



Installation and Maintenance Manual
Dual Diskette Drive
Model 270/272/277

Installation and Maintenance Manual
Dual Diskette Drive
Model 270/272/277

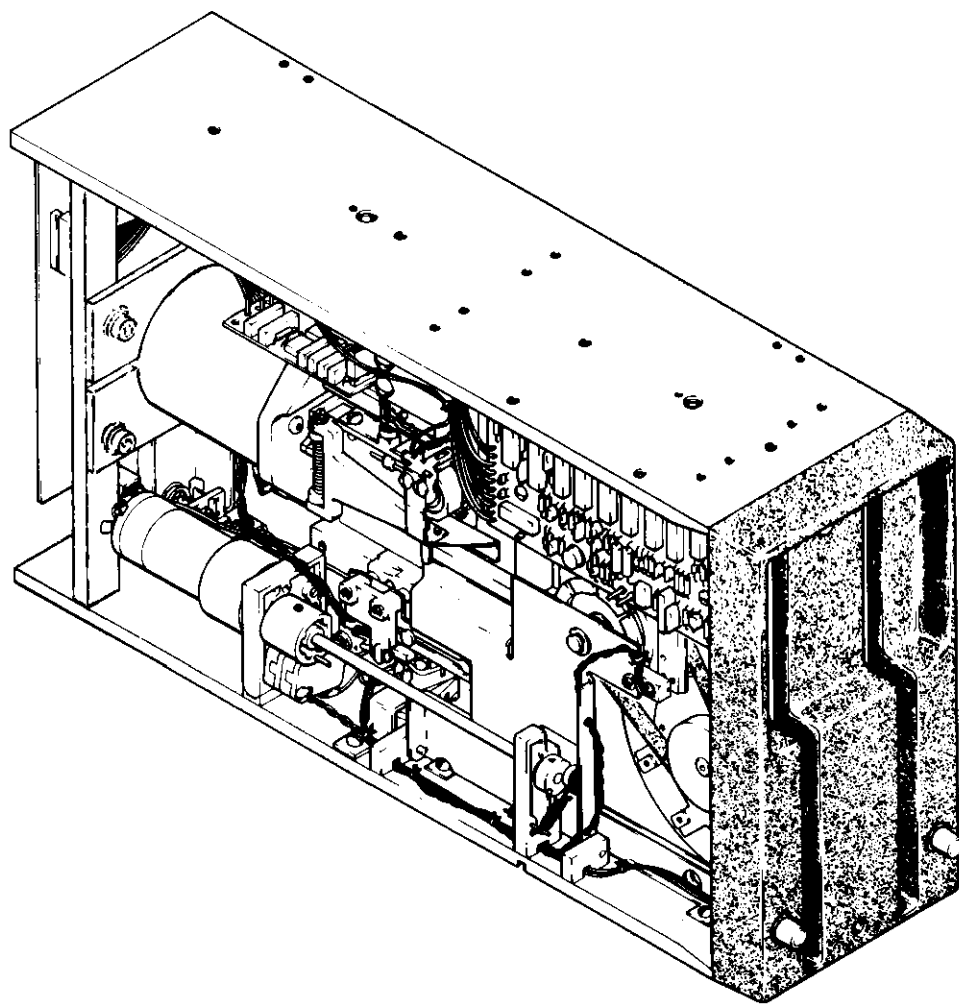


TABLE OF CONTENTS

	PAGE
SECTION 1 - INSTALLATION.....	1-1
INSTALLATION CHECK LIST.....	1-1
Visual Inspection.....	1-1
Unpacking.....	1-2
Mechanical Checks.....	1-2
CABLES.....	1-3
Power Cabling.....	1-3
Signal Cabling.....	1-3
INSTALL DISKETTE DRIVE.....	1-6
Vertical 19-Inch Retma Rack Installation.....	1-6
Horizontal 19-Inch Retma Rack Installation.....	1-7
Desk Top Mounting.....	1-9
Diskette Loading and Unloading.....	1-9
OPTIONS.....	1-10
Vertical Operation.....	1-10
Chassis Ground.....	1-10
Write Protect.....	1-10
Data Separator.....	1-11
Spindle Motor Enable.....	1-11
Remote Eject.....	1-11
High Speed Seek.....	1-13
Parallel Operation.....	1-13
Direct Head Load.....	1-15
Separated Sector and Index.....	1-15
Sector Count Down.....	1-15
Double Density Data Separator.....	1-15
External Data Separator Sync.....	1-16
Decoded Select.....	1-16
SECTION 2 - MAINTENANCE.....	2-1
PREVENTIVE MAINTENANCE SCHEDULE.....	2-1
Quarterly Cleaning.....	2-1
Read/Write System Checks.....	2-1
Drive System Test.....	2-1
PREVENTIVE MAINTENANCE PROCEDURES.....	2-1
Spindle Drive System.....	2-1
Drive Belt Tension.....	2-2
Read/Write System Checks.....	2-2
Read/Write Visual Examination.....	2-2
Read/Write Data Amplitude.....	2-2
MAINTENANCE PROCEDURES.....	2-3
Tools and Test Equipment.....	2-3
Plugs and Jacks.....	2-3
Data and Interface PCB.....	2-3
PCB Replacement.....	2-3
Voltage Adjustment.....	2-6
Drive System.....	2-6
Drive Motor and Belt Checks.....	2-6
Drive Belt Tracking Adjustment.....	2-7
Drive Belt Tension Adjustment.....	2-7
Drive Belt Replacement.....	2-7

TABLE OF CONTENTS (Continued)

	PAGE
Drive Motor Replacement.....	2-8
Spindle Sensor Assembly Replacement.....	2-8
Spindle Servo PCB Replacement.....	2-9
Diskette Spindle Assembly Replacement.....	2-9
Index Transducer and Logic Checks.....	2-10
Index Transducer Alignment.....	2-11
Index Transducer Replacement.....	2-12
Spindle Cone Replacement.....	2-13
Read/Write System.....	2-13
Head Load Check and Adjustment (Side 0).....	2-14
Head Load Check and Adjustment (Side 1).....	2-15
Head Load Solenoid Replacement (Side 0).....	2-15
Head Load Solenoid Replacement (Side 1).....	2-16
Positioning System.....	2-16
Positioner Servo Check.....	2-16
Positioner Track and Azimuth Alignment Check, Side 0.....	2-17
Positioner Track and Azimuth Alignment Check, Side 1.....	2-18
Positioner Servo Adjustment.....	2-18
Preliminary Adjustments.....	2-18
Final Adjustments.....	2-20
Positioner Track and Azimuth Adjustment Side 0.....	2-20
Positioner Track and Azimuth Adjustment Side 1.....	2-21
Positioner Assembly Replacement.....	2-23
Eject Motor Cam Alignment Check.....	2-23
Eject Motor Cam Adjustment Procedure.....	2-23
Head Pressure Arm Check.....	2-25
Head Pressure Pad Replacement.....	2-26
Head Pressure Arm Retract Mechanism (Side 1) Check.....	2-27
Head Pressure Arm Retract Mechanism (Side 1) Adjustment.....	2-28
Read/Write Head Penetration (Side 1) Check.....	2-29
Read/Write Head Penetration (Side 1) Adjustment.....	2-29
DISKETTE DRIVE EXERCISER.....	2-29
Controls, Indicators, and Test Points.....	2-29

LIST OF ILLUSTRATIONS

Figure	Title	Page
1-1	Diskette Drive Shipping Configuration	1-2
1-2	Slide Mounting Dimensions	1-6
1-3	Vertical Retma Rack Mounting	1-7
1-4	Horizontal Retma Rack Mounting	1-7
1-5	Outline Dimensions	1-8
1-6	Write Protect Notch Location	1-9
1-7	Simplified Controller Design Configuration with Fast Multi-Track Seek and Restore Option	1-11
1-8	Parallel (Daisy-Chain) Drive Connection Wiring Diagram	1-12
2-1	Plugs and Jacks Identification	2-5
2-2	Drive System	2-6
2-3	Index Pulse and Data Burst	2-11
2-4	Index Transducer Alignment and Replacement	2-12
2-5	Head Load Check and Adjustment (Side 0)	2-14
2-6	Head Load Check and Adjustment (Side 1)	2-15
2-7	Track Alignment	2-17
2-8	Lamp Amplifier PCB	2-19
2-9	Positioner Track and Azimuth Adjustment (Side 0)	2-21
2-10	Positioner Track and Azimuth Adjustment (Side 1)	2-22
2-11A	Eject Motor Cam Alignment Check-Carrier Open	2-24
2-11B	Eject Motor Cam Alignment Check-Carrier Closed	2-24
2-12	Crank Cam Alignment Check	2-25
2-13	Head Pressure Arm Check	2-26
2-14	Head Pressure Arm Retract Mechanism (Side 1) Check and Adjustment	2-27
2-15	Diskette Exerciser, Model 499	2-30

LIST OF TABLES

Number	Title	Page
1-1	Installation Check List	1-1
1-2	Power and Interface Pin Connections, 270/272/277	1-4
1-3	Option Jumpers	1-17
2-1	Jacks and Plugs	2-4
2-2	Positioner Servo Adjustments	2-19
2-3	Exerciser Switch, Indicator and Test Point Functions	2-31

SECTION 1

INSTALLATION

This section contains procedures to verify the operational integrity of the Diskette drive prior to on-line operation.

INSTALLATION CHECK LIST

The installation check list, Table 1-1, is designed for trained personnel to use as a guide in performing installation checks necessary for proper operation. If more detailed installation information is desired, refer to the appropriate paragraph in this section.

Table 1-1. Installation Check List

Visual Inspection a. Remove all packing material. b. Check packing list. c. Check for shipping damage. d. Remove carriage restraint inserted in side 0
Mechanical Checks a. Check that carriage assembly moves freely over entire stroke. b. Check that position scale is clean and free of foreign particles.
Cables a. Fabricate d. c. and signal cables. b. Check pin to pin resistance (all cables). c. Check pin to conductor continuity (all cables). d. Check for proper pin alignments (all cables).
Mounting a. Install Diskette drive. b. Connect cables to Diskette drive.
Checkout a. Operational checkout with exerciser (optional). b. Operational checkout with system.

Visual Inspection

The Diskette drive is packaged to ensure adequate protection for shipping and handling (See Figure 1-1).

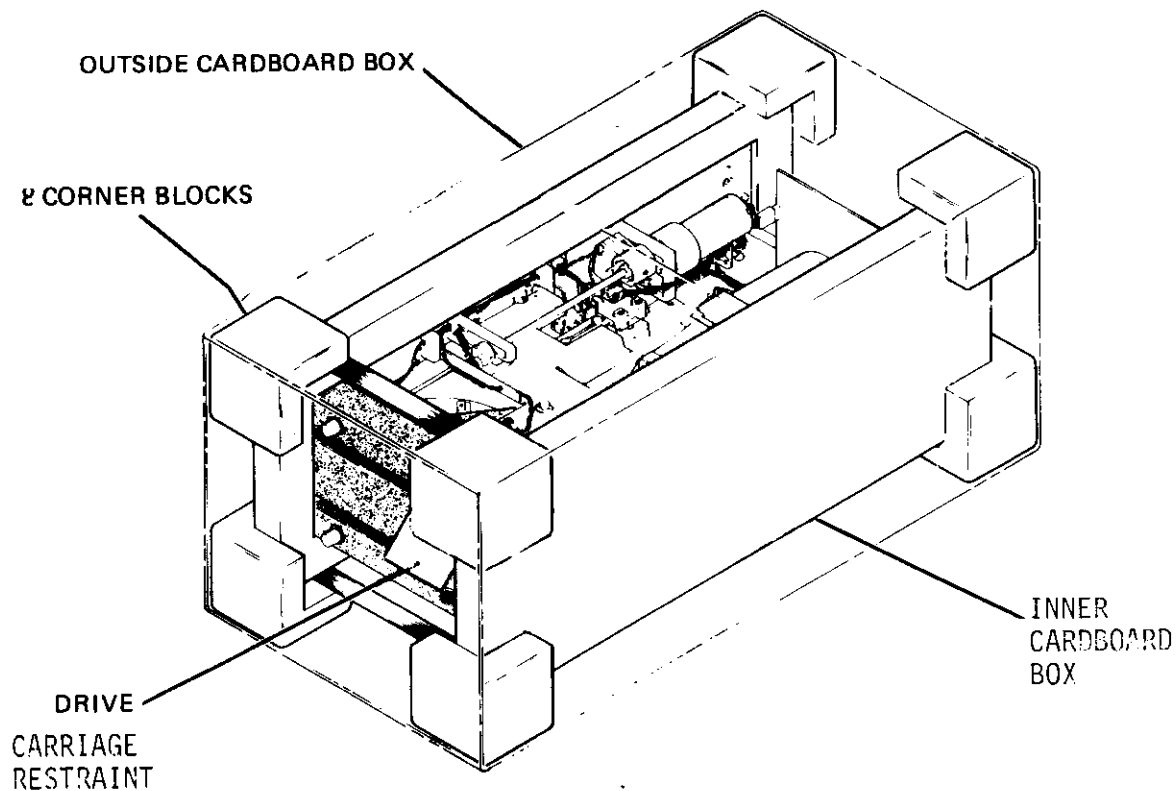


Figure 1-1. Diskette Drive Shipping Configuration

Inspect the shipping container for evidence of any in-transit damage. If damage is evident:

- a. Contact the carrier.
- b. Contact the manufacturer.

Unpacking

After performing a preliminary inspection, unpack the Diskette drive as follows:

- a. Remove all material from shipping container. Remove inner packing material.
- b. Check material received against packing list. If packing shortage, contact manufacturer,
- c. Visually inspect all items received for physical damage. If damage is evident:
 - Contact carrier.
 - Contact the manufacturer.

Mechanical Checks

To check the proper loading and unloading of a Diskette, the Diskette power cable must be connected. A button is located at the front of the bezel adjacent to the Diskette aperture. When the button is pressed, the load mechanism moves to the open position and the Diskette is ejected. The Diskette is inserted in the aperture with the head aperture to the rear and

the label on the opposite side to the read/write head. The load mechanism will automatically close when the Diskette is fully inserted.

- a. Insert a diskette and verify that the load mechanism closes.
- b. Press the button and verify that the load mechanism releases and that the diskette is ejected approximately 3/4".

CABLES

Two cables are necessary to connect power to the Diskette drive and signals to the host system.

- DC Power Cable
- Signal Cable

Power Cabling

All DC power lines shall have lengths and wire diameters consistent with meeting the power regulation requirements of the Diskette drive, as follows:

+5V DC $\pm 5\%$	2.2 Amps maximum
DC Unregulated (Limits: 7.0V to 10.0V)	2.0 Amps maximum running 10.0 Amp maximum 50ms surge to start spindle motor.
-5V DC $\pm 10\%$	0.20 Amps maximum
+24V DC $\pm 10\%$	0.2 Amps nominal when not seeking 1.2 Amps maximum seeking with 3.0 Amp maximum peak surges for up to 10 milleseconds at start of seek.

Eight lines are used to transmit DC power through the power connector from the power supply into a Diskette drive. One line pair (high and ground) is used for +5. 0V DC, one for +5V unregulated, one for +24. 0V DC, and one for -5. 0V DC. In addition, a separate single line is available to connect drive and power supply chassis grounds, which are also connected through eject motors mountings.

Five-foot lengths of #18 AWG wire are normally acceptable for use as DC power lines between the drive and typical power sources.

Fabricate power cable in accordance with Table 1-2.

Signal Cabling

System connection between the controller and Diskette drive is optionally connected in either a radial or daisy chain arrangement. To accommodate either application, plug-in line terminators are provided.

Table 1.2. Power and Interface Pin Connections - Model 270/272/277

P1 Signal Connector (50 Pin PCB Edge Connector - 0.1" Centers)

Pin Numbers		Function	Comments
Gnd	Signal		
1	2	Disk Select	Unassigned Model 277
3	4	Head Load 1	270 and 272
5	4	Drive Select 2, Right	277
7	6	Ready 1	270 and 272
9	6	Ready	277, Wire-or'd to Pin 22
11	8	Index 1	270 and 272
13	8	Index	277, Wire-or'd to Pin 20
15	10	Seek Complete	
17	12	Restore	
19	14	Remote Eject 0	Remote Eject 277
21	16	Direct Head Load	
23	18	Head Load 0	270 and 272
25	18	Drive Select 2, Left	277
27	20	Index 0	270 and 272
29	20	Index	277, Wire-or'd to Pin 8
31	22	Ready 0	270 and 272
33	22	Ready	277, Wire-or'd to Pin 6
35	24	Spindle Motor Enable	
37	26	Drive Select 1	270 and 272
39	26	Drive Select 1, Left	277
41	28	Drive Select 2	270 and 272
43	28	Drive Select 1, Right	277
45	30	Write Protect 1	270 and 272
47	30	Write Protect	277, Wire-or'd to Pin 44
49	32	Remote Eject 1	270 and 272
	34	Direction Select	
	36	Step	
	38	Write Data	
	40	Write Gate	
	42	Track 00	
	44	Write Protect 0	270 and 272
	44	Write Protect	277, Wire-or'd to Pin 30
	46	Read Data	
	48	Separated Data	
	50	Separated Clock	

Mating Connectors

<u>Vendor</u>	<u>Vendor Part Number</u>	<u>Comment</u>
Scotch Flex	3415-000	Flat Cable
T & B Ansley	609-5005	Flat Cable
Viking	3VH25/1JN-5	Solder
Texas Instruments	H312125	Solder

P3 - Power Connector

10 Pin Molex - 0.156" Center

<u>Pin</u>	<u>Function</u>	<u>Pin</u>	<u>Function</u>	<u>Mating Connector</u>
1	Chassis Ground	6	Ground	Connector Molex 09-50-7101
2	+5V DC	7	Ground	Terminal Molex 08-50-0106
3	Spindle Power, +7V to 10V	8	Ground	Polarizing Key Molex 15-04-0219
4	Key	9	Ground	
5	+24V DC	10	-5V DC	

a. **Multiple Diskette Drive Applications**

See Options Section.

b. **Single Diskette Drive Application**

For single drive application, the terminated Diskette drive is used for the Diskette drive-to-controller connection. The I/O cable is simply connected to the connector.

c. **DC and Signal Cable Fabrication**

1. Fabricate the interface signal cable according to Table 1-2 by using the appropriate connectors. The interface signal cable should be a twisted pair with return grounds on odd number pins. I/O wire is No. 24 or No. 26 AWG conductor, approximately 30 twists per foot, with maximum length of 20 feet. Alternately an equivalent flat cable may be used.
2. The ground side of each twisted pair terminates within a few inches of the line receiver or transmitter ground on the Diskette drive.
3. Using a VOM, check each cable for pin-to-pin shorts.
4. Check for continuity between each pin and its conductor, at the opposite end of the cable.
5. Connect all cables into system.
6. Apply power to the dc cables and check for proper pin assignments. Refer to Table 1-2.

NOTE

Do not connect power cable to the drive until voltage checks are completed.

7. Check proper pin assignments on signal cable from system connection to drive connector. (Refer to Table 1-2.)
8. Remove all power from cables after checks have been completed.

INSTALL DISKETTE DRIVE

There are two methods of installing the diskette drive in a 19-inch Retma rack:

- Vertical - 4 maximum
 - Horizontal - 2 maximum
- a. **Vertical 19-inch Retma Rack Installation**

For vertical rack mounting the use of a slide (Figure 1-2) mounted to the top of the Diskette drive is optional. If a slide is used the wide portion of the slide should be mounted to the upper inside surface of the system enclosure. The narrower

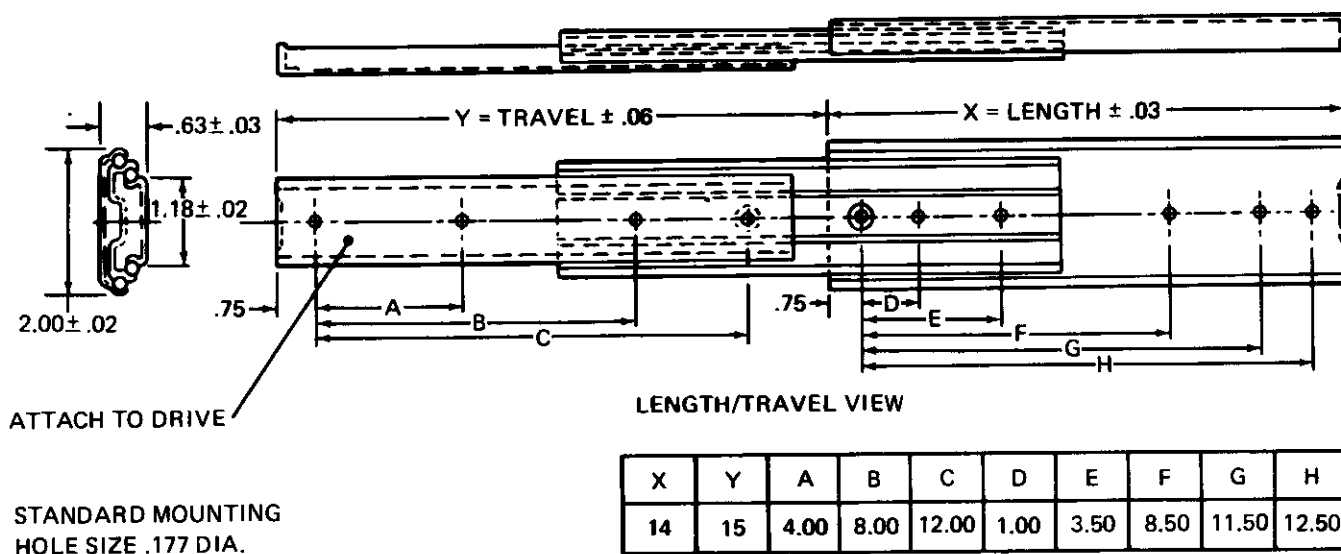


Figure 1-2. Slide Mounting Dimensions

portion of the slide is fastened to the upper edge of the Diskette drive frame via four 8-32 screws .25 long. Tapped holes on the lower edge of the Diskette drive may be used to secure the Diskette drive to a holding member within the system enclosure.

Alternatively if a slide is not used, "skid rails" within the system enclosure may be used. Up to four drives may be mounted vertically in a 19-inch Retma rack. (Figure 1-3.) The vertical orientation of the Diskette drive must be as shown. Vertical mounting of the Diskette drive is preferred over horizontal mounting.

b. Horizontal 19-Inch Retma Rack Installation

If two drives are mounted horizontally, "skid rails" must be used as there is insufficient space to use slides. If a single Diskette drive is mounted horizontally, two slides, one on each side of the Diskette frame, should be used. The wide portion of the slide should be fastened to the system enclosure and the narrow portion to the Diskette frame. The horizontal orientation of the drive is shown in Figure 1-4.

Vertical mounting of the drive is preferred over horizontal mounting.

Power and signal cables may be connected to the drive prior to sliding into the system enclosure providing there is enough service loop. Or if there is rear access to the system enclosure, the power and signal cables can be installed after the Diskette drive is mounted.

Because of the very low total power consumption of the Diskette drive, no external forced air cooling is required. Also, ventilating holes in the sytem enclosure are not necessary for the Diskette drive. However, ventilation of the system enclosure

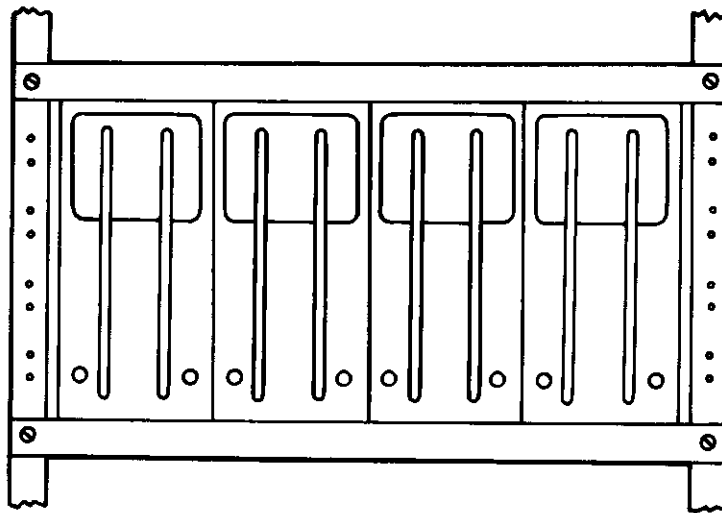


Figure 1-3. Vertical Retma Rack Mounting

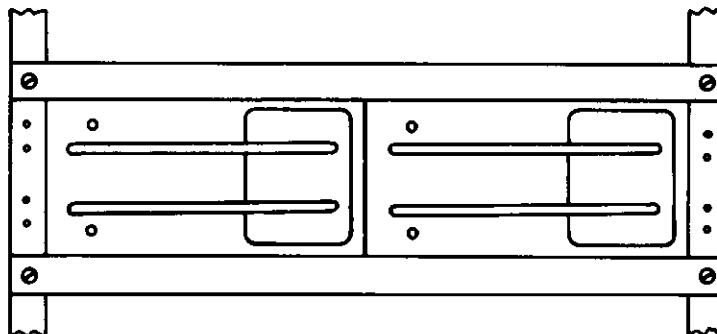


Figure 1-4. Horizontal Retma Rack Mounting

may be necessary depending upon the requirements of other hardware sharing the same enclosure as the Diskette drive.

Desk Top Mounting

The Diskette drive may be desk top mounted, i.e., Positioner Vertical only if proper compensation is made for the mass of the carriage assemblies. This is done by installing Jumper A to B on the positioner Servo PCB.

Diskette Loading and Unloading

Proper loading of the Diskette is vital to the operation of the Diskette drive. Figure 1-5 shows the proper location of the diskette opening for loading.

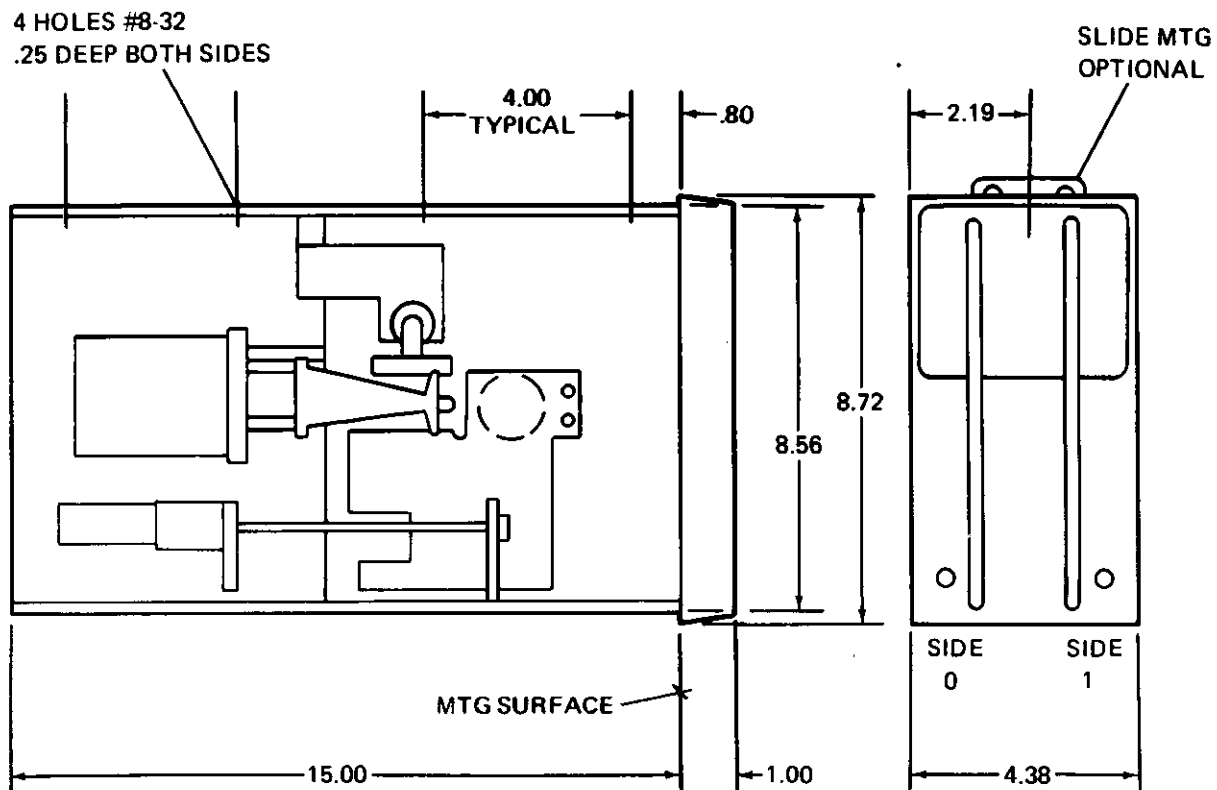


Figure 1-5. Outline Dimensions

Procedure for loading/unloading the Diskette is as follows:

- Insert the diskette into the desired side of the Diskette drive such that the label is at the opposite end of the slot from the pushbutton eject switch. A sensing device in the drive will automatically close the carrier when the diskette is properly positioned. Side 0 is on the left hand of an observer facing the drive which is mounted such that the slot is vertical. Side 1 is then on the right.
- To remove the diskette, press the pushbutton located near the slot containing the diskette. The diskette will be ejected to where it can easily be removed from the drive.

OPTIONS

In order to meet varying requirements of different customers, PerSci provides the following options:

Vertical Operation

If the Diskette drive is to be operated with the carriage moving in a vertical direction, jumper A to B on the positioner Servo PCB must be installed.

Chassis Ground

Jumper W1 provides a convenient means of tying the chassis to ground at the drive. If this jumper is not used, the chassis should be grounded via Pin 1 of the power connector J3. There is also a ground path to the chassis via the eject motor mounting hardware.

Write Protect

Optional write protect sensors are available for the Diskette drive. If a write protected Diskette is inserted, a write protect indication is given to the controller at P1 Pin 44 for Disk 0 and at Pin 30 for Disk 1. These pins go to ground when write protected.

The PerSci "write protect" option is based on the proposed Option 1 by ANSI utilizing a notched diskette. The PerSci drive provides an optional optical sensor at the notched position to determine that the diskette is write protected. To write on a "write protected diskette" an opaque tape (Avery #DGF-K1-D12 or equivalent) must be placed over the notch to prevent the optical sensor from being activated. Figure 1-6 represents the detailed measurements associated with a write protected diskette that the PerSci unit is designed to operate with in a satisfactory manner. I.B.M. does not offer "write protect" for their floppy and thus software write protection techniques must be used with I.B.M. Diskettes.

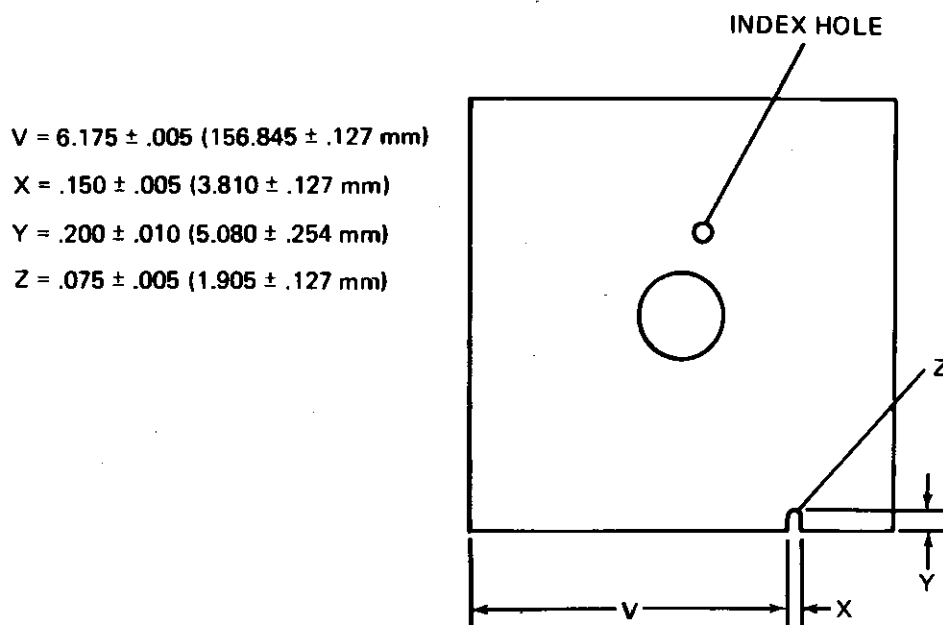


Figure 1-6. Write Protect Notch Location

A phase locked data separator for double frequency code (FM) is optional with PerSci Diskette drives. When this option is used, separated clock is presented to the controller interface at P1 Pin 50, and separated data at P1 Pin 48. The phase locked loop removes jitter due to peak shift from these signals. (P1-50 and P1-48 are at a logic low if this option is not installed.)

Separated clock is a 200 N-sec transition to a logic low state for every "clock bit" written on the Diskette. Separated data is a similar transition for every "data bit" written on the Diskette. A is connected to C on the data separator module for this output.

An alternative jumper connection on the data separator also provides data pulses on the clock line and clock pulses on the data line during a "soft sector" address mark, to simulate the action of a "1-shot" type of data separator. B is jumpered to C on the data separator module for this option. Both connections work as described with "soft sector" formats, and also work with hard sector formats. Three bytes of data is required to synchronize the data separator.

Spindle Motor Enable

Pin 24 of the Diskette drive may be used to provide controller control of the spindle motor. A logic low on this line enables the spindle servo, such that the spindle turns when a Diskette is installed. A logic high inhibits the spindle motor, thus allowing the system to "stand by" at very low power consumption with a Diskette loaded. This option is selected by installing jumper AL to AM. If AM is instead jumpered to AN, the spindle will turn if a Diskette is present in either side.

Remote Eject

A remote eject option is available, allowing the controller to eject a Diskette. This option has a different interface for different drives. For a 270 drive, a low logic level on Pin 14 will eject a Diskette from side 0 if the option is installed; a low logic level on Pin 32 will eject a Diskette from side 1 if the option is installed. The Model 272 is similar to the Model 270, except that the option is only installed for side 0.

For the 277 drive, a logic low on Pin 14 will eject the selected Diskette.

Remote eject is not available on drives requiring external data separator sync, as Pin 14 is used for that purpose instead of remote eject.

Remote eject is a factory installed option only, and is not retrofitted. This is due to the fact that this option requires changes to early assembly stages, which become inaccessible on completed drives.

Remote eject is available if point BF is not jumpered to BH. Jumpering AY to AT creates the Model 270 select interface for this option. Jumpering AS to AT creates the 277 interface, when used in conjunction with other 277 select jumpers.

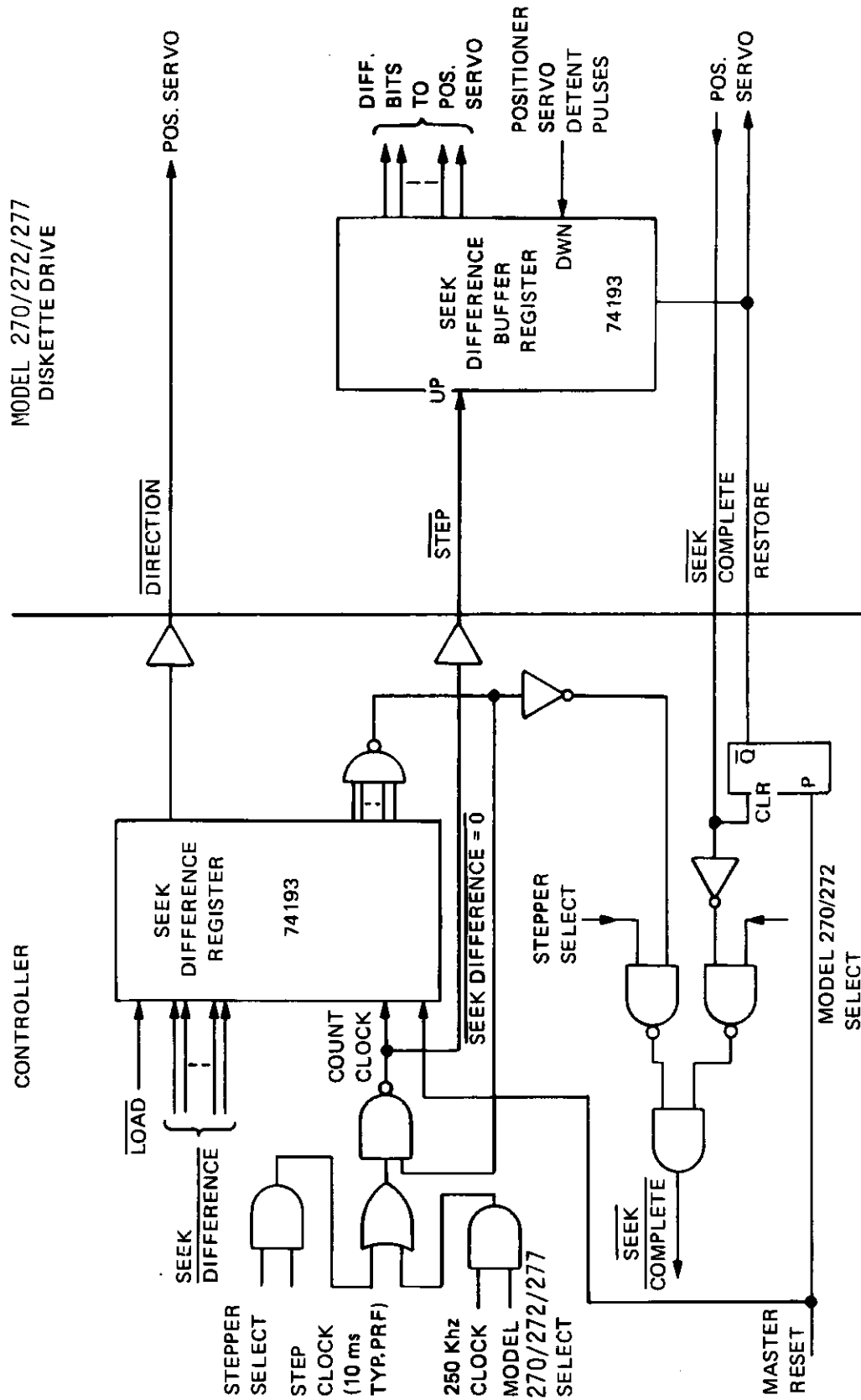


Figure 1-7. Simplified Controller Design Configuration with Fast Multi-Track Seek and Restore Option

High Speed Seek

A high speed seek option is available, shortening maximum seek time to 100 ms. This option makes use of the restore line and seek complete line as well as step and direction. Step pulses for high speed seek may be transferred at rates to 500Khz. A seek complete indication is given by a logic low on P1 Pin 10 when the drive has settled with 0.001" of track center. In the event of a missed seek, a logic low for 500 N-seconds or greater on Pin 12 will cause the drive to find Track 00. The drive automatically seeks Track 00 on power turn on.

The simplified Controller design configuration (Figure 1-7) illustrates utilization of the fast multi-track seek and restore-to-Track 00 option capability of the Model 270, 272, and 277, while simultaneously employing their conventional stepper motor interfaces. This option is selected by jumpering BD to BE.

Parallel Operation

Two dual Diskette drives can be operated with signal connectors in parallel on one signal cable (daisy chain). The drive electrically closer to the controller must have the line terminator resistor pack, U1, removed for this application. The terminator pack must be installed in the drive farther electrically from the controller. A select jumper module must be installed in U11.

The logic implementation of select is the major difference between a 270, 272, and 277 drive. The 272 drive is a special case of the 270. The 277 is totally different in select implementation.

The 270 drive is selected if the select jumper module (U11) is removed. If the select jumper module is installed, the jumpers determine if the drive is a drive 1, selected by a logic low on Pin 28; or a drive 2, selected by a logic low on Pin 26. Side 1 of the selected drive is addressed by a logic low on "disk select" Pin 2.

The select module U11 is jumpered in the following manner for the 270 interface. Pin 7 is tied to Pin 8 in all 270 applications. Pin 12 is jumpered to Pin 3 for drive 1; this jumper is removed and Pin 10 is jumpered to Pin 5 for drive 2.

Separate write protect and ready lines for side 0 and side 1 are used in the 270 interface. Both side 0 and side 1 outputs on these four lines are active when the drive is selected. Index 0 and index 1 lines are also used in this same way, unless the separated index option is used, in which case index 0 becomes separated sector and index 1 becomes separated index. Separate head load input lines are provided in the 270 interface.

Jumpers H to J, D to E, F to G, M to P, R to S, BB to BC and BL to BM, must be installed to establish the Model 270 interface. Jumpers U to V, K to L, BK to BM, BA to BB, N to P, T to S, Z to J, and AP to AR must not be installed.

The 277 interface requires that the select module is installed. Ready, write protect, and index outputs from side 0 and side 1 are wire or'd, except Pin 20 becomes separated sector and Pin 8 becomes separated index if that option is installed. The ready, write protect, or index of the selected side is active.

There are four select inputs; select 1 left, Pin 26; select 1 right, Pin 28; select 2 left, Pin 18; and select 2 right, Pin 6. (Left and right refer to the drive in vertical operation looking at the bezel). The head is loaded by selecting a side.

The select module, U11, has Pin 2 tied to Pin 13, and Pin 4 tied to Pin 11, for drive 1; tying Pin 5 to Pin 10, and Pin 1 to Pin 14 for drive 2.

Jumper point AV must be tied to AW, Z to J, N to P, S to T, BK to BM, BA to BB, AP to AR, U to V, and K to L, for 277 operation. (An exception; for separated index options U to V, BA to BB, and BK to BM are not installed. BB to BC and BL to BM are installed instead. U to V is removed). Jumpers H to J, D to E, F to G, M to P, and R to S are not installed.

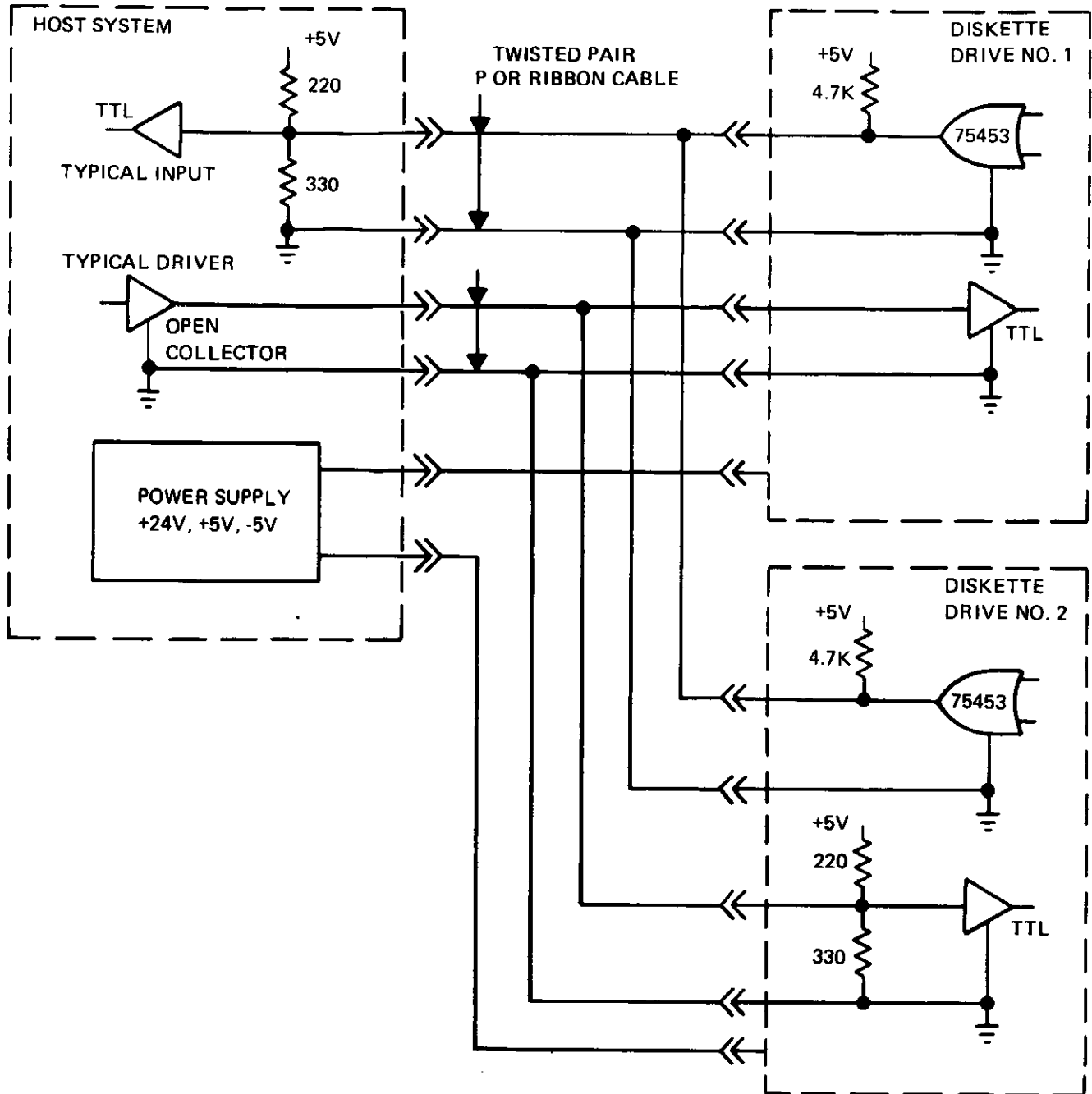


Figure 1-8. Parallel (Daisy-Chain) Drive Connection Wiring Diagram

Direct Head Load

A logic low on Pin 16 will simultaneously load all heads of both drives, overriding select functions. Drives are normally supplied with this function, which may be eliminated by removing U59. The direct head load feature allows copy without the delay caused by 4 ms. head load time.

Separated Index and Sector

Optional logic can be provided to separate the index pulse from the sector pulses of a 33 hole hard sectored Diskette, with this option installed 32 evenly spaced sector pulses per rotation will occur at the separated sector output, Pin 20. One index pulse per rotation will occur at Pin 8.

The separated sector option utilizes independent separation logic; therefore sector pulses are valid immediately after select. One rotation of a disk after insertion will synchronize the sector separation circuit; whether or not that disk is selected.

For unseparated sectors, R 8 and R 94 will be 36K, C 40 and C 41 will be 0.1 μ fd, and jumpers W to X, AD to AE, AH to AJ, and AB to AC must be installed instead of the ones for separating index and sector pulses.

This option is implemented by installing optional values of 11K in R 88 and R 94; and 1 μ fd in C 40 and C 41. Also jumpers W to Y, AD to AF, AA to AB, AH to AK, and sector option jumpers 32 must be installed.

Sector Count Down

This option provides for dividing the sector pulses into 16, 8, 4, or 2 pulses per rotation. Separate counters are used for each side, so sector pulses are valid immediately after select. Two rotations of the disk after insertion will guarantee valid sector pulses whether or not the side was selected.

This option is obtained by the installation of optional chips U 16 and U 27 in conjunction with installing the sector option jumpers (one for each side) having the same number as the number of sectors desired.

Double Density Data Separator

PerSci Diskette drives can be equipped with a double density data separator. This will allow decoding of either MFM or M²FM codes. This data separator is designed to synchronize to a field of 0's for 140 μ -seconds after a sync pulse. (a sector pulse or a sync generated by the controller)

Separated data and separated clock are presented to the controller at P1-48 and P1-50, respectively. Separated data is a 200 N-sec transition to logic low for each data bit written on the Diskette. Separated clock is a 250 Khz train of 200 N-sec pulses marking cell boundaries. It is derived from the phased locked oscillator, and exists whether or not clock bits are present in the encoded data.

The double density data separator replaces the single density data separator when this option is used. Drives cannot be equipped with both.

External Data Separator Sync

When the double density data separator is used, it must be synchronized either to a separated and divided sector pulses, or from sync pulses provided by the controller.

BH should tie to BV to synchronize from divided sector pulses.

BF should tie to BH if the external data separator sync is used. External data separator sync is presented to the drive at P1-14. When external data separator sync is used, remote eject cannot be used.

Decoded Select

The select module, U11, can be powered by installation of jumper auto AW, (normally AV is tied to AW for a select input) when U11 is powered. Customers can fabricate and install select decode modules of their own design.

Table 1-3. Option Jumpers

1. Located on data and interface PCB

COMPONENT AND VALUE, OR JUMPER	FUNCTION
C 40, 0.1 μ fd	Establishes timing of index one shot, side 0
C 40, 1.0 μ fd	Establishes timing of sector separation one shot, side 0
C 41, 1.0 μ fd	Establishes timing of index one shot, side 1
C 41, 1.0 μ fd	Establishes timing of sector separation one shot, side 1
R 88 36K	Establishes timing of index one shot, side 0
R 88 11K	Establishes timing of sector separation one shot, side 1
R 94 36K	Establishes timing of index one shot, side 1
R 94 11K	Establishes timing of sector separator one shot, side 1
U 16, 74193	Provides sector count down, side 1
U 27, 74193	Provides sector count down, side 0
BD to BE	Enables "seek complete" output
AL to AM	Provides spindle motor control from controller
AM to AN	Makes spindle motor independent of controller
AP to AR	Wire or's ready 0 and ready 1
AY to AT	Ties P1-32 to remote eject 1 driver
AS to AT	Ties P1-14 to remote eject 1 driver
W1	Ties signal ground to frame
W to X	Trigger to index one shot, side 0
AD to AE	Trigger to index one shot, side 1
W to Y	Trigger to sector separation one shot, side 0
AD to AF	Trigger to sector separation one shot, side 1
K to L	Wire OR's write protect output

Table 1-3. Option Jumpers

COMPONENT AND VALUE, OR JUMPER	FUNCTION
Sector 0 jumpers, 2 through 32	Selects number of sectors per rotation corresponding to number of jumper
Sector 1 jumpers, 2 through 32	Selects number of sectors per rotation corresponding to number of jumper
BH to BV	Ties sector pulse to double density data separator
BF to BH	Ties external sync (from P1-14) to double density data separator
AA to AB	Separated sector pulses to output driver (U4 Pin 7)
AB to AC	Side 0 index pulses to output driver (U4 Pin 7)
AK to AH	Separated index pulses to output driver (U4 Pin 2)
AH to AV	Side 1 index pulses to output driver (U4 Pin 2)
BA to BB	Select right to index 1 driver (U4 Pin 1)
BB to BC	Select for index 1/separated index driver (U4 Pin 1)
BK to BM	Select left to index 0 driver (U4 Pin 6)
BL to BM	Select to index 0/separated sector driver (U4 Pin 6)
U to V	Wire or index 0 and index 1
N to P	Select left to head load 0 driver (U3-2)
M to P	P1-18 to head load 0 driver (U3-2)
S to T	Select right to head load 1 driver (U3-7)
R to S	P1-4 to head load 1 driver (U3-7)
AV to AW	P1-4 to U11-14 (select 2 R to U11-14)
AV to AW	+5V to U11-14
H to J	Disk select (P1-2) to select 0 - select 1 logic
Z to J	Select right to select 0 - select 1 logic

Table 1-3. Option Jumpers

COMPONENT AND VALUE, OR JUMPER	FUNCTION
D to E T	Select to select right line
F to G T	Select to select left line
A to B	Read Data to read data output
A to C	PL0 clock to read data output

2. Positioner servo PCB

A to B	-IV to vertical position Pins
--------	-------------------------------

3. Double F data separator

A to C	Normal operation
B to C	Simulates one shot output

Legend: T = Tall
S = Small

SECTION 2

MAINTENANCE

This section contains the following:

- Preventive maintenance schedule and procedures.
- Maintenance check, adjustment and replacement procedures.
- Diskette Drive Exerciser, operating procedures and replacement.

PREVENTIVE MAINTENANCE SCHEDULE

Quarterly Cleaning

- a. Clean interior and exterior surfaces with damp cloth using a solution of non-abrasive cleaner. Clean drive belt, drive and driven pulleys with alcohol.
- b. Clean positioner scale surfaces using lint-free cloth (dry) and visually examine for foreign particles after cleaning. Foreign particles on the clear area of the velocity wedge are particularly detrimental to positioner performance.
- c. Clean positioner guide rails with dry, lint-free cloth.
- d. Clean read/write head using alcohol.

Read/Write System Checks

- a. Examine read/write head for scratches, wear and oxide deposits.
- b. Examine pressure arm pad for wear and contamination.
- c. Head load setting time 40 msec maximum.

Drive System Test

- a. Run available diagnostic test to verify proper operation of Diskette drive.

PREVENTIVE MAINTENANCE PROCEDURES

Spindle Drive System

- a. Remove the drive belt and engage both cones by manually depressing Side 0 and Side 1 load switches. With both cones engaged, the drive belt removed and no media present, the hub assembly should rotate virtually frictionless. If friction is detected then either the hub or cone bearings are worn. The problem can be isolated by rotating the hub separately, then engaging the cones separately.
- b. Rotate drive motor shaft and check for uniformity of torque (due to brushes). A non-uniform rotational torque may be due to worn bearings or motor armature interference.

Drive Belt Tension

- a. Drive belt tension is measured by applying a side force to the belt at the center of span and measuring the deflection. Place a scale at the center of span normal to the belt. Apply a 1-lb. force to the belt using a cantilever type force gage and measure the resultant belt deflection. Belt tension is correct when the deflection is $.25 \pm .05$ inches.

Read/Write System Checks

- a. Diskette operation, in read mode on prerecorded data track. Alternately load and unload head load solenoid with the head load logic. Sync on head load logic differentially observe the read preamplifier output. (TP4 and TP5, side 0; TP 6 and TP7, side 1). Interpret settling time when data output level has stabilized above 90% of steady state amplitude.
- b. Head settling time must be no greater than 40 msec.
- c. If the proper reading cannot be obtained, the possible problem areas are:
 1. Solenoid improperly adjusted. When properly adjusted, the energized solenoid should drop the head load arm $.025 \pm .015$ inches.
 2. Defective solenoid.
 3. Improper head/media penetration. The head must protrude into the plane of the media as defined by the "reference boss" by $.008 \pm .005$ inches. This dimension is not adjustable.

Read/Write Visual Examination

- a. With power off examine the read/write head surface for scratches, excessive wear and dirt, oil or oxide deposits. Head must have a clean smooth surface. If the examination reveals any defects, take appropriate corrective action.
 1. If dirty, clean with 95% alcohol and a lint-free wipe.
 2. If head appears to have defective surfaces, and the read/write data amplitude check fails, replace read/write head assembly.

Read/Write Data Amplitude

- a. Diskette operational, drive ready.
- b. Using a new IBM diskette 1, write an all ones pattern (FM) at track 76. Observe read data differentially as in "read/write system checks paragraph preceding this one.
- c. Output must be at least 250 mv p-p.
- d. If the proper reading cannot be obtained, the possible problem areas are:
 1. Defective write drivers.
 2. Defective media. Repeat test with a different diskette to isolate problem.
 3. Defective read/write head.

MAINTENANCE PROCEDURES

The maintenance procedures are divided as follows:

- Check
- Adjustment
- Replacement

Tools and Test Equipment

The following material is required to perform the maintenance procedures:

- Common hand tools
- Flashlight
- Inspection mirror
- Cotton-tipped swabs (Q-Tips)
- 95% Isoprophyl alcohol
- 6-inch steel scale, 1/10ths
- 0-1 oz. or 0-30 gm. Force gage
- 1-lb. Force gage
- Alignment diskette - Dysan 360 or equivalent
- Oscilloscope, differential type
- Drive exerciser - PerSci Model 475

NOTE

The cognizant maintenance personnel should read the entire check, adjustment or replacement procedure prior to performing the routine.

Plugs and Jacks

The interconnecting plugs and jacks are listed in Table 2-1 and identified in Figure 2-1. The connector pins should be checked for cleanliness and total contact if intermittent problems are encountered.

Data and Interface PCB

The data and interface PCB contains the customer's I/O connector, power input connector and various subassemblies connect into it.

PCB Replacement

- a. Disconnect all the connectors along the upper board edge.
- b. Remove two screws holding the lower board edges to the Diskette frame.
- c. Remove four screws holding the PCB pivot brackets to the Diskette frame.
- d. Install replacement PCB by reverse procedure.

Table 2-1. Jacks and Plugs

PCB	CONNECTOR	FUNCTION
Data and Interface PCB	P1	Customer signal interface
	J3	Power
	J4	Power distribution to spindle servo
	J5	Spindle servo interface
	J6	Data separator interface
	J7	Power distribution to positioner servo
	J8	Positioner servo interface
	J9	Index - sector phototransistor, Side 1
	J10	Index - sector LED power, Side 1
	J11	Index - sector phototransistor, Side 0
	J12	Index - sector LED power, Side 0
	J13	Head load mechanism, Side 1
	J14	Head load mechanism, Side 0
	J15	Read/Write head, Side 1
	J16	Read/Write head, Side 0
	J17	Eject assembly, Side 1
	J18	Eject assembly, Side 0
Positioner Servo PCB	P7	Power
	P8	Interface with data and interface PCB
	J8	Drive to voice coil motor
	J5	Interface to lamp amplifier PCB
Spindle Servo PCB	P4	Power
	P5	Signal interface with data and interface PCB
	J1	Drive to spindle motor
	J2	Interface with photosense module
Lamp Amplifier PCB	P5	Interface with positioner servo PCB
	J13	Interface with optical transducer
Data Separator PCB	P6	Interface with data and interface PCB

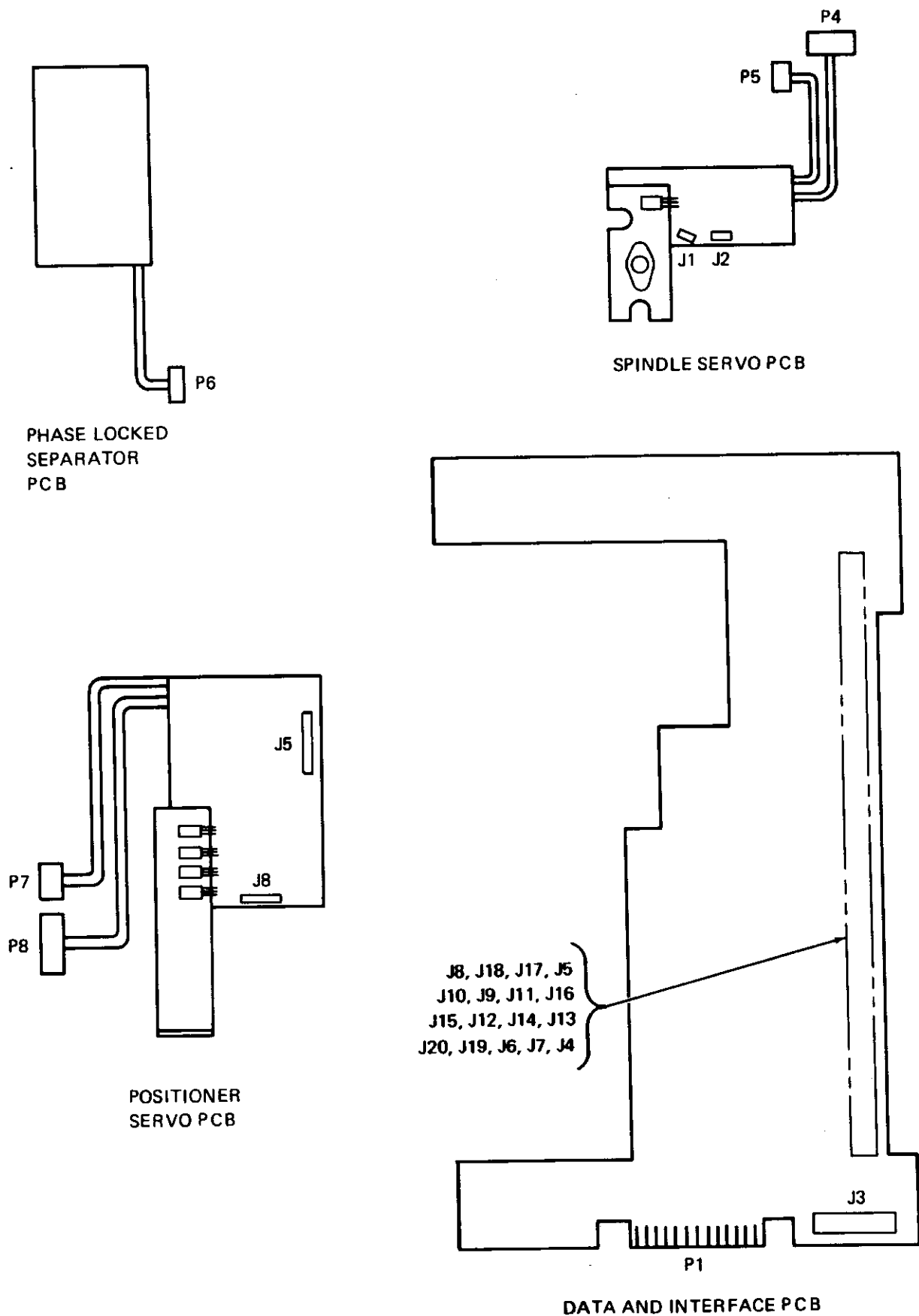


Figure 2-1. Plugs and Jacks Identification

- e. Alignment of replacement PCB to lower mounting points is achieved by slackening four screws holding pivot bar to PCB.

Voltage Adjustment

No adjustments are provided for voltage levels. If any voltage is out of tolerance, check for internal loading by disconnecting diskette drive and checking levels at controller. If levels are correct, check out cable or isolate a defective component or assembly at the data and interface PCB. If necessary, replace the PCB.

Drive System

The drive system comprises drive motor, belt, spindle sensor assembly, hub assembly and spindle servo electronics PCB. (Figure 2-2.)

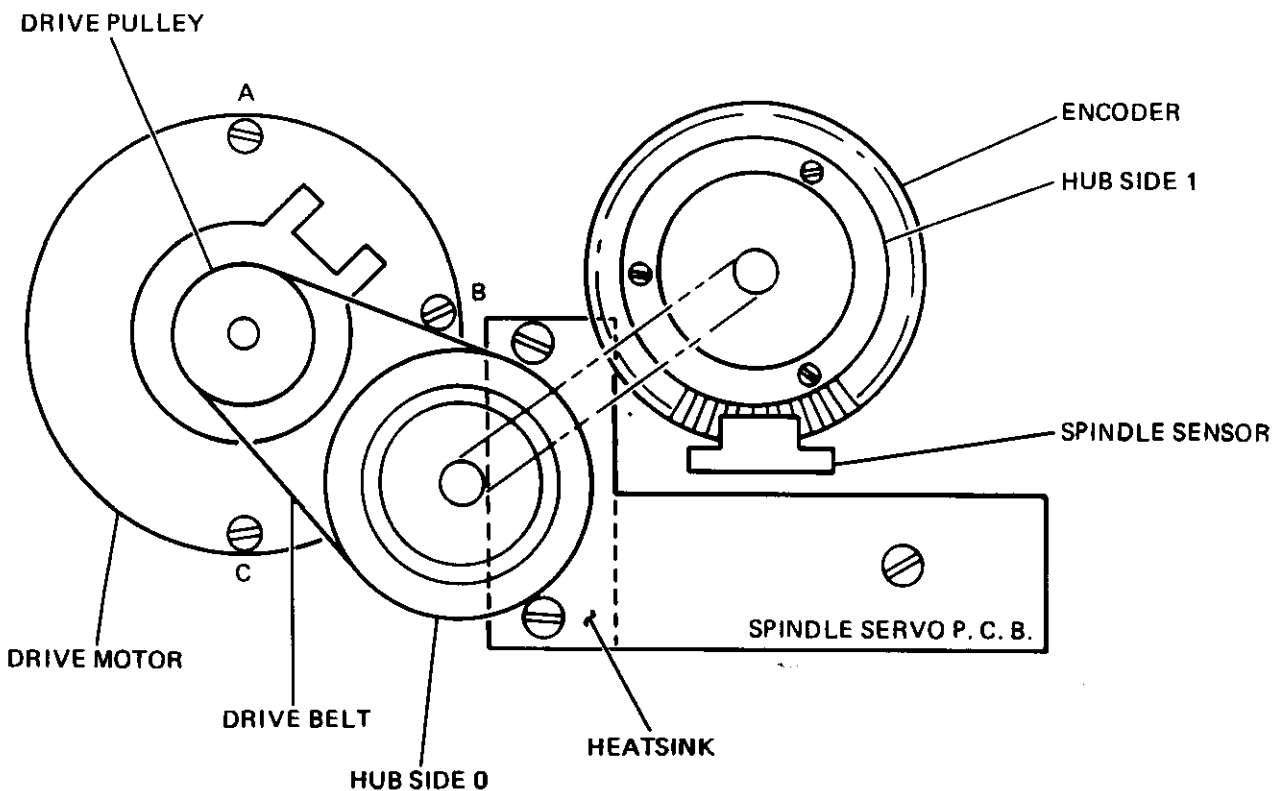


Figure 2-2. Drive System

Drive Motor and Belt Checks

- a. Set Diskette power off.
- b. Inspect drive belt for wear, particularly fraying of the edges.
- c. Manually rotate drive motor. If binding is evident, replace motor.

NOTE

There is always some resistance to rotation due to the brushes.

- d. Verify belt tension.
- e. Verify drive belt tracks in center of both drive and driven pulleys; retrack belt if necessary.

Drive Belt Tracking Adjustment

- a. Remove diskettes from drive.
- b. Set Diskette power off.
- c. Rotate spindle drive motor clockwise by pressing finger against the face of the drive pulley.
- d. Observe if drive belt tracks high or low.
- e. If the drive belt tracks too high, it will scruff the underside of the LED assembly.
- f. If the drive belt tracks too low, place a shim washer (PerSci Part No. 200081-001) between the drive motor and deck plate under Screw A. (Figure 2-2.)
- g. If the drive belt tracks too high, place shim washers (PerSci Part No. 200081-001) between the drive motor and deck plate under Screws B and C. (Figure 2-2), i. e., one washer at each point.
- h. After belt tracking, proceed with belt tension adjustment procedure.

Drive Belt Tension Adjustment

To adjust drive belt tension, proceed as follows:

- a. Set Diskette power off.
- b. Loosen three motor mounting screws. (Figure 2-2.)
- c. Move motor away from hub assembly so as to tension belt.
- d. Tighten motor mounting screws and check belt tension.
- e. Belt tension is correct when the belt deflection at the center of span is $.25 \pm .05$ inches with a 1-lb. side force applied to the belt.
- f. If a force gage is not available, the belt tension should be minimum consistent with the spindle motor stalling when the hub is braked. This may be done by inserting a diskette in Side 1 and holding the hub on Side 0.

Drive Belt Replacement

- a. Set Diskette power off.
- b. Slide drive belt from drive motor pulley.
- c. Clean motor and spindle pulley surfaces, wiping sparingly with alcohol.

- d. Install replacement belt.
- e. Check belt tension and belt tracking. If necessary, make adjustment. Normally, neither would be necessary.

Drive Motor Replacement

To replace drive motor, proceed as follows:

- a. Set Diskette power off.
- b. Remove Drive Belt
- c. Swing out data and interface PCB.
- d. Remove drive motor connector P1 at spindle servo PCB. (Figure 2-1.)
- e. Remove three screws holding drive motor to deck plate.

NOTE

There may be shim washers under the drive motor and these should be replaced under the replacement motor at the same points they originally occupied.

- f. Remove drive motor.

CAUTION

The drive motor pulley is an integral part of the drive motor assembly and should never be removed as this would result in loss of stator/rotor motor alignment.

- g. Install replacement spindle motor assembly.
- h. Replace belt and adjust tension.
- i. Check belt tracking and adjust if necessary.

Spindle Sensor Assembly Replacement

The spindle sensor assembly is located on Side 1 of the deck plate (Figure 2-2) adjacent to the hub encoder disc. To replace, proceed as follows:

- a. Set Diskette power off.
- b. Swing out data and interface PCB.
- c. Remove plug P2 at the spindle servo PCB.
- d. Remove two screws holding spindle sensor assembly to deck plate.

CAUTION

There are two loose spacers between the spindle sensor assembly and deck.

- e. Install replacement spindle sensor assembly by reverse procedure.
- f. Check that spindle sensor mask does not interfere with hub encoder by rotating hub.
- g. If there is interference, remove assembly and check that the circuit board edges are flush with the corresponding plastic assemblies. If they are not, slacken two screws holding the assembly to the PCB. Align the edges before tightening screws.

Spindle Servo PCB Replacement

- a. Set Diskette power off.
- b. Disconnect P4 and P5 at data and interface PCB.
- c. Swing out data and interface PCB.
- d. Disconnect P1 and P2 at spindle servo PCB.
- e. Remove two flat head screws above the spindle servo heatsink. (Figure 2-2.)

CAUTION

There is a loose spacer between the PCB and deck plate at this point.

- g. Remove spindle servo PCB and install replacement PCB.

NOTE

P4 and P5 terminate cables from the PCB which pass between the deck plate and a "U" shaped member mounted to the deck plate. Removal of this "U" shaped member is not necessary since the connector housings will pass through the opening. It is important that the cables pass through this opening; otherwise, they will interfere with diskette insertion.

Diskette Spindle Assembly Repair

The Diskette spindle assembly consisting of two hubs, shaft, two bearings, encoder disc and clamp ring, is not a replaceable assembly. (Figure 2-2.) If any part of this assembly is damaged, the faulty assembly must be repaired at the factory or depot equipped to do such repairs.

- a. Set Diskette power off.
- b. Remove spindle motor assembly.
- c. Remove LED assembly Side 0 and Side 1.
- d. Remove two size 4 cap screws fastening bearing housing to deck plate. Access to these screws is through two holes in the hub Side 1.
- e. Slide assembly out and install replacement assembly.
- f. Replace spindle motor, drive belt and LED assemblies Side 0 and Side 1.
- g. Perform positioner track 38, and azimuth alignment procedure.
- h. Perform index Side 0 and Side 1 alignment procedure.
- i. Perform belt tension and tracking procedure.

Index Transducer and Logic Checks

The procedure for checking index transducer is the same for Side 0 as Side 1, only the test points used are different.

- a. Set Diskette power on.
- b. Insert Dysan alignment diskette 360 into Side 0.
- c. Access track 76 and load head Side 0.
- d. Monitor read data between TP2 and TP3 on the data and interface board grounding both probe grounds to a common point, such as TP1.
- e. Sync to index pulse at Pin 20 of P1 on the data and interface board.

PROG:	INDEX TRANSDUCER
SYNC:	EXT CH 2 NEG
CH 1:	.5V/DIV A.C.
CH 2:	.5V/DIV A.C.
MODE:	CH 1 50 μ SEC/DIV

- f. The start of the data burst should lag the negative going edge of the index pulse by 200 μ sec $\pm$ 50 μ sec. (Figure 2-3.)

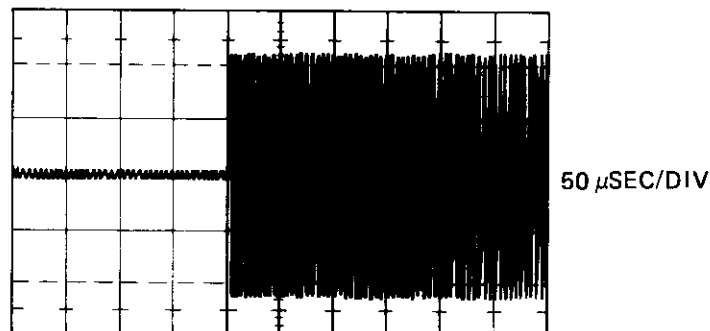


Figure 2-3. Index Pulse and Data Burst

- g. This is true for both track 76 and track 1. Any difference in reading between these two tracks is due to positioner azimuth and the procedure for positioner azimuth should be performed before aligning the index transducer.
- h. Variations in reading will occur with successive insertions of the diskette and an average reading should be taken. Excessive variations with diskette insertion, i.e., greater than $\pm 50 \mu\text{sec}$, indicate a media concentricity problem.
- i. The period should be $166.7 \pm 3 \text{ msec}$ if the diskette is rotating at the correct speed.
- j. To check index Side 1 load Dysan alignment diskette into Side 1. Leave scope probes at TP2 and TP3, but sync from index pulse at Pin 8 of P1 on data and interface board. On drives with sector separation and countdown options, synchronize to Pin 20.

Index Transducer Alignment

To align the index transducer sync off index pulse and monitor data burst on the Dysan alignment diskette 360 as described in the index transducer check procedure.

- a. Access track 1.
- b. Observe time interval between negative going index pulse and data burst.
- c. Slacken No. 2 Allen cap screw securing photosense to carrier. (Figure 2-4.)
- d. Adjust position of photosense until time interval is $200 \pm 20 \mu\text{sec}$ and tighten screw.
- e. Check with successive insertions of diskette that time interval remains $200 \pm 50 \mu\text{sec}$.
- f. If this time interval cannot be achieved by adjustment of the photosense assembly, then proceed as follows:
 - 1. Position the photosense as close to the correct position without losing signal.
 - 2. Remove diskette.

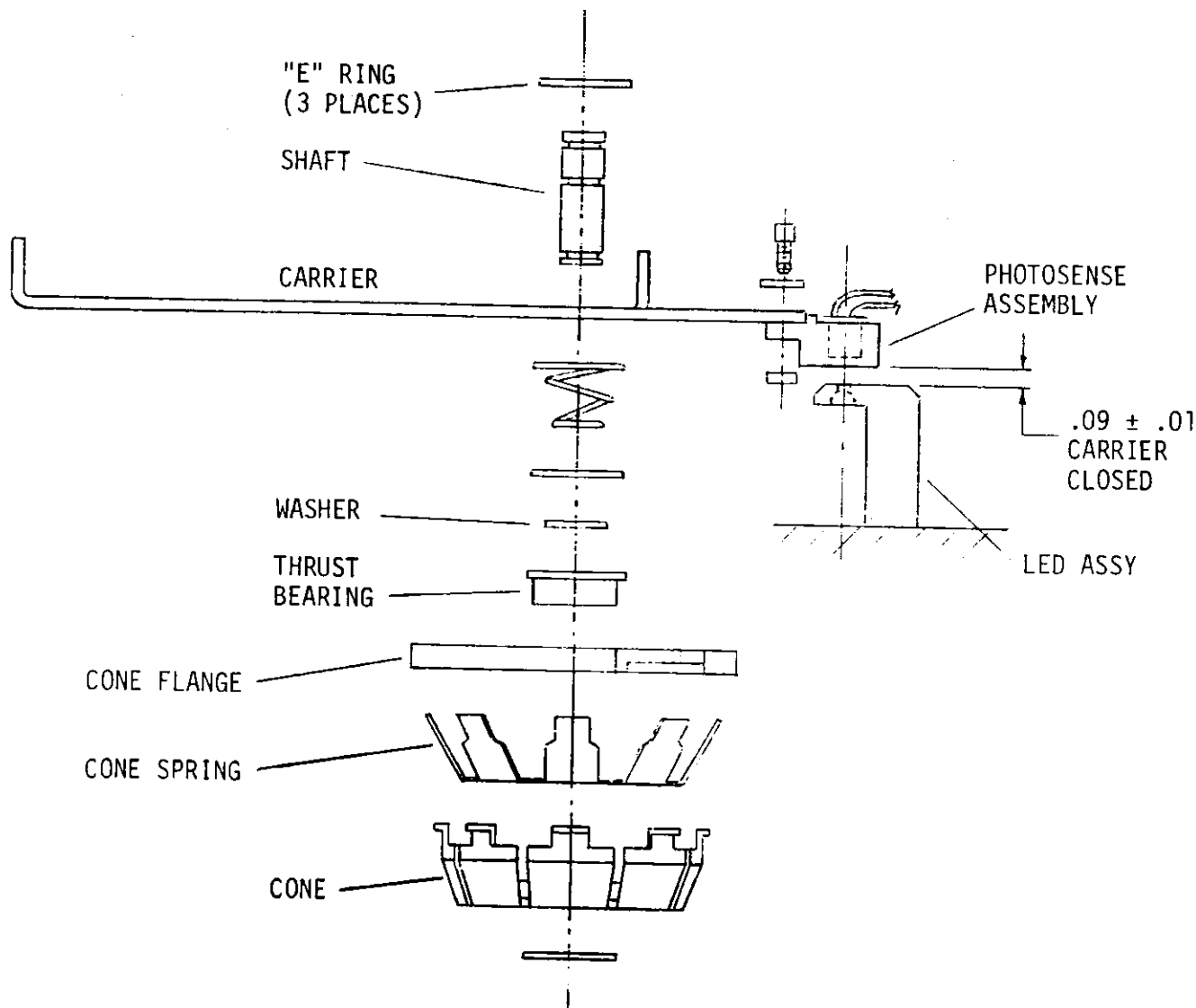


Figure 2-4. Index Transducer Alignment and Replacement

3. Manually load the cone by pressing the carrier in and observe the alignment between the photosense and LED.
4. Slacken two screws holding LED assembly to deck plate and reposition such that the photosense and LED are opposite each other.
5. Insert diskette and proceed with alignment by adjusting photosense only.
6. Repeat above until desired result is achieved.

Index Transducer Replacement

The index transducer consists of two elements - the photosense assembly and the LED assembly for both Side 0 and Side 1.

To replace the photosense assembly proceed as follows:

- a. Set Diskette power off.
- b. Unsolder the black and white twisted lead at the photosense assembly observing lead polarity.
- c. Remove No. 2 Allen cap screw securing photosense assembly to carrier and install replacement assembly.
- d. Solder leads, observing same polarity as on the replaced assembly.
- e. Perform index alignment procedure.

To replace the LED assembly proceed as follows:

- a. Disconnect P12 (Side 0) or P10 (Side 1) at data and interface PCB.
- b. Remove cable clamp at deck plate Side 0 only.
- c. Remove two screws securing LED assembly to deck plate.
- d. Remove LED assembly and install replacement assembly.
- e. Perform index alignment procedure.

Spindle Cone Replacement

The cone assembly engages the media with the drive hub. The cone assemblies for Side 0 and Side 1 are the same and the replacement procedures are the same. To replace the cone or any other part within the assembly, proceed as follows:

- a. Set Diskette power on.
- b. Manually depress the load micro switch, thus engaging the cone with the hub.
- c. Remove E ring holding the cone assembly to the carrier. (Figure 2-4.)
- d. Press the eject button, i. e. , carrier in disengaged position.
- e. Remove cone assembly, compression spring and shim washer between the spring and carrier.
- f. Dismantle cone assembly by removing E ring next to the thrust bearing.
- g. Install replacement cone and assemble by reverse procedure.

Read/Write System

The read/write head on Side 0 is mounted to the bearing carriage and is not replaceable as a unit. The complete positioner assembly must be replaced if determined to be defective. The read/write head on Side 1 is replaceable as an assembly which includes the plastic member to which it is secured. Head load assemblies actuate a spring loaded arm which applies pressure to the media causing it to contact the read/write head.

Head Load Check and Adjustment (Side 0)

To check and adjust head loading (Side 0), proceed as follows:

- a. Set Diskette power on.
- b. Load carrier by manually depressing load micro switch.
- c. Toggle the head load switch and observe that the head load solenoid is energized and de-energized.
- d. The total displacement of the solenoid lifter paddle should be $.09 \pm .02$ inches at the point where it contacts the pressure arm. (Figure 2-5.)
- e. If solenoid paddle displacement is incorrect, adjust the tang to the rear of the solenoid adjacent to the return spring.
- f. The pressure arm should lift off the head $.025 \pm .015$ inches with the solenoid de-energized. This dimension should be checked with the head positioned at track 0 and track 76.
- g. If the pressure arm displacement is incorrect, slacken two Allen cap screws holding the paddle to the solenoid arm and adjust position. Check for correct displacement over entire stroke of positioner. Complete procedure in Paragraph e before making this adjustment.
- h. Toggle head several times with head at track 0 and track 76 to observe correct working.

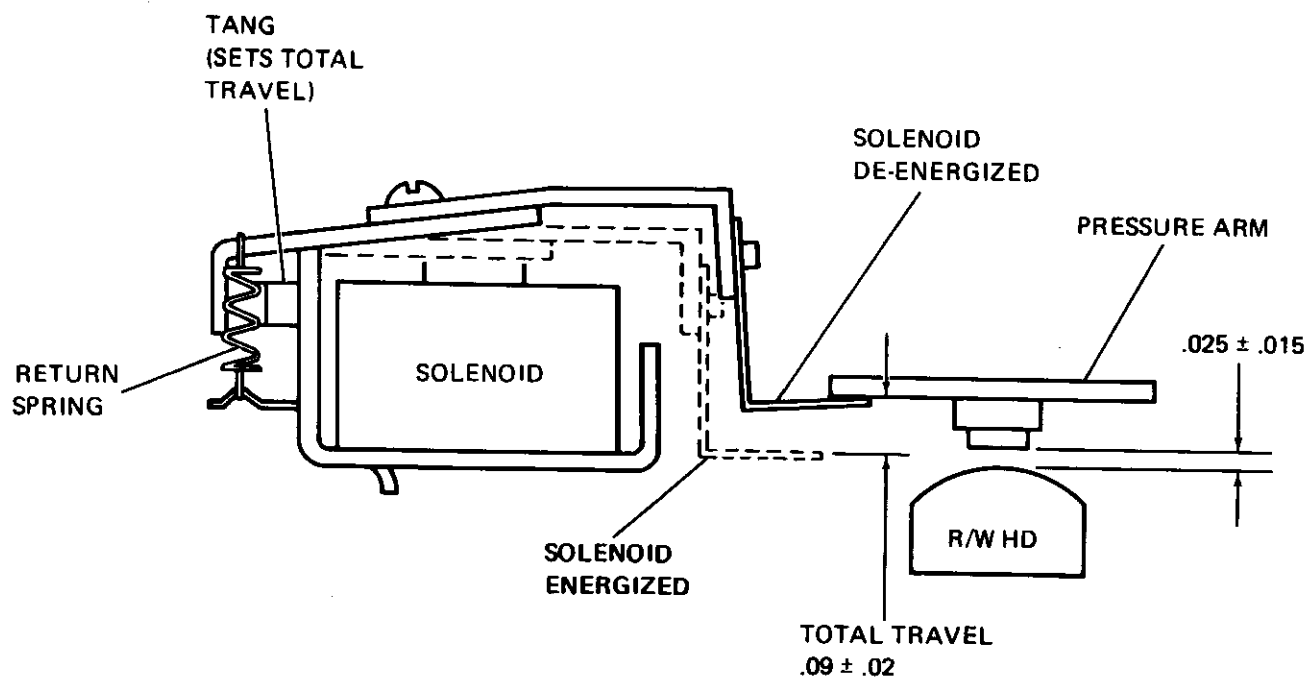


Figure 2-5. Head Load Check and Adjustment (Side 0)

Head Load Check and Adjustment (Side 1)

To check and adjust head loading (Side 1), proceed as follows:

- a. Swing out data and interface PCB.
- b. Set Diskette power on.
- c. Load carrier by manually depressing load micro switch.
- d. Toggle the head load switch and observe that the head load solenoid is energized and de-energized.
- e. The total displacement of the solenoid lifter paddle should be $.09 \pm .02$ inches at the point where it contacts the pressure arm.
- f. If solenoid paddle displacement is incorrect adjust the tang adjacent to the solenoid return spring. (Figure 2-6.)
- g. The pressure arm should lift off the head $.025 \pm .015$ inches with the solenoid de-energized. This dimension should be checked with the head positioned at track 0 and track 76.
- h. If the pressure arm displacement is incorrect bend the paddle at the Z bend next to the solenoid clapper. Complete procedure in Paragraph f before making this adjustment.
- i. Toggle head several times with head at track 0 and track 76 to observe correct working.

Head Load Solenoid Replacement (Side 0)

- a. Set Diskette power off.
- b. Disconnect P14 at data and interface PCB.

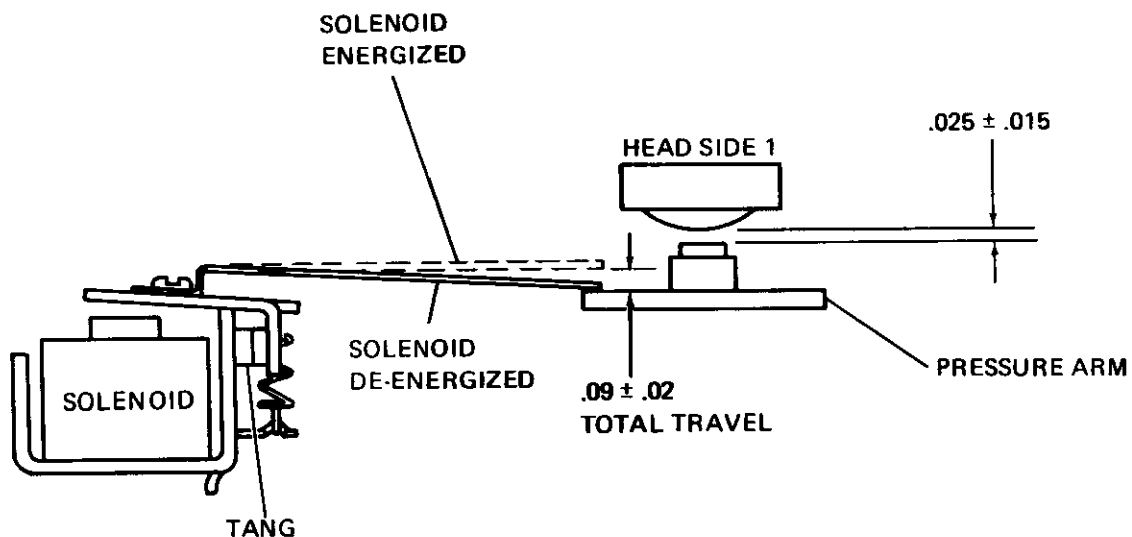


Figure 2-6. Head Load Check and Adjustment (Side 1)

- c. Remove two No. 8 screws holding solenoid assembly to deck plate.
- d. Install replacement solenoid assembly.
- e. Proceed with head load adjustment procedure.

Head Load Solenoid Replacement (Side 1)

- a. Set Diskette power off.
- b. Remove head load solenoid assembly Side 0.
- c. Disconnect P13 at data and interface PCB.
- d. Remove two No. 4 screws securing head load solenoid assembly to deck plate.
- e. Install replacement assembly.
- f. Replace head load solenoid assembly Side 0.
- g. Proceed with head load adjustment procedure Side 1.

Positioning System

The positioner servo comprises a voice coil actuator, optical transducers, head carriage assembly and the electronics required to control the system. Positioner circuits are located on the "lamp amplifier PCB", "positioner servo PCB" and "data and interface PCB".

Positioner Servo Check

Using the oscilloscope, observe the positioner transducer output, obtained at the end of C1 on the positioner servo PCB nearest the potentiometer mounted on that board. (C1 is a 0.022 μ f mylar capacitor near the point the cable leaves the PCB.) The oscilloscope may be conveniently grounded at the end of the power resistors, R77 and R78, farthest from the heatsink. The oscilloscope should be floating except for this ground, as ground loops in the sensitive servo area can cause problems. Synchronize the oscilloscope to "seek complete", available at an exerciser test point or at P1-10 on the data and interface PCB.

After connecting the oscilloscope, alternately seek between track 00 and track 76, using the diskette drive exerciser in SL mode. Verify that each seek requires less than 110 ms, that the positioner transducer output is 3V p-p minimum during seek and that the positioner transducer signal is balanced within ± 100 mv about ground. Observe at 0.5V per division on the oscilloscope.

Step sequentially from track to track with the Diskette exerciser, using step mode. Verify that the positioner settles with 0.5 divisions within 10 ms, and that there are no overshoots greater than 0.5 divisions. (Observe at 0.5V per division.)

Seek in crescendo mode, automatic, with the exerciser for at least two cycles to verify settling to each track from a high speed seek.

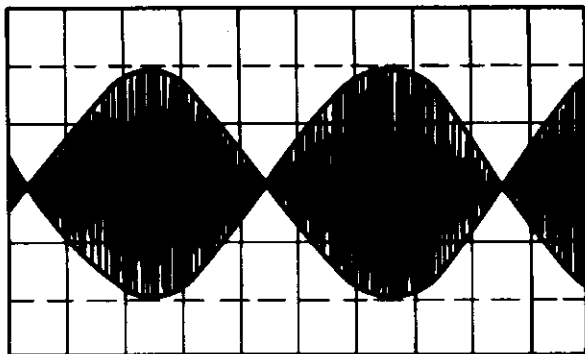
Positioner Track and Azimuth Alignment Check, Side 0

- a. Set Diskette power on.
- b. Load Dysan alignment diskette 360 into Side 0.
- c. Access track 38 and load head Side 0.
- d. Monitor read data.

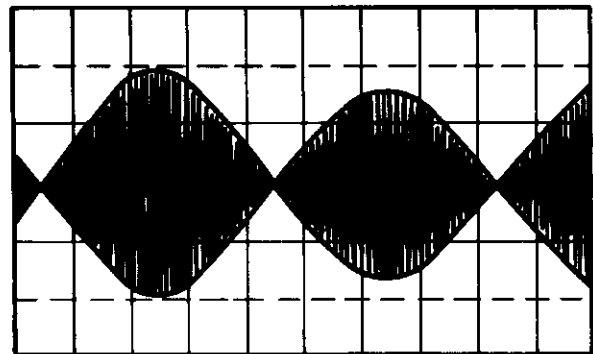
PROG:	TRACK ALIGNMENT SIDE 0
SYNC:	EXT INDEX PULSE NEG. (PIN 20)
CH 1:	50 mV/DIV A. C.
CH 2:	50 mV/DIV A. C. INVERTED
MODE:	ADD CH 1 & CH 2 20 mSEC/DIV

SCOPE PROBES CH 1 TO TP4 AND CH 2 TO TP5 ON DATA AND INTERFACE PCB. BOTH PROBE GROUNDS TO COMMON POINT SUCH AS TP1.

- e. If track alignment is perfect the amplitudes of the cat's eye pattern will be equal. A 20% amplitude difference represents a one mil position error. (Figure 2-7.) 1 mil is the maximum tolerable error.
- f. Access track 76 and load head Side 0 still using alignment diskette. Set up the scope as in "Index Transducer and Logic Checks" page 2-10.
- g. Observe time interval between sync and data burst. (Figure 2-3.)
- h. Access track 1 and observe any change in this time interval.



EVEN AMPLITUDE 100% ON TRACK



80% AMPLITUDE 1 MIL OFF TRACK

Figure 2-7. Track Alignment

- i. If positioner azimuth is correct the time interval should be the same within 20 μ sec.

Positioner Track and Azimuth Alignment Check, Side 1

- a. Before track alignment and azimuth on Side 1 can be checked it must be verified that track alignment and azimuth on Side 0 are correct, since adjustments on Side 0 interact with Side 1. Side 1 adjustments do not affect Side 0.
- b. Set Diskette power on.
- c. Insert Dysan alignment diskette 360 into Side 1.
- d. Access track 38 and load head Side 1.
- e. Monitor read data.

PROG:	TRACK ALIGNMENT SIDE 1
SYNC:	EXT INDEX PULSE NEG (PIN 8)
CH 1:	50 mV/DIV A. C.
CH 2:	50 mV/DIV A. C. INVERTED
MODE:	ADD CH 1 & CH 2 20 mSEC/DIV

SCOPE PROBES CH 1 TO TP7 AND CH 2 TO TP8 ON DATA AND INTERFACE PCB.

- f. If track alignment is perfect the amplitudes of the cats's eye pattern will be equal. A 20% amplitude difference represents a one mil position error. (Figure 2-7.) 1 mil is the maximum tolerable error.
- g. Access track 76 and load head Side 1 still using alignment diskette scope.

PROG:	AZIMUTH ALIGNMENT SIDE 1
SYNC:	INT CH 2 NEG
CH 1:	.5V/DIV A. C.
CH 2:	2V/DIV D. C.
MODE:	CH 1 50 μ SEC/DIV

- h. Observe time interval between sync and data burst. (Figure 2-3.)
- i. Access track 1 and observe any change in this time interval.
- j. If head azimuth is correct the time interval should be the same within 20 μ sec.

Positioner Servo Adjustment

If the positioner servo did not pass the check of the preceeding section, alignment might be required.

Preliminary Adjustments

The positioner servo adjustments are located on the lamp amplifier PCB. (Figure 2-8.)

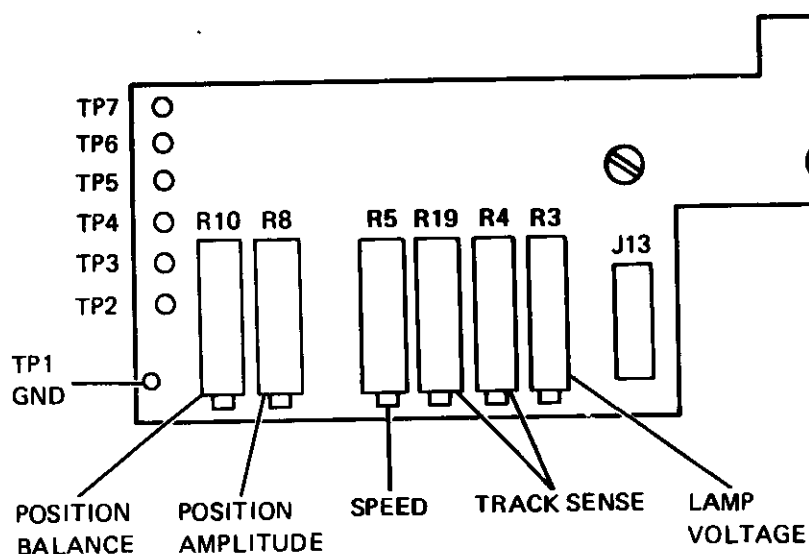


Figure 2-8. Lamp Amplifier PCB

Disconnect the voice coil motor by pulling P8 from J8 at the positioner servo PCB.
Make preliminary adjustments according to Table 2-2.

Table 2-2. Positioner Servo Adjustments

FUNCTION	CONTROL	TEST POINT	ADJUSTMENT
Lamp Voltage	R3	TP7	+1.50V $\pm$ 0.1V
Track Sense Balance	R19	TP6	+0.25 to +0.5 at track 20 (Move carriage by hand to approximate locations.)
Track Sense	R4	TP6	-1.2V to -1.3V at track 76 (Move carriage by hand to approximate locations.)
Speed	R5	TP5	Negative level, changing approximately 1.25V as positioner moved from inner to outer limit.
Position Amplitude	R8	TP2	Adjust for 3.0V p-p minimum amplitude balanced about ground as positioner moved back and forth by hand.
Position Balance	R10	TP2	
Oscilloscope Ground		TP1	(Oscilloscope should be floating to avoid ground loops.)

Final Adjustments

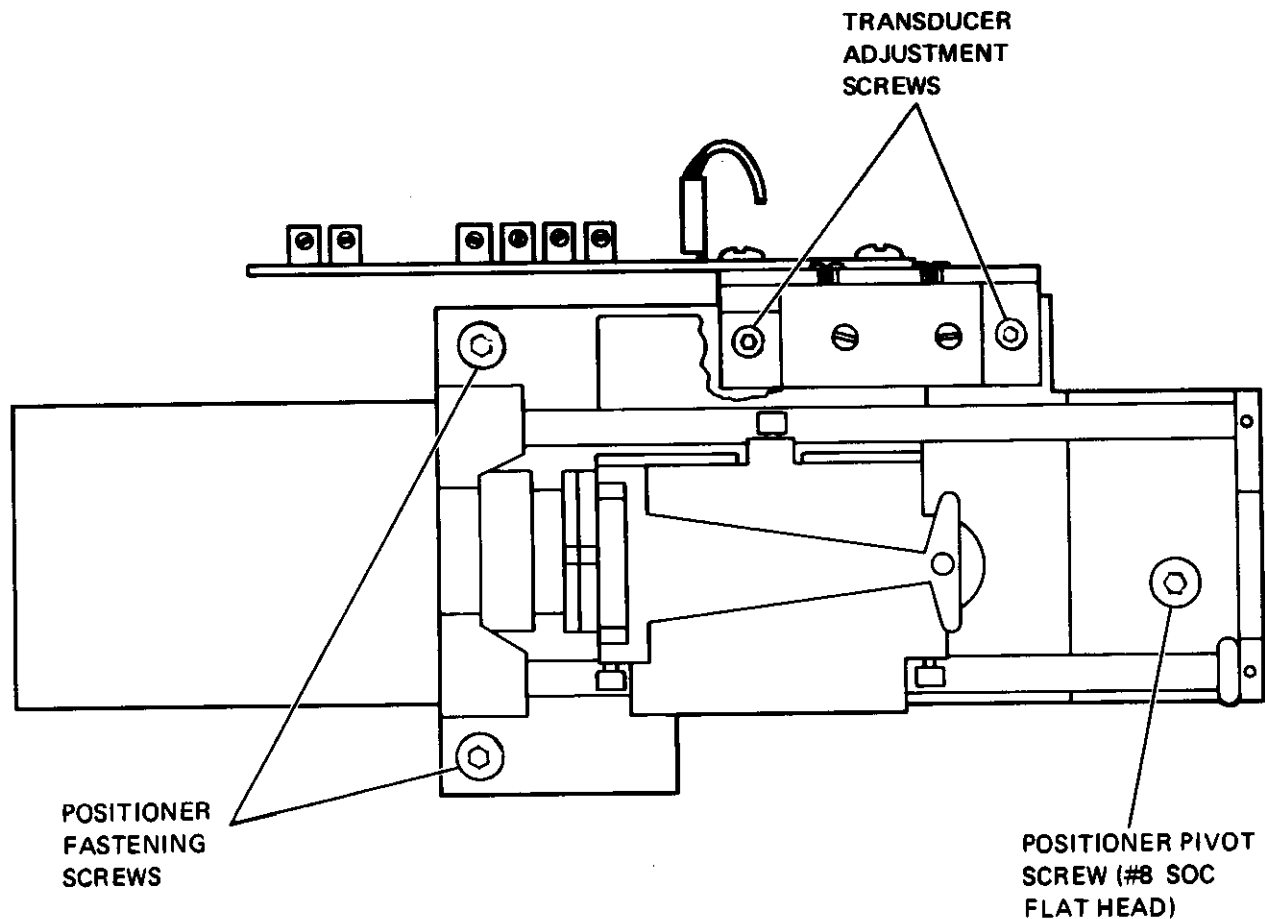
The adjustments of the preceeding sections should be sufficient for operation, but for attaining specified performance levels track sense and speed should be adjusted dynamically. Also forward and reverse speed is balanced by adjusting R33 on the positioner servo PCB.

Plug P8 from the voice coil motor into J8 on the positioner servo PCB. Restore the positioner with the exerciser.

Move the oscilloscope probe to the end of C1 nearest R33, and oscilloscope ground to the end of R77 of R78 furthest from the heatsink, on the positioner servo board. Alternately seek from track 60 to track 1. Synchronize the oscilloscope to the negative edge of the "seek complete" signal found at a test point on the positioner or at P1-10 on the data and interface PCB. Adjust R33 for test symmetry between forward and reverse seeks. Alternate seeks between track 00 and track 76, keeping oscilloscope functions as they were, except for time. Adjust R5 on the lamp amplifier PCB such that the time for the longer seek (forward or reverse) to settle within 0.25V of ground is 95 ms. This may be extended to 110 ms to eliminate overshoots if necessary. This completes the adjustment of the positioner servo.

Positioner Track and Azimuth Adjustment Side 0

- a. Set Diskette power off.
- b. Slacken two screws securing transducer assembly to positioner frame, just sufficiently to allow the assembly to slide within the range of the adjustment slots. (Figure 2-9.)
- c. Set Diskette power on.
- d. Insert Dysan alignment diskette into Side 0 and load head Side 0.
- e. Access track 38 and monitor read data per Paragraph d, Page 2-17.
- f. Gently tap the lamp amplifier PCB to effect a small displacement of this assembly and observe the change in amplitude of the cat's eye pattern.
- g. When the amplitudes are approximately equal proceed with azimuth alignment leaving the transducer housing screws "semi-tight".
- h. Still using alignment diskette, access track 76.
- i. Monitor read data on scope per Paragraph f of check procedure.
- j. Observe time interval between sync and data burst. (Figure 2-3.)
- k. Access track 1 and observe if there is any change in the time interval.
- l. If there is a difference in time greater than $\pm 20 \mu\text{sec}$, slacken two No. 10 slotted screws holding positioner frame to deck plate. (Figure 2-9.)
- m. Pivot assembly until the time interval is the same at track 1 as track 76 and tighten two screws.



- n. Repeat steps d, e, f, and g, and then tighten the two screws holding the transducer housing when the amplitude difference between the lobes is less than 5%. Check that alignment did not shift when the screws were tightened. (The 5% amplitude difference is after tightening.) Factors such as temperature, humidity, and tolerance on the alignment disks can move the alignment as much as 20% from this setting.

Positioner Track and Azimuth Adjustment Side 1

- a. Set Diskette power on.
- b. Insert Dysan alignment diskette 360 into Side 1.
- c. Access track 38 and load head Side 1.
- d. Monitor read data per Paragraph e, Page 2-18.
- e. Slacken screws A & B (Figure 2-10) holding head Side 1 carriage to support bracket.
- f. Slide carriage assembly radially while keeping the inside carriage surface against the bracket edge.
- g. Observe cat's eye pattern on scope and lightly tighten screws when pattern is approxiamtely equal. (Figure 2-7.)

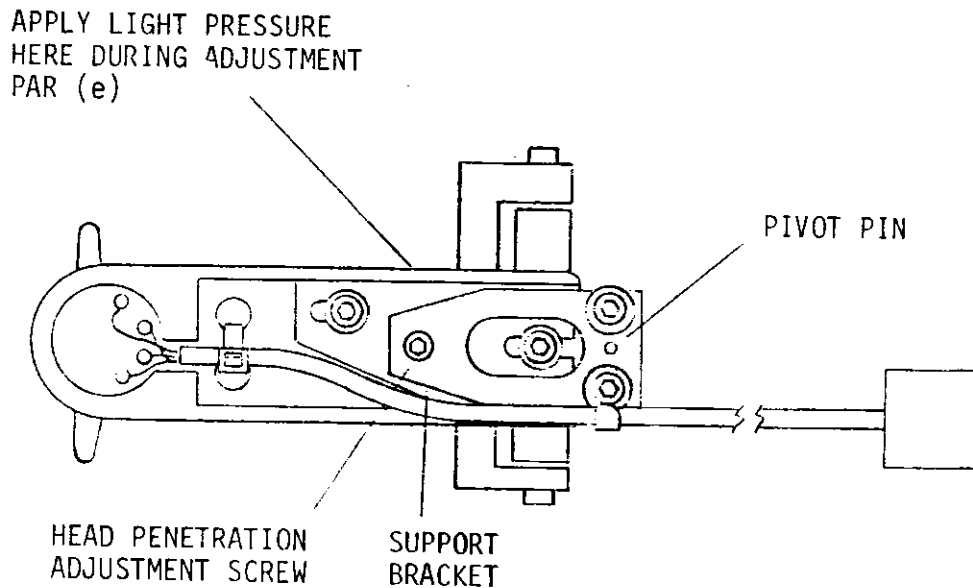


Figure 2-10. Positioner Track and Azimuth Adjustment (Side 1)

- h. Slacken screws C and D and pivot assembly about pivot point.
- i. Lightly tighten screws at point of maximum read back amplitude.
- j. Access track 1 still using Dysan alignment diskette. Monitor read data per Paragraph g of check procedure.
- k. Observe time interval between sync and data burst. (Figure 2-3.)
- l. Access track 76 and observe any change in the time interval.
- m. Pivot carriage assembly until the time interval with the head positioned at track 76 is approximately the same as with the head positioned at track 1.

NOTE

There is interaction and this process will have to be repeated several times before proper azimuth is achieved.

- n. When the time intervals are within 20 μ sec, tighten two screws C and D. (Figure 2-10.)
- o. Access track 38 and repeat track alignment procedure.
- p. Tighten screws A and B when amplitudes are equal within 5%.

CAUTION

Do not apply excessive torque to these screws.

Positioner Assembly Replacement

- a. Disconnect P15 and P16 at data and interface board.
- b. Disconnect P8 and P5 at positioner servo board.
- c. Remove three cable clamps securing leads to deck plate.
- d. Remove two No. 10 slotted screws and one No. 8 Allen flat head screw securing positioner assembly to deck plate and remove positioner assembly. (Figure 2-9.)
- e. Install replacement positioner assembly. Tighten flat head screw before tightening two No. 10 slotted screws. Make sure pressure pad lifter arm is above the carrier lifter surface on Side 0 before securing positioner assembly.
- f. Align positioner assembly per alignment procedure.

Eject Motor Cam Alignment Check

- a. Set Diskette power on.
- b. Manually depress the load micro switch.
- c. Observe the crank cam moves to a bottom dead center position relative to the carrier plane, i.e., maximum penetration of cone assembly into hub. (Figure 2-11B.)
- d. Depress eject button on bezel and observe the crank cam rotate to a point where the bearing follower is just clear of impacting the carrier plane, i.e., 0-.030". Once the carrier is open there must be no further contact between the bearing follower and carrier. (Figure 2-11A.)

Eject Motor Cam Adjustment Procedure

- a. Slacken No. 8 set screw holding cam to motor shaft such that the motor cam can just be rotated on the shaft.
- b. Observe the crank cam in its loaded and unloaded positions.
- c. If incorrect make small rotational adjustment of the motor cam until desired crank cam action is achieved.
- d. Tighten set screw.

Crank Cam Alignment Check

The crank cam angular alignment is determined by the motor cam alignment. To check for cam penetration proceed as follows:

- a. Set Diskette power on.
- b. Manually depress the load micro switch.

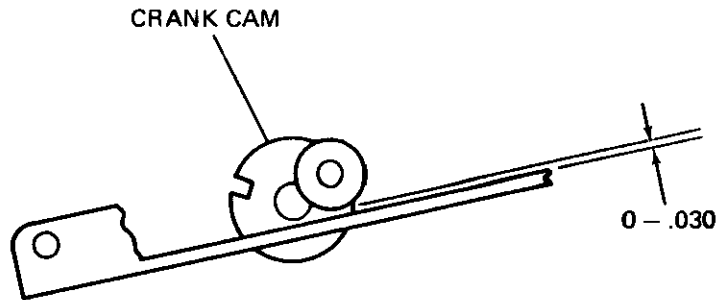


Figure 2-11A. Eject Motor Cam Alignment Check - Carrier Open

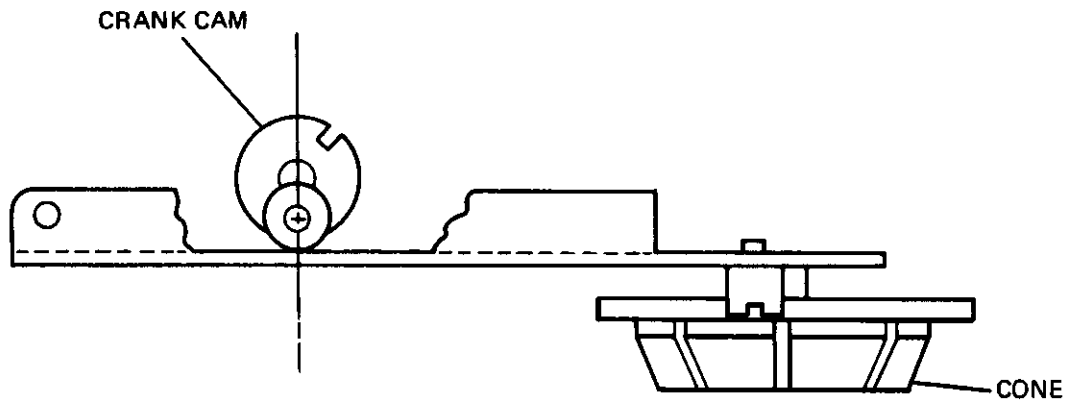


Figure 2-11B. Eject Motor Cam Alignment Check - Carrier Closed

- c. Observe the gap between the E ring which holds the cone assembly to the carrier and the corresponding carrier surface. (Figure 2-12.)
- d. With the carrier in the loaded position the gap should be $.05 \pm .02$.

Crank Cam Alignment Procedure

- a. Slacken two No. 8 slotted screws securing motor bracket to side plate.
- b. Set Diskette power on.
- c. Manually depress the load micro switch and observe gap described in Paragraph c of check procedure.
- d. If incorrect, slacken two No. 4 slotted screws holding motor shaft support to side plate.
- e. Displace arm, tighten screws and check alignment.
- f. Repeat until desired alignment is achieved.
- g. Tighten 2 motor bracket screws **after** aligning support arm.

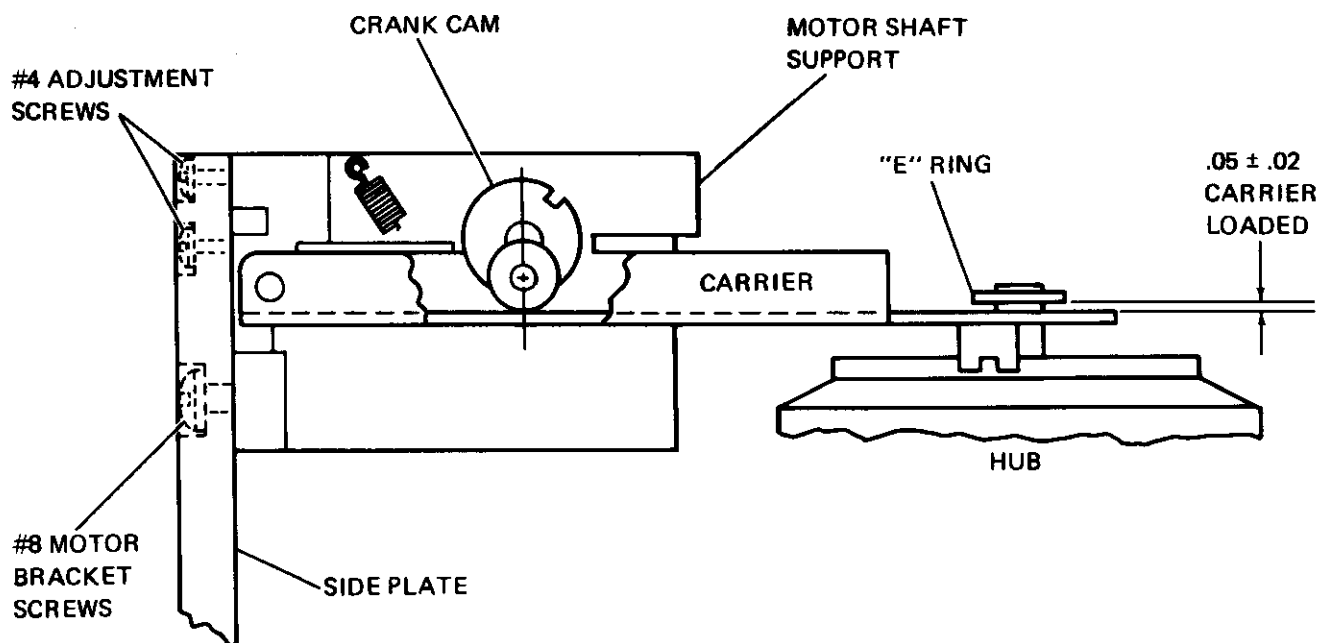


Figure 2-12. Crank Cam Alignment Check

- h. After aligning the crank cam check the space between the photosense assembly on the carrier and the LED assembly on the deck plate. With the carrier in the loaded position this should be $.09 \pm .01$. (Figure 2-4.) There is no adjustment for this. If the dimension is incorrect deform the carrier sheet metal between the cone and photosense assembly.

Head Pressure Arm Check

The pressure arm assembly is the same for Side 0 as Side 1. To check arm pressure proceed as follows:

- a. Load carrier and head solenoid.
- b. Using a cantilever type force gage measure the arm spring force at the head. (Figure 2-13.)
- c. The arm spring force reading will be different, depending on whether the force is measured while the arm is moving toward the head or away from the head.
- d. The correct force is 18 ± 4 gms measured when the arm is moving toward the head.

NOTE

28gms equals one ounce.

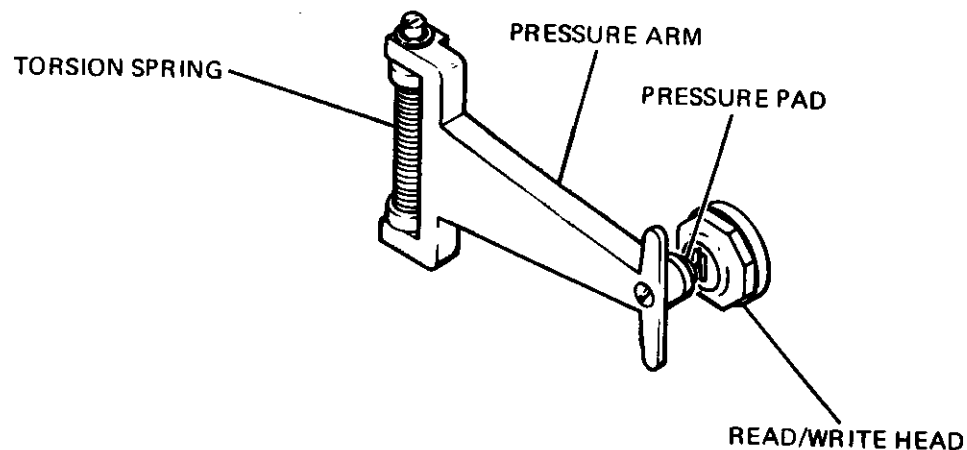


Figure 2-13. Head Pressure Arm Check

Head Pressure Pad Replacement

The pressure pad is fastened to a plastic insert which can be replaced without disturbing the head pressure arm adjustment.

- a. Remove pad insert assembly.
- b. Install replacement assembly.
- c. Write on scratch diskette and observe read data per Paragraph d, Page 2-17 or Paragraph e, Page 2-18, as appropriate.
- d. Rotate the pad insert to achieve maximum amplitude.
- e. Apply additional pressure to pressure arm by hand and observe any change in amplitude of read data.
- f. If the amplitude increases by more than 5% then the pressure pad is not properly located with respect to the read/write head. The arm spring force being too low is a less likely but possible problem.

Head Pressure Arm Retract Mechanism (Side 1) Check

During loading and unloading of a diskette the pressure arm must be in a retracted position so as not to interfere with the diskette during this operation. On Side 0 part of the carrier member is used to perform this function and no adjustments are required. On Side 1 an adjustment screw fastened to the carrier assembly bears against a mechanism which in turn activates the pressure arm. This screw must be properly positioned to provide proper functioning of the pressure arm retract mechanism.

To check for proper adjustment, proceed as follows:

- a. Set Diskette power on.
- b. Manually load carrier Side 1 by depressing load micro switch Side 1.
- c. Observe the position of the pressure arm retract mechanism by looking through the diskette aperture Side 1 in the front bezel.
- d. The mechanism as viewed in this manner should appear as shown in Figure 2-14.

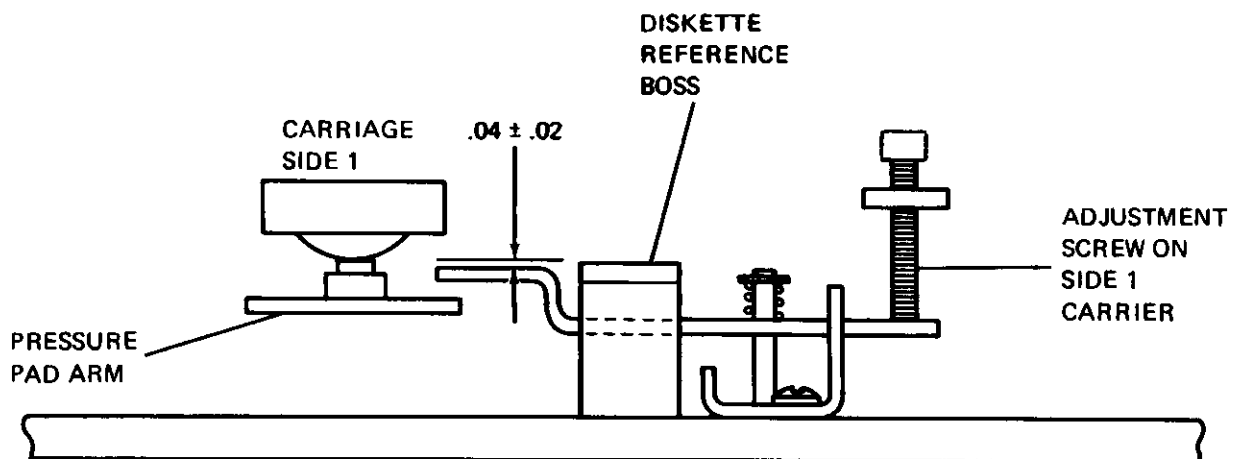


Figure 2-14. Head Pressure Arm Retract Mechanism
(Side 1) Check and Adjustment

Head Pressure Arm Retract Mechanism (Side 1) Adjustment

To adjust the retract mechanism, proceed as follows:

- a. Set Diskette power on.
- b. Manually load carrier (Side 1) by depressing load micro switch Side 1.
- c. Observe the position of the retract mechanism as viewed through the diskette aperture in the bezel. (Figure 2-14.)
- d. Adjust screw on carrier until the desired setting of the retract mechanism is achieved.

Read/Write Head Penetration (Side 1) Check

The penetration of the read/write head into the plane of the diskette media is adjustable on Side 1 only. To check for proper penetration, proceed as follows:

- a. Set Diskette power on.
- b. Load scratch diskette into Side 1.
- c. Access Track 76 and load head Side 1.
- d. Write alternate 1's and 0's pattern.
- e. Monitor read data.

PROG:	Read/Write Head Penetration (Side 1)
SYNC:	Int Ch 1
CH 1:	50mV/div A. C.
CH 2:	50mV/div A. C. inverted
MODE:	Add CH 1 and CH 2 50 usec/div

Scope probes CH 1 and CH 2 to TP6 and TP7 on data and interface PCB.
Tie probe grounds to a common point such as TP1.

- f. While monitoring read data deflect the carriage Side 1 to both increase and decrease penetration of the read/write head and observe the change in read amplitude. This can be done by pressing or pulling lightly on the carriage near the read/write head.
- g. If the amplitude of the read data increases significantly (i. e. , greater than 10%) by increasing or decreasing the head penetration then this is an indication of incorrect read/write head penetration.
- h. De-energize the head load solenoid Side 1.
- i. If the amplitude of the read data does not attenuate substantially (i. e. , greater than 50%) when the head pressure pad is disengaged then this is an indication of excessive head penetration which may cause excessive media wear.
- j. Access Track 0 and repeat steps d through i.

Read/Write Head Penetration (Side 1) Adjustment

To adjust the read/write head penetration on Side 1, proceed as follows:

- a. Set Diskette power on.
- b. Load scratch diskette into Side 1.
- c. Access Track 76 and load head Side 1.
- d. Write alternate 1's and 0's pattern.
- e. Monitor read data per Paragraph e, Page 2-18, of check procedure.
- f. While monitoring read data adjust head penetration via set screw (Figure 2-10). Adjust for maximum read data amplitude.
- g. Re-write and check for maximum amplitude.
- h. De-energize head load solenoid and observe attenuation in read amplitude. This should be at least 50%. If not, the indication is there is excessive read/write head penetration.
- i. Access Track 0 and repeat steps d through h.

DISKETTE DRIVE EXERCISER

Maintenance checks and adjustment procedures can be accomplished on-line using the controller of off-line using the Model 499 Diskette Drive Exerciser (see Figure 2-15).

Controls, Indicators, and Test Points

The exerciser controls, indicators, and test points are described in Table 2-3.

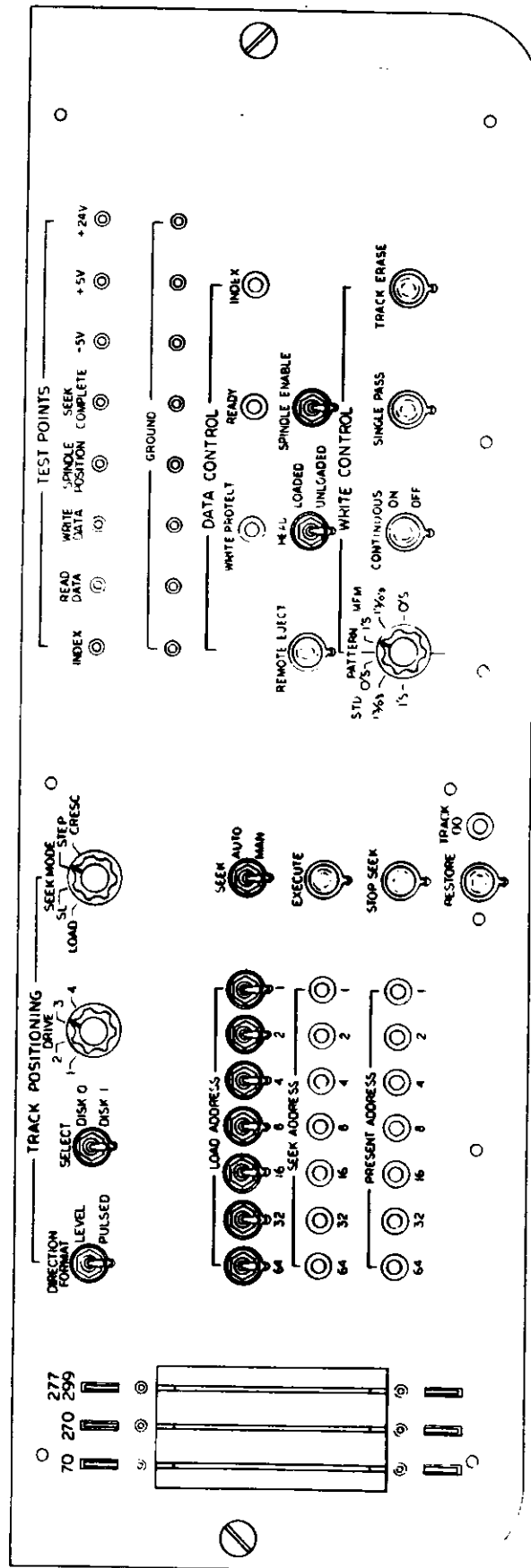


Figure 2-15. Control Panel, Diskette Exerciser, Model 499

Table 2-3. Exerciser Switch, Indicator and Test Point Functions

SWITCH, INDICATOR OR TEST POINT	FUNCTION
POWER SWITCH	Toggle Switch. UP for Power ON, DOWN for Power OFF.
EXECUTE SWITCH	Pushbutton Switch. Pressing this button causes the execution of any of four SEEK functions selected by Seek Mode Switch.
SEEK MODE SWITCH	Four Position Rotary Switch. <u>LOAD</u> position ENABLES Resetting the Seek Address Register according to "Load Switches". <u>SL</u> position programs seeks to alternate between the address in the "Seek Address Register" and any address on the "Load Switches". <u>STEP</u> position programs seeks to successively go to the next higher numbered track until Track 76 is reached, then seeks successively go to lower numbered tracks until Track 1 is reached, and then the process repeats. <u>CRESCENDO</u> programs seeks to alternate between Track 00 and successively higher numbered tracks until seeking Track 76, then alternate between Track 00 and successively lower numbered tracks until Track 01 is reached, and then repeat.
LOAD ADDRESS SWITCHES	Seven Toggle Switches. Each switch binary weighted, weights silk screened below the switch. Switches are used to program Seeks as described in the discussion of the "Seek Mode Switch". The UP position is true; DOWN is false.
RESTORE SWITCH	Pushbutton Switch. Pressing this switch clears the Address Registers in the Exerciser, and holds them Cleared until a Track 00 signal arrives from the Drive under test, or the "Stop Seek" switch is pressed.
STOP SEEK SWITCH	Pushbutton Switch. Pressing this Switch clears a Restore command or a Seek command from the Exerciser.
AUTO, MANUAL SWITCH	Toggle Switch, in DOWN (Manual) position an SL Step, or Crescendo Seek is performed each time Execute is pressed. In UP (Auto) position, pressing Execute starts the first Seek, 20ms after the completion of the first and each succeeding Seek a new Seek is initiated until the Switch is put back to Manual or Stop Seek is pressed.
SELECT SWITCH	Toggle Switch. UP Position selects Side 0 on Dual; DOWN position selects Side 1.

Table 2-3. Exerciser Switch, Indicator and Test Point Functions (Continued)

SWITCH, INDICATOR OR TEST POINT	FUNCTION
EJECT SWITCH	Pushbutton. Pressing this switch ejects Diskette from side selected by Select Switch, if Remote Eject option is installed in drive.
PATTERN SELECT SWITCH	Three Position Rotary Switch. Selects which of six unformatted patterns can be written on the diskette. The patterns are all 0's, FM, alternating bytes of 1's and 0's, FM, and all 1's, FM, all 0's, MFM all 1's, MFM, and groups of 3 1's, MFM.
CONTINUOUS WRITE SWITCH	Pushbutton, holds Write Gate ON continuously while pressed, data as selected by Pattern Select Switch is transferred. Destroys format on diskette.
SINGLE PASS WRITE SWITCH	Pushbutton. Causes Write Gate to come on from the trailing edge of one index to the trailing edge of the next Index. Data as selected by the Pattern Select Switch is transferred. Destroys format on diskette.
TRACK ERASE SWITCH	Pushbutton. Causes drive to hold Write current of one polarity for one revolution, thereby erasing data and format from diskette.
HEAD LOAD SWITCH	Toggle Switch. Putting this switch UP gives a Head Load Command. (Some diskette drives have Head Load combined with Select; this switch is non-functional under this condition.)
SEEK ADDRESS INDICATORS	Seven LED's binary weighted, to indicate the address loaded into the Seek Address Register. Binary weight just below each LED.
PRESENT ADDRESS INDICATORS	Seven LED's, binary weighted, to indicate the address the drive is on, or is in the process of seeking.
TRACK 00 INDICATOR	An LED used to indicate when the drive is on Track 00.
HEAD LOADED INDICATOR	An LED which indicates that a Head Load Command is present.
GROUND TEST POINT	Eight Test Points are provided for Oscilloscope Ground.
+24V TEST POINT	+24 Volts is available at this Test Point for monitoring.
+5V TEST POINT	+5 Volts is available at this Test Point for monitoring.
-5V TEST POINT	-5 Volts is available at this Test Point for monitoring.

Table 2-3. Exerciser Switch, Indicator and Test Point Functions (Continued)

SWITCH, INDICATOR OR TEST POINT	FUNCTION
SEEK COMPLETE TEST POINT	Monitors Seek Complete signal returned from drive.
WRITE DATA TEST POINT	Monitors Write Data sent to drive.
READ DATA TEST POINT	Monitors unseparated Read Data from drive.
INDEX TEST POINT	Monitors Index Pulses from drive.
DIRECTION FORMAT	Toggle switch. This switch should be up (level) for Model 70, 270, 277, and 299 diskette drives.
DRIVE	Rotary switch. This switch selects the drive or side corresponding to the number of the switch position for Model 70,277, or 299 drives.

PERSci, INC.

12210 Nebraska Avenue
West Los Angeles
California 90025

May 1978