

343:360		678	PWRJMP			
343:360	000	679		NOP	.	power-on
343:361	000	680		NOP	.	-jump
343:362	000	681		NOP	.	-sequence
343:363	000	682		NOP	.	-with NOP
343:364	000	683		NOP	.	-padding
343:365	303 000 340	684		JMP	DBOOT	
		685				
343:370	000:010	686		DS	10Q	I/O locations
		687				
347:311		688		AORG	RAM+3:311Q	
		689				
347:311	000:031	690	STACK	DS	31Q	
		691				
347:342	000 000	692	ECOUNT	DW	0	error count cells
347:344	000 030	693	TIMER	DW	30:000Q	head load time out
347:346	000 347	694	DMAADR	DW	RAM+300H	dma address
347:350	010	695	DSFLAG	DB	10Q	
347:351	000	696	HDFLAG	DB	0	read header flag
347:352	176	697	DRVSEL	DB	176Q	drive select constant
347:353	000	698	DISK	DB	0	new drive
347:354	010	699	CDISK	DB	10Q	current disk
347:355	000	700	TZFLAG	DB	0	home cmd indicator
347:356	011	701	DOPRAM	DB	11Q	drive 0 parameters
347:357	377	702	DOTRK	DB	377Q	drive 0 track no
347:360	011	703	D1PRAM	DB	11Q	drive 1 parameters
347:361	377	704	D1TRK	DB	377Q	drive 1 track no
347:362	011	705	D2PRAM	DB	11Q	drive 2 parameters
347:363	377	706	D2TRK	DB	377Q	drive 2 track no
347:364	011	707	D3PRAM	DB	11Q	drive 3 parameters
347:365	377	708	D3TRK	DB	377Q	drive 3 track no
347:366	011	709	DCREG	DB	11Q	current parameters
347:367	000	710	SIDE	DB	0	new side
347:370	001	711	SECTOR	DB	1	new sector
347:371	000	712	TRACK	DB	0	new track
347:372	000	713	TRKNO	DB	0	disk
347:373	000	714	SIDENO	DB	0	-sector
347:374	000	715	SECTNO	DB	0	-header
347:375	000	716	SECLNO	DB	0	-data
347:376	000	717	CRCLNO	DB	0	-buffer
347:377	000	718	CRCHI	DB	0	

E000		1		AORG	0E000H
		2			
E000	E000	3	ORIGIN	EQU	340:000Q
		4			
E000	E3DE	5	BEGINS	EQU	ORIGIN+3:336Q
E000	E400	6	RAM	EQU	ORIGIN+4:000Q
E000	E3F8	7	IO	EQU	ORIGIN+3:370Q
E000	E3F8	8	UDATA	EQU	IO
E000	E3F9	9	DREG	EQU	IO+1
E000	E3F9	10	USTAT	EQU	IO+1
E000	E3FA	11	DCMD	EQU	IO+2
E000	E3FA	12	DSTAT	EQU	IO+2
E000	E3FB	13	CSTALL	EQU	IO+3
E000	E3FC	14	CMDREG	EQU	IO+4
E000	E3FC	15	CSTAT	EQU	IO+4
E000	E3FD	16	TRKREG	EQU	IO+5
E000	E3FE	17	SECREG	EQU	IO+6
E000	E3FF	18	DATREG	EQU	IO+7
		19			
E000	0001	20	LIGHT	EQU	1
E000	0001	21	HEAD	EQU	1
E000	0001	22	DENSITY	EQU	1
E000	0004	23	ISTAT	EQU	4
E000	0004	24	INTRQ	EQU	4
E000	0004	25	TZERO	EQU	4
E000	0004	26	LOAD	EQU	4
E000	0006	27	ULOAD	EQU	6
E000	0008	28	OSTAT	EQU	10Q
E000	0008	29	DSIDE	EQU	10Q
E000	0009	30	NOLITE	EQU	11Q
E000	0009	31	DCRINT	EQU	11Q
E000	0009	32	HCMD	EQU	11Q
E000	0010	33	INDEX	EQU	20Q
E000	0012	34	WINDXD	EQU	22Q
E000	0018	35	SKCMD	EQU	30Q
E000	001A	36	RINDXD	EQU	32Q
E000	001D	37	SVCMD	EQU	35Q
E000	0040	38	WPROT	EQU	100Q
E000	0040	39	ACCESS	EQU	100Q
E000	0080	40	RSTBIT	EQU	200Q
E000	0080	41	READY	EQU	200Q
E000	0088	42	RDCMD	EQU	210Q
E000	00A8	43	WRCMD	EQU	250Q
E000	00C0	44	STBITS	EQU	300Q
E000	00C4	45	RACMD	EQU	304Q
E000	00D0	46	CLRCMD	EQU	320Q
		47			
		48	*NP		

E000	C3 69 E0	49	DBOOT	JMP	BOOT
E003	C3 E9 E0	50	TERMIN	JMP	CIN
E006	C3 DA E0	51	TRMOUT	JMP	COUT
E009	C3 5A E1	52	TKZERO	JMP	HOME
E00C	C3 8B E1	53	TRKSET	JMP	SEEK
E00F	C3 81 E1	54	SETSEC	JMP	SECSET
E012	C3 43 E1	55	SETDMA	JMP	DMA
E015	C3 DD E1	56	DREAD	JMP	READ
E018	C3 BC E1	57	DWRITE	JMP	WRITE
E01B	C3 3C E1	58	SELDRV	JMP	DRIVE
E01E	C3 F8 E0	59	TPANIC	JMP	CPAN
E021	C3 03 E1	60	TSTAT	JMP	TMSTAT
E024	C3 34 E1	61	DMAST	JMP	DMSTAT
E027	C3 09 E1	62	STATUS	JMP	DISKST
E02A	C3 C5 E0	63	DSKERR	JMP	LERROR
E02D	C3 B3 E3	64	SETDEN	JMP	DENFIX
E030	C3 E5 E3	65	SETSID	JMP	SIDEX
		66			
E033	0036	67	DS		66Q
		68			
E069		69	BOOT		
E069	31 FA E7	70	LXI	SP,TRACK+1	initialize SP
E06C	CD D2 E3	71	CALL	TIMOUT	poc/reset timeout
E06F	21 01 00	72	LXI	H,1	
E072	E5	73	PUSH	H	track 0, sector 1
E073	2E 09	74	MVI	L,DCRINT	set up the
E075	E5	75	PUSH	H	-side select
E076	26 FF	76	MVI	H,377Q	-and initial
E078	E5	77	PUSH	H	-drive
E079	E5	78	PUSH	H	-parameters
E07A	E5	79	PUSH	H	
E07B	E5	80	PUSH	H	
E07C	21 08 00	81	LXI	H,10Q	initialize
E07F	E5	82	PUSH	H	-tzflag & cdisk
E080	2E 7E	83	MVI	L,176Q	initialize
E082	E5	84	PUSH	H	-disk & drvsel
E083	2E 08	85	MVI	L,10Q	initialize
E085	E5	86	PUSH	H	-hdflag & dsflag
E086	26 18	87	MVI	H,30Q	initialize
E088	E5	88	PUSH	H	-timer constant
E089	3E 7F	89	MVI	A,177Q	start 1791
E08B	32 F9 E3	90	STA	DREG	
E08E	3E D0	91	MVI	A,CLRCMD	1791 reset
E090	32 FC E3	92	STA	CMDREG	
E093		93	LDHEAD		
E093	AF	94	XRA	A	load the head
E094	CD 1B E3	95	CALL	HDCHK	-and test for
E097	D2 A5 E0	96	JNC	DOOROK	-drive ready
E09A	3E 01	97	MVI	A,LIGHT	turn on the
E09C	32 F6 E7	98	STA	DCREG	-error LED
E09F	CD D2 E3	99	CALL	TIMOUT	timeout to
EOA2	C3 93 E0	100	JMP	LDHEAD	-close drive door
		101	*NP		

EOA5		102	DOOROK		
EOA5	3E 09	103		MVI A,NOLITE	turn off the
EOA7	32 F6 E7	104		STA DCREG	-error LED
EOAA	CD 96 E3	105		CALL MEASUR	head load time
EOAD	C1	106		POP B	adjust the stack
EOAE	01 00 E7	107		LXI B,RAM+300H	DMA addr
EOB1	C5	108		PUSH B	initialize
EOB2	D5	109		PUSH D	-dmaadr & timer
EOB3	21 00 00	110		LXI H,0	initialize
EOB6	E5	111		PUSH H	-error counts
EOB7	00	112		NOP .	debug instruction
EOB8	C5	113		PUSH B	boot address
EOB9	06 0C	114		MVI B,12	number of retrys
EOBB		115	LDLOOP		
EOBB	C5	116		PUSH B	save the retry no.
EOBC	CD DD E1	117		CALL READ	read boot sector
EOBF	C1	118		POP B	restor retry no.
EOC0	D0	119		RNC .	successful read?
EOC1	05	120		DCR B	no! - count down
EOC2	C2 BB E0	121		JNZ LDLOOP	-and try again
EOC5		122	LERROR		
EOC5	0E 09	123		MVI C,11Q	
EOC7	11 C3 A2	124		LXI D,242:303Q	
EOCA		125	LELOOP		
EOCA	1B	126		DCX D	
EOCB	7A	127		MOV A,D	
EOCC	B3	128		ORA E	
EOCD	C2 CA E0	129		JNZ LELOOP	
EODO	3E 08	130		MVI A,10Q	blink
EOD2	A9	131		XRA C	-the LED at
EOD3	4F	132		MOV C,A	-top of the
EOD4	32 FA E3	133		STA DCMD	-circuit board
EOD7	C3 C7 E0	134		JMP LERROR+2	
		135			
EODA		136	COUT		
EODA	3A F9 E3	137		LDA USTAT	get UART status
EODD	E6 08	138		ANI OSTAT	output ready mask
EODF	C2 DA E0	139		JNZ COUT	test buffer empty
EOE2	79	140		MOV A,C	character data
EOE3	2F	141		CMA .	negative logic bus
EOE4	32 F8 E3	142		STA UDATA	send data to UART
EOE7	2F	143		CMA .	make positive
EOE8	C9	144		RET	
		145			
EOE9		146	CIN		
EOE9	3A F9 E3	147		LDA USTAT	get UART status
EOEC	E6 04	148		ANI ISTAT	input ready mask
EOEE	C2 E9 E0	149		JNZ CIN	wait for input
EOF1	3A F8 E3	150		LDA UDATA	get the character
EOF4	2F	151		CMA .	adjust for negative bus
EOF5	E6 7F	152		ANI 177Q	trim to 7 bits
EOF7	C9	153		RET	
		154			
EOF8		155	CPAN		
EOF8	3A F9 E3	156		LDA USTAT	get UART status
EOFB	E6 04	157		ANI ISTAT	input ready mask
EOFD	C0	158		RNZ .	test for data
EOFE	CD E9 E0	159		CALL CIN	get character
E101	B9	160		CMP C	test for panic chtr
E102	C9	161		RET	
		162	*NP		

E103			163	TMSTAT		
E103	3A	F9	E3	164	LDA	USTAT get UART status
E106	E6	04		165	ANI	ISTAT input ready mask
E108	C9			166	RET	
			167			
E109			168	DISKST		
E109	21	FD	E3	169	LXI	H,TRKREG most recent
E10C	4E			170	MOV	C,M -track to C
E10D	23			171	INX	H most recent
E10E	46			172	MOV	B,M -sector to B
E10F	3A	F6	E7	173	LDA	DCREG get current
E112	2F			174	CMA	. -density in
E113	E6	01		175	ANI	1 -the msb
E115	0F			176	RRC	. -position
E116	57			177	MOV	D,A save in D
E117	3A	F7	E7	178	LDA	SIDE put the
E11A	07			179	RLC	. -most recent
E11B	07			180	RLC	. -side select
E11C	07			181	RLC	. -in bit position
E11D	B2			182	ORA	D -6 and merge
E11E	57			183	MOV	D,A save in D
E11F	3A	E8	E7	184	LDA	DSFLAG get the
E122	EE	08		185	XRI	DSIDE -most recent
E124	17			186	RAL	. -double sided
E125	17			187	RAL	. -status and place
E126	82			188	ADD	D -in bit position
E127	57			189	MOV	D,A -5 and merge
E128	3A	FD	E7	190	LDA	SECLEN get the
E12B	17			191	RAL	. -sector length
E12C	17			192	RAL	. -code bits in
E12D	B2			193	ORA	D -positions 2 & 3
E12E	57			194	MOV	D,A -and merge
E12F	3A	EC	E7	195	LDA	CDISK get the current
E132	82			196	ADD	D -disk no. in bit
E133	C9			197	RET	. -positions 0 & 1
			198			
E134			199	DMSTAT		
E134	E5			200	PUSH	H save the HL pair
E135	2A	E6	E7	201	LHLD	DMAADR move the
E138	44			202	MOV	B,H -DMA address to
E139	4D			203	MOV	C,L -the BC pair
E13A	E1			204	POP	H recover HL
E13B	C9			205	RET	
			206			
E13C			207	DRIVE		
E13C	79			208	MOV	A,C drive select
E13D	E6	03		209	ANI	3 -values must be
E13F	32	EB	E7	210	STA	DISK -between zero
E142	C9			211	RET	. -and three
			212	*NP		

E143		213	DMA		
E143	21 00 1C	214		LXI H,-RAM	test the
E146	09	215		DAD B	-DMA address
E147	DA 54 E1	216		JC DMASET	-for conflict
E14A	21 08 20	217		LXI H,8-ORIGIN	
E14D	09	218		DAD B	-with the I/O
E14E	D2 54 E1	219		JNC DMASET	-on the DJ/2D
E151	3E 10	220		MVI A,20Q	-controller
E153	C9	221		RET	
E154		222	DMASET		
E154	60	223		MOV H,B	store the
E155	69	224		MOV L,C	-BC pair
E156	22 E6 E7	225		SHLD DMAADR	
E159	C9	226		RET	
		227			
E15A		228	HOME		
E15A	CD E3 E2	229		CALL HDLOAD	load the head
E15D	D8	230		RC .	not ready error
E15E	CD 70 E1	231		CALL HENTRY	move the head
E161	F5	232		PUSH PSW	save status
E162	9F	233		SBB A	update the
E163	32 F9 E7	234		STA TRACK	-track
E166	32 FD E3	235		STA TRKREG	-registers
E169	AF	236		XRA A	set the not
E16A	32 ED E7	237		STA TZFLAG	-verified flag
E16D	C3 23 E2	238		JMP LEAVE+1	unload the head
E170		239	HENTRY		
E170	AF	240		XRA A	set the force
E171	32 E9 E7	241		STA HDFLAG	-verify flag
E174	21 00 00	242		LXI H,0	timeout constant
E177	3E 09	243		MVI A,HCMD	move the head
E179	CD 62 E3	244		CALL CENTRY	to track 0
E17C	E6 04	245		ANI TZERO	track zero bit
E17E	C0	246		RNZ	
E17F	37	247		STC .	error flag
E180	C9	248		RET	
		249			
E181		250	SECSET		
E181	AF	251		XRA A	test for
E182	B1	252		ORA C	-zero value
E183	37	253		STC .	error flag
E184	C8	254		RZ .	error return
E185	E6 1F	255		ANI 37Q	trim & clear cry
E187	32 F8 E7	256		STA SECTOR	
E18A	C9	257		RET	
		258			
E18B		259	SEEK		
E18B	79	260		MOV A,C	test for
E18C	FE 4D	261		CPI 77	-track
E18E	3F	262		CMC .	-too large
E18F	D8	263		RC	
E190	32 F9 E7	264		STA TRACK	
E193	C9	265		RET	
		266	*NP		

E194		267	ISSUE		
E194	32 E3 E7	268		STA	ECOUNT+1 update count
E197	CD 96 E3	269		CALL	MEASUR find the index
E19A	OE 01	270		MVI	C,1 start w/sector 1
E19C		271	ISLOOP		
E19C	79	272		MOV	A,C initialize the
E19D	32 FE E3	273		STA	SECREG -sector register
E1A0	3A F8 E7	274		LDA	SECTOR test for
E1A3	B9	275		CMP	C -target sector
E1A4	C8	276		RZ	
E1A5	3E 88	277		MVI	A,RDCMD do a fake
E1A7	CD 5D E3	278		CALL	COMAND -read command
E1AA	DA 20 E2	279		JC	PLEAVE abort on error
E1AD	OC	280		INR	C increment sector no.
E1AE	C3 9C E1	281		JMP	ISLOOP
		282			
E1B1		283	COMNDP		
E1B1	32 FC E3	284		STA	CMDREG start the operation
E1B4	48	285		MOV	C,B initialize block count
E1B5	11 FF E3	286		LXI	D,DATREG data register
E1B8	2A E6 E7	287		LHLD	DMAADR transfer address
E1BB	C9	288		RET	
		289			
E1BC		290	WRITE		
E1BC	CD 33 E2	291		CALL	PREP prepare for write
E1BF	DA 22 E2	292		JC	LEAVE abort operation
E1C2		293	WREENTRY		
E1C2	3E A8	294		MVI	A,WRCMD start a write
E1C4	CD B1 E1	295		CALL	COMNDP
E1C7		296	WRLOOP		
E1C7	7E	297		MOV	A,M load 1st byte of data
E1C8	23	298		INX	H advance pointer
E1C9	12	299		STAX	D write 1st byte of data
E1CA	7E	300		MOV	A,M load 2nd byte of data
E1CB	23	301		INX	H advance pointer
E1CC	12	302		STAX	D write 2nd byte of data
E1CD	7E	303		MOV	A,M load 3rd byte of data
E1CE	23	304		INX	H advance pointer
E1CF	12	305		STAX	D write 3rd byte of data
E1D0	OD	306		DCR	C reduce block count
E1D1	7E	307		MOV	A,M load 4th byte of data
E1D2	23	308		INX	H advance pointer
E1D3	12	309		STAX	D write 4th byte of data
E1D4	C2 C7 E1	310		JNZ	WRLOOP write next 4 bytes
E1D7	21 C2 E1	311		LXI	H,WREENTRY return entry addr
E1DA	C3 FB E1	312		JMP	CBUSY
		313	*NP		

E1DD		314	READ		
E1DD	CD 33 E2	315		CALL PREP	prepare for read
E1E0	DA 22 E2	316		JC LEAVE	abort operation
E1E3		317	RDENTRY		
E1E3	3E 88	318		MVI A,RDCMD	start a read
E1E5	CD B1 E1	319		CALL COMNDP	
E1E8		320	RDLOOP		
E1E8	1A	321		LDAX D	read 1st byte
E1E9	77	322		MOV M,A	store 1st byte
E1EA	23	323		INX H	advance pointer
E1EB	1A	324		LDAX D	read 2nd byte
E1EC	77	325		MOV M,A	store 2nd byte
E1ED	23	326		INX H	advance pointer
E1EE	1A	327		LDAX D	read 3rd byte
E1EF	77	328		MOV M,A	store 3rd byte
E1F0	23	329		INX H	advance pointer
E1F1	0D	330		DCR C	reduce block count
E1F2	1A	331		LDAX D	read 4th byte
E1F3	77	332		MOV M,A	store 4th byte
E1F4	23	333		INX H	advance pointer
E1F5	C2 E8 E1	334		JNZ RDLOOP	read next 4 bytes
E1F8	21 E3 E1	335		LXI H,RDENTRY	return entry addr
		336			
E1FB		337	CBUSY		
E1FB	E5	338		PUSH H	save return
E1FC	21 FC E3	339		LXI H,CSTAT	wait for 1791
E1FF	CD 6C E3	340		CALL BUSY	-to finish command
E202	E6 5F	341		ANI 137Q	error bit mask
E204	CA 21 E2	342		JZ LEAVE-1	no error
E207	FE 10	343		CPI 20Q	premature interrupt
E209	C2 20 E2	344		JNZ PLEAVE	other error type
E20C	3A E2 E7	345		LDA ECOUNT	decrement error
E20F	3D	346		DCR A	-count number 1
E210	FA 17 E2	347		JM STEST	hard interrupt error
E213	32 E2 E7	348		STA ECOUNT	update count
E216	C9	349		RET .	do operation over
E217		350	STEST		
E217	3A E3 E7	351		LDA ECOUNT+1	decrement error
E21A	3D	352		DCR A	-count number 2
E21B	F2 94 E1	353		JP ISSUE	issue a command
E21E	3E 10	354		MVI A,20Q	irrecoverable error!
E220		355	PLEAVE		
E220	37	356		STC .	error flag
E221	E1	357		POP H	adjust the stack
E222		358	LEAVE		
E222	F5	359		PUSH PSW	save the status
E223	3A F6 E7	360		LDA DCREG	control bits
E226	EE 04	361		XRI LOAD	toggle the
E228	32 FA E3	362		STA DCMD	-head load bit
E22B	3A EA E7	363		LDA DRVSEL	enable access to
E22E	32 F9 E3	364		STA DREG	-the data register
E231	F1	365		POP PSW	recover the status
E232	C9	366		RET	
		367	*NP		

E233				368	PREP		
E233	CD	E3	E2	369		CALL HDLOAD	load the head
E236	D8			370		RC .	test for drive ready
E237	3A	FD	E3	371		LDA TRKREG	get old track
E23A	3C			372		INR A	test for head
E23B	CC	70	E1	373		CZ HENTRY	-not calibrated
E23E	D8			374		RC .	seek error?
E23F	21	FD	E3	375		LXI H,TRKREG	old track
E242	3A	F9	E7	376		LDA TRACK	new track
E245	BE			377		CMP M	test for head motion
E246	23			378		INX H	advance to the
E247	23			379		INX H	-data register
E248	77			380		MOV M,A	save new track
E249	79			381		MOV A,C	turn off data reg
E24A	32	F9	E3	382		STA DREG	-access control bit
E24D	CA	6A	E2	383		JZ TVERFY	test for seek
E250	AF			384		XRA A	force a read
E251	32	E9	E7	385		STA HDFLAG	-header operation
E254	3A	FA	E3	386		LDA DSTAT	get the double
E257	E6	08		387		ANI DSIDE	-sided flag
E259	32	E8	E7	388		STA DSFLAG	save for status
E25C	1F			389		RAR .	shift for
E25D	1F			390		RAR .	-3/6 ms step
E25E	1F			391		RAR .	-rate constant
E25F	C6	18		392		ADI SKCMD	do a
E261	21	00	00	393		LXI H,0	-seek
E264	CD	62	E3	394		CALL CENTRY	-operation
E267	DA	8E	E2	395		JC SERROR	seek error?
				396			
E26A				397	TVERFY		
E26A	3A	E9	E7	398		LDA HDFLAG	get the force
E26D	B7			399		ORA A	-verify hdr flag
E26E	C2	B9	E2	400		JNZ CHKSEC	no seek & head OK
E271	06	02		401		MVI B,2	verify retry count
E273				402	SLOOP		
E273	3E	1D		403		MVI A,SVCMD	do a verify
E275	CD	5D	E3	404		CALL COMAND	-command
E278	E6	99		405		ANI 231Q	error bit mask
E27A	57			406		MOV D,A	save
E27B	CA	95	E2	407		JZ RDHDR	no error!
E27E	3A	F6	E7	408		LDA DCREG	denisty control
E281	EE	01		409		XRI DENSITY	flip the density
E283	32	F6	E7	410		STA DCREG	update and
E286	32	FA	E3	411		STA DCMD	-change density
E289	05			412		DCR B	decrement retry
E28A	C2	73	E2	413		JNZ SLOOP	-count & test
E28D	7A			414		MOV A,D	restore error bits
E28E				415	SERROR		
E28E	37			416		STC .	error flag
E28F	F5			417		PUSH PSW	save errors
E290	CD	70	E1	418		CALL HENTRY	seek to trk 0
E293	F1			419		POP PSW	recover errors
E294	C9			420		RET	
				421	*NP		

E295		422	RDHDR		
E295	06 0A	423		MVI B,12Q	number of retrys
E297		424	RHLOOP		
E297	11 FF E3	425		LXI D,DATREG	data register
E29A	21 FA E7	426		LXI H,TRACK+1	data pointer
E29D	3E C4	427		MVI A,RACMD	start a read
E29F	32 FC E3	428		STA CMDREG	-header operation
E2A2		429	RHL1		
E2A2	1A	430		LDAX D	get disk data
E2A3	77	431		MOV M,A	store in mem
E2A4	2C	432		INR L	advance pointer
E2A5	C2 A2 E2	433		JNZ RHL1	test end of page
E2A8	21 FC E3	434		LXI H,CSTAT	wait for 1791
E2AB	CD 6C E3	435		CALL BUSY	-to finish cmd
E2AE	B7	436		ORA A	test for errors
E2AF	CA B9 E2	437		JZ CHKSEC	transfer OK?
E2B2	05	438		DCR B	no! - test for
E2B3	C2 97 E2	439		JNZ RHLOOP	-hard error
E2B6	C3 8E E2	440		JMP SERROR	recalibrate
E2B9		441	CHKSEC		
E2B9	3A FD E7	442		LDA SECLEN	get the sector
E2BC	4F	443		MOV C,A	-size and setup
E2BD	06 00	444		MVI B,0	-the table offset
E2BF	21 DF E2	445		LXI H,STABLE	sector table
E2C2	09	446		DAD B	sector size pntr
E2C3	3A F8 E7	447		LDA SECTOR	get the sector
E2C6	47	448		MOV B,A	-and save in B
E2C7	86	449		ADD M	compare w/table
E2C8	3E 10	450		MVI A,20Q	error flag
E2CA	D8	451		RC .	error return
E2CB	78	452		MOV A,B	initialize 1791
E2CC	32 FE E3	453		STA SECREG	-sector register
E2CF	3E 20	454		MVI A,40Q	128 byte sector
E2D1	21 05 05	455		LXI H,5:005Q	initialize
E2D4	22 E2 E7	456		SHLD ECOUNT	-error counts
		457			
E2D7		458	SZLOOP		
E2D7	0D	459		DCR C	reduce size count
E2D8	47	460		MOV B,A	sector size to B
E2D9	F8	461		RM .	return on minus
E2DA	17	462		RAL .	double the count
E2DB	B7	463		ORA A	clear the carry
E2DC	C3 D7 E2	464		JMP SZLOOP	
		465			
E2DF		466	STABLE		
E2DF	E5	467		DB 345Q	26 sector diskettes
E2E0	E5	468		DB 345Q	26 sector diskettes
E2E1	F0	469		DB 360Q	15 sector diskettes
E2E2	F7	470		DB 367Q	8 sector diskettes
		471	*NP		

E2E3			472	HDLOAD		
E2E3	21	EB E7	473	LXI	H,DISK	new drv ptr
E2E6	4E		474	MOV	C,M	save new drv in C
E2E7	23		475	INX	H	current drv ptr
E2E8	5E		476	MOV	E,M	save old drv in E
E2E9	71		477	MOV	M,C	update current drv
E2EA	23		478	INX	H	home cmd flag
E2EB	7B		479	MOV	A,E	test for
E2EC	B9		480	CMP	C	-drive change
E2ED	7E		481	MOV	A,M	head load mask
E2EE	36	O1	482	MVI	M,HEAD	update the mask
E2F0	CA	1B E3	483	JZ	HDCHK	no drive change?
E2F3	23		484	INX	H	addr of drive table
E2F4	E5		485	PUSH	H	save table addr
E2F5	16	00	486	MVI	D,O	set up the
E2F7	42		487	MOV	B,D	-offset address
E2F8	19		488	DAD	D	calculate the
E2F9	19		489	DAD	D	-parameter addr
E2FA	3A	F6 E7	490	LDA	DCREG	save the
E2FD	77		491	MOV	M,A	density status
E2FE	23		492	INX	H	track pointer
E2FF	11	FD E3	493	LXI	D,TRKREG	1791 trk reg
E302	1A		494	LDAX	D	get current track
E303	77		495	MOV	M,A	save in the table
E304	E1		496	POP	H	beginning of table
E305	09		497	DAD	B	new drive
E306	09		498	DAD	B	-table pointer
E307	7E		499	MOV	A,M	get density status
E308	32	F6 E7	500	STA	DCREG	update DCREG
E30B	23		501	INX	H	get the old
E30C	7E		502	MOV	A,M	-track number
E30D	12		503	STAX	D	-and update 1791
E30E	3E	7F	504	MVI	A,177Q	drive select bits
E310			505	DSROT		
E310	07		506	RLC	.	rotate to
E311	0D		507	DCR	C	-select the
E312	F2	10 E3	508	JP	DSROT	-proper drive
E315	E6	7F	509	ANI	177Q	set the run bit
E317	32	EA E7	510	STA	DRVSEL	save in drv reg
E31A	AF		511	XRA	A	force a head load
			512	*NP		

E31B			513	HDCHK		
E31B	21	FA	E3	514	LXI	H, DSTAT test for
E31E	A6			515	ANA	M -head loaded
E31F	32	E9	E7	516	STA	HDFLAG save the head
E322	F5			517	PUSH	PSW -loaded status
E323	3A	EA	E7	518	LDA	DRVSEL get current drive
E326	4F			519	MOV	C,A save
E327	3A	F7	E7	520	LDA	SIDE get current side
E32A	2F			521	CMA	. -and merge
E32B	A1			522	ANA	C -with drive select
E32C	32	F9	E3	523	STA	DREG select drive & side
E32F	EE	40		524	XRI	ACCESS toggle access bit
E331	4F			525	MOV	C,A save for PREP routine
E332	3A	F6	E7	526	LDA	DCREG den & head cntl bits
E335	47			527	MOV	B,A save
E336	3A	F9	E7	528	LDA	TRACK get the new track
E339	D6	01		529	SUI	1 force single
E33B	9F			530	SBB	A -density
E33C	3D			531	DCR	A -if track = 0
E33D	2F			532	CMA	. compliment
E33E	B0			533	ORA	B merge w/control bits
E33F	77			534	MOV	M,A load head & set density
E340	F1			535	POP	PSW head load status
E341	C2	4F	E3	536	JNZ	RDYCHK conditionally
E344	E5			537	PUSH	H -wait for head
E345	2A	E4	E7	538	LHLD	TIMER -load time out
E348				539		
E348	2B			540	DCX	H count down
E349	7C			541	MOV	A,H -40 ms for
E34A	B5			542	ORA	L -head load
E34B	C2	48	E3	543	JNZ	TLOOP -time out
E34E	E1			544	POP	H
E34F				545		
E34F	7E			546	RDYCHK	
E350	E6	80		547	MOV	A,M test for
E352	CO			548	ANI	READY -drive ready
E353				549	UNLOAD	
E353	3A	F6	E7	550	LDA	DCREG force a
E356	F6	06		551	ORI	ULOAD -head
E358	77			552	MOV	M,A -unload
E359	3E	80		553	MVI	A,READY set drive
E35B	37			554	STC	. -not ready
E35C	C9			555	RET	. -error flag
E35D				556		
E35D	2A	E4	E7	557	COMAND	
E360	29			558	LHLD	TIMER get index count
E361	29			559	DAD	H -and multiply
E362				560	DAD	H -by four
E362	EB			561	CENTRY	
E363	21	FC	E3	562	XCHG	. save in D-E pair
E366	77			563	LXI	H,CSTAT issue command
E367				564	MOV	M,A -to the 1791
E367	7E			565	NBUSY	
E367	1F			566	MOV	A,M wait
E368	D2	67	E3	567	RAR	. -for the
E369				568	JNC	NBUSY -busy flag
				569	*NP	

E36C		570	BUSY		
E36C	7E	571		MOV A,M	test for
E36D	1F	572		RAR .	-device busy
E36E	7E	573		MOV A,M	restore status
E36F	DO	574		RNC .	return if not busy
E370	C3 76 E3	575		JMP PATCH+3	jump around patch
E373		576	PATCH		
E373	C3 E3 E2	577		JMP HDLOAD	patch for old ATE
E376	1B	578		DCX D	test for
E377	7A	579		MOV A,D	-two disk
E378	B3	580		ORA E	-revolutions
E379	C2 6C E3	581		JNZ BUSY	47 machine cycles
E37C	5E	582		MOV E,M	get error code
E37D	E5	583		PUSH H	save cmd address
E37E	23	584		INX H	track register
E37F	56	585		MOV D,M	save present track
E380	3A EA E7	586		LDA DRVSEL	control bits
E383	EE 80	587		XRI RSTBIT	reset the 1791
E385	32 F9 E3	588		STA DREG	-controller to
E388	EE CO	589		XRI STBITS	-clear the
E38A	E3	590		XTHL .	-command busy
E38B	32 F9 E3	591		STA DREG	-fault condition
E38E	36 DO	592		MVI M,CLRCMD	force interrupt
E390	E3	593		XTHL .	restore the
E391	72	594		MOV M,D	-the track reg
E392	E1	595		POP H	restore the stack
E393	7B	596		MOV A,E	error code to A
E394	37	597		STC .	-error flag
E395	C9	598		RET	
		599			
E396		600	MEASUR		
E396	11 00 00	601		LXI D,0	initialize count
E399	21 FA E3	602		LXI H,DSTAT	status port
E39C	0E 10	603		MVI C,INDEX	index bit flag
E39E		604	INDXLO		
E39E	7E	605		MOV A,M	wait for
E39F	A1	606		ANA C	-index
E3A0	CA 9E E3	607		JZ INDXLO	-pulse high
E3A3		608	INDXHI		
E3A3	7E	609		MOV A,M	wait for
E3A4	A1	610		ANA C	-index
E3A5	C2 A3 E3	611		JNZ INDXHI	-pulse low
E3A8		612	INDXCT		
E3A8	13	613		INX D	advance count
E3A9	E3	614		XTHL .	four dummy
E3AA	E3	615		XTHL .	-instructions
E3AB	E3	616		XTHL .	-to lengthen
E3AC	E3	617		XTHL .	-the delay
E3AD	7E	618		MOV A,M	wait for
E3AE	A1	619		ANA C	-the index
E3AF	CA A8 E3	620		JZ INDXCT	-to go high
E3B2	C9	621		RET .	98 machine cycles
		622	*NP		

E3B3		623	DENFIX		
E3B3	79	624		MOV A,C	trim the
E3B4	E6 01	625		ANI 1	-excess bits
E3B6	2F	626		CMA .	compliment and
E3B7	47	627		MOV B,A	-save in B
E3B8	21 EB E7	628		LXI H,DISK	new disk ptr
E3BB	5E	629		MOV E,M	get disk no.
E3BC	16 00	630		MVI D,O	offset addr
E3BE	23	631		INX H	current disk ptr
E3BF	7E	632		MOV A,M	move to ACC
E3C0	AB	633		XRA E	cmpr old w/new
E3C1	F5	634		PUSH PSW	save status
E3C2	23	635		INX H	disk table
E3C3	23	636		INX H	-address
E3C4	19	637		DAD D	add the
E3C5	19	638		DAD D	-offset
E3C6	7E	639		MOV A,M	get parameters
E3C7	F6 01	640		ORI 1	mask off density
E3C9	A0	641		ANA B	set new density
E3CA	77	642		MOV M,A	update parameters
E3CB	F1	643		POP PSW	test new=old?
E3CC	C0	644		RNZ	
E3CD	7E	645		MOV A,M	update CDISK
E3CE	32 F6 E7	646		STA DCREG	-also
E3D1	C9	647		RET	
		648			
E3D2		649	TIMOUT		
E3D2	21 00 00	650		LXI H,O	time-out delay
E3D5		651	TILOOP		
E3D5	2B	652		DCX H	decrement count
E3D6	7C	653		MOV A,H	test for delay
E3D7	B5	654		ORA L	-count equal zero
E3D8	E3	655		XTHL .	long NOP
E3D9	E3	656		XTHL .	-instruction
E3DA	C2 D5 E3	657		JNZ TILOOP	
E3DD	C9	658		RET	
		659			
E3DE		660	SBEGIN		
E3DE	E5	661		PUSH H	
E3DF	21 E2 E3	662		LXI H,DSTALL	
E3E2		663	DSTALL		
E3E2	E9	664		PCHL	
E3E3	E1	665		POP H	
E3E4	C9	666		RET	
		667			
E3E5		668	SIDEXF		
E3E5	79	669		MOV A,C	get the side bit
E3E6	E6 01	670		ANI 1	trim the excess
E3E8	17	671		RAL .	move the bit
E3E9	17	672		RAL .	-to the side
E3EA	17	673		RAL .	-select bit
E3EB	17	674		RAL .	-position
E3EC	32 F7 E7	675		STA SIDE	save side bit
E3EF	C9	676		RET	
		677	*NP		

E3F0		678	PWRJMP			
E3F0	00	679		NOP	.	power-on
E3F1	00	680		NOP	.	-jump
E3F2	00	681		NOP	.	-sequence
E3F3	00	682		NOP	.	-with NOP
E3F4	00	683		NOP	.	-padding
E3F5	C3 00 E0	684		JMP	DBOOT	
		685				
E3F8	0008	686		DS	10Q	I/O locations
		687				
E7C9		688		AORG	RAM+3:311Q	
		689				
E7C9	0019	690	STACK	DS	31Q	
		691				
E7E2	00 00	692	ECOUNT	DW	0	error count cells
E7E4	00 18	693	TIMER	DW	30:000Q	head load time out
E7E6	00 E7	694	DMAADR	DW	RAM+300H	dma address
E7E8	08	695	DSFLAG	DB	10Q	
E7E9	00	696	HDFLAG	DB	0	read header flag
E7EA	7E	697	DRVSEL	DB	176Q	drive select constant
E7EB	00	698	DISK	DB	0	new drive
E7EC	08	699	CDISK	DB	10Q	current disk
E7ED	00	700	TZFLAG	DB	0	home cmd indicator
E7EE	09	701	DOPRAM	DB	11Q	drive 0 parameters
E7EF	FF	702	DOTRK	DB	377Q	drive 0 track no
E7F0	09	703	D1PRAM	DB	11Q	drive 1 parameters
E7F1	FF	704	D1TRK	DB	377Q	drive 1 track no
E7F2	09	705	D2PRAM	DB	11Q	drive 2 parameters
E7F3	FF	706	D2TRK	DB	377Q	drive 2 track no
E7F4	09	707	D3PRAM	DB	11Q	drive 3 parameters
E7F5	FF	708	D3TRK	DB	377Q	drive 3 track no
E7F6	09	709	DCREG	DB	11Q	current parameters
E7F7	00	710	SIDE	DB	0	new side
E7F8	01	711	SECTOR	DB	1	new sector
E7F9	00	712	TRACK	DB	0	new track
E7FA	00	713	TRKNO	DB	0	disk
E7FB	00	714	SIDENO	DB	0	-sector
E7FC	00	715	SECTNO	DB	0	-header
E7FD	00	716	SECTNO	DB	0	-data
E7FE	00	717	CRCL0	DB	0	-buffer
E7FF	00	718	CRCHI	DB	0	

Morrow Designs, Inc.


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LIMITED WARRANTY

Morrow Designs Inc. warrants its products to be free from defects in workmanship and material for the period indicated. This warranty is limited to the repair or replacement of parts only and liability is limited to the purchase price of the product. The warranty is void if, in the sole opinion of Morrow Designs Inc., the product has been subject to abuse, misuse, unauthorized modification, improper assembly, non-conformance to assembly directions, or if the unit is used in any other manner than intended.

KITS - Parts, including the printed circuit boards, purchased in kit form are warranted for a period of ninety (90) days from the invoice/purchase date. If a board, which was purchased in kit form, is returned for testing or repair, a minimum service charge of \$35. will be assessed.

ASSEMBLED BOARDS - Parts, including the printed circuit boards, purchased as factory assemblies, are warranted for a period of six (6) months from the invoice/purchase date. Out-of-Warranty boards returned for testing or repair will be assessed a minimum of \$35. service charge. If the charge to repair will exceed \$35., the customer will be notified prior to the actual repair.

ELECTROMECHANICAL PERIPHERALS - Peripheral equipment, such as floppy disk drives, hard disk drives, etc., not manufactured by Morrow Designs Inc. have warranties which vary according to the manufacturer. In most cases, Morrow Designs Inc. provides a warranty equal to or greater than the original manufacturer. Please contact the factory for individual warranty information. Warranty information for each device is included with the equipment when it is shipped.

RETURN PROCEDURE - A COPY OF THE INVOICE OR PROOF OF ORIGINAL PURCHASE IS REQUIRED AND MUST ACCOMPANY THE ITEM FOR IN-WARRANTY SERVICE. Items returned without proof of original purchase will be sent back, shipping charges collect. A description of the problem must accompany the returned item. Shipment must be made prepaid to Morrow Designs Inc. Repaired items will be shipped via U.P.S. surface. Shipment by air requires payment of the additional charges. Morrow Designs Inc. is not responsible for any consequential damages or for damage incurred in transit.

The foregoing warranty is in lieu of all other warranties either expressed or implied and, in any event, is limited to product repair or replacement.

Effective February 1, 1980

Specifications, terms, and pricing are subject to change without notice.



LIMITED WARRANTY

DISCUS 1 and DISCUS 2D Systems

This addendum to Morrow Designs Inc. Limited Warranty applies to the Shugart Associates Model 800/801 Floppy Disk Drives as used in the DISCUS 1 and 2D Disk systems.

Parts and labor for a floppy disk drive purchased from Morrow Designs Inc. are warranted for a period of forty-five (45) days from the invoice/purchase date. For a period of one (1) year from the invoice/purchase date, parts are warranted. A fixed fee of \$55. will be charged for labor. After one (1) year current rates for parts and labor will be charged.

LIMITED WARRANTY

DISCUS 2+2 Systems

This addendum to Morrow Designs Inc. Limited Warranty applies to the EX-CELL-0 Corporation Remex Model RFD4000 Floppy Disk Drives as used in the DISCUS 2+2 System.

Parts and labor for a floppy disk drive purchased from Morrow Designs Inc. are warranted for a period of six (6) months from the invoice/purchase date. After six (6) months current rates for parts and labor will be charged.



