BIOS LISTING
for
CP/M 2.2.04

595-3055-01

```
0000                    ORG     000H
0001 =          H17T    EQU     1
0000 =          H37T    EQU     0
0000 =          H47T    EQU     0
0000 =          H67T    EQU     0

                ;+++++++++++++++++++++
                ;+
                ;+  * * * N O T E * * *
                ;+
                ;+  THE ABOVE 5 LINES OF CODE ARE THE PREAMBLE TO THE BIOS.
                ;+  THESE LINES ARE USED BY 'MAKEBIOS' IN GENERATING THE BIOS.
                ;+  THESE LINES SHOULD NOT BE ALTERED FOR ANY REASON UNLESS THE
                ;+  PROGRAM 'MAKEBIOS' IS ALSO ALTERED.  THESE LINES MUST APPEAR
                ;+  AS THE FIRST 5 LINES IN THIS SOURCE.
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                ;+++++++++++++++++++++

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                        TITLE   'HEATH/ZENITH BIOS                    15 SEP 82'
0004 =          VERS    EQU     04
0020 =          LEVEL   EQU     ' '
0009 =          MONTH   EQU     09
000F =          DAY     EQU     15
0052 =          YEAR    EQU     82

                ;+*********************
                ;+
                ;+  BIOS2, A BIOS MODULE FOR CP/M 2.2
                ;+  FOR USE WITH HEATH/ZENITH H/Z89 AND H-8 COMPUTERS
                ;+      AND H17/H77/H87 5 1/4 INCH DISKS
                ;+      AND H47/Z47     8     INCH DISKS
                ;+      AND H37         5 1/4 INCH DISKS
                ;+      AND H67         HARD DISK WITH 8 INCH FLOPPY
                ;+      AND H8-4,H89-3  SERIAL I/O CARD
                ;+      AND H89-11      H89 SERIAL/PARALLEL CARD
                ;+
                ;+ COPYRIGHT 1980,1981 HEATH COMPANY, BENTON HARBOR, MICHIGAN
                ;+
                ;*
                ;+      HEATH/ZENITH SOFTWARE GROUP
                ;+      HILLTOP ROAD
                ;+      SAINT JOSEPH, MICHIGAN
                ;
                ;  BECAUSE THIS CODE MUST BE ASSEMBLEABLE UNDER BOTH 'ASM' AND 'MAC',
                ;  THE CONDITIONALS MAY SEEM A LITTLE STRANGE.  'ASM' DOESN'T HAVE
                ;  THE FOLLOWING
                ;    1) IF/THEN/ELSE STRUCTURE
                ;    2) NESTED IF CAPABILITY
                ;    3) RELATIONAL OPERATORS
                ;+
                ;+*********************

0000 =          FALSE   EQU     0
0001 =          TRUE    EQU     1
                        IF      TRUE-1
                %:      TRUE NE 1
                        ENDIF

                        IF      (H17T+H37T+H47T+H67T-1) SHR 15
                %:      NO DISK DRIVE TYPES SPECIFIED
                        ENDIF
                        IF      (2-(H17T+H37T+H47T+H67T)) SHR 15
                %:      TOO MANY DISK DRIVE TYPES SPECIFIED
                        ENDIF


0000 =          PARTITN EQU     TRUE AND H67T   ;FALSE = NO HARD DISK PARTITION SUPPORT
                                                ;TRUE  = SUPPORT HARD DISK PARTITIONING

0000 =          H67PART2 EQU    TRUE AND PARTITN ;FALSE = ONLY 1 PARTITION AT A TIME
                                                ;TRUE  = ALLOW 2 DRIVES (PARTITIONS)

0000 =          EXPER   EQU     FALSE           ;EXPERIMENTAL
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                0000 =          TOD     EQU     FALSE           ;TIME OF DAY HANDLER
                0000 =          EVENT   EQU     FALSE           ;EVENT DOWN COUNTER
                0001 =          INTINP  EQU     TRUE            ;ASSEMBLE WITH INTERRUPT CRT DRIVER
                0000 =          BRKKEY  EQU     FALSE AND INTINP ;TRUE  = WARM START ON BREAK KEY
                                                                ;FALSE = NO SPECIAL PROCESSING
                0000 =          H37ED   EQU     TRUE AND H37T   ;TRUE = BIOS SUPPORTS H37 EXTENDED
                                                                ;       DOUBLE DENSITY
                0000 =          H47ED   EQU     TRUE AND H47T   ;TRUE = BIOS SUPPORTS H47 EXTENDED
                                                                ;       DOUBLE DENSITY

                0003 =          H17ND   EQU     3*H17T          ;NUMBER OF H17 DRIVES SUPPORTED
                0000 =          H37ND   EQU     3*H37T          ;NUMBER OF H37 DRIVES SUPPORTED
                0000 =          H47ND   EQU     2*H47T          ;NUMBER OF H47 DRIVES SUPPORTED
                0000 =          H67ND   EQU     2*H67T+H67PART2 ;NUMBER OF H67 DRIVES SUPPORTED

                0000 =          BIOS    EQU     $

                F200 =          BDOS    EQU     BIOS-0E00H
                EA00 =          CCP     EQU     BDOS-0800H
                EA03 =          CCPCLR  EQU     CCP+3
                0000 =          BOOT    EQU     0000H           ;BASE OF USABLE RAM
                0003 =          IOBYTE  EQU     BOOT+3          ;I/O DEVICE ASSIGNMENT BYTE
                0004 =          LOGDSK  EQU     BOOT+4          ;WHERE CPM STORES DEFAULT DRIVE
                0040 =          BDMAP   EQU     0040H           ;LOGICAL TO PHYSICAL DRIVE MAP
                                                                ; (UP TO 8 BYTES [DRIVES] 0040H-0047H)
                0048 =          BBDF    EQU     0048H           ;BOOT DEVICE FLAGS
                0049 =          BBDA    EQU     0049H           ;BOOT DEVICE ADDRESS (BASE PORT #)
                004A =          BBP     EQU     004AH           ;BOOT BEGINNING OF PARTITION
                                                                ; (3 BYTE VALUE)
                004D =          BUPB    EQU     004DH           ;BOOT LAST SECTOR OF PARTITION + 1
                                                                ; (3 BYTE VALUE)
                004E =          BBIOS   EQU     004EH           ;CONTAINS ADDRESS OF START OF BIOS
                                                                ; AFTER COLD BOOT IS COMPLETED
                005C =          FCB     EQU     BOOT+5CH        ;DEFAULT FILE CONTROL BLOCK
                0080 =          BUFF    EQU     BOOT+80H        ;DEFAULT DISK BUFFER
                0100 =          TPA     EQU     BOOT+100H       ;BASE OF TRANSIENT PGM AREA

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                ;
                ; H17 DISK RELATED EQUATES
                ;

007C =          UPDP    EQU     07CH            ;DISK DATA PORT
007D =          UPFC    EQU     07DH            ;FILL CHARACTER
007D =          UPST    EQU     07DH            ;STATUS FLAGS
007E =          UPSC    EQU     07EH            ;SYNC CHARACTER (OUTPUT)
007E =          UPSR    EQU     07EH            ;SYNC RESET (INPUT)
007F =          DPDC    EQU     07FH            ;DISK CONTROL PORT

0002 =          U0      EQU     02H             ;H17    UNIT 0
0004 =          U1      EQU     04H             ;       UNIT 1
0008 =          U2      EQU     08H             ;       UNIT 2
0010 =          DFMO    EQU     10H             ;MOTOR ON (ALL DRIVES)
0020 =          DFDI    EQU     20H             ;DIRECTION (0 = OUT)
0040 =          DFST    EQU     40H             ;STEP COMMAND (ACTIVE HIGH)

0001 =          DFHD    EQU     01H             ;HOLE DETECT
0002 =          DFTO    EQU     02H             ;TRACK 0 DETECT
0004 =          DFWP    EQU     04H             ;WRITE PROTECT
0008 =          DFSD    EQU     08H             ;SYNC DETECT

00FD =          DSYN    EQU     0FDH            ;PREFIX SYNC CHARACTER

0014 =          LPSA    EQU     20              ;NUMBER OF TRIES FOR CORRECT SECTOR
0005 =          STSA    EQU     8/2+1           ;MS/2 TO WAIT FOR INDEX HOLE
0007 =          STSB    EQU     12/2+1          ;MS/2 TO WAIT PAST INDEX HOLE
0014 =          WHDA    EQU     20              ;UDLY COUNT FOR HOLE DEBOUNCE
0014 =          WHNA    EQU     20              ;UDLY COUNT FOR HOLE DEBOUNCE
0050 =          WSCA    EQU     64*25/20        ;LOOP COUNT FOR 25 CHARACTERS
0014 =          WRITA   EQU     20              ;GUARDBAND COUNT FOR WRITE
000A =          WRITB   EQU     10              ;NUMBER OF ZERO CHARACTERS AFTER HOLE EDGE
0010 =          WRITC   EQU     128/8           ;TWO CHARACTER DELAY BEFORE WRITING
0030 =          READA   EQU     48              ;DELAY BEFORE HUNT MODE
00FA =          SPD     EQU     250             ;250 * 4MS = 1 S
0014 =          HLTG    EQU     20              ; 20 * 4MS = 80 MS
0006 =          HST     EQU     24/4            ;HEAD SETTLE TIME 24 MS
000F =          STEPR   EQU     30/2            ;STEP RATE MS/2
060F =          DELAYS  EQU     6*256+15        ;HEAD LOAD AND MOTOR ON TIMER VALUES
000A =          RETRIES EQU     10              ;NUMBER OF RETRIES

0001 =          D$E$TRK EQU     001H            ;BAD TRACK ERROR
0002 =          D$E$HSY EQU     002H            ;HEADER SYNC ERROR
0004 =          D$E$HCK EQU     004H            ;HEADER CHECKSUM
0008 =          D$E$CHK EQU     008H            ;CHECKSUM ERROR
0010 =          D$E$RNF EQU     010H            ;RECORD NOT FOUND
0020 =          D$E$MDS EQU     020H            ;MISSING DATA SYNC
0040 =          D$E$WRP EQU     040H            ;WRITE PROTECT ERROR
0080 =          D$E$UNR EQU     080H            ;UNIT NOT READY

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                        ;
                        ;  H47 DISK EQUATES.
                        ;

0000 =          H47CTL  EQU     0               ;STATUS/CONTROL PORT DISPLACEMENT
0001 =          H47DAT  EQU     1               ;DATA PORT DISPLACEMENT

                        ;  STATUS PORT BITS
0080 =          DSTR    EQU     10000000B       ;TR
0040 =          DSIE    EQU     01000000B       ;INT ENABLE
0020 =          DSDONE  EQU     00100000B       ;DONE (I.E. NOT BUSY)
0001 =          DSERR   EQU     00000001B       ;ERROR

                        ;  CONTROL PORT BITS
0040 =          DCIE    EQU     01000000B       ;INT ENABLE
0002 =          DCRES   EQU     00000010B       ;RESET

                        ;  COMMANDS
0001 =          DRS     EQU     01H             ;READ STATUS
0002 =          DRAS    EQU     02H             ;READ AUXILIARY STATUS
0003 =          DSNS    EQU     03H             ;SET NUMBER OF SECTORS
0007 =          DRD     EQU     07H             ;READ (BUFFERED)
0008 =          DWR     EQU     08H             ;WRITE (BUFFERED)
000B =          DCOPY   EQU     0BH             ;COPY
000D =          DFMT    EQU     0DH             ;SINGLE DENSITY FORMAT
000E =          DFMTD   EQU     0EH             ;FORMAT DOUBLE DENSITY (TRK 0 SINGLE)
000F =          DFMTD2  EQU     0FH             ;FORMAT DOUBLE DENSITY (TRK 0-76)

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                        ;
                        ;  H37 EQUATES
                        ;

                        ;  PORT ASSIGNMENTS
0078 =          FD$BASE EQU     078H            ;BASE PORT ADDRESS
0078 =          FD$CON  EQU     FD$BASE         ;DISK CONTROL PORT
0079 =          FD$INT  EQU     FD$BASE+1       ;INTERFACE MUX PORT
007A =          FD$CMD  EQU     FD$BASE+2       ;1797 COMMAND REGISTER
007A =          FD$STA  EQU     FD$BASE+2       ;     STATUS REGISTER
007B =          FD$DAT  EQU     FD$BASE+3       ;     DATA REGISTER
007A =          FD$SEC  EQU     FD$BASE+2       ;     SECTOR REGISTER
007B =          FD$TRK  EQU     FD$BASE+3       ;     TRACK REGISTER

                        ;  INTERFACE MUX PORT FLAGS
0000 =          FD$CD   EQU     0               ;ACCESS C/D REGISTERS
0001 =          FD$TS   EQU     1               ;ACCESS T/S REGISTERS

                        ;  COMMANDS
0000 =          FDCRST  EQU     000H            ;RESTORE
0010 =          FDCSEK  EQU     010H            ;SEEK
0020 =          FDCSTP  EQU     020H            ;STEP
0040 =          FDCSTI  EQU     040H            ;STEP IN
0060 =          FDCSTO  EQU     060H            ;STEP OUT
0080 =          FDCRDS  EQU     080H            ;READ SECTOR
00A0 =          FDCWRS  EQU     0A0H            ;WRITE SECTOR
00C0 =          FDCRDA  EQU     0C0H            ;READ ADDRESS
00E0 =          FDCRDT  EQU     0E0H            ;READ TRACK
00F0 =          FDCWRT  EQU     0F0H            ;WRITE TRACK
00D0 =          FDCFI   EQU     0D0H            ;FORCE INTERRUPT

                        ;  TYPE 1 COMMAND FLAGS
0010 =          FDFUTR  EQU     00010000B       ;UPDATE TRACK REGISTER
0008 =          FDFHLB  EQU     00001000B       ;HEAD LOAD AT BEGINNING
0004 =          FDFVRF  EQU     00000100B       ;VERIFY FLAGS

                        ;  TYPE 1 COMMAND STEP RATE FLAGS
0000 =          FDFS6   EQU     00000000B       ;STEP RATE  6 MS
0001 =          FDFS12  EQU     00000001B       ;           12
0002 =          FDFS20  EQU     00000010B       ;           20
0003 =          FDFS30  EQU     00000011B       ;           30

                        ;  TYPE 2&3 COMMAND FLAGS
0010 =          FDFMRF  EQU     00010000B       ;MULTIPLE RECORD FLAG
0008 =          FDFSLF  EQU     00001000B       ;SECTOR LENGTH FLAG
0004 =          FDFDLF  EQU     00000100B       ;30 MS DELAY
0002 =          FDFSS1  EQU     00000010B       ;SELECT SIDE 1
0001 =          FDFDDM  EQU     00000001B       ;DELETED DATA MARK

                        ;  TYPE 4 COMMAND FLAGS
0000 =          FDFINI  EQU     00000000B       ;TERMINATE WITH NO INTERRUPT
0001 =          FDFII0  EQU     00000001B       ;NOT READY TO READY TRANSITION
0002 =          FDFII1  EQU     00000010B       ;READY TO NOT READY TRANSITION
0004 =          FDFII2  EQU     00000100B       ;INDEX PULSE
0008 =          FDFII3  EQU     00001000B       ;IMMEDIATE INTERRUPT
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                        ;  STATUS FLAGS
0080 =          FDSNRD  EQU     10000000B       ;NOT READY
0040 =          FDSWPV  EQU     01000000B       ;WRITE PROTECT VIOLATION
0020 =          FDSHLD  EQU     00100000B       ;HEAD IS LOADED
0020 =          FDSRTE  EQU     00100000B       ;RECORD TYPE
0020 =          FDSWTF  EQU     00100000B       ;WRITE FAULT
0010 =          FDSSEK  EQU     00010000B       ;SEEK ERROR
0010 =          FDSRNF  EQU     00010000B       ;RECORD NOT FOUND
0008 =          FDSCRC  EQU     00001000B       ;CRC ERROR
0004 =          FDSTK0  EQU     00000100B       ;FOUND TRACK 0
0004 =          FDSLDT  EQU     00000100B       ;LOST DATA
0002 =          FDSIND  EQU     00000010B       ;INDEX HOLE
0001 =          FDSBSY  EQU     00000001B       ;BUSY

                        ;  INFO RETURNED BY A READ ADDRESS COMMAND
0000 =          FDRATRK EQU     0               ;TRACK
0001 =          FDRASID EQU     1               ;SIDE
0002 =          FDRASEC EQU     2               ;SECTOR
0003 =          FDRASL  EQU     3               ;SECTOR LENGTH
0004 =          FDRACRC EQU     4               ;2 BYTE CRC
0006 =          FDRAL   EQU     6               ;LENGTH OF READ ADDRESS INFO

                        ;  DISK HEADER SECTOR LENGTH VALUES
0000 =          FDSL128 EQU     0               ;SECTOR LENGTH 128
0001 =          FDSL256 EQU     1               ;SECTOR LENGTH 256
0002 =          FDSL512 EQU     2               ;SECTOR LENGTH 512
0003 =          FDSL1K  EQU     3               ;SECTOR LENGTH 1024

                        ;  CONTROL REGISTER FLAGS
0001 =          CONIRQ  EQU     00000001B       ;ENABLE INT REQ
0002 =          CONDRQ  EQU     00000010B       ;ENABLE DRQ INT / DISABLE SYSTEM INT
0004 =          CONMFM  EQU     00000100B       ;ENABLE MFM
0008 =          CONMO   EQU     00001000B       ;MOTOR(S) ON
0010 =          CONDS0  EQU     00010000B       ;DRIVE 0
0020 =          CONDS1  EQU     00100000B       ;       1
0040 =          CONDS2  EQU     01000000B       ;       2
0080 =          CONDS3  EQU     10000000B       ;       3

                        ;  MISCELLANEOUS VALUES
0028 =          NTRKS37 EQU     40              ;NUMBER OF TRACKS SINGLE DENSITY (48 TPI)
0050 =          NTRKD37 EQU     80              ;NUMBER OF TRACKS DOUBLE DENSITY (96 TPI)
                ;NSPTS37        EQU     10              ;NUMBER OF SECTORS PER TRACK
                                                ;  SINGLE DENSITY
                ;NSPTD37        EQU     16              ;NUMBER OF SECTORS PER TRACK
                                                ;  DOUBLE DENSITY
                ;NSPTE37        EQU     5               ;NUMBER OF SECTORS PER TRACK
                                                ;  EXTENDED DOUBLE DENSITY
                ;ILFS37 EQU     3               ;INTERLEAVE FACTOR SINGLE DENSITY
                ;ILFD37 EQU     3               ;INTERLEAVE FACTOR DOUBLE DENSITY
                ;ILFE37 EQU     3               ;INTERLEAVE FACTOR EXTENDED DOUBLE DENSITY
003C =          NSBT37  EQU     60              ;NUMBER OF CP/M RECORDS TO BE LOADED AT BOOT
0014 =          FDHDD   EQU     20              ;HOLE DEBOUNCE DELAY LOOP COUNTER VALUE
060F =          DELAY37 EQU     6*256+15        ;DESELECT AND MOTOR TURN OFF DELAY

0020 =          H37VEC  EQU     8*4             ;LEVEL 4 INTERRUPT
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310  0023 =        DLYMO37 EQU     H37VEC+3        ;MOTOR TURN OFF DELAY COUNTER
311  0024 =        DLYH37  EQU     H37VEC+4        ;DESELECT DELAY COUNTER
312  0025 =        H37CTL  EQU     H37VEC+5        ;H37 CONTROL REGISTER IMAGE
313  0026 =        H37IRET EQU     H37VEC+6        ;WHERE TO GO AFTER INTERRUPT ADDRESS
314
315                        PAGE
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                ;
                ;  H67 EQUATES.
                ;

0001 =          H67BLKIO EQU    TRUE            ;TRUE  = USE Z80 BLOCK I/O
                                                ;FALSE = USE HANDSHAKE I/O

0000 =          SHUGART EQU     FALSE           ;TRUE  = HARD DISK IS SHUGART
                                                ;FALSE = HARD DISK IS MEMOREX

                ;  PORT DISPLACEMENTS.
0000 =          HD$DAT  EQU     0               ;DATA PORT
0001 =          HD$CON  EQU     1               ;CONTROL PORT
0001 =          HD$STA  EQU     1               ;STATUS PORT
0002 =          HD$SWI  EQU     2               ;SWITCH PORT

                ;  CONTROL PORT FLAGS.
0080 =          HDFACKH EQU     10000000B       ;ACKNOWLEDGE HOLD
0040 =          HDFSEL  EQU     01000000B       ;SELECT
0020 =          HDFEI   EQU     00100000B       ;ENABLE INTERRUPTS
0010 =          HDFRES  EQU     00010000B       ;RESET
0002 =          HDFDE   EQU     00000010B       ;DATA ENABLE

                ;  BUS STATUS FLAGS.
0080 =          HDBREQ  EQU     10000000B       ;REQUEST
0040 =          HDBIO   EQU     01000000B       ;I/O (0=IN  1=OUT)
0020 =          HDBMSG  EQU     00100000B       ;MSG
0010 =          HDBCMD  EQU     00010000B       ;CMD/DATA (0=DATA  1=COMMNAD)
0008 =          HDBBSY  EQU     00001000B       ;BUSY
0004 =          HDBPE   EQU     00000100B       ;PARITY ERROR
0002 =          HDBIRQ  EQU     00000010B       ;INTERRUPT REQUEST
0001 =          HDBACK  EQU     00000001B       ;HOS IS HOLDING ACKNOWLEDGE LINE

                ;  COMMANDS.
0000 =          HDCTDR  EQU     000H            ;TEST DRIVE READY
0001 =          HDCRCL  EQU     001H            ;RECALIBRATE
0002 =          HDCRSY  EQU     002H            ;REQUEST SYNDROME
0003 =          HDCRS   EQU     003H            ;REQUEST SENSE
0004 =          HDCFD   EQU     004H            ;FORMAT DRIVE
0006 =          HDCFT   EQU     006H            ;FORMAT TRACK
0007 =          HDCFBS  EQU     007H            ;FORMAT BAD SECTOR
0008 =          HDCRD   EQU     008H            ;READ
0009 =          HDCWPS  EQU     009H            ;WRITE PROTECT SECTOR
000A =          HDCWR   EQU     00AH            ;WRITE
000B =          HDCSEK  EQU     00BH            ;SEEK
0020 =          HDCCPY  EQU     020H            ;COPY
00C0 =          HDCFDD  EQU     0C0H            ;FLOPPY DISK DESCRIPTION

                ;  CLASS 0 COMMAND BLOCK STRUCTURE.
0000 =          HDOOP   EQU     0               ;OPCODE
0001 =          HDOLULA EQU     1               ;LOGICAL UNIT #/LOGICAL ADDR
00E0 =          HDOLUN  EQU     11100000B       ;  BITS 7-5 = LOGICAL UNIT #
001F =          HDOLA2  EQU     00011111B       ;  BITS 4-0 = LOGICAL ADDR (HIGH ORDER)
0002 =          HDOLA1  EQU     2               ;LOGICAL ADDRESS (MIDDLE ORDER)
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372  0003 =          HDOLAO  EQU     3               ;LOGICAL ADDRESS (LOW ORDER)
373  0004 =          HDONB   EQU     4               ;NUMBER OF BLOCKS / INTERLEAVE FACTOR
374  0005 =          HDOCON  EQU     5               ;CONTROL
375
376                  ;  CLASS 1 COMMAND BLOCK STRUCTURE.
377  0000 =          HD1OP   EQU     0               ;OPCODE
378  0001 =          HD1LUAS EQU     1               ;SOURCE LOGICAL UNIT #/ADDR
379  00E0 =          HD1LUNS EQU     11100000B       ;  BITS 7-5 = LOGICAL UNIT #
380  001F =          HD1LA2S EQU     00011111B       ;  BITS 4-0 = LOGICAL ADDR (HIGH ORDER)
381  0002 =          HD1LA1S EQU     2               ;SOURCE LOGICAL ADDRESS (MIDDLE ORDER)
382  0003 =          HD1LAOS EQU     3               ;SOURCE LOGICAL ADDRESS (LOW ORDER)
383  0004 =          HD1NB   EQU     4               ;NUMBER OF BLOCKS
384  0005 =          HD1LUAD EQU     5               ;DESTINATION LOGICAL UNIT #/ADDR
385  00E0 =          HD1LUND EQU     11100000B       ;  BITS 7-5 = LOGICAL UNIT #
386  001F =          HD1LA2D EQU     00011111B       ;  BITS 4-0 = LOGICAL ADDR (HIGH ORDER)
387  0006 =          HD1LA1D EQU     6               ;DESTINATION LOGICAL ADDR (MIDDLE ORDER)
388  0007 =          HD1LAOD EQU     7               ;DESTINATION LOGICAL ADDR (LOW ORDER)
389  0008 =          HD1SPAR EQU     8               ;SPARE
390  0009 =          HD1CON  EQU     9               ;CONTROL
391
392                  ;  CLASS 6 COMMAND BLOCK STRUCTURE.
393  0000 =          HD6OP   EQU     0               ;OPCODE
394  0001 =          HD6LUN  EQU     1               ;LOGICAL UNIT # (BITS 7-5)
395  0005 =          HD6TFC  EQU     5               ;TRACK FORMAT CODE
396
397                  ;  COMMAND BLOCK CONTROL BYTE FLAGS.
398  0080 =          HDFDR   EQU     10000000B       ;DISABLE RETRIES
399  0040 =          HDFDDEC EQU     01000000B       ;DISABLE DATE ERROR CORRECTION
400
401                  ;  TRACK FORMAT CODE FLAGS.
402  0002 =          HDFDEN  EQU     00000010B       ;DENSITY (0=SINGLE  1=DOUBLE)
403  0001 =          HDFSID  EQU     00000001B       ;SIDES (0=SINGLE  1=DOUBLE)
404
405                  ;  COMPLETION STATUS BYTE FLAGS.
406  00E0 =          HDFLUN  EQU     11100000B       ;LOGICAL UNIT # MASK
407  0002 =          HDFERR  EQU     00000010B       ;ERROR DURING COMMAND EXECUTION
408  0001 =          HDFPE   EQU     00000001B       ;PARITY ERROR
409
410                  ;  REQUEST SYNDROME BLOCK.
411  0000 =          HDSMBO  EQU     0               ;M.S. BIT OFFSET
412  0001 =          HDSLBS  EQU     1               ;L.S. BIT OFFSET / SYNDROME
413  00E0 =          HDFLBO  EQU     11100000B       ;  BITS 7-5 = L.S. BIT OFFSET
414  000F =          HDFSYN  EQU     00001111B       ;  BITS 3-0 = SYNDROME
415
416                  ;  REQUEST SENSE BLOCK.
417  0000 =          HDSSB   EQU     0               ;SENSE BYTE
418  0080 =          HDSBAV  EQU     10000000B       ;BLOCK ADDRESS VALID
419  0030 =          HDSET   EQU     00110000B       ;ERROR TYPE MASK
420  000F =          HDSEC   EQU     00001111B       ;ERROR CODE MASK
421  0001 =          HDSLULA EQU     1               ;LOGICAL UNIT #/LOGICAL ADDR
422  00E0 =          HDSLUN  EQU     11100000B       ;  BITS 7-5 = LOGICAL UNIT #
423  001F =          HDSLA2  EQU     00011111B       ;  BITS 4-0 = LOGICAL ADDR (HIGH ORDER)
424  0002 =          HDSLA1  EQU     2               ;LOGICAL ADDRESS (MIDDLE ORDER)
425  0003 =          HDSLAO  EQU     3               ;LOGICAL ADDRESS (LOW ORDER)
426
427                  ;  ERROR CODE TABLE.
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00F0 =          HDECLS  EQU     11110000B       ;CLASS MASK
0000 =          HDECLS0 EQU     000H            ;CLASS 0
0010 =          HDECLS1 EQU     010H            ;CLASS 1
0020 =          HDECLS2 EQU     020H            ;CLASS 2
0080 =          HDECLSZ EQU     080H            ;ZDS EXTENSION CLASS
                ;       TYPE 0 (DRIVE) ERROR CODES
0000 =          HDENS   EQU     000H            ;NO STATUS
0001 =          HDENIS  EQU     001H            ;NO INDEX SIGNAL
0002 =          HDENSC  EQU     002H            ;NO SEEK COMPLETE
0003 =          HDEWF   EQU     003H            ;WRITE FAULT
0004 =          HDEDNR  EQU     004H            ;DRIVE NOT READY
0005 =          HDEDNS  EQU     005H            ;DRIVE NOT SELECTED
0006 =          HDENTO  EQU     006H            ;NO TRACK 00
0007 =          HDEMDS  EQU     007H            ;MULTI-DRIVE SELECTED
                ;       TYPE 1 (CONTROLLER) ERROR CODES
0010 =          HDEIR   EQU     010H            ;ID READ
0011 =          HDEUD   EQU     011H            ;UNCORRECTABLE DATA
0012 =          HDEIAM  EQU     012H            ;ID ADDRESS MARK NOT FOUND
0013 =          HDEDAM  EQU     013H            ;DATA ADDRESS MARK NOT FOUND
0014 =          HDERNF  EQU     014H            ;RECORD NOT FOUND
0015 =          HDESE   EQU     015H            ;SEEK ERROR
0017 =          HDEWP   EQU     017H            ;WRITE PROTECTED
0018 =          HDECDF  EQU     018H            ;CORRECTABLE DATA FIELD ERROR
0019 =          HDEBBF  EQU     019H            ;BAD BLOCK FOUND
001A =          HDEFE   EQU     01AH            ;FORMAT ERROR
                ;       TYPE 2 (COMMAND) ERROR CODES
0020 =          HDEIC   EQU     020H            ;INVALID COMMAND
0021 =          HDEIDA  EQU     021H            ;INVALID DISK ADDRESS
0022 =          HDEIF   EQU     022H            ;ILLEGAL FUNCTION FOR THE DRIVE
                ;       ZDS ERROR CODES
0080 =          HDENZM  EQU     080H            ;NON-ZERO MESSAGE BYTE
0081 =          HDEBP   EQU     081H            ;BUS PARITY ERROR
0082 =          HDEPAR  EQU     082H            ;PARITY ERROR
0083 =          HDEOB   EQU     083H            ;SECTOR # OUT OF PARTITION BOUNDS
0084 =          HDETO   EQU     084H            ;TIME OUT

                ;  MISCELLANEOUS EQUATES

0122 =          H67MIN  EQU     290             ;MINIMUM # OF SECTORS FOR A PARTITION
801A =          H67MAX  EQU     32794           ;MAXIMUM # OF USEABLE SECTORS
                                                ; FOR A PARTITION
                        IF      SHUGART
                NSEC67  EQU     32768           ;TOTAL NUMBER OF SECTORS FOR SHUGART
                        ELSE
9880 =          NSEC67  EQU     39040           ;TOTAL NUMBER OF SECTORS FOR MEMOREX
                        ENDIF
001A =          NSPT67  EQU     26              ;NUMBER OF SECTORS PER TRACK
0001 =          NSYS67H EQU     1               ;NUMBER OF BOOT TRACKS FOR HARD DISK

                        PAGE
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```
                ;
                ;MISC EQUATES
                ;

00C3 =          MI$JMP  EQU     0C3H            ;8080 JUMP INSTRUCTION

00F0 =          H8CTL   EQU     0F0H            ;H8 CONTROL PORT
00D0 =          H8TR    EQU     0D0H            ;H8 CLOCK TICK RESET

00F2 =          H88CTL  EQU     0F2H            ;H88 CONTROL PORT
0020 =          M1H     EQU     020H            ;KEEP RAM AT 0
0040 =          I00     EQU     040H            ;H17 SIDE SELECT
0002 =          CLKE    EQU     002H            ;TURN ON 2MS CLOCK

0008 =          CLKVEC  EQU     0008H           ;CLOCK INTERRUPT VECTOR
000B =          TICCNT  EQU     000BH           ;TWO BYTE TICK COUNTER
000D =          CTLPRT  EQU     000DH           ;CURRENT CONTENTS OF '89 CONTROL LATCH
000E =          H8FLAG  EQU     000EH           ;CONTENTS = 0 FOR H/Z89, = H8TR FOR H8
000F =          DEVCTL  EQU     000FH           ;CURRENT CONTENTS OF H17 CONTROL LATCH
0018 =          SERVEC  EQU     0008H*3         ;SERIAL INTERRUPT VECTOR (LEVEL 3)

                        PAGE
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```
                        ;
                        ;MISC CPM EQUATES
                        ;
0003 =          NDISKS  EQU     H17ND+H37ND+H47ND+H67ND ;MAXIMUM NUMBER OF DISKS
                                                        ; IN THIS SYSTEM
                        IF      TRUE-1
                %:      TRUE NE 1
                        ENDIF
                        IF      (8-NDISKS) SHR 15
                %:      NDISK GT 8 -- DRIVE MAP ONLY HAS 8 ENTRY SLOTS
                        ENDIF

002C =          NSECTS  EQU     44              ;NUM SECTS TO READ ON WM BOOT

                ;  MAX HOST (PHYSICAL) SECTOR SIZE
                        IF      (H47T AND H47ED) OR (H37T AND H37ED)
                HSTSIZ  EQU     1024            ;MAX HOST (PHYSICAL) SECTOR SIZE
                        ELSE
0100 =          HSTSIZ  EQU     256             ;MAX HOST (PHYSICAL) SECTOR SIZE
                        ENDIF

00FF =          BT$WM   EQU     0FFH            ;WARM BOOT FLAG
0000 =          BT$CD   EQU     000H            ;COLD BOOT FLAG
                ;
                ;DEFAULT PORT ASSIGNMENTS
                ;
00FA =          H85CRT  EQU     372Q
00E8 =          H84CRT  EQU     0E8H
                ; H89-11 PORTS
00D8 =          H11TTY  EQU     0D8H
00D0 =          H11LPTP EQU     0D0H
                ; H89-3,H8-4 PORTS
00D0 =          H84TTY  EQU     0D0H
00E0 =          H84LPT  EQU     0E0H
00D8 =          H84RDP  EQU     0D8H
                ;
                ;BAUD RATE DIVISORS FOR 8250'S
                ;
0600 =          B75     EQU     1536
0417 =          B110    EQU     1047
0359 =          B134    EQU     857
0180 =          B300    EQU     384
00C0 =          B600    EQU     192
0060 =          B1200   EQU     96
0030 =          B2400   EQU     48
0018 =          B4800   EQU     24
000C =          B9600   EQU     12
0006 =          B19200  EQU     6
                ;
                ;ASCII VALUES
                ;
0000 =          NULL    EQU     00H
0003 =          CTLC    EQU     03H
0007 =          BELL    EQU     07H
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```
000D =          CR      EQU     0DH
000A =          LF      EQU     0AH
000D =          PADCH   EQU     CR              ;CHAR THAT GETS NULL PADDING, MUST NOT BE NULL

                        PAGE
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                        ;DEFAULT I/O BYTE
                        ;       CON: = CRT:
                        ;       RDR: = UR1:
                        ;       PUN: = UP1:
                        ;       LST: = LPT:
                        ;

0000 =          TTY     EQU     0

0001 =          CRT     EQU     1
0001 =          PTR     EQU     1
0001 =          PTP     EQU     1

0002 =          BAT     EQU     2
0002 =          UR1     EQU     2
0002 =          UP1     EQU     2
0002 =          LPT     EQU     2

0003 =          UC1     EQU     3
0003 =          UR2     EQU     3
0003 =          UP2     EQU     3
0003 =          UL1     EQU     3

00A9 =          DIOB    EQU     (CRT) OR (UR1 SHL 2) OR (UP1 SHL 4) OR (LPT SHL 6)

                        PAGE
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```
                        ;
                        ;  DEVICE DRIVER ENTRY JUMP VECTOR OFFSETS.
                        ;

0000 =          DDSEL   EQU     0               ;SELECT DISK
0003 =          DDRD    EQU     3               ;READ
0006 =          DDWR    EQU     6               ;WRITE
0009 =          DDRES   EQU     9               ;RESET
000C =          DDMNT   EQU     12              ;MOUNT

                        ;
                        ;  DISK PARAMETER ENTRY DESCRIPTION.
                        ;

0000 =          DPEXLT  EQU     0               ;SECTOR TRANSLATE TABLE ADDRESS
000A =          DPEDPB  EQU     10              ;DISK PARAMETER BLOCK ADDRESS
0010 =          DPEHTH  EQU     16              ;HEATH EXTENSIONS
0018 =          DPEL    EQU     24              ;LENGTH OF DISK PARAMETER ENTRY

                        ;  HEATH EXTENSIONS.
0010 =          DPEFLAG EQU     DPEHTH+0        ;FLAGS
00E0 =          DPETYPE EQU     11100000B       ;BIT 7-5 = DEVICE TYPE
0000 =          DPENE   EQU     00000000B       ;NON-EXISTENT
0040 =          DPEH17  EQU     01000000B       ;H17
0060 =          DPEH37  EQU     01100000B       ;H37
0080 =          DPEH47  EQU     10000000B       ;H47
00C0 =          DPEH67H EQU     11000000B       ;H67 HARD DISK
00C8 =          DPEH67F EQU     11001000B       ;H67 FLOPPY DISK
00E8 =          DPETYPF EQU     DPETYPE OR DPEH67F      ;H67 TYPE MASK
0010 =          DPEP7C  EQU     00010000B       ;BIT 4 -- 0=BASE PORT 78H  1=PORT 7CH
0010 =          DPE48RO EQU     00010000B       ;BIT 4 -- FOR H37
                                                ;  48 TPI MEDIA IN 96 TPI DRIVE (R/O)
0008 =          DPE96T  EQU     00001000B       ;BIT 3 -- 0=48 TPI DRIVE  1=96 TPI DRIVE
0004 =          DPEASGN EQU     00000100B       ;BIT 2 -- FOR H67 HARD DISK
                                                ;         0=UNASSIGNED A PARTITION
                                                ;         1=ASSIGNED A PARTITION
0004 =          DPEED   EQU     00000100B       ;BIT 2 -- 1=EXTENDED DOUBLE DENSITY
0002 =          DPEDD   EQU     00000010B       ;BIT 1 -- 0=SINGLE DENSITY  1=DOUBLE
0001 =          DPE2S   EQU     00000001B       ;BIT 0 -- 0=SINGLE SIDED  1=DOUBLE

0011 =          DPEUNIT EQU     DPEHTH+1        ;UNIT SELECT VALUE
0012 =          DPERPS  EQU     DPEHTH+2        ;CP/M RECORDS PER PHYSICAL SECTOR
0013 =          DPERPAB EQU     DPEHTH+3        ;CP/M RECORDS PER ALLOCATION BLOCK
0014 =          DPETRK  EQU     DPEHTH+4        ;TRACK COUNTER
0080 =          DPEUNK  EQU     10000000B       ;TRACK POSITION UNKNOWN
0015 =          DPESEK  EQU     DPEHTH+5        ;MOTOR SPEED AND SEEK SPEED
                                                ;BIT 6-0 = SEEK SPEED VALUE
0080 =          DPEMO   EQU     10000000B       ;BIT 7 = MOTOR UP TO SPEED FLAG
                                                ;  0=1 SEC  1=250 MSEC
0016 =          DPEUPB  EQU     DPEHTH+6        ;H67 PARTITION UPPER BOUND + 1
0016 =          DPEFLG2 EQU     DPEHTH+6        ;2ND FLAG BYTE
0002 =          DPEIMG  EQU     00000010B       ;BIT 1  IMAGINARY DRIVE
0001 =          DPE96TM EQU     00000001B       ;BIT 0  0=48 TPI MEDIA  1=96 TPI MEDIA
0017 =          DPELUN  EQU     DPEHTH+7        ;LAST LOGICAL UNIT MOUNTED
```

```
0008 =          DPEHL   EQU     8               ;LENGTH OF HEATH EXTENSION

                ;
                ;  DISK PARAMETER BLOCK.
                ;

0000 =          DPBSPT  EQU     0               ;SECTORS PER TRACK
0002 =          DPBBSH  EQU     DPBSPT+2        ;BLOCK SHIFT FACTOR
0003 =          DPBBLM  EQU     DPBSPT+3        ;BLOCK MASK
0004 =          DPBEXM  EQU     DPBSPT+4        ;EXTENT MASK
0005 =          DPBDSM  EQU     DPBSPT+5        ;TOTAL # OF BLOCKS - 1
0007 =          DPBDRM  EQU     DPBSPT+7        ;# OF DIRECTORY ENTRIES - 1
0009 =          DPBALO  EQU     DPBSPT+9        ;INITIAL ALO VALUE
000A =          DPBAL1  EQU     DPBSPT+10       ;INITIAL AL1 VALUE
000B =          DPBCKS  EQU     DPBSPT+11       ;SIZE OF DIRECTORY CHECK VECTOR
000D =          DPBOFF  EQU     DPBSPT+13       ;NUMBER OF SYSTEM TRACKS
000F =          DPBL    EQU     15              ;LENGTH OF DISK PARAMETER BLOCK

                ;*********************
                ;
                ;  DISK LABEL DEFINITIONS
                ;
                ;  DISK LABELS ARE USED ON ALL SYSGEN'ED DISKS.
                ;  ALSO THE H37 AND H67 HARD DATA DISKS USE THE LABEL.
                ;  TO MAINTAIN COMPATIBILITY WITH OLDER RELEASES OF CP/M
                ;  THE H17, H47, AND H67 FLOPPY DATA DISKS DO NOT USE LABELS.
                ;
                ;  THE LABEL RESIDES ON THE 1ST SECTOR OF TRACK 0.
                ;
                ;  AT THE END OF THE LABEL IS A CHECKSUM.  THE CHECKSUM IS CALCULATED
                ;  BY ADDING UP THE VALUES IN THE LABEL PRIOR TO THE CHECKSUM SLOT
                ;  A BYTE AT A TIME, THEN TAKING THE ONE'S COMPLEMENT OF THE SUM.
                ;
                ;*********************

0000 =          LABVER  EQU     0               ;CURRENT FORM # FOR LABEL

0000 =          LABBUF  EQU     0               ;SLOT FOR JUMP INSTRUCTION AROUND LABEL
0003 =          BDTYPE  EQU     LABBUF+3        ;SLOT FOR DRIVE TYPE

0004 =          LABEL   EQU     LABBUF+4
0004 =          LABTYP  EQU     LABEL+0         ;SLOT FOR LABEL TYPE
0005 =          LABHTH  EQU     LABTYP+1        ;SLOT FOR HEATH EXTENSIONS TO DPE
000D =          LABDPB  EQU     LABHTH+DPEHL    ;SLOT FOR DISK PARAMETER BLOCK
001C =          LABCS   EQU     LABDPB+DPBL     ;CHECKSUM

0019 =          LABLEN  EQU     LABCS-LABEL+1   ;LABEL LENGTH

                        PAGE
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                ;  SOFTWARE BOOT CODE DEFINITIONS

0000 =          SBC$SBC EQU     0               ;SECTOR # OF SBC

0000 =          SBC$JMP EQU     0000H           ;JUMP TO SOFTWARE BOOT CODE
0003 =          SBC$VER EQU     0003H           ;SOFTWARE BOOT CODE VERSION NUMBER
0004 =          SBC$REV EQU     0004H           ;SOFTWARE BOOT CODE REVISION NUMBER
0005 =          SBC$DBS EQU     0005H           ;DEFAULT BOOT STRING
0018 =          SBC$BSA EQU     0018H           ;SECTOR ADDR OF BAD SECTOR TABLE A
001B =          SBC$BSB EQU     001BH           ;SECTOR ADDR OF BAD SECTOR TABLE B
001E =          SBC$SBA EQU     001EH           ;SECTOR ADDR OF SUPER BLOCK A
0021 =          SBC$SBB EQU     0021H           ;SECTOR ADDR OF SUPER BLOCK B
0024 =          SBC$SSZ EQU     0024H           ;SECTOR SIZE
0026 =          SBC$SPT EQU     0026H           ;SECTORS PER TRACK
0028 =          SBC$TPC EQU     0028H           ;TRACKS PER CYLINDER
002A =          SBC$CPV EQU     002AH           ;CYLINDERS PER VOLUME
002C =          SBC$SPS EQU     002CH           ;SECTORS PER SLAB
002E =          SBC$VSZ EQU     002EH           ;VOLUME SIZE (SECTORS PER VOLUME)
0031 =          SBC$NSL EQU     0031H           ;NUMBER OF SLABS - 1
0032 =          SBC$CSA EQU     0032H           ;CHECKSUM: SUPER BLOCK A
0034 =          SBC$CSB EQU     0034H           ;CHECKSUM: SUPER BLOCK B
0036 =          SBC$CBA EQU     0036H           ;CHECKSUM: BAD SECTOR TABLE A
0038 =          SBC$CBB EQU     0038H           ;CHECKSUM: BAD SECTOR TABLE B

0080 =          SBC$LEN EQU     0080H           ;SBC LENGTH

                ;  SUPER BLOCK DEFINITIONS

0000 =          SPB$OSD EQU     0               ;OPERATING SYSTEM DEFINITIONS
0001 =          SPB$PAT EQU     1               ;PARTITION TABLE

                ;    OPERATING SYSTEM NAME TABLE DEFINITIONS

0010 =          SPB$OSL EQU     16              ;LENGTH OF EACH ENTRY
0010 =          SPB$OSN EQU     16              ;NUMBER OF ENTRIES

                ;    PARTITION TABLE ENTRIES

0000 =          SPB$OSI EQU     0               ;OPERATING SYSTEM ID
001F =          SPB$OSM EQU     00011111B       ;OPERATING SYSTEM ID MASK
001E =          SPB$UAR EQU     00011110B       ;UNALLOCATED REGION
001F =          SPB$EOL EQU     SPB$OSM         ;END OF LIST

0001 =          SPB$FSN EQU     1               ;FIRST SECTOR # OF PARTITION
                                                ; (LOW,MID,HIGH)

0004 =          SPB$PEL EQU     4               ;LENGTH OF ENTRY

                ;  BAD SECTOR TABLE

0003 =          SBC$BEL EQU     3               ;LENGTH OF ENTRY


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                        ;**
                        ;
                        ;       EP3DEF - EQUATES FOR ENHANCED PROGRAMMABLE COMMUNICATION
                        ;                INTERFACE CHIP 2661-3.
                        ;

                        ;       PORT DISPLACEMENTS

0000 =          EPDATA  EQU     0               ;DATA
0001 =          EPSTAT  EQU     1               ;STATUS
0001 =          EPSYN   EQU     1               ;SYN1/SYN2/DLE
0002 =          EPMODE  EQU     2               ;MODE
0003 =          EPCMD   EQU     3               ;COMMAND

                        ;       STATUS REGISTER

0001 =          EPTXR   EQU     00000001B       ;TRANSMITTER READY
0002 =          EPRXR   EQU     00000010B       ;RECEIVER READY
0004 =          EPTXE   EQU     00000100B       ;TRANSMITTER EMPTY
0004 =          EPDSC   EQU     00000100B       ;DATA SET CHANGE
0008 =          EPPE    EQU     00001000B       ;PARITY ERROR
0010 =          EPOE    EQU     00010000B       ;OVERRUN ERROR
0020 =          EPFE    EQU     00100000B       ;FRAME ERROR
0020 =          EPSD    EQU     00100000B       ;SYNC DETECTED
0040 =          EPDCD   EQU     01000000B       ;DATA CARRIER DETECT
0080 =          EPDSR   EQU     10000000B       ;DATA SET READY

                        ;       MODE REGISTER 1

0003 =          EPMBRF  EQU     00000011B       ;MODE AND BAUDRATE FACTOR
0000 =          EPS1X   EQU     000H            ;  SYNCHRONOUS 1X RATE
0001 =          EPA1X   EQU     001H            ;  ASYNCHRONOUS 1X RATE
0002 =          EPA16X  EQU     002H            ;  ASYNCHRONOUS 16X RATE
0003 =          EPA64X  EQU     003H            ;  ASYNCHRONOUS 64X RATE

000C =          EPCL    EQU     00001100B       ;CHARACTER LENGTH
0000 =          EPCL5   EQU     000H            ;  LENGTH 5
0004 =          EPCL6   EQU     004H            ;  LENGTH 6
0008 =          EPCL7   EQU     008H            ;  LENGTH 7
000C =          EPCL8   EQU     00CH            ;  LENGTH 8

0010 =          EPPC    EQU     00010000B       ;PARITY CONTROL (0=DISABLED , 1=ENABLED)
0020 =          EPPT    EQU     00100000B       ;PARITY TYPE (0=ODD , 1=EVEN)

00C0 =          EPASBL  EQU     11000000B       ;ASYNCHRONOUS STOP BIT LENGTH
0040 =          EPSB1   EQU     040H            ;  LENGTH 1
0080 =          EPSB15  EQU     080H            ;  LENGTH 1.5
00C0 =          EPSB2   EQU     0C0H            ;  LENGTH 2

0040 =          EPSTC   EQU     01000000B       ;SYNCHRONOUS TRANSPARENCY CONTROL
                                                ;  (0=NORMAL , 1=TRANSPARENT)
0080 =          EPNSC   EQU     10000000B       ;NUMBER OF SYNC CHARACTERS
                                                ;  (0=DOUBLE , 1=SINGLE)

                        ;       MODE REGISTER 2
```

```
                                
000F =          EPBRS   EQU     00001111B       ;BAUD RATE SELECTION
00F0 =          EPMR2U  EQU     11110000B       ;SEE TEXT
                                
                ;       COMMAND REGISTER
                                
0001 =          EPTXEN  EQU     00000001B       ;TRANSMITTER ENABLE
0002 =          EPDTR   EQU     00000010B       ;DATA TERMINAL READY
0004 =          EPRXEN  EQU     00000100B       ;RECEIVER ENABLE
0008 =          EPSBRK  EQU     00001000B       ;SEND BREAK (ASYNC)
0008 =          EPSDLE  EQU     00001000B       ;SEND DLE (SYNC)
0010 =          EPRESE  EQU     00010000B       ;RESET STATUS ERRORS
0020 =          EPRTS   EQU     00100000B       ;REQUEST TO SEND
                                
00C0 =          EPOM    EQU     11000000B       ;OPERATING MODE
0000 =          EPNORM  EQU     000H            ;  NORMAL
0040 =          EPOM1   EQU     040H            ;  MODE 1
0080 =          EPOMLL  EQU     080H            ;  LOCAL LOOP BACK
00C0 =          EPOMRL  EQU     0C0H            ;  REMOTE LOOP BACK
                                
                ;       BAUDRATE SELECTION VALUES
                                
0000 =          EPB050  EQU     0               ;50
0001 =          EPB075  EQU     1               ;75
0002 =          EPB110  EQU     2               ;110
0003 =          EPB134  EQU     3               ;134.5
0004 =          EPB150  EQU     4               ;150
0005 =          EPB300  EQU     5               ;300
0006 =          EPB600  EQU     6               ;600
0007 =          EPB120  EQU     7               ;1200
0008 =          EPB180  EQU     8               ;1800
0009 =          EPB200  EQU     9               ;2000
000A =          EPB240  EQU     10              ;2400
000B =          EPB360  EQU     11              ;3600
000C =          EPB480  EQU     12              ;4800
000D =          EPB720  EQU     13              ;7200
000E =          EPB960  EQU     14              ;9600
000F =          EPB192  EQU     15              ;19200
                                
                ;**
                ;
                ;       PPDEF - EQUATES FOR PARALLEL PORT USING 8255.
                ;
                                
                ;       PORT DISPLACEMENTS
                                
0000 =          PPDATA  EQU     0               ;DATA PORT A
0001 =          PPDATB  EQU     1               ;DATA PORT B
0002 =          PPDATC  EQU     2               ;DATA PORT C
0003 =          PPCTL   EQU     3               ;CONTROL
                                
                ;       CONTROL WORD
                                
0080 =          PPMSF   EQU     10000000B       ;MODE SET FLAG (0=BIT SET/RESET ,
                                                ; 1=MODE SET)
```

```
0060 =          PPGAMS  EQU     01100000B       ;GROUP A MODE SELECT
0000 =          PPGAM0  EQU     000H            ;  MODE 0
0020 =          PPGAM1  EQU     020H            ;  MODE 1
0040 =          PPGAM2  EQU     040H            ;  MODE 2

0010 =          PPGAPA  EQU     00010000B       ;PORT A (0=OUTPUT , 1=INPUT)
0008 =          PPGAPC  EQU     00001000B       ;PORT C UPPER (0=OUTPUT , 1=INPUT)

0004 =          PPGBMS  EQU     00000100B       ;GROUP B MODE SELECT
0000 =          PPGBM0  EQU     000H            ;  MODE 0
0004 =          PPGBM1  EQU     004H            ;  MODE 1

0002 =          PPGBPB  EQU     00000010B       ;PORT B (0=OUTPUT, 1=INPUT)
0001 =          PPGBPC  EQU     00000001B       ;PORT C LOWER (0=OUTPUT , 1=INPUT)

000E =          PPBSEL  EQU     00001110B       ;BIT SELECT
0000 =          PPBS0   EQU     000H            ;  BIT 0
0002 =          PPBS1   EQU     002H            ;  BIT 1
0004 =          PPBS2   EQU     004H            ;  BIT 2
0006 =          PPBS3   EQU     006H            ;  BIT 3
0008 =          PPBS4   EQU     008H            ;  BIT 4
000A =          PPBS5   EQU     00AH            ;  BIT 5
000C =          PPBS6   EQU     00CH            ;  BIT 6
000E =          PPBS7   EQU     00EH            ;  BIT 7

0001 =          PPBSR   EQU     000000001B      ;BIT SET/RESET (0=RESET, 1=SET)

                ;**
                ;
                ;       H8911DEF - EQUATES FOR H89-11
                ;

                ;       2661-3 SERIAL PORT

0004 =          EPINT   EQU     4               ;INTERRUPT ENABLE REGISTER
0001 =          EPIE    EQU     00000001B       ;0=DISABLE , 1=ENABLE

                ;       PARALLEL PORT PRINTER

0001 =          PPDS    EQU     00000001B       ;DATA STROBE
0080 =          PPRDY   EQU     10000000B       ;PRINTER READY

                        PAGE
```

```
905
906                     ;
907                     ; ENTRY POINT TABLE
908                     ;
909   0000 C3320D               JMP     CBOOT           ;FROM COLD START LOADER
910   0003 C39A00     WBOOTE:   JMP     WBOOT           ;TO INITIATE A WARM BOOT
911   0006 C3E108               JMP     CONST           ;CHECK CONSOLE STATUS
912   0009 C30609               JMP     CONIN           ;READ CONSOLE CHAR
913   000C C31409               JMP     CONOUT          ;WRITE CONSOLE CHAR
914   000F C33209               JMP     LIST            ;WRITE LIST DEVICE CHAR
915   0012 C34209               JMP     PUNCH           ;WRITE PUNCH DEVICE CHAR
916   0015 C35309               JMP     READER          ;READ CHAR FROM READER
917   0018 C37B01               JMP     HOME            ;SET DISK TO TRACK ZERO
918   001B C38E01               JMP     SETDSK          ;SELECT DISK DRIVE
919   001E C38801               JMP     SETTRK          ;SEEK TO TRACK
920   0021 C31602               JMP     SETSEC          ;SET SECTOR NUMBER
921   0024 C31C02               JMP     SETDMA          ;SET STARTING ADDRESS FOR DISK I/O
922   0027 C32F02               JMP     READ            ;READ SELECTED SECTOR
923   002A C34302               JMP     WRITE           ;WRITE SELECTED SECTOR
924   002D C32209               JMP     LISTST          ;CHECK LIST DEVICE STATUS
925   0030 C32202               JMP     SECTRAN         ;SECTOR TRANSLATE ROUTINE
926
927                             PAGE
```

```
                        ;*********************
                        ;
                        ;  BIOS HEADER SECTION.
                        ;
                        ;  * * *   N O T E   * * *
                        ;
                        ;     IF THIS SECTION IS ALTERED, THEN THE FILE 'BIOSDEF.LIB'
                        ;     MUST ALSO BE UPDATED.
                        ;
                        ;*********************

0033 04         BIOSVER DB      VERS            ;BIOS VERSION
0034 A9         DEFIOB  DB      DIOB            ;DEFAULT IOBYTE
0035 10         PRTRDY  DB      010H            ;SERIAL PRINTER (LPT) READY MASK
                                                ; (CTS = 010H WHICH IS DEFAULT
                                                ;  DSR = 020H)

0036 00         MODE    DB      PARTITN*MODEB3
0001 =          MODEB0  EQU     00000001B       ;BIT 0  1=CRT ON H8-5 CARD
0002 =          MODEB1  EQU     00000010B       ;BIT 1  1=EXTENDED DISK ERROR MSG'S
0004 =          MODEB2  EQU     00000100B       ;BIT 2  0 = SERIAL LPT READY IS LOW
                                                ;       1 = SERIAL LPT READY IS HIGH
0008 =          MODEB3  EQU     00001000B       ;BIT 3  1=PARTITIONING USED
0040 =          MODEB6  EQU     01000000B       ;BIT 6  1=RUN 'AUTO' ON WARM BOOT
0080 =          MODEB7  EQU     10000000B       ;BIT 7  1=RUN 'AUTO' ON COLD BOOT

0037 06         MODE2   DB      MODE2B2+MODE2B1
0001 =          MODE2B0 EQU     00000001B       ;BIT 0  0=H89-3 OR H8-4
                                                ;       1=H89-11
0002 =          MODE2B1 EQU     00000010B       ;BIT 1  0=H89-11 LPT IS SERIAL
                                                ;       1=H89-11 LPT IS PARALLEL
0004 =          MODE2B2 EQU     00000100B       ;BIT 2  0=PARALLEL LPT READY IS LOW
                                                ;       1=PARALLEL LPT READY IS HIGH

                        ; SERIAL DEVICE STRUCTURES
                        ;       DB      PORT$NUMBER
                        ;       DW      CONTROL$WORD
                        ;       WHERE THE CONTROL$WORD CONTAINS
                        ;               B15     MAP LOWER TO UPPER CASE
                        ;               B14-B12 NUMBER OF NULLS AFTER A CR
                        ;               B11-B00 BAUD RATE DIVISOR

0038 E8         H84PT1: DB      H84CRT
0039 0C00       CRTBAUD DW      B9600
003B D0         H84PT2: DB      H84TTY
003C 8001       TTYBAUD:DW      B300
003E E0         H84PT3: DB      H84LPT
003F 1800       LPTBAUD:DW      B4800
0041 D8         H84PT4: DB      H84RDP
0042 8001       RDPBAUD:DW      B300
0044 D8         H11PT2  DB      H11TTY
0045 0500       TTY11B  DW      EPB300
0047 D0         H11PT3  DB      H11LPTP
0048 0000               DW      0
                        ;
```

```
 984  004A 12        BSIZE   DB      (BIOSEND-BIOS+255)/256  ;BIOS SIZE IN PAGES
 985  004B 1211      BEND    DW      BIOSEND         ;ENDING ADDRESS OF BIOS + 1
 986  004D 0000      SECNT17 DW      0               ;H17 SOFT ERROR COUNT (SINCE COLD BOOT)
 987  004F 0000      SECNT37 DW      0               ;H37 SOFT ERROR COUNT (SINCE COLD BOOT)
 988  0051 03        BNDISKS DB      NDISKS          ;NUMBER OF DISKS POSSIBLE IN THIS BIOS
 989
 990  0052           DPBASE  DS      0               ;START OF DISK PARAMETER ENTRY TABLES
 991
 992                         PAGE
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```
 993
 994                                IF      H17T
 995  0052 1B0D0000  DPE0           DW      XLT17,0000H     ;TRANSLATE TABLE
 996  0056 00000000                 DW      0000H,0000H     ;SCRATCH
 997  005A 320E0C0D                 DW      DIRBUF,DPB17S   ;DIR BUFF,PARM BLK
 998  005E BE0EB20E                 DW      CSV0,ALV0       ;CHECK,ALLOC VEC
 999  0062 40                       DB      DPEH17          ;DISK TYPE
1000  0063 02                       DB      U0              ;SELECT CODE
1001  0064 02                       DB      2               ;NUMBER OF 128 BYTE RECORDS/PHYSICAL SECTOR
1002  0065 08                       DB      8               ;NUMBER OF RECORDS/ALLOCATION BLOCK
1003  0066 FF                       DB      0FFH            ;TRACK LOCATION
1004  0067 0F                       DB      STEPR           ;STEP RATE
1005  0068 00                       DB      0               ;FLAG BYTE 2
1006  0069 00                       DB      0               ;'REAL' - LAST DISK MOUNTED
1007                                                        ;'IMAGINARY' - CORRESPONDING REAL
1008                                                        ;    DRIVE'S LOGICAL UNIT #
1009  006A 1B0D0000  DPE1           DW      XLT17,0000H
1010  006E 00000000                 DW      0000H,0000H
1011  0072 320E0C0D                 DW      DIRBUF,DPB17S
1012  0076 DA0ECE0E                 DW      CSV1,ALV1
1013  007A 40                       DB      DPEH17
1014  007B 04                       DB      U1
1015  007C 02                       DB      2
1016  007D 08                       DB      8
1017  007E FF                       DB      0FFH
1018  007F 0F                       DB      STEPR
1019  0080 00                       DB      0
1020  0081 00                       DB      0
1021  0082 1B0D0000  DPE2           DW      XLT17,0000H
1022  0086 00000000                 DW      0000H,0000H
1023  008A 320E0C0D                 DW      DIRBUF,DPB17S
1024  008E F60EEA0E                 DW      CSV2,ALV2
1025  0092 40                       DB      DPEH17
1026  0093 08                       DB      U2
1027  0094 02                       DB      2
1028  0095 08                       DB      8
1029  0096 FF                       DB      0FFH
1030  0097 0F                       DB      STEPR
1031  0098 00                       DB      0
1032  0099 00                       DB      0
1033                                ENDIF
1034
1035                                IF      H37T
1036                  DPE37$0       DW      0000H,0000H     ;TRANSLATE TABLE
1037                                DW      0000H,0000H     ;SCRATCH
1038                                DW      DIRBUF,DPB37$0  ;DIR BUFF, PARM BLK
1039                                DW      CSV37$0,ALV37$0
1040                                DB      DPEH37+DPEDD    ;ASSUME DOUBLE DENSITY AT COLD BOOT
1041                                DB      CONDS0
1042                                DB      2
1043                                DB      8
1044                                DB      DPEUNK
1045                                DB      FDFS30
1046                                DB      0
1047                                DB      0
1048                  DPE37$1       DW      0000H,0000H
```

```
1049                            DW      0000H,0000H
1050                            DW      DIRBUF,DPB37$1
1051                            DW      CSV37$1,ALV37$1
1052                            DB      DPEH37+DPEDD
1053                            DB      CONDS1
1054                            DB      2
1055                            DB      8
1056                            DB      DPEUNK
1057                            DB      FDFS30
1058                            DB      0
1059                            DB      0
1060                DPE37$2     DW      0000H,0000H
1061                            DW      0000H,0000H
1062                            DW      DIRBUF,DPB37$2
1063                            DW      CSV37$2,ALV37$2
1064                            DB      DPEH37+DPEDD
1065                            DB      CONDS2
1066                            DB      2
1067                            DB      8
1068                            DB      DPEUNK
1069                            DB      FDFS30
1070                            DB      0
1071                            DB      0
1072                            ENDIF
1073
1074                            IF      H47T
1075                DPE47$0     DW      XLT0S,0000H     ;TRANSLATE TABLE
1076                            DW      0000H,0000H     ;SCRATCH
1077                            DW      DIRBUF,DPB0SS   ;DIR BUFF, PARM BLK
1078                            DW      CSV47$0,ALV47$0 ;CHECK, ALLOC VEC
1079                            DB      DPEH47
1080                            DB      000H
1081                            DB      1
1082                            DB      8
1083                            DB      0,0,0,0
1084                DPE47$1     DW      XLT0S,0000H
1085                            DW      0000H,0000H
1086                            DW      DIRBUF,DPB0SS
1087                            DW      CSV47$1,ALV47$1
1088                            DB      DPEH47
1089                            DB      020H
1090                            DB      1
1091                            DB      8
1092                            DB      0,0,0,0
1093                            ENDIF
1094
1095                            IF      H67T
1096                DPE67$0     DW      0000H,0000H
1097                            DW      0000H,0000H
1098                            DW      DIRBUF,DPB67$0
1099                            DW      0000H,ALV67$0
1100                            DB      DPEH67H         ;H67 HARD DISK
1101                            DB      0               ;SELECT
1102                            DB      2               ;LOGICAL IN EACH PHYSICAL
1103                            DB      32              ;ALLOCATED AT ONCE
1104                            DW      0               ;TRACK 0 OFFSET
```

```
1105                        DW      0               ;END OF PARTITION + 1
1106                        IF      H67PART2
1107            DPE67$2     DW      0000H,0000H
1108                        DW      0000H,0000H
1109                        DW      DIRBUF,DPB67$2
1110                        DW      0000H,ALV67$2
1111                        DB      DPEH67H         ;H67 HARD DISK (2ND PARTITION)
1112                        DB      0               ;SELECT
1113                        DB      2               ;LOGICAL IN EACH PHYSICAL
1114                        DB      32              ;ALLOCATED AT ONCE
1115                        DW      0               ;TRACK 0 OFFSET
1116                        DW      0               ;END OF PARTITION + 1
1117                        ENDIF
1118            DPE67$1     DW      XLT0S,0000H     ;FLOPPY IN H67
1119                        DW      0000H,0000H
1120                        DW      DIRBUF,DPB0SS
1121                        DW      CSV67$1,ALV67$1
1122                        DB      DPEH67F         ;H67 FLOPPY
1123                        DB      020H            ;SELECT
1124                        DB      1               ;LOGICAL IN EACH PHYSICAL
1125                        DB      8               ;ALLOCATED AT ONCE
1126                        DB      0,0,0,0
1127                        ENDIF
1128
1129                        PAGE
```

```
1130
1131                    ;
1132                    ;       WARM BOOT -- READ IN BDOS AND CCP
1133                    ;                       INITIALIZE
1134                    ;                       JUMP TO CCP
1135                    ;
1136
1137  009A 311211   WBOOT:  LXI     SP,STACK        ;SET STACK POINTER
1138  009D FB               EI                      ;INSURE INTERRUPTS ARE ENABLED
1139
1140  009E AF               XRA     A
1141  009F 4F               MOV     C,A             ;BOOT FROM DRIVE 0
1142  00A0 5F               MOV     E,A             ;ACT LIKE THIS IS THE FIRST LOGIN
1143  00A1 CD8E01           CALL    SETDSK
1144  00A4 7C               MOV     A,H
1145  00A5 B5               ORA     L
1146  00A6 CA6301           JZ      WBTE            ; BR IF SELECT ERROR
1147  00A9 E5               PUSH    H               ;GET POINTER TO XLATE AND SPT VALUE FOR
1148                                                ; TRACKS 1 TO N
1149  00AA CDC608           CALL    HLIHL           ;GET THE POINTER TO THE TRANSLATE TABLE
1150  00AD 229610           SHLD    XLTW1           ; AND SAVE IT
1151  00B0 229310           SHLD    XLTW
1152  00B3 E1               POP     H
1153  00B4 E5               PUSH    H
1154  00B5 110A00           LXI     D,DPEDPB        ;GET THE POINTER TO THE DISK PARAM BLOCK
1155  00B8 19               DAD     D
1156  00B9 CDC608           CALL    HLIHL
1157  00BC 7E               MOV     A,M             ;THE FIRST ENTRY OF WHICH IS THE NUMBER
1158  00BD 329510           STA     SPT1            ; OF SECTORS PER TRACK
1159  00C0 329210           STA     SPT
1160  00C3 E1               POP     H
1161
1162                          IF      H47T OR H67T
1163                          PUSH    H
1164                          LXI     D,DPEHTH
1165                          DAD     D               ;GET POINTER TO HEATH DISK TABLE
1166                          MOV     A,M             ;GET TYPE BYTE
1167                          MOV     C,A
1168                          ANI     DPETYPE
1169                          CPI     DPEH47          ;CHECK FOR TYPE H47
1170                          JZ      WBTOX           ;IS H47
1171                          MOV     A,C
1172                          ANI     DPETYPF
1173                          CPI     DPEH67F         ;CHECK FOR TYPE H67 FLOPPY
1174                          JNZ     WBTO            ;IF NOT H47 OR H67, THEN USE THESE VALUES
1175                  WBTOX:  MVI     A,26            ;  ELSE USE SINGLE DENSITY VALUES
1176                          LXI     H,XLTOS         ;    FOR TRACK 0
1177                          STA     SPT
1178                          SHLD    XLTW
1179                  WBTO:   POP     H
1180                          ENDIF
1181
1182  00C4 111000           LXI     D,DPEHTH
1183  00C7 19               DAD     D               ;GET POINTER TO HEATH DISK TABLE
1184  00C8 1180E9           LXI     D,CCP-128       ;ASSUME STARTING ADDRESS OF BOOT TRACK
1185  00CB 01002C           LXI     B,NSECTS*256    ;B = # OF SECTORS, C = STARTING SECTOR
```

```
1186
1187                            IF      H37T OR H67T
1188                            MOV     A,M             ;GET TYPE BYTE
1189                            ANI     DPETYPE
1190                            CPI     DPEH37          ;CHECK FOR H37
1191                            JZ      WBTOY           ;BR IF H37
1192                            CPI     DPEH67H         ;CHECK FOR H67
1193                            JNZ     WBTOZ           ;BR IF NOT H67
1194                    WBTOY:  LXI     D,CCP-256       ;RESET STARTING ADDRESS OF BOOT TRACK
1195                            ENDIF
1196
1197 00CE 210000       WBTOZ:  LXI     H,0             ;STARTING TRACK = 0
1198
1199 00D1 22A210       WBT1:   SHLD    SEKTRK
1200 00D4 EB                   XCHG
1201 00D5 229010               SHLD    DMAB            ;STARTING DMA ADR FOR THIS TRACK
1202
1203 00D8 C5           WBT2:   PUSH    B
1204 00D9 0600                 MVI     B,0             ;TRANSLATE SECTOR IN BC
1205 00DB 2A9310               LHLD    XLTW
1206 00DE EB                   XCHG
1207 00DF CD2202               CALL    SECTRAN
1208 00E2 4D                   MOV     C,L             ;TRANSLATED SECTOR IN HL
1209 00E3 7D                   MOV     A,L
1210 00E4 F5                   PUSH    PSW
1211 00E5 CD1602               CALL    SETSEC          ;SET THIS AS THE SECTOR TO READ
1212 00E8 F1                   POP     PSW
1213 00E9 3D                   DCR     A               ;CHANGE SECTOR NUMBER TO 0 THRU SPT-1
1214 00EA CD6F01               CALL    CDA             ;CORRECT DMA ADDRESS FOR THIS SECTOR
1215 00ED 22B210               SHLD    DMAADR
1216 00F0 7C                   MOV     A,H
1217 00F1 FEEA                 CPI     CCP/256         ;Q. IS THIS SECTOR PART OF BOOT CODE
1218 00F3 DA0801               JC      WBT3            ;YES, SO DON'T REALLY READ IT
1219 00F6 FE00                 CPI     BIOS/256        ;IS THIS SECTOR PART OF THE BIOS
1220 00F8 D20801               JNC     WBT3            ;YES, SO DON'T REALLY READ IT
1221
1222 00FB CD2F02               CALL    READ            ;READ THIS SECTOR
1223
1224 00FE B7                   ORA     A               ;CHECK FOR ERRORS
1225 00FF C26301               JNZ     WBTE
1226
1227 0102 C1                   POP     B
1228 0103 05                   DCR     B               ;COUNT THIS SECTOR AS READ
1229 0104 CA2C01               JZ      WBT4            ;IF THAT IS THE LAST ONE, SET POINTERS & LEAVE
1230
1231 0107 C5                   PUSH    B
1232 0108 C1           WBT3:   POP     B
1233 0109 0C                   INR     C               ;NEXT SECTOR
1234 010A 3A9210               LDA     SPT             ;NUMBER OF SECTORS PER TRACK
1235 010D B9                   CMP     C               ;HAVE WE OVERFLOWED TO NEXT TRACK?
1236 010E C2D800               JNZ     WBT2            ;NO
1237 0111 0E00                 MVI     C,0
1238 0113 CD6F01               CALL    CDA             ;UPDATE TRACK STARTING ADDRESS
1239
1240 0116 E5                   PUSH    H
1241 0117 3A9510               LDA     SPT1            ;BEYOND TRACK 0,
```

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1242  011A 329210          STA     SPT             ; SO UPDATE SPT AND XLTW TO BE THE VALUES
1243  011D 2A9610          LHLD    XLTW1           ; FOR TRACKS 1 AND BEYOND
1244  0120 229310          SHLD    XLTW
1245  0123 E1              POP     H
1246
1247  0124 EB              XCHG
1248  0125 2AA210          LHLD    SEKTRK
1249  0128 23              INX     H
1250  0129 C3D100          JMP     WBT1
1251
1252  012C 3EFF      WBT4: MVI     A,BT$WM         ;FLAG THIS AS A WARM BOOT
1253
1254  012E F5        GOW:  PUSH    PSW             ;SAVE THE BOOT TYPE
1255
1256  012F 3EC3            MVI     A,MI$JMP        ;INITIALIZE BIOS AND BDOS VECTORS
1257  0131 210300          LXI     H,WBOOTE
1258  0134 320000          STA     BOOT
1259  0137 220100          SHLD    BOOT+1
1260  013A 2106F2          LXI     H,BDOS+6
1261  013D 320500          STA     BOOT+5
1262  0140 220600          SHLD    BOOT+6
1263
1264  0143 018000          LXI     B,BUFF          ;SET DEFAULT DMA ADDRESS
1265  0146 CD1C02          CALL    SETDMA
1266
1267  0149 CD1204          CALL    FLUSH1          ;RE-INIT HOST DEBLOCKING
1268
1269  014C F1              POP     PSW             ;GET THE BOOT TYPE
1270  014D 0F              RRC                     ; CARRY SET IF WARM BOOT
1271  014E 3A3600          LDA     MODE
1272  0151 D25501          JNC     GOW1            ;IF WARM BOOT
1273  0154 17              RAL                     ; THEN SHIFT LEFT TWICE
1274  0155 17        GOW1: RAL                     ;CARRY SET IF TO RUN AUTO
1275  0156 3A0400          LDA     LOGDSK          ;GET DISK NUMBER TO
1276  0159 32A110          STA     SEKDSK          ; SAVE AS DESIRED DISK
1277  015C 4F              MOV     C,A             ; PASS TO CCP IN C
1278  015D DA00EA          JC      CCP             ;EXECUTE AUTO
1279  0160 C303EA          JMP     CCPCLR          ;EXECUTE CCP
1280
1281
1282  0163 21C00C    WBTE: LXI     H,BTMSG         ;PRINT BOOT ERROR MESSAGE
1283  0166 CD9B0C          CALL    PMSG
1284  0169 CD0609          CALL    CONIN           ;WAIT FOR KEYBOARD
1285  016C C39A00          JMP     WBOOT           ;TRY AGAIN
1286
1287                       PAGE
```

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1288
1289                    ;CDA - CORRECT DMA ADDRESS
1290                    ;       ENTRY   A       = RECORDS TO ADJUST
1291                    ;               DMAB    = STARTING ADDRESS OF TRACK
1292                    ;       EXIT    HL      = CORRECTED ADDRESS
1293                    ;
1294
1295  016F 2A9010   CDA:    LHLD    DMAB            ;GET STARTING ADDRESS OF TRACK
1296  0172 B7               ORA     A               ;CLEAR CARRY
1297  0173 1F               RAR                     ;DIVIDE BY 2
1298  0174 57               MOV     D,A             ;  D = A/2
1299  0175 3E00             MVI     A,0
1300  0177 1F               RAR
1301  0178 5F               MOV     E,A             ;  E = 00H OR 80H
1302  0179 19               DAD     D
1303  017A C9               RET
1304
1305                    PAGE
```

```
1306
1307                    ;
1308                    ;       HOME - SEEK HEAD TO TRACK 0 (DEFERRED)
1309                    ;
1310
1311  017B 3A300D   HOME:  LDA     HSTWRT          ;CHECK FOR PENDING WRITE
1312  017E B7              ORA     A
1313  017F C28501          JNZ     HOMED
1314  0182 322F0D          STA     HSTACT          ;CLEAR HOST ACTIVE FLAG
1315  0185 010000   HOMED: LXI     B,0             ;SET TO TRACK 0
1316
1317                    ;
1318                    ;       SETTRK - SET DISK TRACK NUMBER
1319                    ;               ENTRY:  BC      DESIRED TRACK ( 0 TO N-1 )
1320                    ;
1321
1322  0188 60       SETTRK: MOV     H,B
1323  0189 69               MOV     L,C
1324  018A 22A210           SHLD    SEKTRK
1325  018D C9               RET
1326
1327                        PAGE
```

```
1328
1329                    ;
1330                    ;       SETDSK - SELECT A DISK DRIVE
1331                    ;                ENTRY:  C       DESIRED DISK
1332                    ;                        E       LSB = 0 IF FIRST LOGIN
1333                    ;
1334
1335  018E 7B           SETDSK: MOV     A,E
1336  018F 32F001               STA     SETDSKB         ;SAVE 1ST FLAG
1337  0192 79                   MOV     A,C             ;GET THE DRIVE # FROM C
1338  0193 32EF01               STA     SETDSKA         ;SAVE LOGICAL UNIT NAME
1339  0196 FE03                 CPI     NDISKS          ;CHECK IF LEGAL
1340  0198 D2DF01               JNC     SETDE           ; BR IF NOT
1341
1342  019B 214000               LXI     H,BDMAP         ;GET MAPPED DRIVE #
1343  019E CDA808               CALL    DADA            ;(HL)=POINTER TO LOGICAL/MAPPED DRIVE #
1344  01A1 7E                   MOV     A,M             ;GET LOGICAL/MAPPED DRIVE #
1345  01A2 32A110               STA     SEKDSK          ;SAVE IT
1346  01A5 CDAD08               CALL    GETDPE          ;GET ADDR OF DPE
1347  01A8 22F101               SHLD    SETDSKC         ;SAVE ADDR OF DPE
1348  01AB 111000               LXI     D,DPEHTH        ;GET ADDR OF DPE'S HEATH EXTENSIONS
1349  01AE 19                   DAD     D
1350  01AF 228C10               SHLD    DPBX            ;SAVE IT
1351
1352                            IF      PARTITN
1353                            MOV     A,M             ;GET HEATH EXTENSION FLAG BYTE
1354                            ANI     DPETYPF
1355                            CPI     DPEH67H
1356                            JNZ     SETDSK1         ;BR IF NOT H67 HARD DISK
1357                            MOV     A,M
1358                            ANI     DPEASGN         ;CHECK IF PARTITION IS ASSIGNED
1359                            JZ      SETDE           ;BR IF NOT
1360                            ENDIF
1361
1362                    SETDSK1:
1363  01B2 3AF001               LDA     SETDSKB         ;RESTORE FIRST LOGIN FLAG
1364  01B5 1F                   RAR                     ;IF FIRST LOGIN
1365  01B6 DADB01               JC      SETDSK2         ; BR IF NOT
1366
1367  01B9 CD0404               CALL    FLUSH           ;FLUSH HOST BUFFER (I MAY NEED IT
1368                                                    ; AND ITS ASSOCIATED VARIABLES)
1369
1370  01BC 213600               LXI     H,MODE          ;SAVE MODE
1371  01BF 7E                   MOV     A,M
1372  01C0 32F301               STA     SETDSKD
1373  01C3 E6FD                 ANI     0FFH-MODEB1     ;TURN OFF EXTENDED ERROR MSG'S
1374  01C5 77                   MOV     M,A
1375
1376  01C6 3AA110               LDA     SEKDSK          ;SET HOST DPE'S HEATH EXTENSION
1377  01C9 CD5104               CALL    SHD             ; ADDR AND SWAP DISK IF NEEDED
1378
1379  01CC 110000               LXI     D,DDSEL         ;CALL DEVICE DRIVER FOR SELECT
1380  01CF CDF401               CALL    DSKDIS
1381
1382  01D2 3AF301               LDA     SETDSKD         ;RESTORE BIOS MODE BYTE
1383  01D5 323600               STA     MODE
```

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1384
1385  01D8 DADF01           JC      SETDE           ; BR IF ERROR RETURNED BY DEVICE DRIVER
1386
1387                  SETDSK2:
1388  01DB 2AF101           LHLD    SETDSKC         ;RET WITH ADDR OF DPE
1389  01DE C9               RET
1390
1391  01DF 3AEF01   SETDE:  LDA     SETDSKA         ;GET DRIVE # FROM ENTRY
1392  01E2 210400           LXI     H,LOGDSK        ;CHECK TO SEE IF ERROR IS
1393  01E5 BE               CMP     M               ; ON DEFAULT DISK
1394  01E6 C2EB01           JNZ     SETDE1          ;  BR IF NOT
1395  01E9 3600             MVI     M,0             ;SET DEFAULT AS DRIVE A
1396  01EB 210000   SETDE1: LXI     H,0000H         ;SET ERROR RETURN VALUE
1397  01EE C9               RET
1398
1399  01EF          SETDSKA DS      1               ;LOGICAL UNIT # FOR SELECTION
1400  01F0          SETDSKB DS      1               ;1ST TIME FLAG
1401  01F1          SETDSKC DS      2               ;ADDR RETURNED BY GETDPE
1402  01F3          SETDSKD DS      1               ;SAVED BIOS MODE BYTE
1403
1404                  PAGE
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1405
1406  01F4 7E       DSKDIS: MOV     A,M             ;GET DISK DRIVE TYPE
1407  01F5 07               RLC
1408  01F6 07               RLC
1409  01F7 07               RLC
1410  01F8 E607             ANI     DPETYPE/32
1411                        IF      DPETYPE-11100000B
1412                  %:    DPETYPE NE 11100000B
1413                        ENDIF
1414  01FA 87               ADD     A               ;*2
1415  01FB 210602           LXI     H,DTT
1416  01FE CDA808           CALL    DADA
1417  0201 CDC608           CALL    HLIHL
1418  0204 19               DAD     D               ;ADD JUMP VECTOR OFFSET
1419  0205 E9               PCHL
1420
1421                  DTT:
1422  0206 0D08             DW      NULDVD          ;000 - NON-EXISTANT
1423  0208 0D08             DW      NULDVD          ;001 - RESERVED
1424
1425                        IF      H17T
1426  020A FC04             DW      H17DVD          ;010 - H17
1427                        ELSE
1428                        DW      NULDVD
1429                        ENDIF
1430
1431                        IF      H37T
1432                        DW      H37DVD          ;011 - H37
1433                        ELSE
1434  020C 0D08             DW      NULDVD
1435                        ENDIF
1436
1437                        IF      H47T
1438                        DW      H47DVD          ;100 - H47
1439                        ELSE
1440  020E 0D08             DW      NULDVD
1441                        ENDIF
1442
1443  0210 0D08             DW      NULDVD          ;101 - RESERVED
1444
1445                        IF      H67T
1446                        DW      H67DVD          ;110 - H67
1447                        ELSE
1448  0212 0D08             DW      NULDVD
1449                        ENDIF
1450
1451  0214 0D08             DW      NULDVD          ;111 - RESERVED
1452
1453                        PAGE
```

```
1454
1455                    ;       SETSEC - SET SECTOR NUMBER
1456                    ;               ENTRY   C       DESIRED SECTOR (NUMBERED 1 TO SPT )
1457                    ;
1458
1459  0216 79           SETSEC: MOV     A,C             ;GET SECTOR NUMBER
1460  0217 3D                   DCR     A               ;SAVE 0 TO SPT-1
1461  0218 32A410               STA     SEKSEC
1462  021B C9                   RET
1463
1464                    ;
1465                    ;       SETDMA - SET DISK I/O ADDRESS
1466                    ;
1467
1468  021C 60           SETDMA: MOV     H,B             ;MOVE ARGUMENT FROM BC TO HL
1469  021D 69                   MOV     L,C
1470  021E 22B210               SHLD    DMAADR
1471  0221 C9                   RET
1472
1473                    ;
1474                    ;       SECTRAN - TRANSLATE SECTOR INDEX USING TABLE AT DE
1475                    ;                 INTO SECTOR NUMBER FOR SKEW
1476                    ;
1477                    ;       ENTRY   C = SECTOR INDEX (0 TO SPT-1)
1478                    ;               DE = ADDR OF TRANSLATE TABLE
1479                    ;       EXIT    HL = SECTOR NUMBER (1 TO SPT)
1480                    ;
1481
1482  0222 EB           SECTRAN: XCHG                   ;HL POINTS TO TABLE
1483  0223 7C                   MOV     A,H             ;CHECK FOR NULL XLATE TABLE
1484  0224 B5                   ORA     L
1485  0225 09                   DAD     B
1486  0226 CA2D02               JZ      SECTRAN1        ;NULL XLATE TABLE
1487  0229 6E                   MOV     L,M             ;L CONTAINS THE TRANSLATE SECTOR
1488  022A 2600                 MVI     H,0
1489  022C C9                   RET
1490
1491                    SECTRAN1:
1492  022D 23                   INX     H               ;PUT IN RANGE 1 TO SPT
1493  022E C9                   RET
1494
1495                            PAGE
```

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1496
1497                    ;
1498                    ;       READ - READ THE (LOGICAL) RECORD SET BY SETDSK, SETTRK, SETSEC
1499                    ;              INTO MEMORY AT DMAADR, DEBLOCKING AS NECESSARY
1500                    ;
1501
1502    0000 =          WRALL   EQU     0               ;WRITE TO ALLOCATED
1503    0001 =          WRDIR   EQU     1               ;WRITE TO DIRECTORY
1504    0002 =          WRUAL   EQU     2               ;WRITE TO UNALLOCATED
1505                    ;
1506                    ;
1507                    ;       READ THE SELECTED CP/M SECTOR
1508    022F AF         READ:   XRA     A
1509    0230 32310D             STA     UNACNT
1510    0233 3E01               MVI     A,1
1511    0235 32B010             STA     READOP          ;READ OPERATION
1512    0238 32AF10             STA     RSFLAG          ;MUST READ DATA
1513    023B 3E02               MVI     A,WRUAL
1514    023D 32B110             STA     WRTYPE          ;TREAT AS UNALLOC
1515    0240 C30D03             JMP     RWOPER          ;TO PERFORM THE READ
1516
1517                            PAGE
```

```
1518
1519                    ;       WRITE - WRITE THE (LOGICAL) RECORD SET BY SETDSK, SETTRK, SETSEC
1520                    ;               FROM MEMORY AT DMAADR, BLOCKING AS NECESSARY
1521                    ;
1522
1523  0243 AF           WRITE:  XRA     A               ;0 TO ACCUMULATOR
1524  0244 32B010               STA     READOP          ;NOT A READ OPERATION
1525  0247 79                   MOV     A,C             ;WRITE TYPE IN C
1526  0248 32B110               STA     WRTYPE
1527  024B FE02                 CPI     WRUAL           ;WRITE UNALLOCATED?
1528  024D C29102               JNZ     CHKUNA          ;CHECK FOR UNALLOC
1529                    ;
1530                    ;       WRITE TO UNALLOCATED, SET PARAMETERS
1531  0250 2A8C10               LHLD    DPBX            ;SET NUMBER OF RECORDS PER ALLOCATION
1532  0253 23                   INX     H
1533  0254 23                   INX     H
1534  0255 23                   INX     H
1535  0256 7E                   MOV     A,M
1536  0257 32310D               STA     UNACNT
1537  025A 3AA110               LDA     SEKDSK          ;DISK TO SEEK
1538  025D 32AA10               STA     UNADSK          ;UNADSK = SEKDSK
1539  0260 2AA210               LHLD    SEKTRK
1540  0263 22AB10               SHLD    UNATRK          ;UNATRK = SEKTRK
1541
1542  0266 2A8C10               LHLD    DPBX
1543  0269 11F0FF               LXI     D,-DPEHTH
1544  026C 19                   DAD     D               ;HL POINTS TO POINTER TO XLATE TABLE
1545  026D CDC608               CALL    HLIHL           ;HL POINTS TO XLATE TABLE
1546
1547  0270 7C                   MOV     A,H
1548  0271 B5                   ORA     L
1549  0272 C27E02               JNZ     WRITEO          ;XLATE TABLE PRESENT
1550  0275 3AA410               LDA     SEKSEC          ;NO XLATE TABLE
1551  0278 32AD10               STA     UNASI           ;  USE SECTOR #
1552  027B C39102               JMP     CHKUNA
1553
1554  027E 3AA410       WRITEO: LDA     SEKSEC          ;GET DESIRED SECTOR
1555  0281 3C                   INR     A               ;CORRECT TO 1 TO SPT
1556  0282 0E00                 MVI     C,0             ;INITIALIZE INDEX
1557
1558  0284 BE           WRITE1: CMP     M               ;FIND SECTOR'S INDEX
1559  0285 CA8D02               JZ      WRITE2          ;  (WHICH IS THE UNTRANSLATED SECTOR-1)
1560
1561  0288 0C                   INR     C               ;NOT THIS ONE, TRY THE NEXT
1562  0289 23                   INX     H
1563  028A C38402               JMP     WRITE1
1564
1565  028D 79           WRITE2: MOV     A,C             ;GET THE INDEX
1566  028E 32AD10               STA     UNASI           ;SAVE IT
1567
1568                    ;
1569                    ;       CHECK FOR WRITE TO UNALLOCATED SECTOR
1570  0291 3A310D       CHKUNA: LDA     UNACNT          ;ANY UNALLOC REMAIN?
1571  0294 B7                   ORA     A
1572  0295 CA0503               JZ      ALLOC           ;SKIP IF NOT
1573                    ;
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1574                    ;       MORE UNALLOCATED RECORDS REMAIN
1575  0298 3D                  DCR     A               ;UNACNT = UNACNT-1
1576  0299 32310D               STA     UNACNT
1577  029C 3AA110               LDA     SEKDSK          ;SAME DISK?
1578  029F 21AA10               LXI     H,UNADSK
1579  02A2 BE                   CMP     M               ;SEKDSK = UNADSK?
1580  02A3 C20503               JNZ     ALLOC           ;SKIP IF NOT
1581                    ;
1582                    ;       DISKS ARE THE SAME
1583  02A6 3AA210               LDA     SEKTRK
1584  02A9 21AB10               LXI     H,UNATRK
1585  02AC BE                   CMP     M               ;SEKTRK LSB = UNATRK LSB?
1586  02AD C20503               JNZ     ALLOC           ;SKIP IF NOT
1587  02B0 3AA310               LDA     SEKTRK+1
1588  02B3 23                   INX     H
1589  02B4 BE                   CMP     M               ;SEKTRK MSB = UNATRK MSB?
1590  02B5 C20503               JNZ     ALLOC           ;SKIP IF NOT
1591                    ;
1592                    ;       TRACKS ARE THE SAME
1593  02B8 2A8C10               LHLD    DPBX
1594  02BB 11F0FF               LXI     D,-DPEHTH
1595  02BE 19                   DAD     D
1596  02BF CDC608               CALL    HLIHL
1597  02C2 7C                   MOV     A,H
1598  02C3 B5                   ORA     L
1599  02C4 C2D002               JNZ     CHKUNA5         ;XLATE TABLE PRESENT
1600  02C7 3AAD10               LDA     UNASI
1601  02CA 21A410               LXI     H,SEKSEC
1602  02CD C3DA02               JMP     CHKUNA6
1603  02D0 3AAD10       CHKUNA5:LDA     UNASI
1604  02D3 CDA808               CALL    DADA
1605  02D6 3AA410               LDA     SEKSEC
1606  02D9 3C                   INR     A
1607  02DA BE           CHKUNA6:CMP     M               ;SEKSEC = UNASI?
1608  02DB 21AD10               LXI     H,UNASI
1609  02DE C20503               JNZ     ALLOC           ;SKIP IF NOT
1610                    ;
1611                    ;       MATCH, MOVE TO NEXT SECTOR FOR FUTURE REF
1612  02E1 34                   INR     M               ;UNASI = UNASI+1
1613  02E2 7E                   MOV     A,M             ;END OF TRACK?
1614  02E3 E5                   PUSH    H
1615  02E4 F5                   PUSH    PSW
1616  02E5 2A8C10               LHLD    DPBX            ;GET NUMBER OF SECTORS/TRACK FROM DPB
1617  02E8 11FAFF               LXI     D,-DPEHTH+DPEDPB
1618  02EB 19                   DAD     D
1619  02EC CDC608               CALL    HLIHL           ;GET DBPX
1620  02EF F1                   POP     PSW
1621  02F0 BE                   CMP     M               ;FIRST ENTRY OF WHICH IS SEC/TRACK
1622  02F1 E1                   POP     H
1623  02F2 DAFE02               JC      NOOVF           ;SKIP IF NO OVERFLOW
1624                    ;
1625                    ;       OVERFLOW TO NEXT TRACK
1626  02F5 3600                 MVI     M,0             ;UNASI = 0
1627  02F7 2AAB10               LHLD    UNATRK
1628  02FA 23                   INX     H
1629  02FB 22AB10               SHLD    UNATRK          ;UNATRK = UNATRK+1
```

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1630                    ;
1631                    ;       MATCH FOUND, MARK AS UNNECESSARY READ
1632   02FE AF          NOOVF:  XRA     A               ;0 TO ACCUMULATOR
1633   02FF 32AF10             STA     RSFLAG          ;RSFLAG = 0
1634   0302 C30D03             JMP     RWOPER          ;TO PERFORM THE WRITE
1635                    ;
1636                    ;       NOT AN UNALLOCATED RECORD, REQUIRES PRE-READ
1637   0305 AF          ALLOC:  XRA     A               ;0 TO ACCUM
1638   0306 32310D             STA     UNACNT          ;UNACNT = 0
1639   0309 3C                 INR     A               ;1 TO ACCUM
1640   030A 32AF10             STA     RSFLAG          ;RSFLAG = 1
1641
1642                            PAGE
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1643
1644                    ;       ENTER HERE TO PERFORM THE LOGICAL READ/WRITE
1645  030D AF           RWOPER: XRA     A               ;ZERO TO ACCUM
1646  030E 32AE10               STA     ERFLAG          ;NO ERRORS (YET)
1647  0311 2A8C10               LHLD    DPBX            ;FIND LOGICAL SECTORS PER PHYSICAL
1648  0314 4E                   MOV     C,M             ;GET DISK TYPE
1649  0315 23                   INX     H
1650  0316 23                   INX     H
1651  0317 46                   MOV     B,M             ;GET LOGICAL SECTORS PER PHYSICAL
1652
1653                            IF      H47T OR H67T
1654                            MOV     A,C
1655                            ANI     DPETYPE
1656                            CPI     DPEH47          ;CHECK FOR H47 FLOPPY
1657                            JZ      RWOX            ;IS H47
1658                            MOV     A,C
1659                            ANI     DPETYPF
1660                            CPI     DPEH67F         ;CHECK FOR H67 FLOPPY
1661                            JNZ     RWO             ;BR IF NOT
1662                    RWOX:   LHLD    SEKTRK          ;WHAT TRACK ARE WE AFTER?
1663                            MOV     A,H
1664                            ORA     L               ;IF NOT TRACK 0
1665                            JNZ     RWO             ;  THEN USE THE VALUE OF LSP IN DPBX
1666                            MVI     B,1             ;  ELSE ON TRACK 0 IT IS 1!
1667                            ENDIF
1668
1669  0318 78           RWO:    MOV     A,B
1670  0319 329C10               STA     LSP
1671
1672  031C 3AA410               LDA     SEKSEC          ;COMPUTE HOST SECTOR
1673  031F F5           RW1:    PUSH    PSW             ;SAVE THE PHSYICAL SECTOR (TO DATE)
1674  0320 78                   MOV     A,B             ;GET SHIFT FACTOR (SHIFT LOG2 SEC PER REC)
1675  0321 1F                   RAR
1676  0322 47                   MOV     B,A
1677  0323 DA2C03               JC      RW2
1678  0326 F1                   POP     PSW
1679  0327 B7                   ORA     A
1680  0328 1F                   RAR
1681  0329 C31F03               JMP     RW1
1682  032C F1           RW2:    POP     PSW
1683  032D 32A910               STA     SEKHST          ;HOST SECTOR TO SEEK
1684                    ;
1685                    ;       ACTIVE HOST SECTOR?
1686  0330 212F0D               LXI     H,HSTACT        ;HOST ACTIVE FLAG
1687  0333 7E                   MOV     A,M
1688  0334 3601                 MVI     M,1             ;ALWAYS BECOMES 1
1689  0336 B7                   ORA     A               ;WAS IT ALREADY?
1690  0337 CA6703               JZ      FILHST          ;FILL HOST IF NOT
1691                    ;
1692                    ;       HOST BUFFER ACTIVE, SAME AS SEEK BUFFER?
1693  033A 3AA110               LDA     SEKDSK
1694  033D 21A510               LXI     H,HSTDSK        ;SAME DISK?
1695  0340 BE                   CMP     M               ;SEKDSK = HSTDSK?
1696  0341 C26003               JNZ     NOMATCH
1697                    ;
1698                    ;       SAME DISK, SAME TRACK?
```

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1699  0344 3AA210           LDA     SEKTRK
1700  0347 21A610           LXI     H,HSTTRK
1701  034A BE               CMP     M               ;SEKTRK LSB = HSTTRK LSB?
1702  034B C26003           JNZ     NOMATCH
1703  034E 3AA310           LDA     SEKTRK+1
1704  0351 23               INX     H
1705  0352 BE               CMP     M               ;SEKTRK MSB = HSTTRK MSB?
1706  0353 C26003           JNZ     NOMATCH
1707                ;
1708                ;       SAME DISK, SAME TRACK, SAME BUFFER?
1709  0356 3AA910           LDA     SEKHST
1710  0359 21A810           LXI     H,HSTSEC        ;SEKHST = HSTSEC?
1711  035C BE               CMP     M
1712  035D CA9203           JZ      MATCH           ;SKIP IF MATCH
1713                ;
1714                ;       PROPER DISK, BUT NOT CORRECT SECTOR
1715  0360 3A300D   NOMATCH: LDA    HSTWRT          ;HOST WRITTEN?
1716  0363 B7               ORA     A
1717  0364 C4F303           CNZ     WRITEHST        ;CLEAR HOST BUFF
1718                ;
1719                ;       MAY HAVE TO FILL THE HOST BUFFER
1720  0367 3AA110   FILHST: LDA     SEKDSK
1721  036A 32A510           STA     HSTDSK
1722  036D 2AA210           LHLD    SEKTRK
1723  0370 22A610           SHLD    HSTTRK
1724  0373 3AA910           LDA     SEKHST
1725  0376 32A810           STA     HSTSEC
1726  0379 3AB010           LDA     READOP
1727  037C B7               ORA     A
1728  037D C28703           JNZ     FIL1            ;YES IT WAS A READ
1729  0380 3A9C10           LDA     LSP
1730  0383 3D               DCR     A
1731  0384 CA8E03           JZ      FIL2            ;DON'T NEED TO PREREAD IF PHYSICAL=LOGICAL
1732
1733  0387 3AAF10   FIL1:   LDA     RSFLAG          ;NEED TO READ?
1734  038A B7               ORA     A
1735  038B C4E303           CNZ     READHST         ;YES, IF 1
1736  038E AF       FIL2:   XRA     A               ;0 TO ACCUM
1737  038F 32300D           STA     HSTWRT          ;NO PENDING WRITE
1738                ;
1739                ;       COPY DATA TO OR FROM BUFFER
1740  0392 3A9C10   MATCH:  LDA     LSP
1741  0395 3D               DCR     A
1742  0396 21A410           LXI     H,SEKSEC
1743  0399 A6               ANA     M
1744  039A 210000           LXI     H,0
1745  039D CAA803           JZ      M2
1746  03A0 118000           LXI     D,128
1747  03A3 19       M1:     DAD     D
1748  03A4 3D               DCR     A
1749  03A5 C2A303           JNZ     M1
1750                ;       HL HAS RELATIVE HOST BUFFER ADDRESS
1751  03A8 11320D   M2:     LXI     D,HSTBUF
1752  03AB 19               DAD     D               ;HL = HOST ADDRESS
1753  03AC EB               XCHG                    ;NOW IN DE
1754  03AD 2AB210           LHLD    DMAADR          ;GET/PUT CP/M DATA
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1755  03B0 0E80              MVI     C,128           ;LENGTH OF MOVE
1756  03B2 3AB010            LDA     READOP          ;WHICH WAY?
1757  03B5 B7                ORA     A
1758  03B6 C2BF03            JNZ     RWMOVE          ;SKIP IF READ
1759                  ;
1760                  ;       WRITE OPERATION, MARK AND SWITCH DIRECTION
1761  03B9 3E01              MVI     A,1
1762  03BB 32300D            STA     HSTWRT          ;HSTWRT = 1
1763  03BE EB                XCHG                    ;SOURCE/DEST SWAP
1764                  ;
1765                  ;       C INITIALLY 128, DE IS SOURCE, HL IS DEST
1766  03BF CDCB08     RWMOVE: CALL    MOVEITX         ;MOVE DATA
1767                  ;
1768                  ;       DATA HAS BEEN MOVED TO/FROM HOST BUFFER
1769  03C2 3AB110            LDA     WRTYPE          ;WRITE TYPE
1770  03C5 FE01              CPI     WRDIR           ;TO DIRECTORY?
1771  03C7 3AAE10            LDA     ERFLAG          ;IN CASE OF ERRORS
1772  03CA C2DB03            JNZ     RW9             ; BR IF NOT DIRECTORY WRITE
1773                  ;
1774                  ;       CLEAR HOST BUFFER FOR DIRECTORY WRITE
1775  03CD B7                ORA     A               ;ERRORS?
1776  03CE C2DD03            JNZ     RW9A            ; BR IF ERROR
1777  03D1 AF                XRA     A               ;0 TO ACCUM
1778  03D2 32300D            STA     HSTWRT          ;BUFFER WRITTEN
1779  03D5 CDF303            CALL    WRITEHST
1780  03D8 3AAE10            LDA     ERFLAG
1781
1782  03DB A7         RW9:   ANA     A               ;CHECK FOR ERROR
1783  03DC C8                RZ                      ; RET IF NONE
1784
1785  03DD F5         RW9A:  PUSH    PSW             ;SAVE ERROR
1786  03DE CD1204            CALL    FLUSH1          ;RE-INIT HOST BUFFER FLAGS
1787  03E1 F1                POP     PSW             ;RESTORE ERROR
1788  03E2 C9                RET
1789
1790                  PAGE
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1791
1792                    ;       WRITEHST PERFORMS THE PHYSICAL WRITE TO
1793                    ;       THE HOST DISK, READHST READS THE PHYSICAL
1794                    ;       DISK.
1795                    ;
1796                    ;       READHST - PERFORM PHYSICAL SECTOR READ
1797                    ;               HSTDSK = HOST DISK #, HSTTRK = HOST TRACK #,
1798                    ;               HSTSEC = HOST SECT #. READ "HSTSIZ" BYTES
1799                    ;               INTO HSTBUF AND RETURN ERROR FLAG IN ERFLAG.
1800                    ;
1801
1802                    READHST:
1803  03E3 AF                   XRA     A               ;INDICATE READ OPERATION
1804  03E4 329B10               STA     RWOP
1805
1806  03E7 3AA510               LDA     HSTDSK          ;GET HOST DISK
1807  03EA CD5104               CALL    SHD             ;SET HOST DEVICE POINTER
1808                                                    ;  AND PERFORM LOGICAL TO PHYSICAL MAPPING
1809
1810  03ED 110300               LXI     D,DDRD
1811  03F0 C3F401               JMP     DSKDIS
1812
1813                    ;
1814                    ;       WRITEHST - WRITE PHYSICAL SECTOR
1815                    ;               HSTDSK = HOST DISK #, HSTTRK = HOST TRACK #,
1816                    ;               HSTSEC = HOST SECT #. WRITE "HSTSIZ" BYTES
1817                    ;               FROM HSTBUF AND RETURN ERROR FLAG IN ERFLAG.
1818                    ;               RETURN ERFLAG NON-ZERO IF ERROR
1819                    ;
1820
1821                    WRITEHST:
1822  03F3 3E01                 MVI     A,1             ;INDICATE WRITE OPERATION
1823  03F5 329B10               STA     RWOP
1824
1825  03F8 3AA510               LDA     HSTDSK
1826  03FB CD5104               CALL    SHD             ;GET HSTDPB, ALSO DO PHYSICAL -> LOGICAL MAP
1827
1828  03FE 110600               LXI     D,DDWR
1829  0401 C3F401               JMP     DSKDIS
1830
1831                    ;
1832                    ;       FLUSH - FLUSHES HOST BUFFER.
1833                    ;       FLUSH1 - REINITIALIZES HOST FLAGS
1834                    ;
1835
1836  0404 3A2F0D       FLUSH:  LDA     HSTACT          ;IS HOST BUFFERING ACTIVE
1837  0407 A7                   ANA     A
1838  0408 CA1204               JZ      FLUSH1          ;BR IF NOT
1839
1840  040B 3A300D               LDA     HSTWRT          ;IS HOST BUFFER WAITING TO BE WRITTEN
1841  040E A7                   ANA     A
1842  040F C4F303               CNZ     WRITEHST        ;YES - WRITE IT
1843
1844  0412 AF           FLUSH1: XRA     A
1845  0413 322F0D               STA     HSTACT          ;DEACTIVATE HOST BUFFER
1846  0416 32300D               STA     HSTWRT          ;NO PENDING WRITE
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1847  0419 32310D          STA     UNACNT          ;NO UNALLOCATED SECTORS IN BLOCK
1848
1849  041C C9              RET
1850
1851                  ;  EXTENDED ERROR MESSAGE HANDLER.
1852                  ;
1853                  ;  ENTRY:  (ERRTYP) = ERROR CODE
1854                  ;          (HL) = ADDR OF DEVICE TYPE MSG
1855                  ;  EXIT:   NONE
1856                  ;  USES:   ALL
1857
1858  041D 3A3600  PRTERR: LDA     MODE            ;CHECK IF EXTENDED ERROR MESSAGES
1859  0420 E602            ANI     MODEB1          ; REQUESTED
1860  0422 C8              RZ                      ;  RET IF NOT
1861
1862  0423 E5              PUSH    H               ;SAVE DEVICE TYPE MSG
1863  0424 21FE0C          LXI     H,CRLF
1864  0427 CD9B0C          CALL    PMSG
1865  042A E1              POP     H               ;RESTORE DEVICE TYPE MSG
1866  042B CD9B0C          CALL    PMSG
1867
1868  042E 3A9B10          LDA     RWOP            ;PRINT I/O TYPE MSG
1869  0431 21E90C          LXI     H,RDMSG         ;ASSUME READ
1870  0434 A7              ANA     A
1871  0435 CA3B04          JZ      PRTERR1
1872  0438 21EF0C          LXI     H,WRMSG         ;WAS WRITE
1873                  PRTERR1:
1874  043B CD9B0C          CALL    PMSG
1875
1876  043E 21F60C          LXI     H,ERRMSG
1877  0441 CD9B0C          CALL    PMSG
1878
1879  0444 3A9E10          LDA     ERRTYP          ;PRINT ERROR TYPE
1880  0447 CDA80C          CALL    HOUT
1881
1882  044A 21FE0C          LXI     H,CRLF
1883  044D CD9B0C          CALL    PMSG
1884
1885  0450 C9              RET
1886
1887                       PAGE
```

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1888
1889                    ; SHD - SET HOST DPB POINTER
1890                    ;       ENTRY   A       HOST DISK
1891                    ;       EXIT    HSTDPB  POINTS TO HOST DISK PARAMETERS
1892                    ;               (HL) = (HSTDPB)
1893                    ;
1894
1895                    SHD:
1896                            IF      H17T OR H37T
1897  0451 32D004               STA     SHDA
1898  0454 32D104               STA     SHDB
1899                            ENDIF
1900  0457 CDBE08               CALL    GETDPEX         ;GET ADDR OF DPE'S HEATH EXTENSIONS
1901  045A 228E10               SHLD    HSTDPB          ; SAVE IT
1902
1903                            IF      H17T OR H37T
1904
1905  045D 7E                   MOV     A,M             ;CHECK DRIVE TYPE
1906  045E E6E0                 ANI     DPETYPE
1907  0460 FE40                 CPI     DPEH17
1908  0462 CA6A04               JZ      SHD1
1909  0465 FE60                 CPI     DPEH37
1910  0467 C2C804               JNZ     SHD6
1911
1912  046A EB           SHD1:   XCHG                    ;(DE) = ADDR OF HEATH EXTENSIONS
1913  046B 210600               LXI     H,DPEFLG2-DPEHTH
1914  046E 19                   DAD     D
1915  046F 7E                   MOV     A,M
1916  0470 E602                 ANI     DPEIMG          ;CHECK IF IMAGINARY DRIVE
1917  0472 CA8104               JZ      SHD2            ; BR IF NOT
1918
1919  0475 210700               LXI     H,DPELUN-DPEHTH ;GET REAL DRIVE LOGICAL UNIT #
1920  0478 19                   DAD     D
1921  0479 7E                   MOV     A,M
1922  047A 32D104               STA     SHDB            ;SAVE IT
1923  047D CDBE08               CALL    GETDPEX         ;GET ADDR OF DPE'S HEATH EXTENSIONS
1924  0480 EB                   XCHG                    ;(DE) = ADDR OF HEATH EXTENSIONS
1925
1926  0481 210700       SHD2:   LXI     H,DPELUN-DPEHTH
1927  0484 19                   DAD     D
1928  0485 3AD004               LDA     SHDA
1929  0488 BE                   CMP     M               ;REQ UNIT = CURRENTLY MOUNTED UNIT
1930  0489 CAC504               JZ      SHD5            ; BR IF YES
1931
1932  048C 77                   MOV     M,A             ;UPDATE MOUNTED UNIT SLOT
1933
1934  048D CDC904               CALL    SHD9            ;GET LOGICAL DISK NAME
1935  0490 C641                 ADI     'A'
1936  0492 32DD04               STA     MNMSGA
1937
1938  0495 3AD104               LDA     SHDB            ;GET PHYSICAL DISK NAME
1939  0498 CDC904               CALL    SHD9
1940  049B C641                 ADI     'A'
1941  049D 32E804               STA     MNMSGB
1942
1943  04A0 110C00               LXI     D,DDMNT         ;MOUNT DISK DRIVE
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1944  04A3 2A8E10          LHLD    HSTDPB
1945  04A6 CDF401          CALL    DSKDIS
1946
1947  04A9 21D204          LXI     H,MNMSG         ;PROMPT USER TO CHANGE DISK
1948  04AC CD9B0C          CALL    PMSG
1949
1950  04AF CD0609   SHD3:  CALL    CONIN           ;GET A CHARACTER FROM THE CONSOLE
1951
1952  04B2 FE0D            CPI     CR              ;IF CHAR == CR
1953  04B4 CABF04          JZ      SHD4            ; THEN GO AHEAD
1954
1955  04B7 0E07            MVI     C,BELL          ;  ELSE RING BELL
1956  04B9 CD1409          CALL    CONOUT
1957  04BC C3AF04          JMP     SHD3            ;    AND WAIT FOR ANOTHER CHARACTER
1958
1959  04BF 21FE0C   SHD4:  LXI     H,CRLF
1960  04C2 CD9B0C          CALL    PMSG
1961
1962  04C5 2A8E10   SHD5:  LHLD    HSTDPB
1963
1964                       ENDIF
1965
1966  04C8 C9       SHD6:  RET
1967
1968                       IF      H17T OR H37T
1969
1970                 ;  GET LOGICAL UNIT #
1971                 ;
1972                 ;    ENTRY:  (A) = LOGICAL AND MAPPED UNIT #'S
1973                 ;                  BIT 7-4 = LOGICAL UNIT #
1974                 ;                  BIT 3-0 = MAPPED UNIT #
1975                 ;    EXIT:   (A) = LOGICAL UNIT #
1976                 ;    USES:   A,F
1977
1978  04C9 1F       SHD9:  RAR
1979  04CA 1F              RAR
1980  04CB 1F              RAR
1981  04CC 1F              RAR
1982  04CD E60F            ANI     0FH
1983  04CF C9              RET
1984
1985  04D0          SHDA   DS      1               ;LOGICAL/MAPPED DRIVE # OF REQ
1986  04D1          SHDB   DS      1               ;LOGICAL/MAPPED DRIVE # OF REAL
1987
1988  04D2 0D0A505554MNMSG DB      CR,LF,'PUT DISK '
1989  04DD 2E20494E20MNMSGA DB     '. IN DRIVE '
1990  04E8 2E3A20414EMNMSGB DB     '.: AND PRESS RETURN',0
1991                       ENDIF
1992
1993                       PAGE
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1994
1995                            IF      H17T
1996
1997                    ;       H17 DEVICE DRIVE                        11 MAR 1982
1998
1999                    H17DVD:
2000   04FC C33A06              JMP     RDYH17          ;SELECT ENTRY POINT
2001   04FF C30B05              JMP     RD17M           ;READ
2002   0502 C32405              JMP     WR17M           ;WRITE
2003   0505 C32D06              JMP     RESH17          ;RESET
2004   0508 C32406              JMP     MNTH17          ;MOUNT
2005
2006                            PAGE
```

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2007
2008  050B 3AA810  RD17M:  LDA   HSTSEC
2009  050E 329910          STA   SECTOR
2010
2011  0511 3AA610          LDA   HSTTRK        ;GET TRACK (# IS ALWAYS < 256)
2012  0514 329810          STA   TRACK
2013
2014  0517 CD4905          CALL  RD17
2015  051A 3E00            MVI   A,00H
2016  051C D22005          JNC   RDH1          ;CARRY SET INDICATES ERROR
2017  051F 3D              DCR   A             ;  IF ERROR, MAKE ERFLAG = OFFH
2018  0520 32AE10  RDH1:   STA   ERFLAG
2019  0523 C9              RET
2020
2021  0524 3AA810  WR17M:  LDA   HSTSEC        ;GET SECTOR NUMBER
2022  0527 329910          STA   SECTOR
2023
2024  052A 3AA610          LDA   HSTTRK        ;GET TRACK (# IS ALWAYS < 256)
2025  052D 329810          STA   TRACK
2026
2027  0530 CD7E05          CALL  WR17
2028  0533 3E00            MVI   A,00H
2029  0535 D23905          JNC   WRH1          ;CARRY SET ON ERROR
2030  0538 3D              DCR   A             ;  MAKE ERFLAG = OFFH ON ERROR
2031  0539 32AE10  WRH1:   STA   ERFLAG
2032  053C C9              RET
2033
2034                       PAGE
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2035
2036                    ;
2037                    ; XOK - EXIT FROM DISK OPERATION WITHOUT ERROR
2038                    ; XIT - EXIT FLAGGING ERROR IN CARRY
2039                    ;
2040
2041  053D AF           XOK:    XRA     A               ;CLEAR CARRY
2042  053E F5           XIT:    PUSH    PSW
2043  053F F3                   DI
2044  0540 210F06               LXI     H,DELAYS        ;SET DISK MOTOR AND SELECT TIMERS
2045  0543 222B08               SHLD    DLYMO
2046  0546 F1                   POP     PSW
2047  0547 FB                   EI
2048  0548 C9                   RET
2049                    ;
2050                    ; RD17 - READ A SELECTED SECTOR
2051                    ;
2052
2053  0549 CDB906       RD17:   CALL    SDP             ;SET PARAMETERS FOR THIS OPERATION
2054
2055  054C CDD506       RD171:  CALL    SDT             ;SEEK THE DESIRED TRACK
2056
2057  054F CD3F07               CALL    LPS             ;FIND THE PROPER SECTOR
2058  0552 DA7505               JC      RD17E           ;COULDN'T FIND IT
2059  0555 0600                 MVI     B,0             ;READ 256 BYTES
2060  0557 21320D               LXI     H,HSTBUF        ;POINTER TO BUFFER
2061  055A CDC907               CALL    WSC             ;WAIT FOR SYNC
2062  055D 3E20                 MVI     A,D$E$MDS       ;MISSING DATA SYNC ERROR
2063  055F DA7505               JC      RD17E           ;MISSING SYNC BYTE
2064
2065  0562 CDBB07       RD172:  CALL    RDB             ;READ A BYTE FROM THE DISK
2066  0565 77                   MOV     M,A             ;PUT IT IN MEMORY
2067  0566 23                   INX     H               ;INCREMENT POINTER
2068
2069  0567 05                   DCR     B               ;COUNT BYTE AS READ
2070  0568 C26205               JNZ     RD172           ;MORE TO READ
2071
2072  056B 42                   MOV     B,D
2073  056C CDBB07               CALL    RDB             ;CHECK CHECKSUM
2074  056F B8                   CMP     B
2075  0570 CA3D05               JZ      XOK             ;EVERYTHING IS OKAY
2076  0573 3E08                 MVI     A,D$E$CHK       ;SIGNAL CHECKSUM ERROR
2077
2078  0575 CDCC05       RD17E:  CALL    H17E            ;H17 ERROR HANDLER
2079  0578 D24C05               JNC     RD171           ;TRY AGAIN
2080  057B C33E05               JMP     XIT             ;RETURN, FLAGGING ERROR IN CARRY
2081
2082                            PAGE
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2083
2084                    ;
2085                    ; WR17 - WRITE A SECTOR
2086                    ;
2087
2088  057E CDB906   WR17:   CALL    SDP             ;SET DISK PARAMETERS
2089
2090  0581 DB7F     WR171:  IN      DPDC            ;SEE IF WRITE PROTECTED
2091  0583 E604             ANI     DFWP
2092  0585 3E40             MVI     A,D$E$WRP       ;POSSIBLE WRITE PROTECT ERROR
2093  0587 C2C305           JNZ     WR17E           ;YES, IT IS A WRITE PROTECT ERROR
2094
2095  058A CDD506           CALL    SDT             ;GET CORRECT TRACK
2096
2097  058D CD3F07           CALL    LPS             ;FIND THE PROPER SECTOR
2098  0590 DAC305           JC      WR17E           ;COULDN'T FIND IT
2099
2100  0593 0600             MVI     B,0             ;256 BYTES/SECTOR
2101  0595 21320D           LXI     H,HSTBUF        ;POINTER TO SOURCE OF DATA
2102
2103  0598 3E14             MVI     A,WRITA
2104  059A 3D       WR172:  DCR     A
2105  059B C29A05           JNZ     WR172
2106
2107  059E 0E0A             MVI     C,WRITB
2108  05A0 3E10             MVI     A,WRITC
2109  05A2 CDEA07           CALL    WSP             ;WRITE THE SYNC PATTERN
2110
2111  05A5 7E       WR173:  MOV     A,M
2112  05A6 CDFF07           CALL    WNB             ;WRITE THIS DATA BYTE
2113  05A9 23               INX     H
2114  05AA 05               DCR     B
2115  05AB C2A505           JNZ     WR173           ;LOOP TO WRITE ALL 256 BYTES
2116
2117  05AE 7A               MOV     A,D             ;WRITE CHECKSUM
2118  05AF CDFF07           CALL    WNB
2119
2120  05B2 CDFF07           CALL    WNB             ;CONTINUE TUNNEL ERASE
2121  05B5 CDFF07           CALL    WNB             ;FOR 3 CHARACTER TIMES
2122  05B8 CDFF07           CALL    WNB
2123
2124  05BB 3A0F00           LDA     DEVCTL          ;OFF WRITE GATE
2125  05BE D37F             OUT     DPDC
2126  05C0 C33D05           JMP     XOK
2127
2128  05C3 CDCC05   WR17E:  CALL    H17E            ;CALL THE H17 ERROR HANDLER
2129  05C6 D28105           JNC     WR171           ;TRY AGAIN
2130  05C9 C33E05           JMP     XIT             ;RETURN FLAGGING ERROR IN CARRY
2131
2132                        PAGE
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2133
2134                    ; H17E - H17 ERROR HANDLER
2135                    ;       ENTRY   A - ERROR TYPE
2136                    ;       EXIT    C - SET IF RETRIES EXHAUSTED
2137
2138  05CC FB           H17E:   EI
2139  05CD 329E10               STA     ERRTYP          ;SAVE THE ERROR TYPE
2140
2141  05D0 E6C0                 ANI     D$E$UNR+D$E$WRP ;IS IT UNIT NOT READ OR
2142                                                    ; WRITE PROTECT VIOLATION
2143  05D2 C21806               JNZ     H17E4           ;IF SO, THEN AUTOMATIC HARD ERROR
2144
2145  05D5 2A4D00               LHLD    SECNT17         ;BUMP THE SOFT ERROR COUNT
2146  05D8 23                   INX     H
2147  05D9 224D00               SHLD    SECNT17
2148
2149  05DC 219D10               LXI     H,ERRCNT        ;GET A POINTER TO THE RETRY COUNTER
2150  05DF 35                   DCR     M               ;  DECREMENT THE RETRY COUNTER
2151  05E0 CA1806               JZ      H17E4           ;RETRIES EXHAUSTED, FLAG HARD ERROR
2152
2153                    ;       BASED ON ERROR TYPE AND RETRY NUMBER
2154                    ;         SELECT FROM THE FOLLOWING RETRY ACTIONS
2155                    ;               SEEK TRACK 0    IF BAD TRACK ERROR OR RETRY 5
2156                    ;               JUST TRY AGAIN  IF RETRY ODD
2157                    ;               MOVE IN THEN OUT        IF RETRY & 2 = 0
2158                    ;               MOVE OUT THEN IN        IF RETRY & 2 = 1
2159
2160  05E3 3A9E10               LDA     ERRTYP
2161  05E6 FE01                 CPI     D$E$TRK         ;WAS IT A BAD TRACK ERROR
2162  05E8 CA1306               JZ      H17E2           ;YES, GO DO A SEEK TRACK ZERO
2163
2164  05EB 7E                   MOV     A,M             ;FETCH RETRY COUNT
2165  05EC FE05                 CPI     5               ;IF == 5
2166  05EE CA1306               JZ      H17E2           ;  THEN SEEK TRACK ZERO
2167
2168  05F1 1F                   RAR                     ;IF ODD, THEN TRY AGAIN IN PLACE
2169  05F2 3F                   CMC                     ;COMPLEMENT CARRY
2170  05F3 D0                   RNC                     ;RETURN WITH CARRY CLEAR
2171
2172  05F4 2A9F10               LHLD    TRKPT           ;GET POINTER TO CURRENT TRACK
2173
2174  05F7 1F                   RAR                     ;IS B1 OF ERRCNT = 1?
2175  05F8 7E                   MOV     A,M             ;GET CURRENT TRACK
2176  05F9 DA0806               JC      H17E1           ;YES, SO MOVE OUT THEN IN
2177
2178  05FC FE27                 CPI     39              ;IF IT IS ALREADY AT THE MAXIMUM TRACK
2179  05FE CA1606               JZ      H17E3           ;  THEN DON'T DO ANYTHING
2180
2181  0601 34                   INR     M               ;INCREMENT CURRENT TRACK
2182  0602 CD1007               CALL    MAI             ;  MOVE ARM IN ONE TRACK
2183  0605 C31606               JMP     H17E3
2184
2185  0608 B7           H17E1:  ORA     A               ;IF IT IS ALREADY AT MINIMUM TRACK
2186  0609 CA1606               JZ      H17E3           ;  THEN DON'T DO ANYTHING
2187
2188  060C 35                   DCR     M               ;DECREMENT CURRENT TRACK
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2189  060D CD1507          CALL    MAO             ;  MOVE ARM OUT ONE TRACK
2190  0610 C31606          JMP     H17E3
2191
2192  0613 CDF506  H17E2:  CALL    STZ
2193
2194  0616 AF      H17E3:  XRA     A               ;CLEAR CARRY
2195  0617 C9              RET
2196
2197                       ;       HARD ERROR HAS OCCURRED
2198                       ;         (OPTIONALLY) PRINT ERROR MESSAGE
2199                       ;         RETURN WITH CARRY SET
2200
2201  0618 212006  H17E4:  LXI     H,H17MSG
2202  061B CD1D04          CALL    PRTERR          ;PRINT EXTENED ERROR MESSAGE
2203
2204  061E 37              STC                     ;RETURN FLAGGING HARD ERROR IN CARRY
2205  061F C9              RET
2206
2207  0620 48313700  H17MSG DB      'H17',0
2208
2209                       PAGE
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2210
2211                    ;
2212                    ;  MNTH17 -- MOUNT
2213                    ;
2214
2215  0624 2A8E10   MNTH17: LHLD    HSTDPB          ;SET TRACK POINTER TO UNKNOWN
2216  0627 110400           LXI     D,DPETRK-DPEHTH
2217  062A 19               DAD     D
2218  062B 3680             MVI     M,DPEUNK
2219
2220                    ;+    JMP     RESH17          ;RESET DRIVE
2221
2222
2223
2224
2225                    ;
2226                    ;  RESH17 -- ABORT OPERATION/RESET H17
2227                    ;
2228
2229  062D AF       RESH17: XRA     A
2230  062E D37F             OUT     DPDC
2231  0630 320F00           STA     DEVCTL
2232  0633 210000           LXI     H,0
2233  0636 222B08           SHLD    DLYMO
2234  0639 C9               RET
2235
2236
2237
2238
2239                    ;
2240                    ;  RDYH17 -- CHECK IF UNIT READY
2241                    ;           1. DRIVE IS AVAILABLE
2242                    ;           2. CORRECT TYPE OF MEDIA HAS BEEN INSERTED
2243                    ;
2244                    ;  ENTRY: NONE
2245                    ;  EXIT:  PSW/C = 0 IF READY
2246                    ;                 = 1 IF NOT READY
2247                    ;  USES:  ALL
2248                    ;
2249                    ;  THE NUMBER OF HOLE TRANSITIONS IS COUNTED IN THE TIME IT TAKES
2250                    ;  FOR 1 REVOLUTION (200MS).  IF THE DISK INSERTED IS HARD SECTORED,
2251                    ;  THEN 11 HOLES PLUS/MINUS 1 (22+-2 TRANSITIONS) SHOULL BE COUNTED,
2252                    ;  10 SECTOR HOLES AND 1 INDEX HOLE.
2253                    ;
2254
2255                    RDYH17:
2256  063A CD7806           CALL    ONH17           ;TURN ON MOTOR AND SELECT DRIVE
2257
2258  063D 212D08           LXI     H,DLYW          ;WAIT UNTIL DRIVE IS UP TO SPEED
2259                    RDYH17A:
2260  0640 7E               MOV     A,M
2261  0641 A7               ANA     A
2262  0642 C24006           JNZ     RDYH17A
2263
2264  0645 210B00           LXI     H,TICCNT        ;GET TIME VALUE
2265  0648 3E64             MVI     A,100
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2266  064A 86              ADD     M
2267  064B 47              MOV     B,A             ;(B) = TIME VALUE
2268
2269  064C 0E00            MVI     C,0             ;(C) = HOLE COUNTER
2270  064E 51              MOV     D,C             ;(D) = INIT HOLE STATUS TO NO HOLE
2271
2272                 RDYH17B:
2273  064F DB7F            IN      DPDC            ;GET HOLE STATUS
2274  0651 E601            ANI     DFHD
2275  0653 BA              CMP     D               ;HAS IT CHANGED
2276  0654 CA5F06          JZ      RDYH17C         ; BR IF NOT
2277
2278  0657 57              MOV     D,A             ;SAVE NEW STATUS
2279  0658 0C              INR     C               ;COUNT TRANSITION
2280
2281  0659 3E14            MVI     A,WHDA          ;DEBOUNCE DELAY
2282                 RDYH17B1:
2283  065B 3D              DCR     A
2284  065C C25B06          JNZ     RDYH17B1
2285
2286                 RDYH17C:
2287  065F 78              MOV     A,B             ;CHECK IF TIME UP
2288  0660 BE              CMP     M
2289  0661 C24F06          JNZ     RDYH17B         ; BR IF NOT
2290  0664 79              MOV     A,C             ;TIME UP -- CHECK # OF HOLES
2291  0665 FE14            CPI     10*2
2292  0667 DA7006          JC      RDYH17D         ;IF < 10 THEN ERROR
2293  066A FE19            CPI     12*2+1
2294  066C 3F              CMC
2295  066D D27506          JNC     RDYH17E         ;IF <= 12 THEN OK
2296
2297                 RDYH17D:
2298  0670 3E80            MVI     A,D$E$UNR       ;  OTHERWISE SAY UNIT NOT READY
2299  0672 CDCC05          CALL    H17E            ;REPORT ERROR
2300
2301                 RDYH17E:
2302  0675 C33E05          JMP     XIT             ;RETURN VIA 'XIT'
2303
2304                       PAGE
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2305
2306                    ;
2307                    ;  ONH17 -- TURNS ON MOTOR, SELECT DRIVE, AND SET SETTLE DELAY COUNTERS.
2308                    ;
2309
2310  0678 FB     ONH17:  EI                      ;MAKE CERTAIN INTERRUPTS ARE ENABLED
2311
2312  0679 210000         LXI     H,0
2313  067C 222B08         SHLD    DLYMO
2314
2315  067F 2A8E10         LHLD    HSTDPB          ;GET DEVICE SELECT CODE
2316  0682 23             INX     H
2317  0683 7E             MOV     A,M
2318  0684 F610           ORI     DPMO            ;TURN ON THE MOTOR
2319  0686 D37F           OUT     DPDC
2320
2321  0688 47             MOV     B,A
2322  0689 210F00         LXI     H,DEVCTL        ;WHAT WAS ITS STATE?
2323  068C 7E             MOV     A,M
2324  068D E610           ANI     DPMO            ;WAS THE MOTOR ON?
2325  068F C2A906         JNZ     ONH17A          ;YES, DON'T HAVE TO WAIT FOR IT
2326
2327  0692 E5             PUSH    H
2328  0693 2A8E10         LHLD    HSTDPB          ;FIND OUT HOW FAST IT COMES UP
2329  0696 110500         LXI     D,DPESEK-DPEHTH
2330  0699 19             DAD     D
2331  069A 7E             MOV     A,M
2332  069B E1             POP     H
2333  069C 17             RAL
2334                        IF      DPEMO-10000000B
2335                %:      DPEMO NE 10000000B
2336                        ENDIF
2337  069D 3EFA           MVI     A,SPD           ;UP TO SPEED IN SPD * 4 MS
2338  069F D2B406         JNC     ONH17B
2339  06A2 1F             RAR                     ;NEW DRIVES UP IN 1/4 TIME
2340  06A3 1F             RAR
2341  06A4 E63F           ANI     03FH
2342  06A6 C3B406         JMP     ONH17B
2343
2344  06A9 7E     ONH17A: MOV     A,M
2345  06AA E60E           ANI     U0+U1+U2        ;CHECK THE AVAILABLE UNITS
2346  06AC A0             ANA     B               ;WAS THIS UNIT SELECTED?
2347  06AD 3E00           MVI     A,0
2348  06AF C2B406         JNZ     ONH17B          ;THIS HEAD WAS ALREADY LOADED
2349  06B2 3E14           MVI     A,HLTG          ;MUST WAIT FOR HEAD LOAD TIMING
2350  06B4 322D08 ONH17B: STA     DLYW
2351
2352  06B7 70             MOV     M,B
2353                    ;MOV    A,B
2354                    ;STA    DEVCTL
2355
2356  06B8 C9             RET
2357
2358                        PAGE
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2359
2360                    ;
2361                    ; SDP - SET DEVICE PARAMETERS
2362                    ;       SET RETRY COUNT, MAKE SURE MOTOR IS ON AND DRIVE SELECTED
2363                    ;
2364
2365                    SDP:
2366  06B9 CD7806               CALL    ONH17           ;TURN ON MOTOR AND SELECT DRIVE
2367
2368  06BC 3E0A                 MVI     A,RETRIES       ;SET TRY COUNTER
2369  06BE 329D10               STA     ERRCNT
2370
2371  06C1 2A8E10               LHLD    HSTDPB          ;GET THE CURRENT TRACK FOR THIS DISK
2372  06C4 110400               LXI     D,DPETRK-DPEHTH ;OFFSET TO TRACK IN DISK TABLES
2373  06C7 19                   DAD     D               ;GET ADDRESS OF TRACK FOR THIS DRIVE
2374  06C8 229F10               SHLD    TRKPT
2375  06CB 7E                   MOV     A,M
2376  06CC 17                   RAL                     ;IF MSB IS 0
2377  06CD D0                   RNC                     ;  THEN TRACK IS POINTED TO BY TRKPT
2378                    ;CALL   STZ                     ;  ELSE HEAD POSITION IS UNKNOWN AND
2379                    ;RET                            ;     IS ZEROED
2380  06CE C3F506               JMP     STZ
2381
2382                    PAGE
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2383
2384                    ; SDT - SEEK DESIRED TRACK
2385                    ;       SEEK TO TRACK UPDATING *TRKPT
2386                    ;
2387  06D1 34           SDTO:   INR     M
2388  06D2 CD1007               CALL    MAI
2389
2390  06D5 2A9F10       SDT:    LHLD    TRKPT
2391  06D8 3A9810               LDA     TRACK
2392  06DB BE                   CMP     M
2393  06DC CAE906               JZ      SDT1            ;AT DESIRED TRACK
2394  06DF F2D106               JP      SDTO            ;  MUST MOVE ARM IN
2395                                                    ;  ELSE MUST MOVE ARM OUT
2396  06E2 35                   DCR     M
2397  06E3 CD1507               CALL    MAO
2398
2399  06E6 C3D506               JMP     SDT
2400
2401
2402  06E9 3A2D08       SDT1:   LDA     DLYW            ;MAKE CERTAIN TO DELAY FOR HEAD SETTLE TIME
2403  06EC FE06                 CPI     HST             ;IS WAIT ALREADY > HEAD SETTLE
2404  06EE D0                   RNC                     ;IF SO, RETURN
2405  06EF 3E06                 MVI     A,HST           ;  ELSE BE SURE TO DELAY FOR HEAD SETTLE
2406  06F1 322D08               STA     DLYW
2407  06F4 C9                   RET
2408
2409                    ;
2410                    ; STZ - SEEK TRACK 0 BY STEPPING THE HEAD OUT UNTIL THE TRACK ZERO INDICATOR
2411                    ;       IS ACTIVE OR 255 STEPS HAVE BEEN DONE.
2412                    ;       CALLED DURING ERROR RECOVERY AND TO INITIALLY POSITION HEADS.
2413
2414                    STZ:
2415  06F5 2E00                 MVI     L,0             ;SET LOOP COUNTER
2416                    STZO:
2417  06F7 DB7F                 IN      DPDC            ;CHECK THE TRACK ZERO SENSOR
2418  06F9 E602                 ANI     DFTO
2419  06FB C20807               JNZ     STZ1            ;IF SET, THEN WE ARE AT TRACK 0
2420  06FE 2D                   DCR     L               ;DCR LOOP COUNTER
2421  06FF CA0807               JZ      STZ1            ; IF COUNTER EXHAUSTED, THEN ASSUME TRACK 0
2422  0702 CD1507               CALL    MAO             ;MOVE OUT ANOTHER TRACK
2423  0705 C3F706               JMP     STZO
2424                    STZ1:
2425  0708 2A9F10               LHLD    TRKPT           ;ZERO TRACK INDICATOR FOR THIS DRIVE
2426  070B 3600                 MVI     M,0
2427  070D C3E906               JMP     SDT1            ;HEAD SETTLE DELAY IN CASE GOING TO 0
2428
2429
2430                            PAGE
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2431
2432                    ; MAI - MOVE ARM IN
2433                    ; MAO - MOVE ARM OUT
2434                    ;
2435
2436  0710 3E20         MAI:    MVI     A,DFDI          ;SET DIRECTION
2437  0712 C31607               JMP     MAO1
2438  0715 AF           MAO:    XRA     A               ;SET DIRECTION
2439  0716 E5           MAO1:   PUSH    H
2440  0717 67                   MOV     H,A
2441  0718 3A0F00               LDA     DEVCTL          ;GET CURRENT VALUE OF DISK PORT
2442  071B B4                   ORA     H               ;OR IN DIRECTION
2443  071C D37F                 OUT     DPDC            ; SEND IT TO DISK
2444  071E F640                 ORI     DFST            ;OR IN STEP
2445  0720 D37F                 OUT     DPDC            ; SEND IT TO DISK
2446  0722 EE40                 XRI     DFST            ;CLEAR STEP
2447  0724 D37F                 OUT     DPDC            ; SEND IT TO DISK
2448  0726 2A8E10               LHLD    HSTDPB          ;GET STEP RATE
2449  0729 110500               LXI     D,5
2450  072C 19                   DAD     D
2451  072D 7E                   MOV     A,M
2452  072E E67F                 ANI     07FH
2453  0730 E1                   POP     H
2454                    ;       CALL    DLY             ;IMPLICIT CALL DLY AND RET
2455                    ;       RET
2456
2457                    ;
2458                    ; DLY - DELAY A * 2 MS
2459                    ;
2460
2461  0731 E5           DLY:    PUSH    H
2462  0732 210B00               LXI     H,TICCNT        ;POINTER TO TICK COUNTER, INCREMENTED EVERY 2MS
2463  0735 86                   ADD     M               ;VALUE OF TICCNT WHEN DELAY COMPLETED
2464  0736 BE           DLY1:   CMP     M               ;WAIT FOR TICCNT TO CATCH UP
2465  0737 C23607               JNZ     DLY1
2466  073A E1                   POP     H
2467  073B C9                   RET
2468
2469
2470                            PAGE
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2471
2472                    ; LPS - LOCATE PROPER SECTOR
2473                    ;
2474
2475  073C CD7D07   LPS0:   CALL    STS             ;SKIP THIS SECTOR
2476
2477  073F 3A2D08   LPS:    LDA     DLYW            ;READY TO READ YET?
2478  0742 B7               ORA     A
2479  0743 C23C07           JNZ     LPS0            ;IF NOT, WAIT A SECTOR TIME
2480
2481  0746 0614             MVI     B,LPSA
2482
2483  0748 F3       LPS1:   DI
2484  0749 CDC907           CALL    WSC             ;WAIT FOR A SYNC CHARACTER
2485  074C 3E02             MVI     A,D$E$HSY       ;FLAG HEADER SYNC ERROR
2486  074E DA7207           JC      LPS2            ;COULDN'T FIND ONE
2487
2488  0751 CDBB07           CALL    RDB             ;READ THE VOLUME NUMBER
2489  0754 CDBB07           CALL    RDB             ;READ THE TRACK NUMBER
2490  0757 219810           LXI     H,TRACK
2491  075A BE               CMP     M
2492  075B 3E01             MVI     A,D$E$TRK       ;BAD TRACK ERROR
2493  075D C27207           JNZ     LPS2            ;WRONG TRACK
2494
2495  0760 CDBB07           CALL    RDB             ;READ THE SECTOR NUMBER
2496  0763 23               INX     H               ;POINT TO SECTOR
2497  0764 BE               CMP     M
2498  0765 3E10             MVI     A,D$E$RNF       ;RECORD NOT FOUND ERROR
2499  0767 C27207           JNZ     LPS2            ;WRONG SECTOR
2500
2501  076A 62               MOV     H,D
2502  076B CDBB07           CALL    RDB             ;DO CHECKSUM ON HEADER
2503  076E BC               CMP     H
2504  076F C8               RZ                      ;OKAY
2505  0770 3E04             MVI     A,D$E$HCK       ;HEADER CHECKSUM IS WRONG
2506
2507  0772 F5       LPS2:   PUSH    PSW
2508  0773 CD7D07           CALL    STS             ;SKIP THIS SECTOR
2509  0776 F1               POP     PSW
2510  0777 05               DCR     B               ;ANOTHER TIME PASSES QUICKLY PAST
2511  0778 C24807           JNZ     LPS1
2512
2513  077B 37               STC                     ;ENOUGH ALREADY
2514  077C C9               RET
2515
2516
2517                        PAGE
```

```
2518
2519                    ; STS - SKIP THIS SECTOR
2520                    ;       EXIT AT BEGINNING OF NEXT SECTOR
2521                    ;       1. IF HEAD IS NOT OVER A HOLE, WAIT 8 MS WHILE HOLE CHECKING.
2522                    ;          IF NO HOLE IN THIS TIME, THEN WE ARE IN A REGULAR GAP.
2523                    ;          WAIT FOR THE NEXT HOLE AND EXIT.
2524                    ;       2. IF THE HEAD IS OVER A HOLE, OR BECOMES SO DURING THE 8 MS
2525                    ;          WAIT, THEN WAIT FOR THE HOLE TO PASS, WAIT 12 MS IN CASE OF
2526                    ;          THE INDEX HOLE, THEN WAIT FOR THE NEXT HOLE AND EXIT.
2527                    ;
2528
2529  077D FB           STS:    EI
2530  077E C5                   PUSH    B
2531  077F DB7F                 IN      DPDC            ;CHECK THE DISK PORT
2532  0781 1F                   RAR                     ;FOR SECTOR HOLES
2533  0782 DA9907               JC      STS2            ;CURRENTLY OVER A HOLE
2534
2535                    ;       NO HOLE YET, WAIT 8 MS MIN (10 MS MAX) FOR HOLE TO APPEAR
2536
2537  0785 210B00               LXI     H,TICCNT
2538  0788 46                   MOV     B,M
2539  0789 DB7F         STS1:   IN      DPDC
2540  078B 1F                   RAR
2541  078C DA9907               JC      STS2            ;FOUND A HOLE
2542
2543  078F 3E05                 MVI     A,STSA
2544  0791 80                   ADD     B
2545  0792 BE                   CMP     M
2546  0793 C28907               JNZ     STS1            ;8 MS STILL NOT UP
2547  0796 C3A107               JMP     STS3            ;FOUND A SECTOR GAP
2548
2549                    ;       HAVE HOLE. SKIP IT AND WAIT 12 MS
2550
2551  0799 CDAE07       STS2:   CALL    WNH             ;WAIT FOR NO HOLE
2552  079C 3E07                 MVI     A,STSB
2553  079E CD3107               CALL    DLY
2554  07A1 C1           STS3:   POP     B
2555  07A2 F3                   DI
2556
2557
2558                            PAGE
```

```
2559
2560                    ; WHD - WAIT HOLE DETECT
2561                    ;
2562
2563  07A3 DB7F   WHD:  IN      DPDC          ;WATCH THE DISK CONTROL PORT
2564  07A5 1F           RAR                   ;UNTIL A HOLE IS FOUND
2565  07A6 D2A307       JNC     WHD           ; STILL NO HOLE
2566  07A9 3E14         MVI     A,WHDA        ;SET UP LOOP DELAY COUNT
2567  07AB C3B607       JMP     UDLY
2568
2569                    ;
2570                    ; WNH - WAIT FOR NO HOLE
2571                    ;
2572
2573  07AE DB7F   WNH:  IN      DPDC          ;WATCH THE DISK CONTROL PORT
2574  07B0 1F           RAR                   ;UNTIL THE CURRENT HOLE IS PAST
2575  07B1 DAAE07       JC      WNH
2576  07B4 3E14         MVI     A,WHNA        ;SET UP LOOP DELAY COUNT
2577
2578                    ;
2579                    ; UDLY - MICROSECOND DELAY
2580                    ;       CALLED WITH INTERRUPTS DISABLED TO WAIT
2581                    ;       A * ( 15 / 2.048 ) MICROSECONDS ON 8080
2582                    ;       A * ( 14 / 2.048 ) MICROSECONDS ON Z80
2583
2584  07B6 3D     UDLY: DCR     A
2585  07B7 C2B607       JNZ     UDLY
2586  07BA C9           RET
2587
2588                    ;
2589                    ; RDB - READ BYTE FROM DISK
2590                    ;
2591
2592  07BB DB7D   RDB:  IN      UPST          ;IS A BYTE READY?
2593  07BD 1F           RAR
2594  07BE D2BB07       JNC     RDB           ;  WAIT UNTIL READY
2595
2596  07C1 DB7C         IN      UPDP          ;GET THE BYTE
2597  07C3 5F           MOV     E,A           ;SAVE IT IN E
2598  07C4 AA           XRA     D             ;UPDATE CRC
2599  07C5 07           RLC
2600  07C6 57           MOV     D,A
2601  07C7 7B           MOV     A,E           ;RESTORE BYTE READ TO A
2602  07C8 C9           RET
2603
2604
2605                    PAGE
```

```
2606
2607                    ; WSC - WAIT SYNC CHARACTER
2608                    ;       WSC WAITS FOR THE APPEARANCE OF A SYNC CHARACTER.  THE DISK
2609                    ;       SHOULD BE SELECTED, MOVING, AND THE HEAD SHOULD BE OVER THE
2610                    ;       PRE-SYNC ZERO BAND
2611                    ;
2612                    ;       IF SYNC IS NOT FOUND IN 25 CHARACTER TIMES, ERROR
2613
2614  07C9 3E30 WSC:    MVI     A,READA         ;DELAY PAST GARBAGE BYTE
2615  07CB 3D   WSC0:   DCR     A
2616  07CC C2CB07       JNZ     WSC0
2617  07CF 3EFD         MVI     A,DSYN          ;SET UP SYNC CHARACTER
2618  07D1 D37E         OUT     UPSC
2619  07D3 DB7E         IN      UPSR            ;RESET SYNC SEARCH
2620  07D5 3E50         MVI     A,WSCA          ;NUMBER OF LOOPS IN 25 CHARACTERS
2621  07D7 57           MOV     D,A
2622  07D8 DB7F WSC1:   IN      DPDC
2623  07DA E608         ANI     DFSD            ;CHECK FOR SYNC
2624  07DC C2E507       JNZ     WSC2            ;GOT IT
2625  07DF 15           DCR     D
2626  07E0 C2D807       JNZ     WSC1            ;TRY UNTIL TIME-OUT
2627
2628  07E3 37           STC                     ;COULDN'T FIND SYNC
2629  07E4 C9           RET
2630
2631                    ;       FOUND SYNC CHARACTER
2632
2633  07E5 DB7C WSC2:   IN      UPDP            ;GOBBLE THE SYNC CHARACTER
2634  07E7 1600         MVI     D,0             ;CLEAR CHECKSUM
2635  07E9 C9           RET
2636
2637
2638                    PAGE
```

```
2639
2640                    ; WSP - WRITE SYNC PATTERN
2641                    ;       WSP WRITES A SYNC PATTERN OF ZEROS, FOLLOWED BY A SYNC CHARACTER
2642                    ;
2643                    ;       ENTRY   A       INITIAL DELAY COUNTER
2644                    ;               C       NUMBER OF ZERO BYTES TO WRITE
2645
2646  07EA 3D           WSP:    DCR     A               ;DELAY
2647  07EB C2EA07               JNZ     WSP
2648
2649                    ;       DELAY IS UP, TURN ON WRITE GATE
2650
2651  07EE 3A0F00               LDA     DEVCTL
2652  07F1 3C                   INR     A               ;SET WRITE GATE ON
2653  07F2 D37F                 OUT     DPDC
2654
2655                    ;       WRITE # OF ZEROS SPECIFIED IN C
2656
2657  07F4 AF           WSP1:   XRA     A
2658  07F5 CDFF07               CALL    WNB             ;WRITE A ZERO
2659  07F8 0D                   DCR     C               ;COUNT IT
2660  07F9 C2F407               JNZ     WSP1
2661
2662  07FC 3EFD                 MVI     A,DSYN          ;WRITE A SYNC CHARACTER
2663  07FE 57                   MOV     D,A             ;PRE-CLEAR CHECKSUM, SO WNB EXITS WITH D = 0
2664                    ;       JMP     WNB             ;IMPLICIT CALL, RETURN WNB
2665
2666
2667                            PAGE
```

```
2668
2669                    ; WNB - WRITE NEXT BYTE
2670                    ;       WRITE A BYTE TO DISK PRESUMING WRITE GATE ALREADY ON
2671                    ;
2672
2673  07FF 5F           WNB:    MOV     E,A             ;SAVE CHARACTER TO BE WRITTEN
2674  0800 DB7D         WNB1:   IN      UPST            ;IS USRT READY FOR ANOTHER CHARACTER
2675  0802 A7                   ANA     A               ;SET FLAGS
2676  0803 F20008               JP      WNB1            ;NOT READY, WAIT SOME MORE
2677
2678  0806 7B                   MOV     A,E             ;GET CHARACTER
2679  0807 D37C                 OUT     UPDP            ;WRITE IT TO DISK
2680  0809 AA                   XRA     D               ;UPDATE CRC
2681  080A 07                   RLC
2682  080B 57                   MOV     D,A
2683  080C C9                   RET
2684
2685                            ENDIF
2686
2687                            PAGE
```

```
2688
2689                    IF      H37T
2690
2691                ;       H37 DISK DEVICE DRIVER                          23 FEB 82
2692
2693                H37DVD: JMP     SET37           ;SETDSK ENTRY POINT
2694                    JMP     RD37            ;READ SECTOR
2695                    JMP     WR37            ;WRITE SECTOR
2696                    JMP     RESH37          ;RESET
2697                    JMP     MNTH37          ;MOUNT
2698
2699                ;
2700                ;  SELECT DISK 1ST LOGIN
2701                ;
2702
2703                SET37:
2704                    LXI     H,0             ;TRACK 0
2705                    SHLD    HSTTRK
2706                    XRA     A               ;1ST SECTOR
2707                    STA     HSTSEC          ; (SECTOR # 0 TO SPT-1)
2708                    DCR     A               ;SET FLAG TO SUSPEND 'H37DONE'
2709                    STA     SET37A          ; PROCESSING AND DO NO RETRIES
2710
2711                ;  CHECK IF DRIVE IS AVAILABLE AND PROPER MEDIA INSERTED.
2712
2713                    CALL    RDYH37          ;CHECK IF DRIVE IS READY
2714                    JC      SET379          ; BR IF NOT
2715
2716                ;  READ LABEL.
2717
2718                    LHLD    DPBX            ;FORCE RESTORE OF HEAD
2719                    LXI     D,DPETRK-DPEHTH
2720                    DAD     D
2721                    MVI     M,DPEUNK
2722
2723                    IF      H37ED
2724
2725                    CALL    RD37            ;TRY READING LABEL AT DENSITY
2726                                            ; CURRENTLY INDICATED IN TABLES
2727                    JZ      SET373          ;  BR IF SUCCESSFUL
2728
2729                    LHLD    DPBX            ;UNABLE TO READ LABEL
2730                    MOV     A,M             ; TRY OTHER DENSITY
2731                    XRI     DPEDD
2732                    MOV     M,A
2733                    CALL    RD37            ;TRY TO READ LABEL
2734                    JNZ     SET379          ; BR IF ERROR
2735
2736                SET373:
2737
2738                    ELSE
2739
2740                    MVI     A,FDCRDA        ;TRY READ ADDRESS COMMAND AT DENSITY
2741                    LXI     D,H37TMP        ; CURRENTLY INDICATED IN TABLES
2742                    CALL    H37RD
2743                    JZ      SET373          ;  BR IF SUCCESSFUL
```

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2744
2745                    LHLD    DPBX            ;UNABLE TO READ
2746                    MOV     A,M             ; CHANGE TO OTHER DENSITY
2747                    XRI     DPEDD
2748                    MOV     M,A
2749                    LXI     H,H37CTL
2750                    MOV     A,M
2751                    XRI     CONMFM
2752                    MOV     M,A
2753                    OUT     FD$CON
2754                    MVI     A,FDCRDA        ;TRY READ ADDRESS COMMAND AGAIN
2755                    LXI     D,H37TMP
2756                    CALL    H37RD
2757                    JNZ     SET379          ; BR IF ERROR
2758
2759            SET373: LDA     H37TMP+FDRASL   ;Q. SECTOR LENGTH = 256
2760                    CPI     FDSL256
2761                    JNZ     SET379          ; BR IF NOT
2762
2763                    CALL    RD37            ;READ LABEL
2764                    JNZ     SET379          ; BR IF ERROR
2765
2766                    ENDIF
2767
2768                    CALL    CHKLAB          ;CHECK CHECKSUM OF LABEL
2769                    JZ      SET373A         ; BR IF CORRECT CHECKSUM
2770
2771                    LHLD    DPBX            ;IF SINGLE DENSITY THEN ASSUME NO LABEL
2772                    MOV     A,M             ; IS PRESENT AND USE DEFAULT LABEL,
2773                    ANI     DPEDD           ;  OTHERWISE ERROR
2774                    JNZ     SET379
2775                    MVI     C,LABLEN-1
2776                    LXI     D,HSTBUF+LABEL
2777                    LXI     H,DFTL37
2778                    CALL    MOVEIT
2779
2780            ;  MOVE LABEL INFO TO DPE'S HEATH EXTENSIONS.
2781
2782            SET373A:
2783                    LHLD    DPBX            ;DENSITY/SIDES
2784                    MOV     A,M
2785                    ANI     DPETYPE+DPE96T
2786                    MOV     B,A
2787                    LXI     D,HSTBUF+LABHTH+DPEFLAG-DPEHTH
2788                    LDAX    D
2789                    ANI     DPEED+DPEDD+DPE2S
2790                    ORA     B
2791                    MOV     M,A
2792
2793                    INX     D               ;CP/M RECORDS PER SECTOR
2794                    INX     D
2795                    LDAX    D
2796                    INX     H
2797                    INX     H
2798                    MOV     M,A
2799
```

```
2800                    INX     D               ;CP/M RECORDS PER ALLOCATION BLOCK
2801                    LDAX    D
2802                    INX     H
2803                    MOV     M,A
2804
2805                    INX     D               ;DPEFLG2
2806                    INX     D
2807                    INX     D
2808                    LDAX    D
2809                    ANI     0FFH-DPEIMG
2810                    MOV     B,A
2811                    INX     H
2812                    INX     H
2813                    INX     H
2814                    MOV     A,M
2815                    ANI     DPEIMG
2816                    ORA     B
2817                    MOV     M,A
2818                    IF      (DPEFLG2-DPERPAB-3)
2819                %:  (DPEFLG2-DPERPAB) NE 3
2820                    ENDIF
2821
2822                ;   IF LABEL INDICATES THAT THE MEDIA IS DOUBLE SIDED, THEN
2823                ;   CHECK OUT THE DRIVE FOR DOUBLE SIDED CAPABILITY.
2824
2825                    LDA     HSTBUF+LABHTH+DPEFLAG-DPEHTH
2826                    ANI     DPE2S
2827                    JZ      SET374          ;BR IF MEDIA IS NOT DOUBLE SIDED
2828
2829                    MVI     A,FDCRDA+FDFSSI
2830                    LXI     D,H37TMP
2831                    CALL    H37RD           ;TRY TO READ A SECTOR HEADER ON 2ND SIDE
2832                    JNZ     SET379          ; BR IF ERROR
2833
2834                    LDA     H37TMP+FDRASID  ;CHECK SIDE INFO
2835                    CPI     1
2836                    JNZ     SET379          ; BR IF NOT 2ND SIDE
2837
2838                ;   STEP IN 2 TRACKS, READ ADDRESS, AND STEP BACK OUT 2 TRACKS.
2839                ;   IF READ ADDRESS FINDS TRACK 1 INSTEAD OF TRACK 2,
2840                ;   THEN ASSUME 48 TPI MEDIA GENERATED
2841                ;   ON A 48 TPI DRIVE WAS INSERTED INTO THE 96 TPI DRIVE; THEREFORE,
2842                ;   USE AS A R/O DISK WITH DOUBLE STEPPING.
2843                ;
2844                ;   THERE ARE TWO 48 TPI MEDIA FORMATS THAT ARE SUPPORTED ON
2845                ;   A 96 TPI DRIVE.
2846                ;     1) MEDIA WAS FORMATTED ON A 96 TPI DRIVE AND ONLY USES
2847                ;        THE FIRST HALF OF THE DISK SURFACE.  (E.G. A 48 TPI MEDIA
2848                ;        IS DUPLICATED ONTO MEDIA IN A 96 TPI DRIVE)
2849                ;     2) MEDIA WAS FORMATTED ON A 48 TPI DRIVE.  THE HARDWARE
2850                ;        GROUP HAS INFORMED ME THAT THE 96 TPI DRIVE CAN RELIABLY
2851                ;        READ SUCH MEDIA BUT CANNOT WRITE ON IT.  TO GO BETWEEN
2852                ;        TRACKS IT IS NECESSARY TO DOUBLE THE NUMBER OF STEPS.
2853                ;
2854                ;   THE FOLLOWING ARE THE POSSIBLE OUTCOMES OF THE READ ADDRESS
2855                ;     MEDIA          DRIVE           DRIVE       OUTCOME
```

```
2856                    ;    FORMAT    GENERATED ON    INSERTED IN     TRACK
2857                    ;    ------    ------------    -----------     -------
2858                    ;    48 TPI      48 TPI          48 TPI          2
2859                    ;    48 TPI      48 TPI          96 TPI          1
2860                    ;    48 TPI      96 TPI          48 TPI        ERROR
2861                    ;    48 TPI      96 TPI          96 TPI          2
2862                    ;    96 TPI      96 TPI          48 TPI        ERROR
2863                    ;    96 TPI      96 TPI          96 TPI          2
2864                    ;
2865
2866                SET374:
2867                        MVI     A,2
2868                        STA     TRACK
2869                        CALL    SDT37           ;STEP IN TWO TRACKS
2870
2871                        MVI     A,FDCRDA
2872                        LXI     D,H37TMP
2873                        CALL    H37RD           ;DO READ ADDRESS
2874                        JNZ     SET379          ; BR IF ERROR
2875
2876                        LDA     H37TMP+FDRATRK  ;CHECK IF TRACK 2
2877                        CPI     2
2878                        JZ      SET374D         ; BR IF YES
2879                                                ;  1) 48 TPI MEDIA GENERATED ON 48 TPI
2880                                                ;     DRIVE INSERTED INTO 48 TPI DRIVE
2881                                                ;  2) 48 TPI MEDIA GENERATED ON 96 TPI
2882                                                ;     DRIVE INSERTED INTO 96 TPI DRIVE
2883                                                ;  3) 96 TPI MEDIA INSERTED IN 96 TPI
2884
2885                        CPI     1               ;CHECK IF TRACK 1
2886                        JNZ     SET379          ; BR IF NOT
2887
2888                        LHLD    DPBX            ;SET FLAG TO INDICATE 48 TPI MEDIA
2889                        MOV     A,M             ; GENERATED ON 48 TPI DRIVE INSERTED
2890                        ORI     DPE48RO         ;  INTO 96 TPI DRIVE.  THE MEDIA
2891                        MOV     M,A             ;  IS TREATED AS R/O
2892
2893                SET374D: CALL   RST37           ;STEP OUT TWO TRACKS BY DOING RESTORE
2894                                                ; ('TRKPT' VARIABLE WAS SET ABOVE)
2895
2896                ;  MOVE LABEL INFO TO DISK PARAMETER BLOCK.
2897
2898                SET375: LHLD    SETDSKC         ;GET DPE ADDRESS
2899                        LXI     B,DPEDPB        ;GET DPB ADDRESS
2900                        DAD     B
2901                        CALL    HLIHL
2902                        LXI     D,HSTBUF+LABDPB ;GET ADDR OF INFO IN LABEL
2903                        MVI     C,DPBL          ;COUNT TO MOVE
2904                        CALL    MOVEITX         ;MOVE INFO
2905
2906                ;  RETURN WITH DPE ADDRESS IN (HL).
2907
2908                        XRA     A               ;INDICATE NO ERROR
2909
2910                SET378: MVI     A,0             ;CLEAR 'H37DONE' SUSPENSION FLAG
2911                        STA     SET37A          ; (MVI USED TO CLEAR ACCUMULATOR
```

```
                                        ;  SINCE I WANT TO PRESERVE PSW/C BIT)
                CALL    H37DONE         ;DONE WITH DRIVE FOR NOW ('H37DONE'
                                        ; DOESN'T DISTURB PSW/C BIT EITHER)
                RET

;  ERROR OCCURRED.

SET379:
                STC                     ;INDICATE ERROR
                JMP     SET378

;

DFTL37  DB      LABVER                  ;DEFAULT LABEL
        DB      DPEH37,0,2,8,0,0,0,0
        DW      20
        DB      3,7,0
        DW      91,63,00C0H,16,3

SET37A  DB      0                       ;SUSPEND 'H37DONE' FLAG
                                        ; 0 = NO   NOT 0 = YES

H37TMP  DS      FDRAL

                PAGE
;
;  H37WAIT -- LOW LEVEL I/O ROUTINE TO ISSUE COMMAND AND WAIT
;             FOR COMPLETION.
;
;    ENTRY:  (A)=COMMAND
;          ((SP))=RET ADDR
;    EXIT:   (A)=STATUS BYTE
;            RET IS DONE VIA H37 INTERRUPT HANDLER
;    USES:  A,F,B,H,L
;

H37WAIT:
                POP     H               ;GET RET ADDR
                SHLD    H37IRET         ;INFORM INTERRUPT HANDLER

                MOV     B,A
                MVI     A,FD$CD         ;ACCESS C/D REGS
                OUT     FD$INT
                MOV     A,B

                OUT     FD$CMD          ;ISSUE COMMAND
                JMP     $               ;WAIT


;
;  H37RD -- LOW LEVEL I/O ROUTINE TO INPUT DATA FROM H37.
;
;    ENTRY:  (A)=COMMAND
;           (DE)=BUFFER ADDRESS
```

```
2968                    ;           ((SP))=RET ADDRESS
2969                    ;     EXIT:   (A)=STATUS BYTE
2970                    ;             PSW/Z = 0 IF ERROR
2971                    ;                   = 1 IF NO ERROR
2972                    ;     USES:  A,F,B,D,E,H,L
2973                    ;
2974
2975                    H37RD:
2976                            LXI     H,H37RD2        ;SET INTERRUPT HANDLER RET ADDR
2977                            SHLD    H37IRET
2978
2979                            MOV     B,A
2980                            LDA     H37CTL          ;TURN ON DRQ
2981                            ORI     CONDRQ
2982                            OUT     FD$CON
2983
2984                            MVI     A,FD$CD         ;ACCESS C/D REGS
2985                            OUT     FD$INT
2986
2987                            MOV     A,B
2988                            LXI     H,H37RD1
2989                            OUT     FD$CMD          ;ISSUE COMMAND
2990
2991                    H37RD1:
2992                            HLT                     ;WAIT FOR NEXT INPUT BYTE
2993                            IN      FD$DAT          ;INPUT BYTE
2994                            STAX    D               ;PUT IT INTO BUFFER
2995                            INX     D               ;BUMP BUFFER POINTER
2996                            PCHL                    ;LOOP
2997
2998                    ;  TURN OFF DRQ ROUTINE.  (ALSO USED BY WR37)
2999                    H37RD2:
3000                            PUSH    PSW
3001                            LDA     H37CTL          ;TURN OFF DRQ
3002                            OUT     FD$CON
3003                            POP     PSW
3004
3005                            ANA     A               ;SET PSW/Z TO INDICATE ERROR STATUS
3006                            RET
3007
3008
3009
3010
3011                    ;
3012                    ;  H37DONE -- DONE WITH H37 FOR NOW
3013                    ;
3014                    ;     USES:  H,L
3015                    ;
3016                    ;     THE SELECT DISK DEVICE DRIVER ENTRY USES OTHER ROUTINES
3017                    ;     IN THE DRIVER WHICH USE 'H37DONE'.  SINCE SELECT USES
3018                    ;     LOW LEVEL I/O ROUTINES ALSO, THE 'H37DONE' PROCESSING
3019                    ;     MUST BE TEMPORARILY SUSPENDED UNTIL SELECT IS DONE.
3020                    ;
3021
3022                    H37DONE:
3023                            PUSH    PSW
```

```
3024
3025                            LDA     SET37A          ;CHECK IF 'H37DONE' IS SUSPENDED
3026                            ANA     A               ; TEMPORARILY
3027                            JNZ     H37DONE1        ;  BR IF IT IS
3028
3029                            LXI     H,H37CTL        ;TURN OFF IRQ
3030                            MOV     A,M
3031                            ANI     0FFH-CONIRQ
3032                            OUT     FD$CON
3033                            MOV     M,A
3034
3035                            LXI     H,DELAY37       ;SET DESELECT AND MOTOR TURN OFF
3036                            SHLD    DLYM037         ; DELAY VALUES
3037
3038                    H37DONE1:
3039                            POP     PSW
3040                            RET
3041
3042                            PAGE
3043                    ;
3044                    ;  RD37 -- HIGH LEVEL I/O ROUTINE TO READ H37 SECTORS.
3045                    ;
3046                    ;     ENTRY:  (HSTDPB) = ADDR OF HEATH EXTENSIONS FOR DRIVE
3047                    ;             (HSTTRK) = TRACK
3048                    ;             (HSTSEC) = SECTOR (0 TO SPT-1)
3049                    ;     EXIT:   (ERFLAG) = 0 IF NO ERROR
3050                    ;                      <> 0 IF ERROR
3051                    ;             PSW/Z = 0 IF ERROR
3052                    ;                   = 1 IF NO ERROR
3053                    ;     USES:   ALL
3054                    ;
3055
3056                    RD37:   CALL    SDP37           ;SET UP
3057
3058                    RD370:  CALL    SDT37           ;SEEK THE DESIRED TRACK
3059
3060                            LDA     SIDE            ;GET SIDE SELECT
3061                            ORI     FDCRDS+FDFSLF   ;SET UP COMMAND
3062                            LXI     D,HSTBUF        ;GET BUFFER ADDR
3063                            CALL    H37RD           ;READ IN DATA
3064                            JZ      RD373           ; BR IF NO ERRORS
3065
3066                            CALL    H37E            ;CHECK IF I SHOULD RETRY
3067                            JNC     RD370           ; BR IF YES
3068
3069                            ORI     0FFH            ;  OTHERWISE FLAG ERROR
3070                            STA     ERFLAG
3071
3072                    RD373:  JMP     H37DONE         ;EXIT THRU 'H37DONE'
3073
3074                            PAGE
3075                    ;
3076                    ;  WR37 -- I/O ROUTINE TO WRITE SECTOR TO H37
3077                    ;
3078                    ;     ENTRY:  (HSTDPB) = ADDR OF HEATH EXTENSIONS FOR DRIVE
3079                    ;             (HSTTRK) = TRACK
```

```
3080                    ;           (HSTSEC) = SECTOR (0 TO SPT-1)
3081                    ;   EXIT:   (ERFLAG) = 0 IF NO ERROR
3082                    ;                     <> 0 IF ERROR
3083                    ;           PSW/Z = 0 IF ERROR
3084                    ;                 = 1 IF NO ERROR
3085                    ;   USES:   ALL
3086                    ;
3087
3088                    WR37:
3089                            LHLD    HSTDPB          ;CHECK FOR 48 TPI R/O
3090                            MOV     A,M
3091                            ANI     DPE48RO
3092                            MVI     A,FDSWPV        ;ASSUME ERROR CODE
3093                            JNZ     WR37E           ; BR IF IT IS -- NO WRITY
3094
3095                            CALL    SDP37           ;SET UP
3096
3097                    WR370:  CALL    SDT37           ;SEEK THE DESIRED TRACK
3098
3099                            MVI     A,FD$CD
3100                            OUT     FD$INT          ;ACCESS C/D REGS
3101                            LDA     H37CTL
3102                            ORI     CONDRQ          ;TURN ON DRQ
3103                            OUT     FD$CON
3104                            LDA     SIDE            ;GET SIDE
3105                            ORI     FDCWRS+FDFSLF   ;SET UP COMMAND
3106                            LXI     H,WR372         ;INTERRUPT RETURN ADDRESS
3107                            SHLD    H37IRET
3108                            LXI     H,WR371         ;LOOP ADDRESS
3109                            LXI     D,HSTBUF
3110                            OUT     FD$CMD          ;SEND THE COMMAND
3111
3112                    WR371:  LDAX    D
3113                            HLT
3114                            OUT     FD$DAT
3115                            INX     D
3116                            PCHL
3117
3118                    WR372:  CALL    H37RD2          ;TURN OFF DRQ USING 'H37RD2'
3119
3120                            JZ      WR373           ;BR IF NO I/O ERROR
3121
3122                    WR37E:  CALL    H37E            ;CHECK IF I SHOULD RETRY
3123                            JNC     WR370           ; BR IF YES
3124
3125                            ORI     0FFH            ;FLAG AS I/O ERROR
3126                            STA     ERFLAG
3127
3128                    WR373:  JMP     H37DONE         ;EXIT THRU H37DONE
3129
3130                            PAGE
3131                    ;
3132                    ;  H37E -- CHECK IF I SHOULD DO RETRIES.
3133                    ;
3134                    ;    ENTRY:  (ERRCNT) = RETRY COUNTER
3135                    ;    EXIT:   PSW/C = 0 IF DO RETRY
```

```
3136                    ;                   = 1 IF DON'T
3137                    ;             (ERRCNT) UPDATED
3138                    ;    USES:    ALL
3139                    ;
3140                    ;  I/O RECOVERY PROCEDURE:
3141                    ;    1) RETRY I/O OPERATION
3142                    ;    2) STEP HEAD IN 1 TRACK, THEN RETRY I/O OPERATION
3143                    ;    3) RETRY I/O OPERATION
3144                    ;    4) STEP HEAD OUT 1 TRACK, THEN RETRY I/O OPERATION
3145                    ;    5) RETRY I/O OPERATION
3146                    ;    6) RESTORE HEAD, THEN RETRY I/O OPERATION
3147                    ;    7) RETRY I/O OPERATION
3148                    ;    8) STEP HEAD IN 1 TRACK, THEN RETRY I/O OPERATION
3149                    ;    9) RETRY I/O OPERATION
3150                    ;   10) STEP HEAD OUT 1 TRACK, THEN RETRY I/O OPERATION
3151                    ;   11) RETRY I/O OPERATION
3152                    ;   12) FLAG AS HARD ERROR
3153                    ;
3154
3155                    H37E:
3156                            STA     ERRTYP          ;SAVE ERROR CODE
3157
3158                            ANI     FDSNRD+FDSWPV   ;CHECK FOR NOT READY OR WRITE PROTECT
3159                            JNZ     H37E9           ; BR IF YES - NO RETRIES
3160
3161                            LDA     SET37A          ;IF NOT DOING SELECT
3162                            ANA     A
3163                            JNZ     H37E0
3164                            LHLD    SECNT37         ;BUMP SOFT ERROR COUNTER
3165                            INX     H
3166                            SHLD    SECNT37
3167
3168                    H37E0:
3169                            LXI     H,ERRCNT        ;UPDATE RETRY COUNTER
3170                            DCR     M
3171                            JZ      H37E9           ; BR IF EXHAUSTED RETRIES
3172
3173                            MOV     A,M
3174                            CPI     6
3175                            JNC     H37E1
3176                            SUI     6
3177                    H37E1:
3178                            JNZ     H37E2           ;BR IF NOT TIME TO DO RESTORE HEAD
3179                            CALL    RST37           ;RESTORE HEAD BEFORE TRYING AGAIN
3180                            JMP     H37E8
3181
3182                    H37E2:
3183                            CPI     4               ;CHECK IF TIME TO STEP OUT
3184                            JNZ     H37E3           ; BR IF NOT
3185                            LXI     H,TRACK         ;DECREMENT TO NEXT TRACK
3186                            DCR     M
3187                            CP      SDT37           ;IF NEXT TRACK >=0 THEN STEP OUT
3188                            LXI     H,TRACK         ;RESTORE DESIRED TRACK
3189                            INR     M
3190                            JMP     H37E8
3191
```

```
3192                    H37E3:
3193                            CPI     2               ;CHECK IF TIME TO STEP IN
3194                            JNZ     H37E8           ; BR IF NOT
3195                            LHLD    HSTDPB          ;GET MAXIMUM TRACK #
3196                            MOV     A,M
3197                            ANI     DPE96T
3198                            MVI     A,79
3199                            JNZ     H37E3A
3200                            MVI     A,39
3201                    H37E3A:
3202                            LXI     H,TRACK         ;INCREMENT TO NEXT TRACK
3203                            INR     M
3204                            CMP     M               ;CHECK IF MAX TRACK # >= NEXT TRACK
3205                            CNC     SDT37           ;STEP IF NOT
3206                            LXI     H,TRACK         ;RESTORE DESIRED TRACK
3207                            DCR     M
3208
3209                    H37E8:
3210                            XRA     A               ;INDICATE TRY AGAIN
3211                            RET
3212
3213                    H37E9:  LXI     H,H37MSG
3214                            CALL    PRTERR          ;PRINT EXTENDED ERROR MSG
3215
3216                            STC                     ;INDICATE DON'T TRY AGAIN
3217                            RET
3218
3219                    H37MSG  DB      'H37',0
3220
3221                            PAGE
3222                    ;
3223                    ;  H37 INTERRUPT HANDLER.
3224                    ;
3225                    ;     USES INTERRUPT LEVEL 4
3226                    ;     THE INTERRUPT HANDLER RETURNS CONTROL TO THE USER PROGRAM
3227                    ;      AT THE ADDRESS IN 'H37IRET'.
3228                    ;
3229                    ;     EXIT:   (A) = STATUS BYTE
3230                    ;     USES:   A,F
3231                    ;
3232
3233                    H37ISR: MVI     A,10            ;DELAY AWHILE TO LET STATUS SETTLE
3234                    H37ISR1: DCR    A
3235                            JNZ     H37ISR1
3236
3237                            IN      FD$STA          ;INPUT STATUS TO CLEAR INTERRUPT
3238                            XTHL                    ;SAVE (HL)  DISCARD RET ADDR
3239                            LHLD    H37IRET         ;GET NEW RETURN ADDRESS
3240                            XTHL                    ;RESTORE (HL)  SET NEW RET ADDR
3241                            EI                      ;RE-ENABLE INTERRUPTS
3242                            RET
3243
3244                            PAGE
3245                    ;
3246                    ;  SDP37 -- SET DEVICE PARAMETERS
3247                    ;
```

```
3248                    ;    ENTRY:  (HSTDPB) = ADDR OF HEATH EXTENSIONS FOR DRIVE
3249                    ;            (HSTTRK) = TRACK
3250                    ;            (HSTSEC) = SECTOR (0 TO SPT-1)
3251                    ;    USES:   ALL
3252                    ;
3253
3254                    SDP37:
3255                            CALL    ONH37           ;SELECT DRIVE
3256
3257                            LDA     SET37A
3258                            ANA     A
3259                            MVI     A,12            ;SET TRY COUNTER
3260                            JZ      SDP371
3261                            MVI     A,4             ;ONLY 4 TRIES IF DOING SELECT
3262                    SDP371: STA     ERRCNT
3263
3264                            LDA     HSTTRK          ;GET TRACK #
3265                            STA     TRACK
3266                            MVI     B,0             ;DEFAULT TO SIDE 0
3267                            LHLD    HSTDPB
3268                            MOV     A,M
3269                            ANI     DPE2S           ;CHECK IF MEDIA IS DOUBLE SIDED
3270                            JZ      SDP374          ;BR IF NOT
3271                            LXI     H,TRACK         ;IS
3272                            MOV     A,M             ; DOUBLE SIDED
3273                            ANA     A               ;  THEREFORE DIVIDE TRACK #
3274                            RAR                     ;  BY 2 TO GET REAL TRACK #
3275                            MOV     M,A
3276                            JNC     SDP374          ;  EVEN TRACKS ON SIDE 0
3277                            MVI     B,FDFSS1        ;  ODD TRACKS ON SIDE 1
3278                    SDP374: MOV     A,B
3279                            STA     SIDE            ;SAVE SIDE
3280                            LDA     HSTSEC          ;GET SECTOR #
3281                            INR     A               ;MAKE 1 - SPT
3282                            STA     SECTOR
3283
3284                            LHLD    HSTDPB          ;SET TRKPT FOR THIS UNIT
3285                            LXI     D,DPETRK-DPEHTH
3286                            DAD     D
3287                            SHLD    TRKPT
3288                            MOV     A,M             ;GET CURRENT TRACK
3289                            RAL                     ;IF MSB==1 THEN DON'T KNOW WHERE
3290                            JC      RST37           ;  HEAD IS, SO RESTORE
3291                            MVI     A,FD$TS
3292                            OUT     FD$INT          ;ACCESS T/S REGS
3293                            MOV     A,M             ;UPDATE TRACK REG
3294                            OUT     FD$TRK          ;  WITH CURRENT VALUE FOR THIS DRIVE
3295                            RET
3296
3297                            PAGE
3298                    ;
3299                    ;  ONH37 -- TURN ON MOTOR, SELECT DRIVE, AND SET SETTLE DELAY COUNTERS
3300                    ;
3301
3302                    ONH37:
3303                            LXI     H,0
```

```
3304                    SHLD    DLYM037
3305                    LHLD    HSTDPB          ;GET THE DRIVE SELECT CODE AND DENSITY
3306                    MOV     A,M
3307                    ANI     DPEDD           ;CHECK BIT DENSITY
3308                    JZ      ONH37A          ; BR IF SINGLE
3309                    MVI     A,CONMFM        ;SET DOUBLE BIT DENSITY CONTROL FLAG
3310            ONH37A: INX     H
3311                    ORA     M               ;OR IN UNIT SELECT
3312                    ORI     CONMO+CONIRQ    ;OR THE MOTOR & IRQ ON
3313                    OUT     FD$CON
3314                    MOV     B,A             ;SAVE THIS VALUE TEMPORARILY
3315                    LXI     H,H37CTL        ;GET THE CURRENT VALUE OF THE CONTROL PORT
3316                    MOV     A,M
3317                    ANI     CONMO           ;IF THE MOTOR WAS ON
3318                    JNZ     ONH37B          ;  THEN WE DON'T HAVE TO WAIT FOR IT TO COME UP
3319                    PUSH    H
3320                    LHLD    HSTDPB          ;FIND OUT HOW FAST THE DRIVE COMES UP TO SPEED
3321                    LXI     D,DPESEK-DPEHTH
3322                    DAD     D
3323                    MOV     A,M
3324                    POP     H
3325                    RAL                     ;SETS CARRY IF UP FAST
3326                    IF      DPEMO-10000000B
3327            %:      DPEMO NE 10000000B
3328                    ENDIF
3329                    MVI     A,(1000+3)/4+1  ;NORMAL TIMING (APPROX 1 SECOND)
3330                    JNC     ONH37C
3331                    RAR                     ;NEW DRIVES UP IN 1/4 THE TIME
3332                    RAR
3333                    ANI     03FH
3334                    JMP     ONH37C
3335            ONH37B  MOV     A,M             ;GET THE OLD VALUE OF THE CONTROL PORT
3336                    ANI     CONDS0+CONDS1+CONDS2+CONDS3     ;CHECK SELECT DRIVE(S)
3337                    ANA     B               ;CHECK TO SEE IF SAME HEAD ALREADY DOWN
3338                    MVI     A,0
3339                    JNZ     ONH37C          ;YES, ALREADY LOADED, NO DELAY
3340                    MVI     A,(50+3)/4+1    ;MUST DELAY FOR HEAD LOAD
3341            ONH37C: STA     DLYW
3342                    MOV     M,B             ;SET NEW VALUE OF CONTROL PORT
3343
3344                    RET
3345
3346                    PAGE
3347                ;
3348                ;  RST37 -- RESTORE HEAD
3349                ;
3350                ;    ENTRY:  (TRKPT) = ADDRESS OF DPETRK SLOT IN HEATH EXTENSION OF DPE
3351                ;    EXIT:   VIA H37WAIT
3352                ;    USES:   ALL
3353                ;
3354
3355            RST37:  CALL    WBS37
3356                    LHLD    TRKPT           ;INDICATE TRACK IS 0
3357                    MVI     M,0
3358
3359                    INX     H               ;HL => STEP RATE
```

```
                        IF      (DPETRK+1)-DPESEK
                %:      DPESEK NE (DPETRK+1)
                        ENDIF
                        MOV     A,M
                        ANI     OFFH-DPEMO
                        ORI     FDCRST
                        JMP     H37WAIT         ;ISSUE COMMAND

                        PAGE
                ;
                ;  MOUNT H37 MEDIA.
                ;

                MNTH37: LHLD    HSTDPB          ;SET TRACK POINT TO UNKNOWN
                        LXI     D,DPETRK-DPEHTH
                        DAD     D
                        MVI     M,DPEUNK

                ;+      JMP     RESH37          ;RESET DRIVE



                ;
                ;  RESET H37
                ;

                RESH37: MVI     A,FD$CD         ;ACCESS C/D REGS
                        OUT     FD$INT
                        MVI     A,FDCFI+FDFINI  ;TERMINATE ANY PRESENT ACTIVITY
                        OUT     FD$CMD
                        XRA     A
                        OUT     FD$CON          ;TURN OFF HARDWARE
                        STA     H37CTL
                        LXI     H,0
                        SHLD    DLYMO37
                        SHLD    H37IRET
                        IN      FD$DAT          ;CLEAR ANY PENDING DRQ

                        MVI     A,10            ;DELAY FOR AWHILE
                RESH371:                        ;  TO LET STATUS SETTLE
                        DCR     A
                        JNZ     RESH371
                        IN      FD$STA          ;CLEAR ANY PENDING IRQ

                        RET

                        PAGE
                ;
                ;  SDT37 -- SEEK DESIRED TRACK AND SET SECTOR REG FOR DESIRED SECTOR
                ;
                ;    ENTRY:  (TRACK) = TRACK
                ;            (SECTOR) = SECTOR
                ;     USES:  ALL
                ;
```

```
3416                    SDT37:  LHLD    TRKPT
3417                            MOV     A,M             ;GET CURRENT TRACK
3418                            LXI     H,TRACK         ;GET DESIRED TRACK #
3419                            CMP     M
3420                            JZ      SDT372          ;ALREADY AT DESIRED TRACK
3421
3422                            CALL    WBS37
3423                            MOV     A,M
3424                            CALL    SDT376          ;DO SEEK
3425
3426                            LHLD    HSTDPB          ;CHECK IF 48TPI R/O MEDIA IN 96TPI DRIVE
3427                            MOV     A,M
3428                            ANI     DPE48RO
3429                            JZ      SDT371          ; BR IF NOT == NO NEED TO DOUBLE STEP
3430
3431                            MVI     A,FD$TS         ;GO THROUGH SEEK PROCEDURE AGAIN A
3432                            OUT     FD$INT          ; A SECOND TIME
3433                            LHLD    TRKPT
3434                            MOV     A,M
3435                            OUT     FD$TRK          ;RESET CONTROLLER'S TRACK REG
3436                            LDA     TRACK
3437                            CALL    SDT376          ;DO 2ND SEEK
3438
3439                    SDT371: MVI     A,FD$TS         ;ACCESS T/S REGS
3440                            OUT     FD$INT
3441                            LDA     TRACK           ;OUTPUT DESIRED TRACK TO TRACK REG
3442                            OUT     FD$TRK          ; THIS IS DONE IN CASE SEEK ABORTED
3443                                                    ; WHEN IT TRIED TO STEP TO NEGATIVE
3444                                                    ; TRACK LEAVING TRACK REGISTER
3445                                                    ; CONTAINING 0.
3446                            LHLD    TRKPT
3447                            MOV     M,A             ;UPDATE IN MEMORY TRACK VALUE
3448
3449                            MVI     A,(15+3)/4+1    ;SETTLE DELAY COUNT (15 MS)
3450                            LXI     H,DLYW          ;CHECK IF DELAY COUNTER
3451                            CMP     M               ;  IS >= STEP SETTLE TIME
3452                            JC      SDT372          ;IT IS
3453                            MOV     M,A             ;FORCE DELAY FOR SETTLE TIME
3454
3455                    SDT372: MVI     A,FD$TS
3456                            OUT     FD$INT          ;ACCESS T/S REGS
3457                            LDA     SECTOR
3458                            OUT     FD$SEC
3459
3460                    SDT373: LDA     DLYW            ;WAIT UNTIL MOTOR IS UP TO SPEED,
3461                            ORA     A               ; AND HEAD SETTLES DUE TO
3462                            JNZ     SDT373          ;  LOADING OR STEPPING
3463
3464                            RET
3465
3466                    ;  DO SEEK
3467                    ;       (A) = DESIRED TRACK
3468
3469                    SDT376: MOV     B,A
3470                            MVI     A,FD$CD
3471                            OUT     FD$INT          ;ACCESS C/D REGS
```

```
3472                    MOV     A,B
3473                    OUT     FD$DAT          ;TELL CONTROLLER DESIRED TRACK
3474
3475                    LHLD    TRKPT           ;GET STEP RATE
3476                    INX     H
3477                    MOV     A,M
3478                    ANI     0FFH-DPEMO
3479                    ORI     FDCSEK+FDFHLB   ; OR IN COMMAND
3480                    JMP     H37WAIT         ;ISSUE COMMAND AND WAIT
3481                                            ; (RET THRU H37WAIT)
3482
3483                    PAGE
3484                ;
3485                ;  RDYH37 -- CHECK IF UNIT READY
3486                ;            1. DRIVE IS AVAILABLE
3487                ;            2. CORRECT TYPE OF MEDIA HAS BEEN INSERTED
3488                ;
3489                ;  ENTRY:  NONE
3490                ;  EXIT:   PSW/C = 0 IF READY
3491                ;                = 1 IF NOT READY
3492                ;  USES:   ALL
3493                ;
3494                ;  THE NUMBER OF HOLE TRANSITIONS IS COUNTED IN THE TIME IT TAKES
3495                ;  FOR 2 REVOLUTIONS (400MS).  IF THE DISK INSERTED IS SOFT SECTORED,
3496                ;  THEN 2 HOLES PLUS/MINUS 1 (4+-2 TRANSITIONS) SHOULD BE SEEN.
3497                ;
3498
3499                RDYH37:
3500                    CALL    ONH37           ;TURN OF MOTOR AND SELECT DRIVE
3501
3502                    LXI     H,DLYW          ;WAIT UNTIL DRIVE IS UP TO SPEED
3503                RDYH37A:
3504                    MOV     A,M
3505                    ANA     A
3506                    JNZ     RDYH37A
3507
3508                    MVI     A,FD$CD         ;ACCESS C/D REGS
3509                    OUT     FD$INT
3510                    MVI     A,FDCFI+FDFINI  ;FORCE TYPE STATUS
3511                    OUT     FD$CMD
3512                    MVI     A,10
3513                RDYH37B:
3514                    DCR     A               ;DELAY AWHILE TO LET CONTROLLER SETTLE
3515                    JNZ     RDYH37B
3516
3517                    LXI     H,TICCNT        ;GET TIME VALUE
3518                    MVI     A,200
3519                    ADD     M
3520                    MOV     B,A             ;(B) = TIME VALUE
3521
3522                    MVI     C,0             ;(C) = HOLE COUNTER
3523                    MOV     D,C             ;(D) = INIT HOLE STATUS TO NO HOLE
3524
3525                RDYH37C:
3526                    IN      FD$STA          ;GET HOLE STATUS
3527                    ANI     FDSIND
```

```
3528                    CMP     D               ;CHECK IF CHANGE IN STATUS
3529                    JZ      RDYH37D         ; BR IF NO CHANGE
3530
3531                    MOV     D,A             ;SAVE NEW STATUS
3532                    INR     C               ;COUNT TRANSITION
3533
3534                    MVI     A,FDHDD         ;DEBOUNCE DELAY
3535            RDYH37C1:
3536                    DCR     A
3537                    JNZ     RDYH37C1
3538
3539            RDYH37D:
3540                    MOV     A,B             ;CHECK IF TIME UP
3541                    CMP     M
3542                    JNZ     RDYH37C         ; BR IF NOT
3543                    MOV     A,C             ;TIME UP -- CHECK # OF HOLES
3544                    CPI     1*2
3545                    JC      RDYH37E         ;IF < 1 THEN ERROR
3546                    CPI     3*2+1
3547                    CMC
3548                    JNC     RDYH37F         ;IF <= 3 THEN OK
3549
3550            RDYH37E:
3551                    MVI     A,FDSNRD        ;ERROR CODE FOR UNIT NOT READY
3552                    CALL    H37E            ;REPORT ERROR
3553
3554            RDYH37F:
3555                    JMP     H37DONE         ;RETRUN VIA 'H37DONE'
3556
3557
3558
3559
3560            ;
3561            ;  WBS37 -- WAIT BEFORE STEPPING
3562            ;           IT IS A DRIVE REQUIREMENT THAT AFTER A WRITE OPERATION, A STEP
3563            ;           COMMAND SHOULD NOT BE EXECUTED BEFORE 1 MS AFTER THE WRITE.
3564            ;           THEREFORE, TO INSURE THIS, WBS37 IS USED BEFORE ANY STEP
3565            ;           OPERATIONS TO DELAY FOR APPROXIMATELY 1 MS.
3566            ;
3567            ;     USES:  A,F
3568            ;
3569
3570            WBS37:  MVI     A,150
3571            WBS371: DCR     A
3572                    JNZ     WBS371
3573                    RET
3574
3575                    ENDIF
3576
3577                    PAGE
```

```
3578
3579                            IF      H47T
3580
3581                    ;       H47 DISK DEVICE DRIVER                  23 JUL 81
3582
3583                    H47DVD: JMP     SETD47          ;SELECT DISK ENTRY POINT
3584                            JMP     RD47            ;READ
3585                            JMP     WR47            ;WRITE
3586                            JMP     RESH47          ;RESET
3587                            XRA A ! RET ! NOP       ;MOUNT
3588
3589                    ;
3590                    ;       8 INCH DISK DESCRIPTORS
3591                    ;
3592                    ;       DW      &XLATE$TABLE    ;POINTER TO TRANSLATE TABLE
3593                    ;       DW      &PARAM$BLOCK    ;POINTER TO PARAMETER BLOCK
3594                    ;       DB      DENSITY AND SIDES
3595                    ;       DB      RECORDS$PER$SECTOR
3596                    ;       DB      RECORDS$PER$ALLOCATION
3597
3598
3599                    H47PMS: DW      XLTOS,DPBOSS    ;FOR    SINGLE DENSITY  SINGLE SIDED
3600                            DB      0,1,8
3601
3602                            DW      XLTOS,DPBOSD    ;       SINGLE          DOUBLE
3603                            DB      DPE2S,1,16
3604
3605                            DW      XLTOD,DPBODS    ;       DOUBLE          SINGLE
3606                            DB      DPEDD,2,16
3607
3608                            DW      XLTOD,DPBODD    ;       DOUBLE          DOUBLE
3609                            DB      DPEDD+DPE2S,2,16
3610
3611                            IF      H47ED
3612
3613                            DW      0,DPBOES        ;       EXTENDED        SINGLE
3614                            DB      DPEED+DPEDD,8,16
3615
3616                            DW      0,DPBOED        ;       EXTENDED        DOUBLE
3617                            DB      DPEED+DPEDD+DPE2S,8,16
3618
3619                            ENDIF
3620                            PAGE
3621                    SETD47: MVI     A,DRAS
3622                            CALL    WCD
3623
3624                            LHLD    DPBX
3625                            INX     H
3626                            MOV     A,M
3627                            ORI     001H
3628                            CALL    WBD
3629
3630                            CALL    W4TR
3631                            CALL    H47IND          ;READ THE AUXILIARY STATUS INFORMATION
3632                            PUSH    PSW
3633
```

```
3634                    ANI     03H             ;FIND SECTOR LENGTH
3635                    CPI     2
3636                    IF      H47ED
3637                    JC      SETD1           ;IF LEN <> 128 OR 256
3638                    MVI     A,2             ;  THEN MAKE INDEX 2
3639                    ELSE
3640                    JNC     SETD9           ;IF LEN <> 128 OR 256 THEN ERROR
3641                    ENDIF
3642
3643            SETD1:  ADD     A               ;*2 TO ALLOW FOR SINGLE/DOUBLE DENSITY
3644                    MOV     D,A             ;SAVE INDEX TO DATE
3645
3646                    POP     PSW
3647                    ANI     10H             ;CHECK FOR SIDE 1
3648                    MOV     A,D
3649                    JZ      SETD2
3650
3651                    ORI     1               ;FLAG SIDE 1 AVAILABLE
3652
3653            SETD2:  MOV     B,A
3654                    ADD     A               ;*2
3655                    ADD     B               ;*3
3656                    ADD     A               ;*6
3657                    ADD     B               ;*7
3658
3659                    LXI     H,H47PMS
3660                    CALL    DADA
3661
3662                    XCHG                    ;DE NOW POINTS TO PARAMETERS FOR THIS DISK
3663                    LHLD    SETDSKC         ;HL POINTS TO DPE FOR THIS DRIVE
3664                    LDAX    D               ;STORE THE NEW TRANSLATE TABLE
3665                    MOV     M,A
3666                    INX     D
3667                    INX     H
3668                    LDAX    D
3669                    MOV     M,A
3670                    INX     D
3671
3672                    PUSH    D
3673                    LXI     D,DPEDPB-1      ;BUMP HL TO POINT TO DPB POINTER
3674                    DAD     D
3675                    POP     D
3676
3677                    LDAX    D               ;NOW SET UP NEW DPB POINTER
3678                    MOV     M,A
3679                    INX     D
3680                    INX     H
3681                    LDAX    D
3682                    MOV     M,A
3683                    INX     D
3684
3685                    LHLD    DPBX            ;GET POINTER TO THIS DRIVE
3686                    MOV     A,M             ;FLAG DENSITY AND SIDEDNESS
3687                    ANI     0FFH-DPEED-DPEDD-DPE2S
3688                    MOV     B,A
3689                    LDAX    D
```

```
3690                    ORA     B
3691                    MOV     M,A
3692                    INX     D               ;RECORDS PER SECTOR
3693                    INX     H
3694                    INX     H
3695                    LDAX    D
3696                    MOV     M,A
3697                    INX     D               ;AND RECORDS PER ALLOCATION
3698                    INX     H
3699                    LDAX    D
3700                    MOV     M,A
3701
3702                    XRA     A               ;INDICATE NO ERRORS
3703                    RET
3704
3705                    IF      NOT H47ED
3706            SETD9:  STC                     ;INDICATE ERROR
3707                    RET
3708                    ENDIF
3709
3710                    PAGE
3711            ;
3712            ;  RESET H47.
3713            ;
3714
3715            RESH47: MVI     A,DCRES
3716                    CALL    H47OUTC
3717                    CALL    W4DONE          ;WAIT FOR THE CONTROLLER TO BE DONE
3718                    XRA     A               ;CLEAR CONTROL REG
3719                    CALL    H47OUTC
3720                    RET
3721
3722                    PAGE
3723            RD47:   MVI     A,DRD           ;DO A BUFFERED READ
3724                    CALL    SET47
3725                    JC      RDERR
3726
3727            RDH3:   CALL    H47INS          ;GET THE CONTROL PORT
3728                    ANI     DSTR+DSDONE+DSERR ;WAIT FOR ANY LINE OF INTEREST
3729                    JZ      RDH3            ;NOTHING YET
3730                    ANI     DSDONE+DSERR    ;LOOK FOR ERROR OR END OF SECTOR
3731                    JNZ     RDH4
3732                    CALL    H47IND          ;GET DATA BYTE
3733                    MOV     M,A             ;SAVE IT
3734                    INX     H               ;BUMP MEMORY POINTER
3735                    JMP     RDH3
3736
3737            RDH4:   CALL    H47INS          ;REREAD IN CASE ERROR WAS LATE
3738                    ANI     DSERR           ;IF THERE WAS NO ERROR
3739                    RZ                      ;  THEN RETURN
3740
3741            RDERR:
3742            ER47:   MVI     A,DRS           ;READ DISK SUBSYSTEM STATUS
3743                    CALL    WCD
3744                    CALL    W4TR
3745                    CALL    H47IND
```

```
3746                    STA     ERRTYP          ;SAVE ERROR CODE
3747
3748                    LXI     H,H47MSG        ;PRINT EXTENDED ERROR MSG
3749                    CALL    PRTERR
3750
3751                    CALL    RESH47          ;RESET THE DISK SUBSYSTEM
3752
3753                    MVI     A,0FFH          ;FLAG ERROR
3754                    STA     ERFLAG
3755                    RET
3756
3757    H47MSG:         DB      'H47',0
3758
3759                    PAGE
3760    WR47:           MVI     A,DWR           ;DO A H47 BUFFERED WRITE
3761                    CALL    SET47           ;DO COMMON SETUP
3762                    JC      WRERR
3763                    CALL    H47INS          ;CHECK ON DISK STATUS
3764                    ANI     DSERR
3765                    JNZ     WRERR           ;WHOOPS
3766    WRH3:           CALL    H47INS          ;CHECK DISK STATUS
3767                    ANI     DSTR+DSDONE+DSERR
3768                    JZ      WRH3
3769                    ANI     DSDONE+DSERR
3770                    JNZ     WRH4
3771                    MOV     A,M             ;WRITE OUT THE NEXT BYTE
3772                    CALL    H47OUTD
3773                    INX     H               ;BUMP MEMORY POINTER
3774                    JMP     WRH3
3775
3776    WRH4:           CALL    H47INS          ;REREAD IN CASE ERROR WAS LATE
3777                    ANI     DSERR
3778                    RZ
3779
3780    WRERR:          JMP     ER47            ;PRINT THE ERROR MESSAGE AND CODE
3781
3782                    PAGE
3783    ;
3784    ;               SET47 - COMMON H47 SETUP FOR READ/WRITE
3785    ;
3786
3787    SET47:          CALL    WCD             ;WRITE THE COMMAND IN A TO DISK CONTROLLER
3788                    RC
3789
3790                    LHLD    HSTDPB
3791                    MOV     A,M
3792                    RAR                     ;IF LEAST SIGNIFICANT BIT IS 1 THEN DS
3793                    IF      DPE2S-1
3794    %:              DPE2S NE 1
3795                    ENDIF
3796                    MVI     A,0
3797                    STA     SIDE
3798                    LDA     HSTTRK
3799                    JNC     SET472          ;DISK IS SINGLE SIDED
3800                    RRC                     ;DIVIDE TRACK BY TWO, SIDE INTO MSB
3801                    PUSH    PSW
```

```
3802                    ANI     080H
3803                    STA     SIDE
3804                    POP     PSW
3805                    ANI     07FH
3806
3807            SET472: CALL    WBD
3808                    RC
3809
3810                    LHLD    HSTDPB
3811                    INX     H               ;HL POINTS TO SPECIFIED UNIT CODE
3812
3813                    LDA     HSTSEC          ;GET DESIRED SECTOR
3814                    INR     A               ;IBM DISK SECTORS NUMBERED 1 TO N
3815                    ORA     M               ;OR IN THE SELECTED DRIVE
3816
3817                    LXI     H,SIDE
3818                    ORA     M
3819
3820                    CALL    WBD
3821                    RC
3822
3823                    LXI     H,HSTBUF        ;(TEMPORARY) DESTINATION FOR DATA
3824                    RET
3825
3826                    PAGE
3827            ;       WCD - WRITE COMMAND TO DISK
3828            ;               DISK SHOULD BE "DONE" TO ACCEPT A NEW COMMAND
3829
3830            WCD:    CALL    W4DONE          ;WAIT UNITL DONE BEFORE COMMANDING
3831                    RC                      ;ERROR - DONE TIMEOUT
3832                    CALL    H47OUTD         ;SEND COMMAND
3833                    CALL    W4ND
3834                    RET
3835
3836            ;
3837            ;       WBD - WRITE BYTE TO DISK
3838            ;               A BYTE CAN BE SENT WHEN TR IS ASSERTED
3839
3840            WBD:    CALL    W4TR
3841                    RC
3842                    CALL    H47OUTD
3843                    RET
3844
3845            ;
3846            ;       W4DONE - WAIT FOR DONE TO BE ASSERTED
3847            ;               TIME OUT IN ABOUT 4 SEC, RETURN WITH C SET
3848
3849            W4DONE: PUSH    PSW
3850                    PUSH    B
3851                    LXI     B,0FFFFH
3852            W4D1:   CALL    H47INS
3853                    ANI     DSDONE          ;IS IT DONE YET?
3854                    JNZ     W4D2            ;YES, CLEAN UP AND RETURN
3855                    DCX     B               ;DECREMENT TIME OUT TIMER
3856                    MOV     A,B             ;IS IT ZERO YET?
3857                    ORA     C
```

```
3858                    JNZ     W4D1            ;NO, WAIT A WHILE LONGER
3859                    POP     B               ;TIME OUT - RETURN WITH C SET
3860                    POP     PSW
3861                    STC
3862                    RET
3863
3864            W4D2:   POP     B
3865                    POP     PSW
3866                    ORA     A               ;CLEAR CARRY
3867                    RET
3868
3869            ;
3870            ;       W4ND - WAIT FOR NOT DONE
3871            ;
3872
3873            W4ND:   PUSH    PSW
3874            W4ND1:  CALL    H47INS
3875                    ANI     DSDONE
3876                    JNZ     W4ND1
3877                    POP     PSW             ;RETURN AFTER DONE REMOVED
3878                    RET
3879
3880            ;
3881            ;       W4TR - WAIT FOR TR TO BE ASSERTED
3882            ;
3883
3884            W4TR:   PUSH    PSW
3885            W4TR1:  CALL    H47INS          ;GET THE DISK STATUS
3886                    ANI     DSDONE+DSTR
3887                    JZ      W4TR1
3888                    ANI     DSDONE
3889                    JNZ     W4TR2
3890                    POP     PSW
3891                    ORA     A
3892                    RET
3893            W4TR2:  POP     PSW
3894                    STC
3895                    RET
3896
3897                    PAGE
3898            H47INS: IN      78H             ;INPUT STATUS BYTE
3899            H47INS1 EQU     $-1
3900                    RET
3901
3902            H47OUTC: OUT    78H             ;OUTPUT CONTROL BYTE
3903            H47OUTC1 EQU    $-1
3904                    RET
3905
3906            H47IND: IN      79H             ;INPUT DATA BYTE
3907            H47IND1 EQU     $-1
3908                    RET
3909
3910            H47OUTD: OUT    79H             ;OUTPUT DATA BYTE
3911            H47OUTD1 EQU    $-1
3912                    RET
3913
```

```
3914                    ENDIF
3915
3916                    PAGE
```

```
3917
3918                            IF      H67T
3919
3920                    ;       H67 DEVICE DRIVER MODULE                        26 MAR 82
3921                    ;
3922                    ;*      JWTITTSLER / BILL ZURNEY
3923                    ;       HEATH/ZENITH SOFTWARE GROUP
3924                    ;       HILLTOP ROAD
3925                    ;       SAINT JOSEPH, MICHIGAN  49085
3926                    ;
3927
3928                    H67DVD: JMP     SET67           ;SELECT DISK ENTRY POINT
3929                            JMP     RD67            ;READ
3930                            JMP     WR67            ;WRITE
3931                            JMP     RESH67          ;RESET
3932                            XRA A ! RET ! NOP       ;MOUNT
3933
3934                    SET67:
3935                            XRA     A               ;1ST SECTOR WILL BE READ
3936                            STA     HSTSEC          ; (SECTOR # 0 TO SPT-1)
3937
3938                            LHLD    DPBX
3939                            MOV     A,M
3940                            ANI     DPETYPF
3941                            CPI     DPEH67F         ;CHECK FOR FLOPPY
3942                            JZ      SET671          ;BR IF YES
3943
3944                    ;  1ST TIME SELECTION FOR HARD DISK.
3945
3946                            LXI     H,0             ;READ LABEL
3947                            SHLD    HSTTRK
3948                            CALL    RD67
3949                            JNZ     SET679          ; BR IF ERROR
3950
3951                            CALL    CHKLAB          ;CHECK CHECKSUM OF LABEL
3952                            JNZ     SET679          ; BR IF INCORRECT CHECKSUM
3953
3954                            IF      PARTITN
3955
3956                            LHLD    DPBX            ;CHECK IF LABEL'S BEGINNING OF
3957                            LXI     B,DPETRK-DPEHTH ; PARTITION SECTOR NUMBER MATCHES
3958                            DAD     B               ;  DRIVE TABLE'S
3959                            CALL    HLIHL
3960                            XCHG
3961                            LHLD    HSTBUF+LABHTH+DPETRK-DPEHTH
3962                            CALL    CPHLDE
3963                            JNZ     SET679          ;BR IF NOT -- PARTITION HAS BEEN MOVED
3964
3965                            LHLD    DPBX            ;CHECK IF LABEL'S LAST SECTOR # + 1
3966                            LXI     B,DPEUPB-DPEHTH ; OF PARTITION MATCHES
3967                            DAD     B               ;  DRIVE TABLE'S
3968                            CALL    HLIHL
3969                            XCHG
3970                            LHLD    HSTBUF+LABHTH+DPEUPB-DPEHTH
3971                            CALL    CPHLDE
3972                            JNZ     SET679          ;BR IF NOT -- PARTITION SIZE HAS CHANGED
```

```
3973
3974                    ENDIF
3975
3976                    LHLD    DPBX            ;UPDATE CP/M RECORDS PER ALLOCATION BLOCK
3977                    LXI     B,DPERPAB-DPEHTH
3978                    DAD     B
3979                    LXI     D,HSTBUF+LABHTH+DPERPAB-DPEHTH
3980                    LDAX    D
3981                    MOV     M,A
3982
3983                    LHLD    SETDSKC         ;UPDATE DISK PARAMETER BLOCK VALUES
3984                    LXI     B,DPEDPB
3985                    DAD     B
3986                    CALL    HLIHL
3987                    LXI     D,HSTBUF+LABDPB
3988                    MVI     C,DPBL
3989                    CALL    MOVEITX
3990
3991                    JMP     SET674
3992
3993            ;  1ST TIME SELECTION FOR FLOPPY.
3994
3995
3996            SET671:
3997                    LHLD    DPBX            ;GET ADDR OF HEATH EXTENSIONS FOR DRIVE
3998                    MOV     A,M             ;GET DENSITY FROM TABLE
3999                    ANI     DPEDD
4000                    JZ      SET671A         ; CURRENT DENSITY IS SINGLE
4001                    MVI     A,HDFDEN        ;DOUBLE DENSITY
4002
4003            SET671A:
4004                    STA     SET67A          ;ASSUME CURRENT DENSITY
4005                    CALL    FDD67           ;SET CURRENT DENSITY/SINGLE SIDED
4006                    JNZ     SET679          ;BR IF ERROR
4007                    LXI     H,1             ;TRY READING TRACK 1 SECTOR 1
4008                    SHLD    HSTTRK
4009                    CALL    RD67
4010                    JZ      SET672          ;BR IF NOT READ ERROR
4011
4012                    LDA     ERRTYP
4013                    CPI     HDEIAM          ;CHECK FOR ID ADDR MARK NOT FOUND
4014                    JZ      SET671C         ; BR IF ID ADDR MARK NOT FOUND
4015                    CPI     HDERNF          ;CHECK FOR RECORD NOT FOUND
4016                    JNZ     SET679          ; BR IF OTHER TYPE OF ERROR
4017            SET671C:
4018                    LXI     H,SET67A        ;TRY OTHER DENSITY
4019                    MOV     A,M
4020                    XRI     HDFDEN
4021                    MOV     M,A
4022                    CALL    FDD67           ;SET OTHER DENSITY/SINGLE SIDED
4023                    CALL    RD67            ;VERIFY OTHER DENSITY
4024                    JNZ     SET679          ; BR IF NOT
4025
4026            SET672: LXI     H,SET67A
4027                    MOV     A,M
4028                    ORI     HDFSID          ;TRY DOUBLE SIDED
```

```
4029                            MOV     M,A
4030                            CALL    FDD67           ;SET DENSITY/SIDE DESCRIPTION
4031                            JNZ     SET679          ;BR IF ERROR
4032
4033                            CALL    RD67            ;TRY READING 2ND SIDE
4034                            JZ      SET673          ;BR IF NO READ ERROR
4035                            LDA     ERRTYP
4036                            CPI     HDEDNR          ;CHECK FOR DRIVE NOT READY
4037                            JNZ     SET679          ; BR IF OTHER TYPE OF ERROR
4038                            LXI     H,SET67A
4039                            MOV     A,M
4040                            ANI     0FFH-HDFSID     ;BACK OFF TO SINGLE SIDED
4041                            MOV     M,A
4042
4043                    SET673: LDA     SET67A
4044                            MOV     B,A
4045                            ADD     A               ;*2
4046                            ADD     B               ;*3
4047                            ADD     A               ;*6
4048                            ADD     B               ;*7
4049                            LXI     H,H67PMS
4050                            CALL    DADA            ;HL = ADDR OF SPECIFIC DISK TYPE VALUES
4051                            XCHG                    ;DE NO POINTS TO PARAMETERS FOR THIS DISK
4052                            LHLD    SETDSKC         ;HL POINTS TO DPE FOR THIS DRIVE
4053
4054                            LDAX    D               ;UPDATE XLATE TABLE ADDR
4055                            MOV     M,A
4056                            INX     D
4057                            INX     H
4058                            LDAX    D
4059                            MOV     M,A
4060                            INX     D
4061                            LXI     B,DPEDPB-1      ;BUMP HL TO POINT TO DPB POINTER
4062                            DAD     B
4063                            LDAX    D               ;NOW SET UP NEW DPB POINTER
4064                            MOV     M,A
4065                            INX     D
4066                            INX     H
4067                            LDAX    D
4068                            MOV     M,A
4069                            LHLD    DPBX            ;GET POINTER TO DRIVE SPECIFIC VALUES
4070                            XCHG                    ;(DE)=DRIVE SPECIFIC VALUES POINTER
4071                                                    ;(HL)=H67 DISK DESCRIPTORS POINTER
4072                            INX     H
4073                            LDAX    D
4074                            ANI     0FFH-DPEDD-DPE2S
4075                            ORA     M
4076                            STAX    D               ;UPDATE DENSITY/SIDE FLAGS
4077                            INX     D
4078                            INX     D
4079                            INX     H
4080                            MOV     A,M
4081                            STAX    D               ;RECORDS PER SECTOR
4082                            INX     H
4083                            INX     D
4084                            MOV     A,M
```

```
4085                    STAX    D               ;RECORDS PER ALLOCATION
4086
4087                    LDA     SET67A
4088                    CALL    FDD67           ;SET CORRECT DENSITY/SIDE DESCRIPTION
4089                    JNZ     SET679          ;BR IF ERROR
4090
4091            SET674:
4092                    XRA     A               ;INDICATE NO ERRORS
4093                    RET
4094
4095            SET679: STC                     ;INDICATE ERROR
4096                    RET
4097
4098            ;  DISK DESCRIPTORS
4099            ;
4100            ;       DW      &XLATE$TABLE    ;POINTER TO TRANSLATE TABLE
4101            ;       DW      &PARAM$BLOCK    ;POINTER TO PARAMETER BLOCK
4102            ;       DB      DENSITY AND SIDES
4103            ;       DB      RECORDS$PER$SECTOR
4104            ;       DB      RECORDS$PER$ALLOCATION
4105
4106            H67PMS: DW      XLTOS,DPBOSS    ;SINGLE DENSITY/SINGLE SIDED
4107                    DB      0,1,8
4108
4109                    DW      XLTOS,DPBOSD    ;SINGLE DENSITY/DOUBLE SIDED
4110                    DB      DPE2S,1,16
4111
4112                    DW      XLTOD,DPBODS    ;DOUBLE DENSITY/SINGLE SIDED
4113                    DB      DPEDD,2,16
4114
4115                    DW      XLTOD,DPBODD    ;DOUBLE DENSITY/DOUBLE SIDED
4116                    DB      DPEDD+DPE2S,2,16
4117
4118            SET67A: DS      1               ;DENSITY/SIDE DESCRIPTION VALUE
4119
4120                    PAGE
4121            ;
4122            ;  RESET H67 CONTROLLER.
4123            ;
4124
4125            RESH67: MVI     A,HDFRES
4126                    CALL    H67OUTC
4127                    MVI     A,10            ;DELAY AWHILE
4128            RESH671:
4129                    DCR     A
4130                    JNZ     RESH671
4131
4132                    RET
4133
4134                    PAGE
4135            ;
4136            ;  RECALIBRATE HEAD.
4137            ;
4138
4139            RCL67:  MVI     A,HDCRCL
4140                    STA     CMDBUF+HDOOP
```

```
4141                    CALL    SETUP3
4142                    MVI     A,1             ;INDICATE DON'T DO RS ON ERROR
4143                    STA     RS67B
4144                    JMP     CMPSTAT
4145
4146                    PAGE
4147                ;
4148                ;  READ SENSE BYTES.
4149                ;
4150                ;     ENTRY:  COMMAND BUFFER ALREADY CONTAINS UNIT SELECT VALUE
4151                ;     EXIT:   4 SENSE BYTES ARE AT 'RS67A'
4152                ;             'ERRTYP' CONTAINS ERROR TYPE & CODE
4153                ;             (A) CONTAINS ERROR TYPE & CODE
4154                ;     USES:   ALL
4155                ;
4156
4157                RS67:   MVI     A,HDCRS
4158                        STA     CMDBUF+HDOOP
4159                        XRA     A
4160                        STA     CMDBUF+HDOCON
4161                        CALL    SETUP3
4162                        MVI     A,1             ;INDICATE DON'T DO RS IF ERROR
4163                        STA     RS67B
4164                        LXI     H,RS67A
4165                        MVI     M,0
4166
4167                        IF      H67BLKIO
4168                        MVI     A,4             ;NUMBER OF BYTES TO READ
4169                        STA     RD673           ; MODIFY COUNT INSTRUCTION
4170                        ENDIF
4171                        CALL    RD671
4172
4173                        MVI     A,0             ;ASSUME NO STATUS IN CASE OF ERROR ON RS
4174                        JNZ     RS671
4175                        LDA     RS67A
4176                RS671:  ANI     HDSET+HDSEC
4177                        STA     ERRTYP
4178                        RET
4179
4180                RS67A   DS      4
4181                RS67B   DS      1
4182
4183                        PAGE
4184                ;
4185                ;  FLOPPY DISK DESCRIPTION.
4186                ;
4187                ;     ENTRY:  (A) = TRACK FORMAT CODE
4188                ;     EXIT:   PSW/Z = 0 IF ERROR
4189                ;                   = 1 IF NO ERROR
4190                ;             EXIT VIA 'CMPSTAT'
4191                ;     USES:   ALL
4192                ;
4193
4194                FDD67:  STA     CMDBUF+HD6TFC
4195                        LHLD    HSTDPB
4196                        INX     H
```

```
4197                    MOV     A,M
4198                    STA     CMDBUF+HD6LUN
4199                    MVI     A,HDCFDD
4200                    STA     CMDBUF+HD6OP
4201                    CALL    SETUP3
4202                    JMP     CMPSTAT
4203
4204                    PAGE
4205            ;
4206            ;  READ SECTOR.
4207            ;
4208            ;    ENTRY:  (HSTDPB) = ADDR OF DPE HEATH EXTENSIONS FOR DRIVE
4209            ;            (HSTTRK) = TRACK
4210            ;            (HSTSEC) = SECTOR (0 TO SPT-1)
4211            ;    EXIT:   PSW/Z = 0 IF ERROR
4212            ;                  = 1 IF NO ERROR
4213            ;            'ERFLAG' = 0 IF NO ERROR
4214            ;                     <> 0 IF ERROR
4215            ;            'HSTBUF' CONTAINS SECTOR
4216            ;    USES:   ALL
4217            ;
4218
4219            RD67:   CALL    H67IOINIT       ;INIT I/O
4220            RD67A:  CALL    RD670           ;DO READ
4221                    JZ      H67XOK          ; BR IF NO ERROR
4222                    CALL    H67RETRY        ;CHECK IF I SHOULD DO RETRY FOR FLOPPY
4223                    JNC     RD67A           ; BR IF I SHOULD
4224                    JMP     H67EXIT         ;  OTHERWISE EXIT
4225
4226            RD670:  MVI     A,HDCRD         ;READ COMMAND
4227                    CALL    SETUP           ;SETUP COMMAND BUFFER, GET ATTENTION, SEND CMD
4228                    RNZ                     ; RET IF ERROR
4229                    LXI     H,HSTBUF        ;POINTER TO DATA STORAGE
4230                    IF      H67BLKIO
4231                    MVI     A,128           ;BLOCK COUNT
4232                    STA     RD673           ; MODIFY COUNT INSTRUCTION
4233                    ENDIF
4234
4235            ;  LOW LEVEL I/O READ ROUTINE
4236            ;
4237            ;    ENTRY:  (HL)=BUFFER ADDRESS
4238            ;    EXIT:   VIA CMPSTAT
4239            ;    USES:   ALL
4240
4241                    IF      H67BLKIO
4242
4243            RD671:  LDA     H67IND1         ;GET DATA INPUT PORT #
4244                    MOV     C,A
4245            RD672:  CALL    H67INS          ;GET THE BUS STATUS
4246                    ANA     A               ;LOOK FOR REQ
4247                    IF      HDBREQ-10000000B
4248            %:      HDBREQ NE 10000000B
4249                    ENDIF
4250                    JP      RD672
4251                    ANI     HDBCMD          ;CHECK FOR COMPLETION
4252                    JNZ     CMPSTAT
```

```
4253                    MVI     B,0             ;BLOCK COUNT
4254            RD673:  EQU     $-1             ; (MODIFIED BY CALLING ROUTINE)
4255                    DB      0EDH,0B2H       ;DO BLOCK INPUT
4256                    JMP     RD672
4257
4258                    ELSE
4259
4260            RD671:  CALL    H67INS          ;GET THE BUS STATUS
4261                    ANA     A               ;LOOK FOR REQ
4262                    IF      HDBREQ-10000000B
4263            %:      HDBREQ NE 10000000B
4264                    ENDIF
4265                    JP      RD671
4266                    ANI     HDBCMD          ;CHECK FOR COMPLETION
4267                    JNZ     CMPSTAT
4268                    CALL    H67IND          ;INPUT DATA FROM THE CONTROLLER
4269                    MOV     M,A             ;STORE IT IN THE HOST BUFFER
4270                    INX     H
4271                    JMP     RD671
4272
4273                    ENDIF
4274
4275                    PAGE
4276            ;
4277            ;  WRITE SECTOR.
4278            ;
4279            ;    ENTRY:  (HSTDPB) = ADDR OF DPE HEATH EXTENSIONS FOR DRIVE
4280            ;            (HSTTRK) = TRACK
4281            ;            (HSTSEC) = SECTOR (0 TO SPT-1)
4282            ;    EXIT:   PSW/Z = 0 IF ERROR
4283            ;                    1 IF NO ERROR
4284            ;                  'ERFLAG' = 0 IF NO ERROR
4285            ;                           <> 0 IF ERROR
4286            ;            DATA AT 'HSTBUF' WRITTEN
4287            ;    USES:   ALL
4288            ;
4289
4290            WR67:   CALL    H67IOINIT       ;INIT I/O
4291            WR67A:  CALL    WR670           ;DO WRITE
4292                    JZ      H67XOK          ; BR IF NO ERROR
4293                    CALL    H67RETRY        ;CHECK IF I SHOULD DO RETRY FOR FLOPPY
4294                    JNC     WR67A           ; BR IF I SHOULD
4295                    JMP     H67EXIT         ;  OTHERWISE EXIT
4296
4297            WR670:  MVI     A,HDCWR         ;WRITE COMMAND
4298                    CALL    SETUP           ;SETUP COMMAND BUFFER, GET ATTENTION, SEND CMD
4299                    RNZ                     ; RET IF ERROR
4300                    LXI     H,HSTBUF        ;POINTER TO DATA SOURCE
4301
4302                    IF      H67BLKIO
4303
4304            WR671:  LDA     H67OUTD1        ;GET OUTPUT DATA PORT #
4305                    MOV     C,A
4306            WR672:  CALL    H67INS          ;GET THE BUS STATUS
4307                    ANA     A               ;LOOK FOR REQ
4308                    IF      HDBREQ-10000000B
```

```
4309                    %:      HDBREQ NE 10000000B
4310                            ENDIF
4311                            JP      WR672
4312                            ANI     HDBCMD          ;CHECK FOR COMPLETION
4313                            JNZ     CMPSTAT
4314                            MVI     B,128           ;128 BYTE BLOCK
4315                            DB      0EDH,0B3H       ;DO BLOCK OUTPUT
4316                            JMP     WR672
4317
4318                            ELSE
4319
4320                    WR671:  CALL    H67INS          ;GET THE BUS STATUS
4321                            ANA     A               ;WAIT FOR REQ
4322                            IF      HDBREQ-10000000B
4323                    %:      HDBREQ NE 10000000B
4324                            ENDIF
4325                            JP      WR671
4326                            ANI     HDBCMD          ;CHECK FOR COMPLETION
4327                            JNZ     CMPSTAT
4328                            MOV     A,M             ;GET THE NEXT BYTE
4329                            CALL    H67OUTD         ;SEND IT TO THE DISK
4330                            INX     H
4331                            JMP     WR671
4332
4333                            ENDIF
4334
4335                            PAGE
4336                    ;
4337                    ;  INIT I/O VARIABLES FOR RETRYING ON FLOPPY.
4338                    ;
4339
4340                    H67IOINIT:
4341                            LDA     ERFLAG
4342                            STA     H67SEF
4343                            MVI     A,3
4344                            STA     H67RCNT
4345                            RET
4346
4347                    H67SEF  DS      1
4348                    H67RCNT DS      1
4349
4350
4351                    ;
4352                    ;  CHECK IF I SHOULD DO RETRY FOR FLOPPY.
4353                    ;
4354                    ;    EXIT - PSW/C - 0=RETRY , 1=NO RETRY
4355                    ;
4356
4357                    H67RETRY:
4358                            LHLD    HSTDPB          ;CHECK IF DOING I/O TO FLOPPY
4359                            MOV     A,M
4360                            ANI     DPETYPF
4361                            CPI     DPEH67F
4362                            JNZ     H67RETRY1       ; BR IF NOT
4363
4364                            LDA     ERRTYP          ;CHECK ERROR TYPE
```

```
4365                    ANI     HDECLS
4366                    CPI     HDECLS1
4367                    JNZ     H67RETRY1       ; BR IF NOT TYPE 1 ERROR
4368
4369                    CALL    RCL67           ;RESTORE HEAD ON DRIVE
4370
4371                    ANA     A               ;CLEAR CARRY BIT
4372                    LXI     H,H67RCNT       ;DECREMENT RETRY COUNTER
4373                    DCR     M
4374                    RNZ                     ; RET INDICATING DO RETRY IF COUNT <> 0
4375
4376            H67RETRY1:
4377                    STC                     ;RET INDICATING DON'T RETRY
4378                    RET
4379
4380
4381            ;
4382            ;  H67 READ/WRITE EXIT POINT
4383            ;
4384
4385            H67XOK:
4386                    LDA     H67SEF          ;EXIT WITH 'ERFLAG' AT THE SAME VALUE
4387                    STA     ERFLAG          ; AS ON ENTRY
4388                    XRA     A               ;INDICATE NO ERROR
4389                    RET
4390
4391            H67EXIT:
4392                    LDA     ERFLAG          ;EXIT INDICATING ERROR STATUS IN 'ERFLAG'
4393                    ORA     A
4394                    RET
4395
4396                    PAGE
4397            ;
4398            ;  CHECK COMPLETION STATUS.
4399            ;
4400            ;       EXIT:   PSW/Z = 0 IF ERROR
4401            ;                       = 1 IF NO ERROR
4402            ;               'ERFLAG' = 0 IF NO ERROR
4403            ;                        <> 0 IF ERROR
4404            ;       USES:   ALL
4405            ;
4406
4407            CMPSTAT: CALL   H67IND          ;INPUT THE COMPLETION STATUS
4408                    MOV     C,A             ;SAVE TEMPORARILY
4409            LREQ:   CALL    H67INS          ;WAIT FOR LAST REQ
4410                    ANA     A               ;REQ?
4411                    IF      HDBREQ-10000000B
4412            %:      HDBREQ NE 10000000B
4413                    ENDIF
4414                    JP      LREQ            ;NOT YET
4415                    MOV     B,A             ;SAVE FOR CHECKING LATER
4416                    CALL    H67IND          ;GET LAST BYTE
4417
4418                    EI                      ;ALLOW INTERRUPTS AGAIN
4419
4420                    ORA     A               ;SHOULD BE A BYTE OF ZEROS
```

```
4421                    MVI     A,HDENZM        ;ERROR CODE
4422                    JNZ     H67ER           ; BR IF ERROR
4423
4424                    MOV     A,B
4425                    ANI     HDBPE           ;CHECK FOR PARITY ERROR ON BUS
4426                    MVI     H,HDEBP         ;ERROR CODE
4427                    JNZ     H67ER           ; BR IF ERROR
4428
4429                    MOV     A,C             ;GET THE COMPLETION BYTE
4430                    ANI     HDFERR+HDFPE    ;CHECK COMPLETION STATUS
4431                    RZ                      ; RET IF NO ERRORS
4432
4433                    ANI     HDFERR          ;CHECK IF I/O ERROR OR BAD PARITY
4434                    MVI     A,HDEPAR        ;ERROR CODE FOR BAD PARITY
4435                    JZ      H67ER           ; BR IF NOT I/O ERROR
4436
4437                    LDA     RS67B           ;CHECK IF ERROR DURING REQUEST SENSE
4438                    ANA     A
4439                    RNZ                     ; IF YES -- THEN DON'T TRY ANOTHER
4440
4441                    CALL    RS67            ;DO A REQUEST SENSE TO GET ERROR CODE
4442
4443            H67ER:  STA     ERRTYP          ;SAVE ERROR CODE
4444
4445                    CPI     HDEWF           ;CHECK FOR WRITE FAULT
4446                    CZ      RCL67           ; IF YES -- RECALIBRATE HEAD TO CLEAR ERROR
4447
4448                    LXI     H,H67MSG        ;PRINT EXTENDED ERROR MESSAGE
4449                    CALL    PRTERR
4450
4451                    ORI     0FFH            ;INDICATE ERROR
4452                    STA     ERFLAG
4453                    RET
4454
4455            H67MSG  DB      'H67',0
4456
4457                    PAGE
4458            SETUP:  LXI     H,CMDBUF        ;POINTER TO THE COMMAND BUFFER
4459                    MOV     M,A             ;SAVE COMMAND IN BUFFER STRING
4460                    INX     H               ;POINT TO LOGICAL UNIT SLOT
4461                    XCHG                    ;(DE)=COMMAND BUFFER POINTER
4462                    LHLD    HSTDPB          ;GET UNIT SELECT VALUE
4463                    INX     H
4464                    MOV     A,M
4465                    STAX    D               ;PLACE IT IN COMMAND BUFFER
4466                    INX     D               ;BUMP COMMAND BUFFER POINTER
4467                    PUSH    D               ;SAVE COMMAND BUFFER POINTER FOR LATER
4468
4469            ;  COMPUTE LOGICAL SECTOR NUMBER.
4470                    LHLD    HSTTRK          ;START WITH CP/M TRACK #
4471                    MOV     D,H
4472                    MOV     E,L
4473                    DAD     H               ;*2
4474                    DAD     D               ;*3
4475                    DAD     H               ;*6
4476                    DAD     H               ;*12
```

```
4477                    DAD     D               ;*13
4478                    DAD     H               ;*26
4479                    IF      NSPT67-26
4480                %:  NSPT67 NE 26
4481                    ENDIF
4482                    LDA     HSTSEC          ;SECTORS NUMBERED 0 TO SPT-1
4483                    CALL    DADA            ;HL IS NOW THE LOGICAL SECTOR NUMBER
4484                    XCHG                    ;NOW DE IS
4485                    LHLD    HSTDPB          ;ADD TRACK 0 OFFSET
4486                    LXI     B,DPETRK-DPEHTH
4487                    DAD     B
4488                    CALL    HLIHL           ;(HL) = TRACK 0 OFFSET
4489                    XCHG                    ;(DE) = TRACK 0 OFFSET
4490                                            ;(HL) = LOGICAL SECTOR #
4491                    DAD     D
4492
4493                ;  CHECK IF WITHIN PARTITION BOUNDARIES.
4494                    MOV     A,D
4495                    ORA     E
4496                    JZ      SETUP2          ;BR IF FLOPPY OR NOT IN PARTITION MODE
4497                                            ; (ASSUMED IF TRACK 0 OFFSET = 0)
4498
4499                    CALL    CPHLDE          ;CHECK LOGICAL SECTOR # AGAINST
4500                                            ; BEGINNING OF PARTITION
4501                    JC      SETUP9          ;  BR IF BEFORE
4502
4503                    XCHG                    ;(DE) = LOGICAL SECTOR #
4504                    LHLD    HSTDPB          ;GET LAST SECTOR # + 1 OF PARTITION
4505                    LXI     B,DPEUPB-DPEHTH
4506                    DAD     B
4507                    CALL    HLIHL
4508                    XCHG                    ;(DE) = LAST SECTOR # + 1 OF PARTITION
4509                                            ;(HL) = LOGICAL SECTOR #
4510                    CALL    CPHLDE
4511                    JNC     SETUP9          ; BR IF AFTER PARTITION
4512
4513                SETUP2: XCHG                ;(DE) = LOGICAL SECTOR NUMBER
4514
4515                ;  PUT LOGICAL SECTOR NUMBER INTO COMMAND BUFFER
4516                    POP     H
4517                    MOV     M,D             ;MSB FIRST
4518                    INX     H
4519                    MOV     M,E
4520                    INX     H
4521                    MVI     M,1             ;1 BLOCK
4522                    INX     H
4523                    MVI     M,0             ;0 THE CONTROL BYTE
4524
4525                ;  SEND COMMAND TO H67 CONTROLLER.
4526
4527                SETUP3:
4528                    XRA     A               ;INDICATE DO RS ON ERROR
4529                    STA     RS67B
4530
4531                    LXI     D,-1            ;INIT TIMEOUT COUNTER
4532
```

```
4533                    GETCON: CALL    H67INS          ;GET THE STATUS
4534                            ANI     HDBBSY          ;IF NOT BUSY
4535                            JZ      SETUP3A         ;  THEN GO AHEAD
4536                            DCX     D
4537                            MOV     A,D             ;CHECK TIMEOUT COUNTER
4538                            ORA     E
4539                            JZ      SETUP8          ; BR IF TIMEOUT
4540                            JMP     GETCON
4541
4542                    SETUP3A:
4543                            MVI     A,HDFSEL        ;ASSERT SEL AND DATAO
4544                            CALL    H67OUTC
4545
4546                            LXI     D,-1            ;INIT TIMEOUT COUNTER
4547
4548                    CBUSY:  CALL    H67INS
4549                            ANI     HDBBSY          ;IF BUSY
4550                            JNZ     SETUP3B         ;  THEN WE GOT ITS ATTENTION
4551                            DCX     D
4552                            MOV     A,D             ;CHECK TIMEOUT COUNTER
4553                            ORA     E
4554                            JZ      SETUP8          ; BR IF TIMEOUT
4555                            JMP     CBUSY
4556
4557                    SETUP3B:
4558                            DI                      ;DON'T WANT TO BE BOTHERED
4559
4560                            MVI     A,HDFDE         ;DATA ENABLE
4561                            CALL    H67OUTC
4562
4563                            LXI     H,CMDBUF
4564                    OUTCOM: CALL    H67INS
4565                            ANI     HDBREQ+HDBCMD+HDBIO
4566                            IF      HDBREQ-10000000B
4567                    %:      HDBREQ NE 10000000B
4568                            ENDIF
4569                            JP      OUTCOM          ;WAIT FOR REQ
4570                            CPI     HDBREQ+HDBCMD+HDBIO     ;CHECK FOR REQ/CMD/OUTPUT
4571                            JNZ     SETUP4
4572                            MOV     A,M             ;GET NEXT BYTE OF COMMAND
4573                            CALL    H67OUTD
4574                            INX     H
4575                            JMP     OUTCOM
4576
4577                    SETUP4: XRA     A               ;INDICATE NO ERROR IN SETUP
4578                            RET
4579
4580                    ;  ERROR IN SETUP DUE TO TIMEOUT.
4581
4582                    SETUP8: MVI     A,HDETO         ;ERROR CODE
4583                            JMP     H67ER           ;HANDLE ERROR
4584
4585                    ;  ERROR IN SETUP DUE TO OUT OF BOUNDS CONDITION.
4586
4587                    SETUP9: POP     H               ;DISCARD COMMAND BUFFER POINTER
4588                            MVI     A,HDEOB         ;ERROR CODE
```

```
4589                    JMP     H67ER           ;HANDLE ERROR
4590
4591                    PAGE
4592            ;
4593            ;  PRIMITIVE H67 I/O PORT ROUTINES.
4594            ;
4595
4596            H67OUTD: OUT    0               ;OUTPUT TO DATA PORT
4597            H67OUTD1 EQU    $-1
4598                    RET
4599
4600            H67IND: IN      0               ;INPUT FROM DATA PORT
4601            H67IND1 EQU     $-1
4602                    RET
4603
4604            H67OUTC: OUT    0               ;OUTPUT TO CONTROL PORT
4605            H67OUTC1 EQU    $-1
4606                    RET
4607
4608            H67INS: IN      0               ;INPUT FROM BUS STATUS PORT
4609            H67INS1 EQU     $-1
4610                    RET
4611
4612            ;  H67 COMMAND BUFFER
4613            ;    INTIALIZED FOR SEEK OPERATION AT COLD BOOT
4614
4615            CMDBUF: DB      HDCSEK          ;OPCODE
4616                    DB      0               ;LUN ! LOG ADR2
4617                    DB      0CH             ;LOG ADR1
4618                    DB      80H             ;LOG ADR0
4619                    DB      1               ;NUMBER OF BLOCKS
4620                    DB      0               ;CONTROL BYTE
4621
4622                    ENDIF
4623
4624                    PAGE
```

```
4625
4626  080D C31C08  NULDVD:  JMP     SETNUL
4627  0810 C31C08           JMP     RDNUL
4628  0813 C31C08           JMP     WRNUL
4629  0816 C31C08           JMP     RESNUL
4630  0819 C31C08           JMP     MNTNUL
4631
4632                SETNUL:
4633                RDNUL:
4634                WRNUL:
4635                RESNUL:
4636                MNTNUL:
4637  081C 3EFF             MVI     A,0FFH
4638  081E 32AE10           STA     ERFLAG
4639  0821 37               STC
4640  0822 C9               RET
4641
4642                        PAGE
```

```
4643
4644                    ;
4645                    ;  2 MS CLOCK INTERRUPT SERVICE ROUTINE
4646                    ;
4647                            IF      TOD
4648                    NDAYS   DB      31,28,31,30,31,30,31,31,30,31,30,31
4649                            ENDIF
4650  0823 000000000000TODVAL   DB      0,0,0,0,0,0     ;TIME OF DAY (SEC [0-59] ,
4651                                                    ; MIN [0-59] , HRS [0-23], DAY[1-N] ,
4652                                                    ; MON [1-12] , YR [0-255])
4653  0829 0000         EVTCTR  DW      0               ;EVENT DOWN COUNTER
4654  082B 00           DLYMO:  DB      0
4655  082C 00           DLYH:   DB      0
4656  082D 00           DLYW:   DB      0
4657
4658  082E 22B410       CLOCK:  SHLD    HSAV            ;SAVE AF,HL
4659  0831 E1                   POP     H               ;GET THE RETURN ADDRESS
4660  0832 22B610               SHLD    RETSAV          ;SAVE IT, BUT NOT ON USER STACK
4661  0835 F5                   PUSH    PSW             ;SAVE AF, HL
4662
4663  0836 210D00               LXI     H,CTLPRT        ;GET THE CURRENT VALUE OF THE CONTROL PORT
4664  0839 7E                   MOV     A,M
4665  083A D3F2                 OUT     H88CTL          ;AND OUTPUT AGAIN, RESETTING INT REQ
4666
4667  083C 23                   INX     H               ;POINT TO THE H8FLAG
4668  083D 7E                   MOV     A,M
4669  083E B7                   ORA     A               ;IF 0 THEN RUNNING IN H/Z89
4670  083F CA4408               JZ      CLK0            ;  THEN DON'T OUTPUT TO 3600
4671  0842 D3F0                 OUT     H8CTL           ;  ELSE CONTAINS H8TR TO RESET H8 CLOCK
4672
4673  0844 2A0B00       CLK0:   LHLD    TICCNT          ;GET THE TICK COUNTER
4674  0847 23                   INX     H               ;INCREMENT IT
4675  0848 220B00               SHLD    TICCNT
4676
4677  084B 7D                   MOV     A,L             ;IS IT A MULTIPLE OF 1/2 SECOND?
4678  084C B7                   ORA     A
4679  084D C27A08               JNZ     CLKRET          ;  IF NOT
4680
4681                            IF      TOD
4682                            MOV     A,H             ;IS IT A MULTIPLE OF 1 SECOND?
4683                            RAR
4684                            JC      CLK1            ; BR IF NOT
4685                            LXI     H,TODVAL        ;HANDLE TIME OF DAY
4686                            INR     M               ; SECONDS
4687                            MOV     A,M
4688                            CPI     60
4689                            JC      CLK1
4690                            MVI     M,0
4691                            INX     H               ; MINUTES
4692                            INR     M
4693                            MOV     A,M
4694                            CPI     60
4695                            JC      CLK1
4696                            MVI     M,0
4697                            INX     H               ; HOURS
4698                            INR     M
```

```
4699                            MOV     A,M
4700                            CPI     24
4701                            JC      CLK1
4702                            MVI     M,0
4703                            INX     H               ; DAYS
4704                            INX     H
4705                            MOV     A,M
4706                            LXI     H,NDAYS-1
4707                            ADD     L
4708                            MOV     L,A
4709                            MOV     A,H
4710                            ACI     0
4711                            MOV     H,A
4712                            MOV     A,M
4713                            LXI     H,TODVAL+3
4714                            INR     M
4715                            CMP     M
4716                            JNC     CLK1
4717                            MVI     M,1
4718                            INX     H               ; MONTHS
4719                            INR     M
4720                            MOV     A,M
4721                            CPI     13
4722                            JC      CLK1
4723                            MVI     M,1
4724                            INX     H               ; YEARS
4725                            INR     M
4726                            ENDIF
4727
4728                    CLK1:
4729
4730                            IF      EVENT
4731                            LHLD    EVTCTR          ;DOWN COUNT EVENT COUNTER IF <> 0
4732                            MOV     A,H
4733                            ORA     L
4734                            JZ      CLK2
4735                            DCX     H
4736                            SHLD    EVTCTR
4737                            ENDIF
4738
4739                    CLK2:
4740
4741                            IF      H17T
4742  0850 212B08               LXI     H,DLYMO         ;POINTER TO MOTOR DELAY TIMER
4743  0853 7E                   MOV     A,M
4744  0854 B7                   ORA     A               ;IF ALREADY ZERO
4745  0855 CA7A08               JZ      CLK4            ;  THEN DON'T DECREMENT
4746
4747  0858 35                   DCR     M               ;DECREMENT TIMER
4748  0859 C26608               JNZ     CLK3            ;  IF IT HAS NOT TIMED OUT CHECK HEADS
4749
4750  085C 3A0F00               LDA     DEVCTL          ;GET THE CURRENT VALUE OF CONTROL PORT
4751  085F E6EF                 ANI     OFFH-DFMO       ;TURN OFF MOTOR
4752  0861 320F00               STA     DEVCTL
4753  0864 D37F                 OUT     DPDC
4754
```

```
4755  0866 23        CLK3:   INX     H               ;POINT TO THE HEAD DELAY
4756  0867 7E                MOV     A,M
4757  0868 B7                ORA     A               ;IF ALREADY ZERO
4758  0869 CA7A08            JZ      CLK4            ;  THEN DON'T DECREMENT
4759
4760  086C 35                DCR     M               ;DECREMENT TIMER
4761  086D C27A08            JNZ     CLK4            ;  IF IT HAS NOT TIMED OUT THEN SKIP
4762
4763  0870 3A0F00            LDA     DEVCTL          ;DESELECT THE DRIVE
4764  0873 E6F1              ANI     0FFH-U0-U1-U2
4765  0875 320F00            STA     DEVCTL
4766  0878 D37F              OUT     DPDC
4767                         ENDIF
4768
4769                   CLK4:
4770                         IF      H37T
4771                         LXI     H,DLYM037       ;POINTER TO MOTOR DELAY TIME FOR H37
4772                         MOV     A,M
4773                         ORA     A               ;IF ALREADY ZERO
4774                         JZ      CLKRET          ;  THEN DON'T DECREMENT
4775
4776                         DCR     M               ;DECREMENT TIMER
4777                         JNZ     CLK5            ;  IF IT HAS NOT TIMED OUT CHECK HEADS
4778
4779                         LDA     H37CTL          ;GET THE CURRENT VALUE OF CONTROL PORT
4780                         ANI     0FFH-CONMO      ;TURN OFF MOTOR
4781                         STA     H37CTL
4782                         OUT     FD$CON
4783
4784                   CLK5: INX     H               ;POINT TO THE HEAD DELAY FOR H37
4785                         MOV     A,M
4786                         ORA     A               ;IF ALREADY ZERO
4787                         JZ      CLKRET          ;  THEN DON'T DECREMENT
4788
4789                         DCR     M               ;DECREMENT TIMER
4790                         JNZ     CLKRET          ;  IF IT HAS NOT TIMED OUT THEN SKIP
4791
4792                         LDA     H37CTL          ;DESELECT THE DRIVE
4793                         ANI     0FFH-CONDS0-CONDS1-CONDS2-CONDS3
4794                         STA     H37CTL
4795                         OUT     FD$CON
4796                         ENDIF
4797
4798  087A 3A0B00      CLKRET: LDA     TICCNT
4799  087D 1F                  RAR                     ;IS IT EVEN, MAKING 4MS BIG TICKS
4800  087E DA8A08              JC      CLKR2
4801  0881 212D08              LXI     H,DLYW          ;CHECK WAIT TIMER
4802  0884 7E                  MOV     A,M             ;  AND DECREMENT IT IF IT IS NOT
4803  0885 B7                  ORA     A               ;  ALREADY ZERO
4804  0886 CA8A08              JZ      CLKR2
4805  0889 35                  DCR     M
4806  088A F1          CLKR2:  POP     PSW             ;RESTORE THE MACHINE STATE
4807  088B 2AB610              LHLD    RETSAV
4808  088E E5                  PUSH    H
4809  088F 2AB410              LHLD    HSAV
4810  0892 FB                  EI
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4811  0893 C9            RET
4812
4813                     PAGE
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```
4814
4815                    ;
4816                    ;  CHKLAB -- CHECK CHECKSUM OF LABEL
4817                    ;
4818                    ;    ENTRY:  'HSTBUF' CONTAINS SECTOR WITH LABEL
4819                    ;    EXIT:   PSW/Z = 0 IF BAD CHECKSUM
4820                    ;                  = 1 IF GOOD CHECKSUM
4821                    ;    USES:   A,F,B,H,L
4822                    ;
4823
4824                    CHKLAB:
4825  0894 AF                   XRA     A               ;ZERO ACCUM
4826  0895 0619                 MVI     B,LABLEN        ;GET LENGTH OF LABEL
4827  0897 21360D               LXI     H,HSTBUF+LABEL
4828
4829                    CHKLAB1:
4830  089A 86                   ADD     M               ;ADD VALUES
4831  089B 23                   INX     H
4832  089C 05                   DCR     B
4833  089D C29A08               JNZ     CHKLAB1
4834
4835  08A0 3C                   INR     A               ;INR CHECKSUM VALUE AND SET/RESET PSW/Z
4836
4837  08A1 C9                   RET
4838
4839                    ;
4840                    ; CPHLDE - COMPARE (HL) TO (DE)
4841                    ;    USES A,F
4842                    ;
4843
4844                    CPHLDE:
4845  08A2 7C                   MOV     A,H
4846  08A3 BA                   CMP     D
4847  08A4 C0                   RNZ
4848  08A5 7D                   MOV     A,L
4849  08A6 BB                   CMP     E
4850  08A7 C9                   RET
4851                    ;
4852                    ; DADA -  ADD 0,A  TO HL
4853                    ;       USES AF
4854
4855  08A8 85           DADA:   ADD     L
4856  08A9 6F                   MOV     L,A
4857  08AA D0                   RNC
4858  08AB 24                   INR     H
4859  08AC C9                   RET
4860                    ;
4861                    ;  GETDPE -- GET ADDRESS OF DPE
4862                    ;
4863                    ;    ENTRY:  (A) = LOGICAL/MAPPED DRIVE #
4864                    ;    EXIT:   (HL) = ADDRESS OF DPE
4865                    ;    USES:   A,F,D,E,H,L
4866                    ;
4867
4868                    GETDPE:
4869  08AD E60F                 ANI     0FH             ;GET MAPPED DRIVE #
```

```
4870  08AF 6F            MOV   L,A          ;FIND DPE ADDR
4871
4872  08B0 2600          MVI   H,0
4873  08B2 54            MOV   D,H
4874  08B3 5D            MOV   E,L
4875  08B4 29            DAD   H            ;*2
4876  08B5 19            DAD   D            ;*3
4877  08B6 29            DAD   H            ;*6
4878  08B7 29            DAD   H            ;*12
4879  08B8 29            DAD   H            ;*24
4880                     IF    DPEL-24
4881                %:   DPEL NE 24
4882                     ENDIF
4883
4884  08B9 115200        LXI   D,DPBASE
4885  08BC 19            DAD   D
4886
4887  08BD C9            RET
4888
4889                ;
4890                ;  GETDPEX -- GET ADDR OF DPE'S HEATH EXTENSIONS
4891                ;
4892                ;    ENTRY:  (A) = LOGICAL/MAPPED DRIVE #
4893                ;    EXIT:   (HL) = ADDR OF HEATH EXTENSIONS
4894                ;    USES:  A,F,D,E,H,L
4895                ;
4896
4897                GETDPEX:
4898  08BE CDAD08       CALL    GETDPE          ;GET ADDR OF DPE
4899
4900  08C1 111000       LXI     D,DPEHTH        ;GET ADDR OF HEATH EXTENSIONS
4901  08C4 19           DAD     D
4902
4903  08C5 C9           RET
4904
4905                ;
4906                ; HLIHL - LOAD HL INDIRECT THROUGH HL
4907                ;       USES AF
4908
4909  08C6 7E       HLIHL:  MOV     A,M
4910  08C7 23               INX     H
4911  08C8 66               MOV     H,M
4912  08C9 6F               MOV     L,A
4913  08CA C9               RET
4914
4915                ;
4916                ;  MOVEITX -- MOVE DATA FROM ONE AREA OF MEMORY TO ANOTHER
4917                ;
4918                ;    ENTRY:    (C) = COUNT
4919                ;              (DE) = SOURCE
4920                ;              (HL) = DESTINATION
4921                ;    USES:     ALL
4922                ;
4923
4924                MOVEITX:
4925  08CB EB           XCHG                    ;(HL)=SOURCE  (DE)=DESTINATION
```

```
4926
4927                            IF      $-MOVEIT
4928                    %:      MOVEIT MUST IMMEDIATELY FOLLOW MOVEITX
4929                            ENDIF
4930
4931                    ;
4932                    ;  MOVEIT -- MOVE DATA FROM ONE AREA OF MEMORY TO ANOTHER
4933                    ;
4934                    ;     ENTRY:    (C) = COUNT
4935                    ;               (DE) = DESTINATION
4936                    ;               (HL) = SOURCE
4937                    ;     USES:     ALL
4938                    ;
4939
4940  08CC 3E81         MOVEIT: MVI     A,81H
4941  08CE C680                 ADI     80H
4942  08D0 E2D808               JPO     MOVEIT1         ;BR IF RUNNING ON 8080
4943
4944  08D3 0600                 MVI     B,0
4945  08D5 EDB0                 DB      0EDH,0B0H       ;USE Z80 BLOCK MOVE INSTRUCTION
4946  08D7 C9                   RET
4947
4948                    MOVEIT1:
4949  08D8 7E                   MOV     A,M             ;MOVE DATA USING 8080 CODE
4950  08D9 12                   STAX    D
4951  08DA 23                   INX     H
4952  08DB 13                   INX     D
4953  08DC 0D                   DCR     C
4954  08DD C2D808               JNZ     MOVEIT1
4955  08E0 C9                   RET
4956
4957                            PAGE
```

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4958
4959                    ;***********************************************
4960                    ;
4961                    ;       LOGICAL DEVICE ROUTINES
4962                    ;
4963                    ;       THESE ROUTINES HANDLE THE LOGICAL TO PHYSICAL
4964                    ;       DEVICE MAPPING ESTABLISHED BY THE CP/M IOBYTE
4965                    ;
4966
4967                    ;
4968                    ; CONSOLE STATUS
4969                    ;
4970
4971  08E1 CDE908       CONST:  CALL    CONS            ;GET STATUS OF SPECIFIC DEVICE
4972  08E4 B7                   ORA     A
4973  08E5 C8                   RZ                      ;IF NOT READY RETURN 0 IN A
4974  08E6 3EFF                 MVI     A,0FFH          ; ELSE RETURN FF
4975  08E8 C9                   RET
4976                    ;
4977  08E9 3A0300       CONS:   LDA     IOBYTE          ;USE BITS 1-0 FOR CONSOLE DEVICE
4978  08EC CD6209               CALL    INDXIT
4979  08EF 820A                 DW      TTYSTAT
4980  08F1 6E09                 DW      CRTSTAT
4981  08F3 F708                 DW      RDRST           ;2: BATCH MODE (USE READER DEVICE)
4982  08F5 6E09                 DW      CRTSTAT
4983                    ;
4984                    ; READER STATUS
4985
4986  08F7 3A0300       RDRST:  LDA     IOBYTE
4987  08FA 0F                   RRC
4988  08FB CD6309               CALL    GOTOIT
4989  08FE 820A                 DW      TTYSTAT
4990  0900 1C0C                 DW      BUSY            ;UNIMPLEMENTED INPUTS
4991  0902 FC0A                 DW      MDSTAT
4992  0904 6E09                 DW      CRTSTAT
4993                    ;
4994                    ; CONSOLE INPUT
4995                    ;
4996  0906 3A0300       CONIN:  LDA     IOBYTE
4997  0909 CD6209               CALL    INDXIT
4998  090C 680A                 DW      TTYIN           ;0: TTY
4999  090E 9609                 DW      CRTIN           ;1: CRT
5000  0910 5309                 DW      READER          ;2: BAT (READER INPUT)
5001  0912 9609                 DW      CRTIN           ;UC1: CRT INPUT, LST: OUTPUT
5002                    ;
5003                    ; CONSOLE OUT
5004                    ;
5005  0914 3A0300       CONOUT: LDA     IOBYTE
5006  0917 CD6209               CALL    INDXIT
5007  091A 930A                 DW      TTYOUT          ;0: TTY
5008  091C 480A                 DW      CRTOUT          ;1: CRT
5009  091E 3209                 DW      LIST            ;2: BAT (OUTPUT TO LST)
5010  0920 3209                 DW      LIST            ;UC1: CRT INPUT, LST: OUTPUT
5011                    ;
5012                    ; LISTST - LIST STATUS CHECK
5013                    ;
```

```
5014
5015  0922 3A0300    LISTST: LDA     IOBYTE          ;GET THE CURRENT IOBYTE
5016  0925 07                RLC                     ;SHIFT INTO POSITION
5017  0926 07                RLC
5018  0927 CD6209            CALL    INDXIT
5019  092A 250B              DW      TTYOS           ;0: TTY
5020  092C 3C0B              DW      CRTOS           ;1: CRT
5021  092E 760B              DW      LPTOS           ;2: LPT
5022  0930 E40B              DW      DBDOS           ;3: DIABLO
5023
5024                   ;
5025                   ; LIST OUT
5026                   ;
5027
5028  0932 3A0300    LIST:   LDA     IOBYTE
5029  0935 07                RLC                     ;BITS 7-6 TO 2-1
5030  0936 07                RLC
5031  0937 CD6209            CALL    INDXIT
5032  093A 930A              DW      TTYOUT          ;0: TTY
5033  093C 480A              DW      CRTOUT          ;1: CRT
5034  093E A50A              DW      LPTOUT          ;2: LPT
5035  0940 CD0A              DW      DBD             ;3: DIABLO
5036                   ;
5037                   ; PUNCH OUT
5038                   ;
5039
5040  0942 3A0300    PUNCH:  LDA     IOBYTE          ;BITS 4-5 TO 1-2
5041  0945 0F                RRC
5042  0946 0F                RRC
5043  0947 0F                RRC
5044  0948 CD6309            CALL    GOTOIT
5045  094B 930A              DW      TTYOUT          ;0: TTY
5046  094D 200C              DW      DMYOUT
5047  094F 0A0B              DW      MDOUT           ;2: UP1 MODEM PORT OUTPUT
5048  0951 480A              DW      CRTOUT
5049                   ;
5050                   ; READER IN
5051                   ;
5052
5053  0953 3A0300    READER: LDA     IOBYTE          ;BITS 3-2 TO 2-1
5054  0956 0F                RRC
5055  0957 CD6309            CALL    GOTOIT
5056  095A 680A              DW      TTYIN           ;0: TTY
5057  095C 1E0C              DW      DMYIN
5058  095E EE0A              DW      MDIN            ;2: UR1 MODEM PORT INPUT
5059  0960 9609              DW      CRTIN
5060                   ;
5061                   ; DISPATCH SUBROUTINE - INDEXED TABLE JUMP
5062                   ;
5063  0962 07        INDXIT: RLC
5064  0963 E606      GOTOIT: ANI     06H             ;MASK BITS
5065  0965 E3                XTHL                    ;SAVE HL, GET TABLE ADDRESS
5066  0966 CDA808            CALL    DADA            ;ADD 0,A TO HL
5067  0969 CDC608            CALL    HLIHL           ;GET ADDRESS IN HL
5068  096C E3                XTHL                    ;XCHG ROUTINE ADDRESS, OLD HL
5069  096D C9                RET                     ;DISPATCH
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5070
5071                    PAGE
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5072
5073                    ;*******************************************************
5074                    ;
5075                    ;       PHYSICAL DEVICE ROUTINES
5076                    ;
5077                    ; ACCESSED VIA THE LOGICAL DEVICE ROUTINES ABOVE
5078                    ;
5079
5080                    ;
5081                    ;"CRT" PHYSICAL STATUS ROUTINE
5082                    ;       USES H84PT1
5083
5084                    CRTSTAT:
5085                            IF      NOT INTINP
5086                            LDA     MODE            ;GET THE MODE BYTE
5087                            RAR                     ;IF THE LSB = 1
5088                            JC      CRTS1           ;  THEN CONSOLE ON H8-5
5089                            IF      MODEB0-1
5090                    %:      MODEBO NE 1
5091                            ENDIF
5092
5093                            LXI     H,H84PT1        ;POINTER TO BASE PORT
5094                            JMP     US              ;GET STATUS
5095
5096                    CRTS1:  IN      H85CRT+1        ;GET 8251 STATUS REGISTER
5097                            ANI     02H             ;MASK RXRDY
5098                            RET
5099                            ENDIF
5100
5101                            IF      INTINP
5102    096E 3A070D             LDA     CRTB            ;FIND OUT HOW MANY CHARACTERS ARE IN THE BUFFER
5103    0971 B7                 ORA     A
5104    0972 C0                 RNZ                     ;RET IF CHARACTER AVAILABLE
5105
5106                    ;  INSURE INTERRUPTS FOR CRT INPUT ARE ENABLED.
5107                    ;  A USER PROGRAM MAY HAVE TURN THEM OFF.
5108    0973 3A3600     CRTS2:  LDA     MODE            ;Q. CRT ON H8-5 CARD
5109    0976 1F                 RAR
5110    0977 D28809             JNC     CRTS2A          ; BR IF NOT
5111                            IF      MODEB0-1
5112                    %:      MODEBO NE 1
5113                            ENDIF
5114
5115    097A DBFB               IN      H85CRT+1        ;IF TRANSMITTER IS EMPTY, THEN INSURE
5116    097C E604               ANI     04H             ; INTERRUPTS ARE ENABLED.  MUST WAIT FOR
5117    097E CA9309             JZ      CRTS3           ;  TXE SO I DON'T LOSE OUTPUT
5118    0981 3E17               MVI     A,17H           ;ENABLE RX & TX PLUS INTERRUPTS
5119    0983 D3FB               OUT     H85CRT+1
5120    0985 C39309             JMP     CRTS3
5121
5122    0988 3A3800     CRTS2A: LDA     H84PT1          ;ENABLE RECEIVER INTERRUPTS ON 8250
5123    098B 3C                 INR     A
5124    098C 329209             STA     CRTS2B
5125    098F 3E01               MVI     A,1
5126    0991 D300               OUT     0
5127    0992 =          CRTS2B  EQU     $-1
```

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5128
5129  0993 FB          CRTS3:  EI                      ;INSURE MASTER ENABLE
5130
5131  0994 AF                  XRA     A              ;INDICATE NO CHARACTER AVAILABLE
5132  0995 C9                  RET
5133                           ENDIF
5134
5135                   ;
5136                   ;"CRT" PHYSICAL INPUT ROUTINE
5137                   ;
5138
5139                   CRTIN:
5140                           IF      NOT INTINP
5141                           LDA     MODE           ;GET MODE BYTE
5142                           RAR                    ;IF LSB = 1
5143                           JC      CRTI1          ;  THEN CONSOLE ON H8-5
5144                           IF      MODEBO-1
5145                   %:      MODEBO NE 1
5146                           ENDIF
5147
5148                           LXI     H,H84PT1
5149                           CALL    UI             ;GET CHAR FROM 8250
5150                           ANI     7FH            ;MASK PARITY
5151                           RET
5152
5153                   CRTI1:  IN      H85CRT+1       ;CHECK IF RXRDY
5154                           ANI     02H
5155                           JZ      CRTI1          ;WAIT FOR CHARACTER
5156
5157                           IN      H85CRT         ;GET CHARACTER
5158                           ANI     7FH            ;MASK PARITY
5159                           RET
5160                           ENDIF
5161
5162                           IF      INTINP
5163  0996 CD6E09      CRTIN1: CALL    CRTSTAT        ;CHECK IF CHARACTER AVAILABLE
5164  0999 CA9609              JZ      CRTIN1         ;BR IF NO CHARACTER AVAILABLE
5165
5166  099C F3                  DI                     ;A CHARACTER IS AVAILABLE -- DON'T
5167                                                  ; LET ANYONE BOTHER ME WHILST I GET IT
5168  099D 21070D              LXI     H,CRTB         ;POINTER TO NUMBER OF CHARS IN BUFFER
5169  09A0 35                  DCR     M              ;MARK ONE TAKEN
5170  09A1 2A080D              LHLD    CRTGET         ;GET THE POINTER TO THE CHAR
5171  09A4 4E                  MOV     C,M            ;PUT THE CHAR IN C
5172  09A5 23                  INX     H              ;ADVANCE THE POINTER
5173  09A6 7D                  MOV     A,L            ;CHECK THAT IT WASN'T ADVANCED PAST END
5174  09A7 FEE2                CPI     CRTBND MOD 256
5175  09A9 C2AF09              JNZ     CRTIN2
5176  09AC 21BA10              LXI     H,CRTBUF
5177  09AF 22080D      CRTIN2: SHLD    CRTGET
5178  09B2 FB                  EI                     ;ALLOW ME TO BE BOTHERED
5179  09B3 79                  MOV     A,C            ;PUT THE CHARACTER IN A (TOO)
5180  09B4 C9                  RET
5181
5182                   ; CRT INTERRUPT SERVICE ROUTINE
5183
```

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5184  09B5 22B410  CRTISR: SHLD   HSAV          ;SAVE THE PROCESSOR STATE
5185  09B8 E1              POP    H             ;GET RETURN ADDRESS
5186  09B9 22B610          SHLD   RETSAV
5187  09BC F5              PUSH   PSW
5188  09BD 210000          LXI    H,0           ;SAVE THE OLD SP
5189  09C0 39              DAD    SP
5190  09C1 22B810          SHLD   OLDSP
5191  09C4 31F210          LXI    SP,LCLSTK     ;SET UP OUR VERY OWN STACK
5192  09C7 213800          LXI    H,H84PT1      ;POINTER TO SERIAL DEVICE STRUCTURE
5193  09CA 3E02            MVI    A,2           ;INPUT INTERRUPT IDENTIFICATION REG
5194  09CC CD410A          CALL   IPINX
5195  09CF FE04            CPI    0100B         ;CHECK FOR RECEIVED DATA AVAILABLE INT
5196  09D1 C2390A          JNZ    CRTIS6        ;IT WASN'T THIS 8250
5197
5198                       IF     BRKKEY
5199                       MVI    A,5           ;CHECK FOR BREAK
5200                       CALL   IPINX
5201                       ANI    10H
5202                       JNZ    CRTIS8
5203                       ENDIF
5204
5205  09D4 CD400A          CALL   IUI1          ;GET THE CHARACTER
5206
5207               CRTIS1:
5208  09D7 E67F            ANI    7FH           ;MASK PARITY BIT
5209  09D9 F5              PUSH   PSW           ;SAVE THE CHARACTER
5210  09DA 3A070D          LDA    CRTB          ;GETTING NEAR THE END OF THE BUFFER?
5211  09DD FE24            CPI    CRTLEN-4
5212  09DF DA110A          JC     CRTIS2        ;NOT YET
5213
5214  09E2 3A3600          LDA    MODE          ;WARN HIM BY SENDING BELL
5215  09E5 1F              RAR
5216                       IF     MODEBO-1
5217               %:      MODEBO NE 1
5218                       ENDIF
5219  09E6 D2F409          JNC    CRTIS1B       ; BR IF NOT H8-5
5220               CRTIS1A:
5221  09E9 DBFB            IN     H85CRT+1      ; WAIT FOR H8-5 TRANSMITTER READY
5222  09EB 1F              RAR
5223  09EC D2E909          JNC    CRTIS1A
5224  09EF 3EFA            MVI    A,H85CRT      ; SET OUTPUT DATA PORT ADDRESS
5225  09F1 C3020A          JMP    CRTIS1C
5226               CRTIS1B:
5227  09F4 3E05            MVI    A,5           ; WAIT FOR 8250 TRANSMITTER READY
5228  09F6 213800          LXI    H,H84PT1
5229  09F9 CD410A          CALL   IPINX
5230  09FC E620            ANI    20H
5231  09FE CAF409          JZ     CRTIS1B
5232  0A01 7E              MOV    A,M           ; SET OUTPUT DATA PORT ADDRESS
5233               CRTIS1C:
5234  0A02 32080A          STA    CRTIS1D       ; MODIFY OUT INSTRUCTION WITH DATA PORT ADDR
5235  0A05 3E07            MVI    A,BELL
5236  0A07 D300            OUT    0             ; SEND BELL CHARACTER
5237  0A08 =       CRTIS1D EQU    $-1
5238
5239  0A09 3A070D          LDA    CRTB          ;CAN WE ACCEPT THIS CHARACTER
```

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5240  0A0C FE28            CPI   CRTLEN
5241  0A0E CA350A          JZ    CRTIS5
5242
5243  0A11 F1      CRTIS2: POP   PSW           ;RECALL THE CHARACTER
5244  0A12 2A0A0D          LHLD  CRTPUT         ;THE BUFFER PUT POINTER
5245  0A15 77              MOV   M,A           ;PUT THE CHARACTER IN THE BUFFER
5246  0A16 23              INX   H             ;ADVANCE THE POINTER
5247  0A17 7D              MOV   A,L           ;CHECK FOR WRAP-AROUND
5248  0A18 FEE2            CPI   CRTBND MOD 256
5249  0A1A C2200A          JNZ   CRTIS3
5250  0A1D 21BA10          LXI   H,CRTBUF
5251  0A20 220A0D  CRTIS3: SHLD  CRTPUT
5252  0A23 21070D          LXI   H,CRTB
5253  0A26 34              INR   M             ;ANOTHER CHARACTER IS AVAILABLE
5254
5255  0A27 2AB810  CRTIS4: LHLD  OLDSP         ;RESTORE THE OLD STACK
5256  0A2A F9              SPHL
5257  0A2B F1              POP   PSW           ;RESTORE THE MACHINE STATE
5258  0A2C 2AB610          LHLD  RETSAV
5259  0A2F E5              PUSH  H
5260  0A30 2AB410          LHLD  HSAV
5261  0A33 FB              EI                  ;ENABLE MORE INTERRUPTS
5262  0A34 C9              RET                 ;AND RETURN
5263  0A35 F1      CRTIS5: POP   PSW           ;CLEAN STACK
5264  0A36 C3270A          JMP   CRTIS4
5265
5266  0A39 DBFB    CRTIS6: IN    H85CRT+1      ;GET STATUS
5267                       IF    BRKKEY
5268                       ANI   20H           ;HAD AN OVERRUN?
5269                       JNZ   CRTI11        ;  YES, BREAKOUT
5270                       ENDIF
5271
5272  0A3B DBFA            IN    H85CRT        ;IF THE CRT 8250 DIDN'T DO IT, THE 8251 DID
5273  0A3D C3D709          JMP   CRTIS1
5274
5275                       IF    BRKKEY
5276                 CRTIS8: CALL  IUI1          ;GET THE GARBAGE
5277                       LXI   D,6000        ;WAIT FOR THE DUST TO SETTLE
5278                 CRTIS9: MVI   A,5
5279                       CALL  IPINX
5280                       ANI   9
5281                       JNZ   CRTIS8
5282                       DCX   D
5283                       MOV   A,D
5284                       ORA   E
5285                       JNZ   CRTIS9
5286                       CALL  IUI1          ;MAKE SURE THERE IS NO GARBAGE PRESENT
5287
5288                 CRTI10: LXI   H,CRTBUF
5289                       SHLD  CRTGET
5290                       SHLD  CRTPUT
5291                       XRA   A
5292                       STA   CRTB
5293                       IF    H17T
5294                       CALL  RESH17
5295                       ENDIF
```

```
                            IF      H37T
                            CALL    RESH37
                            ENDIF
                            IF      H47T
                            CALL    RESH47
                            ENDIF
                            IF      H67T
                            CALL    RESH67
                            ENDIF
                            CALL    FLUSH1          ;FLUSH (ABORT) HOST BUFFER
                            EI
                            JMP     BOOT

                    CRTI11: IN      H85CRT
                            MVI     A,17H
                            OUT     H85CRT+1

                            LXI     D,6000
                    CRTI12: IN      H85CRT+1
                            ANI     22H
                            JNZ     CRTI11
                            DCX     D
                            MOV     A,D
                            ORA     E
                            JNZ     CRTI12

                            IN      H85CRT
                            JMP     CRTI10
                            ENDIF

                    ; IUI1 - INPUT FROM UART AT INTERRUPT TIME

0A40 AF             IUI1:   XRA     A
                    ;       JMP     IPINX

                    ;
                    ; IPIN - INPUT BYTE FROM PORT IN (A) AT INTERRUPT TIME
                    ;

0A41 86             IPINX:  ADD     M
0A42 32460A         IPIN:   STA     IPIN1+1
0A45 DB00           IPIN1:  IN      00H             ;SELF-MODIFYING CODE
0A47 C9                     RET

                            ENDIF
                    ;
                    ;"CRT" PHYSICAL OUTPUT ROUTINES
                    ;

0A48 CD3C0B         CRTOUT: CALL    CRTOS
0A4B B7                     ORA     A
0A4C CA480A                 JZ      CRTOUT

0A4F 3A3600                 LDA     MODE            ;GET MODE BYTE
0A52 1F                     RAR                     ;IF LSB = 1
0A53 DA590A                 JC      CRTO1           ;  THEN CONSOLE ON H8-5
```

```
5352                            IF      MODEB0-1
5353                    %:      MODEB0 NE 1
5354                            ENDIF
5355
5356    0A56 C3310C             JMP     UO              ;OUTPUT CHARACTER IN C
5357
5358    0A59 E5         CRTO1:  PUSH    H
5359    0A5A 23                 INX     H
5360    0A5B 23                 INX     H               ;POINT TO FLAG BYTE
5361    0A5C 7E                 MOV     A,M
5362    0A5D 17                 RAL
5363    0A5E E1                 POP     H
5364    0A5F 79                 MOV     A,C
5365    0A60 DC920C             CC      MUC             ;MAP TO UPPER CASE
5366    0A63 D3FA               OUT     H85CRT
5367
5368    0A65 C3410C             JMP     POUT2           ;CHECK FOR NULLS
5369
5370                    ;
5371                    ; TTY INPUT
5372                    ;
5373
5374    0A68 213B00     TTYIN:  LXI     H,H84PT2
5375    0A6B 3A3700             LDA     MODE2           ;CHECK FOR H89-11
5376    0A6E E601               ANI     MODE2B0
5377    0A70 C2790A             JNZ     TTYIN1          ; BR IF H89-11
5378    0A73 CD520C             CALL    UI
5379    0A76 C37F0A             JMP     TTYIN2
5380    0A79 214400     TTYIN1: LXI     H,H11PT2
5381    0A7C CD700C             CALL    EPI
5382    0A7F E67F       TTYIN2: ANI     07FH
5383    0A81 C9                 RET
5384                    ;
5385                    ; TTY STATUS
5386                    ;
5387
5388    0A82 213B00     TTYSTAT:LXI     H,H84PT2
5389    0A85 3A3700             LDA     MODE2           ;CHECK FOR H89-11
5390    0A88 E601               ANI     MODE2B0
5391    0A8A CA210C             JZ      US              ; BR IF NOT
5392    0A8D 214400             LXI     H,H11PT2
5393    0A90 C3600C             JMP     EPS
5394
5395                    ;
5396                    ; TTY OUTPUT
5397                    ;
5398
5399    0A93 CD250B     TTYOUT: CALL    TTYOS
5400    0A96 B7                 ORA     A
5401    0A97 CA930A             JZ      TTYOUT
5402    0A9A 3A3700             LDA     MODE2           ;CHECK FOR H89-11
5403    0A9D E601               ANI     MODE2B0
5404    0A9F C27B0C             JNZ     EPO             ; BR IF H89-11
5405    0AA2 C3310C             JMP     UO
5406
5407                    ;
```

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5408                    ; LINE PRINTER OUT
5409                    ;
5410
5411  0AA5 3A010D  LPTOUT:  LDA     DCLPOS          ;IF DON'T CHECK LP OUTPUT STATUS
5412  0AA8 B7               ORA     A
5413  0AA9 C2B30A           JNZ     LPTOU2          ;  THEN SKIP THE TEST
5414
5415  0AAC CD760B  LPTOU1:  CALL    LPTOS           ;  ELSE, WAIT FOR READY LP OUTPUT STATUS
5416  0AAF B7               ORA     A
5417  0AB0 CAAC0A           JZ      LPTOU1
5418
5419  0AB3 213E00  LPTOU2:  LXI     H,H84PT3        ;POINTER TO DEVICE STRUCTURE
5420  0AB6 11040D           LXI     D,LPTCTS        ;AND ONE TO CHAR TO SEND
5421
5422  0AB9 AF               XRA     A               ;FORCE A CHECK OF LP OUTPUT STATUS
5423  0ABA 32010D           STA     DCLPOS          ;  NEXT TIME
5424
5425  0ABD 3A3700           LDA     MODE2           ;CHECK FOR H89-11 PARALLEL
5426  0AC0 E603             ANI     MODE2B1+MODE2B0
5427  0AC2 FE03             CPI     MODE2B1+MODE2B0
5428  0AC4 C2310C           JNZ     UO              ; BR IF NOT
5429  0AC7 214700           LXI     H,H11PT3        ;POINTER TO DEVICE STRUCTURE FOR PARALLEL
5430  0ACA C37F0C           JMP     PPO
5431
5432                    ;
5433                    ; DIABLO ETX/ACK PROTOCOL DRIVER
5434                    ;
5435
5436  0ACD CDE40B  DBD:     CALL    DBDOS
5437  0AD0 B7               ORA     A
5438  0AD1 CACD0A           JZ      DBD
5439  0AD4 CD310C           CALL    UO              ;SEND CHARACTER IN C TO PRINTER
5440
5441  0AD7 21ED0A           LXI     H,HSCNT         ;UPDATE HANDSHAKE COUNT
5442  0ADA 35               DCR     M
5443  0ADB FE1B             CPI     01BH            ;ESC?
5444  0ADD 7E               MOV     A,M
5445  0ADE C2E70A           JNZ     DBD1            ;WAS NOT AN ESCAPE
5446  0AE1 FE02             CPI     2               ;LAST CHAR WAS ESCAPE,
5447  0AE3 D0               RNC                     ;  MAKE CERTAIN AT LEAST TWO CHARS FOLLOW
5448  0AE4 3602             MVI     M,2             ;  WITHOUT INTERVENING ETX
5449  0AE6 C9               RET
5450  0AE7 B7       DBD1:   ORA     A               ;TIME TO HANDSHAKE?
5451  0AE8 C0               RNZ
5452  0AE9 3E01             MVI     A,1             ;TELL DBDOS IT IS TIME TO HANDSHAKE
5453  0AEB 12               STAX    D
5454  0AEC C9               RET
5455
5456  0AED 20       HSCNT:  DB      32
5457
5458                    ;
5459                    ; MDIN = MODEM INPUT ROUTINE
5460                    ;
5461
5462  0AEE 214100   MDIN:   LXI     H,H84PT4
5463  0AF1 3A3700           LDA     MODE2           ;CHECK FOR H89-11
```

```
5464  0AF4 E601            ANI     MODE2BO
5465  0AF6 C21E0C          JNZ     DMYIN           ; BR IF H89-11
5466  0AF9 C3520C          JMP     UI
5467
5468                ;
5469                ; MDSTAT - MODEM INPUT STATUS
5470                ;
5471
5472  0AFC 214100   MDSTAT: LXI     H,H84PT4
5473  0AFF 3A3700           LDA     MODE2           ;CHECK FOR H89-11
5474  0B02 E601             ANI     MODE2BO
5475  0B04 C21C0C           JNZ     BUSY            ; BR IF H89-11
5476  0B07 C3210C           JMP     US
5477
5478                ;
5479                ; MDOUT - MODEM OUTPUT
5480                ;
5481
5482  0B0A 3A3700   MDOUT:  LDA     MODE2           ;CHECK FOR H89-11
5483  0B0D E601             ANI     MODE2BO
5484  0B0F C2200C           JNZ     DMYOUT          ; BR IF H89-11
5485  0B12 CD1C0B   MDOUT1: CALL    MDOS
5486  0B15 B7               ORA     A
5487  0B16 CA120B           JZ      MDOUT1
5488  0B19 C3310C           JMP     UO
5489
5490                ;
5491                ; MDOS, TTYOS, AND CRTOS - MODEM, TTY, AND CRT OUTPUT STATUS
5492                ;       RETURNS 00 FOR BUSY
5493                ;               FF FOR READY TO ACCEPT ANOTHER CHARACTER
5494
5495  0B1C 214100   MDOS:   LXI     H,H84PT4
5496  0B1F 11050D           LXI     D,MDCTS
5497  0B22 C3490B           JMP     CRTOS1
5498
5499  0B25 213B00   TTYOS:  LXI     H,H84PT2
5500  0B28 11020D           LXI     D,TTYCTS
5501  0B2B 3A3700           LDA     MODE2           ;CHECK FOR H89-11
5502  0B2E E601             ANI     MODE2BO
5503  0B30 CA490B           JZ      CRTOS1          ; BR IF NOT
5504  0B33 214400           LXI     H,H11PT2
5505  0B36 CD680C           CALL    EPOS
5506  0B39 C34C0B           JMP     CRTOS1A
5507
5508  0B3C 213800   CRTOS:  LXI     H,H84PT1
5509  0B3F 11030D           LXI     D,CRTCTS
5510
5511  0B42 3A3600           LDA     MODE            ;HANDLE H8-5 CASE SPECIALLY
5512  0B45 1F               RAR
5513  0B46 DA610B           JC      CRTOS3
5514
5515  0B49 CD290C   CRTOS1: CALL    UOS     ;CHECK TO SEE IF THE UART CAN TAKE A CHAR
5516                CRTOS1A:
5517  0B4C CA5F0B           JZ      CRTOSB          ;  THEN RETURN FLAGGING BUSY
5518
5519  0B4F 1A               LDAX    D               ;SEE IF THERE ARE ANY NULLS TO BE SENT
```

```
5520  0B50 B7            ORA   A
5521  0B51 C2560B        JNZ   CRTOS2        ;IF SO, GO SEND ONE
5522
5523  0B54 3D            DCR   A             ;ELSE, SET READY
5524  0B55 C9            RET
5525
5526  0B56 3D      CRTOS2: DCR   A           ;COUNT THIS NULL AS SENT
5527  0B57 12            STAX  D
5528  0B58 C5            PUSH  B
5529
5530  0B59 0E00          MVI   C,NULL        ;SEND A NULL
5531  0B5B CD310C        CALL  UO
5532
5533  0B5E C1            POP   B
5534
5535  0B5F AF      CRTOSB: XRA   A           ;RETURN CLAIMING TO BE STILL BUSY
5536  0B60 C9            RET
5537
5538  0B61 DBFB    CRTOS3: IN    H85CRT+1    ;SPECIAL CASE: H8-5 SERIAL CARD
5539  0B63 1F            RAR
5540  0B64 D25F0B        JNC   CRTOSB        ;STILL BUSY
5541
5542  0B67 1A            LDAX  D             ;ANY NULLS STILL TO SEND?
5543  0B68 B7            ORA   A
5544  0B69 C26E0B        JNZ   CRTOS4        ;IF SO, GO SEND ONE
5545
5546  0B6C 3D            DCR   A             ;RETURN READY
5547  0B6D C9            RET
5548
5549  0B6E 3D      CRTOS4: DCR   A           ;COUNT THIS NULL AS SENT
5550  0B6F 12            STAX  D
5551
5552  0B70 3E00          MVI   A,NULL        ;SEND A NULL
5553  0B72 D3FA          OUT   H85CRT
5554
5555  0B74 AF            XRA   A             ;RETURN BUSY
5556  0B75 C9            RET
5557
5558                ;
5559                ; LPTOS - LINE PRINTER OUTPUT STATUS
5560                ;       WITH HARDWARE HANDSHAKE
5561                ;
5562
5563  0B76 11040D  LPTOS: LXI   D,LPTCTS
5564
5565  0B79 3A3700        LDA   MODE2         ;CHECK FOR H89-11 PARALLEL PRINTER
5566  0B7C E603          ANI   MODE2B1+MODE2B0
5567  0B7E FE03          CPI   MODE2B1+MODE2B0
5568  0B80 C29E0B        JNZ   LPTOS3
5569  0B83 214700        LXI   H,H11PT3      ;POINTER TO PARALLEL PRINTER STRUCTURE
5570  0B86 3E02          MVI   A,PPDATC      ;GET PRINTER STATUS
5571  0B88 CD590C        CALL  PINX
5572  0B8B 47            MOV   B,A           ;SAVE IT
5573  0B8C 3A3700        LDA   MODE2         ;GET PRINTER READY POLARITY
5574  0B8F E604          ANI   MODE2B2
5575  0B91 78            MOV   A,B           ;RESTORE STATUS
```

```
5576  0B92 C2960B          JNZ   LPTOS5          ;BR IF PRINTER READY STATUS IS ACTIVE HIGH
5577  0B95 2F              CMA                   ; INVERT PRINTER STATUS IF NOT
5578  0B96 E680    LPTOS5: ANI   PPRDY           ;TEST FOR PRINTER READY
5579  0B98 CAE20B          JZ    LPTOSB          ; BR IF PRINTER NOT READY
5580  0B9B C3BF0B          JMP   LPTOS2          ;  BR IF PRINTER READY
5581
5582  0B9E 213E00  LPTOS3: LXI   H,H84PT3
5583  0BA1 CD290C          CALL  UOS     ;CHECK TO SEE IF THE UART CAN TAKE A CHAR
5584  0BA4 CAE20B          JZ    LPTOSB          ;THE UART IS STILL BUSY
5585
5586                ;       HANDSHAKE USED FOR H14/WH24
5587                ;            IF YOUR PRINTER DOES NOT USE HANDSHAKE TO INDICATE "BUSY"
5588
5589  0BA7 3E06            MVI   A,6             ;INPUT MODEM STATUS REG
5590  0BA9 CD590C          CALL  PINX
5591  0BAC 47              MOV   B,A
5592  0BAD 3A3600          LDA   MODE            ;CHECK FOR POLARITY OF READY SIGNAL
5593  0BB0 E604            ANI   MODEB2
5594  0BB2 C2B80B          JNZ   LPTOSO          ; BR IF READY IS HIGH POLARITY
5595  0BB5 78              MOV   A,B             ;READY IS INDICATED BY LOW POLARITY
5596  0BB6 2F              CMA                   ; THEREFORE, COMPLEMENT STATUS
5597  0BB7 47              MOV   B,A             ;  BEFORE CHECKING
5598  0BB8 3A3500  LPTOSO: LDA   PRTRDY          ;GET LPT PRINTER READY MASK
5599  0BBB A0              ANA   B               ;CHECK APPROPRIATE READY LINE
5600  0BBC CAE20B          JZ    LPTOSB          ; BR IF NOT READY
5601
5602  0BBF 1A      LPTOS2: LDAX  D               ;ANY NULLS TO SEND?
5603  0BC0 B7              ORA   A
5604  0BC1 C2C90B          JNZ   LPTOS1          ;YES, THERE ARE NULLS REQUIRED
5605
5606  0BC4 3D              DCR   A               ;NO, RETURN WITH A = OFFH INDICATING READY
5607  0BC5 32010D          STA   DCLPOS          ;FLAG DON'T CHECK LP STATUS
5608  0BC8 C9              RET
5609
5610  0BC9 3D      LPTOS1: DCR   A               ;COUNT THIS NULL AS SENT
5611  0BCA 12              STAX  D
5612
5613  0BCB C5              PUSH  B               ;SAVE THE ORIGINAL CHARACTER
5614
5615  0BCC 0E00            MVI   C,NULL
5616  0BCE 3A3700          LDA   MODE2           ;CHECK FOR H89-11 PARALLEL PRINTER
5617  0BD1 E603            ANI   MODE2B1+MODE2B0
5618  0BD3 FE03            CPI   MODE2B1+MODE2B0
5619  0BD5 C2DE0B          JNZ   LPTOS4          ; BR IF NOT
5620  0BD8 CD7F0C          CALL  PPO
5621  0BDB C3E10B          JMP   LPTOS4A
5622
5623  0BDE CD310C  LPTOS4: CALL  UO
5624
5625               LPTOS4A:
5626  0BE1 C1              POP   B
5627
5628  0BE2 AF      LPTOSB: XRA   A               ;INDICATE BUSY
5629  0BE3 C9              RET
5630
5631                ;
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5632                    ; DBDOS - DIABLO OUTPUT STATUS
5633                    ;       IF CTS == 0 THEN OKAY TO SEND CHARACTERS
5634                    ;          CTS == 1 THEN SEND ETX, SET CTS TO 2
5635                    ;          CTS == 2 THEN WAIT FOR ACK, THEN SET CTS TO 0
5636
5637  0BE4 213E00       DBDOS:  LXI     H,H84PT3
5638  0BE7 11060D               LXI     D,DBDCTS
5639
5640  0BEA 1A                   LDAX    D               ;FIND OUT THE STATE OF OUTPUT
5641  0BEB FE02                 CPI     2               ;IF NOT 2,
5642  0BED C2060C               JNZ     DBDOS1          ;  THEN GO DO OUTPUT
5643
5644                    ; MUST RECEIVE AN ACK FROM THE PRINTER
5645
5646  0BF0 CD210C               CALL    US              ;CHECK UART FOR INCOMING
5647  0BF3 CA1C0C               JZ      DBDOSB          ;NO CHARACTER BACK FROM PRINTER YET
5648                                                    ;  SO FLAG BUSY
5649  0BF6 CD580C               CALL    UII             ;GET THE CHARACTER
5650  0BF9 E67F                 ANI     07FH            ;STRIP OFF PARITY
5651  0BFB D606                 SUI     'F' MOD 32      ;COMPARE IT TO ACK
5652  0BFD C21C0C               JNZ     DBDOSB          ;NOT AN ACK, SO STILL BUSY
5653  0C00 12                   STAX    D               ;WAS AN ACK, SO ABLE TO SEND MORE CHARS
5654
5655  0C01 3E20                 MVI     A,32            ;RESET THE HANDSHAKE COUNT
5656  0C03 32ED0A               STA     HSCNT
5657
5658  0C06 CD290C       DBDOS1: CALL    UOS     ;CHECK TO SEE IF UART CAN TAKE A CHAR
5659  0C09 CA1C0C               JZ      DBDOSB          ;UART IS NOT READY TO ACCEPT A CHARACTER
5660
5661  0C0C 1A                   LDAX    D               ;IS IT TIME TO SEND ETX?
5662  0C0D B7                   ORA     A
5663  0C0E C2130C               JNZ     DBDOS2          ;YES, GO SEND ETX
5664
5665  0C11 3D                   DCR     A               ;NO, INDICATE READY (A == 0FFH)
5666  0C12 C9                   RET
5667
5668  0C13 3C           DBDOS2: INR     A               ;FLAG THAT THE NEXT THING TO DO IS WAIT FOR ACK
5669  0C14 12                   STAX    D
5670
5671  0C15 C5                   PUSH    B
5672
5673  0C16 0E03                 MVI     C,'C' MOD 32    ;SEND THE ETX
5674  0C18 CD310C               CALL    UO
5675
5676  0C1B C1                   POP     B
5677
5678                    BUSY:
5679  0C1C AF           DBDOSB: XRA     A
5680  0C1D C9                   RET
5681
5682                    ;
5683                    ; DUMMY INPUT AND OUTPUT ROUTINES
5684                    ;
5685
5686  0C1E 3E1A         DMYIN:  MVI     A,'Z'-40H       ;UNIMPLEMENTED INPUTS RETURN CTL-Z
5687  0C20 C9           DMYOUT: RET                     ;DUMMY OUTPUTS DO NOTHING
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5689
5690                    PAGE
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5691
5692                    ;
5693                    ; 8250 I/O ROUTINES
5694                    ;
5695
5696                    ; US - GET UART (INPUT) STATUS
5697
5698  0C21 3E05   US:   MVI   A,5           ;OFFSET TO THE STATUS REGISTER
5699  0C23 CD590C       CALL  PINX
5700  0C26 E601         ANI   1             ;MASK THE DATA AVAILABLE BIT
5701  0C28 C9           RET
5702
5703                    ;  UOS - GET UART (OUTPUT) STATUS
5704
5705  0C29 3E05   UOS:  MVI   A,5           ;OFFSET TO STATUS REG
5706  0C2B CD590C       CALL  PINX
5707  0C2E E620         ANI   20H
5708  0C30 C9           RET
5709
5710                    ; UO - OUTPUT TO UART
5711
5712  0C31 7E     UO:   MOV   A,M
5713                    ;     JMP   POUT
5714
5715                    ;
5716                    ; POUT - OUTPUT BYTE IN C TO PORT IN A
5717                    ;
5718
5719  0C32 32400C POUT: STA   POUT1+1
5720  0C35 E5           PUSH  H
5721  0C36 23           INX   H
5722  0C37 23           INX   H             ;POINT TO FLAG BYTE
5723  0C38 7E           MOV   A,M
5724  0C39 17           RAL
5725  0C3A E1           POP   H
5726  0C3B 79           MOV   A,C
5727  0C3C DC920C       CC    MUC           ;MAP TO UPPER CASE
5728  0C3F D300   POUT1:OUT   00H           ;SELF-MODIFYING CODE
5729  0C41 FE0D   POUT2:CPI   PADCH         ;CHECK IF THIS CHAR NEEDS PADDING (USUALLY CR)
5730  0C43 C0           RNZ                 ;NO
5731
5732  0C44 E5           PUSH  H             ;FIND OUT NUMBER OF NULLS REQUIRED
5733  0C45 23           INX   H
5734  0C46 23           INX   H
5735  0C47 7E           MOV   A,M           ;GET COUNT FROM DATA STRUCTURE
5736  0C48 E1           POP   H
5737  0C49 1F           RAR                 ;SHIFT INTO LEAST SIG 3 BITS
5738  0C4A 1F           RAR
5739  0C4B 1F           RAR
5740  0C4C 1F           RAR
5741  0C4D E607         ANI   07H           ;MASK ONLY COUNT
5742  0C4F C8           RZ                  ;RETURN IF NO NULLS ARE REQUIRED
5743  0C50 12           STAX  D             ;SAVE COUNT OF NULLS TO SEND IN XXXCTS
5744
5745  0C51 C9           RET
5746
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5747
5748                    ; UI - INPUT FROM UART
5749
5750  0C52 CD210C   UI:     CALL    US
5751  0C55 CA520C           JZ      UI
5752  0C58 AF       UI1:    XRA     A
5753                ;       JMP     PINX
5754
5755                    ;
5756                    ; PIN - INPUT BYTE FROM PORT IN A
5757                    ;
5758
5759  0C59 86       PINX:   ADD     M
5760  0C5A 325E0C   PIN:    STA     PIN1+1
5761  0C5D DB00     PIN1:   IN      00H             ;SELF-MODIFYING CODE
5762  0C5F C9               RET
5763
5764
5765
5766
5767
5768                    ;
5769                    ;  2661-3 I/O ROUTINES
5770                    ;
5771
5772                    ;  EPS - GET INPUT STATUS
5773
5774  0C60 3E01     EPS:    MVI     A,EPSTAT
5775  0C62 CD590C           CALL    PINX
5776  0C65 E602             ANI     EPRXR
5777  0C67 C9               RET
5778
5779                    ;  EPOS - GET OUTPUT STATUS
5780
5781  0C68 3E01     EPOS:   MVI     A,EPSTAT
5782  0C6A CD590C           CALL    PINX
5783  0C6D E601             ANI     EPTXR
5784  0C6F C9               RET
5785
5786                    ;  EPI - INPUT DATA
5787
5788  0C70 CD600C   EPI:    CALL    EPS
5789  0C73 CA700C           JZ      EPI
5790  0C76 3E00     EPI1:   MVI     A,EPDATA
5791  0C78 C3590C           JMP     PINX
5792
5793                    ;  EPO - OUTPUT DATA
5794
5795  0C7B 7E       EPO:    MOV     A,M
5796                        IF      EPDATA
5797                %:      EPDATA NE 0
5798                        ENDIF
5799  0C7C C3320C           JMP     POUT
5800
5801
5802
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5803
5804                    ;
5805                    ;  8255 I/O ROUTINES
5806                    ;
5807
5808                    ;  PPO - OUTPUT DATA
5809
5810  0C7F 7E           PPO:    MOV     A,M
5811                            IF      PPDATA
5812                    %:      PPDATA NE 0
5813                            ENDIF
5814  0C80 CD320C               CALL    POUT
5815  0C83 7E                   MOV     A,M
5816  0C84 C603                 ADI     PPCTL
5817  0C86 32900C               STA     PPO1A
5818  0C89 AF                   XRA     A
5819                            IF      PPDS-00000001B
5820                    %:      PPDS NE 00000001B
5821                            ENDIF
5822  0C8A CD8F0C               CALL    PPO1
5823  0C8D 3E01                 MVI     A,PPDS
5824  0C8F D300         PPO1:   OUT     0
5825  0C90 =            PPO1A   EQU     $-1
5826  0C91 C9                   RET
5827
5828
5829
5830
5831
5832                    ;
5833                    ; MUC - MAP CHARACTER IN A TO UPPER CASE
5834                    ;
5835
5836  0C92 FE61         MUC:    CPI     'a'             ;IF LESS THAN LOWER CASE A
5837  0C94 D8                   RC                      ;  THEN ALREADY UPPER CASE
5838  0C95 FE7B                 CPI     'z'+1           ;IF GREATER THAN LOWER CASE Z
5839  0C97 D0                   RNC                     ;  THEN NOT A LOWER CASE LETTER
5840  0C98 D620                 SUI     'a'-'A'         ;CONVERT TO UPPER CASE
5841  0C9A C9                   RET
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5843
5844                            PAGE
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5845
5846                    ; PMSG - PRINT THE MESSAGE AT HL UNTIL NULL
5847                    ;
5848
5849  0C9B 7E   PMSG:   MOV     A,M             ;GET A CHAR
5850  0C9C B7           ORA     A               ;CHECK FOR NULL
5851  0C9D C8           RZ                      ;END OF MESSAGE
5852  0C9E 4F           MOV     C,A             ; ELSE
5853  0C9F E5           PUSH    H               ;SAVE THE POINTER
5854  0CA0 CD1409       CALL    CONOUT          ; PRINT THIS CHARACTER
5855  0CA3 E1           POP     H
5856  0CA4 23           INX     H               ; POINT TO NEXT
5857  0CA5 C39B0C       JMP     PMSG            ;REPEAT
5858
5859                    ;
5860                    ; HOUT - HEX OUTPUT ROUTINE
5861                    ;       TYPE CONTENTS OF A IN HEX ON CONSOLE
5862
5863  0CA8 F5   HOUT:   PUSH    PSW             ;SAVE CONTENTS OF A
5864  0CA9 0F           RRC
5865  0CAA 0F           RRC
5866  0CAB 0F           RRC
5867  0CAC 0F           RRC
5868  0CAD CDB10C       CALL    NIBBLE          ;PUT OUT HIGH ORDER NIBBLE
5869  0CB0 F1           POP     PSW             ;FALL THROUGH TO PUT OUT LOW NIBBLE
5870  0CB1 E60F NIBBLE: ANI     0FH             ;MASK
5871  0CB3 FE0A         CPI     10              ;> 10 ?
5872  0CB5 FABA0C       JM      NIBBL1          ;IF 0-9
5873  0CB8 C607         ADI     7               ;  ELSE CONVERT TO A-F
5874  0CBA C630 NIBBL1: ADI     30H             ;BINARY TO ASCII
5875  0CBC 4F           MOV     C,A             ;TYPE IT ON THE CONSOLE
5876  0CBD C31409       JMP     CONOUT
5877
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5879
5880                    ; BIOS MESSAGES
5881                    ;
5882  0CC0 0D0A         BTMSG:  DB      CR,LF
5883  0CC2 4552524F52           DB      'ERROR DURING WARM BOOT - PRESS ANY KEY',0
5884  0CE9 2052454144   RDMSG:  DB      ' READ',0
5885  0CEF 2057524954   WRMSG:  DB      ' WRITE',0
5886  0CF6 204552524F   ERRMSG: DB      ' ERROR ',0
5887  0CFE 0D0A00       CRLF:   DB      CR,LF,0
5888
5889  0D01 00           DCLPOS: DB      0               ;FORCE A CHECK OF LP OUTPUT STATUS
5890  0D02 00           TTYCTS: DB      0               ;CHRACTERS TO SEND COUNT FOR    TTY
5891  0D03 00           CRTCTS: DB      0               ;                               CRT
5892  0D04 00           LPTCTS: DB      0               ;                               LPT
5893  0D05 00           MDCTS:  DB      0               ;                               MODEM
5894  0D06 00           DBDCTS: DB      0               ;OUTPUT STATE MACHINE FOR       DBD
5895
5896                            IF      INTINP
5897  0D07 00           CRTB:   DB      0               ;NUMBER OF CHARACTERS IN THE CRT BUFFER
5898  0D08 BA10         CRTGET: DW      CRTBUF          ;POINTER TO NEXT CHAR TO BE TAKEN
5899  0D0A BA10         CRTPUT: DW      CRTBUF          ;POINTER TO NEXT POSITION TO STORE CHAR
5900                            ENDIF
5901
5902
5903                            PAGE
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5904
5905                            IF      H17T
5906  0D0C 1400         DPB17S: DW      20              ;SEC PER TRACK
5907  0D0E 03                   DB      3
5908  0D0F 07                   DB      7
5909  0D10 00                   DB      0
5910  0D11 5B00                 DW      91              ;DISK SIZE (IN K) - 1
5911  0D13 3F00                 DW      63
5912  0D15 C0                   DB      192
5913  0D16 00                   DB      0
5914  0D17 1000                 DW      16
5915  0D19 0300                 DW      3
5916                            ENDIF
5917
5918                            IF      H47T OR H67T
5919                    DPBOSS: DW      26              ;SECTORS PER TRACK
5920                            DB      3,7,0           ;BLOCK SHIFT, BLOCK MASK, EXTENT MASK
5921                            DW      242             ;DISK SIZE - 1
5922                            DW      63              ;DIR MAX
5923                            DB      192,0           ;ALLOC0,ALLOC1
5924                            DW      16              ;CHECK SIZE
5925                            DW      2               ;OFFSET
5926                    DPBOSD: DW      26              ;SECTORS PER TRACK
5927                            DB      4,15,1          ;BLOCK SHIFT, MASK, EXTENT MASK
5928                            DW      246             ;DISK SIZE - 1
5929                            DW      127             ;DIR MAX
5930                            DB      0C0H,000H       ;ALLOCATION
5931                            DW      32
5932                            DW      2
5933
5934                    DPBODS: DW      52
5935                            DB      4,15,0
5936                            DW      242
5937                            DW      127
5938                            DB      0C0H,000H
5939                            DW      32
5940                            DW      2
5941
5942                    DPBODD: DW      52
5943                            DB      4,15,0
5944                            DW      493
5945                            DW      255
5946                            DB      0F0H,000H
5947                            DW      64
5948                            DW      2
5949                            ENDIF
5950
5951                            IF      H47T AND H47ED
5952                    DPBOES: DW      64
5953                            DB      4,15,0
5954                            DW      299
5955                            DW      127
5956                            DB      0C0H,000H
5957                            DW      32
5958                            DW      2
5959
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5960                    DPB0ED: DW      64
5961                            DB      4,15,0
5962                            DW      607
5963                            DW      255
5964                            DB      0F0H,000H
5965                            DW      64
5966                            DW      2
5967                            ENDIF
5968
5969                            PAGE
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5970
5971                                    IF      H17T
5972   0D1B 0102090A11XLT17:            DB      1,2,9,10,17,18
5973   0D21 05060D0E                    DB      5,6,13,14
5974   0D25 03040B0C13                  DB      3,4,11,12,19,20
5975   0D2B 07080F10                    DB      7,8,15,16
5976                                    ENDIF
5977
5978                                    IF      H47T OR H67T
5979                         XLTOS:     DB      1,7,13,19,25
5980                                    DB      5,11,17,23
5981                                    DB      3,9,15,21
5982                                    DB      2,8,14,20,26
5983                                    DB      6,12,18,24
5984                                    DB      4,10,16,22
5985
5986                         XLTOD:     DB      1,2,19,20,37,38
5987                                    DB      3,4,21,22,39,40
5988                                    DB      5,6,23,24,41,42
5989                                    DB      7,8,25,26,43,44
5990                                    DB      9,10,27,28,45,46
5991                                    DB      11,12,29,30,47,48
5992                                    DB      13,14,31,32,49,50
5993                                    DB      15,16,33,34,51,52
5994                                    DB      17,18,35,36
5995                                    ENDIF
5996
5997                                    PAGE
```

```
5998
5999                    ;
6000                    ;  HOST BUFFER FLAGS THAT MUST BE INITIALIZED AT ASSEMBLY TIME.
6001                    ;
6002
6003  0D2F 00           HSTACT  DB      0               ;HOST BUFFER ACTIVE FLAG
6004  0D30 00           HSTWRT  DB      0               ;HOST BUFFER PENDING WRITE FLAG
6005  0D31 00           UNACNT  DB      0               ;UNALLOCATED RECORD COUNT
6006
6007
6008
6009
6010                    ;
6011  0D32 =            HSTBUF  EQU     $
6012
6013                    ;
6014                    ; THE FOLLOWING "ONE-TIME" CODE GETS OVERLAID BY DISK BUFFERS
6015                    ;  AND POSSIBLY RUN-TIME VARIABLES.
6016                    ;
6017
6018                    ;
6019                    ; BOOT - EXECUTED FOR COLD START
6020                    ;
6021  0D32 F3           CBOOT:  DI
6022  0D33 311211               LXI     SP,STACK
6023
6024  0D36 3A3400               LDA     DEFIOB          ;SET THE DEFAULT IOBYTE
6025  0D39 320300               STA     IOBYTE
6026
6027  0D3C 3EC3                 MVI     A,MI$JMP
6028  0D3E 212E08               LXI     H,CLOCK         ;ESTABLISH POINTER TO CLOCK INT SERVICE ROUTINE
6029  0D41 320800               STA     CLKVEC
6030  0D44 220900               SHLD    CLKVEC+1
6031
6032                            IF      INTINP
6033  0D47 21B509               LXI     H,CRTISR        ;POINTER TO CRT INTERRUPT SERVICE ROUTINE
6034  0D4A 321800               STA     SERVEC          ;AT SERIAL VECTOR
6035  0D4D 221900               SHLD    SERVEC+1
6036                            ENDIF
6037
6038  0D50 210D00               LXI     H,CTLPRT        ;GET THE CURRENT VALUE OF THE RAM AT 0 PORT
6039  0D53 7E                   MOV     A,M             ;  ESTABLISHED BY BLDR
6040  0D54 D3F2                 OUT     H88CTL          ;RESET THE CLOCK ON THE H/Z89
6041
6042  0D56 23                   INX     H               ;POINT TO H8FLAG
6043  0D57 7E                   MOV     A,M
6044  0D58 B7                   ORA     A               ;IF 0 THEN RUNNING ON H/Z89
6045  0D59 CA5E0D               JZ      CBT0            ;  THEN DON'T OUTPUT TO 3600
6046  0D5C D3F0                 OUT     H8CTL           ;  ELSE CONTAINS H8TR TO RESET H8 CLOCK
6047                    ;
6048                    ; INITIALIZE 8251 (ONLY IF USED)
6049                    ;
6050  0D5E 3A3600       CBT0:   LDA     MODE            ;FIRST, ASSUME IT IS NOT USED
6051  0D61 E6FE                 ANI     0FFH-MODEB0
6052  0D63 323600               STA     MODE
6053
```

```
6054  0D66 3A0E00          LDA     H8FLAG          ;IF ON Z/H89
6055  0D69 B7              ORA     A               ; THEN THE CONSOLE IS NOT AN H8-5
6056  0D6A CA9D0D          JZ      CBT1            ;CONSOLE ON H8-4 CARD
6057
6058  0D6D 213800          LXI     H,H84PT1        ;POINT TO CRT PORT
6059  0D70 7E              MOV     A,M             ;GET BASE PORT NUMBER
6060  0D71 C603            ADI     3               ;SEE IF YOU CAN GET A RESPONSE FROM 8250 @ 3500
6061  0D73 323610          STA     OUTH84+1
6062  0D76 F5              PUSH    PSW
6063  0D77 3E03            MVI     A,3             ;SET 8 BIT WORDS
6064  0D79 CD3510          CALL    OUTH84
6065  0D7C F1              POP     PSW
6066  0D7D CD5A0C          CALL    PIN
6067  0D80 FE03            CPI     3
6068  0D82 CA9D0D          JZ      CBT1            ;CONSOLE ON H8-4 CARD
6069  0D85 3A3600          LDA     MODE
6070  0D88 F601            ORI     MODEB0          ;CONSOLE MUST BE ON H8-5 CARD THEN
6071  0D8A 323600          STA     MODE            ; SO SET MODE
6072
6073  0D8D 3E15            MVI     A,15H           ;DUMMY MODE BYTE
6074  0D8F D3FB            OUT     H85CRT+1
6075
6076  0D91 3E40            MVI     A,40H           ;RESET 8251
6077  0D93 D3FB            OUT     H85CRT+1
6078
6079  0D95 3E4E            MVI     A,4EH           ;8 BIT WORDS, 1 STOP BIT, NO PARITY
6080  0D97 D3FB            OUT     H85CRT+1
6081
6082                       IF      INTINP
6083  0D99 3E17            MVI     A,17H           ;ENABLE TX AND RX WITH INTERRUPTS ON
6084                       ELSE
6085                       MVI     A,15H           ;ENABLE TX AND RX WITH INTERRUPTS OFF
6086                       ENDIF
6087  0D9B D3FB            OUT     H85CRT+1
6088
6089                  ;
6090                  ; NOW INITIALIZE THE PORTS
6091                  ;
6092  0D9D 2A3900     CBT1:  LHLD    CRTBAUD         ;PICK UP BAUD RATE
6093  0DA0 3A3800          LDA     H84PT1          ; AND THE PORT NUMBER
6094  0DA3 CDF50F          CALL    IN8250          ;INITIALIZE THIS UART
6095
6096                       IF      INTINP
6097  0DA6 3A3800          LDA     H84PT1          ;ENABLE 8250 RECEIVER INTERRUPTS
6098  0DA9 3C              INR     A
6099  0DAA 323610          STA     OUTH84+1
6100  0DAD 3E01            MVI     A,1
6101  0DAF CD3510          CALL    OUTH84
6102                       ENDIF
6103
6104                  ;  DETERMINE IF H89-11 BOARD IS IN SYSTEM
6105
6106  0DB2 3A4400          LDA     H11PT2          ;GET BASE PORT OF H89-11 TTY PORT
6107  0DB5 47              MOV     B,A             ;SAVE IT
6108  0DB6 C603            ADI     EPCMD           ;TRY SETTING COMMAND PORT
6109  0DB8 323610          STA     OUTH84+1
```

```
6110  0DBB 3E02          MVI   A,EPDTR
6111  0DBD CD3510        CALL  OUTH84
6112  0DC0 214400        LXI   H,H11PT2      ;SEE IF COMMAND PORT EXISTS
6113  0DC3 3E03          MVI   A,EPCMD
6114  0DC5 CD590C        CALL  PINX
6115  0DC8 FE02          CPI   EPDTR
6116  0DCA C2080E        JNZ   H893          ; BR IF NOT
6117  0DCD AF            XRA   A             ;ZERO COMMAND PORT
6118  0DCE CD3510        CALL  OUTH84
6119
6120  0DD1 3E04          MVI   A,4           ;CHECK TTY PORT FOR 8250
6121  0DD3 80            ADD   B
6122  0DD4 323610        STA   OUTH84+1
6123  0DD7 3E10          MVI   A,010H
6124  0DD9 CD3510        CALL  OUTH84
6125  0DDC 3E04          MVI   A,4
6126  0DDE CD590C        CALL  PINX
6127  0DE1 FE10          CPI   010H
6128  0DE3 CA080E        JZ    H893          ; BR IF 8250, THIS IS NOT H89-11 BOARD
6129
6130  0DE6 213700        LXI   H,MODE2       ;INDICATE H89-11 BOARD IS IN SYSTEM
6131  0DE9 7E            MOV   A,M
6132  0DEA F601          ORI   MODE2B0
6133  0DEC 77            MOV   M,A
6134  0DED 2A4500        LHLD  TTY11B        ;INIT TTY PORT
6135  0DF0 3A4400        LDA   H11PT2
6136  0DF3 CD3810        CALL  IN2661
6137  0DF6 2A3F00        LHLD  LPTBAUD       ;INIT SERIAL PRINTER PORT
6138  0DF9 3A3E00        LDA   H84PT3
6139  0DFC CDF50F        CALL  IN8250
6140  0DFF 3A4700        LDA   H11PT3        ;INIT PARALLEL PRINTER PORT
6141  0E02 CD7910        CALL  IN8255
6142  0E05 C32A0E        JMP   CBT1A
6143
6144  0E08 213700  H893: LXI   H,MODE2       ;INDICATE H89-11 BOARD IS NOT IN SYSTEM
6145  0E0B 7E            MOV   A,M
6146  0E0C E6FE          ANI   OFFH-MODE2B0
6147  0E0E 77            MOV   M,A
6148  0E0F 2A3C00        LHLD  TTYBAUD       ;INIT TTY PORT
6149  0E12 3A3B00        LDA   H84PT2
6150  0E15 CDF50F        CALL  IN8250
6151  0E18 2A3F00        LHLD  LPTBAUD       ;INIT PRINTER PORT
6152  0E1B 3A3E00        LDA   H84PT3
6153  0E1E CDF50F        CALL  IN8250
6154  0E21 2A4200        LHLD  RDPBAUD       ;INIT MODEM PORT
6155  0E24 3A4100        LDA   H84PT4
6156  0E27 CDF50F        CALL  IN8250
6157
6158                ;  PRINT SIGNON MESSAGE.
6159
6160  0E2A 218F0E  CBT1A: LXI   H,SMSGO       ;PRINT THE SIGNON MESSAGE
6161  0E2D CD9B0C        CALL  PMSG
6162  0E30 3E12          MVI   A,(BIOSEND+255)/256 ;FINE OUT NEWLY RELOCATED SIZE
6163  0E32 1F            RAR                 ;GET THE VALUE IN K BY DIVIDING BY 4
6164  0E33 1F            RAR                 ;  (DONE AT RUN TIME FOR RELOCATION)
6165  0E34 E63F          ANI   03FH
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6166  0E36 C23B0E          JNZ   CBOOT1          ;IF THE TOP OF MEMORY IS NOT 0000H
6167  0E39 3E40            MVI   A,64            ; ELSE TAKE CARE OF THE 64K CASE
6168  0E3B CDD90F  CBOOT1: CALL  TYDN            ;TYPE A 2 DIGIT DECIMAL NUMBER
6169  0E3E 21930E          LXI   H,SMSG1
6170  0E41 CD9B0C          CALL  PMSG
6171
6172  0E44 FB              EI                    ;ALLOW INTERRUPTS NOW
6173
6174                ;
6175                ;  DO INITIALIZATION FOR BOOT DEVICE.
6176                ;
6177
6178  0E45 3A4900          LDA   BBDA            ;GET BOOT DEVICE BASE PORT #
6179  0E48 32DB0E          STA   CBIB
6180
6181  0E4B 21630E          LXI   H,CBI1          ;SET RETURN ADDR
6182  0E4E E5              PUSH  H
6183
6184  0E4F 3A0400          LDA   LOGDSK          ;GET BOOT UNIT #
6185  0E52 4F              MOV   C,A
6186
6187  0E53 3A4800          LDA   BBDF            ;GET BOOT DEVICE FLAGS
6188  0E56 E6E0            ANI   DPETYPE
6189
6190                       IF    H17T
6191  0E58 FE40            CPI   DPEH17
6192  0E5A CADD0E          JZ    CBH17           ;BR IF H17
6193                       ENDIF
6194
6195                       IF    H37T
6196                       CPI   DPEH37
6197                       JZ    CBH37           ;BR IF H37
6198                       ENDIF
6199
6200                       IF    H47T
6201                       CPI   DPEH47
6202                       JZ    CBH47           ;BR IF H47
6203                       ENDIF
6204
6205                       IF    H67T
6206                       CPI   DPEH67H
6207                       JZ    CBH67           ;BR IF H67
6208                       ENDIF
6209
6210  0E5D 0E07            MVI   C,BELL          ;BIOS IS NOT SET UP TO HANDLE
6211  0E5F CD1409          CALL  CONOUT          ; BOOT DEVICE
6212  0E62 76              HLT                   ;HALT EVERYTHING
6213
6214                ;
6215                ;  DO INITITIALIZATION FOR OTHER DISK DEVICE (IF ANY).
6216                ;
6217
6218  0E63 AF      CBI1:   XRA   A               ;INDICATE NOT BOOT DEVICE
6219  0E64 32DA0E          STA   CBIA
6220
6221  0E67 3ADB0E          LDA   CBIB            ;SWITCH BASE PORT #
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6222  0E6A EE04          XRI   7CH-78H       ;DRIVE BASE PORT #'S ARE 78H & 7CH
6223  0E6C 32DB0E        STA   CBIB          ; WHICH DIFFER ONLY AT BIT 2
6224
6225  0E6F 21800E        LXI   H,CBI2        ;SET RET ADDR
6226  0E72 E5            PUSH  H
6227
6228  0E73 3A4800        LDA   BBDF          ;GET DEVICE FLAGS OF BOOT DEVICE
6229  0E76 E6E0          ANI   DPETYPE       ;MASK FOR DRIVE TYPE
6230  0E78 0E00          MVI   C,0           ;1ST UNIT IS UNIT 0
6231
6232                     IF    H17T
6233  0E7A FE40          CPI   DPEH17        ;BOOT DEVICE H17
6234  0E7C C2DD0E        JNZ   CBH17         ;IF NOT, THEN OTHER DEVICE IS H17
6235                     ENDIF
6236
6237                     IF    H37T
6238                     CPI   DPEH37        ;BOOT DEVICE H37
6239                     JNZ   CBH37         ;IF NOT, THEN OTHER DEVICE IS H37
6240                     ENDIF
6241
6242                     IF    H47T
6243                     CPI   DPEH47        ;BOOT DEVICE H47
6244                     JNZ   CBH47         ;IF NOT, THEN OTHER DEVICE IS H47
6245                     ENDIF
6246
6247                     IF    H67T
6248                     CPI   DPEH67H       ;BOOT DEVICE H67
6249                     JNZ   CBH67         ;IF NOT, THEN OTHER DEIVCE IS H67
6250                     ENDIF
6251
6252  0E7F E1            POP   H             ;NO OTHER DEVICE, DISCARD RET ADDR
6253
6254               CBI2:
6255
6256                ;
6257                ;  FINISH COLD BOOT AND SIGN ON.
6258                ;
6259
6260  0E80 AF            XRA   A             ;MAKE A THE DEFAULT DRIVE
6261  0E81 320400        STA   LOGDSK
6262
6263  0E84 210000        LXI   H,BIOS        ;PLACE ADDRESS OF START OF BIOS
6264  0E87 224E00        SHLD  BBIOS         ; IN PAGE ZERO
6265
6266  0E8A 3E00          MVI   A,BT$CD       ;FLAG AS A COLD BOOT
6267  0E8C C32E01        JMP   GOW
6268
6269  0E8F 0D0A0A00 SMSG0: DB   CR,LF,LF,0
6270  0E93 4B20484541SMSG1: DB  'K HEATH/ZENITH CP/M 2.2'
6271                     IF    EXPER
6272                     DB    'X'
6273                     ELSE
6274  0EAA 2E            DB    '.'
6275                     ENDIF
6276  0EAB 303420        DB    VERS/10+'0',(VERS MOD 10)+'0',LEVEL
6277  0EAE 2030392F31    DB    ' ',MONTH/10+'0',(MONTH MOD 10)+'0','/',DAY/10+'0'
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```
6278  0EB3 352F3832          DB      (DAY MOD 10)+'0','/',YEAR/10+'0',(YEAR MOD 10)+'0'
6279  0EB7 0D0A              DB      CR,LF
6280  0EB9 464F52            DB      'FOR'
6281                         IF      H17T
6282  0EBC 20483137          DB      ' H17'
6283                         ENDIF
6284                         IF      H37T
6285                         DB      ' H37'
6286                         ENDIF
6287                         IF      H47T
6288                         DB      ' H47'
6289                         ENDIF
6290                         IF      H67T
6291                         DB      ' H67'
6292                         ENDIF
6293  0EC0 2044495348        DB      ' DISKS'
6294  0001 =          WRKVARX EQU     PARTITN OR H67PART2 OR INTINP OR BRKKEY OR TOD OR EVENT
6295  0001 =          WRKVAR  EQU     WRKVARX OR H37ED OR H47ED
6296                         IF      WRKVAR
6297  0EC6 2057495448        DB      ' WITH OPTION(S) '
6298                         IF      PARTITN
6299                         DB      'P'
6300                         ENDIF
6301                         IF      H67PART2
6302                         DB      '2'
6303                         ENDIF
6304                         IF      TOD
6305                         DB      'T'
6306                         ENDIF
6307                         IF      EVENT
6308                         DB      'E'
6309                         ENDIF
6310                         IF      INTINP
6311  0ED6 49                DB      'I'
6312                         ENDIF
6313                         IF      BRKKEY
6314                         DB      'B'
6315                         ENDIF
6316                         IF      H37ED
6317                         DB      'E3'
6318                         ENDIF
6319                         IF      H47ED
6320                         DB      'E4'
6321                         ENDIF
6322                         ENDIF
6323  0ED7 0D0A00            DB      CR,LF,0
6324
6325                         PAGE
```

```
6326
6327  0EDA 01        CBIA:   DB      1               ;0 = INIT AS OTHER DEVICE
6328                                                 ;1 = INIT AS BOOT DEVICE
6329  0EDB           CBIB:   DS      1               ;BASE PORT #
6330  0EDC 00        CBIC:   DB      0               ;LOGICAL DRIVE #
6331
6332                         IF      H17T
6333                 ;
6334                 ;  COLD BOOT INIT ROUTINE FOR H17.
6335                 ;
6336
6337  0EDD 3ADB0E    CBH17:  LDA     CBIB            ;CHECK IF VALID BASE PORT #
6338  0EE0 FE7C              CPI     7CH
6339  0EE2 C0                RNZ                     ;ONLY 7CH ALLOWED
6340
6341  0EE3 0603              MVI     B,H17ND
6342  0EE5 1600              MVI     D,(DPE0-DPBASE)/DPEL
6343  0EE7 CD2D0F            CALL    CBTFIL          ;FILL IN DRIVE MAP TABLE
6344
6345  0EEA 3E10              MVI     A,DFMO          ;INIT H17 CONTROL REG IMAGE
6346  0EEC 320F00            STA     DEVCTL
6347
6348  0EEF 3ADA0E            LDA     CBIA            ;CHECK IF BOOT DEVICE
6349  0EF2 A7                ANA     A
6350  0EF3 CC2D06            CZ      RESH17          ;IF NOT, THEN RESET DEVICE
6351
6352                 ;     INSURE THE HEAD ON ALL DRIVES IS NOT BEFORE TRACK 0
6353
6354  0EF6 0603              MVI     B,H17ND         ;# DRIVES
6355  0EF8 3E0A              MVI     A,10            ;SET TO SEEK TO TRACK 10
6356  0EFA 329810            STA     TRACK
6357  0EFD 216200            LXI     H,DPE0+DPEHTH   ;GET ADDR FOR HSTDPB
6358
6359                 CBH171:
6360  0F00 C5                PUSH    B
6361  0F01 228E10            SHLD    HSTDPB          ;SET ADDR INTO HSTDPB
6362  0F04 110600            LXI     D,DPEFLG2-DPEHTH ;ONLY DO THIS FOR REAL DRIVES
6363  0F07 19                DAD     D
6364  0F08 7E                MOV     A,M
6365  0F09 E602              ANI     DPEIMG
6366  0F0B C21E0F            JNZ     CBH171A         ; BR IF IMAGINARY
6367  0F0E CDB906            CALL    SDP             ;TURN ON DRIVE AND RESTORE HEAD
6368  0F11 DB7F              IN      DPDC            ;CHECK IF HEAD MADE IT TO TRACK 0
6369  0F13 E602              ANI     DFT0            ; THIS CHECKS IF REAL DRIVE EXISTS
6370  0F15 CA1E0F            JZ      CBH171A         ;  BR IF DRIVE DOES NOT EXIST
6371  0F18 CDD506            CALL    SDT             ;STEP OUT 10 TRACKS
6372  0F1B CDF506            CALL    STZ             ;RESTORE HEAD
6373                 CBH171A:
6374  0F1E 2A8E10            LHLD    HSTDPB          ;BUMP HSTDPB TO NEXT DRIVE
6375  0F21 111800            LXI     D,DPEL
6376  0F24 19                DAD     D
6377  0F25 C1                POP     B
6378  0F26 05                DCR     B               ;LOOP
6379  0F27 C2000F            JNZ     CBH171
6380
6381  0F2A C33D05            JMP     XOK             ;RETURN VIA 'XOK'
```

```
6382
6383                    ENDIF
6384
6385                    IF      H37T
6386            ;
6387            ;  H37 COLD BOOT INIT ROUTINE.
6388            ;
6389
6390            CBH37:  LDA     CBIB            ;CHECK IF VALID BASE PORT #
6391                    CPI     78H
6392                    RNZ                     ;ONLY 78H ALLOWED
6393
6394                    MVI     B,H37ND
6395                    MVI     D,(DPE37$0-DPBASE)/DPEL
6396                    CALL    CBTFIL          ;FILL IN DRIVE MAP TABLE
6397
6398                    DI
6399                    MVI     A,MI$JMP        ;INSTALL H37 INTERRUPT SERVICE ROUTINE
6400                    LXI     H,H37ISR
6401                    STA     H37VEC
6402                    SHLD    H37VEC+1
6403                    EI
6404
6405                    MVI     A,CONMO         ;INIT CONTROL REG IMAGE
6406                    STA     H37CTL
6407
6408                    LDA     CBIA            ;CHECK IF BOOT DEVICE
6409                    ANA     A
6410                    CZ      RESH37          ;IF NOT, THEN RESET DEVICE
6411
6412            ;    INSURE THE HEAD ON ALL DRIVES IS NOT BEFORE TRACK 0
6413
6414                    MVI     B,H37ND         ;# DRIVES
6415                    MVI     A,10            ;SET TO SEEK TO TRACK 10
6416                    STA     HSTTRK
6417                    LXI     H,DPE37$0+DPEHTH        ;GET ADDR FOR HSTDPB
6418
6419            CBH371:
6420                    PUSH    B
6421                    SHLD    HSTDPB          ;SET ADDR INTO HSTDPB
6422                    LXI     D,DPEFLG2-DPEHTH ;ONLY DO THIS FOR REAL DRIVES
6423                    DAD     D
6424                    MOV     A,M
6425                    ANI     DPEIMG
6426                    JNZ     CBH371A         ; BR IF IMAGINARY
6427                    CALL    SDP37           ;TURN ON DRIVE AND RESTORE HEAD
6428                    MVI     A,FD$CD
6429                    OUT     FD$INT
6430                    IN      FD$STA          ;CHECK IF HEAD MADE IT TO TRACK 0
6431                    ANI     FDSTK0          ; THIS CHECKS IF REAL DRIVE EXISTS
6432                    JZ      CBH371A         ;  BR IF DRIVE DOES NOT EXIST
6433                    CALL    SDT37           ;STEP OUT 10 TRACKS
6434                    CALL    RST37           ;RESTORE HEAD
6435            CBH371A:
6436                    LHLD    HSTDPB          ;BUMP HSTDPB TO NEXT DRIVE
6437                    LXI     D,DPEL
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6438                    DAD     D
6439                    POP     B
6440                    DCR     B               ;LOOP
6441                    JNZ     CBH371
6442
6443                    JMP     H37DONE         ;RETURN VIA "H37DONE"
6444
6445                    ENDIF
6446
6447                    IF      H47T
6448                ;
6449                ;   H47 COLD BOOT INIT ROUTINE.
6450                ;
6451
6452            CBH47:  MVI     B,H47ND
6453                    MVI     D,(DPE47$0-DPBASE)/DPEL
6454                    CALL    CBTFIL          ;FILL IN DRIVE MAP TABLE
6455
6456                    LDA     CBIB            ;SET PORT #'S
6457                    IF      H47CTL
6458            %:      H47CTL NE 0
6459                    ENDIF
6460                    STA     H47INS1         ;STATUS PORT #
6461                    STA     H47OUTC1        ;CONTROL PORT #
6462                    INR     A
6463                    IF      H47CTL+1-H47DAT
6464            %:      H47DAT NE H47CTL+1
6465                    ENDIF
6466                    STA     H47IND1         ;INPUT DATA PORT #
6467                    STA     H47OUTD1        ;OUTPUT DATA PORT #
6468
6469                    LDA     CBIB            ;CHECK BASE PORT ADDR
6470                    CPI     7CH
6471                    JNZ     CBH472          ; BR IF NOT PORT 7CH
6472                    MVI     B,H47ND
6473                    LXI     D,DPEL
6474                    LXI     H,DPE47$0+DPEFLAG
6475            CBH471: MOV     A,M
6476                    ORI     DPEP7C          ;SET PORT 7CH FLAG
6477                    MOV     M,A
6478                    DAD     D
6479                    DCR     B
6480                    JNZ     CBH471
6481
6482            CBH472: LDA     CBIA            ;CHECK IF BOOT DEVICE
6483                    ANA     A
6484                    CZ      RESH47          ;IF NOT, THEN RESET DEVICE
6485
6486                    RET
6487                    ENDIF
6488
6489                    IF      H67T
6490                ;
6491                ;   H67 COLD BOOT INIT ROUTINE.
6492                ;
6493
```

```
6494                    CBH67:
6495
6496                            IF      H67PART2
6497                            LDA     BBDF            ;0. BOOTED FROM FLOPPY
6498                            ANI     DPETYPF
6499                            CPI     DPEH67F
6500                            JNZ     CBH670          ; BR IF NOT
6501                            INR     C               ;BUMP LOGICAL UNIT #
6502                    CBH670:
6503                            ENDIF
6504
6505                            MVI     B,H67ND
6506                            MVI     D,(DPE67$0-DPBASE)/DPEL
6507                            CALL    CBTFIL          ;FILL IN DRIVE MAP TABLE
6508
6509                            LDA     CBIB            ;SET PORT #'S
6510                            IF      HD$DAT
6511                    %:      HD$DAT NE 0
6512                            ENDIF
6513                            STA     H67IND1         ;INPUT DATA PORT #
6514                            STA     H67OUTD1        ;OUTPUT DATA PORT #
6515                            INR     A
6516                            IF      (HD$DAT+1-HD$STA) OR (HD$DAT+1-HD$CON)
6517                    %:      (HD$STA NE (HD$DAT+1)) OR (HD$CON NE (HD$DAT+1))
6518                            ENDIF
6519                            STA     H67INS1         ;STATUS PORT #
6520                            STA     H67OUTC1        ;CONTROL PORT #
6521
6522                            LDA     CBIB            ;CHECK BASE PORT ADDR
6523                            CPI     7CH
6524                            JNZ     CBH672          ; BR IF NOT PORT 7CH
6525                            MVI     B,H67ND
6526                            LXI     D,DPEL
6527                            LXI     H,DPE67$0+DPEFLAG
6528                    CBH671: MOV     A,M
6529                            ORI     DPEP7C          ;SET PORT 7CH FLAG
6530                            MOV     M,A
6531                            DAD     D
6532                            DCR     B
6533                            JNZ     CBH671
6534
6535                    CBH672:
6536                            LDA     CBIA            ;CHECK IF BOOT DEVICE
6537                            ANA     A
6538                            JZ      CBH673          ; BR IF NOT BOOT DEVICE
6539                            LDA     BBDF            ;CHECK IF BOOT DEVICE IS THE HARD DISK
6540                            ANI     DPETYPF
6541                            CPI     DPEH67H
6542                            JZ      CBH675          ; BR IF IT IS
6543
6544                    ;       IF NOT BOOT DEVICE, THEN INSURE HEAD IS NOT BEFORE TRACK 0 ON WINCHESTER.
6545
6546                    CBH673:
6547                            CALL    RESH67          ;RESET H67 CONTROLLER
6548                            LDA     DPE67$0+DPEUNIT ;SET UNIT SELECT
6549                            STA     CMDBUF+HDOLULA
```

```
6550                            CALL    SETUP3          ;ISSUE SEEK COMMAND TO INSURE
6551                            MVI     A,1             ; THE HEAD IS NOT STUCK BEFORE TRACK 0
6552                            STA     RS67B
6553                            CALL    CMPSTAT         ;CHECK ERROR STATUS OF SEEK
6554                            JNZ     CBH673B         ; BR IF ERROR
6555                    CBH673A:
6556                            CALL    H67INS          ;WAIT FOR SEEK TO FINISH (CONTROLLER NOT BUSY)
6557                            ANI     HDBBSY
6558                            JNZ     CBH673A
6559                    CBH673B
6560                            JMP     RCL67           ;RESTORE HEAD AND RETURN
6561
6562                    ;
6563
6564                    CBH675:
6565                            IF      PARTITN
6566                            LDA     DPE67$0+DPEFLAG ;MARK PARTITION IS ASSIGNED
6567                            ORI     DPEASGN
6568                            STA     DPE67$0+DPEFLAG
6569                            LHLD    BBP             ;GET SECTOR # FOR BEGINNING
6570                            SHLD    DPE67$0+DPETRK  ; OF PARTITION
6571                            LHLD    BUPB            ;GET LAST SECTOR # + 1
6572                            SHLD    DPE67$0+DPEUPB  ; OR PARTITION
6573                            ENDIF
6574                            RET
6575                            ENDIF
6576
6577                            PAGE
```

```
6578
6579                    ; CBTFIL - FILL THE LOGICAL TO PHYSICAL MAPPING TABLE
6580                    ;          FOR REAL DRIVES.  THEN DO THE SAME FOR THE IMAGINARY
6581                    ;          DRIVES PLUS SET UP THE IMAGINARY'S LINK TO HIS
6582                    ;          CORRESPONDING REAL DRIVE.
6583                    ;
6584                    ;    UPON ENTRY -- (B) = # DRIVES
6585                    ;                  (C) = STARTING UNIT #
6586                    ;                  (D) = STARTING DRIVE MAP #
6587                    ;                  (CBIC) = NEXT LOGICAL DRIVE # TO BE ASSIGNED
6588                    ;    UPON EXIT  -- (CBIC) UPDATED
6589                    ;    USES       -- ALL
6590                    ;
6591
6592                    CBTFIL:
6593  0F2D 210000               LXI     H,0             ;INIT CBTIA
6594  0F30 22D70F               SHLD    CBTIA
6595
6596                    CBTFIL1:
6597  0F33 C5                   PUSH    B
6598  0F34 D5                   PUSH    D
6599
6600  0F35 3ADA0E               LDA     CBIA            ;IF BOOT DEVICE THEN INSURE
6601  0F38 A7                   ANA     A               ; BOOT UNIT IS MARKED REAL
6602  0F39 C4C10F               CNZ     CBTF7
6603
6604  0F3C AF                   XRA     A               ;INDICATE REAL CYCLE
6605  0F3D CD520F               CALL    CBTF0           ;HANDLE REAL DRIVES
6606
6607  0F40 D1                   POP     D
6608  0F41 C1                   POP     B
6609
6610  0F42 2AD70F               LHLD    CBTIA           ;IF NO REAL DRIVES THEN MARK
6611  0F45 7C                   MOV     A,H             ; 1ST AVAILABLE DRIVE AS REAL
6612  0F46 B5                   ORA     L
6613  0F47 C2500F               JNZ     CBTFIL2         ;  BR IF REAL DRIVE FOUND
6614
6615  0F4A CDC10F               CALL    CBTF7           ;MARK 1ST AVAILABLE DRIVE REAL
6616
6617  0F4D C3330F               JMP     CBTFIL1         ;GO THRU REAL DRIVE CYCLE AGAIN
6618
6619                    CBTFIL2:
6620  0F50 3E01                 MVI     A,1             ;INDICATE IMAGINARY CYCLE
6621
6622                    ;  THIS SECTION OF CODE IS RAN THROUGH TWICE.
6623                    ;  FIRST TIME IS FOR HANDLING THE REAL DRIVES.
6624                    ;  SECOND TIME IS FOR HANDLING THE IMAGINARY DRIVES.
6625
6626  0F52 32D60F   CBTF0:  STA     CBTFA           ;SAVE TYPE OF CYCLE INDICATOR
6627
6628  0F55 58                   MOV     E,B             ;COPY OF # DRIVES
6629
6630  0F56 79       CBTF1:  MOV     A,C             ;GET THIS DRIVE'S NUMBER
6631  0F57 B8                   CMP     B               ;MOD # DRIVES
6632  0F58 DA5C0F               JC      CBTF2
6633  0F5B 90                   SUB     B
```

```
6634  0F5C 82       CBTF2:  ADD     D               ;COMPUTE DISK ENTRY TABLE TO USE
6635
6636  0F5D C5               PUSH    B
6637  0F5E 47               MOV     B,A             ;COMBINE LOGICAL AND MAPPED DRIVE #'S
6638  0F5F 3ADC0E           LDA     CBIC            ; BIT 7-4 = LOGICAL
6639  0F62 87               ADD     A               ; BIT 3-0 = MAPPED
6640  0F63 87               ADD     A
6641  0F64 87               ADD     A
6642  0F65 87               ADD     A
6643  0F66 80               ADD     B
6644  0F67 47               MOV     B,A             ;(B) = LOGICAL/MAPPED DRIVE #'S
6645  0F68 D5               PUSH    D
6646  0F69 CDBE08           CALL    GETDPEX         ;GET ADDR OF DPE'S HEATH EXTENSIONS
6647  0F6C EB               XCHG                    ;(DE) = HEATH EXTENSIONS
6648  0F6D 210600           LXI     H,DPEFLG2-DPEHTH
6649  0F70 19               DAD     D
6650  0F71 7E               MOV     A,M
6651  0F72 E602             ANI     DPEIMG          ;CHECK IF IMAGINARY DRIVE
6652  0F74 3AD60F           LDA     CBTFA           ;GET CYCLE INDICATOR ALSO
6653  0F77 C2950F           JNZ     CBTF3           ;BR IF IMAGINARY DRIVE
6654
6655                ;       HANDLE REAL DRIVE IF THIS IS REAL DRIVE CYCLE:
6656  0F7A A7               ANA     A
6657  0F7B C2AA0F           JNZ     CBTF4           ;BR IF THIS IS NOT REAL DRIVE CYCLE
6658
6659  0F7E E5               PUSH    H               ;IF THIS IS FIRST REAL DRIVE ENCOUNTERED
6660  0F7F 2AD70F           LHLD    CBTIA           ; THEN REMEMBER ITS HEATH EXTENSION
6661  0F82 7C               MOV     A,H             ;  ADDRESS
6662  0F83 B5               ORA     L
6663  0F84 E1               POP     H
6664  0F85 C28D0F           JNZ     CBTF2A
6665  0F88 EB               XCHG
6666  0F89 22D70F           SHLD    CBTIA
6667  0F8C EB               XCHG
6668
6669  0F8D 23       CBTF2A: INX     H               ;PLACE LOGICAL/MAPPED IN DPELUN SLOT
6670                        IF      DPEFLG2+1-DPELUN
6671                %:      '(DPEFLG2+1)' NE 'DPELUN'
6672                        ENDIF
6673  0F8E 70               MOV     M,B
6674
6675  0F8F CDB20F           CALL    CBTF6           ;MAP DRIVE
6676
6677  0F92 C3AA0F           JMP     CBTF4
6678
6679                ;       HANDLE IMAGINARY DRIVE IF THIS IS THE IMAGINARY DRIVE CYCLE.
6680  0F95 A7       CBTF3:  ANA     A
6681  0F96 CAAA0F           JZ      CBTF4           ;BR IF THIS IS NOT IMAGINARY DRIVE CYCLE
6682
6683  0F99 E5               PUSH    H               ;(DE) = ADDR OF HEATH EXTENSIONS
6684                                                ;(HL) = ADDR OF 2ND FLAG BYTE
6685
6686  0F9A CDB20F           CALL    CBTF6           ;MAP DRIVE
6687
6688  0F9D 2AD70F           LHLD    CBTIA           ;MOVE THE REAL DRIVE'S TABLE
6689  0FA0 0E08             MVI     C,DPEHL         ; INTO THIS IMAGINARY DRIVE'S TABLE
```

```
6690  0FA2 CDCC08          CALL    MOVEIT
6691
6692  0FA5 E1              POP     H               ;(HL) = ADDR OF 2ND FLAG BYTE
6693  0FA6 7E              MOV     A,M
6694  0FA7 F602            ORI     DPEIMG          ;REMARK AS IMAGINARY DRIVE
6695  0FA9 77              MOV     M,A
6696
6697  0FAA D1        CBTF4:  POP     D
6698  0FAB C1                POP     B
6699  0FAC 0C                INR     C               ;ROUND ROBIN TO NEXT DRIVE
6700  0FAD 1D                DCR     E               ;COUNT THIS ONE AS DONE
6701  0FAE C2560F            JNZ     CBTF1
6702
6703  0FB1 C9                RET
6704
6705                  ;  PLACE MAPPED DRIVE # INTO MAP DRIVE TABLE.
6706                  ;  (B) = MAPPED DRIVE #
6707
6708  0FB2 3ADC0E    CBTF6:  LDA     CBIC            ;GET LOGICAL DRIVE #
6709  0FB5 214000            LXI     H,BDMAP         ;GET ADDR OF MAP DRIVE
6710  0FB8 CDA808            CALL    DADA            ; TABLE SLOT
6711  0FBB 70                MOV     M,B             ;PLACE MAPPED DRIVE # THERE
6712  0FBC 21DC0E            LXI     H,CBIC          ;BUMP VALUE NEXT LOGICAL DRIVE #
6713  0FBF 34                INR     M
6714  0FC0 C9                RET
6715
6716                  ;  INSURE 1ST DRIVE OF GROUP IS REAL DRIVE (NOT IMAGINARY).
6717                  ;  THE 1ST DRIVEHAS TO BE MARKED REAL SO IMAGINARY DRIVES,
6718                  ;  IF ANY, HAVE A REAL UNIT TO USE.
6719
6720                  CBTF7:
6721  0FC1 C5                PUSH    B
6722  0FC2 D5                PUSH    D
6723
6724  0FC3 79                MOV     A,C             ;GET ADDR OF HEATH EXTENSIONS
6725  0FC4 82                ADD     D
6726  0FC5 CDBE08            CALL    GETDPEX
6727  0FC8 22D70F            SHLD    CBTIA           ;SAVE ADDR OF ITS DPE'S HEATH
6728                                                 ; EXTENSIONS FOR IMAGINARY DRIVES
6729  0FCB 110600            LXI     D,DPEFLG2-DPEHTH
6730  0FCE 19                DAD     D
6731  0FCF 7E                MOV     A,M
6732  0FD0 E6FD              ANI     0FFH-DPEIMG     ;MARK REAL (NOT IMAGINARY)
6733  0FD2 77                MOV     M,A
6734
6735  0FD3 D1                POP     D
6736  0FD4 C1                POP     B
6737
6738  0FD5 C9                RET
6739
6740
6741  0FD6           CBTFA   DS      1               ;CYCLE TYPE INDICATOR SLOT
6742  0FD7           CBTIA   DS      2               ;ADDR OF REAL DRIVE'S DPE HEATH EXT.
6743
6744                         PAGE
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6745
6746                    ; TYDN - TYPE A TWO DIGIT DECIMAL NUMBER ON CONSOLE
6747                    ;       ENTRY   A       VALUE
6748                    ;
6749
6750  0FD9 0E00         TYDN:   MVI     C,0             ;INITIALIZE QUOTIENT
6751  0FDB D60A         TYDN1:  SUI     10              ;REPEATEDLY SUBTRACT 10
6752  0FDD DAE40F               JC      TYDN2           ;IF UNDERFLOW
6753  0FE0 0C                   INR     C               ;ELSE INCREMENT THE QUOTIENT
6754  0FE1 C3DB0F               JMP     TYDN1           ;AND SUBTRACT AGAIN
6755
6756  0FE4 C60A         TYDN2:  ADI     10              ;CORRECT THE UNDERFLOW
6757  0FE6 F5                   PUSH    PSW             ;SAVE THE REMAINDER
6758  0FE7 79                   MOV     A,C             ;GET THE QUOTIENT
6759  0FE8 C630                 ADI     030H            ;ASCII ADJUST IT
6760  0FEA 4F                   MOV     C,A
6761  0FEB CD1409               CALL    CONOUT          ;SEND IT TO CONSOLE
6762  0FEE F1                   POP     PSW             ;RECALL REMAINDER
6763  0FEF C630                 ADI     030H            ;ASCII ADJUST
6764  0FF1 4F                   MOV     C,A
6765  0FF2 C31409               JMP     CONOUT          ;PRINT IT, WITH IMPLICIT RETURN
6766
6767                            PAGE
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6768
6769                    ; IN8250 - INITIALIZE AN 8250
6770                    ;    HL CONTAINS BAUD RATE DIVISOR (WORD)
6771                    ;    A  HAS BASE PORT NUMBER
6772                    ;
6773
6774  0FF5 47           IN8250: MOV     B,A             ;SAVE BASE PORT NUMBER IN B
6775  0FF6 EB                   XCHG                    ;MOVE BAUD RATE DIVISOR TO DE
6776  0FF7 213610               LXI     H,OUTH84+1      ;POINT TO PORT IN OUT INSTRUCTION
6777  0FFA 3E03                 MVI     A,3             ;BAUD RATE ACCESS BIT ON BASE+3 PORT
6778  0FFC 80                   ADD     B               ;GET ACTUAL PORT
6779  0FFD 4F                   MOV     C,A             ;SAVE IN C FOR LATER
6780  0FFE 77                   MOV     M,A             ;AND MODIFY OUTPUT INSTRUCTION
6781  0FFF 3E83                 MVI     A,83H           ;SET DIVISOR LATCH ACCESS BIT
6782  1001 CD3510               CALL    OUTH84          ;TO A "1"
6783  1004 34                   INR     M               ;POINT TO MODEM CONTROL REGISTER
6784  1005 3E0F                 MVI     A,0FH           ;AND SET DSR & CTS HIGH FOR DIABLO
6785  1007 CD3510               CALL    OUTH84          ; AND OTHER TERMINALS WHICH REQUIRE THEM
6786  100A 70                   MOV     M,B             ;SET PORT TO LEAST SIG BYTE
6787  100B 7B                   MOV     A,E
6788  100C CD3510               CALL    OUTH84
6789  100F 7A                   MOV     A,D             ;NOW DO MOST SIG BYTE
6790  1010 E60F                 ANI     0FH             ;AND OFF CONTROL FLAGS
6791  1012 34                   INR     M               ;ON NEXT PORT
6792  1013 CD3510               CALL    OUTH84
6793  1016 71                   MOV     M,C             ;RESET PORT TO DIVISOR LATCH ACCESS
6794  1017 FE04                 CPI     B110 SHR 8      ;IF SET FOR GREATER THAN 110
6795  1019 3E03                 MVI     A,3             ; THEN SET NO PARITY, 8 BIT WORDS, 1 STOP BIT
6796  101B DA2010               JC      IN821
6797  101E F604                 ORI     4               ; ELSE SET TWO STOP BITS FOR 110 AND BELOW
6798  1020 CD3510     IN821:    CALL    OUTH84
6799  1023 35                   DCR     M               ;NOW SET PORT FOR INTERRUPT CONTROL
6800  1024 35                   DCR     M
6801  1025 AF                   XRA     A               ;DISABLE ALL DEVICE INTERRUPTS
6802  1026 CD3510               CALL    OUTH84          ;DISABLE INTS
6803
6804                    ; DELAY FOR APPROXIMATELY TWO CHARACTER TIMES
6805
6806  1029 EB                   XCHG                    ;PUT BAUD RATE DIVISOR IN HL
6807  102A 29                   DAD     H               ;MULTIPLY BY 16 TO GET DELAY
6808  102B 29                   DAD     H
6809  102C 29                   DAD     H
6810  102D 29                   DAD     H
6811  102E 2B         LOOP1:    DCX     H
6812  102F 7D                   MOV     A,L
6813  1030 B4                   ORA     H
6814  1031 C22E10               JNZ     LOOP1
6815  1034 C9                   RET
6816
6817                    ; SELF MODIFYING OUT INSTRUCTION USED BY IN8250
6818
6819  1035 D300       OUTH84:   OUT     0               ;PORT IS MODIFIED
6820  1037 C9                   RET
6821
6822                              PAGE
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6823
6824
6825                    ; IN2661 - INITIALIZE A 2661-3
6826                    ;     HL CONTAINS BAUD RATE DIVISOR (WORD)
6827                    ;     A  HAS BASE PORT NUMBER
6828                    ;
6829
6830  1038 47           IN2661: MOV     B,A             ;SAVE BASE PORT #
6831  1039 EB                   XCHG                    ;SAVE BAUD RATE
6832  103A 213610               LXI     H,OUTH84+1      ;GET ADDR OF OUT INSTRUCTION TO MODIFY
6833  103D C603                 ADI     EPCMD           ;RET MODE REG POINTER
6834  103F CD5A0C               CALL    PIN             ; BY INPUTTING FROM COMMAND REG
6835  1042 3E03                 MVI     A,EPCMD         ;SHUT DOWN 2661
6836  1044 80                   ADD     B
6837  1045 77                   MOV     M,A
6838  1046 AF                   XRA     A
6839  1047 CD3510               CALL    OUTH84
6840  104A 3E02                 MVI     A,EPMODE        ;SET MODE REG 1
6841  104C 80                   ADD     B
6842  104D 77                   MOV     M,A
6843  104E 7B                   MOV     A,E             ; CHECK # STOP BITS
6844  104F FE05                 CPI     EPB300
6845  1051 3E40                 MVI     A,EPSB1
6846  1053 D25810               JNC     IN2661B
6847  1056 3EC0                 MVI     A,EPSB2
6848                    IN2661B:
6849  1058 F60E                 ORI     EPCL8+EPA16X
6850  105A CD3510               CALL    OUTH84
6851  105D 3E70                 MVI     A,70H           ;SET MODE REG 2
6852  105F B3                   ORA     E
6853  1060 CD3510               CALL    OUTH84
6854  1063 3E03                 MVI     A,EPCMD         ;SET COMMAND REG
6855  1065 80                   ADD     B
6856  1066 77                   MOV     M,A
6857  1067 3E37                 MVI     A,EPNORM+EPRTS+EPRESE+EPRXEN+EPDTR+EPTXEN
6858  1069 CD3510               CALL    OUTH84
6859  106C 3E00                 MVI     A,EPDATA        ;FLUSH INPUT BUFFER REGS
6860  106E 80                   ADD     B
6861  106F CD5A0C               CALL    PIN
6862  1072 3E00                 MVI     A,EPDATA
6863  1074 80                   ADD     B
6864  1075 CD5A0C               CALL    PIN
6865  1078 C9                   RET
6866
6867
6868
6869
6870                    ; IN8255 - INITIALIZE AN 8255
6871                    ;     A  HAS BASE PORT NUMBER
6872                    ;
6873
6874  1079 47           IN8255: MOV     B,A             ;SAVE BASE PORT #
6875  107A 213610               LXI     H,OUTH84+1      ;GET ADDR OF OUT INSTRUCTION TO MODIFY
6876  107D 3E03                 MVI     A,PPCTL         ;SET CONTROL WORD
6877  107F 80                   ADD     B
6878  1080 77                   MOV     M,A
```

```
6879  1081 3EAA          MVI   A,PPMSF+PPGAM1+PPGAPC+PPGBPB
6880  1083 CD3510        CALL  OUTH84
6881  1086 3E01          MVI   A,PPDS          ;SET DATA STROBE TO OFF (HIGH)
6882  1088 CD3510        CALL  OUTH84
6883  108B C9            RET
6884
6885
6886
6887  035A =       CLEN  EQU   $-HSTBUF        ;COLD BOOT CODE LENGTH
6888
6889                     PAGE
```

```
6890
6891                    ;+*********************
6892                    ;+
6893                    ;+  IF COLD BOOT CODE IS SMALLER THAN HOST BUFFER,
6894                    ;+  THEN FILL OUT 'HSTBUF' WITH DS STATEMENT.
6895                            IF      (CLEN-HSTSIZ) SHR 15
6896                            DS      HSTSIZ-CLEN
6897                    ;+  OTHERWISE REORG SO RUN-TIME VARIABLES CAN ALSO OVERLAY
6898                    ;+  COLD BOOT CODE.
6899                            ELSE
6900  0E32                      ORG     HSTBUF+HSTSIZ
6901                            ENDIF
6902                    ;+
6903                    ;+*********************
6904
6905  0E32              DIRBUF: DS      128
6906
6907                            IF      H17T
6908  0EB2              ALV0:   DS      12
6909  0EBE              CSV0:   DS      16
6910  0ECE              ALV1:   DS      12
6911  0EDA              CSV1:   DS      16
6912  0EEA              ALV2:   DS      12
6913  0EF6              CSV2:   DS      16
6914                            ENDIF
6915
6916                            IF      H37T
6917                    DPB37$0 DS      DPBL
6918                    ALV37$0 DS      50
6919                    CSV37$0 DS      64
6920                    DPB37$1 DS      DPBL
6921                    ALV37$1 DS      50
6922                    CSV37$1 DS      64
6923                    DPB37$2 DS      DPBL
6924                    ALV37$2 DS      50
6925                    CSV37$2 DS      64
6926                            ENDIF
6927
6928                            IF      H47T
6929                    ALV47$0 DS      77
6930                    CSV47$0 DS      64
6931                    ALV47$1 DS      77
6932                    CSV47$1 DS      64
6933                            ENDIF
6934
6935                            IF      H67T
6936                    DPB67$0 DS      DPBL
6937                    ALV67$0 DS      256
6938                    ALV67$1 DS      77
6939                    CSV67$1 DS      64
6940                            IF      H67PART2
6941                    DPB67$2 DS      DPBL
6942                    ALV67$2 DS      256
6943                            ENDIF
6944                            ENDIF
6945
```

6946 PAGE

```
                ;*********************
                ;
                ;  THE FOLLOWING AREAS CANNOT OVERLAY THE COLD BOOT CODE, SINCE
                ;  THEY CAN/ARE USED DURING COLD BOOT.
                ;
                ;  IF HOST BUFFER + RUN-TIME VARIABLES OCCUPY LESS SPACE THAN THE
                ;  COLD BOOT CODE, IT IS NECESSARY TO REORG PAST THE COLD BOOT CODE.
                ;
                ;*********************

                        IF      ((HSTBUF)-CLEN) SHR 15
108C                    ORG     HSTBUF+CLEN
                        ENDIF

108C            DPBX:   DS      2
108E            HSTDPB: DS      2

1090            DMAB:   DS      2               ;DMA BUFFER = USED TO STORE STARTING ADDRESS
                                                ;  OF TRACK DURING WARM BOOT
1092            SPT:    DS      1               ;NUMBER OF SECTORS PER TRACK (DURING WBOOT)
1093            XLTW:   DS      2               ;SECTOR XLATE TABLE (DURING WBOOT)
1095            SPTI:   DS      1               ;DITTO, BEYOND TRACK 0
1096            XLTW1:  DS      2               ;DITTO, BEYOND TRACK 0

1098            TRACK:  DS      1               ;       TRACK (# < 256)
1099            SECTOR: DS      1               ;       SECTOR
109A            SIDE:   DS      1
109B            RWOP    DS      1               ;I/O TYPE OPERATION
                                                ;0=READ  1=WRITE
109C            LSP:    DS      1               ;LOGICAL SECTORS PER PHYSICAL
109D            ERRCNT: DS      1               ;RETRY COUNTER
109E            ERRTYP: DS      1               ;TYPE OF ERROR
109F            TRKPT:  DS      2               ;CONTAINS POINTER TO TRACK REGISTER
                                                ;FOR CURRENT DRIVE
                ;
10A1            SEKDSK: DS      1               ;SEEK DISK NUMBER
10A2            SEKTRK: DS      2               ;SEEK TRACK NUMBER
10A4            SEKSEC: DS      1               ;SEEK SECTOR NUMBER
                ;
10A5            HSTDSK: DS      1               ;HOST DISK NUMBER
10A6            HSTTRK: DS      2               ;HOST TRACK NUMBER
10A8            HSTSEC: DS      1               ;HOST SECTOR NUMBER
                ;
10A9            SEKHST: DS      1               ;SEEK SHR SECSHF
                ;
10AA            UNADSK: DS      1               ;LAST UNALLOC DISK
10AB            UNATRK: DS      2               ;LAST UNALLOC TRACK
10AD            UNASI:  DS      1               ;LAST UNALLOC SECTOR INDEX INTO XLT TABLE
                ;
10AE            ERFLAG: DS      1               ;ERROR REPORTING
10AF            RSFLAG: DS      1               ;READ SECTOR FLAG
10B0            READOP: DS      1               ;1 IF READ OPERATION
10B1            WRTYPE: DS      1               ;WRITE OPERATION TYPE
10B2            DMAADR: DS      2               ;LAST DMA ADDRESS
```

```
7003
7004  10B4            HSAV:   DS      2               ;SAVED HL DURING INTERRUPT SERVICE
7005  10B6            RETSAV: DS      2               ;SAVED RETURN ADDRESS DURING INT SERVICE
7006  10B8            OLDSP:  DS      2               ;SAVE SP DURING INTERRUPT SERVICE
7007
7008                          IF      INTINP
7009
7010  10BA            CRTBUF: DS      40              ;CRT TYPE-AHEAD BUFFER
7011  10E2 =          CRTBND  EQU     $
7012  0028 =          CRTLEN  EQU     CRTBND-CRTBUF
7013
7014  10E2                    DS      16              ;LOCAL STACK FOR CRT INTERRUPT SERVICE
7015  10F2 =          LCLSTK  EQU     $
7016
7017                          ENDIF
7018
7019  10F2                    DS      32              ;STACK AREA DURING COLD & WARM BOOT
7020  1112            STACK   DS      0
7021
7022  1112 =          BIOSEND EQU     $
7023
7024  1112                    END
```

```
ALLOC           0305  1572  1580  1586  1590  1609  1637#
ALV0            0EB2   998  6908#
ALV1            0ECE  1012  6910#
ALV2            0EEA  1024  6912#
B110            0417   542# 6794
B1200           0060   548#
B134            0359   543#
B19200          0006   550#
B2400           0030   547#
B300            0180   544#  974   978
B4800           0018   548#  976
B600            00C0   545#
B75             0600   541#
B9600           000C   549#  972
BAT             0002   576#
BBDA            0049   102# 6178
BBDF            0048   101# 6187  6228  6497  6539
BBIOS           004E   107# 6264
BBP             004A   103# 6569
BDMAP           0040    99# 1342  6709
BDOS            F200    93#   94  1260
BDTYPE          0003   683#
BELL            0007   556# 1955  5235  6210
BEND            004B   985#
BIOS            0000    91#   93   984  1219  6263
BIOSEND         1112   984   985  6162  7022#
BIOSVER         0033   940#
BNDISKS         0051   988#
BOOT            0000    96#   97    98   109   110   111  1258  1259  1261  1262
                       5307
BRKKEY          0000    79# 5198  5267  5275  6294  6313
BSIZE           004A   984#
BTCD            0000   525# 6266
BTMSG           0CC0  1282  5882#
BTWM            00FF   524# 1252
BUFF            0080   110# 1264
BUPB            004D   105# 6571
BUSY            0C1C  4990  5475  5678#
CBH17           0EDD  6192  6234  6337#
CBH171          0F00  6359# 6379
CBH171A         0F1E  6366  6370  6373#
CBI1            0E63  6181  6218#
CBI2            0E80  6225  6254#
CBIA            0EDA  6219  6327# 6348  6408  6482  6536  6600
CBIB            0EDB  6179  6221  6223  6329# 6337  6390  6456  6469  6509  6522
CBIC            0EDC  6330# 6638  6708  6712
CBOOT           0D32   909  6021#
CBOOT1          0E3B  6166  6168#
CBTO            0D5E  6045  6050#
CBT1            0D9D  6056  6068  6092#
CBT1A           0E2A  6142  6160#
CBTF0           0F52  6605  6626#
CBTF1           0F56  6630# 6701
CBTF2           0F5C  6632  6634#
CBTF2A          0F8D  6664  6669#
CBTF3           0F95  6653  6680#
```

```
CBTF4           0FAA  6657  6677  6681  6697#
CBTF6           0FB2  6675  6686  6708#
CBTF7           0FC1  6602  6615  6720#
CBTFA           0FD6  6626  6652  6741#
CBTFIL          0F2D  6343  6396  6454  6507  6592#
CBTFIL1         0F33  6596# 6617
CBTFIL2         0F50  6613  6619#
CBTIA           0FD7  6594  6610  6660  6666  6688  6727  6742#
CCP             EA00    94#   95  1184  1194  1217  1278
CCPCLR          EA03    95# 1279
CDA             016F  1214  1238  1295#
CHKLAB          0894  2768  3951  4824#
CHKLAB1         089A  4829# 4833
CHKUNA          0291  1528  1552  1570#
CHKUNA5         02D0  1599  1603#
CHKUNA6         02DA  1602  1607#
CLEN            035A  6887# 6895  6896  6958  6959
CLK0            0844  4670  4673#
CLK1            0850  4684  4689  4695  4701  4716  4722  4728#
CLK2            0850  4734  4739#
CLK3            0866  4748  4755#
CLK4            087A  4745  4758  4761  4769#
CLKE            0002   491#
CLKR2           088A  4800  4804  4806#
CLKRET          087A  4679  4774  4787  4790  4798#
CLKVEC          0008   493# 6029  6030
CLOCK           082E  4658# 6028
CONDRQ          0002   285# 2981  3102
CONDS0          0010   288# 1041  3336  4793
CONDS1          0020   289# 1053  3336  4793
CONDS2          0040   290# 1065  3336  4793
CONDS3          0080   291# 3336  4793
CONIN           0906   912  1284  1950  4996#
CONIRQ          0001   284# 3031  3312
CONMFM          0004   286# 2751  3309
CONMO           0008   287# 3312  3317  4780  6405
CONOUT          0914   913  1956  5005# 5854  5876  6211  6761  6765
CONS            08E9  4971  4977#
CONST           08E1   911  4971#
CPHLDE          08A2  3962  3971  4499  4510  4844#
CR              000D   557#  559  1952  1988  5882  5887  6269  6279  6323
CRLF            0CFE  1863  1882  1959  5887#
CRT             0001   572#  586
CRTB            0D07  5102  5168  5210  5239  5252  5292  5897#
CRTBAUD         0039   972# 6092
CRTBND          10E2  5174  5248  7011# 7012
CRTBUF          10BA  5176  5250  5288  5898  5899  7010# 7012
CRTCTS          0D03  5509  5891#
CRTGET          0D08  5170  5177  5289  5898#
CRTIN           0996  4999  5001  5059  5139#
CRTIN1          0996  5163# 5164
CRTIN2          09AF  5175  5177#
CRTIS1          09D7  5207# 5273
CRTIS1A         09E9  5220# 5223
CRTIS1B         09F4  5219  5226# 5231
CRTIS1C         0A02  5225  5233#
```

```
CRTIS1D         0A08  5234  5237#
CRTIS2          0A11  5212  5243#
CRTIS3          0A20  5249  5251#
CRTIS4          0A27  5255# 5264
CRTIS5          0A35  5241  5263#
CRTIS6          0A39  5196  5266#
CRTISR          09B5  5184# 6033
CRTLEN          0028  5211  5240  7012#
CRTO1           0A59  5351  5358#
CRTOS           0B3C  5020  5345  5508#
CRTOS1          0B49  5497  5503  5515#
CRTOS1A         0B4C  5506  5516#
CRTOS2          0B56  5521  5526#
CRTOS3          0B61  5513  5538#
CRTOS4          0B6E  5544  5549#
CRTOSB          0B5F  5517  5535# 5540
CRTOUT          0A48  5008  5033  5048  5345# 5347
CRTPUT          0D0A  5244  5251  5290  5899#
CRTS2           0973  5108#
CRTS2A          0988  5110  5122#
CRTS2B          0992  5124  5127#
CRTS3           0993  5117  5120  5129#
CRTSTAT         096E  4980  4982  4992  5084# 5163
CSV0            0EBE   998  6909#
CSV1            0EDA  1012  6911#
CSV2            0EF6  1024  6913#
CTLC            0003   555#
CTLPRT          000D   495# 4663  6038
DADA            08A8  1343  1416  1604  3660  4050  4483  4855# 5066  6710
DAY             000F    25# 6277  6278
DBD             0ACD  5035  5436# 5438
DBD1            0AE7  5445  5450#
DBDCTS          0D06  5638  5894#
DBDOS           0BE4  5022  5436  5637#
DBDOS1          0C06  5642  5658#
DBDOS2          0C13  5663  5668#
DBDOSB          0C1C  5647  5652  5659  5679#
DCIE            0040   183#
DCLPOS          0D01  5411  5423  5607  5889#
DCOPY           000B   192#
DCRES           0002   184# 3715
DDMNT           000C   598# 1943
DDRD            0003   595# 1810
DDRES           0009   597#
DDSEL           0000   594# 1379
DDWR            0006   596# 1828
DECHK           0008   160# 2076
DEFIOB          0034   941# 6024
DEHCK           0004   159# 2505
DEHSY           0002   158# 2485
DELAY37         060F   307# 3035
DELAYS          060F   154# 2044
DEMDS           0020   162# 2062
DERNF           0010   161# 2498
DETRK           0001   157# 2161  2492
DEUNR           0080   164# 2141  2298
```

```
DEVCTL          000F   497# 2124  2231  2322  2441  2651  4750  4752  4763  4765
                       6346
DEWRP           0040   163# 2092  2141
DFDI            0020   130# 2436
DFHD            0001   133# 2274
DFMO            0010   129# 2318  2324  4751  6345
DFMT            000D   193#
DFMTD           000E   194#
DFMTD2          000F   195#
DFSD            0008   136# 2623
DFST            0040   131# 2444  2446
DFTO            0002   134# 2418  6369
DFWP            0004   135# 2091
DIOB            00A9   586#  941
DIRBUF          0E32   997  1011  1023  1038  1050  1062  1077  1086  1098  1109
                       1120  6905#
DLY             0731  2461# 2553
DLY1            0736  2464# 2465
DLYH            082C  4655#
DLYH37          0024   311#
DLYMO           082B  2045  2233  2313  4654# 4742
DLYMO37         0023   310# 3036  3304  3395  4771
DLYW            082D  2258  2350  2402  2406  2477  3341  3450  3460  3502  4656#
                       4801
DMAADR          10B2  1215  1470  1754  7002#
DMAB            1090  1201  1295  6966#
DMYIN           0C1E  5057  5465  5686#
DMYOUT          0C20  5046  5484  5687#
DPB17S          0D0C   997  1011  1023  5906#
DPBAL0          0009   657#
DPBAL1          000A   658#
DPBASE          0052   990# 4884  6342  6395  6453  6506
DPBBLM          0003   653#
DPBBSH          0002   652#
DPBCKS          000B   659#
DPBDRM          0007   656#
DPBDSM          0005   655#
DPBEXM          0004   654#
DPBL            000F   661#  689  2903  3988  6917  6920  6923  6936  6941
DPBOFF          000D   660#
DPBSPT          0000   651#  652   653   654   655   656   657   658   659   660
DPBX            108C  1350  1531  1542  1593  1616  1647  2718  2729  2745  2771
                      2783  2888  3624  3685  3938  3956  3965  3976  3997  4069
                      6963#
DPDC            007F   124# 2090  2125  2230  2273  2319  2417  2443  2445  2447
                      2531  2539  2563  2573  2622  2653  4753  4766  6368
DPE0            0052   995# 6342  6357
DPE1            006A  1009#
DPE2            0082  1021#
DPE2S           0001   628# 2789  2826  3269  3603  3609  3617  3687  3793  3794#
                      4074  4110  4116
DPE48RO         0010   620# 2890  3091  3428
DPE96T          0008   622# 2785  3197
DPE96TM         0001   642#
DPEASGN         0004   623# 1358  6567
DPEDD           0002   627# 1040  1052  1064  2731  2747  2773  2789  3307  3606
```

```
                        3609  3614  3617  3687  3999  4074  4113  4116
DPEDPB          000A     605#  1154  1617  2899  3673  3984  4061
DPEED           0004     626#  2789  3614  3617  3687
DPEFLAG         0010     610#  2787  2825  6474  6527  6566  6568
DPEFLG2         0016     640#  1913  2818  2819#  6362  6422  6648  6670  6671#  6729
DPEH17          0040     613#   999  1013  1025  1907  6191  6233
DPEH37          0060     614#  1040  1052  1064  1190  1909  2926  6196  6238
DPEH47          0080     615#  1079  1088  1169  1656  6201  6243
DPEH67F         00C8     617#   618  1122  1173  1660  3941  4361  6499
DPEH67H         00C0     616#  1100  1111  1192  1355  6206  6248  6541
DPEHL           0008     645#   688  6689
DPEHTH          0010     606#   610   630   631   632   633   635   639   640   643
                        1164  1182  1348  1543  1594  1617  1913  1919  1926  2216
                        2329  2372  2719  2787  2825  3285  3321  3374  3957  3961
                        3966  3970  3977  3979  4486  4505  4900  6357  6362  6417
                        6422  6648  6729
DPEIMG          0002     641#  1916  2809  2815  6365  6425  6651  6694  6732
DPEL            0018     607#  4880  4881#  6342  6375  6395  6437  6453  6473  6506
                        6526
DPELUN          0017     643#  1919  1926  6670  6671
DPEMO           0080     637#  2334  2335#  3326  3327#  3364  3478
DPENE           0000     612#
DPEP7C          0010     619#  6476  6529
DPERPAB         0013     632#  2818  2819  3977  3979
DPERPS          0012     631#
DPESEK          0015     635#  2329  3321  3360  3361#
DPETRK          0014     633#  2216  2372  2719  3285  3360  3361  3374  3957  3961
                        4486  6570
DPETYPE         00E0     611#   618  1168  1189  1410  1411  1412#  1655  1906  2785
                        6188  6229
DPETYPF         00E8     618#  1172  1354  1659  3940  4360  6498  6540
DPEUNIT         0011     630#  6548
DPEUNK          0080     634#  1044  1056  1068  2218  2721  3376
DPEUPB          0016     639#  3966  3970  4505  6572
DPEXLT          0000     604#
DRAS            0002     188#  3621
DRD             0007     190#  3723
DRS             0001     187#  3742
DSDONE          0020     179#  3728  3730  3767  3769  3853  3875  3886  3888
DSERR           0001     180#  3728  3730  3738  3764  3767  3769  3777
DSIE            0040     178#
DSKDIS          01F4    1380  1406#  1811  1829  1945
DSNS            0003     189#
DSTR            0080     177#  3728  3767  3886
DSYN            00FD     138#  2617  2662
DTT             0206    1415  1421#
DWR             0008     191#  3760
EPA16X          0002     783#  6849
EPA1X           0001     782#
EPA64X          0003     784#
EPASBL          00C0     795#
EPB050          0000     828#
EPB075          0001     829#
EPB110          0002     830#
EPB120          0007     835#
EPB134          0003     831#
```

```
EPB150          0004   832#
EPB180          0008   836#
EPB192          000F   843#
EPB200          0009   837#
EPB240          000A   838#
EPB300          0005   833#  980  6844
EPB360          000B   839#
EPB480          000C   840#
EPB600          0006   834#
EPB720          000D   841#
EPB960          000E   842#
EPBRS           000F   807#
EPCL            000C   786#
EPCL5           0000   787#
EPCL6           0004   788#
EPCL7           0008   789#
EPCL8           000C   790# 6849
EPCMD           0003   763# 6108  6113  6833  6835  6854
EPDATA          0000   759# 5790  5796  5797# 6859  6862
EPDCD           0040   775#
EPDSC           0004   770#
EPDSR           0080   776#
EPDTR           0002   813# 6110  6115  6857
EPFE            0020   773#
EPI             0C70  5381  5788# 5789
EPI1            0C76  5790#
EPIE            0001   897#
EPINT           0004   896#
EPMBRF          0003   780#
EPMODE          0002   762# 6840
EPMR2U          00F0   808#
EPNORM          0000   821# 6857
EPNSC           0080   802#
EPO             0C7B  5404  5795#
EPOE            0010   772#
EPOM            00C0   820#
EPOM1           0040   822#
EPOMLL          0080   823#
EPOMRL          00C0   824#
EPOS            0C68  5505  5781#
EPPC            0010   792#
EPPE            0008   771#
EPPT            0020   793#
EPRESE          0010   817# 6857
EPRTS           0020   818# 6857
EPRXEN          0004   814# 6857
EPRXR           0002   768# 5776
EPS             0C60  5393  5774# 5788
EPS1X           0000   781#
EPSB1           0040   796# 6845
EPSB15          0080   797#
EPSB2           00C0   798# 6847
EPSBRK          0008   815#
EPSD            0020   774#
EPSDLE          0008   816#
EPSTAT          0001   760# 5774  5781
```

```
EPSTC           0040   800#
EPSYN           0001   761#
EPTXE           0004   769#
EPTXEN          0001   812# 6857
EPTXR           0001   767# 5783
ERFLAG          10AE  1646  1771  1780  2018  2031  3070  3126  3754  4341  4387
                      4392  4452  4638  6998#
ERRCNT          109D  2149  2369  3169  3262  6979#
ERRMSG          0CF6  1876  5886#
ERRTYP          109E  1879  2139  2160  3156  3746  4012  4035  4177  4364  4443
                      6980#
EVENT           0000    77# 4730  6294  6307
EVTCTR          0829  4653# 4731  4736
EXPER           0000    75# 6271
FALSE           0000    55#   75    76    77    79   325
FCB             005C   109#
FDBASE          0078   204#  205   206   207   208   209   210   211
FDCD            0000   214# 2953  2984  3099  3387  3470  3508  6428
FDCFI           00D0   228# 3389  3510
FDCMD           007A   207# 2957  2989  3110  3390  3511
FDCON           0078   205# 2753  2982  3002  3032  3103  3313  3392  4782  4795
FDCRDA          00C0   225# 2740  2754  2829  2871
FDCRDS          0080   223# 3061
FDCRDT          00E0   226#
FDCRST          0000   218# 3365
FDCSEK          0010   219# 3479
FDCSTI          0040   221#
FDCSTO          0060   222#
FDCSTP          0020   220#
FDCWRS          00A0   224# 3105
FDCWRT          00F0   227#
FDDAT           007B   209# 2993  3114  3397  3473
FDFDDM          0001   246#
FDFDLF          0004   244#
FDFHLB          0008   232# 3479
FDFII0          0001   250#
FDFII1          0002   251#
FDFII2          0004   252#
FDFII3          0008   253#
FDFINI          0000   249# 3389  3510
FDFMRF          0010   242#
FDFS12          0001   237#
FDFS20          0002   238#
FDFS30          0003   239# 1045  1057  1069
FDFS6           0000   236#
FDFSLF          0008   243# 3061  3105
FDFSS1          0002   245# 2829  3277
FDFUTR          0010   231#
FDFVRF          0004   233#
FDHDD           0014   306# 3534
FDINT           0079   206# 2954  2985  3100  3292  3388  3432  3440  3456  3471
                      3509  6429
FDRACRC         0004   274#
FDRAL           0006   275# 2934
FDRASEC         0002   272#
FDRASID         0001   271# 2834
```

```
FDRASL          0003   273# 2759
FDRATRK         0000   270# 2876
FDSBSY          0001   267#
FDSCRC          0008   263#
FDSEC           007A   210# 3458
FDSHLD          0020   258#
FDSIND          0002   266# 3527
FDSL128         0000   278#
FDSL1K          0003   281#
FDSL256         0001   279# 2760
FDSL512         0002   280#
FDSLDT          0004   265#
FDSNRD          0080   256# 3158  3551
FDSRNF          0010   262#
FDSRTE          0020   259#
FDSSEK          0010   261#
FDSTA           007A   208# 3237  3403  3526  6430
FDSTKO          0004   264# 6431
FDSWPV          0040   257# 3092  3158
FDSWTF          0020   260#
FDTRK           007B   211# 3294  3435  3442
FDTS            0001   215# 3291  3431  3439  3455
FIL1            0387  1728  1733#
FIL2            038E  1731  1736#
FILHST          0367  1690  1720#
FLUSH           0404  1367  1836#
FLUSH1          0412  1267  1786  1838  1844# 5305
GETDPE          08AD  1346  4868# 4898
GETDPEX         08BE  1900  1923  4897# 6646  6726
GOTOIT          0963  4988  5044  5055  5064#
GOW             012E  1254# 6267
GOW1            0155  1272  1274#
H11LPTP         00D0   533#  981
H11PT2          0044   979# 5380  5392  5504  6106  6112  6135
H11PT3          0047   981# 5429  5569  6140
H11TTY          00D8   532#  979
H17DVD          04FC  1426  1999#
H17E            05CC  2078  2128  2138# 2299
H17E1           0608  2176  2185#
H17E2           0613  2162  2166  2192#
H17E3           0616  2179  2183  2186  2190  2194#
H17E4           0618  2143  2151  2201#
H17MSG          0620  2201  2207#
H17ND           0003    86#  506  6341  6354
H17T            0001     2#   61    64    86   994  1425  1896  1903  1968  1995
                      4741  5293  5905  5971  6190  6232  6281  6332  6907
H37CTL          0025   312# 2749  2980  3001  3029  3101  3315  3393  4779  4781
                      4792  4794  6406
H37ED           0000    81#  518  2723  6295  6316
H37IRET         0026   313# 2950  2977  3107  3239  3396
H37ND           0000    87#  506  6394  6414
H37T            0000     3#   61    64    81    87   518  1035  1187  1431  1896
                      1903  1968  2689  4770  5296  6195  6237  6284  6385  6916
H37VEC          0020   309#  310   311   312   313  6401  6402
H47CTL          0000   173# 6457  6458# 6463  6464
H47DAT          0001   174# 6463  6464#
```

```
H47ED           0000    83#  518  3611  3636  3705  5951  6295  6319
H47ND           0000    88#  506  6452  6472
H47T            0000     4#   61    64    83    88   518  1074  1162  1437  1653
                       3579  5299  5918  5951  5978  6200  6242  6287  6447  6928
H67BLKIO        0001   322# 4167  4230  4241  4302
H67MAX          801A   467#
H67MIN          0122   466#
H67ND           0000    89#  506  6505  6525
H67PART2        0000    72#   89  1106  6294  6301  6496  6940
H67T            0000     5#   61    64    69    89  1095  1162  1187  1445  1653
                       3918  5302  5918  5978  6205  6247  6290  6489  6935
H84CRT          00E8   530#  971
H84LPT          00E0   536#  975
H84PT1          0038   971# 5093  5122  5148  5192  5228  5508  6058  6093  6097
H84PT2          003B   973# 5374  5388  5499  6149
H84PT3          003E   975# 5419  5582  5637  6138  6152
H84PT4          0041   977# 5462  5472  5495  6155
H84RDP          00D8   537#  977
H84TTY          00D0   535#  973
H85CRT          00FA   529# 5096  5115  5119  5153  5157  5221  5224  5266  5272
                       5309  5311  5314  5322  5366  5538  5553  6074  6077  6080
                       6087
H88CTL          00F2   488# 4665  6040
H893            0E08  6116  6128  6144#
H8CTL           00F0   485# 4671  6046
H8FLAG          000E   496# 6054
H8TR            00D0   486#
HD0CON          0005   374# 4160
HD0LA0          0003   372#
HD0LA1          0002   371#
HD0LA2          001F   370#
HD0LULA         0001   368# 6549
HD0LUN          00E0   369#
HD0NB           0004   373#
HD0OP           0000   367# 4140  4158
HD1CON          0009   390#
HD1LA0D         0007   388#
HD1LA0S         0003   382#
HD1LA1D         0006   387#
HD1LA1S         0002   381#
HD1LA2D         001F   386#
HD1LA2S         001F   380#
HD1LUAD         0005   384#
HD1LUAS         0001   378#
HD1LUND         00E0   385#
HD1LUNS         00E0   379#
HD1NB           0004   383#
HD1OP           0000   377#
HD1SPAR         0008   389#
HD6LUN          0001   394# 4198
HD6OP           0000   393# 4200
HD6TFC          0005   395# 4194
HDBACK          0001   349#
HDBBSY          0008   346# 4534  4549  6557
HDBCMD          0010   345# 4251  4266  4312  4326  4565  4570
HDBIO           0040   343# 4565  4570
```

```
HDBIRQ  0002  348#
HDBMSG  0020  344#
HDBPE   0004  347# 4425
HDBREQ  0080  342# 4247  4248# 4262  4263# 4308  4309# 4322  4323# 4411
              4412# 4565  4566  4567# 4570
HDCCPY  0020  363#
HDCFBS  0007  358#
HDCFD   0004  356#
HDCFDD  0000  364# 4199
HDCFT   0006  357#
HDCON   0001  330# 6516  6517
HDCRCL  0001  353# 4139
HDCRD   0008  359# 4226
HDCRS   0003  355# 4157
HDCRSY  0002  354#
HDCSEK  000B  362# 4615
HDCTDR  0000  352#
HDCWPS  0009  360#
HDCWR   000A  361# 4297
HDDAT   0000  329# 6510  6511# 6516  6516  6517  6517
HDEBBF  0019  451#
HDEBP   0081  459# 4426
HDECDF  0018  450#
HDECLS  00F0  428# 4365
HDECLS0 0000  429#
HDECLS1 0010  430# 4366
HDECLS2 0020  431#
HDECLSZ 0080  432#
HDEDAM  0013  446#
HDEDNR  0004  438# 4036
HDEDNS  0005  439#
HDEFE   001A  452#
HDEIAM  0012  445# 4013
HDEIC   0020  454#
HDEIDA  0021  455#
HDEIF   0022  456#
HDEIR   0010  443#
HDEMDS  0007  441#
HDENIS  0001  435#
HDENS   0000  434#
HDENSC  0002  436#
HDENTO  0006  440#
HDENZM  0080  458# 4421
HDEOB   0083  461# 4588
HDEPAR  0082  460# 4434
HDERNF  0014  447# 4015
HDESE   0015  448#
HDETO   0084  462# 4582
HDEUD   0011  444#
HDEWF   0003  437# 4445
HDEWP   0017  449#
HDFACKH 0080  335#
HDFDDEC 0040  399#
HDFDE   0002  339# 4560
HDFDEN  0002  402# 4001  4020
HDFDR   0080  398#
```

```
HDFEI           0020  337#
HDFERR          0002  407#  4430  4433
HDFLBO          00E0  413#
HDFLUN          00E0  406#
HDFPE           0001  408#  4430
HDFRES          0010  338#  4125
HDFSEL          0040  336#  4543
HDFSID          0001  403#  4028  4040
HDFSYN          000F  414#
HDSBAV          0080  418#
HDSEC           000F  420#  4176
HDSET           0030  419#  4176
HDSLA0          0003  425#
HDSLA1          0002  424#
HDSLA2          001F  423#
HDSLBS          0001  412#
HDSLULA         0001  421#
HDSLUN          00E0  422#
HDSMBO          0000  411#
HDSSB           0000  417#
HDSTA           0001  331#  6516  6517#
HDSWI           0002  332#
HLIHL           08C6  1149  1156  1417  1545  1596  1619  2901  3959  3968  3986
                      4488  4507  4909#  5067
HLTG            0014   151#  2349
HOME            017B   917  1311#
HOMED           0185  1313  1315#
HOUT            0CA8  1880  5863#
HSAV            10B4  4658  4809  5184  5260  7004#
HSCNT           0AED  5441  5456#  5656
HST             0006   152#  2403  2405
HSTACT          0D2F  1314  1686  1836  1845  6003#
HSTBUF          0D32  1751  2060  2101  2776  2787  2825  2902  3062  3109  3823
                      3961  3970  3979  3987  4229  4300  4827  6011#  6887  6900
                      6958  6959
HSTDPB          108E  1901  1944  1962  2215  2315  2328  2371  2448  3089  3195
                      3267  3284  3305  3320  3373  3426  3790  3810  4195  4358
                      4462  4485  4504  6361  6374  6421  6436  6964#
HSTDSK          10A5  1694  1721  1806  1825  6988#
HSTSEC          10A8  1710  1725  2008  2021  2707  3280  3813  3936  4482  6990#
HSTSIZ          0100   519#   521#  6895  6896  6900
HSTTRK          10A6  1700  1723  2011  2024  2705  3264  3798  3947  4008  4470
                      6416  6989#
HSTWRT          0D30  1311  1715  1737  1762  1778  1840  1846  6004#
IN2661          1038  6136  6830#
IN2661B         1058  6846  6848#
IN821           1020  6796  6798#
IN8250          0FF5  6094  6139  6150  6153  6156  6774#
IN8255          1079  6141  6874#
INDXIT          0962  4978  4997  5006  5018  5031  5063#
INTINP          0001    78#    79  5085  5101  5140  5162  5896  6032  6082  6096
                      6294  6310  7008
IOO             0040   490#
IOBYTE          0003    97#  4977  4986  4996  5005  5015  5028  5040  5053  6025
IPIN            0A42  5336#
IPIN1           0A45  5336  5337#
```

```
IPINX           0A41  5194  5200  5229  5279  5335#
IUI1            0A40  5205  5276  5286  5328#
LABBUF          0000   682#  683   685
LABCS           001C   689#  691
LABDPB          000D   688#  689  2902  3987
LABEL           0004   685#  686   691  2776  4827
LABHTH          0005   687#  688  2787  2825  3961  3970  3979
LABLEN          0019   691# 2775  4826
LABTYP          0004   686#  687
LABVER          0000   680# 2925
LCLSTK          10F2  5191  7015#
LEVEL           0020    23# 6276
LF              000A   558# 1988  5882  5887  6269  6269  6279  6323
LIST            0932   914  5009  5010  5028#
LISTST          0922   924  5015#
LOGDSK          0004    98# 1275  1392  6184  6261
LOOP1           102E  6811# 6814
LPS             073F  2057  2097  2477#
LPS0            073C  2475# 2479
LPS1            0748  2483# 2511
LPS2            0772  2486  2493  2499  2507#
LPSA            0014   140# 2481
LPT             0002   579#  586
LPTBAUD         003F   976# 6137  6151
LPTCTS          0D04  5420  5563  5892#
LPTOS           0B76  5021  5415  5563#
LPTOS0          0BB8  5594  5598#
LPTOS1          0BC9  5604  5610#
LPTOS2          0BBF  5580  5602#
LPTOS3          0B9E  5568  5582#
LPTOS4          0BDE  5619  5623#
LPTOS4A         0BE1  5621  5625#
LPTOS5          0B96  5576  5578#
LPTOSB          0BE2  5579  5584  5600  5628#
LPTOU1          0AAC  5415# 5417
LPTOU2          0AB3  5413  5419#
LPTOUT          0AA5  5034  5411#
LSP             109C  1670  1729  1740  6978#
M1              03A3  1747# 1749
M1H             0020   489#
M2              03A8  1745  1751#
MAI             0710  2182  2388  2436#
MAO             0715  2189  2397  2422  2438#
MAO1            0716  2437  2439#
MATCH           0392  1712  1740#
MDCTS           0D05  5496  5893#
MDIN            0AEE  5058  5462#
MDOS            0B1C  5485  5495#
MDOUT           0B0A  5047  5482#
MDOUT1          0B12  5485# 5487
MDSTAT          0AFC  4991  5472#
MIJMP           00C3   483# 1256  6027  6399
MNMSG           04D2  1947  1988#
MNMSGA          04DD  1936  1989#
MNMSGB          04E8  1941  1990#
MNTH17          0624  2004  2215#
```

```
MNTNUL          081C  4630  4636#
MODE            0036   946#  1271  1370  1383  1858  5086  5108  5141  5214  5349
                       5511  5592  6050  6052  6069  6071
MODE2           0037   955#  5375  5389  5402  5425  5463  5473  5482  5501  5565
                       5573  5616  6130  6144
MODE2B0         0001   956#  5376  5390  5403  5426  5427  5464  5474  5483  5502
                       5566  5567  5617  5618  6132  6146
MODE2B1         0002   955   958#  5426  5427  5566  5567  5617  5618
MODE2B2         0004   955   960#  5574
MODEB0          0001   947#  5089  5090#  5111  5112#  5144  5145#  5216  5217#  5352
                       5353#  6051  6070
MODEB1          0002   948#  1373  1859
MODEB2          0004   949#  5593
MODEB3          0008   946   951#
MODEB6          0040   952#
MODEB7          0080   953#
MONTH           0009    24#  6277  6277
MOVEIT          08CC  2778  4927  4928#  4940#  6690
MOVEIT1         08D8  4942  4948#  4954
MOVEITX         08CB  1766  2904  3989  4924#  4928
MUC             0C92  5365  5727  5836#
NDISKS          0003   506#  511   988  1339
NIBBL1          0CBA  5872  5874#
NIBBLE          0CB1  5868  5870#
NOMATCH         0360  1696  1702  1706  1715#
NOOVF           02FE  1623  1632#
NSBT37          003C   305#
NSEC67          9880   470#  472#
NSECTS          002C   515#  1185
NSPT67          001A   474#  4479  4480#
NSYS67H         0001   475#
NTRKD37         0050   295#
NTRKS37         0028   294#
NULDVD          080D  1422  1423  1428  1434  1440  1443  1448  1451  4626#
NULL            0000   554#  5530  5552  5615
OLDSP           10B8  5190  5255  7006#
ONH17           0678  2256  2310#  2366
ONH17A          06A9  2325  2344#
ONH17B          06B4  2338  2342  2348  2350#
OUTH84          1035  6061  6064  6099  6101  6109  6111  6118  6122  6124  6776
                       6782  6785  6788  6792  6798  6802  6819#  6832  6839  6850
                       6853  6858  6875  6880  6882
PADCH           000D   559#  5729
PARTITN         0000    69#   72   946  1352  3954  6294  6298  6565
PIN             0C5A  5760#  6066  6834  6861  6864
PIN1            0C5D  5760  5761#
PINX            0C59  5571  5590  5699  5706  5759#  5775  5782  5791  6114  6126
PMSG            0C9B  1283  1864  1866  1874  1877  1883  1948  1960  5849#  5857
                       6161  6170
POUT            0C32  5719#  5799  5814
POUT1           0C3F  5719  5728#
POUT2           0C41  5368  5729#
PPBS0           0000   878#
PPBS1           0002   879#
PPBS2           0004   880#
PPBS3           0006   881#
```

```
PPBS4           0008   882#
PPBS5           000A   883#
PPBS6           000C   884#
PPBS7           000E   885#
PPBSEL          000E   877#
PPBSR           0001   887#
PPCTL           0003   855# 5816  6876
PPDATA          0000   852# 5811  5812#
PPDATB          0001   853#
PPDATC          0002   854# 5570
PPDS            0001   901# 5819  5820# 5823  6881
PPGAM0          0000   863#
PPGAM1          0020   864# 6879
PPGAM2          0040   865#
PPGAMS          0060   862#
PPGAPA          0010   867#
PPGAPC          0008   868# 6879
PPGBM0          0000   871#
PPGBM1          0004   872#
PPGBMS          0004   870#
PPGBPB          0002   874# 6879
PPGBPC          0001   875#
PPMSF           0080   859# 6879
PPO             0C7F  5430  5620  5810#
PPO1            0C8F  5822  5824#
PPO1A           0C90  5817  5825#
PPRDY           0080   902# 5578
PRTERR          041D  1858# 2202  3214  3749  4449
PRTERR1         043B  1871  1873#
PRTRDY          0035   942# 5598
PTP             0001   574#
PTR             0001   573#
PUNCH           0942   915  5040#
RD17            0549  2014  2053#
RD171           054C  2055# 2079
RD172           0562  2065# 2070
RD17E           0575  2058  2063  2078#
RD17M           050B  2001  2008#
RDB             07BB  2065  2073  2488  2489  2495  2502  2592# 2594
RDH1            0520  2016  2018#
RDMSG           0CE9  1869  5884#
RDNUL           081C  4627  4633#
RDPBAUD         0042   978# 6154
RDRST           08F7  4981  4986#
RDYH17          063A  2000  2255#
RDYH17A         0640  2259# 2262
RDYH17B         064F  2272# 2289
RDYH17B1        065B  2282# 2284
RDYH17C         065F  2276  2286#
RDYH17D         0670  2292  2297#
RDYH17E         0675  2295  2301#
READ            022F   922  1222  1508#
READA           0030   149# 2614
READER          0953   916  5000  5053#
READHST         03E3  1735  1802#
READOP          10B0  1511  1524  1726  1756  7000#
```

```
RESH17          062D  2003  2229# 5294  6350
RESNUL          081C  4629  4635#
RETRIES         000A   155# 2368
RETSAV          10B6  4660  4807  5186  5258  7005#
RSFLAG          10AF  1512  1633  1640  1733  6999#
RW0             0318  1661  1665  1669#
RW1             031F  1673# 1681
RW2             032C  1677  1682#
RW9             03DB  1772  1782#
RW9A            03DD  1776  1785#
RWMOVE          03BF  1758  1766#
RWOP            109B  1804  1823  1868  6976#
RWOPER          030D  1515  1634  1645#
SBCBEL          0003   746#
SBCBSA          0018   704#
SBCBSB          001B   705#
SBCCBA          0036   717#
SBCCBB          0038   718#
SBCCPV          002A   711#
SBCCSA          0032   715#
SBCCSB          0034   716#
SBCDBS          0005   703#
SBCJMP          0000   700#
SBCLEN          0080   720#
SBCNSL          0031   714#
SBCREV          0004   702#
SBCSBA          001E   706#
SBCSBB          0021   707#
SBCSBC          0000   698#
SBCSPS          002C   712#
SBCSPT          0026   709#
SBCSSZ          0024   708#
SBCTPC          0028   710#
SBCVER          0003   701#
SBCVSZ          002E   713#
SDP             06B9  2053  2088  2365# 6367
SDT             06D5  2055  2095  2390# 2399  6371
SDTO            06D1  2387# 2394
SDT1            06E9  2393  2402# 2427
SECNT17         004D   986# 2145  2147
SECNT37         004F   987# 3164  3166
SECTOR          1099  2009  2022  3282  3457  6974#
SECTRAN         0222   925  1207  1482#
SECTRAN1        022D  1486  1491#
SEKDSK          10A1  1276  1345  1376  1537  1577  1693  1720  6984#
SEKHST          10A9  1683  1709  1724  6992#
SEKSEC          10A4  1461  1550  1554  1601  1605  1672  1742  6986#
SEKTRK          10A2  1199  1248  1324  1539  1583  1587  1662  1699  1703  1722
                      6985#
SERVEC          0018   498# 6034  6035
SETDE           01DF  1340  1359  1385  1391#
SETDE1          01EB  1394  1396#
SETDMA          021C   921  1265  1468#
SETDSK          018E   918  1143  1335#
SETDSK1         01B2  1356  1362#
SETDSK2         01DB  1365  1387#
```

```
SETDSKA         01EF  1338  1391  1399#
SETDSKB         01F0  1336  1363  1400#
SETDSKC         01F1  1347  1388  1401# 2898  3663  3983  4052
SETDSKD         01F3  1372  1382  1402#
SETNUL          081C  4626  4632#
SETSEC          0216   920  1211  1459#
SETTRK          0188   919  1322#
SHD             0451  1377  1807  1826  1895#
SHD1            046A  1908  1912#
SHD2            0481  1917  1926#
SHD3            04AF  1950# 1957
SHD4            04BF  1953  1959#
SHD5            04C5  1930  1962#
SHD6            04C8  1910  1966#
SHD9            04C9  1934  1939  1978#
SHDA            04D0  1897  1928  1985#
SHDB            04D1  1898  1922  1938  1986#
SHUGART         0000   325#  469
SIDE            109A  3060  3104  3279  3797  3803  3817  6975#
SMSG0           0E8F  6160  6269#
SMSG1           0E93  6169  6270#
SPBEOL          001F   737#
SPBFSN          0001   739#
SPBOSD          0000   724#
SPBOSI          0000   734#
SPBOSL          0010   729#
SPBOSM          001F   735#  737
SPBOSN          0010   730#
SPBPAT          0001   725#
SPBPEL          0004   742#
SPBUAR          001E   736#
SPD             00FA   150# 2337
SPT             1092  1159  1177  1234  1242  6968#
SPT1            1095  1158  1241  6970#
STACK           1112  1137  6022  7020#
STEPR           000F   153# 1004  1018  1030
STS             077D  2475  2508  2529#
STS1            0789  2539# 2546
STS2            0799  2533  2541  2551#
STS3            07A1  2547  2554#
STSA            0005   141# 2543
STSB            0007   142# 2552
STZ             06F5  2192  2380  2414# 6372
STZ0            06F7  2416# 2423
STZ1            0708  2419  2421  2424#
TICCNT          000B   494# 2264  2462  2537  3517  4673  4675  4798
TOD             0000    76# 4647  4681  6294  6304
TODVAL          0823  4650# 4685  4713
TPA             0100   111#
TRACK           1098  2012  2025  2391  2490  2868  3185  3188  3202  3206  3265
                      3271  3418  3436  3441  6356  6973#
TRKPT           109F  2172  2374  2390  2425  3287  3356  3416  3433  3446  3475
                      6981#
TRUE            0001    56#   57    58#   69    72    78    81    83   322   508
                      509#
TTY             0000   570#
```

```
TTY11B          0045   980# 6134
TTYBAUD         003C   974# 6148
TTYCTS          0D02  5500  5890#
TTYIN           0A68  4998  5056  5374#
TTYIN1          0A79  5377  5380#
TTYIN2          0A7F  5379  5382#
TTYOS           0B25  5019  5399  5499#
TTYOUT          0A93  5007  5032  5045  5399# 5401
TTYSTAT         0A82  4979  4989  5388#
TYDN            0FD9  6168  6750#
TYDN1           0FDB  6751# 6754
TYDN2           0FE4  6752  6756#
U0              0002   126# 1000  2345  4764
U1              0004   127# 1014  2345  4764
U2              0008   128# 1026  2345  4764
UC1             0003   581#
UDLY            07B6  2567  2584# 2585
UI              0C52  5149  5378  5466  5750# 5751
UI1             0C58  5649  5752#
UL1             0003   584#
UNACNT          0D31  1509  1536  1570  1576  1638  1847  6005#
UNADSK          10AA  1538  1578  6994#
UNASI           10AD  1551  1566  1600  1603  1608  6996#
UNATRK          10AB  1540  1584  1627  1629  6995#
UO              0C31  5356  5405  5428  5439  5488  5531  5623  5674  5712#
UOS             0C29  5515  5583  5658  5705#
UP1             0002   578#  586
UP2             0003   583#
UPDP            007C   119# 2596  2633  2679
UPFC            007D   120#
UPSC            007E   122# 2618
UPSR            007E   123# 2619
UPST            007D   121# 2592  2674
UR1             0002   577#  586
UR2             0003   582#
US              0C21  5094  5391  5476  5646  5698# 5750
VERS            0004    22#  940  6276  6276
WBOOT           009A   910  1137# 1285
WBOOTE          0003   910# 1257
WBT02           00CE  1193  1197#
WBT1            00D1  1199# 1250
WBT2            00D8  1203# 1236
WBT3            0108  1218  1220  1232#
WBT4            012C  1229  1252#
WBTE            0163  1146  1225  1282#
WHD             07A3  2563# 2565
WHDA            0014   143# 2281  2566
WHNA            0014   144# 2576
WNB             07FF  2112  2118  2120  2121  2122  2658  2673#
WNB1            0800  2674# 2676
WNH             07AE  2551  2573# 2575
WR17            057E  2027  2088#
WR171           0581  2090# 2129
WR172           059A  2104# 2105
WR173           05A5  2111# 2115
WR17E           05C3  2093  2098  2128#
```

```
WR17M           0524  2002  2021#
WRALL           0000  1502#
WRDIR           0001  1503# 1770
WRH1            0539  2029  2031#
WRITA           0014   146# 2103
WRITB           000A   147# 2107
WRITC           0010   148# 2108
WRITE           0243   923  1523#
WRITE0          027E  1549  1554#
WRITE1          0284  1558# 1563
WRITE2          028D  1559  1565#
WRITEHST        03F3  1717  1779  1821# 1842
WRKVAR          0001  6295# 6296
WRKVARX         0001  6294# 6295
WRMSG           0CEF  1872  5885#
WRNUL           081C  4628  4634#
WRTYPE          10B1  1514  1526  1769  7001#
WRUAL           0002  1504# 1513  1527
WSC             07C9  2061  2484  2614#
WSC0            07CB  2615# 2616
WSC1            07D8  2622# 2626
WSC2            07E5  2624  2633#
WSCA            0050   145# 2620
WSP             07EA  2109  2646# 2647
WSP1            07F4  2657# 2660
XIT             053E  2042# 2080  2130  2302
XLT17           0D1B   995  1009  1021  5972#
XLTW            1093  1151  1178  1205  1244  6969#
XLTW1           1096  1150  1243  6971#
XOK             053D  2041# 2075  2126  6381
YEAR            0052    26# 6278  6278
```