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                                TITLE  BOOTSTRAPLOADER VERS 6.5 (03.02.83)
                                ;
                                .Z80
                                .PHASE  OH
                                ;=====
0000      EPC    EQU    0          ; EPC I WANTED
          ;EPC   EQU    1          ; FDC 5 or 8/5
          ;=====
          ;
          ;
          ;      **** I/O-PORTS ****
          ;
          IFF    EPC
          .PRINTX / EPC I selected /
00F2      FDC    EQU    0F2H      ; FLOPPY STATUS
8000      MSTART EQU    8000H
          ELSE
          .PRINTX / FDC 8-5 selected /
          FDC    EQU    0          ; FLOPPY STATUS
          MSTART EQU    2000H
          PAGE0   EQU    0ECH      ; REGISTER FOR 0000..3FFF
          PAGE4   EQU    PAGE0+1   ; REGISTER FOR 4000..7FFF
          PAGE8   EQU    PAGE4+1   ; REGISTER FOR 8000..BFFF
          PAGEC   EQU    PAGE8+1   ; REGISTER FOR C000..FFFF
          ENDIF
00F3      FDD    EQU    FDC+1      ; FLOPPY DATA
00F4      FTC    EQU    FDC+2      ; FLOPPY TERMINATE
00F5      DMA    EQU    FDC+3      ; DMA - PORT
          ;
00EA      CTC    EQU    0EAH      ; BAUDRATE
00E3      CONB   EQU    0E3H      ; SIO B STATUS
          ;
          ;      **** ENTRYPOINT ****
          ;
0000      31 FF00      BOOT:: LD    SP,0FFD0H    ; STACK IS NOT USED
0003      C3 0340      JP     GOBOOT
          ;
          ;      **** TABLE FOR Z-80 INTERRUPT MODE 2 ****
          ;
          ;
0006      0634      VECTOR: DEFW  TERMI
FFFF      CL        EQU    0FFFFH
0008      FFFF FFFF      DEFW  CL,CL,CL,CL,CL,CL,CL,CL,CL,CL,CL,CL
000C      FFFF FFFF
0010      FFFF FFFF
0014      FFFF FFFF
0018      FFFF FFFF
001C      FFFF FFFF

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;
; **** PATCH AREA FOR JUMPS INTO ****
; **** USER-ROUTINES, LOCATED AT ****
; **** END OF PROGRAM (LOC: LAST) ***
;
; **** USER ROUTINES MUST NOT USE STACK ****
;
; **** USE ONLY THE ALLOWED REGISTERS ****
;
; **** USER FUNCTION 0 ****
; ***** SWITCH ON RAM *****
;
; FREE REGISTERS: AF, BC, DE, HL, IY
; RETURN      JP (IX)
;
0020 USER0: EMPTY      ; INITIALIZE I/O
;
; **** USER FUNCTION 1 ****
; *** INIT USER-CONSOLE ***
;
; FREE REGISTERS: AF, BC, DE, HL, IY
; RETURN:      JP (IX)
;
0023 USER1: EMPTY
;
; **** USER FUNCTION 2 ****
; ***** SEND MESSAGE *****
;
; FREE REGISTERS: AF, BC, DE
; RETURN:      JP (IX)
; HL POINTS TO MESSAGE
; MESSAGE ENDS ON '$'
;
0026 USER2: EMPTY
;
; **** USER FUNCTION 3 ****
; ***** CHECK MEMORY *****
;
; FREE REGISTERS: AF, BC, DE, IY
; RETURN:      JP (IX)
;
; SET      IY = HIGHEST AVAILABLE RAM
;
0029 USER3: EMPTY

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;
;
;      **** USER FUNCTION 4 ****
;      ***** DEFINE MODE *****
;
;      FREE REGISTERS: AF,BC,DE,HL
;      RETURN:          JP (IX)
;      SET      ZERO-FLAG IF DMA-MODE
;      SET      NON-ZERO-FLAG IF NON-DMA
;
002C      USER4:  EMPTY
;
;      **** USER FUNCTION 5 ****
;      ** SPECIFY DISK TIMING **
;      *** NON-DMA-MODE ONLY ***
;
;      FREE REGISTERS: AF,BC,DE,HL
;      RETURN:          JP (IX)
;
002F      USER5:  EMPTY
;
;      **** USER FUNCTION 6 ****
;      ** SPECIFY DISK TIMING **
;      ***** DMA-MODE-ONLY *****
;
;      FREE REGISTERS: AF,BC,DE,HL
;      RETURN:          JP (IX)
;
0032      USER6:  EMPTY
;
;      **** USER FUNCTION 7 ****
;      **** EXECUTED BEFORE ****
;      **** JP TO HEAS-BOOT ****
;
;      FREE REGISTERS: AF,BC,DE
;      RETURN:          JP (IX)
;
0035      USER7:  EMPTY
;
;      **** USER FUNCTION 8 ****
;      ***** CONSOLE INPUT *****
;
;      FREE REGISTERS: AF,BC,DE,HL
;      RETURN:          JP (IX)
;
0038      USER8:  EMPTY

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OFF
;
;
; **** DISK ROUTINES ****
;
; **** EQUATES ****
;
000A      RETRY EQU 10 ; RETRY COUNTER
;
00F0      HLT EQU 240 ; MS HEADLOAD TIME (8MHZ)
000E      SRT EQU 14 ; MS STEP RATE TIME (8 MHZ)
00F0      HUT EQU 240 ; HEADUNLOAD TIME
;
00EE      HLTS EQU ((HLT-1)/2)*2 ; COMPUTED VALUES FOR UPD 765
000F      HUTS EQU (HUT+15)/16
000Z      SRTS EQU 16-SRT
OFF
;
; **** SPECIFY DISK TIMING FOR NON-DMA-MODE ****
;
0240      21 024A      SPEC: LD HL,SPCT ; .SPEC TABLE
0243      06 03        LD B,3 ; 3 BYTES COMMAND
0245      CD 02EF      CALL CMFD
;
;
024A      03 2F EF      SPCT: DEFB 03H,SRTS*16+HUTS,HLTS+1
;
; **** SPECIFY FOR DMA-MODE ****
;
024D      21 0257      SPECD: LD HL,SPCDT
0250      06 03        LD B,3
0252      CD 02DC      CALL MOTO
;
;
0257      03 2F EE      SPCDT: DEFB 3,SRTS*16+HUTS,HLTS
;
;
; **** MAIN PROGRAM ****
;
0340      GOBOOT: IFT EPC ; CPU - II only (not EPC I)
;
; LD A,0 ; SET MEMORY-PAGE-REGISTERS
; OUT (PAGE0),A ; TO NORMAL CONFIGURATION
; LD A,4
; OUT (PAGE4),A
; LD A,8
; OUT (PAGE8),A
; LD A,0CH
; OUT (PAGEC),A
; ENDF
;
; EXE USER0 ; INITIALIZE
; LD HL,NDBAUD
;
; EXX ; SAVE MESSAGE
;
; EXE USER1,INIT ; HL' = .BAUDRATE
; LD HL,$GON ; "BOOTSTRAPLOADER..."
;
; EXE USER2,SENDM ; SEND MESSAGE
;
; RUN CBR ; SEND BAUDRATE
;
; EXE USER2,SENDM
;
; LD HL,BDMES ; "BAUD"

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0394	21 0154	BDR9:	EXE	USER2, SENDM	
			LD	HL, MEMORY	; "MEMORY OK"
			EXE	USER3, CHECK	; CHECK MEMORY
03A5	7E		LD	A, (HL)	; ERROR ?
03A6	23		INC	HL	
03A7	0B		EX	AF, AF'	
			EXE	USER2, SENDM	; "MEMORY OK/FAILED"
03B6	FD		DEFB	0FDH	; LD A, HIGH(IY)
03B7	7C		LD	A, H	
03B8	1F		RRR		; COMPUTE SIZE
03B9	1F		RRR		
03BA	1F		RRR		
03BB	1F		RRR		
03BC	E6 0C		AND	0CH	
03BE	21 0144		LD	HL, MSIZE	
03C1	06 00		LD	B, 0	
03C3	4F		LD	C, A	
03C4	09		ADD	HL, BC	
			EXE	USER2, SENDM	; 64K/48K/32K/16K
03D3	0B		EX	AF, AF'	
03D4	B7		OR	A	
03D5	20 FE	STOP:	JR	NZ, STOP	; IF ERROR STOP
03D7	AF		XOR	A	
03D8	0B		EX	AF, AF'	; A' = 0
03D9	FD		DEFB	0FDH	; SET STACK POINTER
03DA	7C		LD	A, H	; LD A, HIGH(IY)
03DB	67		LD	H, A	
03DC	FD		DEFB	0FDH	
03DD	7D		LD	A, L	; LD A, LOW(IY)
03DE	6F		LD	L, A	
03DF	11 002F		LD	DE, 2FH	
03E2	B7		OR	A	
03E3	ED 52		SBC	HL, DE	
03E5	F9		LD	SP, HL	; STACK=HIGHEST_MEM-2FH
03E6	EB		EX	DE, HL	
03E7	21 06C9		LD	HL, CMDTAB	; COPY COMMAND-TABLES
03EA	01 002E		LD	BC, CMDLEN	
03ED	ED B0		LDIR		
03EF	F3		DI		; SET INTERRUPT MODE 2
03F0	3E 00		LD	A, HIGH(VECTOR)	
03F2	ED 47		LD	I, A	
03F4	ED 5E		IM	2	
03F6	FB		EI		
			EXE	USER4, MODE	; DMA OR NON DMA MODE ?
0405	CA 04A4		JP	Z, DMAMOD	
0408	D9		EXX		
0409	16 01		LD	D, 1	; NON DMA FLAG
040B	D9		EXX		
040C	21 0187		LD	HL, NONMES	; NON DMA MODE
			EXE	USER2, SENDM	
				5, 25", DD, 512 BYTE, 10 SEC'S, INVERTED DATA	
041D		NONAGA:			
041D	CD 0233	RDNMA:	CALL	INIFDC	; SOFT RESET
			EXE	USER5, SPEC	; SPEC DISK TIMING
042E	CD 025A		CALL	RECAL	

0431	CD 025A		CALL	RECAL	
0434	06 0A		LD	B, RETRY	; NORM. 10 TIMES
0436	C5	RDLP0:	PUSH	BC	; SAVE
0437	FD E5		PUSH	IY	; HIGHEST RAM
0439	E1		POP	HL	
043A	11 1FFF		LD	DE, 1FFFH	
043D	B7		OR	A	
043E	ED 52		SBC	HL, DE	; START OF ZDOS
0440	E5		PUSH	HL	
0441	21 0492		LD	HL, R00	; READ TRACK 0 NONDMA
0444	06 09		LD	B, 9	
0446	CD 02DC		CALL	MOTD	; TRANSFER COMMAND
0449	E1		POP	HL	; ADDRESS
044A	16 0A		LD	D, 10	; 10 SECTORS
044C	CD 0293	RDLO:	CALL	RDDATA	
044F	15		DEC	D	
0450	20 FA		JR	NZ, RDLO	; 10 DONE ?
0452	D3 F4		OUT	(FTC), A	; TERMINATE
0454	CD 02A9		CALL	RESULT	; ERROR ?
0457	C1		POP	BC	
0458	28 07		JR	Z, RDT1	; NO: READ TRACK 1
045A	10 DA		DJNZ	RDLP0	; YES: TRY AGAIN
045C	CD 0300		CALL	RDERR	
045F	18 BC		JR	RDNDMA	
0461	CD 026D	RDT1:	CALL	SEEK1	; TRACK 1
0464	06 0A		LD	B, RETRY	
0466	C5	RDLP1:	PUSH	BC	
0467	FD E5		PUSH	IY	; SET UP PARAMETERS
0469	E1		POP	HL	
046A	11 0BFF		LD	DE, 0BFFH	
046D	B7		OR	A	
046E	ED 52		SBC	HL, DE	
0470	E5		PUSH	HL	
0471	21 049B		LD	HL, RD1	
0474	06 09		LD	B, 9	
0476	CD 02DC		CALL	MOTD	; TRANSFER COMMAND
0479	E1		POP	HL	
047A	16 05		LD	D, 5	
047C	CD 0293	RD1:	CALL	RDDATA	; READ TRACK
047F	15		DEC	D	
0480	20 FA		JR	NZ, RD1	
0482	D3 F4		OUT	(FTC), A	
0484	CD 02A9		CALL	RESULT	; ERROR ?
0487	C1		POP	BC	
0488	CA 063F		JP	Z, LOADED	; NO: IS LOADED
048B	10 D9		DJNZ	RDLP1	; TRY AGAIN
048D	CD 0300		CALL	RDERR	
0490	18 8B		JR	RDNDMA	
0492	46 00 00 00	R00:	DEFB	46H, 0, 0, 0, 1, 2, 10, 10H, 2	
0496	01 02 0A 10				
049A	02				
049B	46 00 01 00	RD1:	DEFB	46H, 0, 1, 0, 1, 2, 10, 10H, 2	
049F	01 02 0A 10				
04A3	02				

;

04A4		DMA MOD:	EXX		
04A4	D9		LD	D, 0	; DMA FLAG
04A5	16 00				
04A7	D9		EXX		
04A8	21 0196		LD	HL, DMAMES	; DMA MODE
			EXE	USER2, SENDM	
04B9		DMA ABA:			
04B9	CD 0233		CALL	INIFDC	
			EXE	USER6, SPEC D	; SPECIFY TIMING
04CA	CD 025A		CALL	RECAL	; SEEK TRACK 0
04CD	CD 025A		CALL	RECAL	
				**** SINGLE OR DOUBLE DENSITY ****	
04D0	06 0A	TRYDD:	LD	B, RETRY	
04D2	C5	TRYLP:	PUSH	BC	
04D3	06 02		LD	B, 2	
04D5	21 04F8		LD	HL, RDDDT	; READ ID (DOUBLE DENSITY)
04D8	CD 02DC		CALL	MOTO	
04DB	CD 02A9		CALL	RESULT	
04DE	C1		POP	BC	
04DF	28 1B		JR	Z, RDDD	; OK: DOUBLE DENSITY
04E1	C5		PUSH	BC	
04E2	06 02		LD	B, 2	; ERROR: TRY SINGLE DENSITY
04E4	21 04FA		LD	HL, RDSDT	
04E7	CD 02DC		CALL	MOTO	
04EA	CD 02A9		CALL	RESULT	
04ED	C1		POP	BC	
04EE	CA 05A3		JP	Z, RDS D	; OK: SINGLE DENSITY
04F1	10 DF		DJNZ	TRYLP	; TRY AGAIN
04F3	CD 0300		CALL	RDERR	
04F6	18 D8		JR	TRYDD	
04F8	4A 00	RDDDT:	DEFB	4AH, 0	
04FA	0A 00	RDSDT:	DEFB	0AH, 0	
				**** READ IN DOUBLE DENSITY ****	
04FC	06 0A	RDD:	LD	B, RETRY	; NOM. 10 TIMES
04FE	C5	RDDL P:	PUSH	BC	; SAVE
			OFF		; SET UP PARAMETERS
0520	E5		PUSH	HL	
0521	06 09		LD	B, 9	
0523	21 0591		LD	HL, RDDO	
0526	CD 02DC		CALL	MOTO	; READ TRACK 0
0529	01 12F5		LD	BC, RDLEN*256+DMA	
052C	E1		POP	HL	
052D	ED B3		OTIR		; START DMA
052F	CD 02B6		CALL	RESDMA	; ERRORS ?
0532	C1		POP	BC	
0533	CA 063F		JP	Z, LOADED	; NO: IS LOADED
0536	FE 40		CP	40H	; ONLY 10 SECTORS READ ?
0538	20 0A		JR	NZ, NOT5	
053A	7A		LD	A, D	
053B	FE 04		CP	4	
053D	20 05		JR	NZ, NOT5	


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053F 7B LD A,E
0540 FE 0B CP 11
0542 2B 0B JR Z,RDDT1 ; YES: READ TRACK 1 TOO
0544 10 4B NOTS: DJNZ RDD0 ; ERROR, TRY AGAIN
0546 CD 0300 CALL RDERR
0549 C3 04B9 JP DMAAGA
054C CD 026D RDDT1: CALL SEEK1 ; READ TRACK 1
054F 06 0A LD B,RETRY
0551 C5 RDDLP1: PUSH BC
OFF ; SET UP PARAMETERS
0573 E5 PUSH HL
0574 06 09 LD B,9
0576 21 059A LD HL,RDD1T
0579 CD 02DC CALL MOTO ; TRANSFER COMMAND
057C 01 12F5 LD BC,RDLEN*256+DMA
057F E1 POP HL
0580 ED B3 OTIR ; START DMA
0582 CD 02A9 CALL RESULT
0585 C1 POP BC
0586 CA 063F JP Z,LOADED ; NO ERROR: IS LOADED
0589 10 C6 DJNZ RDDLP1 ; ERROR: TRY AGAIN
058B CD 0300 CALL RDERR
058E C3 04B9 JP DMAAGA
0591 46 00 00 00 RDD0: DEFB 46H,0,0,0,1,2,15,10H,2
0595 01 02 0F 10
0599 02
059A 46 00 01 00 RDD1T: DEFB 46H,0,1,0,1,2,10,10H,2
059E 01 02 0A 10
05A2 02
;
; ***** READ IN SINGLE DENSITY *****
; ***** 8" FLOPPY'S ONLY ! *****
;
05A3 RDS0:
05A3 06 0A LD B,RETRY
05A5 C5 RDSLPO: PUSH BC
OFF ; SET UP PARAMETERS
05C7 E5 PUSH HL
05C8 06 09 LD B,9
05CA 21 0622 LD HL,RDSOT
05CD CD 02DC CALL MOTO ; READ TRACK 0 (SD)
05D0 01 12F5 LD BC,RDLEN*256+DMA
05D3 E1 POP HL
05D4 ED B3 OTIR ; START DMA
05D6 CD 02A9 CALL RESULT ; ERROR ?
05D9 C1 POP BC
05DA 2B 0B JR Z,RDST1 ; NO: READ TRACK 1
05DC 10 C7 DJNZ RDSLPO ; ERROR: TRY AGAIN
05DE CD 0300 CALL RDERR
05E1 C3 04B9 JP DMAAGA
05E4 CD 026D RDST1: CALL SEEK1 ; READ TRACK 1
05E7 06 0A LD B,RETRY
05E9 C5 RDSLPI: PUSH BC
OFF ; SET UP PARAMETERS
0604 E5 PUSH HL

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0605 06 09          LD      B,9
0607 21 062B        LD      HL,RDS1T
060A CD 02DC        CALL    MOTO          ; TRANSFER COMMAND
060D 01 12F5        LD      BC,RDLEN*256+DMA
0610 E1             POP      HL
0611 ED B3          OTIR          ; START DMA
0613 CD 02A9        CALL    RESULT        ; ERROR ?
0616 C1             POP      BC
0617 CA 063F        JP      Z,LOADED      ; NO: IS LOADED
061A 10 CD          DJNZ     RDSLPL1      ; YES: TRY AGAIN
061C CD 0300        CALL    RDERR
061F C3 04B9        JP      DMAAGA
0622 06 00 00 00    RDSOT: DEFB 6,0,0,0,1,0,26,7,128
0626 01 00 1A 07
062A B0
062B 06 00 01 00    RDS1T: DEFB 6,0,1,0,1,0,26,7,128
062F 01 00 1A 07
0633 B0

;
;      **** TERMINATE READ-COMMAND ****
;
0634 D3 F4          TERMI: OUT    (FTC),A      ; TERMINATE UPD 765
0636 F5             PUSH    AF
0637 3E C3          LD      A,0C3H          ; RESET DMA
0639 D3 F5          OUT    (DMA),A
063B F1             POP      AF
063C FB             EI
063D ED 4D          RETI

;
;      **** SYSTEM LOADED, CHECK IT ! ****
;
063F              LOADED:
OFF              ; CHECK ZDOS !
0678 11 1400        GDDOS: LD      DE,1400H      ; HL = START OF SYSTEM
067B 19             ADD      HL,DE              ; HL = .HEAS-COLDSTART
067C D9             EXX
067D 7E             LD      A,(HL)              ; BAUDRATE VALUE
067E D9             EXX
067F F5             PUSH    AF                  ; SAVE
EXE              USER7
068B F1             POP      AF
068C E9             JP      (HL)              ; GO TO COLDSTART

;
OFF
0717 FFFF          LAST: DEFW    CL              ; ROOM FOR USER
END

```