

olivetti ope

OEM PRODUCTS

8" FLEXIBLE DISK DRIVE

FD 801/802

GENERAL MANUAL

Printed in Italy

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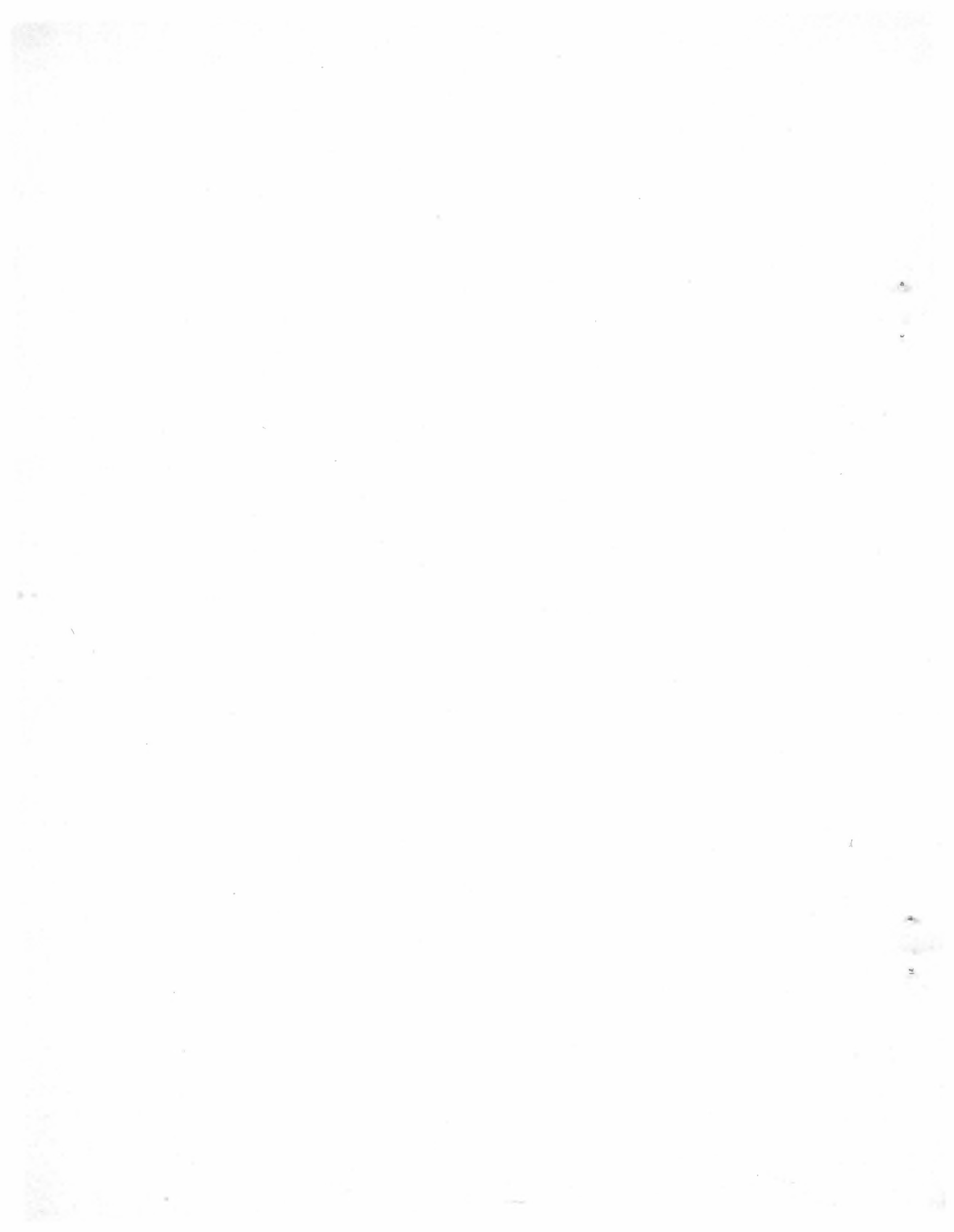
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8" FLEXIBLE DISK DRIVE

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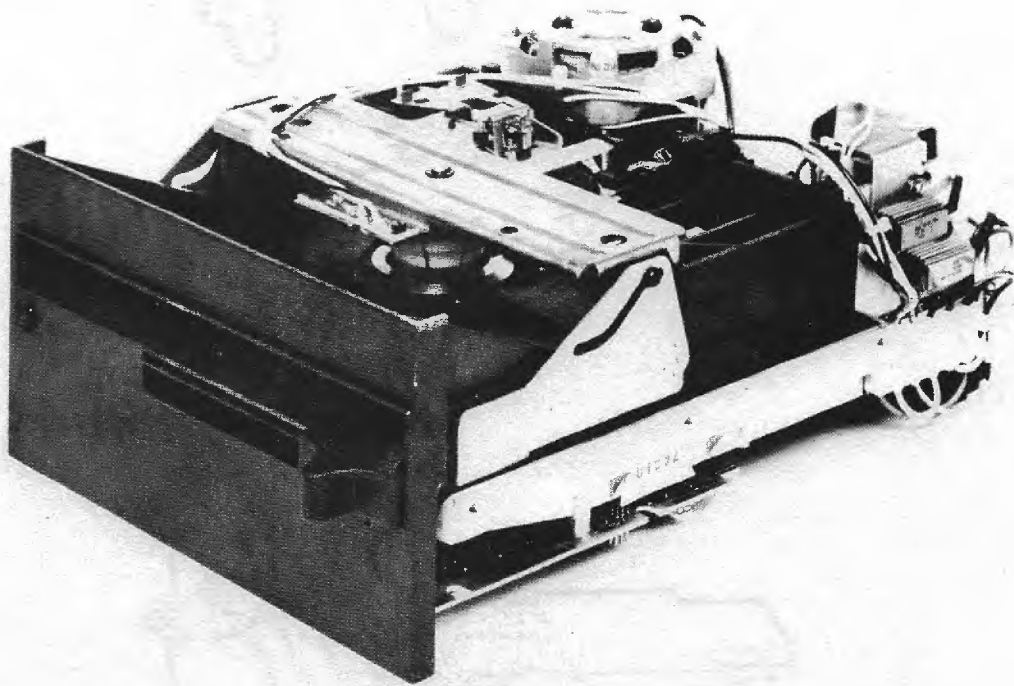


Figure 1. FD 801 and FD 802 Flexible Disk Drive

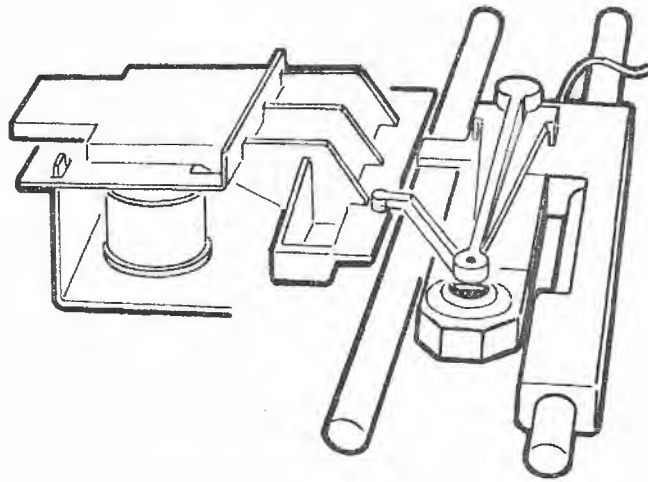


Figure 2A. FD 801 - Flexible Disk with Pressure Pad

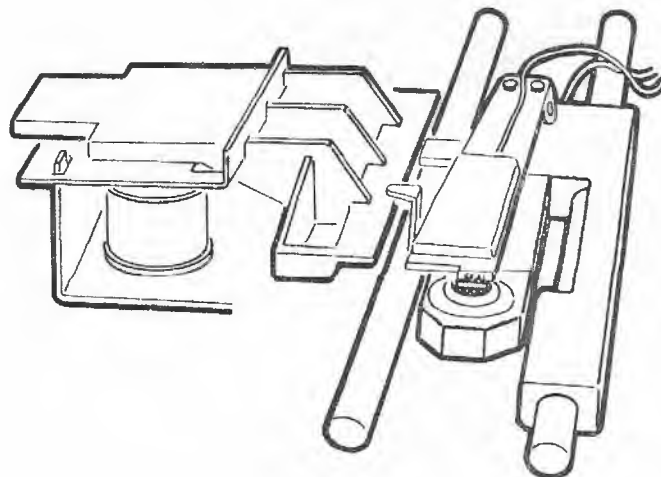


Figure 2B. FD 802 - Flexible Disk with Two Heads

## 1. INTRODUCTION

### 1.1 GENERAL DESCRIPTION

The FD 801 and FD 802 8" flexible disk drives read and write both in single or double density, on standard disks and on both sides of two-sided disks. The FD 801 and 802 are media compatible with the IBM 3740.

The read/write head(s) are precisely positioned on the recording tracks via a metal band and stepping motor system which provides fast, 3 ms track-to-track access time.

The read/write head(s) are mounted on a carriage that moves along two precision guides and provides for simultaneous loading of the heads on both sides of the disk (FD 802). The design of this head geometry guarantees maximum signal transfer with minimal wear to head and disk surfaces.

Besides a standard dual-index sensor to distinguish between single and double sided disks, two options are available to provide for Write Protection and Access Door Interlock Control.

The FD 801 and FD 802 provide the user with low-cost operation for applications such as: word processing systems, intelligent calculators and terminals, program storage, small business and point-of-sale systems and mini/micro computer systems.

#### Features

- Reads and writes data on standard single-sided disks (FD 801 and 802) as well as the IBM Diskette 2 or its equivalents (FD 802).
- Fast 3 ms track-to-track access time
- Simultaneous loading of heads on both sides of disk (FD 802)
- Optional Write Protection and Access Door Interlock Control
- The FD 801 and 802 are equally capable for use in hard-sectored or soft-sectored applications.

## 1.2 PERFORMANCE SPECIFICATIONS

FD 801/FD 802

CAPACITY	SINGLE DENSITY	DOUBLE DENSITY
Unformatted:		
- Per disk	400/800 Kilobytes	800/1600 Kilobytes
- Per surface	400 Kilobytes	800 Kilobytes
- Per track	5.2 Kilobytes	10.4 Kilobytes
ECMA format:		
- Per disk	256/512 Kilobytes	512/1024 Kilobytes
- Per surface	256 Kilobytes	512 Kilobytes
- Per track	1664 Bytes	6656 Bytes
- Per sector	128 Bytes	256 Bytes
Transfer rate	250 Kilobits/sec	500 Kilobits/sec
Latency (avg)	83 ms	83 ms
Access time:		
- Track to track	3 ms	3 ms
- Average (incl. settling)	91 ms	91 ms
- Settling Time	15 ms	15 ms
- Head load time	35 ms	35 ms

### 1.3 PHYSICAL SPECIFICATIONS

#### Environmental limits:

- Ambient temperature range: 40°F to 115°F (4.4°C to 46.1°C)
- Relative humidity range: 20% to 80%
- Maximum Wet Bulb: 78°F (25.6°C)

#### AC power requirements:

50/60 Hz  $\pm$  0.5 Hz

- 100/115 VAC Installation: 90V - 127V at 0.3A typical
- 220/240 VAC Installation: 187V - 264V at 0.25A typical

#### DC Voltage Requirements:

- + 24 VDC  $\pm$  10% 1A typical
- + 5 VDC  $\pm$  5% 0.7A typical

Heat Dissipation: 195 BTU/hr. typical (57 watts)

#### Physical Dimensions: (Inclusive of front panel)

Height:	4.52 inch	(115 mm)
Width:	9.05 inch	(230 mm)
Depth:	12.30 inch	(312.5mm)
Weight:	10.7 lbs	(4.8 kg)

### 1.4 RELIABILITY SPECIFICATIONS

MTBF: 8000 POH under typical usage

MTTR: 30 minutes

Preventive Maintenance: Not required

Product Life: 6 years

#### Error Rate:

- Soft Read Errors: 1 per  $10^9$  bits read
- Hard Read Errors: 1 per  $10^{11}$  bits read
- Seek Errors: 1 per  $10^6$  seeks

Media Life:

- Passes per Track 3.5 x 10<sup>6</sup>
- Insertions Over 30.000

1.5 FUNCTIONAL SPECIFICATIONS

FD 801/FD 802

	SINGLE DENSITY	DOUBLE DENSITY
Rotational speed	360 rpm	360 rpm
Recording Density (Inside Track)	3200 bpi	6816 bpi
Flux Density	6400 fci	6816 fci
Track Density	48 tpi	48 tpi
Cylinders	77	77
Tracks	77/154	77/154
Heads	1/2	1/2
Physical Sectors	0 or 32/16/8	0 or 32/16/8
Index	1	1
Encoding Method	FM/MFM/M <sup>2</sup> FM	FM/MFM/M <sup>2</sup> FM
Media Requirements	Industry Standard Flexible Disk	

## 2. FUNCTIONAL CHARACTERISTICS

### 2.1 GENERAL OPERATION

The FD 801 and FD 802 are composed of the following: read/write electronics and read/write head(s) which control the reading and writing of data, control electronics to interpret and generate control signals, drive mechanism and track positioning mechanism for moving the read/write head(s) to the desired track.

When the read/write head(s) have been positioned on the desired track via the metal band and stepping motor system, a solenoid controls the loading of the head(s) on the disk, allowing data to be recorded on or read from the disk.

### 2.2 READ/WRITE AND CONTROL ELECTRONICS

A single P.C. Board contains:

- Index/Sector detection circuits
- Head positioning circuits
- Head loading control
- Read/Write amplifier and transition detector
- Drive Selection circuits
- Track 42 detection circuits
- Ready detection circuit
- Side select circuit
- In Use circuit
- Write protect
- Access door interlock control

### 2.3 DRIVE MECHANISM

The flexible disk drive stepper motor operates on 24 VDC. The spindle rotates at 360 rpm, driven through a belt system by an AC motor. By selecting the purpose pulley, the drive can be adapted to either 50 Hz or 60 Hz power line frequency.

### 2.4 POSITIONING MECHANISM

The read/write head(s) are precisely positioned on the recording tracks by means of a metal band and stepping motor system. The metal band winds on a capstan and the stepping motor is a high resolution type with 1.8 degree steps used to position the head carriage for track selection.



## 2.5 READ/WRITE HEAD

The head(s) used in the FD 801 and 802 (respectively) consist of a single ferrite element for reading and recording as well as two "Tunnel Erase" elements which sweep areas adjacent to recorded tracks clear of fringe recording. This ensures that normal interchange tolerances between media and drives will not degrade the signal to noise ratio thereby ensuring disk interchangeability. The read/write head(s) are mounted on a carriage moving along two precision guides. The geometrical relationship between the plane of the disk, the heads and the alignment of the loading arm is such that normal wiping action maintains a clean disk surface, to maximize disk life.

The loading of the head, for both models, is controlled by a solenoid. For the FD 801 this causes the loading of the pressure pad against the disk followed by the loading of the disk against the head. For the FD 802, the solenoid causes the upper head to load against the disk and the subsequent loading of the disk against the opposite head.

The design of the head geometry ensures maximum signal transfer and minimum wear of both head(s) and disk surfaces.

## 2.6 WRITE PROTECT

Olivetti OPE disks are capable of being write protected. Located on the side of the disk jacket is a notch. This notch must be left open in order to inhibit writing and activate the write protect interface signal. A tab placed over this notch will allow writing.

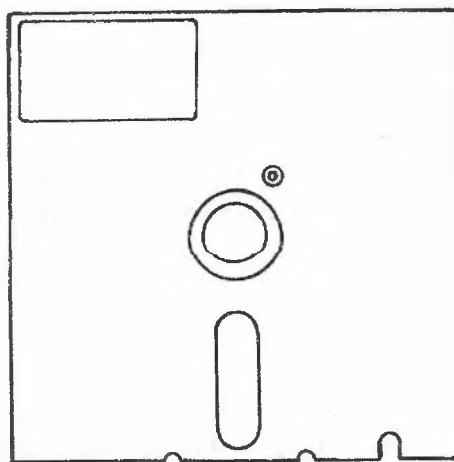


Figure 3. FD801/802 Write Protect (Disk)

### 3. FUNCTIONAL OPERATION

#### 3.1 POWER SEQUENCING

AC and DC power can be applied to the FD 801 and FD 802 in any sequence. After the application of the AC power, however, a 2 second delay to provide for stabilization of the rotational speed of the disk must be observed before a read or write operation can be performed.

After the application of DC power, before any read, write or seek operation, or before the control output signals are valid, a 90 millisecond delay must be observed.

The position of the read/write head(s) in respect to the data tracks on the media, after power on, is indefinite. To ensure correct positioning of the head(s) on the proper track, a step out operation should be performed until the track 0 line becomes active.

#### 3.2 DRIVE SELECTION

When the drive select line is activated, drive selection will take place. Only the drive with this line active, will respond to input lines or gate output lines. In normal operating circumstances, the drive select line enables the input lines and activates the output lines. Optional methods of drive selection are explained in Chap. 7.

#### 3.3 TRACK ACCESSING

The following steps will permit the seeking of the read/write head from one track to another:

- Activate drive select line
- Select the desired direction using the direction select line
- Write gate being inactive
- Pulsing the step line

Repeatedly pulsing the step line will cause the read/write head to move one track for each pulse, in or out, depending on the direction select line. This is referred to as "multiple track accessing" and is used until the desired track has been reached. Head movement and direction latching is initiated on the leading edge of this step pulse.

##### 3.3.1 STEP OUT

When a pulse is applied to the step line, with the direction select line at plus logic level (2.5V to 5.25V), the read/write head will move one track out

from the center of the disk. For the timing characteristics, see Fig. 4..

### 3.3.2 STEP IN

When a pulse is applied to the step line, with the direction select line at a minus logic level (0V to 0.4V), the read/write head will move one track in towards the center of the disk. For timing characteristics see Fig. 4.

### 3.4 SIDE SELECTION

Head selection in the FD 802 model is controlled via the I/O signal line designated "side select". The side select line will select the read/write head on the 0 side of the disk when at a plus logic level. When at a minus logic level, it will select the read/write head on side 1 of the disk. A 100 microsecond delay must be observed after switching from one head to the other, before any read or write operation can be initiated. Two options are available for the side select feature and can be achieved through appropriate jumper connections. For further description refer to Chapter 7.

### 3.5 READ OPERATION

In order to read data from the FD 801 and FD 802, three conditions must be in effect:

- Drive select line active
- Side select (if necessary)
- Write gate inactive.

Please refer to Fig. 5 for the timing relationships required to initiate the read sequence. The purpose of these timing specifications is to assure that the read/write head position is stabilized before reading.

### 3.6 WRITE OPERATION

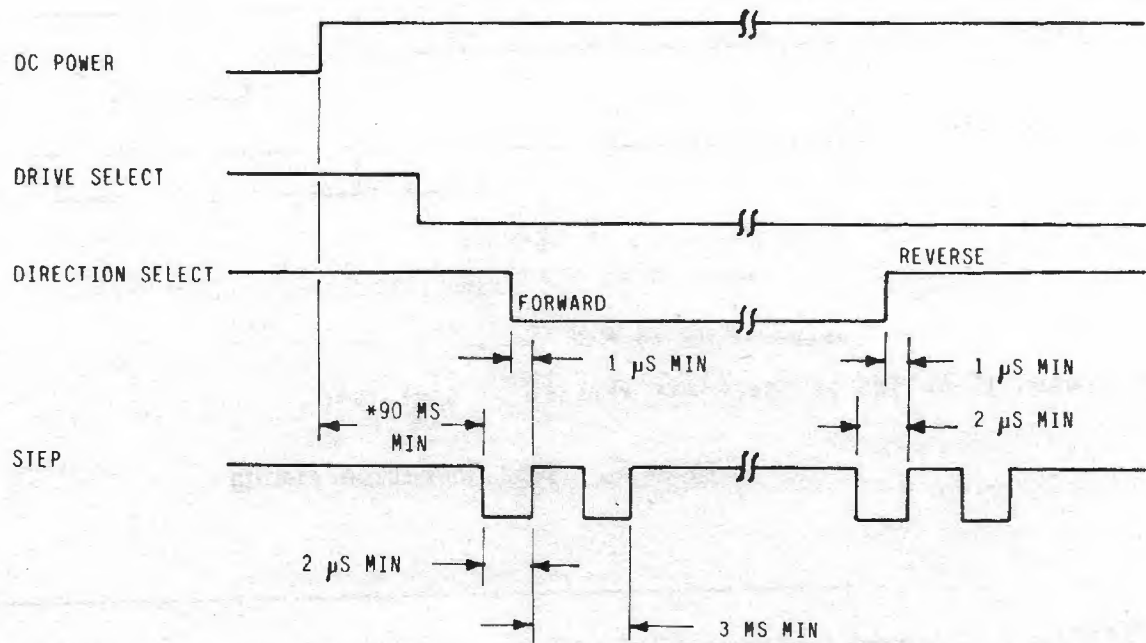
In order to write data onto the FD 801 and FD 802:

- Activate the drive select line
- Select side (if necessary)
- Activate write gate line
- Pulse write data line with data to be written

For the timing relationships required to initiate the write data sequence see Fig. 6. The purpose of these timing specifications is to assure that the read/write head is stabilized before writing.

### 3.7 SEQUENCE OF EVENTS

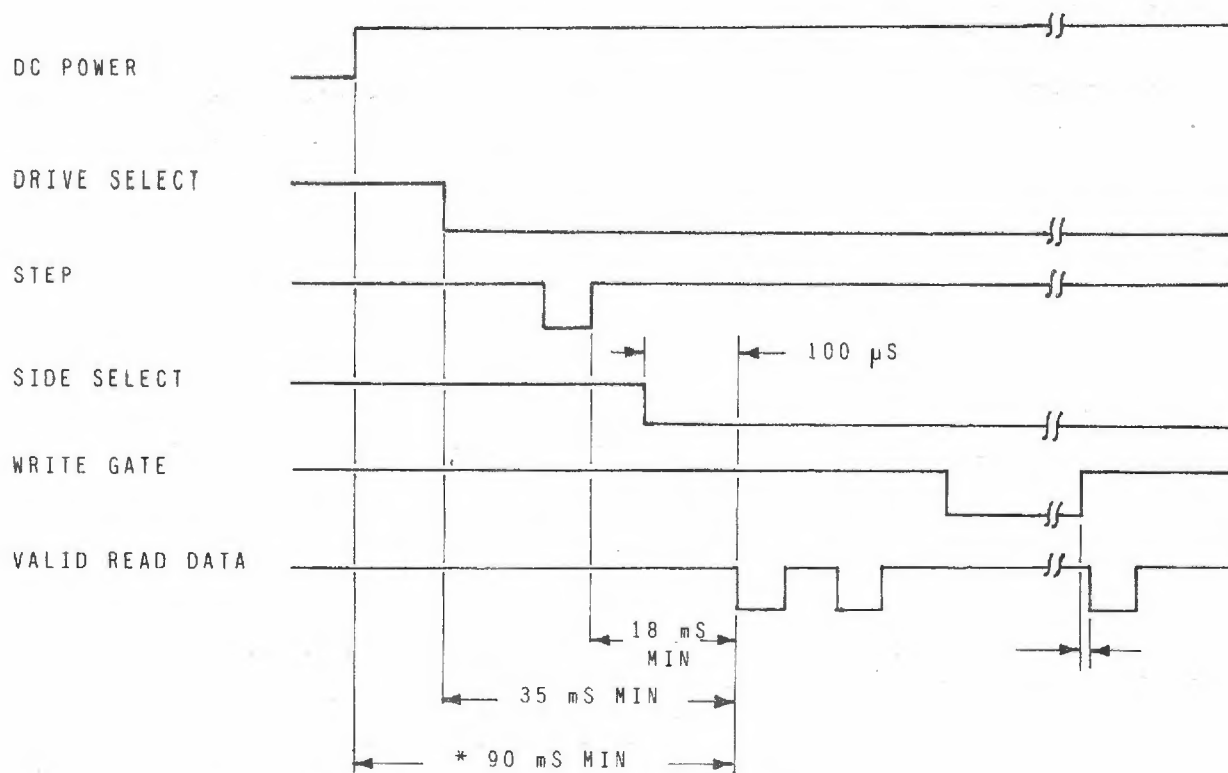
For the proper operation, please refer to the timing diagram in Fig. 7 for the required sequence of events and relating timing restrictions.



\* 2 SECONDS IF AC AND DC POWER ARE APPLIED AT SAME TIME

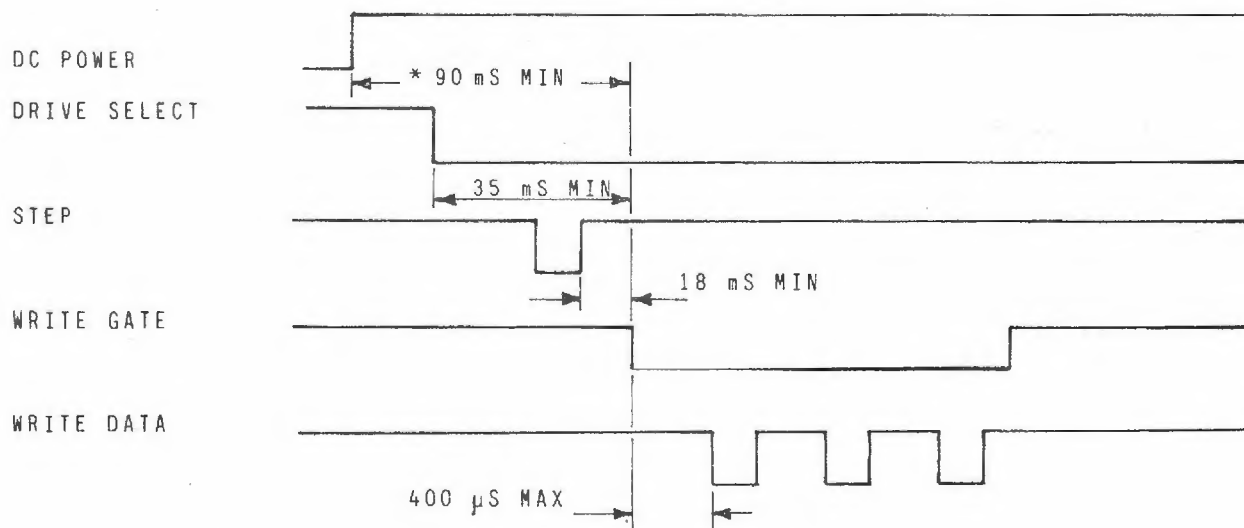
\*\* STEP RATE WITH DUTY CYCLE MAX = 30%

Figure 4. Track Access Time



\* 2 SECONDS IF AC AND DC POWER ARE APPLIED AT SAME TIME

Figure 5. Read Operation Timing



\* 2 SECONDS IF AC AND DC POWER ARE APPLIED AT SAME TIME

Figure 6. Write Operation Timing

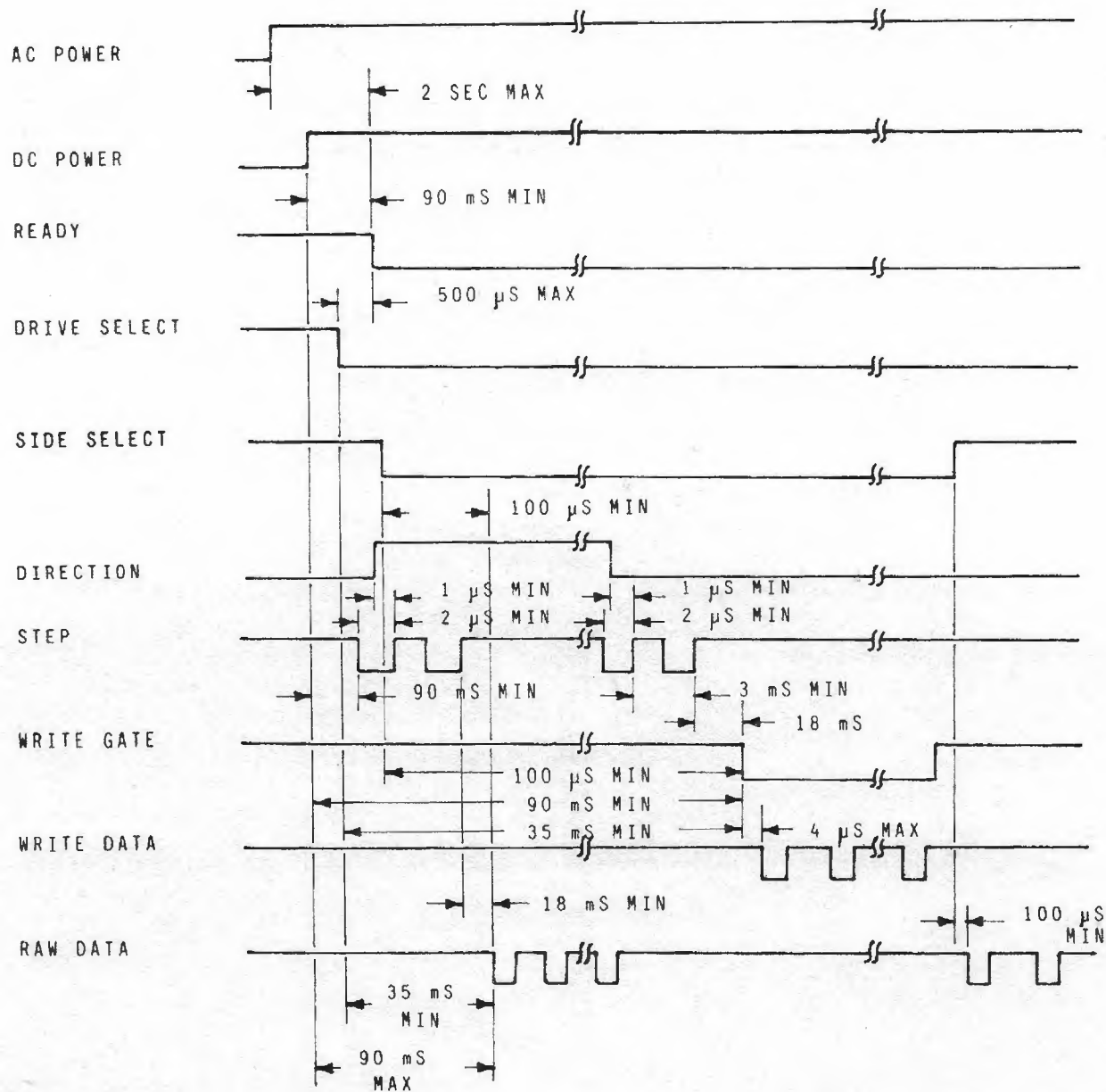


Figure 7. Sequence of Events Timing Diagram





#### 4. ELECTRICAL INTERFACE

The FD 801 and FD 802 are composed of two sections:

- Signal
- Power

Following are the electrical definitions for both lines.

##### 4.1 SIGNAL INTERFACE

The signal interface is divided into two categories: Control and Data transfer. All lines in the signal interface are digital and provide signals to the drive (input) or to the host (output) via interface connector J1/P1 (see Table 1).

##### 4.1.1 INPUT LINES

There are 12 signal input lines. (For the options, see Chapter 7).  
The input signals are of two types:

- Input signals to be multiplexed (in a "Daisy Chain" configuration)

- |                     |                  |
|---------------------|------------------|
| 1. Direction Select | 5. Side Select   |
| 2. Step             | 6. Low Current * |
| 3. Write Data       | 7. In Use        |
| 4. Write Gate       | 8. Head Load     |

\* Note: For description of this signal refer to Chapter 7

- Input signals which perform the multiplexing:

- |                   |                   |
|-------------------|-------------------|
| 1. Drive Select 1 | 3. Drive Select 3 |
| 2. Drive Select 2 | 4. Drive Select 4 |

Input Lines - Electrical Specifications:

True = Logical Zero =  $V_{in} + 0.0V$  to  $+ 0.4V$   
at  $I_{in} = 40$  ma (max)

False = Logical One =  $V_{in} + 2.5V$  to  $+ 5.25V$   
at  $I_{in} = 0$  ma (open)

Input impedance = 150 ohms


P1			J1		
C O N T R O L L E R	LOW CURRENT	2	1	F D 8 0 1 / F D 8 0 2	
	ALTERNATE I/O	4	3		
	ALTERNATE I/O	6	5		
	ALTERNATE I/O	8	7		
	TWO SIDED	10	9		
	DISK CHANGE	12	11		
	SIDE SELECT	14	13		
	IN USE	16	15		
	HEAD LOAD	18	17		
	INDEX	20	19		
	READY	22	21		
	SECTOR	24	23		
	DRIVE SELECT 1	26	25		
	DRIVE SELECT 2	28	27		
	DRIVE SELECT 3	30	29		
	DRIVE SELECT 4	32	31		
	DIRECTION	34	33		
	STEP	36	35		
	WRITE DATA	38	37		
	WRITE GATE	40	39		
	TRACK 0	42	41		
	WRITE PROTECT	44	43		
	RAW DATA	46	45		
	Spare	48	47		
	Spare	50	49		
					

Table 1. Signal Interface Connector

Please refer to Fig. 8 for the interface input circuits.

#### 4.1.1.1 INPUT LINES TERMINATIONS

The FD 801 and FD 802 have been equipped with a removable resistor pack to aid in the termination of the seven input lines that are to be multiplexed. The seven input lines are:

- |                     |               |
|---------------------|---------------|
| 1. Side Select      | 5. Write Data |
| 2. Direction Select | 6. Head Load  |
| 3. Step             | 7. In Use     |
| 4. Write Gate       |               |

The last drive must have these lines terminated in order to function properly. Following are two methods to accomplish this.

- The resistor packs are located in positions 154 and 156 as shipped from the factory. The resistor pack can be removed from all but the last drive on the interface.
- External terminations may be used, provided the terminator is beyond the last drive. Each of the lines should be terminated to +5VDC through a 150 ohm 1/4 watt resistor.

#### 4.1.1.2 DRIVE SELECT

When activated to a logical zero level, drive select will activate the multiplexed I/O lines. In this condition, only the drive with its drive select line active will respond to the input lines and gate the output lines. Four input lines are provided in a "Daisy Chain" multiple drive system, to enable the using system to select which drive on the interface is to be used. A shorting plug has been installed on D.SEL.1 in the factory. To select another line, move this plug to the appropriate drive select pin. The terminator is located on the same position of resistor pack (156). For alternate methods of selecting drives, refer to Chapter 7.

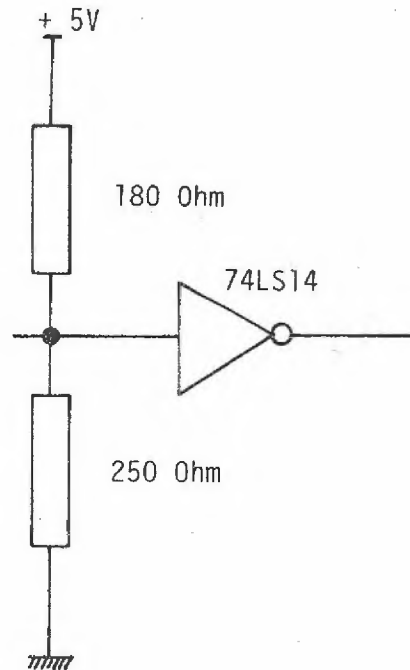
#### 4.1.1.3 SIDE SELECT

In the FD 802, this signal defines on which side of a double-sided disk information will be recorded or read. To select side 0, this line must be at logical one level or open circuit. A short to ground or logical zero level will select side 1. After changing sides, a 100 microsecond delay must be observed before any read or write operation can be attempted.

Two jumper connectable options are available for this function and are described further in Chapter 7.

INPUT LINES

SIDE SELECT  
DIRECTION  
STEP  
HEAD LOAD  
IN USE  
WRITE GATE  
WRITE DATA



DRIVE SELECT

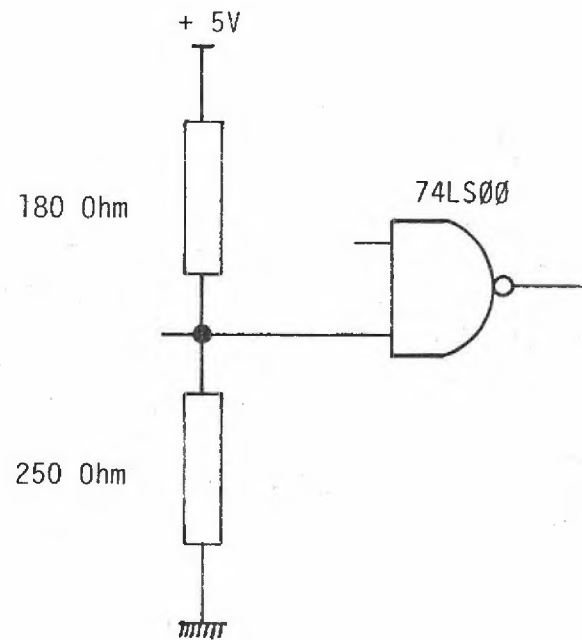


Figure 8. Interface Input Circuits

#### 4.1.1.4 DIRECTION SELECT

The control signal of this interface line determines the direction the read/write head(s) will move when a pulse is applied to the step line. If a pulse is applied to the step line during an open circuit or logical one level, the read/write head will move away from the center of the disk. This determines the direction as "Out". Direction "In", when the read/write head moves towards the center of the disk, is accomplished by applying a pulse to the step line during logical zero or when this input is shorted to ground.

An option has been provided the user, jumper selectable, which allows the direction select line to be time shared for both functions, direction select and side select. The direction select line will control the direction of motion of the head during a head positioning operation and will determine which head is selected during a read or write operation. For further information concerning this option, refer to Chapter 7.

#### 4.1.1.5 STEP

The control signal of this interface line will determine the direction in which the read/write head moves as indicated by the direction select line. The access motion is begun on each logical zero to logical one transition (Leading edge of the signal pulse).

A change in the direction select line must be effected at least 1 microsecond before the leading edge of the step pulse.

#### 4.1.1.6 WRITE GATE

This signal is divided into two states:

Active - Logical zero: allows Write Data to be written on the disk

Inactive - Logical one: enables the read data logic and stepper logic.

#### 4.1.1.7 WRITE DATA

This interface line provides the data that is to be written on the disk. Transition from logical one level to logical zero will cause a reversal of current through the read/write head, effecting the writing of a data bit. Write gate in the active state enables this line.

#### 4.1.1.8 HEAD LOAD

When this interface signal is active (logical zero state) and the access door is closed, it will load the head(s) against the disk. Refer to Chapter

7 for further use and installation information.

#### 4.1.1.9 IN USE

When this signal is activated to a logical zero level, the activity LED will light. For further information refer to Chapter 7.

#### 4.1.2 OUTPUT LINES

The FD 801 consists of 5 standard output lines and the FD 802 of 6 lines. In addition 3 optional output lines and 4 alternate outputs are available for either models.

Output lines - Electrical Specifications:

True = Logical zero =  $V_{out} + 0.0V$  to  $+0.4V$   
at  $I_{out} = 48\text{ ma (max)}$

False = Logical one =  $V_{out} + 2.5V$  to  $5.25V$   
(open collector at  $I_{out} = 250\text{ }\mu\text{a max}$ ).

Please refer to Fig. 9 for the interface output circuits.

#### 4.1.2.1 TRACK 0

This signal, when active (logical zero level), indicates that the head(s) are correctly positioned on track 0 (outermost track) and that current is being driven, by the access circuitry, through phases "AC" of the stepping motor. When the head(s) are not at track 0, this signal will be inactive (logical one level).

#### 4.1.2.2 INDEX

This interface signal will be provided by the drive, once each revolution (166.67 ms) to indicate the beginning of a track. During each revolution, the signal will go from a logical one to a logical zero level, for a period of 1.8 ms (0.4 ms when using hard sector media). Please refer to timing diagram, Fig. 10.

When no disk is present, this signal remains active or at a logical zero level. Therefore, when trying to determine the status of this signal, the control unit should see the transition from logical one (false) to logical zero (true) after the drive has been selected.

#### 4.1.2.3 SECTOR

Each time a sector hole is sensed, this signal will be provided by the drive (32 time per revolution). Each time a sector hole is sensed, the signal will go from a logical one level to a logical zero level for a period of 0.4 ms. For timing information see Fig. 10.

Note: Index/Sector pulses should not be used to load the read/write head(s). This can cause the media to wear in one spot on the disk.

#### 4.1.2.4 READY

On single sided disks, this signal indicates two index holes have been sensed, either after inserting a disk and closing the access door, or after applying +5V power to the drive.

In case of double sided disks, three index holes must be sensed.

When a single sided disk is inserted, if side 0 has been selected, this signal will be active (logical zero). If side 1 has been selected, it will be false (logical one).

When a double sided disk is inserted, this signal will be active regardless of which side is selected.

For additional information see Chapter 7.

#### 4.1.2.5 RAW DATA

"Raw Data" (clock and data together), as discerned by the drive electronics, is provided by this interface line. This signal will be at logical one level under normal circumstances and becomes to logical zero level for the active state.

#### 4.1.2.6 DISK CHANGE

When a disk is inserted, this signal is at level one; it will go to level zero when removed.

#### 4.1.2.7 TWO SIDED

Level one indicates a single sided disk and level zero indicates a double sided disk.

#### 4.1.2.8 WRITE PROTECT

When a write protected disk is installed, the drive provides this interface signal. When protected, this signal will be at logical zero level. In normal



operating circumstances, with a protected disk installed, the drive will notify the interface to prevent writing.

#### 4.1.3 ALTERNATE I/O PINS

These pins are supplied for use in connection with the user installable options. For further information refer to Chapter 7.

### 4.2 POWER INTERFACE

The FD 801 and FD 802 require AC power for spindle drive motor and DC power for the electronics and stepping motor.

#### 4.2.1 AC POWER

AC power to the drive is provided via connector J3. For further information see Chapter 5.

#### 4.2.2 DC POWER

DC power is provided to the drive via connector J2. For further information see Chapter 5.

OUTPUT LINES

INDEX  
TRACK 0  
RAW DATA  
TWO SIDED  
READY  
DISK CHANGE  
SECTOR  
WRITE PROTECT

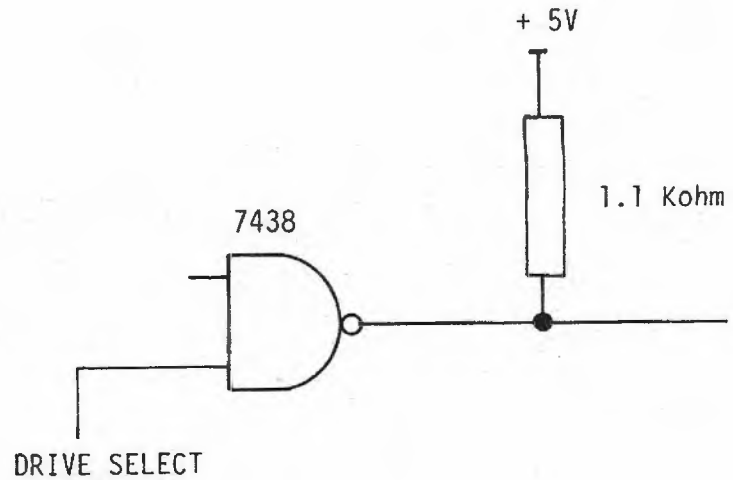


Figure 9. Interface Output Circuits

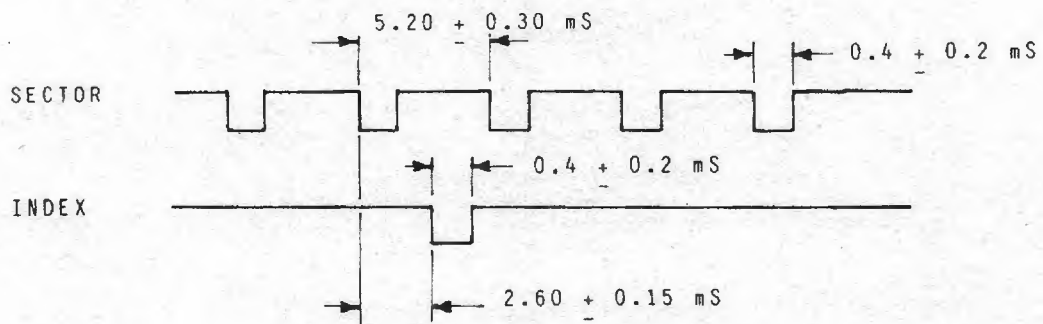


Figure 10. Sector and Index Timing



## 5. PHYSICAL INTERFACE (Connections)

The electrical interface between the FD 801 and the FD 802 and the host system consists of three connectors: J1, J2 and J3. The first connector, J1, provides the signal interface, the second connector, J2, provides the DC power and the third connector, J3, provides AC power and frame ground.

This chapter will describe the physical connectors to be used on the drive, as well as the recommended connectors to be used with them.

### 5.1 J1/P1 CONNECTOR

The connection to J1 is via a 50 pin, PCB edge card connector. The pins are numbered 1 to 50. All even numbered pins are located on the component side of the PCB with the odd numbered pins on the non-component side. Pin 2 location is labeled on the end of the PCB connector closest to the corner.

For optional connecto keying, a key slot has been provided between pins 4 and 6. Refer to Fig. 11 for the dimensions of this connector.

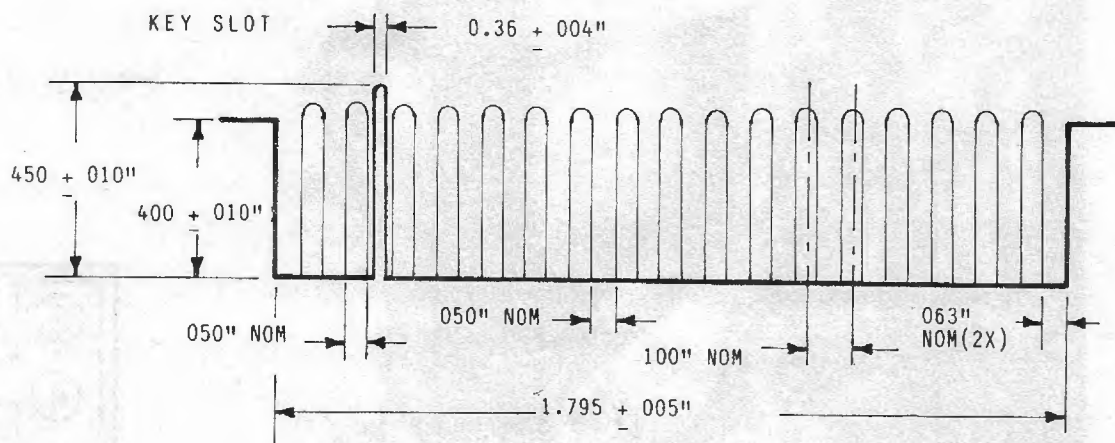


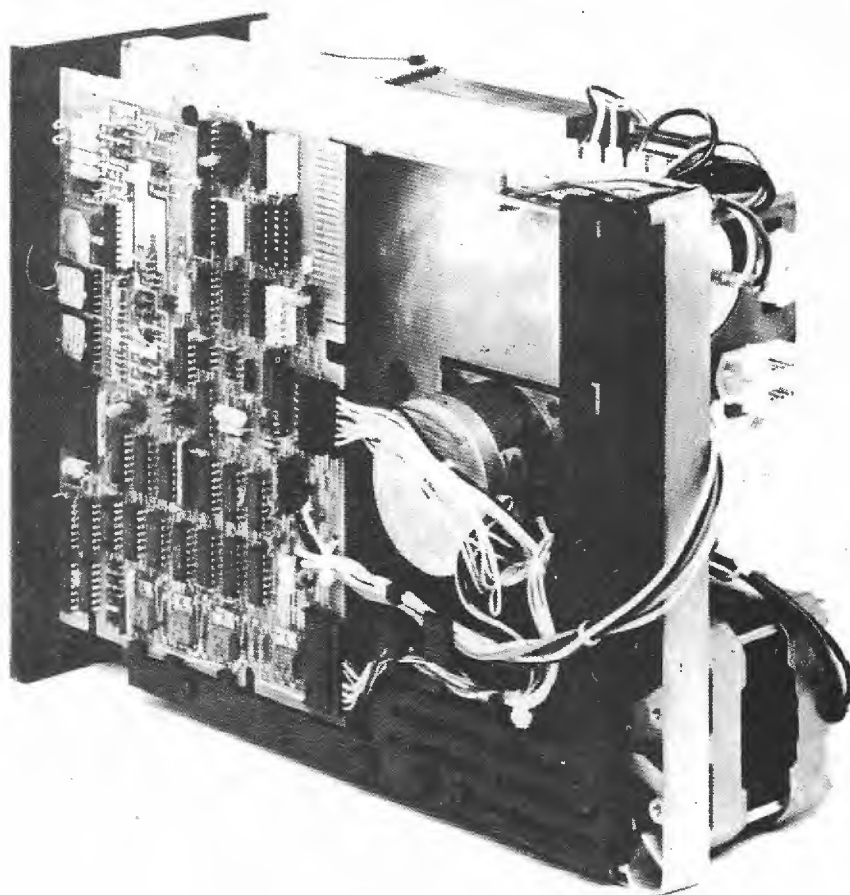
Figure 11. J1 Connector - Physical Dimensions

The recommended connectors for P1 are the following:

TYPE OF CABLE	MANUFACTURER	CONNECTOR P/N	CONTACT P/N
Twisted Pair No. 26 (solder term.)	Viking	3VH25/1JN-5	N/A
Twisted Pair No. 26 (crimp or solder)	AMP	1-583717-1	583616-5 (crimp) 583854-3 (solder)
Flat Cable	3M "Scotchflex" Ansley	3415-0001 609-3415M	N/A

## 5.2 J2/P2 CONNECTOR

J2 (DC power connector) is mounted on the component side of the PCB via a "floating" cable. J2 is a 6 pin, AMP Mate-N-Lok connector, part no. 1-380999-0. The recommended mating connector (P2) is AMP part no. 1/480270-0 utilizing AMP pins part no. 60619-1. Fig. 12 illustrates the J2 connector.



See page 5.4

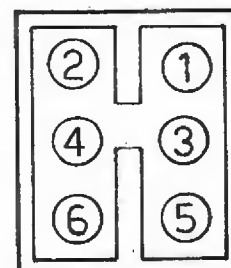


Figure 12. J2 DC Connector

### 5.3 AC POWER CONNECTOR

J3 (AC power connector) is mounted on the motor via a "floating" cable. J3 is a 3 pin connector, AMP part no. 1-480701-0 with pins part no. 350547-1, 2 each, and 350654-1, 1 each. Recommended mating connector is AMP part no. 1-480700-8 using pins 350550-1. See Fig. 13 for details on connector J3.

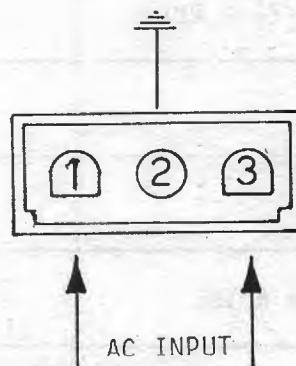
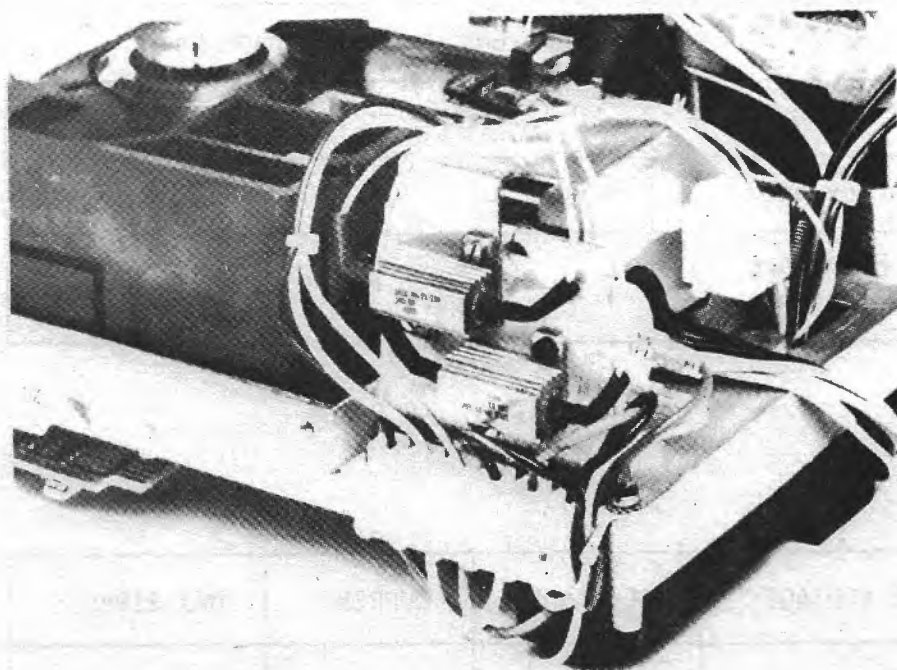


Figure 13. J3 AC Connector

#### 5.4 AC AND DC POWER TABLES

Pin	60 Hz 100-115 VAC	50 Hz 220-240 VAC
1	90-127 VAC	187- 264 VAC
2	Frame Gnd	Frame Gnd
3	90-127 VAC	187- 264 VAC
Current	0.3 A	0.25 A
Frequency Tolerance	$\pm 0.5$ Hz	

Table 2. AC Power

PIN	DC VOLTAGE	TOLERANCE	CURRENT	MAX RIPPLE
1	+24 VDC	$\pm 10\%$	1 A	100 mv
2	+24 V Return			
3				
4				
5	+ 5 VDC	$\pm 5\%$	0.7 A	50 mv
6	+ 5 V Return			

Table 3. DC Power



## 6. DRIVE PHYSICAL SPECIFICATIONS

This chapter describes the mechanical dimensions and mounting recommendations for the FD 801 and the FD 802.

### 6.1 MECHANICAL DIMENSIONS

(inclusive of front panel)

Width:	9.05 inch	(230 mm)
Height:	4.52 inch	(115 mm)
Depth:	12.30 inch	(312.5 mm)
Weight:	10.7 lbs	(4.8 kg)

See Fig. 14.

### 6.2 MOUNTING

The FD 801 and FD 802, as shipped from the factory, can be mounted in any one of the following positions, with no mechanical adjustments:

1. Vertical
2. Horizontal
3. Upright

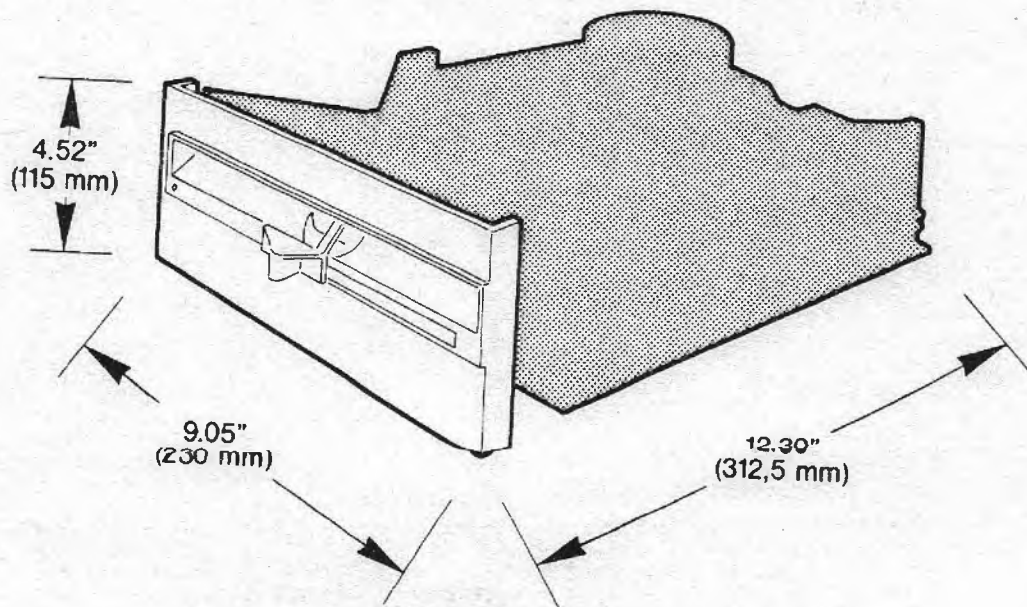


Figure 14. Drive Physical Dimensions



## 7. OPTIONS

### 7.1 GENERAL

In the FD 801/FD 802 there are two types of options:

1. Factory installed options
2. Customer fitted options.

### 7.2 FACTORY INSTALLED OPTIONS

Are intended as options for which some components are to be mounted on the board or on the frame. They are:

ALC 800	Automatic low current. The write current is automatically reduced from track 42 to track 76. To do this, a photosensor (the same component for track 0) is installed in the proper place.
AS 1/8	Automatic selection of 1 of 8 units in daisy chain configuration. A special circuit has to be installed on the PCB to have up to 8 units selectable in daisy chain.
WIN 800	Write inhibit performance. A photosensor is installed to improve this feature via the interface.
HS 800	Hard sectoring performance. A special circuit has to be installed to improve this feature.

### 7.3 CUSTOMER FITTED OPTIONS

Are intended as the options for which the customer has to make a particular alteration of the interface signals configuration. The following signals may be altered:

SIDE SELECT  
DISK CHANGE  
UNIT READY  
HEAD LOAD  
IN USE  
SECTOR

For the door interlock control, four special modes of operation can be performed. All possible configurations for these signals are explained on the following pages.

#### 7.4 DOOR INTERLOCK CONTROL

The FD 801/FD 802 drive is delivered with this configuration: D.SEL 1 activates both LED and Door Lock. User can configure these functions as follows:

- a) The signal drive select (D. SEL 1 to 4) locks the door and activates the LED (typical configuration).
- b) The signal IN USE and D.SEL, when in logical configuration "AND" will lock the door and activate the LED.
- c) Signals HEAD LOAD, IN USE and D. SEL in "AND" configuration will lock the door and activate the LED.
- d) Signals HEAD LOAD and D.SEL will lock the door and activate the LED.

#### 7.5 SIDE SELECT - LINE ELIMINATION N° 1

As an option, the SIDE SELECT signal can be eliminated and the DIRECTION signal used instead to select the side during the stopped position of the carriage. Reference Appendix A, option 2, and Fig. 15.

#### 7.6 SIDE SELECT - LINE ELIMINATION N° 2

In the event of a 2 drive configuration (as opposed to 4) D.SEL 3 and D.SEL 4 can be used to select the side. Reference Appendix A, option 3, and Fig. 15.

#### 7.7 DRIVE SELECT - ONE TO EIGHT DRIVES

As an option, it is possible to select one of 8 drives using the drive select signal (D.SEL 1, D.SEL 2, D.SEL 3, D.SEL 4) by placing a comparator on the PCB. Reference Fig. 15 and Appendix A, option 4.

#### 7.8 DISK CHANGE

Before the drive has been selected (not-ready condition), this signal will be low or level zero. When the drive has been selected (disk inserted - READY signal active) this signal will go high or level one. See Fig. 15 and Appendix A, option 5.

#### 7.9 RADIAL MODE CONNECTIONS

J1 connector has 3 pins dedicated to the radial connection. They are pin 4,

pin 6 and pin 8. One of the following lines can be connected in radial mode when the configuration of the system is 4 drives:

READY  
IN USE  
HEAD LOAD  
INDEX  
SECTOR

(In 2 drives configurations, the three free connector pins allow up to 3 lines connected in radial mode.)

To improve this feature, user must cut jumpers or printed circuits wires and physically wire the signals to the connector pins on drives 2, 3 and 4. See Fig. 15 and Appendix A, option 6.

#### 7.10 HEAD LOAD SIGNAL ELIMINATION

This option provides for the elimination of this signal and the use of D.SEL 1 to 4 lines to load the head(s). Refer to Appendix A, option 7, and Fig. 15.

#### 7.11 IN USE

This signal can be activated via a pulse mode as opposed to the level. The controller gives the pulse and the drive will automatically convert it to level. Refer to Appendix A, option 8.

#### 7.12 SECTOR

Hard sectored configuration of drive - Information from drive to controller. In this option, the timing of the signal INDEX is  $0.4 \pm 0.2$  msec. There are three alternatives according to the number of sectors per disk:

- a) 32 pulses per revolution (32 sectors)
- b) 16 pulses per revolution (16 sectors)
- c) 8 pulses per revolution (8 sectors)

This option requires the addition of some electronic components to the PCB. See Appendix A, option 9.

## APPENDIX A

### JUMPER AND CUT LOCATIONS FOR THE IMPLEMENTATION OF OPTIONS

OPE utilizes the jumpers of "BERG", part no. 65474/004 and "MOLEX", part no. 7590.

The position of jumpers on the board is referenced in Fig. 15.

The location of the cuts is represented in the same Fig. 15.

#### OPTION 1 - DOOR INTERLOCK

- a) Typical condition: "A" and "Z" cut.
- b) with IN USE level: Jumper "A" and "Z"  
with IN USE pulse: cut "A" and "Z"  
Jumper 66J pin 1-3  
Jumper 89J pin 7-10
- c) with IN USE level: cut "E". Jumper 15 pin 1-2  
Jumper "Z" and 66J pins 7-5 and 6-8  
with IN USE pulse: cut "E". Jumper 15 pin 1-2  
Jumper 66J pins 1-3 and 7-5 and 6-8
- d) cut "Z" and "E". Jumper 15 pin 1-2  
Jumper 66J pins 7-5 and 6-8

#### OPTION 2 - SIDE SELECT ELIMINATION NO. 1

Cut "D". Jumper 128J pin 13-21

#### OPTION 3 - SIDE SELECT ELIMINATION NO.2

Cut "D". Jumper 128J pin 20-21. See table below for drive select and side select:

For Drive 1:	128J pin 4-12	= Side 0
	128J pin 11-19	= Side 1
For Drive 2:	128J pin 2-10	= Side 0
	128J pin 9-17	= Side 1

#### OPTION 4 - DRIVE SELECT 1 TO 8

Jumper 128J pin 4-5. See table below for the Jumper of each drive:

D.SEL 2 3 4	DRIVE NO.	JUMPERS (128J)		
0 0 0	1	14-6	15-7	16-8
1 0 0	2	14-22	15-7	16-8
0 1 0	3	14-6	15-23	16-8
1 1 0	4	14-22	15-23	16-8
0 0 1	5	14-6	15-7	16-24
1 0 1	6	14-22	15-7	16-24
0 1 1	7	14-6	15-23	16-24
1 1 1	8	14-22	15-23	16-24

#### OPTION 5 - DISK CHANGE

Jumper 94J pin 6-7.

#### OPTION 6 - RADIAL MODE CONNECTIONS

##### a) READY

Keep the jumper "R" of SH155 only on the first drive (READY 1 line will be on J1 connector pin 22). Cut "R" in the remaining drives. Wire signals on PCB of other drives with wire wrap as follows:

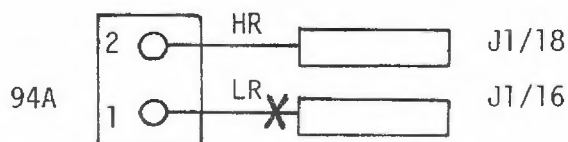
Drive 2      READY 2 : from 142 pin 3 to 94 pin 2. This line will be on J1 connector pin 4.

Drive 3      READY 3 : from 142 pin 3 to 94 pin 3. This line will be on J1 connector pin 6.

Drive 4      READY 4 : from 142 pin 3 to 94 pin 4. This line will be on J1 connector pin 8.

##### b) IN USE

Cut printed circuit wire "LR" only on drives 2, 3 and 4 as shown in the following figure.





Wire signals as follows:

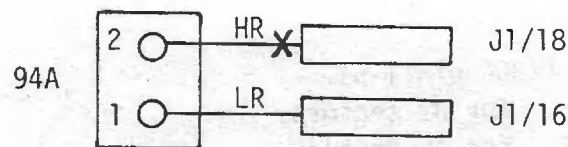
Drive 2      IN USE 2 : from 94A pin 1 to 94 pin 2.

Drive 3      IN USE 3 : from 94A pin 1 to 94 pin 3.

Drive 4      IN USE 4 : from 94A pin 1 to 94 pin 4.

c) HEAD LOAD

Cut printed circuit wire "HR" only on drives 2, 3 and 4 as shown in the following figure.



Wire signals as follows:

Drive 2      HEAD LOAD 2: from 94A pin 2 to 94 pin 2.

Drive 3      HEAD LOAD 3: from 94A pin 2 to 94 pin 3.

Drive 4      HEAD LOAD 4: from 94A pin 2 to 94 pin 4.

d) INDEX

Cut jumper "H" of SH155 only on drives 2, 3 and 4. Wire the lines as follows:

Drive 2      INDEX 2 : from 142 pin 4 to 94 pin 2.

Drive 3      INDEX 3 : from 142 pin 4 to 94 pin 3.

Drive 4      INDEX 4 : from 142 pin 4 to 94 pin 4.

e) SECTOR

Cut jumper "S" of SH155 only on drives 2, 3 and 4. Wire the lines as follows:

Drive 2      SECTOR 2 : from 142 pin 2 to 94 pin 2.

Drive 3      SECTOR 3 : from 142 pin 2 to 94 pin 3.

Drive 4      SECTOR 4 : from 142 pin 2 to 94 pin 4.

NOTE : 142 jumpers are printed (on PCB) with the following names:

R for READY signal  
S for SECTOR signal  
I for INDEX signal

#### OPTION 7 - HEAD LOAD

Cut "X" of SH155.

#### OPTION 8 - IN USE

Cut "A" of SH155. Jumper 89J pin 7-10. To use IN USE line to drive also the door lock solenoid, cut "Z" of SH155 and jumper 66J pin 1-3.

#### OPTION 9 - SECTOR

Cut "P". Jumper "L" (130J pin 1-5).

Jumper 159J pin 2-6 for 32 sectors.

159J pin 3-7 for 16 sectors.

159J pin 4-8 for 8 sectors.

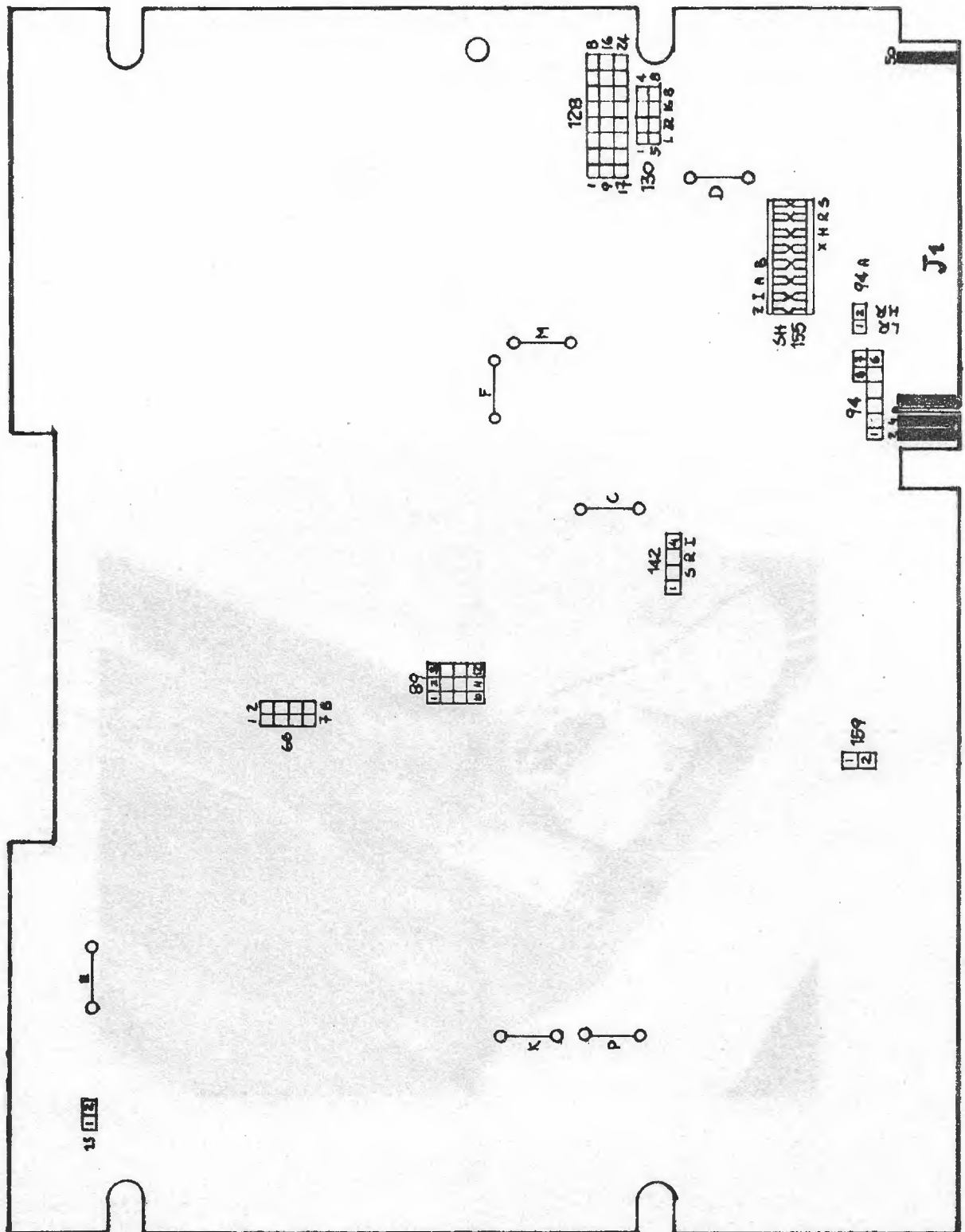


Figure 15. Jumpers and Cuts Positions

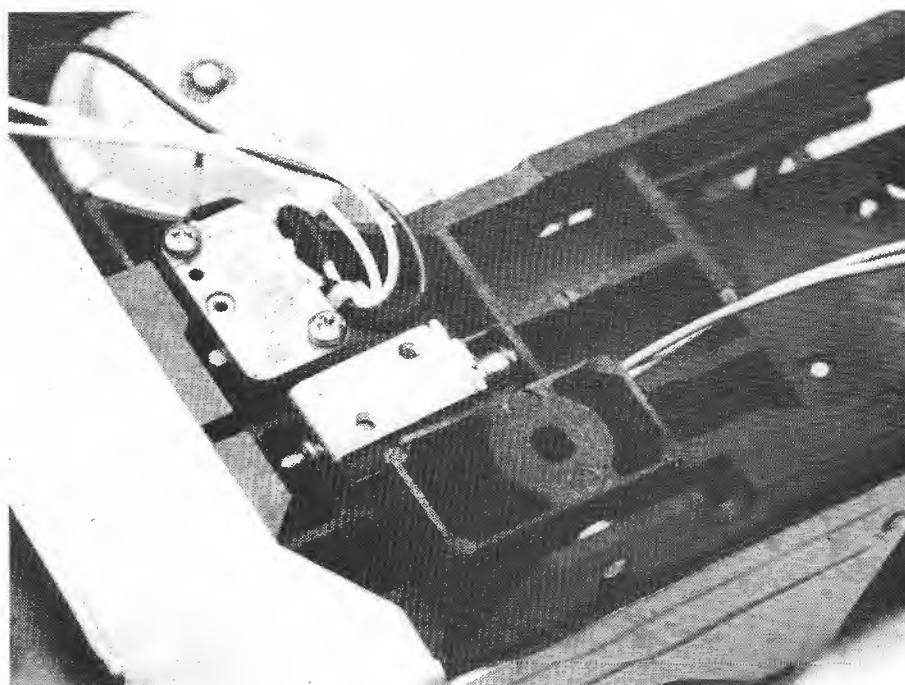


Figure 16 FD 801/FD 802 - Door Interlock Solenoid

## 8. OPERATIONAL PROCEDURES

This chapter provides the information necessary for the handling procedures of the FD 801 and the FD 802 flexible disk drive.

The design of the FD 801 and FD 802 provides for ease of operator use, thereby facilitating a wide range of operator oriented applications.

### 8.1 DISK LOADING

In order to load a disk into the FD 801 or the FD 802, insert the disk as illustrated in Fig. 17. If the drive is mounted:

1. Vertically - Label should face towards the left
2. Horizontally - Label should face up
3. Upright - Label should face towards back of unit.

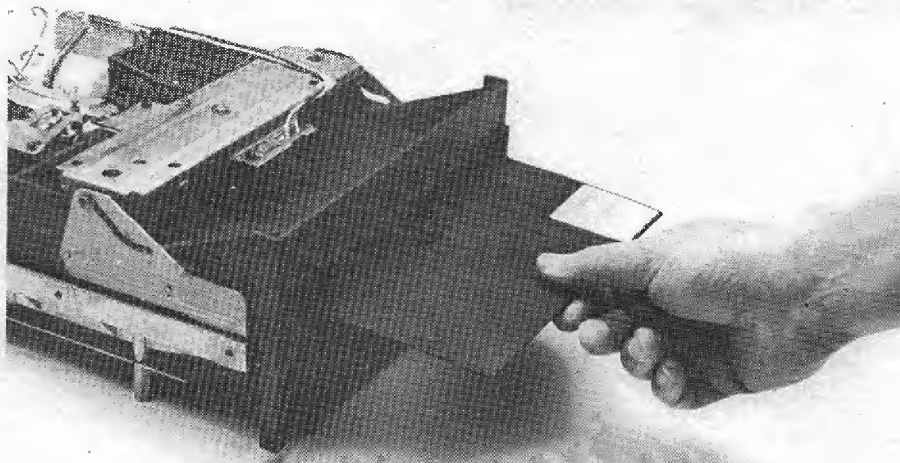


Figure 17. FD 801/FD 802 - Disk Loading Procedure

## 8.2 DISK HANDLING

In order to protect the disk from damage or loss of data, the following steps should always be observed:

1. Whenever the disk is removed from the drive, return it immediately to its storage envelope.
2. Check the storage envelope for wear, cracks or distortion. If any of these conditions occur, replace the storage envelope.
3. Always use a felt-tip pen for writing on the plastic jacket, never a lead pencil or a ball-point pen.
4. Do not touch or attempt to wipe the surface of the disk as this will cause abrasions which may produce loss of data.
5. The disk should not be expose to heat or sunlight.
6. The heat and dirt resulting from a carelessly dropped ash can damage the disk.
7. A strong magnetic field can cause distortion of the data recorded. The disk should be kept away from magnetic fields and ferromagnetic materials which may become magnetized.

## 9. ADJUSTMENTS

### 9.1 STANDARD ADJUSTMENTS

For the FD 801 and the FD 802, there are 6 standard adjustments that can be made, as well as 2 optional adjustments. The standard adjustments are as follows:

1. Regulation of the photo-assembly for Track 0.
2. Regulation of the stop-movement of the carriage on Track 0.
3. Regulation of the step-motor hub assembly.
4. Regulation for the adjustment of the step-motor in the machine.
5. Regulation of the pressure-pad that controls the cleaning of the disk.
6. Regulation of the micro-switch for "door-open" and "door-closed".

#### 9.1.1 ADJUSTMENT OF PHOTO-ASSEMBLY FOR TRACK 0

- a) Attach the photo-cell on the mechanical board. Using the two screws, align the board so that the slot in the bottom is centered over the hole.
- b) Manually position the tab on the carriage, so that it is centered on the photocell.
- c) Activate the step-motor. The motor will automatically go into phase "AC" or Track 0. Using an oscilloscope, adjust the photocell assembly (moving the "A" screw, see Fig. 18) so that when at Track 0, the signal will be dark. When at track 1, the signal will be uncertain or "flickering" and at track 2 it will be light.

#### 9.1.2 STOP-MOVEMENT ADJUSTMENT

Activate the step-motor to Track 0. Adjust the distance between the sector hub and the friction stud from 0.15 mm to 0.3 mm. See Fig. 19.

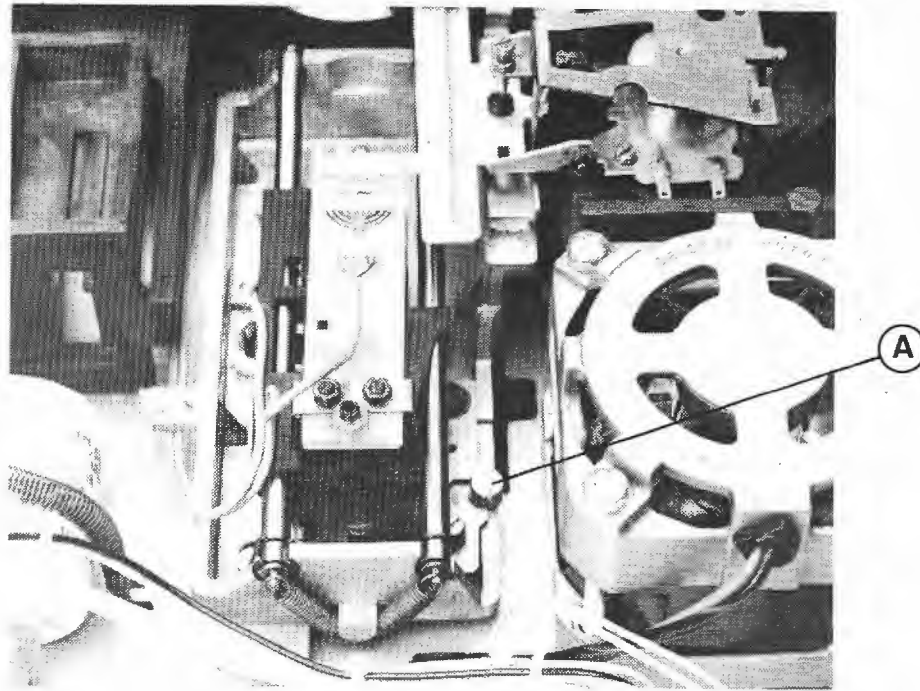


Figure 18. FD 801/FD 802 - Track 0 Adjustment

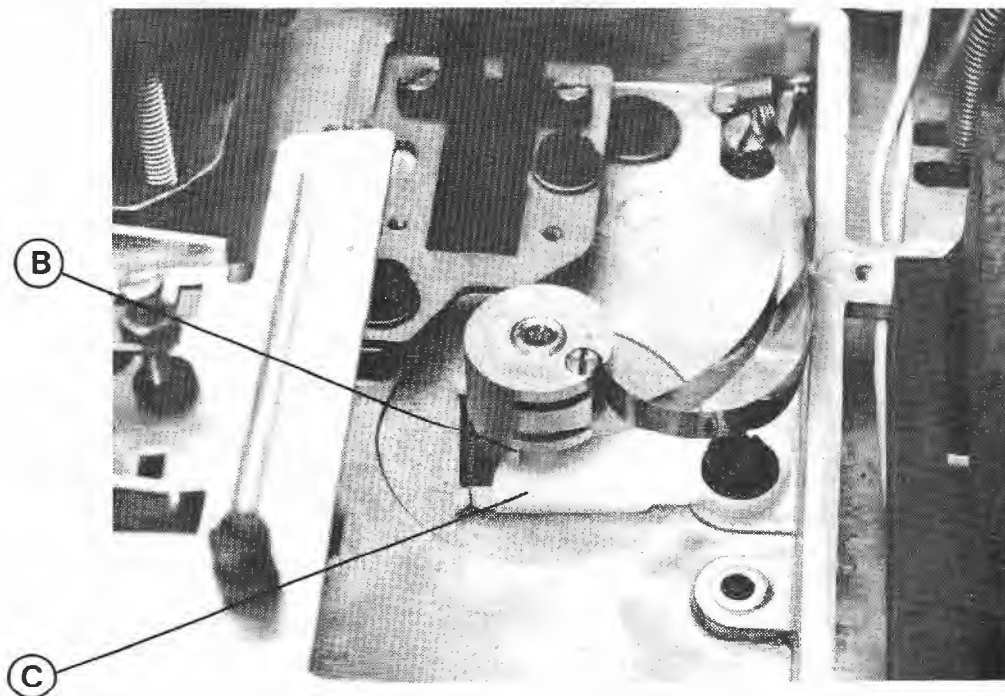


Figure 19. FD 801/FD 802 - Stop-Movement Regulation



### 9.1.3 HUB ASSEMBLY REGULATION

Position the band and the pin in their proper seat in the hub. Insert the hub and adjust the distance between the bottom part of the hub (see "D", Fig. 20) and the neck of the motor (see "E", Fig. 20) to  $4 \text{ mm} \pm 0.050 \text{ mm}$ .

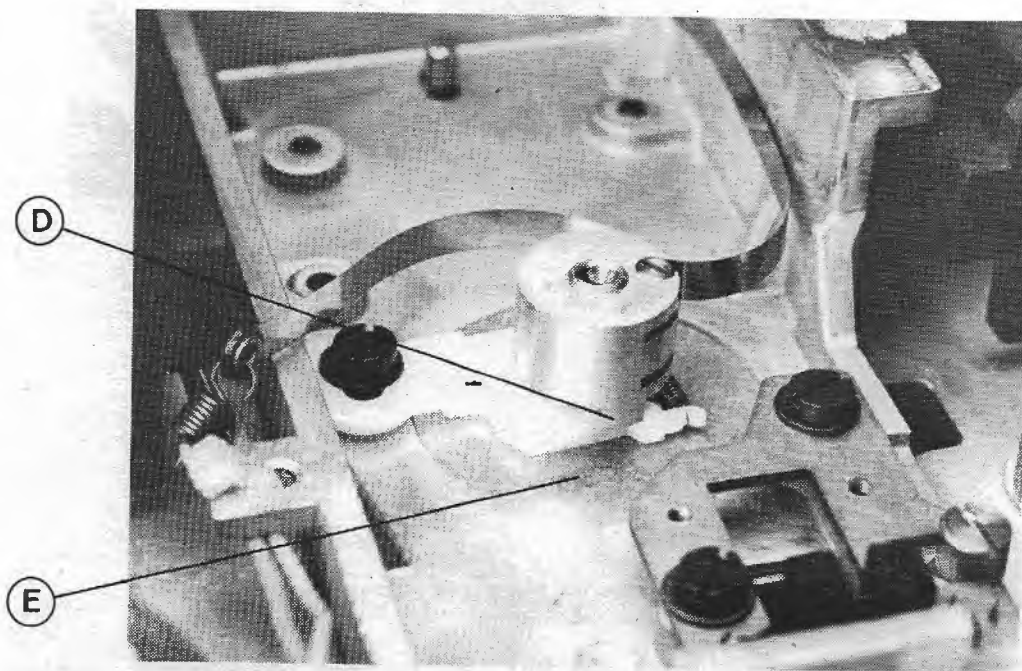


Figure 20. FD 801/FD 802 - Hub Assembly Regulation

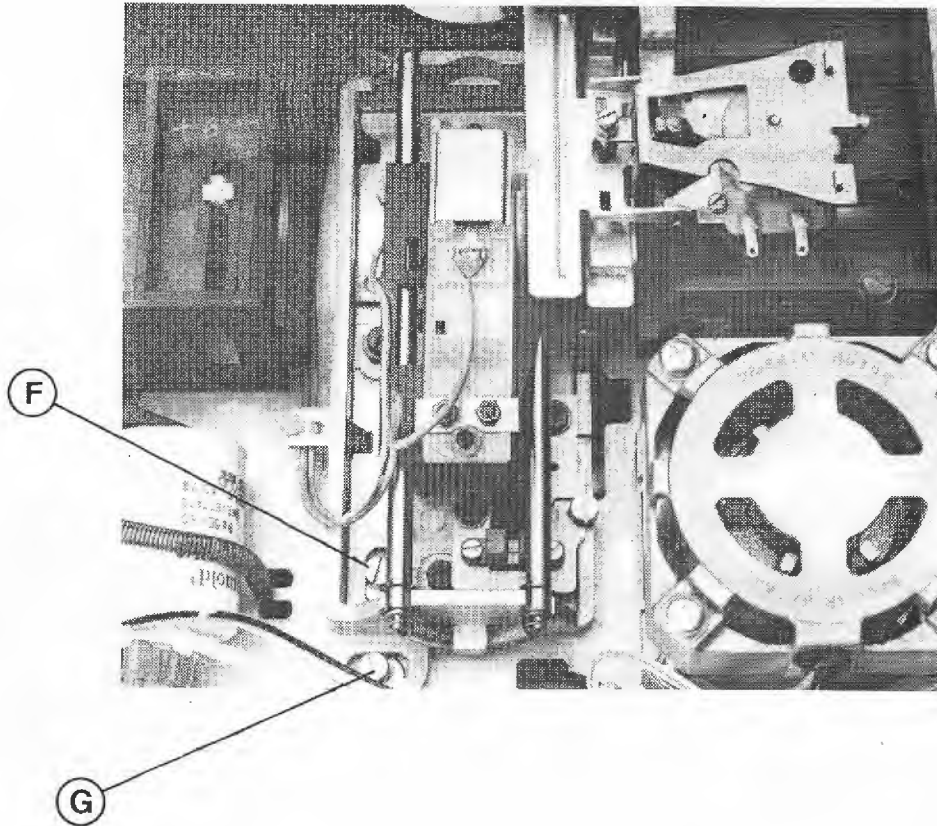


Figure 21. FD 801/FD 802 - Head Alignments

#### 9.1.4 ADJUSTMENTS OF ELECTROMAGNET FOR HEAD LOAD

- a) Activate the electromagnet and verify that between the tab on the head (see "K", Fig. 22) and the tab of the electromagnet (see "L", Fig. 22) there is a distance of  $0.4 \text{ mm} + 100 \mu\text{m}$ . To obtain this distance, turn the appropriate screws (see "M", Fig. 22). The distance must remain constant from Track 0 to track 76.
- b) Verify that between the screw on the cross-piece and the tab of the electromagnet (see "L") there is a distance of  $0.8 \text{ mm} - 0 + 100 \mu\text{m}$ . Adjust using the screw.

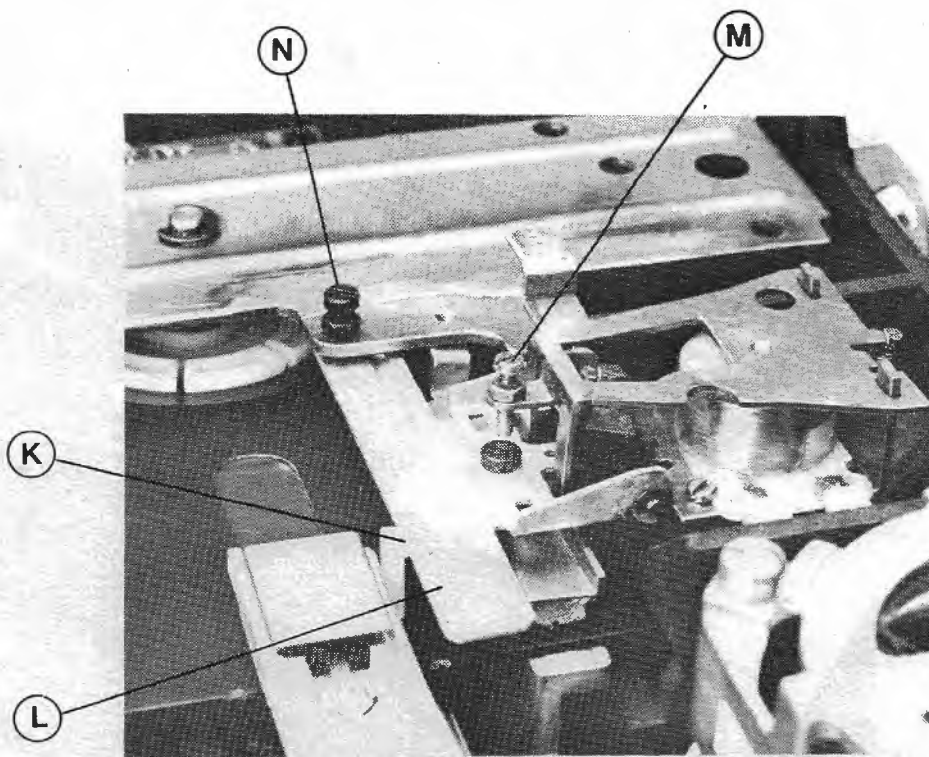


Fig. 22. FD 801/FD 802 - Head Load E.M. Regulation

#### 9.1.5 DOOR LOCK MICROSWITCH AND E.M. ADJUSTMENT

Position the door lock in the closed position, leaving a distance of 0.1 - 0.3 mm between the profile of the slot (see "P", Fig. 23) and the microswitch (see "Q", Fig. 23).

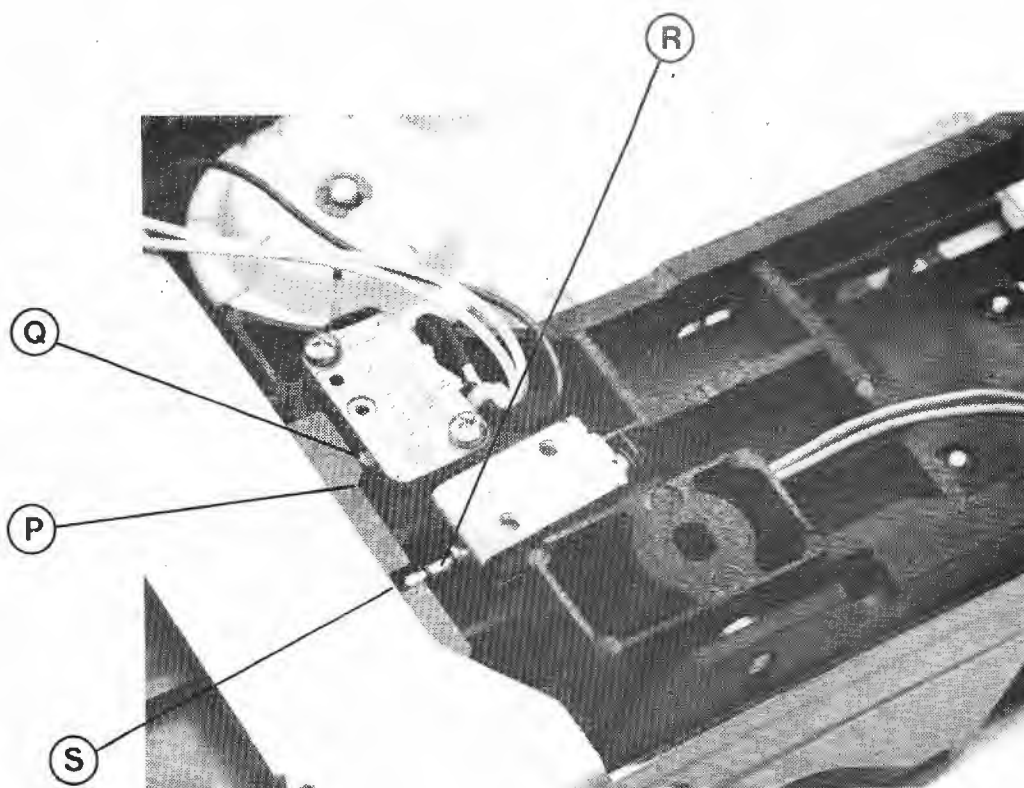


Figure 23. FD 801/FD 802 - Door Lock Microswitch and E.M. Regulation



Figure 24. FD 801/FD 802 - Write Protect Photo Sensor

## 9.2 OPTIONAL ADJUSTMENTS

### 9.2.1 ADJUSTMENT FOR ACCESS DOOR INTERLOCK CONTROL

With the door lock in the closed position, when the electromagnet is activated it will automatically be positioned on the center of the slot of the door lock mechanism. The pin of the electromagnet (see "R", Fig. 23) must enter into the slot, a distance of 3 mm (see "S", Fig. 23). Tighten the screws. De-activate the electromagnet and verify that the distance between the pin of the electromagnet and the slot is 1 mm.

### 9.2.2 WRITE PROTECT PHOTO SENSOR ADJUSTMENT

Insert a disk facsimile and regulate the photo sensor (see "T", Fig. 24) to obtain the proper signal on the scope.

## 9.3 ALIGNMENT PROCEDURES

### 9.3.1 GENERAL INFORMATION

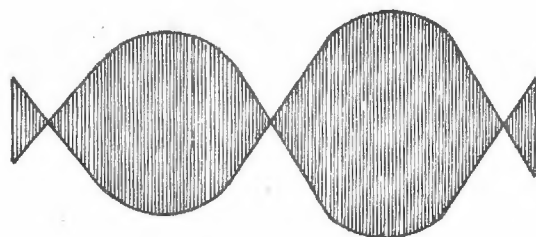
To perform these operations, OPE suggest to use the DYSAN 360/2A Alignment Diskette that is media compatible with IBM two-sided Diskette 2 (IBM P/N 2736700) but has an additional index hole at the same location as that of an IBM one-sided Diskette 1 (IBM P/N 2305830). The DYSAN 360/2A diskette has been recorded with special purpose data in order to accomplish ONLY alignment operations. It is not possible to use this diskette to verify Read Amplitude Signals.

Before using the 360/2A diskette, acclimate it to the environment where it will be used for as long as it was removed from that environment or up to 24 hours, whichever occurs first.

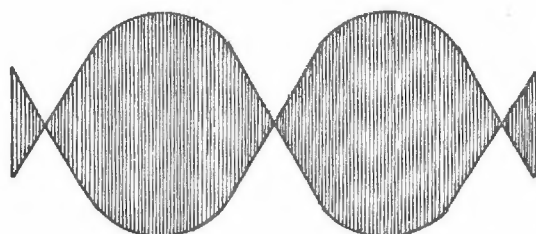
### 9.3.2 READ/WRITE HEAD RADIAL ALIGNMENT

- a) Insert Dysan 360/2A diskette
- b) Step the Head Carriage to track 38.
- c) Using the scope, put SYNC input to the index pulse (T.P. 2 or 3 on PCB) and vertical probe to T.P. 9 or 10. Ground the probe to the drive PCB. Put vertical magnitude of the scope to 100 mv/cm and time base to 20 ms/cm.
- c) The two lobes (cat-eyes) displayed must be within 80% amplitude of each

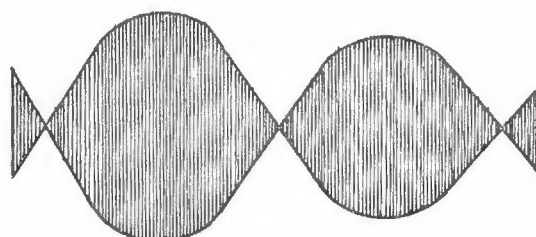
other. If the difference between the two lobes is more than 20% (see Fig. 25), adjustment is required. Turn the screw "G" of Fig. 21 after having loosened the two screws "I" of Fig. 12 until the lobes are equal or in tolerance.



LEFT 80% OF RIGHT  
(-1 MIL OFF TRACK, TOWARDS 37)



EQUAL AMPLITUDE  
(ON TRACK 38)



RIGHT 80% OF LEFT  
(+ 1 MIL OF TRACK, TOWARDS 39)

Figure 25. FD 801/FD 802 - Radial Alignment Waveform

- e) Tighten the screws previously loosened.
- f) Check the adjustment by stepping off track 38 and returning. Check in both directions. Check both heads on FD 802 drives.
- g) Whenever Radial Head Alignment has been adjusted, the Track 0 Detector Adjustment and Track 0 Stop must be checked.



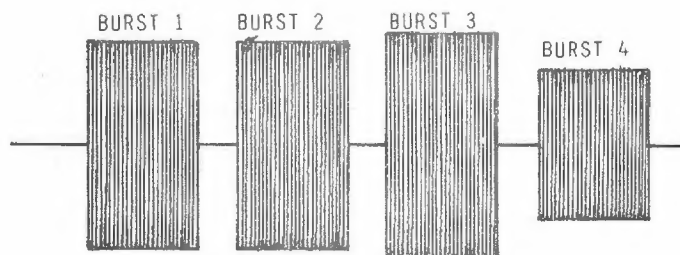
### 9.3.3 HEAD AZIMUTH ADJUSTMENT

- a) Insert Dysan 360/2A diskette.
- b) Step the Head Carriage to track 76.
- c) Using the scope, put SYNC input to the index pulse (T.P. 2 or 3 on PCB) and vertical probe to T.P. 9 or 10. Ground the probe to the drive PCB. Set vertical magnitude of the scope to 50 mv/cm and time base to 0.5 ms/cm.
- d) Compare the waveform displayed to those in Fig. 26. If you are aligning a FD 802 drive, check both heads. If the displayed waveform indicates Head Azimuth which is not within  $\pm 12$  minutes, adjustment is required. Continue to next step (e).
- e) Loosen the screws "I" of Fig. 12. Rotate screw "F" of Fig. 21 to obtain the correct conditions.
- f) If desired, Head Azimuth angle may be more accurately determined than 12 minutes. This determination is made by making burst amplitude ratio comparisons (refer to Fig. 27).
- g) Tighten the screws previously loosened.
- h) Whenever Azimuth has been adjusted, the Index/Sector Photo Transducer Alignment and Radial Head Alignment must be checked and readjusted if necessary.

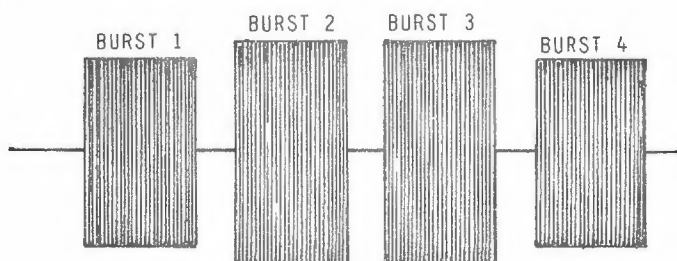
### 9.3.4 INDEX/SECTOR PHOTO TRANSDUCER ALIGNMENT

- a) Insert Dysan 360/2A diskette.
- b) Step the Head Carriage to Track 1.
- c) Using the scope, put SYNC input to the index pulse (T.P. 2 or 3 on PCB) and vertical probe to T.P. 9 or 10. Ground the probe to the drive PCB. Set vertical magnitude to 20 mv/cm and time base to 50  $\mu$ s/cm.
- d) Observe the timing between the start of the sweep and the first peak of the timing pulse. This time should be 200  $\mu$ sec  $\pm$  50  $\mu$ sec. If the checked drive is FD 802, control the timing triggering the scope on each "Index" signal.

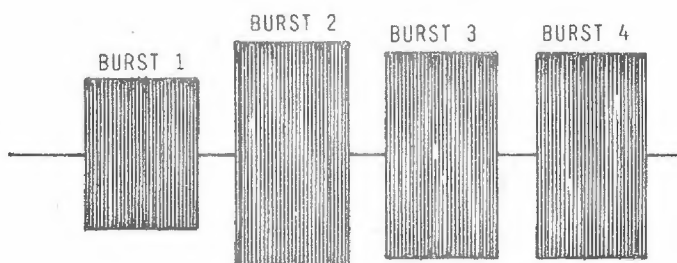
e) Seek to track 73 and 76 to reverify that the timing is the same.



DEPICTS AN ALIGNMENT OF EXACTLY -12 MINUTES OF AZIMUTH ERROR. NOTE THAT BURST 1 AND 2 ARE OF EQUAL AMPLITUDE. \*



DEPICTS AN OPTIMUM ALIGNMENT OF ZERO MINUTES OF AZIMUTH ERROR. NOTE THAT BURSTS 1 AND 4 ARE OF EQUAL AMPLITUDE, AND 2 AND 3 ARE OF EQUAL AMPLITUDE.



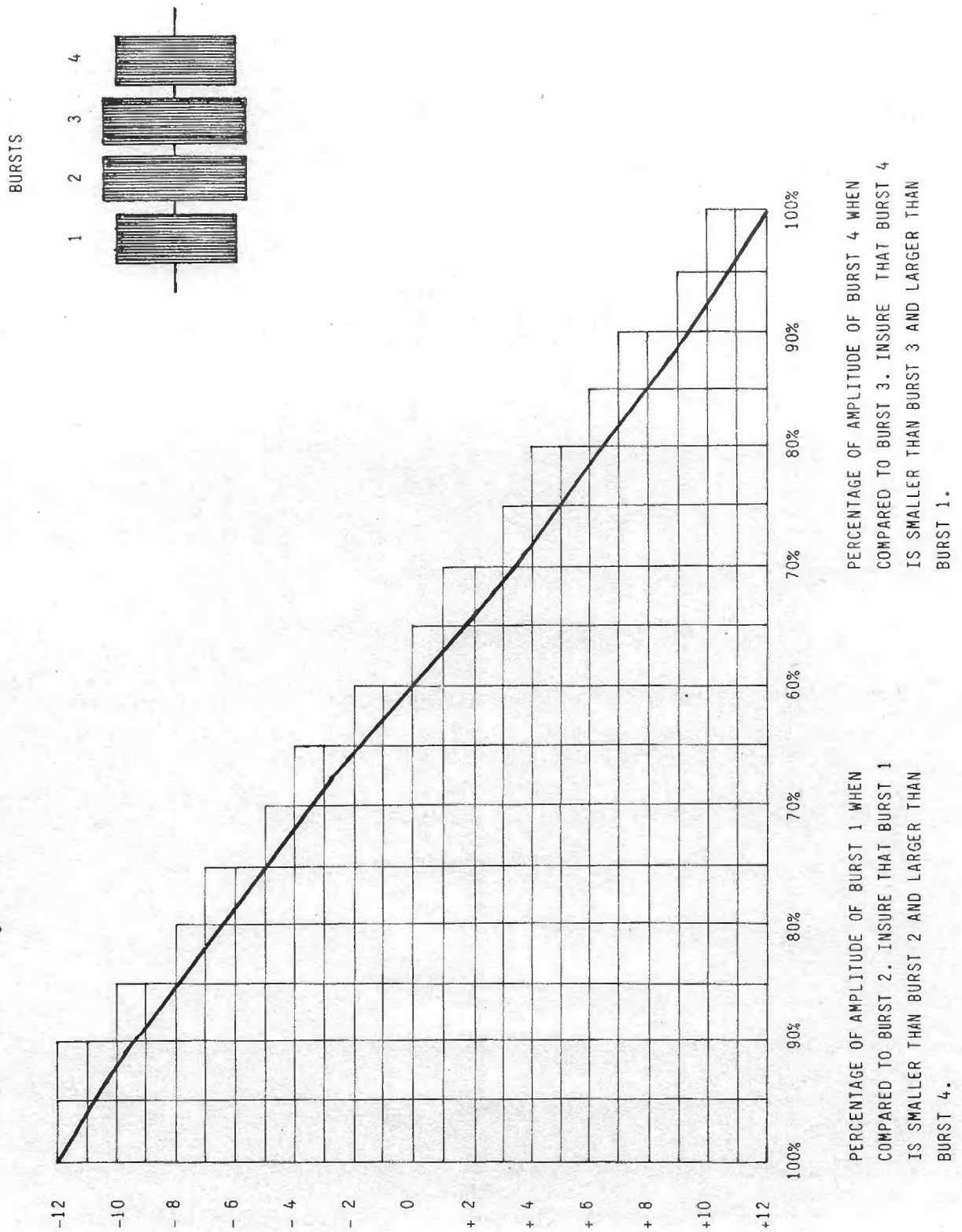
DEPICTS AN ALIGNMENT OF EXACTLY + 12 MINUTES OF AZIMUTH ERROR. NOTE THAT BURSTS 3 AND 4 ARE OF EQUAL AMPLITUDE. \*

\* TO HAVE AN ALIGNMENT WITHIN + 12 MINUTES OF AZIMUTH ERROR THE AMPLITUDE OF BURSTS 1 AND 4 MUST BE EQUAL TO OR LESS THAN THE AMPLITUDE OF BURSTS 2 AND 3.

Figure 26. Head Azimuth Adjustment



Figure 27. DYSAN 360/2A Azimuth Determination Graph





# 10. SPARE PARTS CATALOG

REFERENCE NUMBER	PART NUMBER	DESCRIPTION	NPM
1	780658 X	PSB ATO 90	1
2	780660 V	PLASTIC SUPPORT DISK GUIDE	1
3	5441045 Z	AC MOTOR (115V)	1
3	5441046 D	AC MOTOR (220V)	1
4	63003	STEP MOTOR ASSEMBLY	1
5	760531 B	HEAD ASSEMBLY	1
6	760517 D	SLIDER	1
7	780455 C	CROSSPIECE	1
8	760516 C	CURSOR	1
9	780444 H	KEEPER	1
10	780445 A	HEAD COMMAND BRIDGE	1
11	760501 N	STEP MOTOR SUPPORT	1
12	760509 W	PHOTO ASSEMBLY BOARD	1
13	780443 G	ELECTROMAGNET HEAD LOAD	1
14	760521 H	SLIDER EXPELLER	1
15	780608 W	HEAD ASSEMBLY	1
16	760507 L	STEP MOTOR CLUTCH	1
17	772374 M	CONNECTOR BLOCK	1
18	772461 D	SPRING COLLECT	1
19	760513 H	CHUCK	1
20	760512 G	PULLEY	1
21	760527 F	BELT	1
22	760522 A	BASEPLATE	1
23	780583 V	LED ASSEMBLY	1
24	760514 A	FLANGE	1
25	772416 Y	FLANGE	1
26	760526 E	CHUCK BEARING	1
27	5009160 V	CAPACITOR 2.5 UF	1
28	780270 W	PHOTOEMITTER AND RESISTOR ASSEMBLY	1
29	780324 G	PHOTOSENSOR TRACK 0	1
30	945230 F	BRACKET	2
31	780280 R	PHAN	1
32	679146 L	PULLEY (50 HZ)	1
32	679145 K	PULLEY (60 HZ)	1
33	760504 R	CARRIAGE SHAFT	2
34	772462 E	CONE	1
35	949870 M	BEARING	1
36	679192 R	SPONGE	1
37	772464 G	SPRING	1
38	772463 F	PIVOT	1

REFERENCE NUMBER	PART NUMBER	DESCRIPTION	NPM
39	760519 P	SCREW	1
40	926327 R	SCREW	3
41	925709 G	SCREW	2
42	772447 F	SCREW	1
43	680417 S	SPRING	1
44	402115 R	SPRING	1
45	680319 P	SPRING	1
46	680616 H	SPRING	1
47	680622 F	SPRING	2
48	780387 G	SPRING	1
49	772465 H	SPRING	1
50	945500 F	BRACKET	1
51	945400 B	BRACKET	6
52	940615 C	WASHER	1
53	940639 L	WASHER	1
54			
55	938210 C	NUT	1
56			
57	938212 S	NUT	5
58	940103 C	WASHER	3
59	920047 S	SCREW	4
60	923408 Z	SCREW	2
61	920315 T	SCREW	2
62	920027 M	SCREW	1
63	924927 H	SCREW	2
64	924923 D	SCREW	2
65	920057 D	SCREW	3
66	924710 T	SCREW	1
67	760529 R	SCREW	2
68	925985 D	SCREW	1
69	920302 F	SCREW	2
70	920307 C	SCREW	1
71	925242 T	SCREW	1
72			
73	920882 M	SCREW	2
74	920614 X	SCREW	4
75	925136 H	SCREW	3
76	920056 T	SCREW	2
77	920305 A	SCREW	4
78	5812155 M	CLAMP	6
79	963123 J	SPRING	1
80	63004	BAND	2

REFERENCE NUMBER	PART NUMBER	DESCRIPTION	NPM
81	63005	ROLLER	2
82	760505 J	HUB	1
83	126009 V	BOARD	1
84	780611 G	AC/DC CONNECTORS SUPPORT	1
85	780596 S	AC CABLE	1
86	63012	DOOR LOCK SOLENOID	1
87	926362	SCREW	2
88	940105 Z	WASHER	2
89	63013	WRITE PROTECT PHOTO ASSEMBLY	1
90	920883	SCREW	2



## 11. ELECTRICAL SCHEMATICS

See FD 801/FD 802 Schematics Set, publication number 50409.01.

