3783*
                          3784*   3785*   3786*   3795*   3796*   3805*   3806*   3807*   3809*   3810*   3811*   3814*   3815*
                          3816*   3817*   3820*   3822*   3823*   3824*   3825*   3826*   3827*   3828*   3832*   3833*   3835*
                          3836*   3838*   3839*   3840*   3841*   3842*   3846*   3847*   3848*   3850*   3851*   3852*   3853*
                          3856*   3858*   3859*   3860*   3861*   3862*   3863*   3864*   3868*   3869*   3870*   3876*   3878*
                          3879*   3880*   3881*   3884*   3886*   3887*   3888*   3889*   3894*   3896*   3897*   3898*   3899*
                          3900*   3904*   3906*   3907*   3908*   3909*   3913*   3915*   3916*   3917*   3920*   3921*   3922*
                          3923*   3924*   3928*   3930*   3931*   3932*   3935*   3936*   3937*   3938*   3939*   3940*   3944*
                          3946*   3947*   3948*   3949*   3954*   3956*   3958*   3959*   3960*   3964*   3966*   3967*   3968*
                          3969*   3970*   3971*   3975*   3977*   3978*   3979*   3980*   3981*   3984*   3986*   3987*   3988*
                          3993*   3994*   3996*   3997*   3998*   3999*   4000*   4006*   4008*   4009*   4010*   4016*   4019*
                          4022*   4025*   4028*   4031*   4034*   4037*   4044*   4058*   4060*   4061*   4062*   4063*   4064*
                          4065*   4076*   4078*   4079*   4080*   4081*   4082*   4083*   4089*   4092*   4116*   4119*   4122*
                          4125*   4132*   4133*   4134*   4136*   4146*   4156*   4166*   4182*   4183*   4204*   4205*   4212*
                          4213*   4218*   4219*   4223*   4225*   4226*   4227*   4233*   4240*   4243*   4246*   4249*   4251*
                          4259*   4260*   4262*   4263*   4264*   4286*   4295*   4317*   4318*   4353*   4356*   4359*   4365*
                          4368*   4371*   4376*   4398*   4412*   4417*   4423*   4432*   4445*   4454*   4471*   4478*   4497*
                          4498*   4499*   4501*   4525*   4549*   4569*   4616*   4656*   4681*   4687*   4712*   4716*   4720*
                          4723*   4736*   4746*   4756*   4766*   4769*   4778*   4782*   4794*   4797*   4802*   4820*   4825*
                          4828*   4831*   4842*   4861*   4869*   4873*   4882*   4894*   4911*   4914*   4920*   4923*   4942*
                          4966*   4985*   4993*   4997*   5009*   5027*   5033*   5036*   5038*   5043*   5047*   5058*   5059*
                          5063*   5064*   5065*   5066*   5068*   5071*   5072*   5076*   5077*   5081*   5082*   5084*   5088*
                          5090*   5091*   5096*   5099*   5100*   5104*   5108*   5110*   5113*   5114*   5116*   5124*   5127*
                          5129*   5135*   5136*   5141*   5142*   5147*   5148*   5150*   5158*   5162*   5164*   5170*   5173*
                          5178*   5180*   5183*   5184*   5186*   5193*   5196*   5201*   5204*   5206*   5212*   5215*   5218*
                          5221*   5224*   5230*   5234*   5236*   5242*   5252*   5264*   5267*   5279*   5280*   5283*   5287*
                          5288*   5292*   5293*   5299*   5306*   5307*   5311*   5312*   5315*   5318*   5324*   5329*   5330*
                          5360*   5372*   5403*   5422*   5429*   5439*   5443*   5456*   5465*   5466*   5469*   5470*   5474*
                          5475*   5479*   5480*   5484*   5485*   5495*   5496*   5499*   5500*   5503*   5504*   5507*   5508*
                          5515*   5516*   5518*   5526*   5531*   5535*   5547*   5559*   5571*   5583*   5595*   5606*   5683*
                          5687*   5691*   5697*   5701*   5711*   5725*   5727*   5728*   5730*   5738*   5745*   5746*   5747*
                          5758*   5760*   5774*   5796*   5797*   5811*   5814*   5823*   5855*   5884*   5947*   5996*   6013*
                          6021*   6056*   6076*   6083*   6087*   6106*   6116*   6167*   6170*   6187*   6196*   6220*   6248*
                          6295*   6307*   6322*   6327*   6338*   6339*   6380*   6421*   6447*   6483*   6490*   6495*   6538*
                          6543*   6563*   6572*   6586*   6695*   6708*   6769*   6994*   7025*   7062*   7067*   7102*   7105*
                          7134*   7158*   7161*   7459*   7488*   7495*   7521*   7609*   7617*   7623*   7641*   7646*   7654*
```

```
                        7563*  7665*  7668*  7671*  7690*  7774*  7805*  7809*  7810*  7815*  7824*  7829*  7836*
                        7846*  7850*  7860*  7862*  7864*  7906*  7916*  7918*  7941*  7942*  7943*  7946*  7951*
                        7952*  7974*  7996*  7997*  8008*  8019*  8034*  8035*  8036*  8045*  8058*  8074*  8092*
                        8106*  8116*  8120*  8132*  8136*  8138*  8147*  8170*  8172*  8173*  8176*  8229*  8231*
                        8244*  8255*  8280*  8285*  8292*  8296*  8297*  8313*  8333*  8335*  8367*  8414*  8435*
                        8513*  8525*  8563*  8580*
PCLOCK  001206          2751*  5377*  5382*
PDONE   051717         10473*
PERIOD  052327         10523*
PIRQ  = 177772          0566*
PIRQVE= 000240          2660*
POPQUE  037042          7646   7690   7805   8132   8572*
PCSER   007254          3802   3832*
PRESET= 000121          2676*
PREVST  015624          4842   4882   4918*
PROCES  004460          3361   3413*
PRTATN  052333          6525  10525*
PRTBAD  012610          3587   3635   3981   4391*
PRTIM   005144          3449   3518*
PRTOCT  024740          4016   4019   4022   4025   4028   4031   4034   4037   4243   4246   4249   4353   4356
                        4359   4365   4366   4371   4412   4417   5043   5158   5162   5193   5196   5212   5215
                        5218   5221   5230   5234   6255*
PRT2B   016416          3362*  4961*  5010   5050*  5542   5554   5566   5578   5590
PR0   = 000000          2583*
PR1   = 000040          2584*
PR2   = 000100          2585*
PR3   = 000140          2586*
PR4   = 000200          2587*
PR5   = 000240          2588*
PR6   = 000300          2589*
PR7   = 000340          2590*
PS    = 177776          2563*  2564   3057*  6304   6305*  6317*  6321   6326   7457   7458*  7485*  7493*  7578
                        7579*  7615*  7639   7666*  7891*  8212   8213*  8278*
PSW   = 177776          2564*
PUNSAF  004654          3439   3454*
PWRVEC= 000024          2655*
QCNT    036250          8438*  8497   8521*  8536   8538*  8558   8572*
QDRV0   036442          8449   8460   8469   8481*
QDRV1   036462          8450   8461   8470   8482*
QDRV2   036502          8451   8462   8471   8483*
QDRV3   036522          8452   8463   8472   8484*
QDRV4   036542          8453   8464   8473   8485*
QDRV5   036562          8454   8465   8474   8486*
QDRV6   036602          8455   8466   8475   8487*
QDRV7   036622          8456   8467   8476   8488*
QINPT   036360          8449*  8523   8540*  8541*  8542   8544*
QOUTPT  036400          8460*  8523*  8561   8574   8575*  8576   8578*
QSTART  036420          8469*  8503   8508   8544   8578
QSTOP   036422          8470*  8542   8576
QTERM = 036642          8477   8489*
QUES    052331          5990  10524*
RANWRT  014772          4723   4801*
RATIO   001314          2793*  3099   4721  10614
RDCHR = 104406          6627   7205*
RDDAT = 000171          2686*  9431
RDHD  = 000173          2687*  4463   4906   9432
```

```
RDLIN = 104407          2972    2979    3012    5878    5904    6345    6387    7206#
RD.ADR  035724          9311*   8312*   8314#  10134
RD.RP   035700          7525    7542    7548    7753    7777    7791    7878    7892    7934    8003    8060    8070    8085
                        8217    8266    8309#   8357    8370    8376
RD.RP1  035722          8313#   8337
RD.RP2  036024          8309*   8336#
RD.RP3  036030          8328    8338#
RD.WRD  035726          8315#   8316   10134   10137
READDR  020124          3391    3598    3758    3795    4920    4942    5063    5348#
READHD  013064          3759    3796    4459#
RECAL = 000107          2671#   4439
RECALT  013006          3832    4438#
RECRLO  013012          4439#   5738
RED%PX  023040          5701    5865#
REFMT   004310          3382#   3636    3654    3712    3739    3785    3827    3863    3939
REFMTX  004456          3383    3385    3387    3404    3409#
REL   = 000113          2673#
RELBUF  013644          3371    3595    4592#
REPAR   053136          3130   10629#
RESREG= 104411          7066    7133    7208#
RESVEC= 000010          2650#
RETRY   013146          3673    3731    3778    3820    3856    3884    3954    3984    4478#   4496
RHAS  = 000016          7429#   7547*   7995*   7999    8047*   8093*   8121*   8137*   8154*   8257
RHBA  = 000004          7424#
RHCA  = 000034          7436#   7705    7717    7748
RHCC  = 000036          7437#   7879
RHCS1 = 000000          7422#   7536    7709    7730    7772    7792    7803    7818    7827    7935    8004    8077    8267
                        8358
RHCS2 = 000010          7426#   7477*   7517*   7519    7601*   7694*   7714*   7735*   7861*   7877*   7933*   7987*   8059*
                        8140*   8153*   8216*   8232*   8396*   8403    8424*   8429
RHDA  = 000006          7425#   7701    7726    7741
RHFB  = 000022          7431#   8400
RHDS1 = 000012          7427#   7543    7563*   7649*   8061    8086    8141    8218
RHDT  = 000026          7433#   7526
RHEC1 = 000044          7440#
RHEC2 = 000046          7441#   8411
RHER1 = 000014          3760    3797    7428#   7549    8071    8142    8371
RHER2 = 000040          7438#   8143
RHER3 = 000042          7439#   8144
RHLA  = 000020          7430#   7893
RHMR  = 000024          7432#
RHOF  = 000032          7435#   7540    7754    7758    7778    7782
RHSN  = 000030          7434#
RHWC  = 000002          7423#
RNOP  = 000101          2668#
RPADR   030714          3138*   7408#   7476    7585    7592    7693    7713    7734    7838    7876    7913    8215    8311
                        8317    8331    8366    8395    8423
RPERRS  030536          7230#   7460    8040    8043    8141*   8142*   8143*   8144*  10130
RPINIT  030732          3141    7456#
RPTMR   035126          5642    8184#
RPVEC   030716          3139*   7409#   7473    7475    7579    8213
RPZERO  024652          6225    6227    6229    6231#
RPZRC   024736          6224*   6226*   6228*   6230*   6243    6250#
RPOA    031442          4429    4440    4451    4464    4702    7578#
RSTART  002302          2958    3017    3047    3051    3056#
RTC   = 000117          2675#   4428
```

```
RTNCTR  012762          4427#
R0      =%000000        2571#  3218*  3251*  3252*  3253*  3254*  3255*  3257#  3258*  3259*  3260*  3261*  3262#
                        3263*  3264   3266*  3277*  3278   3280   3285   3295*  3302   3303   3308   3325#  3328#
                        3336   3337   3342   3353*  3355   3374*  3388*  3392*  3393*  3394*  3397*  3398*  3400#
                        3401*  3405   3413   3415   3417   3419   3430   3437   3438   3440   3442   3444   3446
                        3448   3529   3532   3535   3538   3541   3544   3547   3550   3553   3556   3559   3562
                        3564   3567   3570   3573   3588*  3589   3593*  3599*  3600*  3601*  3602   3604*  3605#
                        3606*  3609*  3611   3614   3616   3618   3620*  3621*  3626*  3663   3666*  3672*  3686
                        3688*  3690   3693*  3696*  3697*  3699   3701   3724   3729*  3730*  3753   3770   3776*
                        3777*  3790   3800   3812   3818*  3819*  3854*  3855*  3882*  3883*  3918   3933   3950
                        3952*  3953*  3982*  3983*  4048   4050   4052   4054   4056   4069   4071   4073   4074
                        4087   4095   4096   4097   4098   4100   4106   4110   4111   4112   4170   4290   4291
                        4292   4294   4300   4306   4321   4324   4342   4393   4394   4395   4397   4405   4413
                        4427   4429*  4438   4440*  4449   4451*  4461   4462   4464*  4479   4482*  4485   4487
                        4489   4492   4494*  4495*  4511   4529   4530   4533*  4534*  4535   4539   4541*  4542*
                        4543*  4544*  4545   4547*  4548*  4562   4571   4573*  4574   4575*  4596   4598   4604
                        4605   4609   4610   4617   4618   4646   4650   4654   4657   4658   4659   4661   4663
                        4669   4682   4684   4685   4688*  4689*  4700   4701   4702*  4705*  4706*  4707*  4708
                        4710*  4711*  4728*  4738*  4748*  4758*  4759   4771*  4775   4784   4790*  4793*  4795*
                        4796*  4810   4812*  4813*  4819*  4836*  4837   4839*  4840*  4843*  4846*  4847   4848*
                        4849*  4850*  4851*  4852*  4853*  4854*  4855*  4856   4858*  4859*  4874   4876   4878
                        4881*  4883*  4884*  4885*  4886   4889   4891*  4892*  4893*  4899*  4900*  4901*  4902
                        4904*  4905*  4906*  4908*  4909*  4910*  4912*  4913*  4921*  4922*  4936   4938   4992
                        4996   4998   5016   5057   5070   5075   5080   5095   5098   5107   5123   5126   5134
                        5140   5146   5157   5161   5169   5172   5175   5176   5191*  5192   5195   5197   5198
                        5200   5229   5233   5263   5278   5282   5286   5291   5305   5310   5314   5317   5349
                        5354   5359   5408   5414*  5418*  5425*  5427   5430*  5436*  5464   5510   5511   5512
                        5513   5514   5523   5528   5529   5534*  5544   5546*  5556   5558*  5568   5570*  5580
                        5582*  5592   5594*  5610   5642*  5649*  5666   5710*  5744*  5748*  5751*  5810*  5880*
                        5881*  5882*  5898   6001   6004   6010   6019   6027   6030   6033   6036   6040   6043
                        6046   6059   6068*  6072   6075   6099   6104*  6109*  6132*  6133*  6139*  6144*  6146*
                        6149*  6151*  6161*  6162*  6177   6195*  6206*  6209*  6215*  6216*  6231   6232*  6233
                        6235*  6236*  6238   6240*  6241*  6246*  6346*  6347   6348   6350   6354   6373*  6388*
                        6389   6390   6392   6395   6414*  6435   6436*  6437   6439   6441*  6442   6445*  6475
                        6476*  6477   6480*  6529   6530*  6532   6535*  6725   6726*  6727*  6734*  6735*  6736*
                        6737*  6738*  6739   6744   6750   6752*  6753   6767*  6862   6872*  6876   6892   6893
                        6906*  6934   6959*  6973   6976*  6979*  6983*  6986*  6939   6993*  7005   7009*  7019
                        7024*  7042*  7043   7061*  7065*  7123*  7127   7137*  7139*  7141*  7171   7172*  7173
                        7174*  7175   7179*  7180*  7181*  7456*  7479*  7494*  7496*  7512*  7525*  7535*  7539*
                        7542*  7548*  7559   7560*  7561*  7581*  7582   7593*  7602*  7612   7613*  7616*  7619*
                        7639*  7660*  7667*  7700*  7704*  7708*  7716*  7725*  7729*  7740*  7747*  7753*  7757*
                        7771*  7777*  7781*  7791*  7802*  7817*  7826*  7837*  7863*  7878*  7892*  7903   7904
                        7905*  7907*  7912*  7919*  7934*  7965*  8003*  8060*  8070*  8076*  8085*  8145*  8164*
                        8187*  8194*  8200*  8203*  8214*  8217*  8237*  8266*  8271   8277*  8279*  8312   8320
                        8321*  8338*  8340*  8353   8357*  8364*  8365*  8370*  8375   8376*  8381*  8382*  8383
                        8384*  8392*  8413*  8496*  8512*  8546   8547*  8608*  8627*
R1      =%000001        2572#  3204*  3205   3207   3209*  3211*  3212   3214   3216*  3218   3222*  3256*  3257
                        3284*  3285   3287   3309*  3319*  3343*  3352*  3353   3357*  3358   3365*  3369   3376*
                        3402*  3403   3405   3407*  3594*  3623*  3624   4015   4018   4021   4024   4027   4030
                        4033   4036   4039*  4095*  4114   4117   4120   4123   4140   4152   4161   4208   4210*
                        4217*  4241   4248   4270   4272*  4278   4285*  4393*  4402*  4404*  4407*  4411   4413
                        4416   4555   4561*  4562   4566*  4568*  4570   4571*  4574*  4581   4583*  4584*  4592
                        4593*  4599   4601*  4604*  4605*  4609*  4610*  4615*  4617*  4618*  4625   4633   4635
                        4637*  4638*  4657*  4661*  4662*  4663*  4664*  4665*  4673*  4690*  4693*  4865*  4867*
                        4933   4935*  4936*  4938   4943   4945   4949   4953*  4954   4965*  5247*  5248   5383*
                        5384*  5385*  5393*  5394*  5395*  5667   5709*  5889   5897*  5898*  5899*  5902*  5915*
```

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                    5924*  5934*  5937*  5939*  5940*  5946*  6098   6105*  6107   6110*  6131*  6138*  6143*
                    6148*  6160*  6178   6194*  6207*  6210*  6214*  6335   6352*  6360*  6362*  6364*  6367*
                    6370   6395*  6397   6399   6407*  6408   6749   6750*  6755   6759   6761   6766*  6863
                    6876*  6877   6881   6905*  6935   6958*  6974   6977*  6980*  6984*  6985*  6987*  6988*
                    6990   6992*  7006   7014*  7015   7016   7018*  7022   7023*  7044*  7050*  7056*  7119*
                    7123   7124*  7136*  7138*  7140*  7460*  7462*  7463   7466*  7467   7478*  7481*  7482*
                    7484*  7486   7489   7491*  7513*  7514   7517   7547   7556*  7558*  7564*  7565*  7584*
                    7586   7588   7590   7595   7597   7599   7601   7606*  7607   7625   7640   7644   7673*
                    7674   7694   7711   7714   7732   7735   7767*  7768*  7769*  7811*  7812*  7813*  7814*
                    7830*  7831*  7832   7839*  7841   7844   7852*  7853*  7854*  7856*  7877   7884*  7885
                    7902*  7914*  7925*  7927*  7928*  7929*  7933   7978*  7980   7982   7984*  7989*  7990*
                    7992   7998*  8001*  8012*  8015*  8020   8023   8026   8030   8032   8038   8047   8053
                    8055*  8056*  8057*  8059   8066   8091*  8093   8098*  8099*  8100*  8101*  8102*  8105*
                    8108   8111*  8114   8121   8125   8127*  8128*  8129   8137   8140   8150*  8151*  8152*
                    8153   8154   8157*  8158*  8159*  8161   8163*  8166   8175*  8188*  8196*  8198   8216
                    8222   8224   8227   8233*  8234*  8235*  8239   8242   8246*  8247*  8250*  8251   8258
                    8260   8262   8264   8272   8274   8282*  8283*  8291*  8424   8503*  8504   8508*  8509
                    8521*  8522*  8523*  8524*  8536   8538*  8539*  8540*  8541*  8542   8544*  8545*  8558
                    8560*  8561   8562*  8572*  8573*  8574   8575*  8576   8578*  8579*  8602   8626*
R2      =%000002    2573#  3229*  3244   3246*  3248*  3251   3267*  4040   4042*  4108*  4110*  4126*  4128
                    4147*  4410*  4418*  4559*  4564*  4579*  4585*  4594*  4602*  4607*  4619   4620*  4628*
                    4632*  4639*  4658*  4666*  4674*  4691*  4694*  4934   4937*  4956*  4964*  5409   5427*
                    5428*  5437*  5468   5472*  5473   5477*  5478   5482*  5483   5487*  5493*  5494   5498
                    5502   5506   5524   5529*  5530*  5533*  5668   5708*  5890   5905*  5906   5945*  5956
                    5958   5960   5962   5972   5973*  5980*  6097   6102*  6111*  6137*  6179   6183*  6188
                    6193*  6211*  6353*  6361*  6363*  6365*  6864   6875*  6879*  6882   6889*  6890*  6891
                    6896*  6904*  6936   6957*  6975   6978*  6981*  6991*  7041*  7044   7045*  7051*  7052*
                    7057*  7058*  7125*  7126   7127*  7142*  7143*  7461*  7463   7465*  7467   7582*  7583*
                    7584   7604   7611*  7627*  7629*  7642   7647*  7652   7691   7692   7707   7715   7719
                    7724   7736   7739   7746   7756   7780   7787   7789   7790   7806*  7821   7823*  7843*
                    7847   7849*  7881   7887   7930*  7932*  7944   7950*  7961   7963   7967*  7968*  7969*
                    7970*  7971*  7972*  7973*  7979*  7985*  8068*  8081   8083*  8094*  8104*  8133*  8168
                    8171*  8226*  8230*  8241*  8245*  8286   8288*  8293   8295*  8393   8396   8397*  8405*
                    8409*  8497*  8498*  8499*  8500*  8501*  8504*  8509*  8540   8557*  8561*  8574*  8603
                    8625*
R3      =%000003    2574#  3023*  3028*  3034   3145*  3173*  3196*  3201*  3228*  3236*  4139*  4149*  4277*
                    4280*  4508   4513*  4515*  4518*  4520*  4524*  4581*  4582*  4583   4584   4596*  4597*
                    4598*  4599   4672*  4676*  4678*  5410   5413*  5419*  5432*  5436*  5669   5707*  5717*
                    5722*  5753*  5781*  5789*  5798*  5816*  5820*  5835*  5849*  5891   5896*  5900*  5903*
                    5935*  5944*  6057   6061*  6064*  6067*  6096   6103*  6108   6112*  6136*  6155*  6158*
                    6164*  6180   6184*  6189   6192*  6212*  6258   6267*  6273*  6274*  6277*  6282*  6283*
                    6284   6293*  6622   6624*  6625   6628*  6629   6636*  6637   6639   6647   6649   6655
                    6657   6659*  6665*  6805   6814*  6820*  6821*  6824*  6829*  6830*  6831   6840*  6865
                    6873*  6874*  6888*  6891*  6900*  6901*  6903*  6937   6956*  7049*  7054*  7060*  7061
                    7122*  7135*  7142   7473*  7474*  7475*  7514*  7515*  7516*  7529*  7562*  7674*  7675*
                    7676*  7692*  7695*  7697   7698   7699   7703   7719*  7720*  7722*  7723   7736*  7737
                    7744   7751   7761   7763   7765   7770   7775   7785   7787*  7794*  7799   7801   7816
                    7840*  7851*  7855*  7887*  7888*  7889*  7890*  7895*  7897*  7898   7900   7999*  8010
                    8011*  8013   8016*  8189*  8190   8192*  8197   8236*  8248*  8249   8276*  8284*  8290*
                    8399*  8401   8408   8410   8411   8502*  8505*  8507*  8510*  8604   8624*
R4      =%000004    2575#  3024*  3025   3032   3144*  3150   3157*  3158   3160   3162   3169*  3176*  3230*
                    3235*  3240   3250*  4138   4271*  4273*  4274   4282*  4509   4511*  4512*  4514*  4517*
                    4519*  4523*  4622*  4623*  4624*  4625   4668*  4669*  4671   4679   5411   5412*  5415
                    5417*  5423   5431*  5435*  5461   5525   5527*  5528*  5532*  5670   5706*  5716*  5720*
                    5723   5733   5737   5739   5742*  5743*  5744   5752*  5755*  5761*  5762   5764   5766
                    5773*  5778*  5782*  5783   5785*  5786*  5787*  5788*  5791*  5803*  5806*  5807   5809*
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                    5810    5817    5819*   5834*   5836    5839    5852*   5873    5983    6000*   6001*   6002*   6003*
                    6004*   6058    6059*   6060*   6063*   6066*   6071*   6072*   6073*   6074*   6075*   6095    6101*
                    6113*   6126    6151    6162    6181    6185*   6191*   6216    6259    6261*   6262*   6263*   6264
                    6265*   6279    6281*   6289*   6292*   6806    6808*   6809*   6810*   6811    6812*   6826    6828*
                    6836*   6839*   6938    6955*   7047*   7050    7056    7058    7121*   7128*   7476*   7477*   7517*
                    7518*   7519    7523    7547*   7563*   7585*   7592*   7601*   7621    7649*   7650    7669    7693*
                    7694*   7696*   7697*   7698*   7713*   7714*   7734*   7735*   7838*   7861*   7876*   7877*   7913*
                    7933*   7948*   7953*   7954*   7987*   7995*   7999    8047*   8048*   8049*   8059*   8093*   8107*
                    8121*   8122*   8137*   8140*   8141    8142    8143    8144    8153*   8154*   8155    8215*   8216*
                    8232*   8257    8395*   8396*   8403    8407    8422    8423*   8424*   8425    8428*   8429    8433*
                    8434*   8605    8623*
R5      =%000005    2576#   2961*   2962*   2963    2973*   2974    2975    2976    2977    2980*   2981    2982    2983
                    3013*   3014    3016    3032*   3033    3039*   3044*   3197*   3198    3200*   3207    3214    3221*
                    3231*   3232    3234*   3248    3249*   3299*   3300    3302*   3305*   3306    3308*   3312*   3314
                    3316*   3318*   3333*   3334    3336*   3339*   3340    3342*   3366*   3367    3369*   3400    4138*
                    4140    4162    4209    4211*   4216*   4245    4274*   4278    4510    4522*   4621*   4622    4624
                    4627*   4633*   4635*   4636*   4637    4638    4671*   4673    4679*   4719*   4721    4725*   4726*
                    4727*   4728    4732*   4733*   4735*   4737*   4738    4742*   4743*   4745*   4747*   4748    4752*
                    4753*   4755*   4757*   4758    4764*   4765*   4767    4771    4772    4795    4801*   4806*   4808
                    4815*   4818*   4819    4824*   4826    4830*   4835    4847*   4848    4860*   4912    5014    5015*
                    5016*   5018    5019*   5020    5021    5022    5037*   5039*   5040    5042    5444*   5446*   5450*
                    5452*   5454*   5671    5672*   5674    5676    5678    5680*   5681    5685    5689    5693    5699
                    5705*   5718    5720    5779    5782    5793    5804    5806    5870    5879*   5880    5881    5882
                    5883*   5909*   5917*   5927*   5979*   5981*   6082    6084*   6094    6100*   6114*   6127    6148
                    6160    6182    6186*   6190*   6214    6260    6266*   6268*   6270*   6271*   6272*   6273    6291*
                    6306    6309*   6334    6807    6813*   6815*   6817*   6918*   6819*   6820    6838*   6866    6868*
                    6870*   6877*   6881*   6896    6902*   6939    6954*   7048*   7052    7059    7120*   7126*   7131*
                    7132    7528*   7529    7530    7532    7545*   7553*   7554*   7790*   7795    8043*   8050*   8063*
                    8073*   8079*   8088*   8096    8119*   8257*   8258    8400*   8401    8606    8622*
R6      =%000006    2577#   2928*   2929*   2930
R7      =%000007    2578#
S       047611      5067    5078    10260#
SAVEFG  030654      3142*   7360#   7807    7939    8134
SAVER1  011410      4104*   4161*   4189#   4200    4210    4214*
SAVERS  011412      4105*   4162*   4190#   4211    4215*
SAVLOD  001312      2791#   3046    10612
SAVREG= 104410      7040    7118    7207#
SAVR0S  037104      8601#
SAVR1S  037104      7456    7512    7581    7638    7837    7912    8187    8214    8392    8496    8602#
SC      033716      7918    7978#   7991
SCMND   022554      5691    5803#
SC1     033756      7989#   8007
SC1A    033776      7988    7995#
SC10    034600      8054    8119#
SC11    034626      8042    8067    8125#
SC12    034716      8036    8045    8120    8140#
SC13    034766      8022    8025    8150#
SC2     034012      7947    7949    7955    7981    7983    7998#
SC3     034064      8015#   8052    8103    8110    8112    8124    8139    8177
SC4     034060      8013#   8017
SC5     034076      8014    8020#
SC6     034246      8031    8053#
SC6A    034364      8044    8079#
SC7     034516      8069    8084    8095    8105#
SC8     034554      8062    8072    8078    8087    8113#   8149
SDETAL  020644      5429    5460#   5531
```

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SEARCH= 000131  2678#
SECOND  021712  2969*  4984  5605  5615*  5616  5618*  5619*  5620  5622*  5656#
SEEK  = 000105  2670#
SEEKFG  030656  7368#  7461  7658
SELDRV= 000145  2681#
SELPAR  014416  3291  3375  4716#
SEPART  023560  5908*  5958  5984#
SETFMT= 000143  2680#
SETVEC  002740  3108  3110  3112  3114  3116  3120  3137#
SET.IE  036276  7488  7521  7623  7671  7862  7996  8422#
SHDTYP  020572  5422  5443#  5526
SIXTEE  021720  2965*  2966*  5611*  5613*  5614*  5661#
SIZMEM  001770  2987#
SKIER   010074  3575  3964#
SP    =%000006  2579#  2932*  2940*  2948*  2952  2973  2980  3013  3033*  3039  3044  3056*  3070*
                3077*  3081*  3085*  3089*  3093*  3097*  3101*  3105*  3121*  3126  3189  3293*  3295
                3326*  3328  3349  3358*  3365  3389*  3390*  3392  3393  3596*  3597*  3599  3600
                3607*  3609  3756*  3757*  3793*  3794*  4015*  4018*  4021*  4024*  4027*  4030*  4033*
                4036*  4071*  4072*  4073*  4074  4208*  4209*  4216  4217  4241*  4242*  4245*  4248*
                4258*  4270*  4272  4284*  4285  4291*  4292*  4293*  4294*  4296  4298*  4299  4305*
                4315*  4316*  4334*  4335*  4337  4347*  4348*  4350  4352*  4355*  4358*  4364*  4367*
                4370*  4394*  4395*  4396*  4397*  4399  4401*  4402  4406*  4411*  4416*  4459  4460
                4469*  4470  4483*  4500  4508*  4509*  4510*  4522  4523  4524  4555*  4568  4570*
                4592*  4615  4619*  4630  4632  4700*  4705  4772*  4773*  4774*  4777*  4779*  4780
                4835*  4860  4897  4918*  4919*  4921  4922  4933*  4934*  4940*  4941*  4943  4947
                4949  4952  4962*  4964  4965  5014*  5037  5042*  5057*  5061*  5062*  5070*  5074*
                5075*  5079*  5080*  5095*  5098*  5103*  5106*  5107*  5112*  5115*  5123*  5126*  5134*
                5139*  5140*  5145*  5146*  5157*  5161*  5169*  5172*  5175*  5176*  5177*  5182*  5185*
                5192*  5195*  5197*  5198*  5199*  5200*  5202*  5211*  5214*  5217*  5220*  5229*  5233*
                5262*  5263*  5277*  5278*  5282*  5285*  5286*  5290*  5291*  5304*  5305*  5309*  5310*
                5314*  5317*  5348*  5349*  5350*  5352*  5353*  5354*  5355*  5357*  5359*  5370*  5389*
                5398*  5408*  5409*  5410*  5411*  5435  5436  5437  5438  5464*  5468*  5473*  5478*
                5483*  5494*  5498*  5502*  5506*  5510*  5511*  5512*  5513*  5514*  5523*  5524*  5525*
                5532  5533  5534  5610*  5641*  5649  5666*  5667*  5668*  5669*  5670*  5671*  5705
                5706  5707  5708  5709  5710  5731*  5757*  5870*  5873*  5874*  5875  5879  5883
                5889*  5890*  56 !*  5905  5944  5945  5946  5967*  5970  5971*  5972*  5974*  5975
                6040*  6057*  605B*  6066  6067  6080*  6081*  6082*  6084  6085  6094*  6095*  6096*
                6097*  6098*  6099*  6100  6102  6103  6107*  6108*  6109  6110  6111  6112  6113
                6114  6115*  6125*  6126*  6127*  6128*  ,129*  6130*  6131  6133  6135*  6140  6142*
                6143  6145*  6146  6150*  6152*  6153  6156*  6165*  6168*  6177*  6178*  6179*  6180*
                6181*  6182*  6184  6186  6188*  6189*  6190  6191  6192  6193  6194  6195  6208*
                6217*  6219  6231*  6232  6242  6246  6247*  6258*  6259*  6260*  6266  6291  6292
                6293  6294*  6304*  6320  6321*  6325  6326*  6329*  6344*  6346  6354*  6356  6358
                6366*  6367  6369  6370*  6372  6378*  6379*  6386*  6388  6394*  6401*  6402*  6403*
                6404*  6405*  6408*  6411*  6413  6419*  6420*  6435*  6436  6445  6446*  6475*  6476
                6477*  6479  6480  6481*  6484  6486*  6488*  6494  6526*  6529*  6530  6531  6532*
                6534  6535  6536*  6542  6568*  6569*  6574  6576  6582  6590  6607*  6608*  6611*
                6612*  6622*  6623*  6628  6631  6635*  6642  6646*  6664  6665  6666*  6667*  6668*
                6703  6725*  6730*  6749*  6755*  6759*  6766  6767  6797*  6798  6799  6800*  6805*
                6806*  6807*  6813  6838  6839  6840  6841*  6842*  6862*  6863*  6864*  6865*  6866*
                6867*  6868  6871*  6884  6886*  6888  6898  6900  6902  6903  6904  6905  6906
                6908*  6909*  6934*  6935*  6936*  6937*  6938*  6939*  6940*  6941*  6942*  6943*  6950*
                6951*  6952*  6953*  6954  6955  6956  6957  6958  6959  6973*  6974*  6975*  6991
                6992  6993  7005*  7006*  7007*  7008*  7009  7012  7019*  7020  7021  7023  7024
                7041  7043*  7100  7101*  7103*  7104*  7119  7132*  7156  7157*  7159*  7160*  7171*
                7172  7186*  7187*  7457*  7493  7528  7534*  7538*  7545  7551*  7578*  7615  7639*
```

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SW6    = 000100          2612#
SW7    = 000200          2611#   3384
SW8    = 000400          2610#
SW9    = 001000          2609#
SYSTAT  051527           3147   10452#
T       047565           5060    5073   10256#
TBITVE= 000014           2651#
TD      033434           7916    7925#   8029
TIMER   030660           7373#   7562#   7676#   7812#   7851#   7928#   8056#   8101#   8151#   8158#   8190    8192#   8248#
                         8276#   8284#   8290#
TITLE   052100           2954   10496#
TKVEC = 000060           2658#   6559#   6560#
TPVEC = 000064           2659#
TRAPVE= 000034           2657#   2936#   2937#   2957#
TRFER   007774           3537    3944#
TRNSWT  030626           7306#   7691#   7834#   7843    7859#   7930    7931#   8226    8241    8254#
TRTVEC= 000014           2652#
TYPDS = 104405           3036    6041    6760    7202#
TYPE  = 104401           2954    2971    2978    3011    3022    3030    3037    3042    3127    3128    3130    3146    3147
                         3148    3149    3170    3172    3178    3180    3219    3241    3242    3243    3454    3455    3456
                         3457    3458    3470    3471    3476    3477    3478    3479    3480    3502    3503    3504    3505
                         3506    4978    5340    5341    5342    5399    5462    5463    5467    5471    5476    5481    5486
                         5490    5491    5492    5497    5501    5505    5509    5517    5602    5603    5604    5605    5673
                         5703    5826    5827    5830    5831    5832    5840    5841    5844    5846    5848    5854    5871
                         5876    5877    5892    5893    5894    5895    5941    5990    5991    5992    5993    5995    6005
                         6006    6007    6008    6011    6012    6038    6039    6048    6049    6050    6051    6053    6054
                         6055    6070    6244    6374    6376    6415    6417    6525    6573    6575    6580    6634    6640
                         6645    6651    6653    6656    6660    6662    6701    6709    6724    6741    6743    6746    6748
                         6763    6768    6832    6907    7198#
TYPEST  021176           3220    5522#   5811    6056
TYPOC = 104402           3041    6732    6756    7199#
TYPON = 104404           7201#
TYPOS = 104403           7200#
TYPRI4  025134           5444    5446    5450    5452    5454    6304#
UCPAR   004740           3441    3470#
ULDFLG  030634           7333#   7588    7606#   7769#   7830#   7853#   8032    8108    8111#   8125    8127#   8234#   8247#
UNIT    001262           2768#   3143#   3148    3175#   3239#   3240#   3242    3436#   3437#   3457    3479    3505    5017#
                         5018#   5025    5460#   5461#   5462    5838#   5839#   5840    5872#   5875#   5876    5893    5988#
                         5989#   5992    6009#   6010#   6011    6042#   6043#   6050    6054
UNLOAD= 000103           2669#
UNSAF   010230           3531    3994#
UNTASN  051437           5721   10440#
UNTMSG  051367           3241    5991   10431#
UNTNOT  051415           5795    5813   10436#
UNTOFF  051374           3155    5759   10432#
UNTON   051405           3153   10434#
WAIT    041736           3211    3273    3314    3318#   3325    3343    9388#
WC      033610           7942    7959#
WCFER   010132           3555    3975#
WCKD  = 000151           2682#   9427
WCKER   006146           3534    3662#
WCKHD = 000153           2683#   9428
WLEER   007606           3561    3904#
WRTDAT= 000161           2684#   4910    9429
WRTHD = 000163           2685#   9430
WRTPK   015340           3282    4873#
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WRTPK1  015370          4875    4877    4881#
WRTPK2  015540          4880    4904#
WRTPK3  015564          4879    4903    4908#
WRTPK4  015616          4907    4913#
WRT.AD  036126          8353*   8366*   8369*  10137
WRT.RP  036036          7535    7539    7700    7704    7708    7716    7725    7729    7740    7747    7757    7771    7781
                        7802    7817    7826    8076    8351#
WRT.WD  036124          8351*   8355    8362*   8368*  10137
ZROIND  011406          4103*   4154*   4160*   4164    4185#
$AUTOB  001134          2726#
$BDADR  001122          2721#
$BCDAT  001126          2723#
$BDSEC= 000114          4935    5897    8674#   8675
$BELL   001160          2739#   4978    6580    6701    6716
$BUF  = 000006          3295*   3328*   3609*   4073    4095    4530    4598    4604    4609    4617    4646    4657    5169
                        5176    8641#   8642
$CKSWR= ****** U        7205
$CMTAG  001100          2709#   2927    2928    2938
$CM3  = 000000          2739#
$CNTLC  026563          6662    6673#
$CNTLU  026556          6651    6672#
$CODE = 000030          3255*   3264    4087    4112    4170    4300    4405    4535    4539    4654    4659    4682    4810
                        4812    4836    4846*   4856    4881    4905*   4909*   4992    7961    7963    7968    7971*   8651#
                        8652
$COMND= 000002          3257*   4428*   4439*   4450*   4463*   4848*   4906*   4910*   7972*   7973*   8638#   8639
$CRLF   001165          2741#   2955    3022    3146    3172    3178    3454    3458    3470    3476    3480    3502    3506
                        4013    4020    4026    4032    4038    4230    4250    4261    4363    4375    4420    4422    4979
                        4989    5000    5012    5023    5046    5083    5089    5109    5128    5149    5163    5179    5205
                        5223    5235    5241    5251    5266    5294    5295    5319    5320    5340    5342    5445    5451
                        5490    5517    5602    5673    5848    5854    5995    6005    6006    6012    6038    6051    6055
                        6070    6573    6709    6716    6724    6743    6748    6768
$CYL  = 000012          3254*   3601*   4098    4462*   4545    4661    4708    4839    4851*   4885*   4886    4893*   5134
                        7969    8644#   8645
$DBLK   027532          6873    6907    6915#
$DB2D   030036          5279    5287    5292    5306    5311    5469    5474    5479    5484    7040#   7102
$DB2O   030266          7118#   7158
$DECVL  030216          7042    7088#
$DRVID= 000154          5833    5880*   5881*   5882*   8675#   8676
$DSPLY  025162          6315#   7209
$DTBL   027522          6876    6911#
$ERFLG  001103          2712#   6696*   6716
$ERMAX  001115          2718#
$ERROR  026602          2934    6694#
$ERRPC  001116          2719#   6703*   6704*   6705    6716    6730
$ERRTB  001346          2865#   6738
$ERRTY  026714          6708    6723#
$ERTTL  001112          2716#   6702*   6716
$FILLC  001156          2737#   6484
$FILLS  001155          2736#
$FMT  = 000001          3624*   8637#   8638
$GDADR  001120          2720#
$GDDAT  001124          2722#
$GTSWR= ****** U        7204
$HARD = 000066          5512    5556    5558*   8662#   8663
$HD   = 000000          2531
$HINUM  027734          3060*   4685*   4689    4693    6081    6977    6985    6990*   6995#
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$ICNT   001104          2713#
$INTAG  001135          2727#
$ITEMB  001114          2717#   6705*   6716    6727
$LF     001166          2742#   6660    6716
$LINAD  016410          5020*   5021*   5022*   5031*   5032*   5035*   5039    5049#
$LKCSB  001176          2747#   5386*
$LKCSR  001174          2746#   5380    5387*
$LKS    001202          2749#   5391    5396*
$LLVEC  001204          2750#   5393
$LONUM  027736          3059*   4684*   4688    4690    4725    6080    6976    6983    6989*   6996#
$LPADR  001106          2714#
$LPERR  001110          2715#
$LPVEC  001200          2748#   5383
$LSCS   001214          2754#   5367    6520    6540
$LSDB   001216          2755#   6542*
$LSTAD  030034          2988    2993    7022*   7026#
$MAIL = ****** U        2954    6711
$MASK = 000024          3588*   3616    3666*   3729*   3776*   3818*   3854*   3882*   3953*   3983*   4487    4492    8649#
                        8650
$MISPO= 000072          5314    5514    5580    5582*   8664#   8665
$NCODE= 000102          3398*   4728*   4759    4775    4784    4812*   4813*   4819*   4837    4846    4847    8667#   8668
$NCYL = 000106          3388*   4758*   4851    8671#   8672
$NEXT = 000112          3278    3401*   4796*   4859*   4913*   8673#   8674
$NPATC= 000103          3400*   4795*   4849    8668#   8669
$NSEC = 000104          3393*   4738*   4850    8669#   8670
$NTRK = 000105          3392*   4748*   8670#   8671
$NULL   001154          2735#   6486
$NWRDL= 000110          3394*   3397*   4771*   4790*   4793*   4852    4853    8672#   8673
$OCNT   027312          6804*   6833*   6846#
$OCTVL  030370          7120    7145#
$OMODE  027314          6799*   6803*   6808    6811*   6822*   6848#
$OPERC= 000042          4706*   4707*   4874    4876    5277    5304    5428    5530    6060    8656#   8657
$PACK = 000031          3280    3303    3337    4878    4902    5751*   8652#   8653
$PASS   001100          2710#
$PASSC= 000074          5464    5748*   6040    6046    6068*   8665#   8666
$PATTC= 000034          3258*   3259*   4669    4849*   4912*   8654#   8655
$POSIT= 000046          4547*   4548*   4710*   4711*   5309    6033    6036    8657#   8658
$PREVA= 000036          4708    4839*   4840*   4843*   4883*   4921*   4922*   5070    5075    5080    5095    7969*   7970*
                        8655#   8656
$PREVO= 000032          4836*   4881*   4996    7968*   8653#   8654
$PRFLG  001212          2753#   5364*   5368*   6318    6516
$PRINT  025744          6322    6516#
$PRTER  001220          2756#   6522    6524*   6528*
$PSEL = 000003          8639#   8640
$QUES   001164          2740#   5895    6376    6417    6653    6716
$RAND   027636          4687    4716    4769    4782    4828    4873    6972#
$RDCHR  026266          6607#   7205
$RDDEC= ****** U        7207
$RDLIN  026322          6622#   7206
$RDOCT= ****** U        7207
$READ = 000056          4543*   4544*   5290    6027    6030    8659#   8660
$REG  = 000014          4518    8645#   8646
$RESRE  027600          6949#   7208
$RETRY= 000022          3593*   3620*   3621*   3626*   3672*   3688*   3693*   3696*   3697*   3730*   3777*   3819*   3855*
                        3883*   3952*   3982*   4482*   4494*   4495*   5263    8648#   8649
$RHAS = 000202          8683#   8684   10173   10177   10181   10185   10189   10193   10197   10201
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$RHBA = 000170          4074   4290   4321   4342   4393   4413   4529   5123   5175   5191*  5192   8678*  8679
                       10173  10177  10181  10185  10189  10193  10197  10201
$RHCA = 000220          4545   4885   5161   8690*  8691  10206  10208  10210  10212  10214  10216  10218  10220
$RHCC = 000222          3388   3601   3800   4462   4843   4883   4938   5057   5098   8691*  8692  10206  10208
                       10210  10212  10214  10216  10218  10220
$RHCS1= 000164          3415   3417   4048   8676*  8677  10140  10144  10148  10152  10156  10160  10164  10168
$RHCS2= 000174          3532   3724   3770   3812   3918   3933   3950   4050   8680*  8681  10140  10144  10148
                       10152  10156  10160  10164  10168
$RHDA = 000172          4884   5107   5157   5349   5354   5359   8679*  8680  10173  10177  10181  10185  10189
                       10193  10197  10201
$RHDB = 000206          5195   8685*  8686  10175  10179  10183  10187  10191  10195  10199  10203
$RHDS1= 000176          3419   3535   3564   8681*  8682  10140  10144  10148  10152  10156  10160  10164  10168
$RHDT = 000212          8687*  8688  10175  10179  10183  10187  10191  10195  10199  10203
$RHEC1= 000230          4306   5229   8694*  8695  10142  10146  10150  10154  10158  10162  10166  10170
$RHEC2= 000232          4324   4518   5233   5418   5425   5430   5851   8695*  10142  10146  10150  10154  10158
                       10162  10166  10170
$RHER1= 000200          3538   3541   3544   3547   3550   3553   3556   3559   3562   3567   3570   3589   3616
                        3618   3663   3686   3699   3701   3790   4052   4489   4492   8682*  8683  10140  10144
                       10148  10152  10156  10160  10164  10168
$RHER2= 000224          4054   8692*  8693  10142  10146  10150  10154  10158  10162  10166  10170
$RHER3= 000226          3573   4056   8693*  8694  10142  10146  10150  10154  10158  10162  10166  10170
$RHLA = 000204          8684*  8685  10173  10177  10181  10185  10189  10193  10197  10201
$RHMR = 000210          8686*  8687  10175  10179  10183  10187  10191  10195  10199  10203
$RHOF = 000216          8689*  8690  10206  10208  10210  10212  10214  10216  10218  10220
$RHSN = 000214          8688*  8689  10206  10208  10210  10212  10214  10216  10218  10220
$RHWC = 000166          4069   4097   4291   4395   5126   5197   8677*  8678  10173  10177  10181  10185  10189
                       10193  10197  10201
$RPADR  001170          2744*  3138  10608
$RPVEC  001172          2745*  3139  10610
$RPZR0  024646          5480   5485   6230*
$RPZR4  024626          5496   5500   5504   5508   5516   6226*
$RPZR5  024636          5466   6228*
$RPZR8  024616          5470   5475   6224*
$RSAV = 000076          4684   4685   4688*  4689*  8666*  8667
$R2A  = ****** U        7209
$SAVRE  027542          6933*  7207
$SB20D  030232          4259   4317   5058   5064   5066   5071   5076   5081   5113   5135   5141   5147   5465
                        5495   5499   5503   5507   5515   7100*
$SB20   030406          5183   7156*
$SEC  = 000010          3252*  3600*  4100   4460*  4663   4840   4850*  4884*  4892*  5146   7970   8642*  8643
$SETUP= 000006          2916*  2933   2934   2936   2938   6695   6714   6715
$SIZE   027740          2987   7005*
$SKI  = 000070          5317   5513   5568   5570*  8663*  8664
$SOFT = 000064          5511   5544   5546*  8661*  8662
$SSEC = 000026          3263*  3266*  3602   3604   4106   4110   4111   4294   4397   4855*  4858*  4904*  4908*
                        5200   8650*  8651
$STUP = 177777          2916*
$SUPRS  025576          4260   4318   5059   5065   5068   5072   5077   5082   5114   5136   5142   5148   5184
                        5280   5288   5293   5307   5312   6435*
$SWR  = 122000          2520*  2531   2535   2536   2537   2538   2739   2938   6687   6688   6689   6690   6691
                        6699   6706   6711   6714   6716
$STATUS= 000016         3355   3413   3430   3438   3440   3442   3444   3446   3448   3529   3611   3614   3628
                        3690   3753   4443   4467   4479   4485   4998   8646*  8647  10206  10208  10210  10212
                       10214  10216  10218  10220
$TERM = 000026          7175   7210*
$TIME   021402          5443   5600*  6338   6572
```

DERPNB.P11 CROSS REFERENCE TABLE -- USER SYMBOLS

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$TKB    001146          2732*  6561   6568   6611
$TKCNT  026260          6557*  6570   6583*  6587*  6594*
$TKINT  026066          3179   6557*
$TKQEN= 026266          6578   6597*
$TKQIN  026262          6558*  6578   6582*  6584*  6588*  6595*
$TKQSR  026264          5672   6558   6588   6589*  6596*
$TKS    001144          2731*  6562*  6609
$TKSRV  026130          6559   6568*
$TN     = 000001        2520*  2531
$TNPWR  030146          7047   7048   7068*
$TOTAL= 000062          5282   5510   5592   5594*  6019   8660*  8661
$TPB    001152          2734*  6494*
$TPFLG  001157          2738*  2960*  6471
$TPS    001150          2733*  6492
$TRANS= 000052          4533*  4534*  4541*  4542*  5285   8658*  8659
$TRAP   030442          2936   7171*
$TRAP2  030476          7186*  7197
$TRK    = 000011        3253*  3599*  4459*  4889   4891*  5140   8643*  8644
$TRP    = 000013        7190*  7199*  7200*  7201*  7202*  7203*  7205   7206*  7207*  7208*  7209*  7210*
$TRPAD  030510          7180   7197*  7210
$TSTNM  001102          2711*  6698   6716
$TTYIN  026570          6624   6625   6637   6663*  6668   6674*
$TYPBN= ****** U        7203
$TYPDS  027316          6861*  7202
$TYPE   025636          6307   6327   6471*  7190   7198
$TYPOC  027114          6802*  7199
$TYPON  027130          6801   6804*  7201
$TYPOS  027070          6797*  7200
$WRDL   = 000020        3260*  3602   3604*  3605   4071   4096   4292   4394   4541   4562   4571   4573*  4574
                        4575*  4596   4605   4610   4618   4650   4658   4852*  4899*  5172   5198   8647*  8648
$WRDM   = 000004        3261*  3262*  3605*  3606*  4853*  4854*  4900*  4901*  8640*  8641
$OFILL  027313          6798*  6802*  6812   6847*
$40CAT= ****** U        6708
.       = 053654        2691*  2695*  2708*  2743   2769*  2931   2964   3190   3193   3301   3335   3350   3483
                        3530   3533   3536   3539   3542   3545   3548   3551   3554   3557   3560   3568   3571
                        3574   3725   3754   3761   3771   3791   3801   3813   3919   3934   4088   4091   4107
                        4109   4115   4118   4121   4124   4322   4516   4521   4557   4613   4647   4649   4651
                        4653   4776   4977   5297   5322   5659*  5918   5928   6154   6596*  6597   6674*  6716
                        6771*  6915*  7088*  7145*  7176   7178   7210   8021   8024   8041   8082   8109   8481*
                        8482*  8483*  8484*  8485*  8486*  8487*  8488*  8489   8706   8788   8870   8952   9034
                        9116   9198   9280   9360*  9499*  10128* 10231* 10576* 10687* 10694
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DERPNB.P11 CROSS REFERENCE TABLE -- MACRO NAMES

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A          5536#   5537    5549    5561    5573    5585
COMMEN        1#   2661#
ENDCOM        1#   2661#
ERROR      2555#   7994    8051    8123    8322    8379
ESCAPE        1#   2661#
GETPRI        1#   2661#   7011
GETSWR        1#   2661#
MORETA     2702#   2744
MULT          1#   2661#
NEWTST        1#   2661#
POP           1#   2661#   4216    4522    4963    5434    5532    5704    5943    6109    6190    6902    6954    6991
PUSH          1#   2661#   4207    4507    4932    5407    5522    5665    5888    6093    6176    6861    6934    6972
REPORT        1#   2661#
SCOPE      2556#
SETPRI        1#   2661#
SETTPA     7190#   7199    7200    7201    7202    7205    7206    7207    7208    7209
SETUP         1#   2661#   2925
SKIP          1#   2661#
SLASH         1#   2661#
SPACE      2661#
STARS         1#   2661#   2662    2666    2704    2743    2771    2775    2816    2820    2829    2833    2916    2923    3183
           3187    4968    4972    5332    5336    6424    6449    6497    6545    6600    6615    6677    6683    6718    6774
           6851    6918    6963    6999    7029    7091    7109    7148    7165    7212    7222    8629    8633    9362    9366
           9530    9534    9827    9831   10681   10685   10689
SWRSU         1#   2661#   2938#
TRMTRP     7190#   7210
TYPBIN        1#   2661#
TYPDEC        1#   2661#   6758
TYPNAM        1#   2661#
TYPNUM        1#   2661#
TYPOCS        1#   2661#
TYPOCT        1#   2661#   6730    6755
TYPTXT        1#   2661#
$$CMRE     2702#
$$CMTM     2702#
$$ESCA        1#   2661#
$$NEWT        1#   2661#
$$SET      7190#   7199    7200    7201    7202    7205    7206    7207    7208    7209
$$SKIP        1#   2661#
.EQUAT        1#   2520#   2551
.HEADE        1#   2520#   2521
.KTI1         1#
.SETUP        1#   2520#   2916
.SWRHI        1#   2520#   2531
.SWRLO     2520#   2538#   2539    2540    2541    2542    2543    2544    2545    2546    2547    2548    2549    2550
.$ACTI        1#
.$APTB        1#
.$APTH        1#
.$APTY        1#
.$ASTA        1#
.$CATC        1#   2520#   2689
.$CMTA        1#   2520#   2702
.$DB2D        1#   2520#   7027
.$DB2O        1#   2520#   7107
.$DIV         1#
.$EOP         1#
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.$ERRO      1#   2520#   6681
.$ERRT      1#   2520#   6716
.$MULT      1#
.$POWE      1#
.$RAND      1#   2520#   6961
.$RDDE      1#
.$RDOC      1#
.$READ      1#
.$R2AZ      1#
.$SAVE      1#   2520#   6916
.$SB2D      1#   2520#   7089
.$SB2O      1#   2520#   7146
.$SCOP      1#
.$SIZE      1#   2520#   6997
.$SUPR      1#
.$TRAP      1#   2520#   7163
.$TYPB      1#
.$TYPD      1#   2520#   6849
.$TYPE      1#
.$TYPO      1#   2520#   5772
.$40CA      1#
.1170       1#
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DERPNB.P11 CROSS REFERENCE TABLE -- PERMANENT SYMBOLS

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ADC     4534  4542  4544  4548  4707  4711  6132  6144  6145  6149  6150  6152  6161  6215  6984
        6987  7057
ADD     3050  3052  3200  3209  3216  3234  3246  3266  3267  3316  4039  4040  4073  4097  4282
        4284  4292  4302  4305  4320  4341  4395  4408  4483  4512  4517  4533  4541  4543  4547
        4566  4574  4582  4598  4601  4618  4624  4627  4633  4636  4706  4710  4727  4737  4747
        4757  4777  4858  4867  4936  4953  4962  5006  5198  5278  5286  5291  5305  5310  5370
        5389  5398  5418  5425  5428  5430  5472  5477  5482  5487  5493  5530  5757  5651  5898
        5937  5970  5975  5979  6060  6131  6133  6143  6146  6148  6151  6160  6162  6165  6168
        6214  6216  6243  6263  6329  6367  6379  6405  6408  6420  6481  6526  6536  6738  6800
        6810  6881  6983  6985  6986  6988  7056  7058  7103  7143  7159  7695  7696  7722  7797
        7855  7897  8312  8366  8408  8541  8575
ASL     3157  4072  4298  4329  4401  4573  4597  4623  4830  5003  5004  5005  5019  5247  5742
        5761  5786  5809  5966  5968  5969  6003  6074  6360  6362  6364  6401  6403  6404  6735
        6736  6727  6979  7179  7515  7675  7811  7927  8055  8100  8150  8157  8522  8539  8560
        8573
ASLB    3259  6886  7985  8016
ASR     3169  4311  4312  4313  4316  4532  4575  5177  5752  5773  5788  5874  7135  7813  7883
        7890  7929  8057  8102  8152  8159  8524  8545  8562  8579
BCC     6213  6887  7986
BCS     6134  6159
BEQ     3015  3017  3026  3108  3110  3112  3114  3116  3151  3159  3161  3163  3174  3190  3193
        3206  3208  3213  3215  3245  3265  3276  3281  3286  3288  3296  3315  3350  3354  3356
        3373  3387  3404  3416  3431  3483  3530  3533  3539  3542  3545  3548  3551  3554  3557
        3560  3563  3565  3568  3574  3612  3615  3617  3619  3625  3629  3687  3691  3698  3700
        3725  3754  3771  3791  3801  3813  3919  3934  3951  4057  4075  4091  4115  4118  4121
        4124  4143  4145  4148  4153  4165  4235  4256  4275  4297  4327  4339  4362  4392  4400
        4414  4444  4468  4480  4486  4493  4531  4538  4546  4560  4565  4572  4578  4580  4595
        4600  4626  4655  4660  4670  4675  4692  4695  4709  4734  4744  4754  4760  4776  4805
        4811  4857  4866  4977  4999  5011  5041  5121  5155  5297  5322  5449  5489  5634  5644
        5675  5719  5740  5750  5754  5763  5765  5767  5780  5784  5790  5794  5805  5808  5825
        5829  5837  5850  5907  5926  5936  5957  5959  5965  6020  6026  6141  6154  6280  6349
        6351  6355  6391  6393  6396  6438  6440  6577  6643  6648  6697  6700  6740  6745  6751
        6762  6827  7130  7487  7520  7524  7531  7643  7651  7762  7764  7796  7800  7822  7842
        7845  7848  7945  7960  7962  8021  8024  8054  8082  8115  8162  8169  8228  8240  8243
        8275  8287  8294  8326  8374  8394  8398  8537  8559
BGE     7657  7721  7896  7901  7981  8337
BGT     4722  6157  6287  6357  6398  6834  6895  7129  7176  7587  7645  7886  8002  8031  8067
        8157  8193  8199  8252
BHI     3067  4107  4129  4322  4343  4540  4809  4888  5914  5923  5933  6028  6034
BHIS    3073  3076  3080  3084  3088  3092  3096  3100  3104  3396  3603  4557  4613  4647  4651
        4781  4792  5545  5557  5569  5581  5593  5677  5963  6031
BIC     3062  3799  4309  4310  4335  4336  4348  4349  4726  4818  6277  6366  6569  6612  6824
        7142  7482  7554  7856  8361
BICB    3143  3239  3436  4813  5017  5460  5680  5838  5872  5974  5988  6009  6042  7640  7971
        7972
BIS     3803  3837  4099  4337  4350  4662  4815  6282  6283  6829  6830  6889  6890  7060  7611
        7627  7629  7647  7806  7849  7932  7950  8068  8083  8094  8104  8133  8171  8230  8245
        8288  8295  8329  8426
BISB    3240  3437  4806  5018  5461  5839  5875  5989  6010  6043  6727  7732  7973
BIT     3362  3384  3415  3417  3419  3423  3430  3438  3440  3442  3444  3446  3448  3482  3529
        3532  3535  3538  3541  3544  3547  3550  3553  3556  3559  3562  3564  3567  3573  3589
        3614  3616  3618  3663  3686  3699  3701  3724  3753  3760  3770  3790  3797  3812  3918
        3933  3950  4048  4050  4090  4144  4238  4391  4485  4492  4717  4837  4844  4856  4895
        4976  4998  5028  5120  5154  5296  5321  5695  6017  6044  6315  6336  6699  6706  7519
        7523  7621  7650  7669  8013  8040  8155  8318  8325  8373  8429
BITB    3264  4087  4535  4654  4659  4682  4775  4810  8129  8258
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BLE     4127  4169  4667  7598  8033  8039  8126  8412
BLO     2989  3006  4174  4178  4887  5679  5961  6029  6035  6037  6047  6638
BLOS    3069  4563  4890  6626  7464  7468
BLT     6288  6359  6400  6489  6835  6878  6894  7053  7626  7653  7899  7915  7991  8191  8356
BMI     3152  3414  3692  4159  4203  4221  4481  4879  4903  4955  5741  5912  5921  5931  6319
        6885  7552  7659  7938  8065  8080  8097  8221  8324  8404
BNE     2931  2945  2964  2998  3003  3035  3047  3049  3118  3120  3199  3202  3233  3237  3274
        3279  3301  3304  3307  3329  3335  3338  3341  3368  3383  3385  3406  3418  3420  3424
        3439  3441  3443  3445  3447  3449  3536  3590  3622  3650  3664  3702  3761  3798  4005
        4049  4051  4053  4055  4070  4088  4113  4141  4150  4171  4201  4222  4237  4239  4279
        4281  4301  4406  4419  4488  4490  4496  4516  4521  4536  4586  4603  4629  4640  4677
        4683  4718  4768  4785  4817  4827  4838  4845  4875  4877  4896  4939  4944  4950  4957
        4960  4981  5029  5416  5420  5424  5433  5543  5555  5567  5579  5591  5601  5612  5617
        5621  5626  5630  5636  5646  5682  5686  5690  5694  5696  5700  5724  5734  5818  5821
        5843  5901  6018  6045  6065  6218  6234  6239  6278  6316  6337  6478  6485  6523  6533
        6571  6579  6630  6632  6650  6658  6707  6728  6754  6825  6883  6982  7064  7483  7490
        7533  7555  7589  7591  7596  7600  7605  7608  7622  7670  7738  7745  7752  7766  7776
        7786  7833  7857  7883  7964  7983  7993  8000  8014  8017  8027  8041  8109  8131  8156
        8185  8223  8225  8259  8261  8263  8265  8273  8319  8354  8402  8430  8506  8511  8543
        8577
BPL     3027  3571  3613  3630  4946  5351  5356  5736  6276  6472  6493  6517  6521  6541  6610
        6712  6823  6869  6899  7492  7546  7808  7940  8007  8090  8135  8270
BR      2947  3000  3018  3029  3040  3045  3051  3154  3156  3165  3167  3177  3203  3210  3217
        3224  3238  3247  3268  3283  3289  3311  3317  3345  3472  3592  3642  3644  3674  3676
        3678  3695  3704  3706  3732  3779  3821  3857  3885  3890  3955  3957  3985  3990  4011
        4109  4130  4135  4137  4151  4157  4163  4167  4206  4228  4283  4303  4331  4345  4373
        4403  4421  4484  4491  4567  4576  4587  4608  4631  4641  4649  4653  4680  4686  4696
        4724  4770  4783  4786  4807  4814  4829  4841  4868  4880  4907  4948  4951  4958  5045
        5055  5358  5369  5388  5397  5421  5426  5639  5684  5688  5692  5698  5702  5756  5769
        5771  5792  5799  5812  5815  5822  5845  5853  5910  5918  5928  5929  5938  5942  5976
        5978  6032  6052  6069  6147  6225  6227  6229  6237  6269  6290  6324  6368  6371  6377
        6410  6412  6418  6474  6491  6519  6539  6581  6585  6641  6652  6654  6661  6733  6757
        6764  6801  6816  6837  6880  6897  7017  7055  7144  7178  7497  7522  7557  7566  7594
        7603  7610  7618  7620  7624  7628  7630  7648  7655  7661  7662  7664  7672  7677  7733
        7743  7750  7760  7784  7798  7820  7917  7947  7949  7955  7966  7988  8044  8052  8069
        8094  8095  8146  8149  8160  8174  8195  8238  8256  8281  8289  8298  8328  8363  8406
        8432
BVS     6406  6409
CLC     2995  6163
CLR     2929  2959  2962  3023  3057  3058  3144  3194  3221  3222  3229  3230  3231  3249  3293
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        5079  5106  5139  5145  5199  5262  5348  5353  5366  5368  5379  5381  5382  5392  5412
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        6135  6142  6183  6185  6206  6207  6230  6267  6352  6353  6394  6528  6557  6587  6589
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        8499  8500  8501  8557
CLRB    2960  2970  3131  4093  4160  4175  4179  5785  6002  6073  6373  6414  6659  6901  7065
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        8128  8163  8175  8201  8233  8234  8246  8247  8282  8283  8291  8521
CLV     6166
CMP     2930  2944  2963  2988  3005  3066  3068  3072  3075  3079  3083  3087  3091  3095  3099
        3103  3109  3111  3113  3115  3117  3160  3162  3189  3207  3214  3285  3349  3395  3405
        3602  3800  4074  4106  4114  4117  4128  4140  4278  4321  4342  4413  4545  4556  4562
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	4599	4612	4625	4646	4650	4708	4721	4780	4791	4808	4886	4938	5544	5556	5568
	5580	5592	5633	5764	5766	5913	5922	5932	6013	6027	6030	6033	6036	6046	6576
	6578	6625	6637	6893	7059	7175	7463	7467	7530	7532	7795	7832	7844	7881	7898
	7900	8026	8198	8227	8242	8251	8264	8320	8401	8411	8542	8576			
CMPB	3014	3016	4112	4170	4173	4177	4300	4405	4539	4759	4784	4889	4943	4949	5616
	5620	5625	5629	5635	5674	5676	5678	5681	5685	5689	5693	5699	5718	5779	5793
	5804	5906	5958	5960	5962	6233	6350	6356	6358	6392	6397	6399	6439	6484	6629
	6647	6649	6657	7604	7652	7737	7744	7751	7761	7763	7765	7775	7785	7799	7885
	7961	7963	8355	8536											
COM	6524	7553													
DEC	3173	3201	3236	4147	4149	4236	4280	4307	4328	4418	4515	4564	4577	4579	4585
	4602	4628	4634	4639	4674	4676	4691	4694	4956	5419	5432	5753	5789	5820	5849
	5900	5935	6064	6156	6217	6240	6441	6636	6734	7062	7128	7491	7990	8001	8335
	8505	8510													
DECB	3621	3697	4495	5350	5355	5623	6275	6286	6488	6822	6833	8572			
EMT	2555														
HALT	2695	3191	3351	3484	4431	4442	4453	4466	4648	4652	4704	5298	5323	5343	5400
	6473	6518	6713	7177											
INC	3028	3176	3235	3623	4102	4131	4155	4180	4606	4607	4611	4735	4745	4755	4765
	5417	5431	5546	5558	5570	5582	5594	5611	5755	5791	5819	5852	5919	5973	5980
	6068	6155	6236	6281	6289	6583	6584	6702	6828	6836	6879	6981	7054	7131	7481
	7854	7984	8015	8196	8250	8332									
INCB	3175	3620	3693	3696	4172	4176	4482	4494	5615	5619	5624	5628	5632	5638	6696
	7884	8538													
IOT	2556														
JMP	2699	2700	2990	3071	3078	3082	3086	3090	3094	3098	3102	3106	3122	3132	3181
	3321	3330	3378	3432	3466	3514	3531	3534	3537	3540	3543	3546	3549	3552	3555
	3558	3561	3569	3572	3575	3576	3658	3755	3762	3792	3802	3804	3872	4181	4323
	4503	4898	5002	5092	5257	5272	5344	5401	5726	5729	5732	5860	5866	6381	6422
	7712	8022	8025	8029	8042	8103	8110	8112	8117	8118	8124	8139	8177		
JSR	2987	3038	3043	3137	3140	3141	3179	3195	3220	3223	3282	3290	3291	3292	3294
	3297	3298	3310	3320	3327	3331	3332	3344	3359	3361	3363	3364	3370	3371	3375
	3377	3391	3399	3408	3421	3422	3425	3459	3461	3462	3463	3464	3465	3481	3489
	3491	3492	3493	3494	3495	3507	3509	3510	3511	3512	3513	3518	3520	3521	3522
	3523	3524	3580	3582	3584	3585	3586	3587	3591	3595	3599	3608	3610	3627	3631
	3632	3633	3634	3635	3636	3638	3639	3640	3641	3643	3645	3646	3648	3651	3653
	3654	3656	3662	3667	3668	3669	3670	3671	3673	3675	3677	3679	3682	3683	3684
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DERPNB.P11      CROSS REFERENCE TABLE -- PERMANENT SYMBOLS



 ERRORS DETECTED:  0
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Spooler runtime 3 Seconds. 151 K*S, 1037 disk reads, 0 disk writes, 255 pages