‖ DIGITAL RESEARCH

Post Office Box 579, Pacific Grove, California 93950, (408) 373-3403

MDS BASIC I/O SYSTEM (BIOS)

```
                                              ┌─────────────────────────────┐
                                              │ CP/M VERSION _____ │     1500 C34415              JMP    BOOT
                                              │                             │     1503 C35415    WBOOTE: JMP    WBOOT
            BIOS                              │     COPYRIGHT © 1976        │     1506 C3F815             JMP    CONST
                                              │     DIGITAL RESEARCH        │     1509 C3F815             JMP    CONIN
                                              │     P. O. BOX 579           │     150C C30116             JMP    CONOUT
                                              │  PACIFIC GROVE, CA. 93950   │     150F C31716             JMP    LIST
                        ; MDS I/O DRIVERS FOR CP/M                          │     1512 C31A16             JMP    PUNCH
                        ; VERSION 1.3  OCTOBER, 1976                        │     1515 C31D16             JMP    READER
         0000 =  BIAS   EQU    000H    ;FOR RELOCATION │ SER. # _____  │     1518 C32016             JMP    HOME
                        ;                └──────────────────────────────────     151B C32516             JMP    SELDSK
                        ; COPYRIGHT (C) 1976                                      151E C33B16             JMP    SETTRK
                        ; DIGITAL RESEARCH                                        1521 C34016             JMP    SETSEC
                        ; BOX 579, PACIFIC GROVE CA.                              1524 C34516             JMP    SETDMA
                        ;                                                         1527 C34B16             JMP    READ
                        ;                                                         152A C35416             JMP    WRITE
                                                                                  ;
         000D =  VERS   EQU    13        ;CPM VERSION NUMBER                       ;
         1500 =  PATCH  EQU    1500H+BIAS                                          ;     END OF CONTROLLER - INDEPENDENT CODE, THE REMAINING SUBROUTI
                        ;                                                          ;     ARE TAILORED TO THE PARTICULAR OPERATING ENVIRONMENT, AND MU
         1500           ORG    PATCH                                              ;     BE ALTERED FOR ANY SYSTEM WHICH DIFFERS FROM THE INTEL MDS
         0000 =  CPMB   EQU    000H+BIAS      ;BASE OF CPM CONSOLE PROCESSOR       ;
         0906 =  BDOS   EQU    906H+BIAS      ;BASIC DOS (RESIDENT PORTION)        ;     THE FOLLOWING CODE ASSUMES THE MDS MONITOR EXISTS AT 0F800H
         1500 =  CPML   EQU    $-CPMB   ;LENGTH (IN BYTES) OF CPM SYSTEM           ;     AND USES THE I/O SUBROUTINES WITHIN THE MONITOR
         002A =  NSECTS EQU    CPML/128  ;NUMBER OF SECTORS TO LOAD                ;
         0900 =  LBIAS  EQU    900H-CPMB ;LOADER BIAS VALUE USED IN SYSGEN         ;     WE ALSO ASSUME THE MDS SYSTEM HAS TWO DISK DRIVES AVAILABLE
         0002 =  OFFSET EQU    2        ;NUMBER OF DISK TRACKS USED BY CPM  0002 =  NDISKS EQU    2     ;NUMBER OF DRIVES AVAILABLE
         0004 =  DISKA  EQU    04H      ;ADDRESS OF LAST LOGGED DISK ON WARM START 00FD =  REVRT  EQU    0FDH  ;INTERRUPT REVERT PORT
         0080 =  BUFF   EQU    80H      ;DEFAULT BUFFER ADDRESS              00FC =  INTC   EQU    0FCH  ;INTERRUPT MASK PORT
         000A =  RETRY  EQU    10       ;MAX RETRIES ON DISK I/O BEFORE ERROR 00F3 = ICON   EQU    0F3H  ;INTERRUPT CONTROL PORT
                        ;                                                    007E =  INTE   EQU    0111$1110B  ;ENABLE RST 0(WARM BOOT), RST 7 (MON
                        ; PERFORM FOLLOWING FUNCTIONS                              ;
                        ; BOOT    COLD START                                       ;     MDS MONITOR EQUATES
                        ; WBOOT   WARM START (SAVE I/O BYTE)                 F800 =  MON80  EQU    0F800H  ;MDS MONITOR
                        ; (BOOT AND WBOOT ARE THE SAME FOR MDS)             FF0F =  RMON80 EQU    0FF0FH  ;RESTART MON80 (DISK SELECT ERROR)
                        ; CONST   CONSOLE STATUS                             F803 =  CI     EQU    0F803H  ;CONSOLE CHARACTER TO REG-A
                        ;         REG-A = 00 IF NO CHARACTER READY           F806 =  RI     EQU    0F806H  ;READER IN TO REG-A
                        ;         REG-A = FF IF CHARACTER READY              F809 =  CO     EQU    0F809H  ;CONSOLE CHAR FROM C TO CONSOLE OUT
                        ; CONIN   CONSOLE CHARACTER IN (RESULT IN REG-A)     F80C =  PO     EQU    0F80CH  ;PUNCH CHAR FROM C TO PUNCH DEVICE
                        ; CONOUT  CONSOLE CHARACTER OUT (CHAR IN REG-C)      F80F =  LO     EQU    0F80FH  ;LIST FROM C TO LIST DEVICE
                        ; LIST    LIST OUT (CHAR IN REG-C)                   F812 =  CSTS   EQU    0F812H  ;CONSOLE STATUS 00/FF TO REGISTER A
                        ; PUNCH   PUNCH OUT (CHAR IN REG-C)                        ;
                        ; READER  PAPER TAPE READER IN (RESULT TO REG-A)           ;     DISK PORTS AND COMMANDS
                        ; HOME    MOVE TO TRACK 00                           0078 =  BASE   EQU    78H     ;BASE OF DISK COMMAND IO PORTS
                        ;                                                    0078 =  DSTAT  EQU    BASE    ;DISK STATUS (INPUT)
                        ; (THE FOLLOWING CALLS SET-UP THE IO PARAMETER BLOCK FOR THE 0079 = RTYPE EQU  BASE+1  ;RESULT TYPE (INPUT)
                        ; MDS, WHICH IS USED TO PERFORM SUBSEQUENT READS AND WRITES) 007B = RBYTE EQU  BASE+3  ;RESULT BYTE (INPUT)
                        ; SELDSK  SELECT DISK GIVEN BY REG-C (0,1,2...)            ;
                        ; SETTRK  SET TRACK ADDRESS (0,...76) FOR SUBSEQUENT READ/WRITE 0079 = LOW EQU BASE+1  ;IOPB LOW ADDRESS (OUTPUT)
                        ; SETSEC  SET SECTOR ADDRESS (1,...,26) FOR SUBSEQUENT READ/WRITE 007A = HIGH EQU BASE+2 ;IOPB HIGH ADDRESS (OUTPUT)
                        ; SETDMA  SET SUBSEQUENT DMA ADDRESS (INITIALLY 80H)       ;
                        ;                                                    0004 =  READF  EQU    4H      ;READ FUNCTION
                        ; (READ AND WRITE ASSUME PREVIOUS CALLS TO SET UP THE IO PARAMETER 0006 = WRITF EQU 6H  ;WRITE FUNCTION
                        ; READ    READ TRACK/SECTOR TO PRESET DMA ADDRESS    0003 =  RECAL  EQU    3H      ;RECALIBRATE DRIVE
                        ; WRITE   WRITE TRACK/SECTOR FROM PRESET DMA ADDRESS  0004 =  IORDY  EQU    4H      ;I/O FINISHED MASK
                                                                            000D =  CR     EQU    0DH     ;CARRIAGE RETURN
                                                                            000A =  LF     EQU    0AH     ;LINE FEED
                                                                                  ;
                                                                            SIGNON: ;SIGNON MESSAGE: XXK CP/M VERS Y.Y
```

```
 1>  152D 0D0A0A           DB      CR,LF,LF
 2>  1530 30304B2043       DB      '00K CP/M VERS '
 3>  153E 312E33           DB      VERS/10+'0','.',VERS MOD 10+'0'
 4>  1541 0D0A00           DB      CR,LF,0
 5>                        ;
 6>              BOOT,  ;PRINT SIGNON MESSAGE AND GO TO DOS
 7>  1544 310001  .        LXI     SP,BUFF+80H
 8>  1547 212D15           LXI     H,SIGNON
 9>  154A CD5D16           CALL    PRMSG   ;PRINT MESSAGE
 0>  154D AF               XRA     A       ;CLEAR ACCUMULATOR
 1>  154E 320400           STA     DISKA   ;SET INITIALLY TO DISK A
 2>  1551 C3A015           JMP     GOCPM   ;GO TO CP/M
 3>                        ;
 4>                        ;
 5>              WBOOT,; LOADER ON TRACK 0, SECTOR 1, WHICH WILL BE SKIPPED FOR WARM
 6>                     ;  READ CP/M FROM DISK - ASSUMING THERE IS A 128 BYTE COLD START
 7>                     ;  START.
 8>                     ;
 9>  1554 318000          LXI     SP,BUFF ;USING DMA - THUS 80 THRU FF AVAILABLE FOR STACK
 0>                        ;
 1>  1557 0E0A            MVI     C,RETRY ;MAX RETRIES
 2>  1559 C5              PUSH    B
 3>              WBOOT0, ;ENTER HERE ON ERROR RETRIES
 4>  155A 010000          LXI     B,CPMB  ;SET DMA ADDRESS TO START OF DISK SYSTEM
 5>  155D CD4516          CALL    SETDMA
 6>  1560 0E02            MVI     C,2     ;START READING SECTOR 2
 7>  1562 CD4016          CALL    SETSEC
 8>  1565 0E00            MVI     C,0     ;START READING TRACK 0
 9>  1567 CD3816          CALL    SETTRK
 0>  156A 0E00            MVI     C,0     ;START WITH DISK 0
 1>  156C CD2516          CALL    SELDSK  ;CHANGES DISKN TO 0
 2>                        ;
 3>                        ;   READ SECTORS, COUNT NSECTS TO ZERO
 4>  156F C1              POP     B       ;10-ERROR COUNT
 5>  1570 062A            MVI     B,NSECTS
 6>              RDSEC,  ;READ NEXT SECTOR
 7>  1572 C5              PUSH    B       ;SAVE SECTOR COUNT
 8>  1573 CD4B16          CALL    READ
 9>  1576 C2DA15          JNZ     BOOTERR ;RETRY IF ERRORS OCCUR
 0>  1579 2AC216          LHLD    IOD     ;INCREMENT DMA ADDRESS
 1>  157C 118000          LXI     D,128   ;SECTOR SIZE
 2>  157F 19              DAD     D       ;INCREMENTED DMA ADDRESS IN HL
 3>  1580 44              MOV     B,H
 4>  1581 4D              MOV     C,L     ;READY FOR CALL TO SET DMA
 5>  1582 CD4516          CALL    SETDMA
 6>  1585 3AC116          LDA     IOS     ;SECTOR NUMBER JUST READ
 7>  1588 FE1A            CPI     26      ;READ LAST SECTOR?
 8>  158A DA9615          JC      RD1
 9>                        ;   MUST BE SECTOR 26, ZERO AND GO TO NEXT TRACK
 0>  158D 3AC016          LDA     IOT     ;GET TRACK TO REGISTER A
 1>  1590 3C              INR     A
 2>  1591 4F              MOV     C,A     ;READY FOR CALL
 3>  1592 CD3816          CALL    SETTRK
 4>  1595 AF              XRA     A       ;CLEAR SECTOR NUMBER
 5>  1596 3C      RD1,    INR     A       ;TO NEXT SECTOR
 6>  1597 4F              MOV     C,A     ;READY FOR CALL
 7>  1598 CD4016          CALL    SETSEC
 8>  159B C1              POP     B       ;RECALL SECTOR COUNT
 9>  159C 05              DCR     B       ;DONE?
 0>  159D C27215          JNZ     RDSEC
```

```
                              ;
                              ;   DONE WITH THE LOAD, RESET DEFAULT BUFFER ADDRESS
              GOCPM, ;(ENTER HERE FROM COLD START BOOT)
                              ;   ENABLE RST0 AND RST7
 15A0 F3                      DI
 15A1 3E12                    MVI     A,12H   ;INITIALIZE COMMAND
 15A3 D3FD                    OUT     REVRT
 15A5 AF                      XRA     A
 15A6 D3FC                    OUT     INTC    ;CLEARED
 15A8 3E7E                    MVI     A,INTE  ;RST0 AND RST7 BITS ON
 15AA D3FC                    OUT     INTC
 15AC AF                      XRA     A
 15AD D3F3                    OUT     ICON    ;INTERRUPT CONTROL
                              ;
                              ;   SET DEFAULT BUFFER ADDRESS TO 80H
 15AF 018000                  LXI     B,BUFF
 15B2 CD4516                  CALL    SETDMA
                              ;
                              ;   RESET MONITOR ENTRY POINTS
 15B5 3EC3                    MVI     A,JMP
 15B7 320000                  STA     0
 15BA 210315                  LXI     H,WBOOTE
 15BD 220100                  SHLD    1       ;JMP WBOOT AT LOCATION 00
 15C0 320500                  STA     5
 15C3 21C609                  LXI     H,BDOS
 15C6 220600                  SHLD    6       ;JMP BDOS AT LOCATION 5
 15C9 323800                  STA     7*8     ;JMP TO MON80 (MAY HAVE BEEN CHANGED BY DDT)
 15CC 2100F8                  LXI     H,MON80
 15CF 223900                  SHLD    7*8+1
                              ;   LEAVE IOBYTE SET
                              ;   PREVIOUSLY SELECTED DISK WAS B, SEND PARAMETER TO CPM
 15D2 210400                  LXI     H,DISKA
 15D5 4E                      MOV     C,M     ;LOOKS LIKE A SINGLE PARAMETER TO CPM
 15D6 FB                      EI
 15D7 C30000                  JMP     CPMB
                              ;
                              ;   ERROR CONDITION OCCURRED, PRINT MESSAGE AND RETRY
              BOOTERR,
 15DA C1                      POP     B       ;RECALL COUNTS
 15DB 0D                      DCR     C
 15DC CAE315                  JZ      BOOTER0
                              ;   TRY AGAIN
 15DF C5                      PUSH    B
 15E0 C35A15                  JMP     WBOOT0
              BOOTER0,
                              ;   OTHERWISE TOO MANY RETRIES
 15E3 21EC15                  LXI     H,BOOTMSG
 15E6 CD6A16                  CALL    ERROR
 15E9 C35415                  JMP     WBOOT   ;FOR ANOTHER TRY
                              ;
              BOOTMSG,
 15EC 43414E4E4F              DB      'CANNOT BOOT',0
                              ;
              CONST, ;CONSOLE STATUS TO REG-A
                              ;   (EXACTLY THE SAME AS MDS CALL)
 15F8 C312F8                  JMP     CSTS
                              ;
              CONIN, ;CONSOLE CHARACTER TO REG-A
```

```
31>   15FB CD03F8          CALL    CI
32>   15FE E67F            ANI     7FH         ;REMOVE PARITY BIT
33>   1600 C9              RET
34>                     ;
35>             CONOUT: ;CONSOLE CHARACTER FROM C TO CONSOLE OUT
36>                     ;   SAME AS MDS CALL, BUT WAIT FOR SLOW CONSOLES ON LINE FEED
37>   1601 79             MOV     A,C         ;GET CHARACTER TO ACCUM
38>   1602 FE0A           CPI     LF          ;END OF LINE?
39>   1604 F5             PUSH    PSW         ;SAVE CONDITION FOR LATER
40>   1605 CD09F8         CALL    CO          ;SEND THE CHARACTER (MAY BE LINE FEED)
41>   1608 F1             POP     PSW
42>   1609 C0             RNZ                 ;RETURN IF IT WASN'T A LINE FEED
43>                     ;
44>                     ;   WAIT 13 CHARACTER TIMES (AT 2400 BAUD) FOR LINE FEED TO HAPPEN
45>                     ;   (THIS WORKS OUT TO ABOUT 50 MILLISECS)
46>   160A 0632           MVI     B,50        ;NUMBER OF MILLISECS TO WAIT
47>   160C 0EB6   T1:     MVI     C,182       ;COUNTER TO CONTROL 1 MILLISEC LOOP
48>   160E 0D     T2:     DCR     C           ;1 CYCLE = .5 USEC
49>   160F C20E16         JNZ     T2          ;10 CYCLES= 5.5 USEC
50>                     ;                    -----------
51>                     ;                  =  5.5 USEC PER LOOP*  182 = 1001 USEC
52>   1612 05             DCR     B
53>   1613 C20C16         JNZ     T1          ;FOR ANOTHER LOOP
54>   1616 C9             RET
55>                     ;
56>             LIST,   ;LIST DEVICE OUT
57>                     ;   (EXACTLY THE SAME AS MDS CALL)
58>   1617 C30FF8         JMP     LO
59>                     ;
60>             PUNCH:  ;PUNCH DEVICE OUT
61>                     ;   (EXACTLY THE SAME AS MDS CALL)
62>   161A C30CF8         JMP     PO
63>                     ;
64>             READER: ;READER CHARACTER IN TO REG-A
65>                     ;   (EXACTLY THE SAME AS MDS CALL)
66>   161D C306F8         JMP     RI
67>                     ;
68>             HOME,   ;MOVE TO HOME POSITION
69>                     ;   TREAT AS TRACK 00 SEEK
70>   1620 0E00           MVI     C,0
71>   1622 C33B16         JMP     SETTRK
72>                     ;
73>             SELDSK, ;SELECT DISK GIVEN BY REGISTER C
74>                     ;   CP/M HAS CHECKED FOR DISK SELECT 0 OR 1, BUT WE MAY HAVE
75>                     ;   A SINGLE DRIVE MDS SYSTEM, SO CHECK AGAIN AND GIVE ERROR
76>                     ;   BY CALLING MON80
77>   1625 79             MOV     A,C
78>   1626 FE02           CPI     NDISKS      ;TOO LARGE?
79>   1628 D40FFF         CNC     RMON80      ;GIVES #ADDR MESSAGE AT CONSOLE
80>                     ;
81>   162B 17             RAL
82>   162C 17             RAL
83>   162D 17             RAL
84>   162E 17             RAL
85>   162F E610           ANI     10000B      ;UNIT NUMBER IN POSITION
86>   1631 4F             MOV     C,A         ;SAVE IT
87>   1632 21BE16         LXI     H,IOF       ;IO FUNCTION
88>   1635 7E             MOV     A,M
89>   1636 E6CF           ANI     11001111B       ;MASK OUT DISK NUMBER
90>   1638 B1             ORA     C           ;MASK IN NEW DISK NUMBER
```

```
291>  1639 77             MOV     M,A         ;SAVE IT IN IOPB
292>  163A C9             RET
293>                   ;
294>                   ;
295>             SETTRK, ;SET TRACK ADDRESS GIVEN BY C
296>  163B 21C016         LXI     H,IOT
297>  163E 71             MOV     M,C
298>  163F C9             RET
299>                   ;
300>             SETSEC, ;SET SECTOR NUMBER GIVEN BY C
301>  1640 21C116         LXI     H,IOS
302>  1643 71             MOV     M,C
303>  1644 C9             RET
304>                   ;
305>             SETDMA, ;SET DMA ADDRESS GIVEN BY REGS B,C
306>  1645 69             MOV     L,C
307>  1646 60             MOV     H,B
308>  1647 22C216         SHLD    IOD
309>  164A C9             RET
310>                   ;
311>             READ,   ;READ NEXT DISK RECORD (ASSUMING DISK/TRK/SEC/DMA SET)
312>  164B 0E04           MVI     C,READF     ;SET TO READ FUNCTION
313>  164D CD7B16         CALL    SETFUNC
314>  1650 CD8416         CALL    WAITIO      ;PERFORM READ FUNCTION
315>  1653 C9             RET                 ;MAY HAVE ERROR SET IN REG-A
316>                   ;
317>                   ;
318>             WRITE,  ;DISK WRITE FUNCTION
319>  1654 0E06           MVI     C,WRITF
320>  1656 CD7B16         CALL    SETFUNC ;SET TO WRITE FUNCTION
321>  1659 CD8416         CALL    WAITIO
322>  165C C9             RET                 ;MAY HAVE ERROR SET
323>                   ;
324>                   ;
325>                   ;   UTILITY SUBROUTINES
326>             PRMSG,  ;PRINT MESSAGE AT H,L TO 0
327>  165D 7E             MOV     A,M
328>  165E B7             ORA     A           ;ZERO?
329>  165F C8             RZ
330>                   ;   MORE TO PRINT
331>  1660 E5             PUSH    H
332>  1661 4F             MOV     C,A
333>  1662 CD0116         CALL    CONOUT
334>  1665 E1             POP     H
335>  1666 23             INX     H
336>  1667 C35D16         JMP     PRMSG
337>                   ;
338>             ERROR,  ;ERROR MESSAGE ADDRESSES BY H,L
339>  166A CD5D16         CALL    PRMSG
340>                   ;   ERROR MESSAGE WRITTEN, WAIT FOR RESPONSE FROM CONSOLE
341>  166D CDFB15         CALL    CONIN
342>  1670 0E0D           MVI     C,CR        ;CARRIAGE RETURN
343>  1672 CD0116         CALL    CONOUT
344>  1675 0E0A           MVI     C,LF        ;LINE FEED
345>  1677 CD0116         CALL    CONOUT
346>  167A C9             RET                 ;MAY BE RETURNING FOR ANOTHER RETRY
347>                   ;
348>             SETFUNC:
349>                   ;   SET FUNCTION FOR NEXT I/O (COMMAND IN REG-C)
350>  167B 21BE16         LXI     H,IOF       ;IO FUNCTION ADDRESS
```

```
51>   167E 7E            MOV     A,M       ;GET IT TO ACCUMULATOR FOR MASKING
52>   167F E6F8          ANI     11111000B      ;REMOVE PREVIOUS COMMAND
53>   1681 B1            ORA     C         ;SET TO NEW COMMAND
54>   1682 77            MOV     M,A       ;REPLACED IN IOPB
55>   1683 C9            RET
56>                 ;
57>               WAITIO,
58>   1684 0E0A          MVI     C,RETRY ;MAX RETRIES BEFORE PERM ERROR
59>               REWAIT,
60>                 ;    START THE I/O FUNCTION AND WAIT FOR COMPLETION
61>   1686 DB79          IN      RTYPE
62>   1688 DB7B          IN      RBYTE   ;CLEARS THE CONTROLLER
63>                 ;
64>   168A 3EBD          MVI     A,IOPB AND 0FFH ;LOW ADDRESS FOR IOPB
65>   168C D379          OUT     LOW     ;TO THE CONTROLLER
66>   168E 3E16          MVI     A,IOPB SHR 8   ;HIGH ADDRESS FOR IOPB
67>   1690 D37A          OUT     HIGH    ;TO THE CONTROLLER, STARTS OPERATION
68>                 ;
69>   1692 DB78    WAIT0, IN     DSTAT   ;WAIT FOR COMPLETION
70>   1694 E604          ANI     IOPDY   ;READY?
71>   1696 CA9216        JZ      WAIT0
72>                 ;
73>                 ;    CHECK IO COMPLETION OK
74>   1699 DB79          IN      RTYPE          ;MUST BE I/O COMPLETE (00) UNLINKED
75>                 ;    00 UNLINKED I/O COMPLETE.    01 LINKED I/O COMPLETE (NOT USED)
76>                 ;    10 DISK STATUS CHANGED       11 (NOT USED)
77>   169B FE02          CPI     10B     ;READY STATUS CHANGE?
78>   169D CAB116        JZ      WREADY
79>                 ;
80>                 ;    MUST BE 00 IN THE ACCUMULATOR
81>   16A0 B7            ORA     A
82>   16A1 C2B616        JNZ     WERROR         ;SOME OTHER CONDITION, RETRY
83>                 ;
84>                 ;    CHECK I/O ERROR BITS
85>   16A4 DB7B          IN      RBYTE
86>   16A6 17            RAL
87>   16A7 DAB116        JC      WREADY         ;UNIT NOT READY
88>   16AA 1F            RAR
89>   16AB E6FE          ANI     11111110B      ;ANY OTHER ERRORS?  (DELETED DATA OK)
90>   16AD C2B616        JNZ     WERROR
91>                 ;
92>                 ;    READ OR WRITE IS OK, ACCUMULATOR CONTAINS ZERO
93>   16B0 C9            RET
94>                 ;
95>               WREADY, ;NOT READY, TREAT AS ERROR FOR NOW
96>   16B1 DB7B          IN      RBYTE   ;CLEAR RESULT BYTE
97>   16B3 C3B616        JMP     TRYCOUNT
98>                 ;
99>               WERROR, ;RETURN HARDWARE MALFUNCTION (CRC, TRACK, SEEK, ETC.)
00>                 ;    THE MDS CONTROLLER HAS RETURNED A BIT IN EACH POSITION
01>                 ;    OF THE ACCUMULATOR, CORRESPONDING TO THE CONDITIONS,
02>                 ;    0     - DELETED DATA (ACCEPTED AS OK ABOVE)
03>                 ;    1     - CRC ERROR
04>                 ;    2     - SEEK ERROR
05>                 ;    3     - ADDRESS ERROR (HARDWARE MALFUNCTION)
06>                 ;    4     - DATA OVER/UNDER FLOW (HARDWARE MALFUNCTION)
07>                 ;    5     - WRITE PROTECT (TREATED AS NOT READY)
```

```
08>             ;    6     - WRITE ERROR (HARDWARE MALFUNCTION)
09>             ;    7     - NOT READY
10>             ;    (ACCUMULATOR BITS ARE NUMBERED 7 6 5 4 3 2 1 0)
11>             ;
12>             ;    IT MAY BE USEFUL TO FILTER OUT THE VARIOUS CONDITIONS,
13>             ;    BUT WE WILL GET A PERMANENT ERROR MESSAGE IF IT IS NOT
14>             ;    RECOVERABLE.   IN ANY CASE, THE NOT READY CONDITION IS
15>             ;    TREATED AS A SEPARATE CONDITION FOR LATER IMPROVEMENT
16>           TRYCOUNT,
17>             ;    REGISTER C CONTAINS RETRY COUNT, DECREMENT 'TIL ZERO
18>   16B6 0D      DCR     C
19>   16B7 C28616      JNZ     REWAIT ;FOR ANOTHER TRY
20>             ;
21>             ;    CANNOT RECOVER FROM ERROR
22>   16BA 3E01      MVI     A,1     ;ERROR CODE
23>   16BC C9        RET
24>             ;
25>             ;
26>             ;    DATA AREAS (MUST BE IN RAM)
27>           IOPB,  ;IO PARAMETER BLOCK
28>   16BD 80       DB      80H     ;NORMAL I/O OPERATION
29>   16BE 04  IOF,  DB     READF   ;IO FUNCTION, INITIAL READ
30>   16BF 01  ION,  DB     1       ;NUMBER OF SECTORS TO READ
31>   16C0 02  IOT,  DB     OFFSET  ;TRACK NUMBER
32>   16C1 01  IOS,  DB     1       ;SECTOR NUMBER
33>   16C2 8000 IOD,  DW    BUFF    ;IO ADDRESS
34>             ;
35>             ;
36>   16C4              END
```