Installation and Maintenance Manual
Diskette Drive
Model 70 Series

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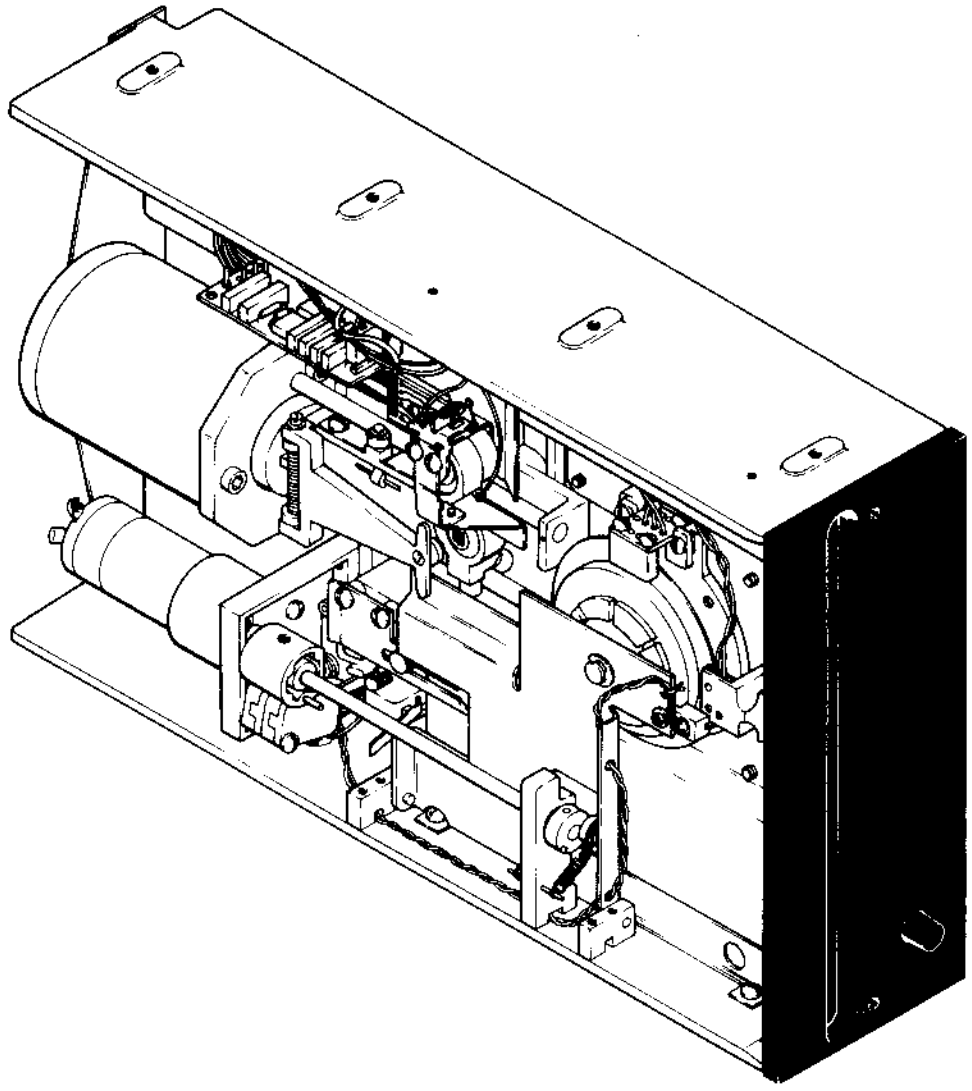

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SECTION 1

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 rubber band holding carriage assembly to magnet assembly.
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 esure adequate protection for shipping and handling (See Figure 1-1).

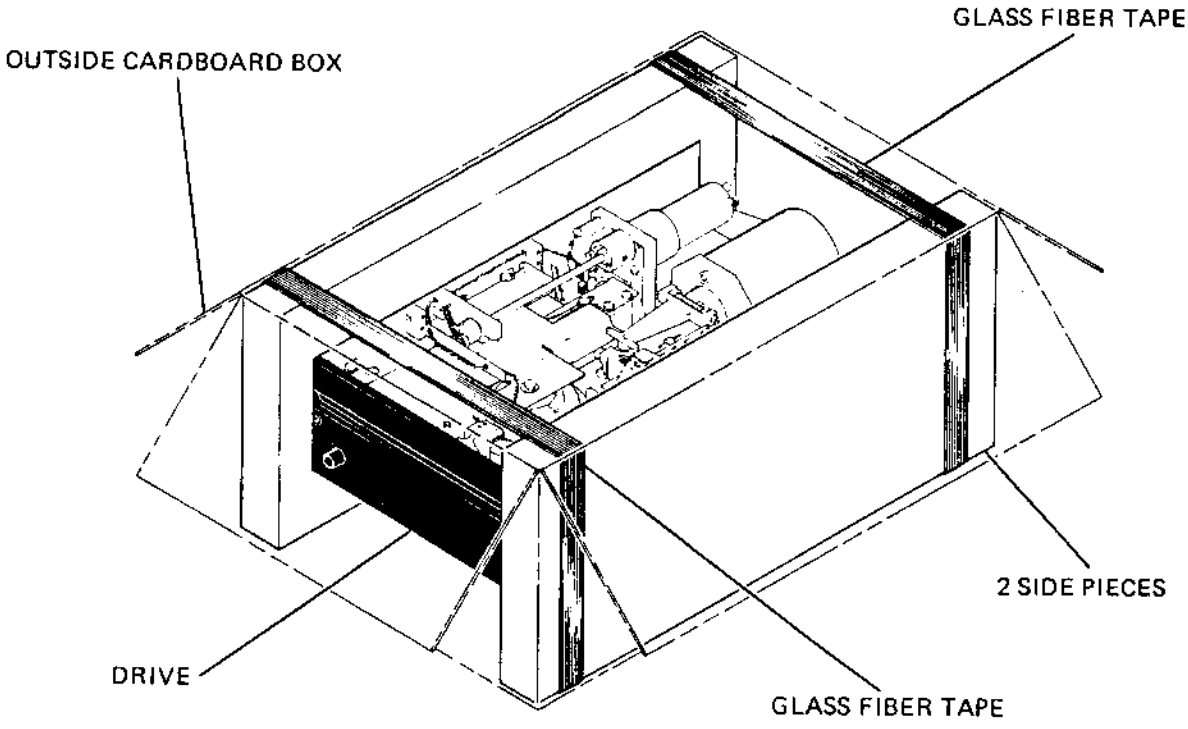


Figure 1-1. Diskette Drive Shipping Configuration

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. Remove rubber band from voice coil.

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 apeture 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 ±5%	*2.0 Amps nominal running 2.5 Amps maximum running
Spindle Motor Power: +5V DC ±5% or +5V DC Unregulated (Limits: 4.7-10.0V)	*1.0 Amps nominal running 1.4 Amps maximum running
-5V DC ±10%	0.15 Amps nominal 0.25 Amps maximum
+24V DC ±10%	0.5 Amp nominal when seeking 0.2 Amp nominal when not seeking 0.6 Amp maximum seeking with 1.5 Amp maximum peak surges for up to 10 milliseconds at start of seek

*The regulated +5 current is reduced by the amount of current on the unregulated +5 when this option is used.

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 (or +5V DC) 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.

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 70 Series

P1 - SIGNAL CONNECTOR

(50 Pin PCB Edge Connector-0.1" Centers)

Pin Numbers		
Gnd	Signal	
1	2	Spindle Motor Enable
3	4	Spare
5	6	Spare
7	8	Spare
9	10	Seek Complete (Option)
11	12	Restore (Option)
13	14	Remote Eject (Option)
15	16	Spindle Position Pulses (Option)
17	18	Head Load (Option)
19	20	Index
21	22	Ready
23	24	Sector (Option)
25	26	Drive Select 1
27	28	Drive Select 2
29	30	Drive Select 3
31	32	Drive Select 4
33	34	Direction Select
35	36	Step
37	38	Write Data
39	40	Write Gate
41	42	Track 00
43	44	Write Protect (Option)
45	46	Read Data
47	48	Separated Data
49	50	Separated Clock

Mating Connectors

Flat Cable
Scotchflex 3415-0000
Polarizing Key 3439
or
T&B Ansley 609-5005
Polarizing Key 609-0005

Solder Connector
Viking Connector 3VH25/1JN-5
Polarizing Key 091-0071-000
or
TI Connector H312125
Polarizing Key R014100

P3 - POWER CONNECTOR

(10 Pin Molex-0.156" Centers)

Pin No.	Signal
1	Chassis Gnd
2	+5V DC
3	+5V Unreg.
4	Key
5	+24V DC
6	Gnd
7	Gnd
8	Gnd
9	Gnd
10	-5V DC

Mating Connector

Connect-Molex 09-50-7101

Terminal- 08-50-0106

Polarizing Key-15-04-0219

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.

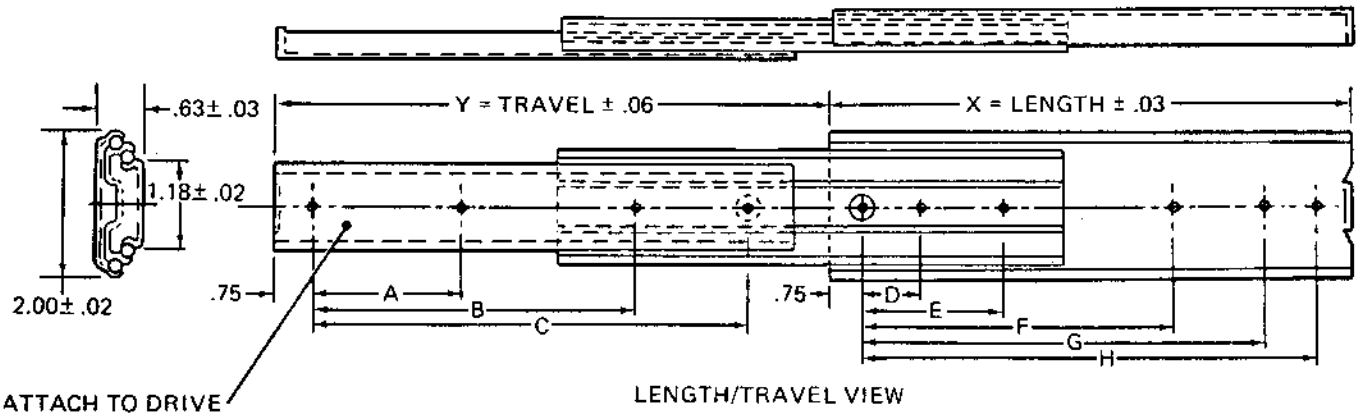
INSTALL DISKETTE DRIVE

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

- Vertical - 5 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



X	Y	A	B	C	D	E	F	G	H
14	15	4.00	8.00	12.00	1.00	3.50	8.50	11.50	12.50

STANDARD MOUNTING
HOLE SIZE .177 DIA.

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 five 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 system enclosure are not necessary for the Diskette drive. However, ventilation of the system enclosure

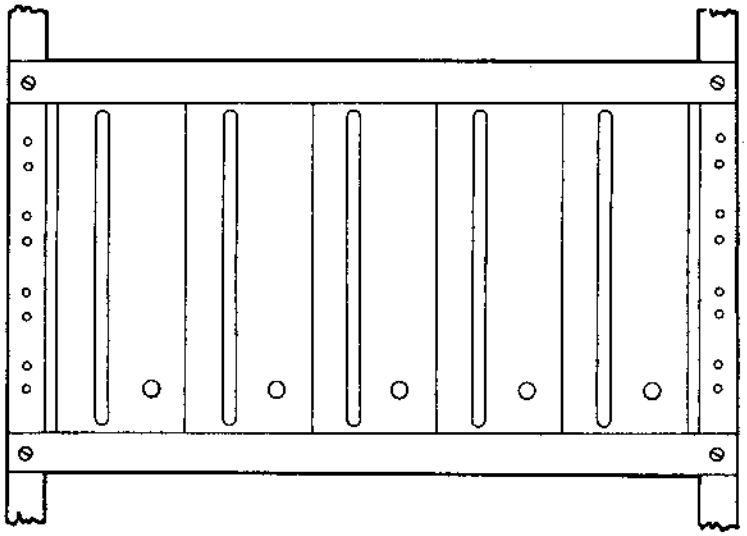


Figure 1-3. Vertical Retma Rack Mounting

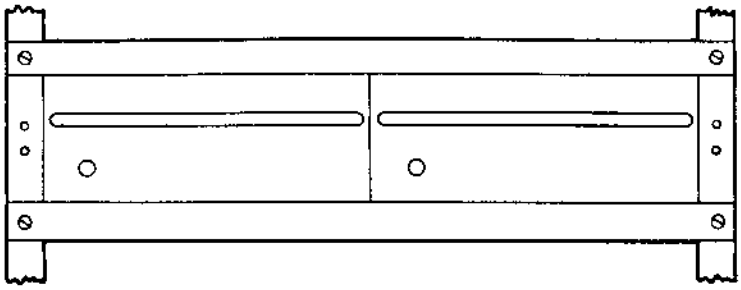


Figure 1-4. Horizontal Retma Rack Mounting

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 electrical compensation is made for the mass of the carriage assemblies. This is done by installing Jumper P to R.

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.

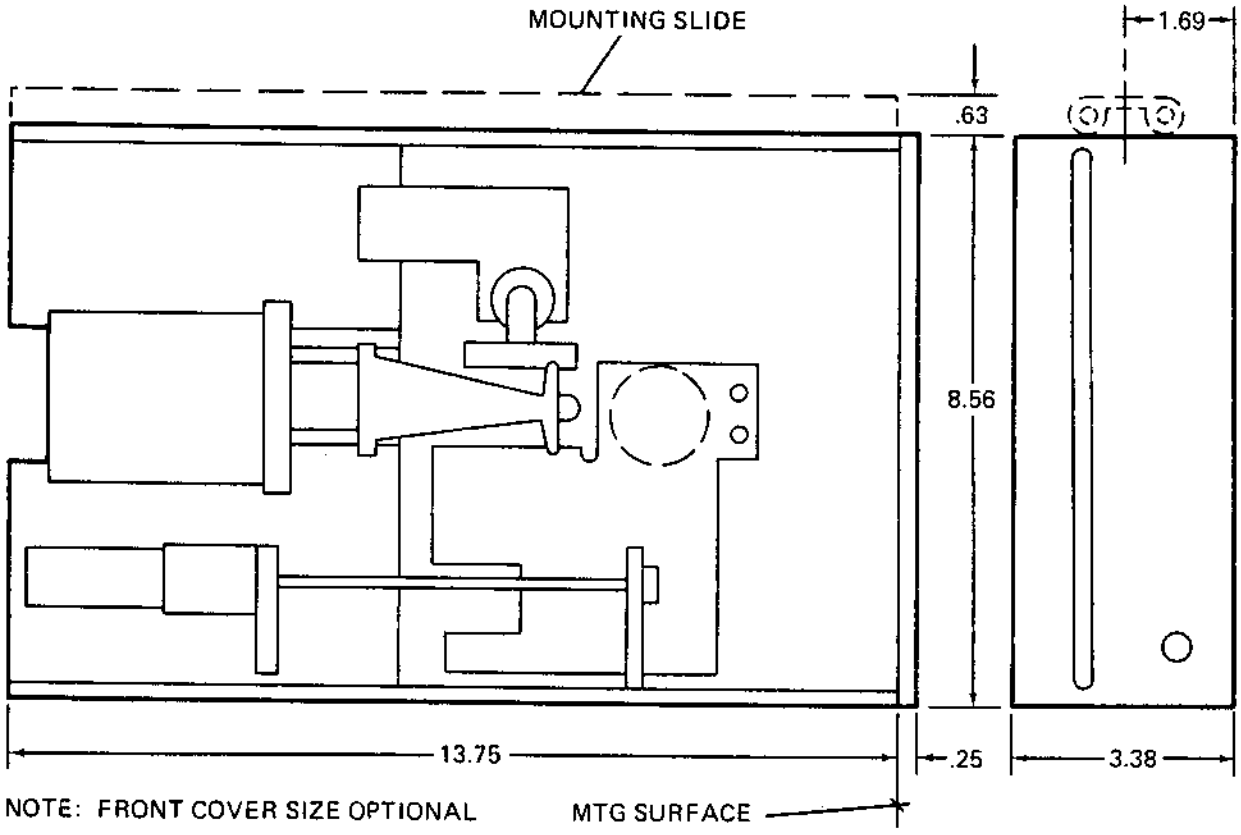


Figure 1-5. Outline Dimensions

Procedure for loading/unloading the Diskette is as follows:

a. Insert the diskette into 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.

b. To remove the diskette, press the pushbutton located on the front bezel. 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 P to R must be installed.

Chassis Ground

Jumper C to D provides a convenient means of tying the chassis to ground at the drive. If this jumper is not used, the chassis must be grounded via Pin 1 of the power connector J3.

Write Protect

Optional write protect is 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.

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 mannor. 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.

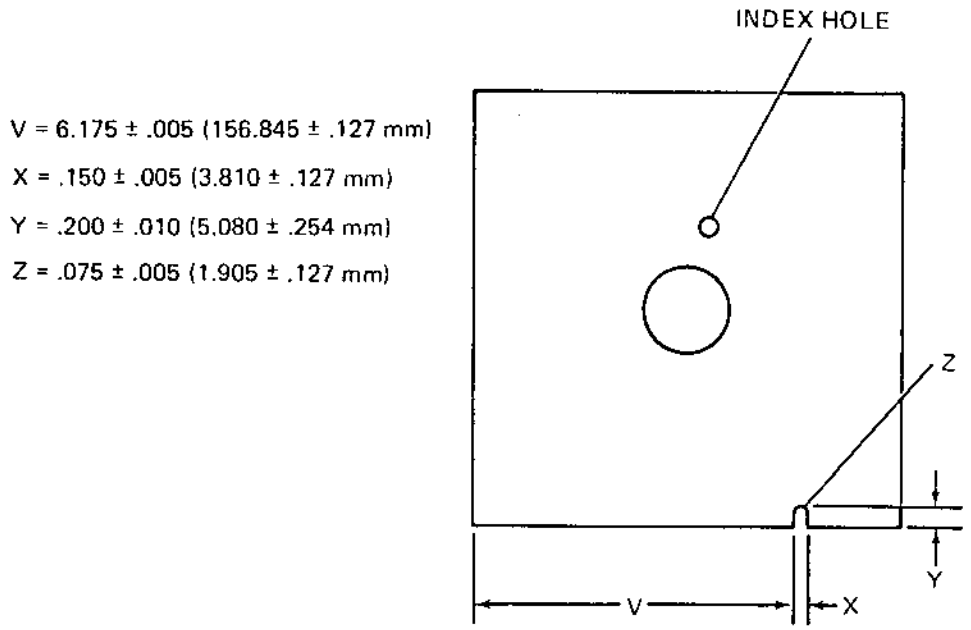


Figure 1-6. Write Protect Notch Location

Data Separator - Single Density

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 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 sectored" 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 sectored" formats, and also work with hard sectored formats. Three bytes of Os are required to synchronize the data separator.

Double Density Data Separator

This option provides a data separator capable of decoding MFM or M^2FM codes at a 500 KHz data rate. Jumper A to C on the double desnity data separator selects MFM, alternately, Jumper B to C selects M^2FM.

Data Acquisition Sync

In conjunction with the double density data separator, jumpering AA to AB allows a sync pulse from the controller on Pin 14 to put the double density data separator to acquisition mode for 140 μseconds. Alternatively, AA to AC puts the double density data separator into acquisition mode for 140 μseconds on the leading edge of each sector pulse.

Data acquisition sync is useful in double density formats when data fields are not preceded by sector pulses, or if sector separation is in the controller instead of the drive.

Use of Pin 14 for data acquisition sync precludes the use of Pin 14 for remote eject.

Remote Eject

A remote Diskette eject option is available, allowing the controller to eject the diskette at the end of a job. When this option is installed, a low logic level on Pin 14 will eject the diskette. This line must be held low for 1 second to insure proper activation of this function. Use of Pin 14 for this option precludes its use for Data Aquisition Sync. Therefore AA to AB must not be installed.

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 500 Khz. A seek complete indication is given by a logic low on P1 Pin 10 when the drive has settled within 0.001" of track center. In the event of a missed seek, a logic low for 500 N-seconds or greater will cause the drive to find Track 00. Track 00 is automatically sought 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 70, while simultaneously employing its conventional interface.

Parallel Operation

Four 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, U4 removed for this application. The terminator pack must be installed in the drive furthest electrically from the controller. A select jumper module must be installed in U5, the jumpers on this module program whether the drive is Diskette Drive 1, selected by a low logic signal on P1 Pin 26; Diskette drive 2, selected by a low logic signal on P1 Pin 28; Diskette drive 3 selected by a low logic signal on P1 Pin 30 or Diskette drive 4 selected by a low logic signal on P1 Pin 32. A jumper from Pin 3 to Pin 12 on the select module programs selection of Drive 1; 4 to 11 Drive 2; 5 to 10 Drive 3 and 6 to 9 Drive 4, 8 is jumpered to 7 for all combinations. Removing the select module permanently selects the drive.

A drive being de-selected causes all outputs to go to the high logic state, and inhibits all inputs except spindle motor enable. (See Figure 1-8 for parallel wiring.)

Sector Separation and Countdown

A sector separation and countdown option is available. separating the sector and index pulses derived from a 33-hole, OEM type hard sector diskette. Countdown is provided to program the sector output into 32, 16, 8, 4, or 2 pulses per revolution. A 1 sector format is available by using index as sector. Installing jumper 2, 4, 6, 8, 16, or 32 selects the equivalent number of pulses per revolution. Installing jumper 1 makes the sector output, Pin 24, remain at a logic high. Jumper N to M must be installed to separate the index pulse from the sector pulses.

If unseparated sectors are desired, or if 3740 type soft sectored format is to be used, jumper N to M must not be installed, jumper N to L must be installed instead. Drives built for these uses don't have separation and countdown circuits installed. Separated sector timing is shown in Figure 1-9.

Pulse Direction Transfer

This option allows direction information to be transferred by a 0.1 μsecond to a 5 msecond negative pulse on the direction line, Pin 34. A negative pulse on Pin 34 selects inward (higher track number) and the absence of a pulse selects outward (lower track number). Jumper U to T must be installed for this option.

If Jumper S to T is installed, a negative logic level at Pin 34 selects inward and a positive logic level outward.

PLO Clock

This option allows a clock phase-locked to read data to be substituted for read data at Pin 46. This is used in conjunction with first data separator option in some controllers. Timing is shown in Figure 1-10.

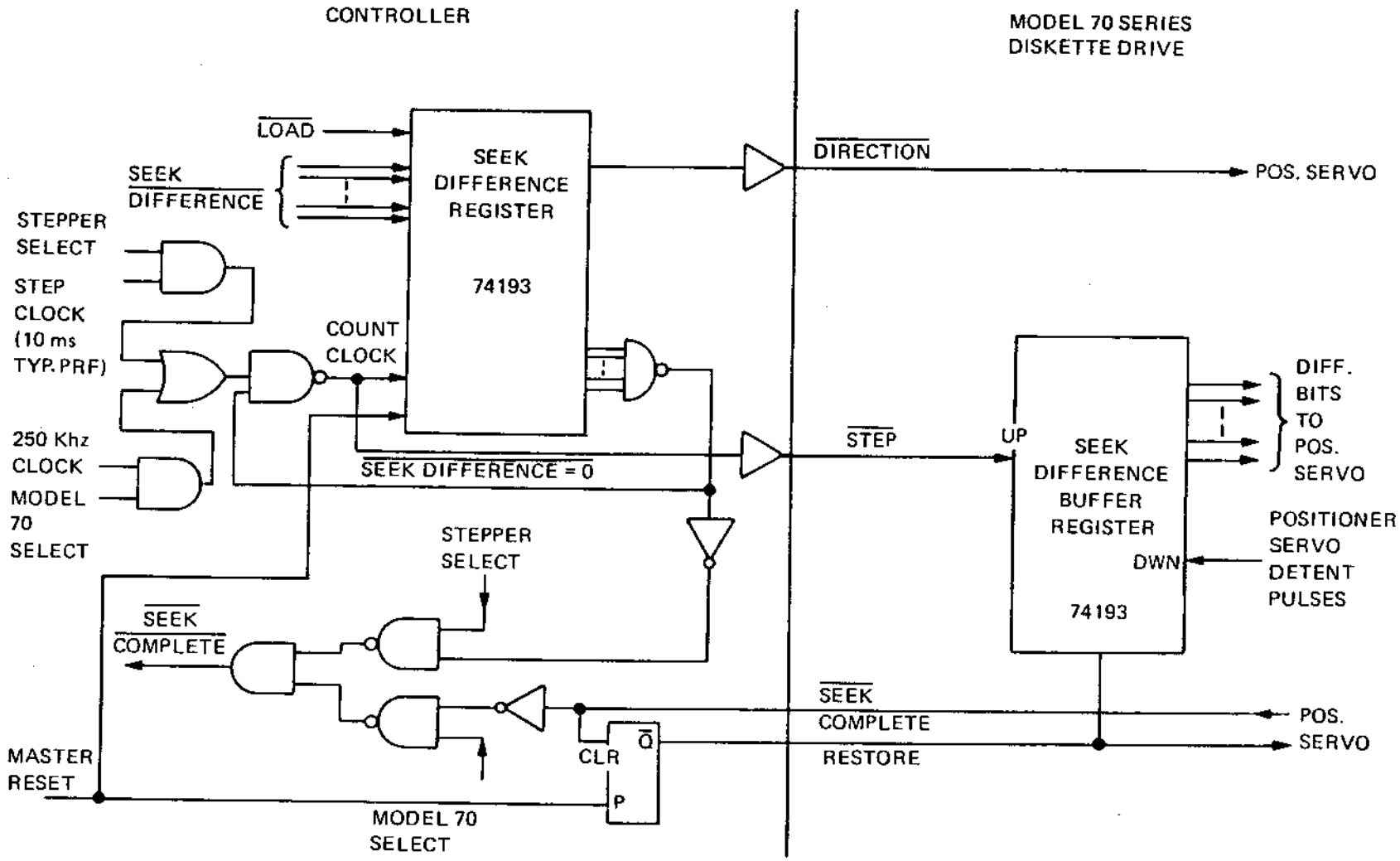


Figure 1-7. Simplified Controller Design Configuration with Fast Multi-Track Seek and Restore Option

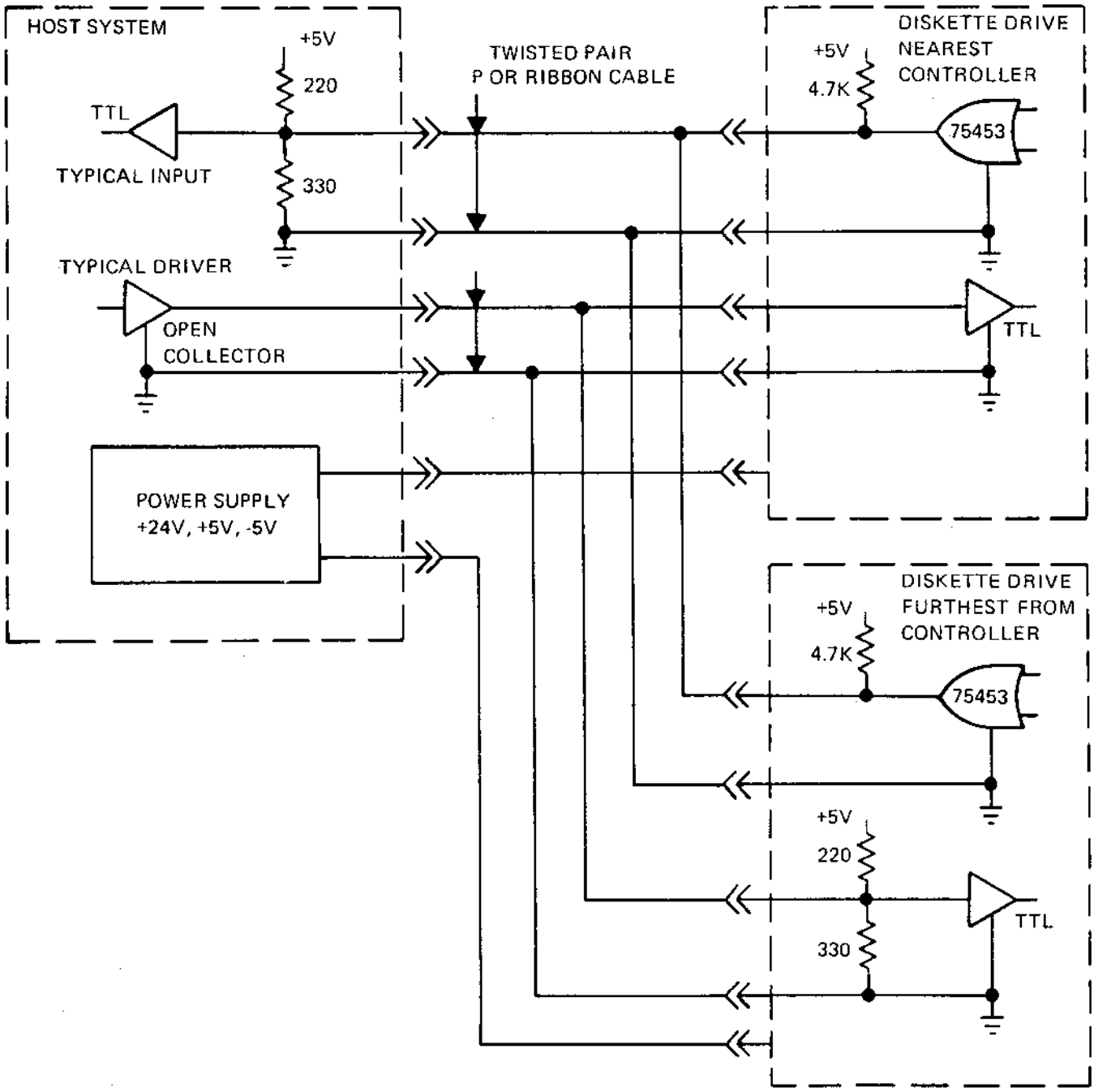


Figure 1-8. Parallel (Daisy-Chain) Drive Connection Wiring Diagram

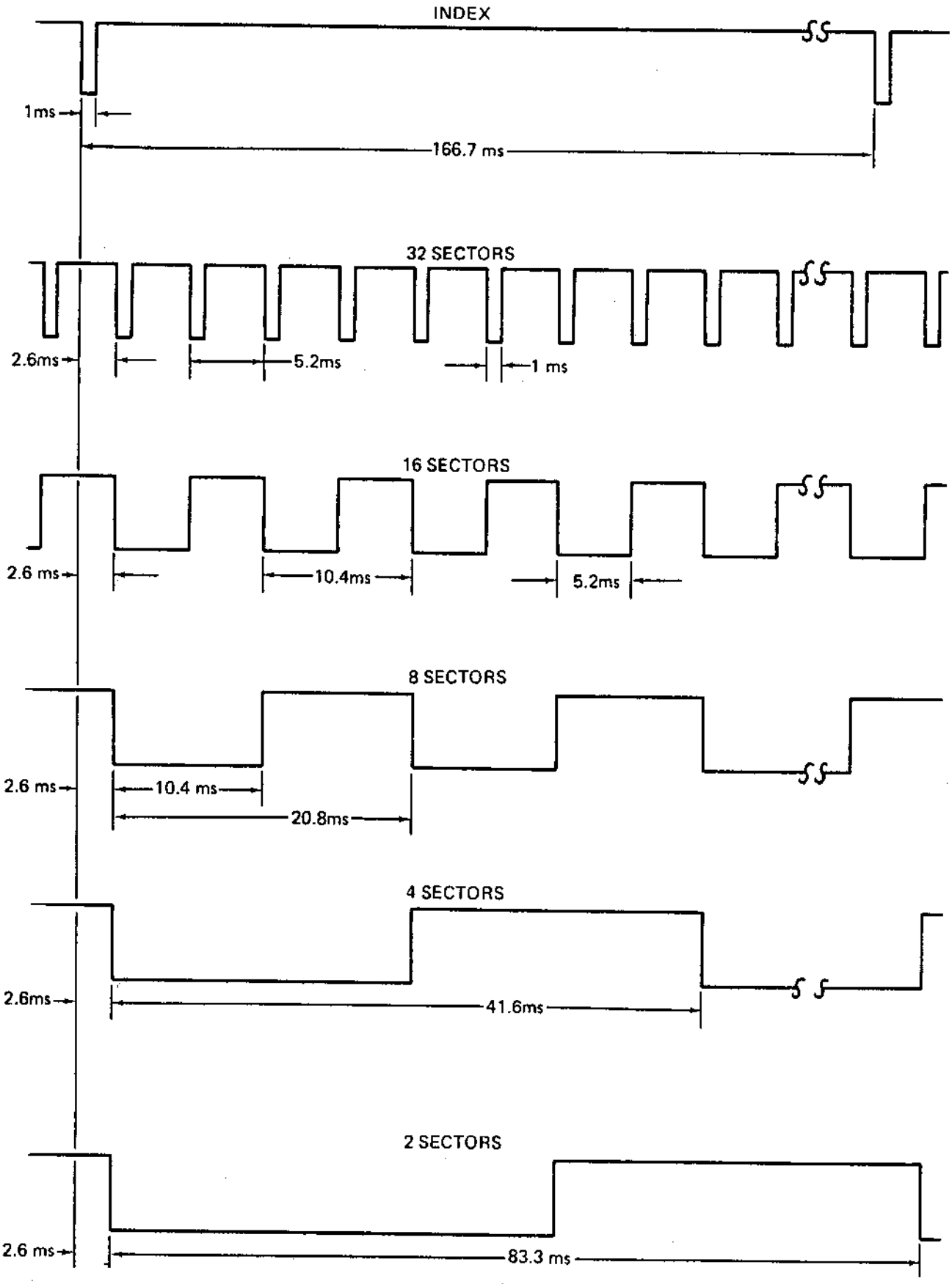


Figure 1-9. Timing Diagram for Sector Separation and Countdown

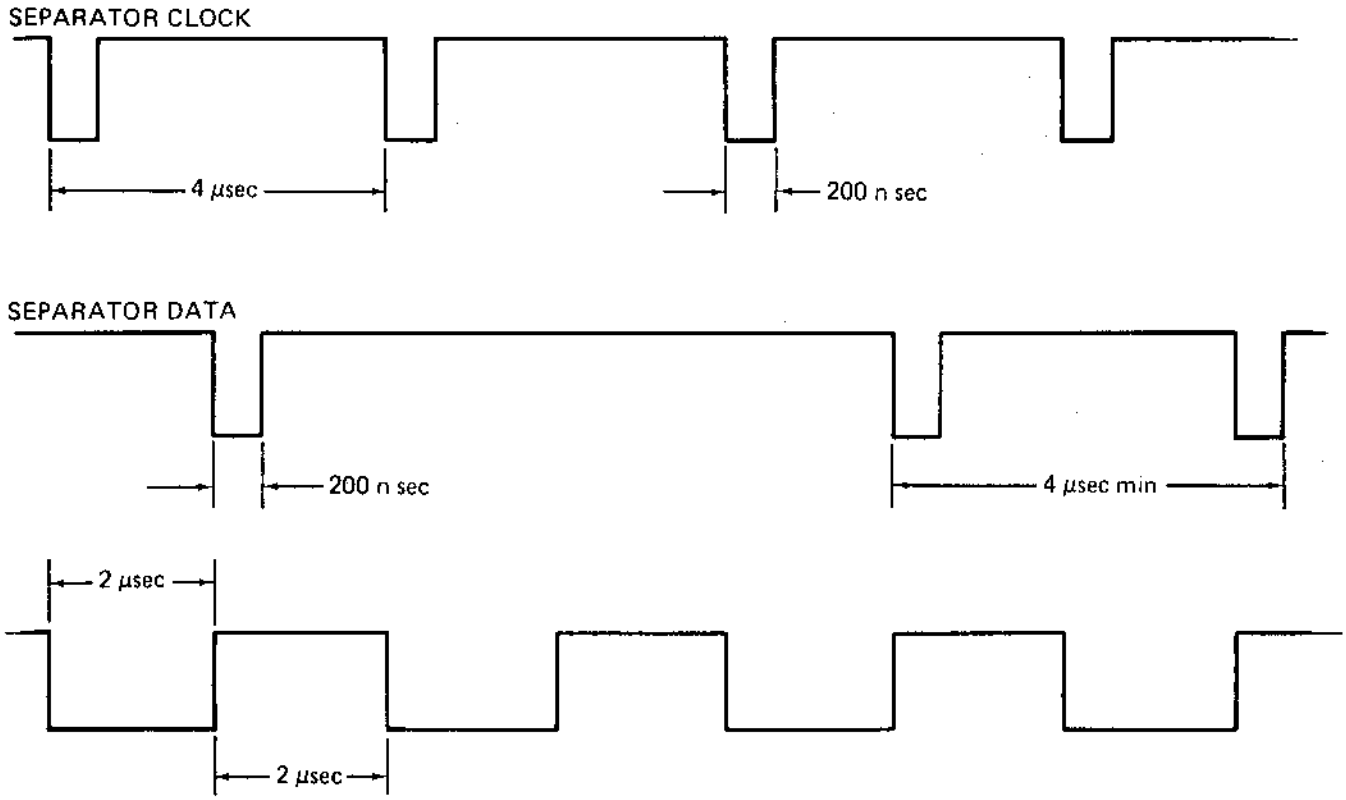


Figure 1-10. Timing Diagram for PLO Clock

Head Load

This option allows control of loading the head from the controller. If Jumper E to G is connected, a negative logic level on Pin 18 will cause the head to load, a positive level will cause the head to unload. This signal is active only when the drive is selected. If Jumper E to G is removed, and G to F is installed, Pin 18 is a terminated spare and the head is loaded whenever the drive is selected.

Spindle Motor Enable

Turn off of the spindle motor via the controller may be accomplished by connecting Jumper H to K. If this jumper is installed, the spindle motor is turned on by a low logic level at Pin 2, if a diskette has been inserted. The spindle motor is turned off by a high logic level at Pin 2, or by a diskette not being inserted. This option is independent of the select line.

If Jumper H to K is not installed, but J to K is installed, turn on and off of the spindle motor is controlled by insertion and removal of a diskette only.

-15V, -12V Operation

This option allows operation of the drive on -15V or -12V instead of -5V. Jumper Y to Z is removed and regulator components are installed for this option. Jumper Y to Z is connected for -5V operation. The drive can operate on -5V with Jumper Y to Z connected even with regulator components present.

Erase Turn Off Delay

Installation of C-32 delays the turn off of erase gate 500 µseconds. If this capacitor is not installed, erase gate turns off effectively coincident with the turn off of write gate. Erase gate turn on is always delayed 200 µseconds.

Automatic Restore

Connecting Jumper AD to AE activates logic to make the positioner seek Track 00 whenever a diskette is removed. Removing this jumper deletes this function.

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.

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. If extremely dirty, clean with acetone and remove all residue with dry lint-free cloth.

c. Clean positioner guide rails with dry, lint-free cloth.

d. Clean read/write head using 90% isopropyl 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

Rotate drive hub and check for uniformity of torque (due to brushes). A non-uniform rotational torque may be due to worn bearings or motor armature interference.

Read/Write System Checks

a. Diskette operation, in read mode on prerecorded data track. Alternately trigger solenoid load and unload. Sync on solenoid trigger and observe data output differentially across read head output. Interpret settling time when data track output width has approximately normalized (10% 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 ± .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 ± .005 inches. This dimension is not adjustable.

Read/Write Visual Examination

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.

a. If dirty, clean with 90% isopropyl alcohol and a lint-free wipe.

b. 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 diskette (approved brand), write all one's pattern at track 00 and 76. Observe read data output differentially across read preamp output.

c. All one's at track 76 must be at least 200 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.

   4. Defective read preamp or differentiator circuit.

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)
- 90% Isoprophy alcohol
- 6-inch steel scale, 1/10ths
- 0-1 oz. or 0-30 gm. 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.

Diskette Drive PCB

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

PCB Replacement

a. Disconnect all the connectors both sides of the PCB.

b. Remove four screws holding the board to the Diskette frame.

c. Install replacement PCB by reverse procedure.

NOTE

Do not remove mylar insulator behind PCB.

Voltage Adjustment

No adjustments are provided for voltage levels. If +24Vdc, +5Vdc or -5Vdc are 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 Diskette drive PCB. If necessary, replace the PCB.

Table 2-1. Jacks and Plugs

PCB	CONNECTOR	FUNCTION
Data and Interface PCB	P1	Customer signal interface
	P3	Power
	J12	Data separator interface
	J9	Index - sector phototransistor
	J10	Index - sector LED power
	J4	Head load mechanism
	J1	Read/Write head
	J11	Eject assembly
	J8	Drive to voice coil motor
	J5	Interface to lamp amplifier PCB
	J2	Interface with write protect assembly
	J7	Drive to spindle motor
	J6	Interface with photosense module
Lamp Amplifier PCB	P5	Interface with positioner servo PCB
	J13	Interface with optical transducer
Data Separator PCB	P12	Interface with data and interface PCB

Drive Motor Check

a. Set Diskette power off.

b. Manually rotate drive motor. If binding is evident, replace motor.

NOTE

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

Drive Motor Replacement

To replace drive motor, proceed as follows:

a. Set Diskette power off.

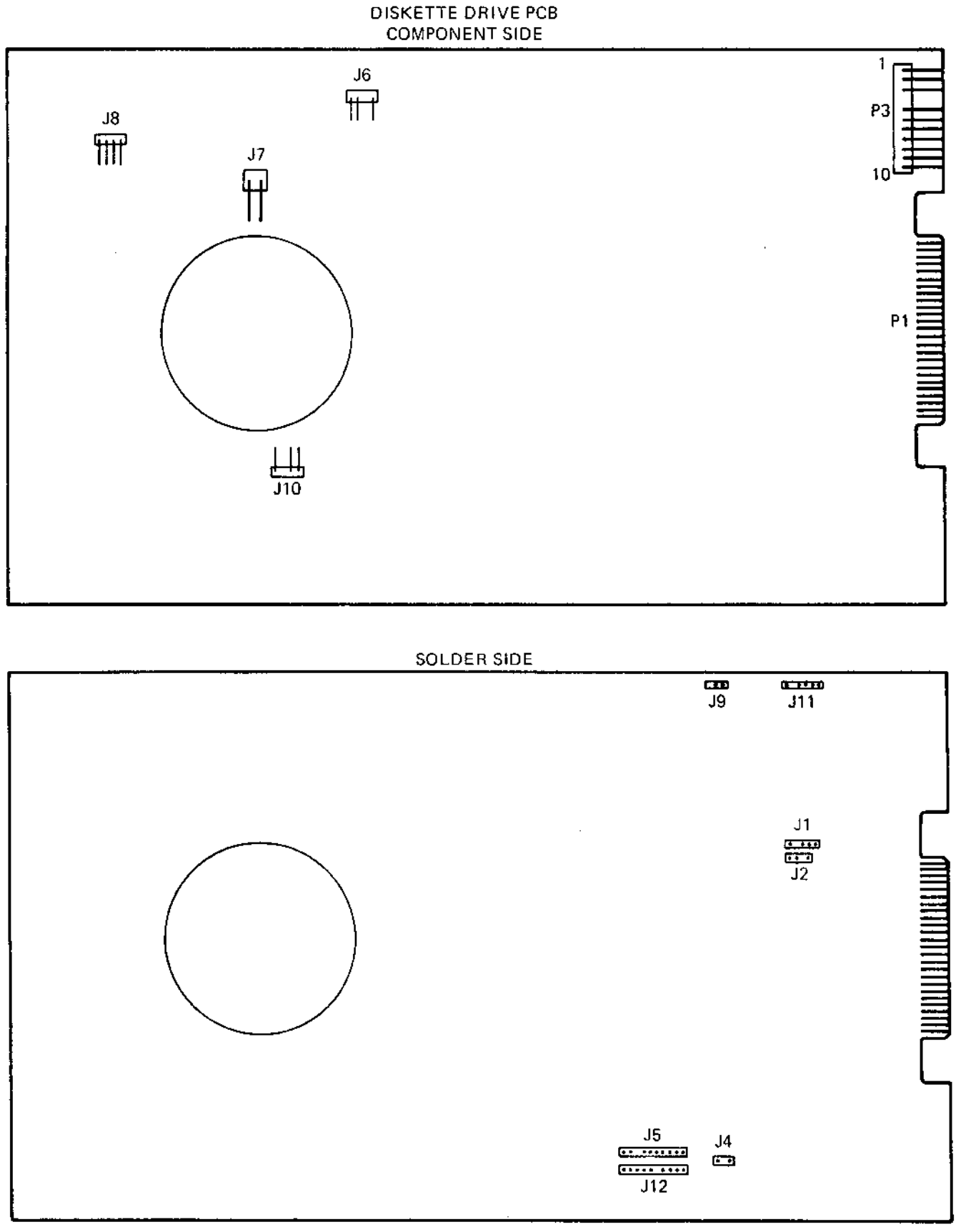


Figure 2-1. Plugs and Jacks Identification

b. Remove Diskette drive PCB.

c. Remove mylar insulator behind PCB.

d. Remove four screws holding drive motor to deck plate.

e. Remove drive motor.

f. Install replacement spindle motor assembly.

Spindle Sensor Assembly Replacement

The spindle sensor assembly is located on the drive motor assembly adjacent to the hub encoder disc. To replace, proceed as follows:

a. Set Diskette power off.

b. Remove Diskette drive PCB.

c. Remove plug P2 at the Diskette drive PCB.

d. Remove two screws holding spindle sensor assembly to drive motor assembly.

e. Remove cable clamp at deck plate.

f. Install replacement spindle sensor assembly by reverse procedure.

g. Check that spindle sensor mask does not interfere with hub encoder by rotating hub.

h. 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.

Index Transducer and Logic Checks

a. Set Diskette power on.

b. Insert Dysan alignment diskette 360.

c. Access track 76 and load head.

d. Monitor read data at TP15 or TP16 on the Diskette drive PCB.

e. Monitor index pulse at Pin 20 of P1 on the Diskette drive PCB.

PROG:	INDEX TRANSDUCER
SYNC:	INT CH 2 NEG
CH 1:	.5V/DIV A.C.
CH 2:	2V/DIV D.C.
MODE:	CH 1, 50μSEC/DIV

f. The start of the data burst should lag the negative going edge of the index pulse by 200 μsec ± 50 μsec. (Figure 2-2.)

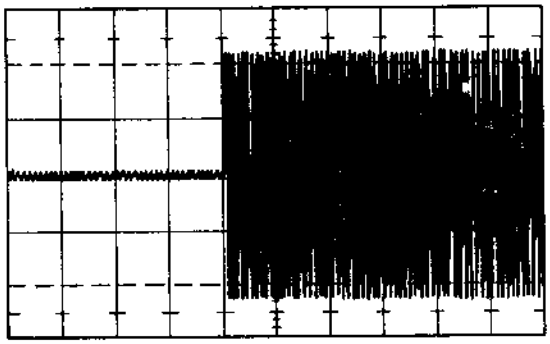


Figure 2-2. Index Pulse and Data Burst

PROG:	INDEX PERIOD
SYNC:	INT CH 2 NEG
CH 2:	2V/DIV D. C.
MODE:	CH 2 20SEC/DIV

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 first.

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 ±50 μsec, indicate a media concentricity problem.

i. The period should be 166.7 ± 3 msec if the diskette is rotating at the correct speed.

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 2-3.)

d. Adjust position of photosense until time interval is 200 ± 20 μsec and tighten screw.

e. Check with successive insertions of diskette that time interval remains 200 ± 50 μsec.

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.

   3. Manually load the cone by pressing the carrier in and observe the alignment between the photosense and LED.

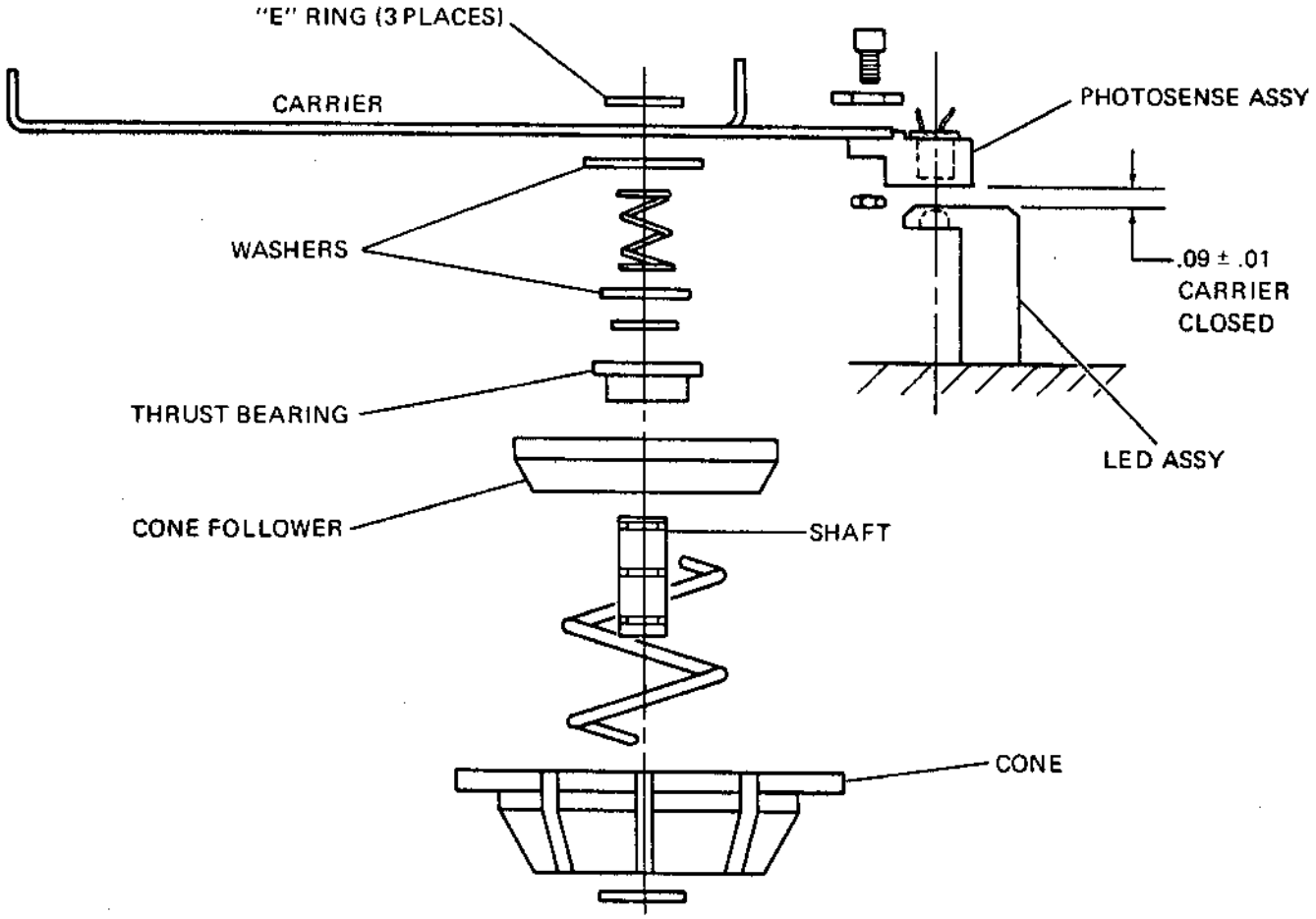


Figure 2-3. Index Transducer Alignment and Replacement

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.

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 P10 at Diskette drive PCB.

b. Remove Diskette drive PCB.

c. Remove cable clamp at deck plate.

d. Remove two screws securing LED assembly to deck plate.

e. Remove LED assembly and install replacement assembly.

f. Perform index alignment procedure.

Spindle Cone Replacement

The cone assembly engages the media with the drive hub. 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 2-3.)

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 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 head load assembly actuates a spring loaded arm which applies pressure to the media causing it to contact the read/write head.

Head Load Check and Adjustment

To check and adjust head loading 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 ± .02 inches at the point where it contacts the pressure arm. (Figure 2-4.)

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 ± .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.

Head Load Solenoid Replacement

a. Set Diskette power off.

b. Disconnect P4 at Diskette drive PCB.

c. Remove two No. 8 screws holding solenoid assembly to deck plate.

d. Install replacement solenoid assembly.

e. Proceed with head load adjustment procedure.

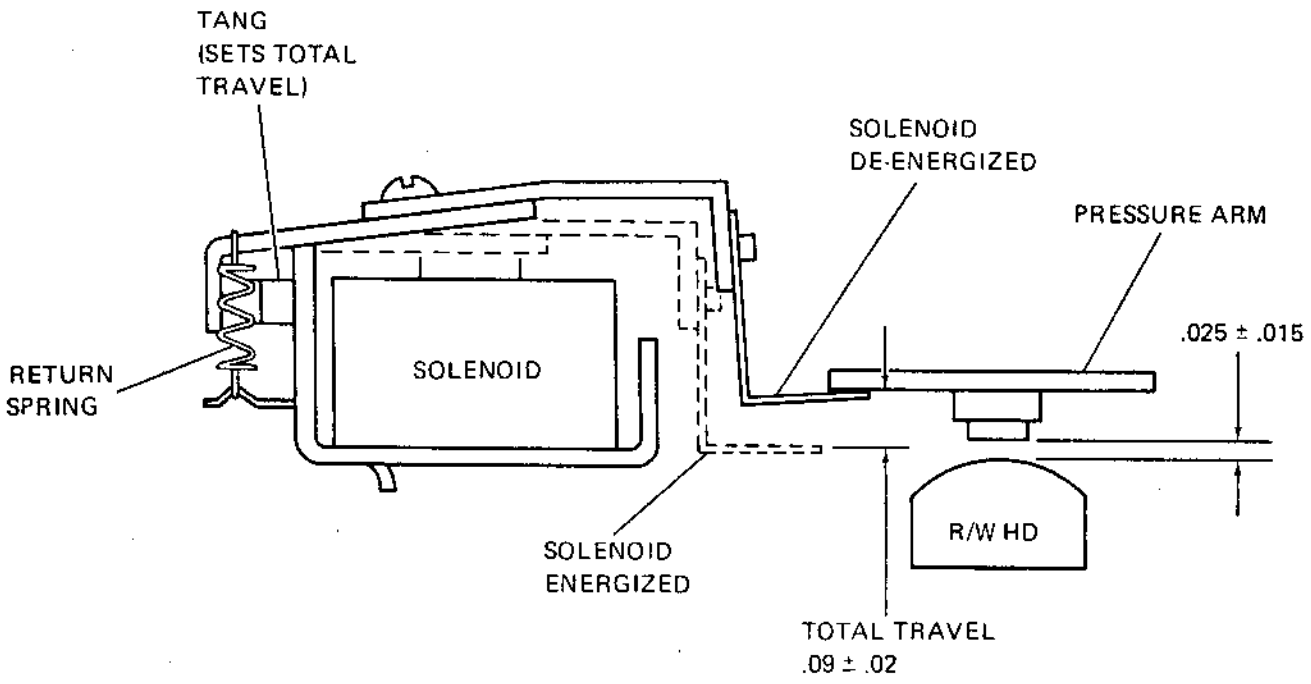


Figure 2-4. Head Load Check and Adjustment

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", and "Diskette drive PCB".

Positioner Servo Check

Using the oscilloscope, observe the positioner transducer output, obtained at TP24 on Diskette drive PCB. The oscilloscope may be conveniently grounded at TP30. 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 Diskette drive 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 100 ms, that the positioner transducer output is 3V p-p at the minimum amplitude point 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 within 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

a. Set Diskette power on.

b. Load Dysan alignment diskette 360.

c. Access track 38 and load head.

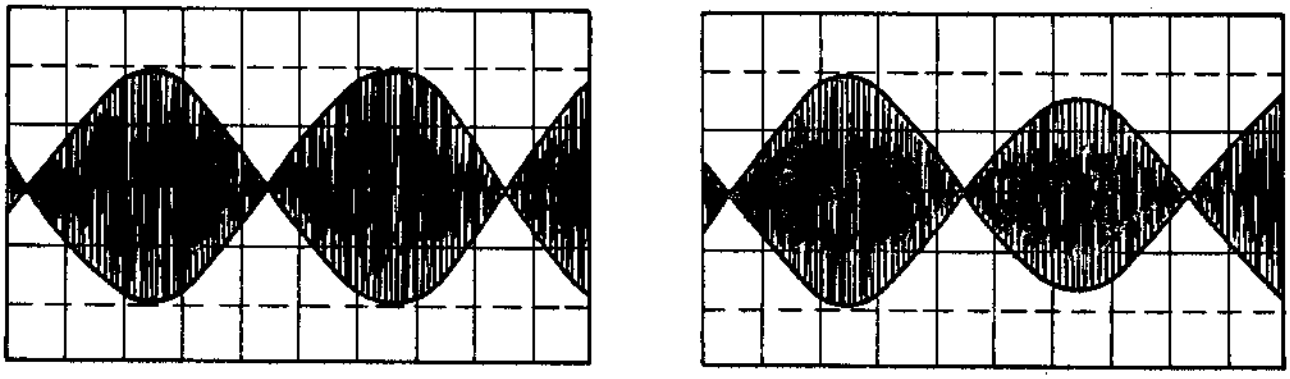
d. Monitor read data.

PROG:	TRACK ALIGNMENT
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 & CH 2 BETWEEN TP17 AND TP18 ON THE DISKETTE DRIVE PCB.

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 2-5.)

f. Access track 76 and load head still using alignment diskette.



EVEN AMPLITUDE 100% ON TRACK

80% AMPLITUDE 1 MIL OFF TRACK

Figure 2-5. Track Alignment

PROG:	AZIMUTH ALIGNMENT
SYNC:	EXT INDEX PULSE NEG (PIN 20)
CH 1:	.5V/DIV A.C.
CH 2:	2V/DIV D.C.
MODE:	CH 1 50 μSEC/DIV

g. Observe time interval between sync and data burst. (Figure 2-2.)

h. Access track 1 and observe any change in this time interval.

i. If positioner azimuth is correct the time interval should be the same within 20 μsec.

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 2-6.)

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

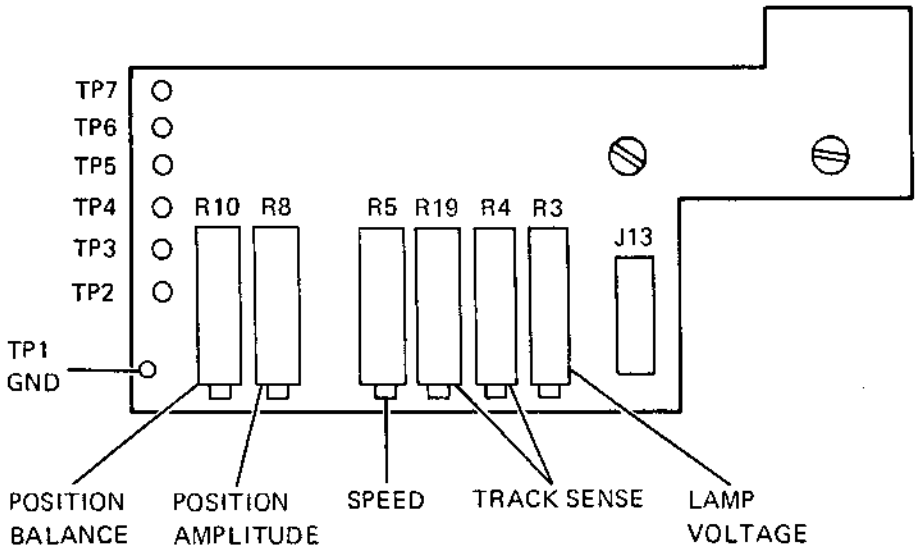


Figure 2-6. Lamp Amplifier PCB

Table 2-2. Positioner Servo Adjustments

FUNCTION	CONTROL	TEST POINT	ADJUSTMENT
Lamp Voltage	R3	TP7	+1.50V ± 0.1V
Track Sense Balance	R19	TP6	+0.25V track 20 (Move carriage by hand to approximate locations.)
Track Sense	R4	TP6	To -1.25V track 76 (Move carriage by hand to approximate locations.)
Speed	R5	TP5	Negative level, changing 1.25V as positioner moved from inner to outer limit.
Position Amplitude	R8	TP2	Adjust for 3.0V p-p at minimum amplitude point blanced 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 R173 on the Diskette drive PCB.

Plug P8 on the voice coil motor into J8 on the diskette drive PCB. Alternately automatically seek between Track 00 and Track 64. Observe and synchronize the oscilloscope to P1 Pin 42 of the diskette drive PCB (Track 00). The oscilloscope sync should be normal, DC, negative slope, 2 ms/div. Having achieved reliable sync, switch to manual and access Track 64. Press the restore pushbutton. The Track 00 signal should sweep across the screen at a negative logic level, with no pulses to positive logic level. If such a pulse occurs, readjust R19 on the lamp amplifier PCB such that on repeating the procedure the pulse does not occur. Then adjust R4 on the lamp amplifier PCB to bring TP6 on the lamp amplifier PCB to -1.25V.

Move the oscilloscope probe to TP24 on the Diskette drive PCB, and oscilloscope ground to the end of R77 or R78 furthest from the heatsink, on the positioner servo board. Alternately seek from track 31 to track 32. Synchronize the oscilloscope to the negative edge of the "seek complete" signal found at P1-10 on the Diskette drive PCB. Adjust R173 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 95ms. This completes the adjustments of the positioner servo.

Positioner Track and Azimuth Adjustment

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 2-7.)

c. Set Diskette power on.

d. Insert Dysan alignment diskette 360 and load head.

e. Access track 38 and monitor read data per Paragraph d of check procedure.

f. Gently tap the positioner transducer 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.

l. Monitor read data on scope per Paragraph f of check procedure.

j. Observe time interval between sync and data burst. (Figure 2-2.)

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 ±20 μsec, slacken three No. 10 slotted screws holding positioner frame to deck plate, and one No. 6 allen cap screw supporting magnet assembly. (Figure 2-7.)

m. Pivot assembly until the time interval is the same at track 1 as track 76 and tighten three screws holding positioner frame and one magnet support screw.

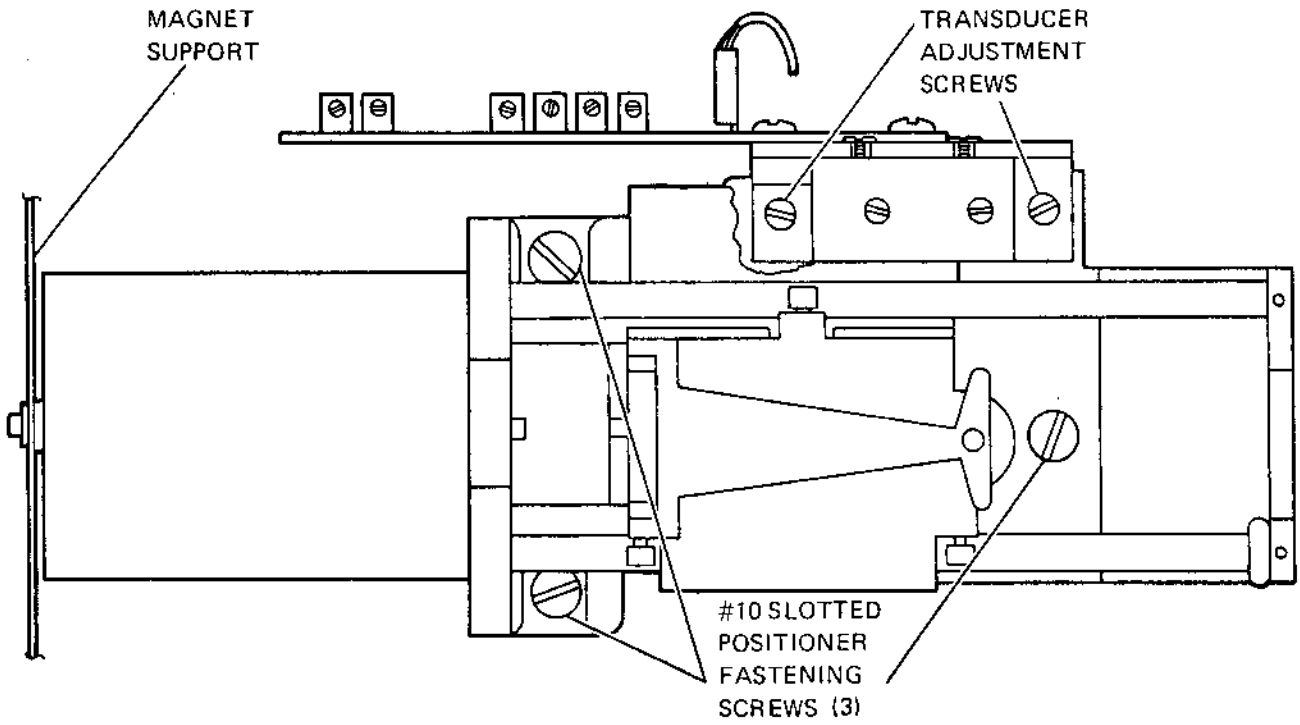


Figure 2-7. Positioner Track and Azimuth Adjustment

n. Repeat track 38 alignment procedure and tighten two screws holding transducer housing when cat's eye pattern is within 10% amplitude.

Positioner Assembly Replacement

a. Remove Diskette drive PCB.

b. Remove cable clamp securing leads to deck plate.

c. Remove three No. 10 slotted screws securing positioner assembly to deck plate and remove positioner assembly. (Figure 2-7.)

d. Install replacement positioner assembly. Make sure pressure pad lifter arm is above the carrier lifter surface before securing positioner assembly.

e. 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 2-8B.)

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 2-8A.)

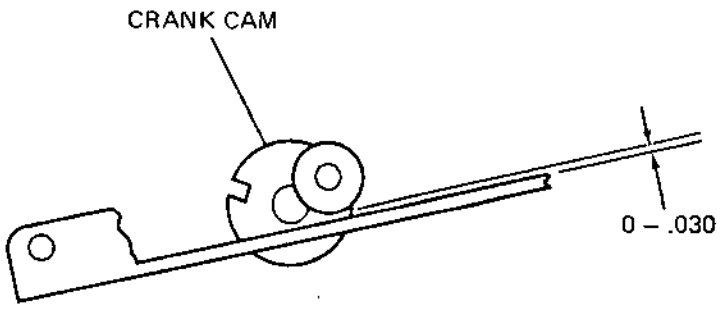


Figure 2-8A. Eject Motor Cam Alignment Check - Carrier Open

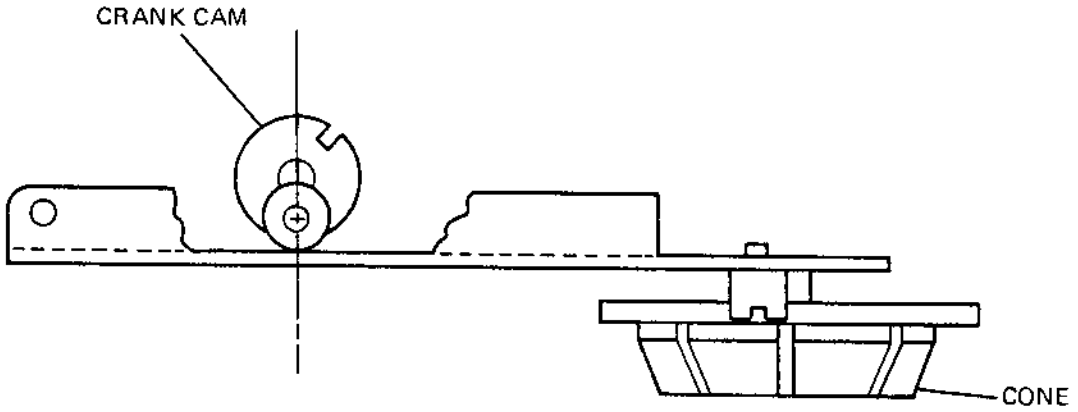


Figure 2-8B. Eject Motor Cam Alignment Check - Carrier Closed

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.

c. Observe the gap between the E ring which holds the cone assembly to the carrier and the corresponding carrier surface. (Figure 2-9.)

d. With the carrier in the loaded position the gap should be .05 ± .02.

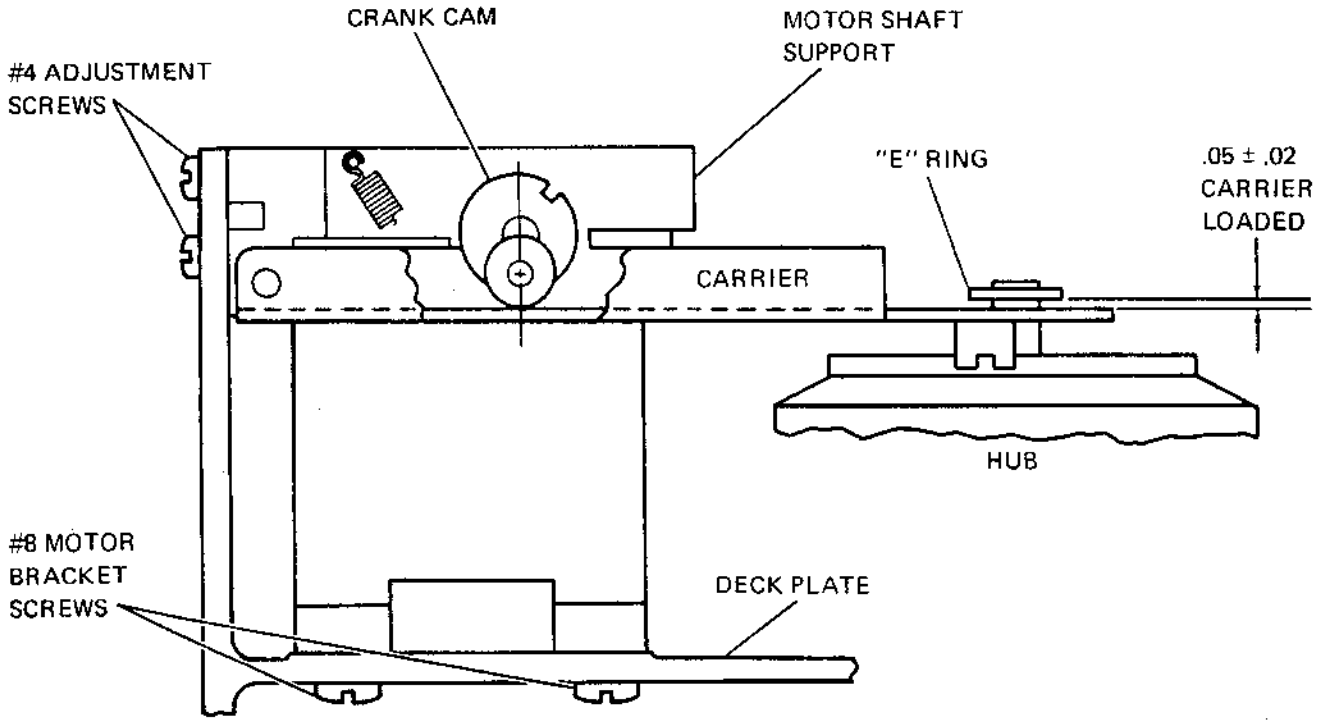


Figure 2-9. Crank Cam Alignment Check

Crank Cam Alignment Procedure

a. Remove Diskette drive PCB.

b. Slacken two No. 8 slotted screws securing motor bracket to deck plate.

c. Set Diskette power on.

d. Manually depress the load micro switch and observe gap described in Paragraph c of check procedure.

e. If incorrect, slacken two No. 4 slotted screws holding motor shaft support to deck plate.

f. Displace arm, tighten screws and check alignment.

g. Repeat until desired alignment is achieved.

h. Tighten two motor bracket screws after aligning support arm.

i. Replace Diskette drive PCB.

j. 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 ± .01. (Figure 2-3.) 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

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 2-10.)

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

28 gms equals one ounce.

Head Pressure Arm Adjustment

If the pressure arm force at the head is incorrect, proceed as follows:

a. Set Diskette power off.

b. Slacken No. 2 set screw securing arm to pivot shaft.

c. Rotate pivot shaft clockwise to increase force, anti-clockwise to decrease force and tighten set screw.

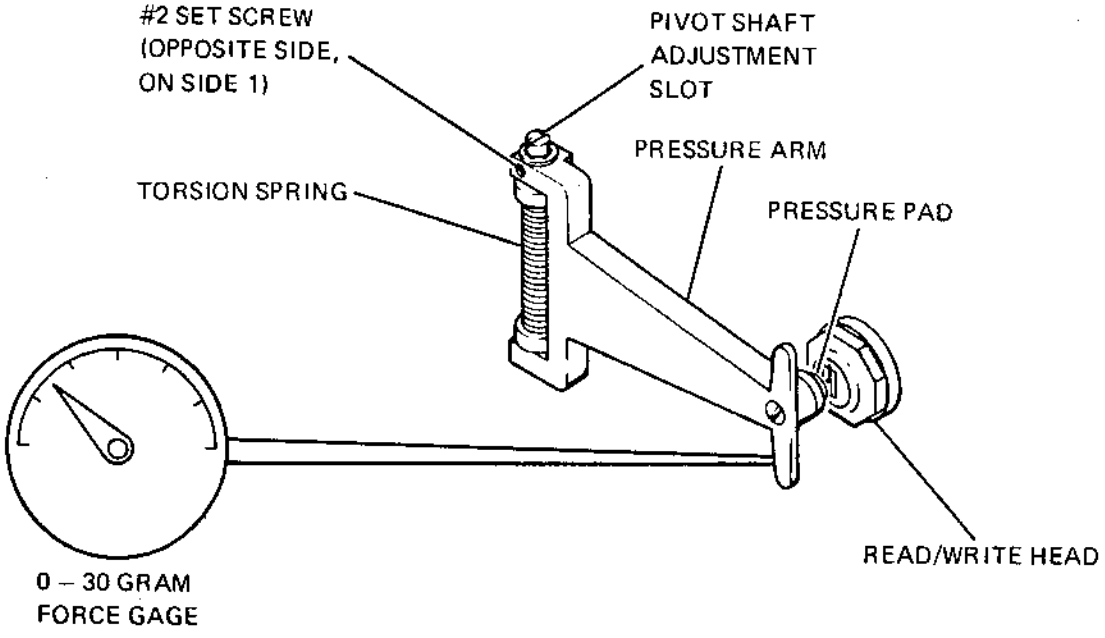


Figure 2-10. Head Pressure Arm Check

NOTE

There are four flats on the pivot shaft which the set screw can locate against. Therefore, only quarter turn increments of the pivot shaft can be made.

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.

d. Apply additional pressure to pressure arm by hand and observe any change in amplitude of read data.

e. If the amplitude increases by more than 15% then the pressure pad is not properly located with respect to the read/write head or the arm spring force is too low.

f. Rotation of the pad insert may improve contact between media and read/write head if this appears to be the problem.

DISKETTE DRIVE EXERCISER

Maintenance checks and adjustment procedures can be accomplished on-line using the controller of off-line using the Model 475 Diskette Drive Exerciser (see Figure 2-11).

There are three connectors at the exerciser allowing three interface options. To test a Model 70 drive, the plug should be inserted into the connector marked Model 70 with the ground side of the connector forward.

Controls, Indicators, and Test Points

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

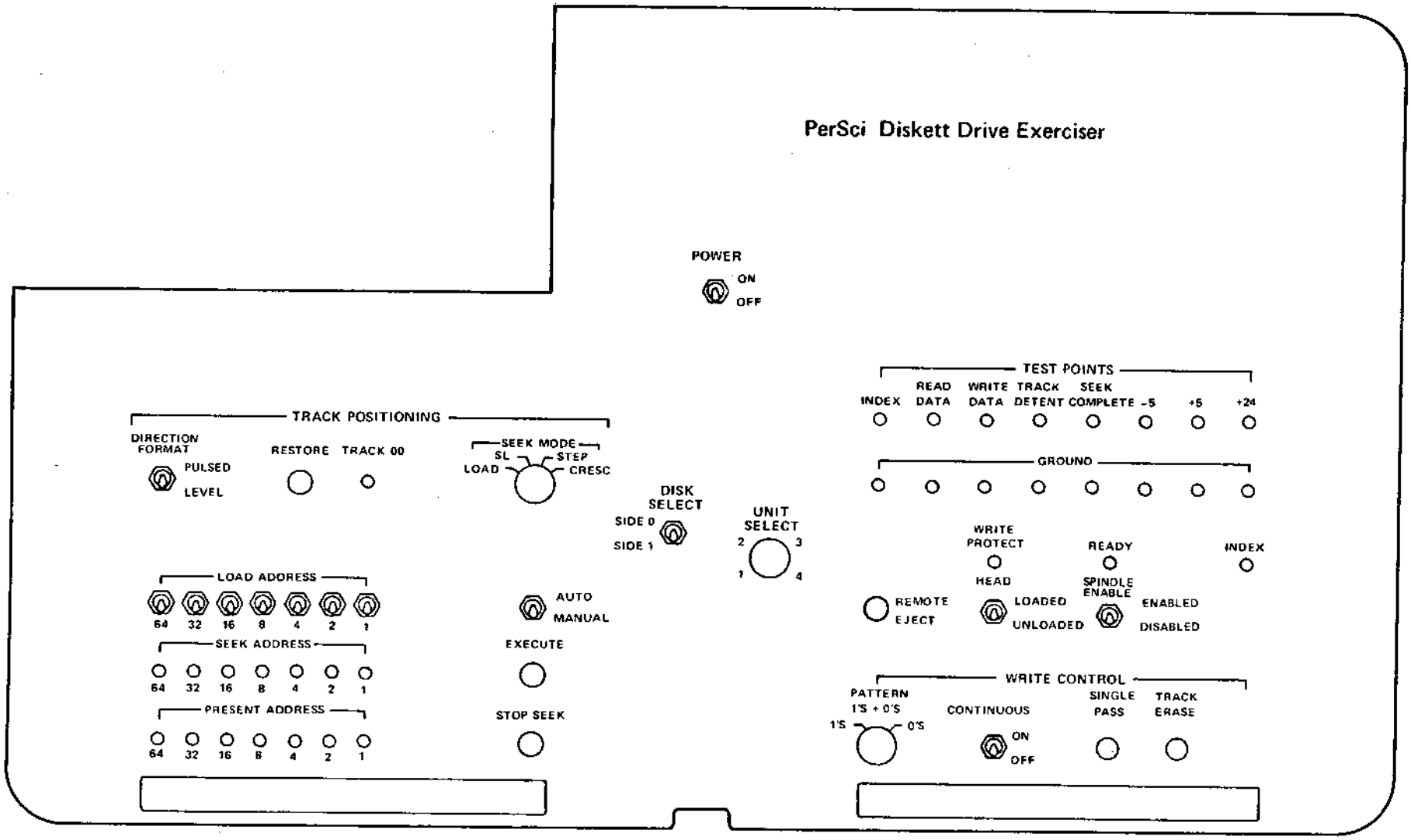


Figure 2-11. Diskette Exerciser, Model 475

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. LOAD position ENABLES Resetting the Seek Address Register according to "Load Switches". SL position programs seeks to alternate between the address in the "Seek Address Register" and any address on the "Load Switches". STEP 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. CRESCENDO 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.
DISK SELECT SWITCH	Toggle Switch. UP Position selects Side 0 on an optional dual drive interface; DOWN position selects Side 1.

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

SWITCH, INDICATOR OR TEST POINT	FUNCTION
UNIT SELECT SWITCH	Rotary switch positions 1 through 4 select corresponding Diskette drives or Diskettes if drives are configured for "Daisy Chain" option.
EJECT SWITCH	Pushbutton. Pressing this switch ejects Diskette if Remote Eject option is installed in drive.
PATTERN SELECT SWITCH	Three Position Rotary Switch. Selects which of three unformatted patterns can be written on the diskette. The patterns are all 0's, alternating bytes of 1's and 0's, and all 1's.
CONTINUOUS WRITE SWITCH	Toggle Switch, holds Write Gate ON continously when UP, 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.)
SPINDLE ENABLE SWITCH	Toggle Switch. UP alows spindle motion on drive with spindle motor enable option. DOWN prevents spindle motion even if a diskette is present.
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	A LED used to indicate when the drive is on Track 00.
READY INDICATOR	A LED which indicates presence of a "Ready" signal from the diskette drive.
WRITE PROTECT INDICATOR	A LED which indicates a write protect signal from the diskette drive.

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

SWITCH, INDICATOR OR TEST POINT	FUNCTION
DIRECTION FORMAT SWITCH	Toggle Switch. Putting this switch up causes direction to be transferred as a pulse. Down causes direction to be transferred as a level.
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.
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.

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