

SECTION II OPERATOR'S GUIDE

2-1. SYSTEM DESCRIPTION

The Altair Floppy Disk is used for mass storage of data for the Altair 8800 computer, and has a capacity of over 300K bytes per Disk with access time less than one second. A typical system using an Altair computer and Disk consists of an Altair 8800 mainframe with an 8080 CPU, 32K of memory, an I/O card for communicating to a terminal, a PROM card for initializing the system, a set of Disk Controller cards and two Disk Drives.

The software most commonly used is Altair Disk BASIC which resides in the lower 24K of memory and provides the Disk utilization routines. Altair Disk BASIC includes the standard features of BASIC, plus many extra functions that significantly increase programming power. The Software Driver for the Disk Read/Write functions is based on the Hard Sectoring technique, allowing maximum data storage on the Diskette.

The Altair computer interacts with the Disk Drives through two Disk Controller boards that plug into the Altair bus. All Control, Status and Data I/O is handled through three I/O ports dedicated to Disk Control. The circuitry in the Disk Controller consists of LSI and MSI TTL logic and performs the necessary housekeeping functions for data transfers and control of Disk Drive operations.

Inside the Altair Disk Drive cabinet is a PERTEC FD-400 Drive, a Power Supply, Line Buffers and Addressing Circuitry. The PERTEC FD-400 Drive has several features, including a direct drive D.C. motor for rotating the Diskette. This system has two advantages. First, the Drive is insensitive to line frequency variations, and second, no drive belts are required reducing maintenance.

2-2. SYSTEM SPECIFICATIONS

A. Software and System Features

Altair Disk Extended BASIC is an enhanced version of Altair Extended BASIC with added capabilities for saving and loading programs, and manipulating data files on the Disk. It requires a minimum of 24K of RAM memory for operation and utilizes random and sequential files for storing information on the Disk.

Utility Software is included with Altair Disk Extended BASIC for copying Diskettes, initializing blank Diskettes, listing directories, etc.

A Disk Bootstrap Loader is available on paper tape, cassette tape, or PROM (used with an 88-PMC PROM Memory Card). The PROM Disk Bootstrap Loader allows loading of Altair Disk Extended BASIC in less than ten seconds from the time power is turned on. A Hard Sector format (non-IBM compatible) allows storage of over 300,000 data bytes.

B. Hardware

1. Description and Features

The Disk Controller, which acts as the interface between the Altair computer and the Disk Drives, consists of two printed circuit boards that fit in the Altair chassis. They require two slots in the computer, contain over 60 ICs, and connect to the Disk Drives via an 18-pair flat cable. The Controller can address up to 16 Drives.

The Disk Drive Unit consists of a PERTEC FD-400 Drive in an Optima™ case 5 1/2" high, 17" wide and 17 1/2" deep (same width and depth as the Altair 8800). A Power Supply and a Buffer/Address board for selecting the Drive and interconnecting multiple Disk systems are also contained in the Disk unit. A fan is included to maintain low ambient temperature for continuous operation. The Disk Drive units interconnect to each other in "daisy chain" fashion and to the Controller using 18-pair flat cables and DC-37 type 37-pin rectangular connectors.

2. Hardware Specifications

a) Access Time

Track to track: 10 ms.

Head load and settle time: 45 ms.

Average time to Read or Write: 400 ms.

Worst case: 1135 ms.

b) Rotational speed: 360 RPM (166.7 ms/rev)

c) Tracks: 77 per Disk

d) Sectoring: Hard Sectored, 32 Sectors per track, 5.2 ms/Sector (non-IBM compatible)

- e) Data Transfer Rate: 250,000 bits/sec. (one 8-bit byte every 32 μ s.)
- f) Maximum number of Drives per system: 16
- g) Data storage capacity: 310,000 bytes per Disk
- h) Data bytes per sector: 128
- i) Data bytes per track: 4,096
- j) Disk Drive head life: over 10,000 hours of Diskette to Head contact
- k) Disk Drive Mean Time Between Failure (MTBF): exceeds 4,000 hours
- l) Disk Drive data reliability: not more than 1 in 10^9 soft (recoverable errors), 1 in 10^{12} hard (non-recoverable errors)
- m) Power
 - Controller: 1.1 amps at +8v unregulated (from Altair bus)
 - Disk Drive Unit: 110 watts 50/60 Hz, 117/220 VAC
- n) Diskette: Hard Sected, 32 Sectors + Index hole (Dysan #101, ITC #FD 32-1000)
- o) Disk Drive Unit Weight: 40 pounds

3. Operating Principle

The Disk Controller boards provide the interface between the Disk Drive Unit and the Altair bus. Serial Read Data from the Disk is converted into 8-bit parallel form by the Controller for transfer to memory via the CPU. Data is written on the Disk by converting the 8-bit bytes output from the Altair CPU to serial form. All Read and Write Data is transferred one byte at a time through the CPU.

Disk Controller Board 1 controls I/O address selection, Sector counting, Read Data and Disk Status. Disk Controller Board 2 controls Disk Drive addressing, Write Data and Disk Drive functions.

C. Ordering Information

- 1. 88-DCDD includes:
 - a) 2 Controller boards
 - b) 1 Disk Drive Unit
 - c) 1 Interconnect cable--6 ft. long
 - d) 1 Assembly and Operators Manual

- e) 1 Disk Extended BASIC Manual
- f) 1 blank Diskette
- 2. 88-DISC includes:
 - a) 1 Disk Drive Unit (117 VAC unless otherwise requested)
 - b) 1 Interconnect cable--6 ft. long
 - c) 1 blank Diskette
- 3. Altair Disk Extended BASIC requiring a minimum 24K of memory for operation includes:
 - a) Altair Disk Extended BASIC on Diskette
 - b) Altair Disk Extended BASIC Manual
 - c) Paper tape or cassette magnetic tape Bootstrap Loader (specify when ordering)
- 4. Disk Bootstrap Loader on PROM
 - a) Order 88-PMC (PROM Memory Card) and DBL PROM (PROM programmed with Disk Bootstrap Loader routine)
- 5. Manuals
 - a) Disk Hardware Manual
 - b) Altair Disk Extended BASIC Manual
- 6. Write Protect Option is available

2-3. DISK SYSTEM BLOCK DIAGRAM DESCRIPTION (Figure 2-1)

- A. Controller Board 1

Controller Board 1 performs all input functions to the Altair bus (Read Data, Sector Data, Status Information) as well as Control Addressing of all Disk to Computer I/O.
- B. Controller Board 2

Controller Board 2 performs all output functions from the Altair bus (Write Data, Disk Control, Disk Enable and Drive Selection).
- C. Interconnect Cable

An 18-pair flat cable with two 37-pin connectors (male on one end and female on the other) connects the Disk Drive to the Altair Disk Controller and "daisy chains" one Disk Drive to another in multiple Disk Systems.
- D. Disk Drive Cabinet
 - 1. Power Supply

The Disk Drive Cabinet contains a Power Supply for powering the Disk Buffer and Disk Drive.

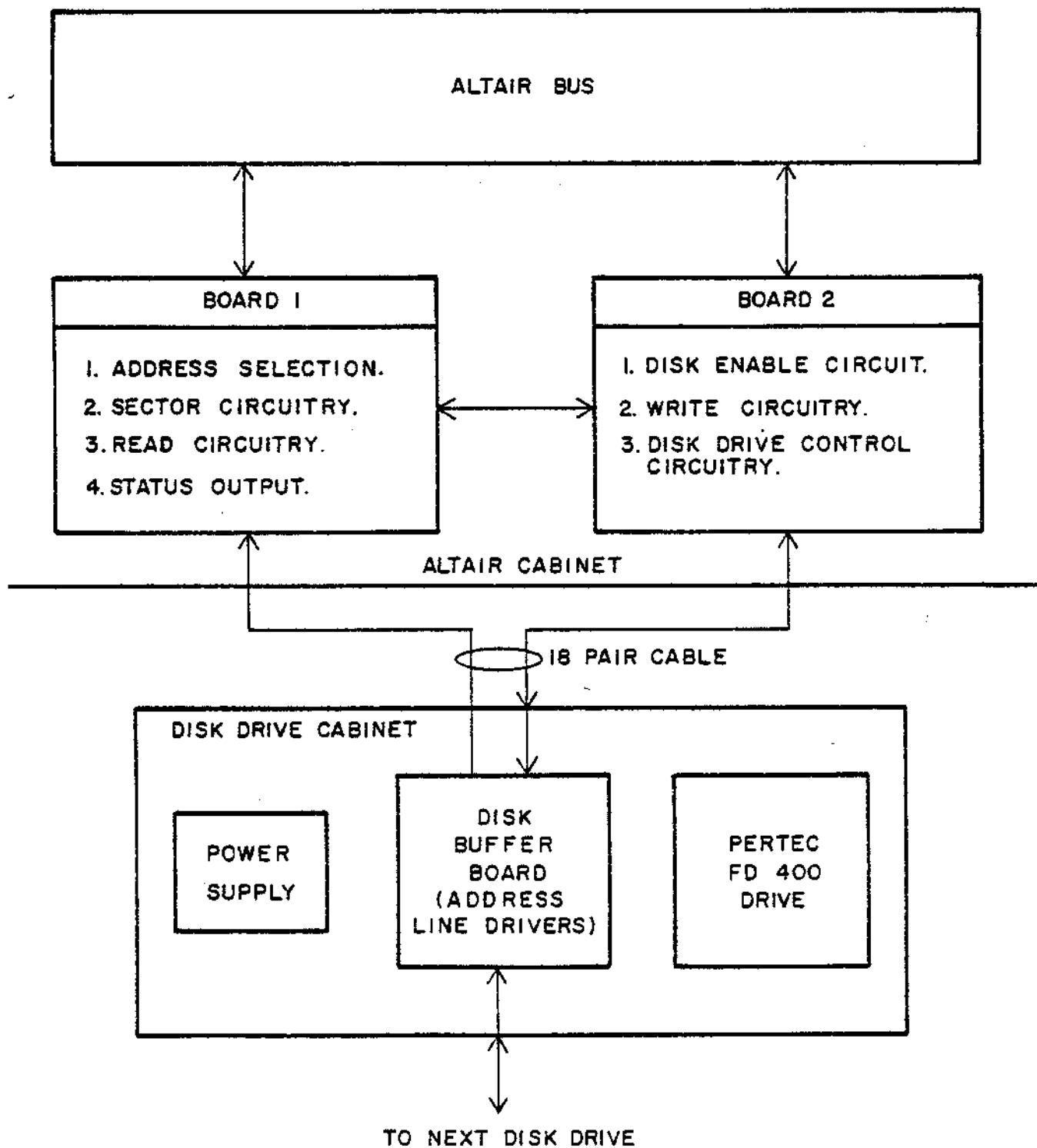


Figure 2-1. Disk System Block Diagram

2. The Disk Buffer

The Disk Buffer board contains the necessary line drivers and receivers for interconnection with long cables to the Disk Drive. In addition, it contains the Disk Drive Address Circuitry that allows the controller to select one of 16 Disk Drives. The Disk Buffer board also contains the line drivers for connection of multiple Disk Systems.

3. The Disk Drive

The Disk Drive (PERTEC FD-400) contains the mechanism and electronics that actually Read and Write data on the Diskette.

2-4. CONNECTION OF DISK SYSTEM

A. Controller Boards

1. Items Supplied

- a) Controller Board 1 (vertical and horizontal rows of ICs)
- b) Controller Board 2 (with short cable wired to it)
- c) Controller Cable (with 37-pin connector on one end and 3 miniature connectors on the other end)
- d) Connector Mounting Bracket and Hardware

2. Connection of Controller Boards

- a) Take cover off Altair computer (power off).
- b) Feed miniature (flat) connector ends of Controller cable through hole on connector panel in back of Altair computer. (37-pin connector outside chassis, miniature connectors inside chassis). Disregard this step if the chassis has mounting hole for 37-pin connector.
- c) Facing the front of the computer lay Controller board 1 flat in front of you on the Altair chassis with components up and stab connector to the right.
- d) Connect the short wired cable of board 2 to the 20-pin connector on board 1 (note polarization key of connector and missing pin on the PC board).
- e) Place board 2 flat, to the left of board 1 with components up and stab connector to the right.

- f) Connect 20-pin miniature connector on Controller cable to 20-pin connector on board 2. Note keying.
- g) Take 10-pin connector on Controller cable with the orange and yellow wires connected to it and connect to 10-pin connector on board 2. Note Keying.
- h) Take remaining 10-pin connector on Controller cable with white and gray wires on it and connect to 10-pin connector on board 1. Note Keying.
- i) Be sure wires from connector go out between card guides, and do not catch on card guides.
- j) Push cards firmly into connector on Altair motherboard.
- k) Install 37-pin connector in bracket and on back of Altair computer, straddling 2 connector holes. Use #4-40 x 5/16 screws, #4 lockwashers and #4-40 nuts.

NOTE

If unit has holes for 37-pin socket, disregard installation of bracket. Mount connector using #4-40 hardware on INSIDE of back panel.

B. Disk Drive Connection to Altair Computer

Connect the male connector of the six foot flat cable to Disk Controller connector on Altair computer. Connect the female end to connector on the Disk Drive marked "TO CONTROLLER."

C. Multiple Disk Drive Connection

1. With multiple Disk Drives, the Disks should have sequential addresses, i.e., for a 3-Drive System you should have Disks with addresses 0, 1 and 2. They may be connected in any order. The Disk Address is determined by four jumper wires in the Disk Buffer PC board inside the Drive and may be changed. See Table 3-A for the Disk Address Chart, indicating the wiring of the jumpers on the Disk Buffer PC board.
2. Connect the Disks by using the 6 ft. flat cable. Connect the male connector to the connector marked "FROM NEXT DISK" on the Disk Drive connected to the Controller. The other end of the cable connects to the next Disk Drive connector marked "TO CONTROLLER." This procedure is repeated for added Disk Drives.

2-5. USING THE DISK DRIVE

A. Diskette Information

1. Always keep Diskette in envelope when not in use.
2. Keep Diskette away from heat, magnetic fields (flourescent lights, power transformers, etc.) and dust.
3. Never touch recording surface of Diskette (opposite label side).
4. Always label the Diskette, using an adhesive label. Do not write on label after it is attached to the Diskette.
5. The type of Diskette used is Hard Sectorred (32 Sector holes and 1 Index hole). Blank Diskettes are available from MITS for \$15.00 each. The Diskettes are not IBM compatible. Recommended Diskettes are Dyan 101, ITC FD32-1000, etc.

B. Operating the Disk Drive

1. Depending on door style, open door to Disk Drive by pulling out and down, or releasing latch by pulling up on tab.
2. Insert Diskette into Drive with label side up, making sure it catches on retaining tab.
3. Close door to Disk Drive. Disk "PWR" light will go off.
4. The "PWR" LED indicates the on state except for about 5 seconds when the power is turned on, or for about 5 seconds after the door is closed. When the "PWR" light is on, it indicates that the Disk Drive may be enabled and that programs may be activated to access the Disk. This delay allows the Disk Drive motor speed time to stabilize.
5. NEVER open Disk Drive door or turn power off when DISK ENABLE and HEAD LOAD lights are on. It is possible to interrupt the software during a Write function and destroy data on the Diskette.
6. Consult software documentation on methods for loading BASIC and utilizing software. For applications in which the user writes his own software, refer to Altair Disk Controller I/O Information, page 15.
7. Keep the 18-pair flat interconnect cable away from power cords. If there is excess cable, fold it and secure with a rubber band.
8. It is very important that the Altair computer and Disk Drives be connected to a grounded power outlet. If you must use a ground-

ing outlet adapter, be sure the green wire is connected to a good earth ground such as a cold water pipe.

Table 2-A. Disk Buffer/Drive Address Wiring

Disk Address	Pads			
	1	2	3	4
(0000) 0	\bar{A}	\bar{B}	\bar{C}	\bar{D}
(0001) 1	A	\bar{B}	\bar{C}	\bar{D}
(0010) 2	\bar{A}	B	\bar{C}	\bar{D}
(0011) 3	A	B	\bar{C}	\bar{D}
(0100) 4	\bar{A}	\bar{B}	C	\bar{D}
(0101) 5	A	\bar{B}	C	\bar{D}
(0110) 6	\bar{A}	B	C	\bar{D}
(0111) 7	A	B	C	\bar{D}
(1000) 8	\bar{A}	\bar{B}	\bar{C}	D
(1001) 9	A	\bar{B}	\bar{C}	D
(1010) 10	\bar{A}	B	\bar{C}	D
(1011) 11	A	B	\bar{C}	D
(1100) 12	\bar{A}	\bar{B}	C	D
(1101) 13	A	\bar{B}	C	D
(1110) 14	\bar{A}	B	C	D
(1111) 15	A	B	C	D

C. Altair Disk Controller I/O Information

1. Address Codes for I/O

	<u>Address</u>	<u>Mode</u>	
a)	010_8	Out	Selects, latches and enables Controller and Disk Drive
b)	010_8	In	Indicates status of Disk Drive and Controller
c)	011_8	Out	Controls Disk Function
d)	011_8	In	Indicates Sector position of Disk
e)	012_8	Out	Write Data
f)	012_8	In	Read Data

2. Address Code Definitions (in order as listed above)

a) Selection of Disk Drive Output on Channel $\emptyset 1\emptyset_8$

- | | | |
|--------|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| D0 LSB | } | Enables 1 of 16 Drives (each Drive has a unique address, selected by 4 jumper wires) and enables Controller (on Disk Drive Buffer PC card) |
| D1 | | |
| D2 | | |
| D3 MSB | | |
| D4 | } | Not used, User Selectable |
| D5 | | |
| D6 | | |
| D7 | } | Clears (Disables) Disk Control if set to 1 (D0-D6 are User Selectable). Disk Control is also cleared by opening the Disk Drive door or turning the Disk Drive power off. |

NOTE

- 1) If Disk Drive door is open, Drive and Controller cannot be enabled.
- 2) If Disk power is off, Drive and Controller cannot be enabled.
- 3) If Disk interconnect cable is not connected between the Controller and the Drive, Drive and Controller cannot be enabled.

- b) Status ($\emptyset 1\emptyset_8$ - INPUT) indicates Disk Status when Drive and Controller are enabled. Also provides valid INTE Status (D5) from the Altair bus when the Controller is enabled. True Condition = 0, False = 1
All False if Disk and Controller are not enabled

D0 - ENWD (Enter New Write Data) - indicates Write Circuit is ready for new data byte to be written. It occurs every 32 μ s. and starts 280 μ s. after Sector True (when Write enabled). It is reset by outputting to the Write Data Channel ($\emptyset 12_8$).

D1 - Move Head - indicates head movement allowed when True (STEP IN or STEP OUT). Goes False for 10 ms., True 1 ms., False 20 ms. after step command. May step every 10 ms.

Goes False during Write and 475 μ s. after Write to allow completion of TRIM ERASE.

- D2 - HS (Head Status) - True 40 ms. after head loaded or step command (if stepping with head already loaded). Indicates when head is properly loaded for Reading and Writing. Also enables Sector Position Channel when True.
 - D3 - Not Used = 0
 - D4 - Not Used = 0
 - D5 - INTE - indicates interrupt enabled.
 - D6 - TRACK 0 - indicates when head is on outermost track.
 - D7 - NRDA (New Read Data Available) - indicates that the Read Circuit has 1 byte of data ready to be taken from the Read Data Channel ($\emptyset 12_g$). After the sync* bit is detected, it occurs every 32 μ s. and is reset by an input instruction on Channel $\emptyset 12_g$. The byte containing the sync bit is the first byte read from the Disk.
- c) Control ($\emptyset 11_g$ - Out) - Controls Disk operations when Disk Drive and Controller enabled. A True signal (logic 1) on a data line will control the Disk as follows:
- D0 - STEP IN - steps Disk head in one position to higher numbered track
 - D1 - STEP OUT - steps Disk head out one position to lower numbered track
 - D2 - HEAD LOAD - loads head onto Disk - enables Sector Position Status
 - D3 - HEAD UNLOAD - removes head from Disk surface; may be unloaded immediately after WRITE ENABLE (Write and Trim Erase Circuits hold head loaded until completed)
 - D4 - IE (INTERRUPT ENABLE) - enables interrupts to occur when SRO True (see Sector definition)
 - D5 - ID (INTERRUPT DISABLE) - disables interrupt circuit. Interrupt Circuit also disabled by clearing Disk Control.

*See WRITE ENABLE (D7) of part c (Channel $\emptyset 11_g$ - Out)

D6 - HCS (HEAD CURRENT SWITCH) - must be True when outputting a Write instruction with the head on tracks 43-76. This reduces head current and optimizes resolution on inner tracks (automatically reset at end of Writing a Sector).

D7 - WRITE ENABLE - Initiate Write sequence as follows:

- 1) Disk selected and enabled, head loaded, enabling Sector Status.
- 2) (Sector True) detected for desired Sector, Write Circuit enabled by software.
- 3) 200 μ s. from WRITE ENABLE, TRIM ERASE automatically turned on. 280 μ s. from start of Sector, ENWD goes True, sync byte written by software.
- 4) First byte written always has most significant (D7) bit (sync bit), a logic 1 (most significant bit written first).
- 5) ENWD goes True every 32 μ s. Maximum number of data bytes per Sector is 137 (including sync).
- 6) The last or 138th byte written must be a 000. This will be written for the remainder of the Sector. Ignore ENWD from this point to end of Sector.
- 7) At end of Sector, the Write Circuit automatically disabled. TRIM ERASE disabled 475 μ s. later.

NOTE

- a) Write Circuit will continue Writing last byte output on Channel $\emptyset 12_g$ to the end of that Sector.
- b) Head may be unloaded anytime during Write cycle if no Read or Write function is expected after current Write cycle. Once Write is enabled, it holds the head loaded for the required time. (For Writing and TRIM ERASE).

d) Sector position ($\emptyset 11_g$ -INPUT) with Disk Drive and Controller enabled, and 40 ms. after head is loaded, is as follows:

DO-SRO-Sector True-True when = 0 and is 30 μ s. long. The

Write mode should begin as soon as D0 goes True. Write Data will be requested 280 μ s. after D0 goes True and Read Data will be available 140 μ s. after \overline{RD} goes True.

Sector #	0	1	2	3.....31
BIT PATTERN				
D1-SR1-	0	1	0	1.....1
D2-SR2-	0	0	1	1.....1
D3-SR3-	0	0	0	0.....1
D4-SR4-	0	0	0	0.....1
D5-SR5-	0	0	0	0.....1
D6 and D7 Not Used (=1)				

- e) Write Data ($\overline{D12}_8$ - Output) Output on the ENWD Status request.
- f) Read Data ($\overline{D12}_8$ - Input) Input on the NRDA Status flag.

D. Read/Write Function Timing

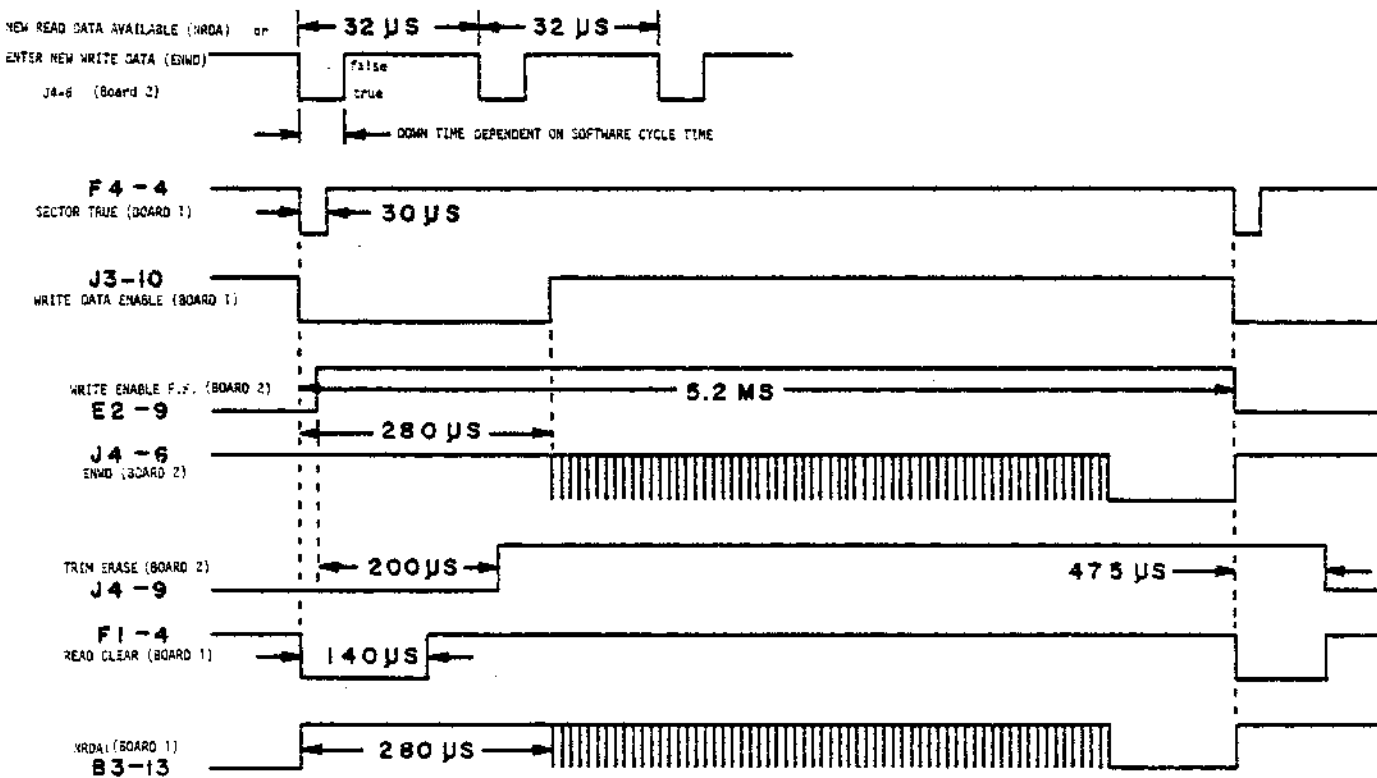


Figure 2-2. Read/Write Function Timing

E. Assembly Code to Read and Write a Sector

Program 2-I is provided to help users write their own Assembly language subroutines to Read and Write Data on the Floppy Disk. It is assumed that the Disk being used has already been enabled and positioned to the correct track.

Two data bytes at a time are always Read or Written so that the CPU can keep up with the data rate of the Floppy Disk (1 byte/32 μ s). After two bytes are Read or Written, the CPU resynchronizes with the next "byte ready" Status from the Floppy Disk Controller.

```
Program 2-I. Assembly Code to Read and Write a Sector
; CALL WITH NUMBER OF DATA BYTES TO WRITE IN [A]
; AND POINTER TO DATA BUFFER IN [H,L]
; ALL REGS DESTROYED.
DSKO:  MOV    C,A           ; SAVE # OF BYTES IN C
        MVI   A,136        ; CALCULATE NUMBER OF ZEROS TO WRITE
        SUB   C           ; SUBTRACT THE NUMBER OF DATA BYTES
        MOV   B,A         ; NUMBER OF ZEROS+1
        CALL  SECGET      ; LATENCY
        MVI   A,128       ; ENABLE WRITE WITHOUT SPECIAL CURRENT
        OUT   9
;
; CALL WITH [B]=NUMBER OF ZEROS [C]=NUMBER OF DATA BYTES
; AND [H,L] POINTING AT OUTPUT DATA
;
OHLDSK: MVI   D,1         ; SETUP A MASK (READY TO WRITE)
        MVI   A,128       ; HIGH BIT (D7) ALWAYS ON IN FIRST BYTE
        ORA   M           ; OR ON DATA BYTE
        MOV   E,A         ; SAVE FOR LATER
        INX   H           ; INCREMENT BUFFER POINTER
NOTYTD: IN    8           ; GET WRITE DATA READY STATUS
        ANA   D           ; TEST STATUS BIT
        JNZ  NOTYTD      ; NOT READY TO WRITE, WAIT
        ADD   E           ; ADD BYTE WE WANT TO SEND TO ZERO
        OUT   10         ; SEND THE BYTE
        MOV   A,M         ; GET NEXT BYTE TO SEND
        INX   H           ; MOVE BUFFER POINTER AHEAD
```



```

MOV   E,M           ; GET NEXT DATA BYTE
INX   H             ; MOVE BUFFER POINTER AHEAD AGAIN
DCR   C             ; DECREMENT COUNT OF CHARS TO SEND
JZ    ZRLOP        ; IF DONE, QUIT & GO TO ZRLOP
DCR   C             ; DECREMENT COUNT OF CHARS AGAIN
OUT   10           ; SEND THIS BYTE
JNZ   NOTYTD       ; STILL MORE CHARS, DO THEM.
ZRLOP: IN   8       ; GET READY TO WRITE
ANA   D             ; IS IT READY
JNZ   ZRLOP        ; IF NOT, LOOP
OUT   10           ; KEEP SENDING FINAL BYTE
DCR   B             ; DECREMENT COUNT OF BYTES TO SEND
JNZ   ZRLOP        ; KEEP WAITING
EI                    ; RE-ENABLE INTERRUPTS
MVI   A,8           ; UNLOAD HEAD
OUT   9             ; SEND COMMAND
RET                    ; DONE

```

```

; DISK INPUT ROUTINE.  ENTER WITH POINTER
; OF 137 BYTE BUFFER IN [H,L].  ALL REGS DESTROYED.

```

```

DSKI:  CALL  SECGET      ; POINT TO RIGHT SECTOR
        MVI   C,137      ; GET # OF CHARS TO READ
READOK: IN   8          ; GET DISK STATUS
        ORA   A          ; READY TO READ BYTE
        JM    READOK
        IN   10         ; READ THE STUFF
        MOV   M,A        ; SAVE IN BUFFER
        INX   H          ; BUMP DESTINATION POINTER
        DCR   C          ; LESS CHARS
        JZ    RETDO      ; IF OUT OF CHARS, RETURN
        DCR   C          ; DECREMENT COUNT OF CHARS
        NOP                    ; DELAY INTO NEXT BYTE
        IN   10         ; GET NEXT BYTE
        MOV   M,A        ; SAVE BYTE IN BUFFER
        INX   H          ; MOVE BUFFER POINTER
        JNZ   READOK     ; IF CHARS STILL LEFT, LOOP BACK

```

```

RETDO:  EI           ; RE-ENABLE INTERRUPTS
        MVI  A,8     ; UNLOAD HEAD
        OUT  9       ; SEND COMMAND
        RET

SECGET: MVI  A,4     ; LOAD THE HEAD
        OUT  9
        DI           ; DISABLE INTERRUPTS

SECLP2: IN   9       ; GET SECTOR INFO
        RAR         ; FIX UP SECTOR #
        JC   SECLP2  ; IF NOT, KEEP WAITING
        ANI  31     ; GET SECTOR #
        CMP  E       ; IS IT THE ONE WE WANTED
        JNZ  SECLP2  ; TRY TO FIND IT
        RET

```

F. Disk Boot Loader Octal Listing

Program 2-II is an octal listing of the Disk Boot Loader for Disk Systems without cassette or paper tape capabilities:

Program 2-II. Disk Boot Loader Listing

ADDRESS	CONTENTS	ADDRESS	CONTENTS	ADDRESS	CONTENTS
46000	363	46050	004	46120	132
46001	061	46051	302	46121	114
46002	142	46052	045	46122	035
46003	115	46053	114	46123	333
46004	257	46054	076	46124	012
46005	323	46055	020	46125	167
46006	010	46056	365	46126	043
46007	076	46057	325	46127	302
46010	004	46060	305	46130	104
46011	323	46061	325	46151	114
46012	011	46062	021	46132	341
46013	303	46063	206	46133	021
46014	031	46064	200	46134	327
46015	114	46065	041	46135	114
46016	333	46066	324	46136	001
46017	010	46067	114	46137	200
46020	346	46070	333	46140	000
46021	002	46071	011	46141	032
46022	302	46072	037	46142	167
46023	016	46073	332	46143	276
46024	114	46074	070	46144	302
46025	076	46075	114	46145	301
46026	002	46076	346	46146	114
46027	323	46077	037	46147	200
46030	011	46100	270	46150	107
46031	333	46101	302	46151	023
46032	010	46102	070	46152	043
46033	346	46103	114	46153	015
46034	100	46104	333	46154	302
46035	302	46105	010	46155	141
46036	016	46106	267	46156	114
46037	114	46107	372	46157	032
46040	021	46110	104	46160	376
46041	000	46111	114	46161	377
46042	000	46112	333	46162	302
46043	006	46113	012	46163	170
46044	000	46114	167	46164	114
46045	333	46115	043	46165	023
46046	010	46116	035	46166	032
46047	346	46117	312	46167	270

Continued on next page

ADDRESS	CONTENTS	ADDRESS	CONTENTS	ADDRESS	CONTENTS
46170	301	46240	333	46310	170
46171	353	46241	010	46311	323
46172	302	46242	346	46312	001
46173	265	46243	002	46313	303
46174	114	46244	302	46314	311
46175	361	46245	240	46315	114
46176	361	46246	114	46316	172
46177	052	46247	076	46317	274
46200	325	46250	001	46320	300
46201	114	46251	323	46321	173
46202	325	46252	011	46322	275
46203	021	46253	303	46323	311
46204	000	46254	043	46324	204
46205	377	46255	114	46325	000
46206	315	46256	076	46326	114
46207	316	46257	200	46327	044
46210	114	46260	323	46330	026
46211	321	46261	010	46331	126
46212	332	46262	303	46332	026
46213	276	46263	000		
46214	114	46264	000		
46215	315	46265	321		
46216	316	46266	361		
46217	114	46267	075		
46220	322	46270	302		
46221	256	46271	056		
46222	114	46272	114		
46223	004	46273	076		
46224	004	46274	103		
46225	170	46275	001		
46226	376	46276	076		
46227	040	46277	117		
46230	332	46300	001		
46231	054	46301	076		
46232	114	46302	115		
46233	006	46303	107		
46234	001	46304	076		
46235	312	46305	200		
46236	054	46306	323		
46237	114	46307	010		