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FDMA      EQU      FDPORT+2      ;Dma address (when write)
INTS      EQU      FDPORT+2      ;Status Register (when read)
SER        EQU      FDPORT+3      ;Serial port

;          Controller function definitions
;          Specify (00) command
F.RTK      =        02            ;Read track
F.SPEC      =        03            ;Specify
F.DSTS      =        04            ;Drive status
F.RDAT      =        06            ;Read sector FM
F.DRDT      =        46H          ;Read sector MFM
F.WRAT      =        05            ;Write sector FM
F.WRDT      =        45H          ;Write sector MFM
F.RECA      =        07            ;recalibrate
F.RSTS      =        08            ;Read status
F.SEEK      =        0Fh          ;Seek

SRT         =        16-8          ;= Shugart 800s (8 ms)
;           =        16-3          ;= Shugart 850s (3 ms)
;           =        16-3          ;= Remex (3 ms)
HUT:        =        240/16        ;Head unload = 240 ms
HLT:        =        (35+1)/2      ;Head load = 35 ms
ND:         =        00            ;Set DMA mode

;          JUMP TABLE FOR ROUTINES
;          These routines are callable subroutines
;          Some require parameters passed in the "A" and "C" registers

START:      ORG      BEGIN
            JMP      DDMA          ;load DMA address
            JMP      DSPEC         ;specify drive stat
            JMP      RCAL          ;recalibrate (track 00)
            JMP      DSEEK         ;seek a track
            JMP      READS         ;read sector (FM)
            JMP      DREADS        ;read sector (MFM)
            JMP      WRS           ;write sector (FM)
            JMP      DWRS          ;write sector (MFM)

;          DMA address load routine using 16 bit value in
;          HL register for the 24 bit DMA value
DDMA:       MVI      A,0           ;extended address
            OUT      FDMA          ;output
            MOV      A,H           ;high byte
            OUT      FDMA          ;output
            MOV      A,L           ;low byte
            OUT      FDMA          ;output
            RET

;          Drive Specify Command
DSPEC:      MVI      B,LSPEC        ;3 byte command
            LXI      D,SPEC        ;point to command bytes
SPEC1:      IN       FDCS          ;get status
            ANI      0COH
            CPI      80H
            JNZ      SPEC1         ;if no master ready bit

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LDAX    D                ;load command byte
OUT     FDCD              ;to controller
INX     D                ;next byte
DCR     B                ;dec. counter
JNZ     SPEC1             ;if more bytes
RET

; Recalibrate drive (seek track 0)
RCAL:   MVI     B,LRECAL   ;2 byte command
LXI     D,RECAL           ;point to command bytes
RCAL1:  IN      FDCS       ;get status
ANI     0C0H
CPI     80H
JNZ     RCAL1             ;if no master ready bit
LDAX    D                ;load command byte
OUT     FDCD              ;to controller
INX     D
DCR     B
JNZ     RCAL1             ;if more bytes
RET

; Seek a Track with cylinder number in "A"
DSEEK:  MVI     B,LSEEK    ;3 byte command
LXI     D,SEEK           ;point to command bytes
STA     CYLD             ;store cylinder #
SEEK1:  IN      FDCS       ;check status
ANI     0C0H
CPI     80H
JNZ     SEEK1             ;if not ready
LDAX    D                ;load command byte
OUT     FDCD              ;to controller
INX     D
DCR     B
JNZ     SEEK1             ;if more bytes
RET

; FM Sector read command with sector in "A"
; and cylinder in "C"
READS:  MVI     B,LREAD    ;9 byte command
LXI     D,READ           ;point to command bytes
STA     RSEC             ;store sector number
MOV     A,C
STA     RSCYL            ;store cylinder number
READ1:  IN      FDCS       ;check status
OR      A
JP      READ1             ;if no master ready bit
LDAX    D                ;load command byte
OUT     FDCD              ;to controller
INX     D
DCR     B
JNZ     READ1             ;if more bytes

READ2:  IN      INTS       ;check interrupt status
ORA     A                ;for read complete
JP      READ2             ;if not complete

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READ3:    IN      FDCS          ;in status
          ORA     A
          JP      READ3        ;if not ready
          IN      FDCD          ;read result byte ST0
          SUI     40h          ;strip
          MOV     L,A          ;save
READ4:    IN      FDCS          ;in status
          ORA     A
          JP      READ4        ;if not ready
          IN      FDCD          ;read result byte ST1
          SUI     80h          ;strip
          MOV     H,A          ;save

          MVI     B,7-2        ;5 more bytes
READ5:    IN      FDCS          ;in status
          OR      A
          JP      READ5        ;if not ready
          IN      FDCD          ;read result byte
          DEC     B
          JNZ     READ5        ;wait until all done
          MOV     A,L          ;check results
          ORA     H
          RZ                  ;return no error
          STC                  ;set carry
          RET                  ;return from error

;          MFM Sector read command with sector in "A"
;          and cylinder in "C"
DREADS:   MVI     B,DLREAD      ;9 byte command
          LXI     D,DREAD      ;point to command bytes
          STA     DRSEC        ;store sector number
          MOV     A,C
          STA     DCYL        ;store cylinder number
DREAD1:   IN      FDCS          ;check status
          OR      A
          JP      DREAD1        ;if no master ready bit
          LDAX    D            ;load command byte
          OUT     FDCD        ;to controller
          INX     D
          DCR     B
          JNZ     DREAD1        ;if more bytes
          JMP     READ2

;          FM Sector write command with sector in "A"
;          cylinder number in "C"
WRS:      MVI     B,LWR        ;9 byte command
          LXI     D,WR         ;point to command bytes
          STA     WSEC        ;store sector number
          MOV     A,C
          STA     WCYL        ;store cylinder number
WR1:      IN      FDCS          ;check status
          OR      A
          JP      WR1          ;if no master ready bit
          LDAX    D            ;load command byte

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        OUT    FDCD          ;to controller
        INX    D
        DCR    B
        JNZ    WR1          ;if more bytes
        JMP    READ1

;      MFM Sector write command with sector in "A"
;      and cylinder in "C"
DWRS:   MVI    B,DLWR        ;9 byte command
        LXI    D,DWR        ;point to command bytes
        STA    DWSEC        ;store sector number
        MOV    A,C
        STA    DWRCYL       ;store cylinder number
DWR1:   IN     FDCS         ;check status
        OR     A
        JP     DWR1        ;if no master ready bit
        LDAX   D           ;load command byte
        OUT    FDCD        ;to controller
        INX    D
        DCR    B
        JNZ    DWR1        ;if more bytes
        JMP    READ2

;      Function data for controller
SPEC    DB     F.SPEC        ;specify command
        VFD    4@SRT,4@HUT
        VFD    7@HLT,1@ND
LSPEC   =      *-SPEC

RECAL   DB     F.RECA,0      ;recalibrate command
LRECAL  =      *-RECAL

SEEK    DB     F.SEEK        ;seek command
        DB     0
CYLD    DB     0
LSEEK   =      *-SEEK

READ:   DB     F.RDAT        ;read command (FM)
        DB     0            ;hds,dsl,ds0
RSCYL   DB     0            ;C = cylinder info
        DB     0            ;Head
RSEC:   DB     1            ;Record (first sector)
        DB     0            ;N 128 BYTE SECTOR
        DB     25           ;EOT (last sectors)
        DB     7            ;GPL
        DB     128          ;DTL
LREAD   =      *-READ

DREAD:  DB     F.DRDT        ;read command (MFM)
        DB     0            ;hds,dsl,ds0
DCYL    DB     2            ;C = cylinder info
        DB     0            ;Head
DRSEC:  DB     1            ;Record (first sector)
        DB     3            ;N 1024 BYTE SECTOR
        DB     7            ;EOT (last sectors)

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	DB	35H	;GPL
	DB	0	;DTL
DLREAD	=	*-DREAD	
WR:	DB	F.WRAT	;write command (FM)
	DB	0	;hds,dsl,ds0
WSCYL	DB	0	;C = cylinder info
	DB	0	;Head
WSEC:	DB	1	;Record (first sector)
	DB	0	;N 128 BYTE SECTOR
	DB	25	;EOT (last sectors)
	DB	7	;GPL
	DB	128	;DTL
LWR	=	*-WR	
DWR	DB	F.WRDT	;write command (MFM)
	DB	0	;hds,dsl,ds0
DWRCYL	DB	2	;C = cylinder info
	DB	0	;Head
DWSEC:	DB	1	;Record (first sector)
	DB	3	;N 1024 BYTE SECTOR
	DB	7	;EOT (last sectors)
	DB	35H	;GPL
	DB	0	;DTL
DLWR	=	*-DWR	
	END		