SECTION VI
MAINTENANCE AND TROUBLESHOOTING

6.1 INTRODUCTION

This section provides information necessary to perform electrical and mechanical adjustments, parts replacement, and troubleshooting. Sections IV and V contain the theory of operation of components and circuits for reference.

6.2 FUSE REPLACEMENT

The four fuses which protect the disk drive electrical components are located under the left rear corner of the base casting. Fuse identification and types are listed in Table 6-1.

6.3 SCHEDULED MAINTENANCE

The disk drive is designed to operate with a minimum of maintenance and adjustments. Part replacement is planned to be as simple as possible. Repair equipment is kept to a minimum and only common tools are required in most cases. A list of hand tools required to service the disk drive is given in Paragraph 6.31.

6.3.1 MAINTENANCE PHILOSOPHY

To ensure reliable operation of the disk drive at its optimum design potential a scheduled preventive maintenance program is recommended.

The objective of any maintenance program is to provide maximum machine readiness with a minimum of downtime. To provide this type of reliability it is necessary to perform preventive maintenance at the specified intervals. This schedule is given in Table 6-2.

In general, it is not necessary to alter any adjustment on equipment that is performing in a satisfactory manner.

Table 6-1
Fuse Requirements

	Function	Type
F1	Line Fuse	5 Amp, 3AG, SB, 125v and below 2.5 Amp, 3AG, SB, 190v and above
F2	+20v dc (Unregulated)	10 Amp, 3AG, FB
F3	−20v dc (Unregulated)	10 Amp, 3AG, FB
F4	+10v dc (Unregulated)	10 Amp, 3AG, FB

Table 6-2
Preventive Maintenance Schedule

Interval	Item	Paragraph Reference
1000 Hours**	Clean Heads and Disks.	6.4, 6.4.1, and 6.4.2
1000 Hours**	Clean Pre-filter.	6.26.1
2000 Hours	Inspect Static Discharge	6.20
2000 Hours	Check Belt for Wear	6.19
2000 Hours or 6 Months**	Replace Air Filter.	6.26.2 and 6.26.3
2000 Hours	Lubricate Catch Assembly Ball Studs in Bezel.	6.17
2000 Hours or 6 Months	Clean Spindle Magnetic Chuck and Cone.	6.4.4
4000 Hours or 12 Months	Clean Positioner.	6.4.5
4000 Hours or 12 Months (100 tpi Models)	Check CE Alignment.	6.14
1000 Hours or 3 Months, and when Unit is Moved (200 tpi Models)		
4000 Hours or 12 Months	Clean Base Casting, Filters, and Dust Cover, and Inspect Machine.	6.3.2, 6.3.3, and 6.4
12,000 Hours	Check Drive Mechanism for Wear. Lubricate Drive Slot (Top Load Only).	6.19
24,000 Hours	Replace Drive Motor. Replace Spindle.	6.28

*The listed preventive maintenance frequency is based on operating hours. Typically, about 200 hours operating time per month will be accumulated for the average installation. When operating hours are less than the specified time interval, perform the maintenance on the basis of time interval only if stated in the table above.

**More frequent servicing may be required if operating in an abnormally dirty environment or if a high rate of cartridge loading is encountered.

6.3.2 GENERAL MAINTENANCE

Perform a visual inspection of the disk drive for loose electrical connections, dirt, cracks, binding, excessive wear, and loose hardware while conducting any maintenance function.

Cleanliness is essential for proper operation. Minute particles of dirt trapped between the flying heads and the disk causes the disk surface to become scored. This condition may result in an unusable disk or head damage, or both.

Accumulated foreign matter can also cause the read/write heads to fly at an excessive distance from the disk surface. This will severely impair the retrieval of data and result in improper writing.

6.3.3 GENERAL PRECAUTIONS

Any work performed on the drive should be accomplished with the power off and, preferably, with the power cord disconnected from the power line unless otherwise necessary.

CAUTION

THE DISK DRIVE POSITIONER ASSEMBLY CONTAINS A PERMANENT MAGNET; KEEP ALL ITEMS MADE OF FERROUS MATERIALS [TOOLS, WRIST WATCHES, RINGS, ETC.] AWAY FROM THIS AREA.

WARNING

AVOID PLACING HANDS IN THE VICINITY OF THE CARTRIDGE OR VOICE COIL WHEN THE DISK DRIVE IS OPERATING. AN EMERGENCY UNLOAD OF THE MAGNETIC HEADS COULD CAUSE SERIOUS INJURY TO MAINTENANCE OR OPERATING PERSONNEL.

CAUTION

CIGARETTE SMOKE AND TOBACCO ASHES ARE A COMMON CAUSE OF PROBLEMS INDUCED DURING SERVICING. AVOID SMOKING IN THE IMMEDIATE VICINITY WHEN SERVICING THE DRIVE WITH THE COVER OFF OR THE AIR FILTER REMOVED.

NOTE

Avoid operating the disk drive with the top cover removed unless maintenance cannot be performed otherwise. If the disk drive must be operated with the dust cover off, use a work cartridge.

6.4 CLEANING THE DISK DRIVE

The disk drive requires cleaning in these major areas: heads, disks, spindle, positioner, base casting, dust cover, and filters. Details are given in Paragraphs 6.4.1 through 6.4.5, and 6.26, respectively.

The following cleaning materials are recommended for use when cleaning the disk drive.

(1) Lint-free wiper such as Microwipes TX500* or Absorband TX404* or Kaydry Disposable Wipes 34720** or equivalent.

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*Available from Texwipe Co., Hillsdale, New Jersey 07642.
**Available from Kimberly-Clark.

(2) Isopropyl alcohol, 91 percent by volume.

CAUTION

DO NOT USE ISOPROPYL ALCOHOL, OR ITS EQUIVALENT, ON ANY PART OF THE DISK DRIVE OR ITS CARTRIDGE UNLESS SPECIFICALLY INSTRUCTED TO DO SO IN THIS MANUAL.

CAUTION

USE ONLY 91 PERCENT ISOPROPYL ALCOHOL TO CLEAN DISK AND HEADS. USE OF ANY OTHER TYPE OF CLEANER OR SOLVENT, SUCH AS CARBON TETRACHLORIDE OR TRICHLORETHYLENE MAY RESULT IN DAMAGE TO THE DISKS OR HEADS. DO NOT USE CONTAMINATED ALCOHOL WHICH COULD CONTAIN ANY FORM OF RESIDUE.

WARNING

THE 91 PERCENT ISOPROPYL ALCOHOL SOLUTION IS A FLAMMABLE LIQUID. KEEP THE BOTTLE CONTAINING ISOPROPYL ALCOHOL STORED IN A SEALED METAL CONTAINER EXCEPT WHEN IN USE.

WARNING

WHEN SHIPPING 91 PERCENT ISOPROPYL ALCOHOL, COMPLY WITH THE APPROPRIATE REGULATIONS FOR SHIPMENT OF FLAMMABLE LIQUIDS.

(3) Disk cleaning wands (2 required) Texwipe Part No. TX800*, PERTEC Part No. 623-0002.

(4) Masking tape 12.7 mm (½-inch) or 19.1 mm (¾-inch) wide.

6.4.1 INSPECTING AND CLEANING THE HEADS

Remove the cover from the disk drive and raise the logic PCBA to the extended position. Instructions for removal of the disk drive cover are contained in Paragraph 2.2. Remove the disk cartridge also, if necessary.

NOTE

The Read/Write PCBA should be removed prior to performing the head cleaning operation.

Use a dental mirror and a suitable light source (such as a penlight) to inspect each head before and after cleaning. It is important that all debris be removed from the head.

Examples of slider defects and head contamination are shown in Figures 6-1 and 6-2 with explanations for each example. If the contamination shown in Figure 6-1 cannot be removed with alcohol without scratching slider surface, affected heads must be replaced.

Any physical damage to the gimbal spring, load spring, slider, or the load pin will necessitate replacement of the head assembly.

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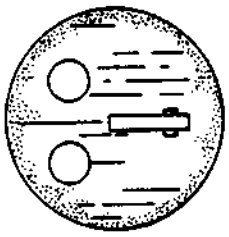
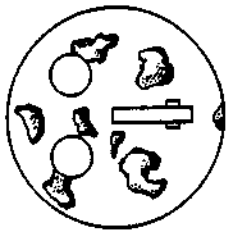
*Available from Texwipe Co., Hillsdale, New Jersey 07642

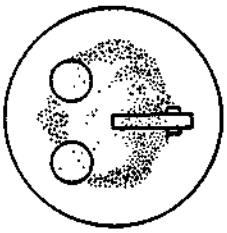
**Chesebrough-Ponds, Inc., Greenwich, CT 06830



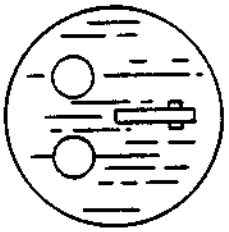
SLIGHT OXIDE ACCUMULATION ON SLIDER SURFACE



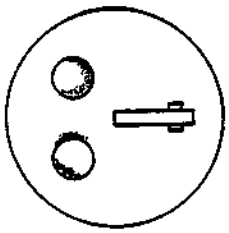
ALCOHOL RESIDUE DRIED ON SLIDER SURFACE



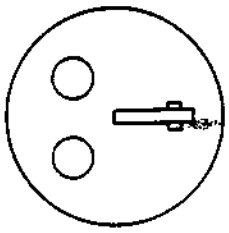
FINGERPRINTS ON SLIDER SURFACE



LIGHT SCRATCHES ON SLIDER SURFACE WITHOUT OXIDE ACCUMULATION



EXCESSIVE LOOSE OXIDE PARTICLE BUILD UP IN BLEED HOLES



MINOR OXIDE STREAK

DIRECTION OF DISK ROTATION

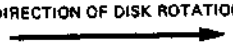
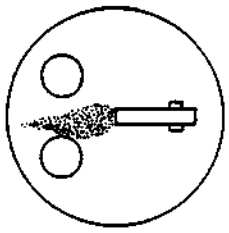
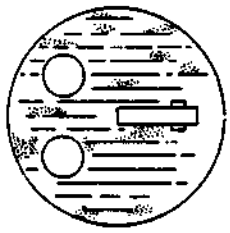


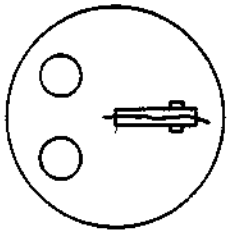
Figure 6-1. Slider Defects and Head Contamination which Require Cleaning Action



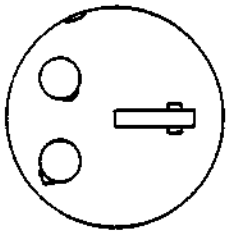
SLIDER SURFACE HAS A HEAVY OXIDE ACCUMULATION IN POLE TIP AREA WHICH CANNOT BE REMOVED



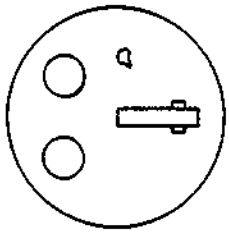
SLIDER SURFACE HAS DEEP SCRATCHES WITH OXIDE ACCUMULATION



DEEP SCRATCH OR SCRATCHES THRU CORE FACE OR POLE TIPS



CHIPPED EDGE OF SLIDER SURFACE PERIPHERY OR CHIPS AT EDGE OF BLEED HOLES



LARGE PIT OR VOID IN SLIDER SURFACE

DIRECTION OF DISK ROTATION

Figure 6-2. Slider Defects and Head Contamination which Require Head Replacement

Use the following procedure for cleaning each head.

(1) Remove a cleaning Q-tip from its container, without touching the cotton swab.

(2) Saturate the Q-tip cotton swab with 91% isopropyl alcohol.

NOTE

Do not dip the swab into the isopropyl alcohol, but pour the liquid over the swab so as not to contaminate the alcohol.

CAUTION

DO NOT TOUCH THE FACE OF THE MAGNETIC HEADS WITH YOUR FINGERS. ACIDS EMITTED FROM THE SKIN CAN CAUSE PERMANENT DAMAGE TO THE HEAD. DO NOT BLOW ON THE HEADS AS MOISTURE WILL CONTAMINATE THE HEADS.

(3) Carefully clean the slider surface and edges of the head.

NOTE

To facilitate cleaning the heads, the positioner may be moved forward from its fully retracted position about ½ to ¾-inch. This will cause the head pairs to separate more thus allowing more space between the heads.

(4) Clean the two bleed holes in the head by rotating the cotton swab at each hole opening (this will clear any loose oxide or contamination that may be trapped at the edge of the holes) — make sure you do this from the slider face side of the head — not from the back.

(5) Wipe the slider face dry using a second cotton swab; this operation must be done before the alcohol has evaporated.

(6) Inspect each head after all heads have been cleaned. Repeat the cleaning process if necessary.

6.4.2 INSPECTING AND CLEANING THE FIXED DISK

Remove the cover from the disk drive and raise the Logic PCBA to the extended position. Instructions for removal of the disk drive cover are contained in Paragraph 2.2. Also remove the disk cartridge, if necessary.

Use a dental mirror and a suitable light source (such as a penlight) to inspect each disk surface before and after cleaning. It is important that all debris be removed from the disk surface.

Use the following procedure for cleaning each disk surface.

(1) For front load models only, gain access to the lower fixed disk(s) by removing the access cover plate on the side of the lower disk cover.

(2) Prepare two cleaning wands as follows.

- Insert a lint-free pad* into the barbed slot of wand.
- It is important to rotate the wand counterclockwise, thereby wrapping the pad completely around the wand. Take care not to contaminate the pad.

*Some pads, such as Texpads (from the Texwipe Co., Hillsdale, NJ 07642) come packaged in a sealed container already saturated with 90% isopropyl alcohol.

(3) Saturate pad with 91% isopropyl alcohol.

NOTE

Do not dip the lint-free pad into alcohol, but pour the liquid over pad so as not to contaminate the alcohol.

(4) While rotating the spindle chuck CCW, insert the cleaning wand parallel to the disk far enough to cover the innermost track. The lint-free pad should lightly contact the surface of the disk and should point directly at its center.

(5) After the disk surface has been subjected to the alcohol treatment, and with the disk still spinning, quickly withdraw the wand with a steady motion lifting it gently from the disk surface.

(6) Using the procedure in Step (4), wipe the disk surface dry with the second cleaning wand. Remember that you are gently drying the disk — not polishing it. This operation must be done before the alcohol evaporates to prevent *puddles* and *solvent spots* from forming on the disk surface.

CAUTION

EXCESSIVE WAND PRESSURES CAN CAUSE DRY FRICTION HEAT WHICH CAN DESTROY RECORDED DATA.

CAUTION

DO NOT ALLOW ALCOHOL TO DRY ON THE DISK SURFACE. DO NOT TOUCH THE DISK WITH FINGERS. ACIDS EMITTED FROM SKIN CAN CAUSE PERMANENT DAMAGE TO THE DISK SURFACE.

(7) As the disk continues to spin, withdraw the cleaning wand with a steady motion, lifting it gently from the disk surface.

(8) Inspect each disk surface after cleaning; repeat the cleaning process if necessary.

(9) Reinstall the plate and hardware removed in Step (1).

6.4.3 REMOVABLE DISK CARTRIDGE CLEANING

The 2315 and 5440-type removable disk cartridges must be cleaned periodically. Pertec recommends the use of a mechanical disk cartridge cleaner; there are several of these cleaners available on the commercial market. Additionally, there may be media cleaning and refurbishment services available locally.

6.4.4 CLEANING THE SPINDLE

Wipe the spindle cone and the magnetic chuck with a dry lint-free wiper. Metal particles that have become attracted to the magnetic chuck may be removed using masking tape.

6.4.5 CLEANING THE POSITIONER

The positioner shaft and scale can be cleaned with a lint-free wiper slightly moistened with isopropyl alcohol. Carefully wipe the surfaces to remove any accumulated matter.

CAUTION

DO NOT WET THE SHAFT, SCALE, OR WIPER WITH AN EXCESSIVE AMOUNT OF ISOPROPYL ALCOHOL AS IT COULD SEEP INTO CARRIAGE BEARINGS CAUSING BREAKDOWN OF THE BEARING LUBRICANT.

CAUTION

DO NOT DISASSEMBLE THE POSITIONER FOR CLEANING.

6.5 PART REPLACEMENT ADJUSTMENTS

Table 6-3 defines the adjustments that may be necessary when a part is replaced in the disk drive; details are given in Paragraphs 6.6 and 6.7.

6.6 ELECTRICAL ADJUSTMENTS

In addition to the tools listed in Paragraph 6.28, the following equipment (or equivalent) will be required for electrical adjustments.

(1) Oscilloscope, dual trace, having at least a 50 MHz bandwidth. Vertical and horizontal sensitivity specified to ±3 percent accuracy.

(2) Three calibrated X10 test probes with ground clips.

(3) One X1 test probe with ground clip.

(4) Digital Volt Meter, Fairchild 7050 (±0.1 percent specified accuracy) or equivalent, with test leads.

Table 6-3

Part Replacement Adjustments

Part Replaced	Auxiliary Adjustments	Time Required (Hrs)	Paragraph Reference
Spindle	Circumference Alignment, Radial Alignment, Sector PLL Adjustment	2:00	6.14,6.14.5 or 6.14.7,6.11
Servo PCBA	Servo, Power Supplies, and Spindle Speed Control	1:00	6.7,6.9,6.6.2, 6.6.3
Position Transducer Assy	Servo Readjustment	1:00	6.7,6.9
Logic PCBA	Sector PLL Adjustment	0:45	6.11
Read/Write PCBA	RPN Pulsewidth Adjustment	0:30	6.12.1
Magnetic Transducer, Upper	Magnetic Transducer Gap, CE	0:35	6.14,6.18
Magnetic Transducer, Lower	Magnetic Transducer Gap	0:35	6.18.2 or 6.18.3
Photoelectric Sensor, Upper (Front Load Only)	Circumferential Alignment	0:30	6.14
Cartridge Interlock Switch	Interlock Adjustment	0:30	6.15,6.16
Cartridge Interlock Solenoid	Solenoid and Interlock Adjustment	0:30	6.15,6.16
Head	CE Alignment*	1:00	6.14
Fixed Disk	Check Data Reliability	1:00	—
Power Supply	Power Supply Adjustment	1:00	6.6.2
Bezel Assy (Front Load Only)	Solenoid and Interlock Adjustment	0:30	6.17

*Applies to removable media heads only.

(5) Disk Exerciser and 6-foot extender cable.

(6) Counter Timer, Monsanto Model 100B (±0.1 percent specified accuracy) or equivalent.

(7) Jumper, not to exceed 6 inches in length, with alligator clips on each end.

(8) Emergency Unload Bypass Jumper Plug, PERTEC Part No. 103608.

(9) Voice Coil Polarity Tester, PERTEC Part No. 103607.

6.6.1 ADJUSTMENT PHILOSOPHY

Acceptable limits are defined in each adjustment procedure, taking into consideration the assumed accuracy of the test equipment specified in Paragraph 6.6.

When the measured value of any parameter is within the specified acceptable limits, NO ADJUSTMENTS should be made. Should the measured value fall outside the specified acceptable limits, adjustments should be made in accordance with the relevant procedure.

NOTE

Some adjustments may require corresponding adjustments in other parameters. Ensure corresponding adjustments are made as specified in the individual procedures. The +5v, —5v, +10v, and —10v voltages must be checked prior to attempting any electrical adjustments.

When adjustments are made, the value set should be the exact value specified, to the best of the operator's ability.

CAUTION

PRIMARY POWER SHOULD BE REMOVED FROM THE DISK DRIVE WHEN ACCESS IS REQUIRED EXCEPT IN CASES OF ELECTRICAL TESTING AND ADJUSTMENTS.

Allowable line voltage variation is ±10 percent of nominal. See Figure 4-14 for transformer primary connections. Allowable line frequency variations are:

- ☐ 50 Hz line
  - 48 Hz minimum
  - 52 Hz maximum
- ☐ 60 Hz line
  - 58 Hz minimum
  - 62 Hz maximum

6.6.2 10V AND 5V REGULATORS

The 10v and 5v regulator circuitry is located on the Servo PCBA. The 10v sources are established by zener diodes and cannot be adjusted. The 5v sources are adjustable by

means of potentiometers located on the Servo PCBA. Potentiometer R158 adjusts the +5v source; potentiometer R167 adjusts the —5v source.

NOTE

When a new Servo PCBA is installed, or any change is made to the power supply circuitry, do not perform the following tests but go directly to the adjustment procedure, Paragraph 6.6.2.4.

6.6.2.1 Test Configuration

(1) Connect the disk drive to appropriate ac power source and set the ON/OFF switch to the ON position.

(2) All test points are located on the Servo PCBA unless otherwise noted.

6.6.2.2 Test Procedure, 10v

(1) Using a DVM (Fairchild 7050 or equivalent), connect the positive test lead to TP21 and the common test lead to TP1.

(2) Acceptable limits (+10v)

- +11.5v maximum
- +9.9v minimum

(3) Change the positive DVM test lead connection to TP25.

(4) Acceptable limits (– 10v)

- – 10.9v maximum
- – 9.3v minimum

NOTE

In the event the readings obtained in Steps (2) and (4) fall outside the acceptable limits, remove power from the disk drive and disconnect J210 from the Servo PCBA. Apply power to the disk drive and proceed to troubleshoot using the schematic contained in Section VII. While troubleshooting, the 10v measurements will be made with J210 removed.

6.6.2.3 Test Procedure, 5v

(1) Establish test configuration described in Paragraph 6.6.2.1.

(2) Verify that J210 is installed.

(3) Using a DVM, connect the positive test lead to TP18 on the Logic PCBA and the common test lead to TP15 on the Logic PCBA.

(4) Acceptable limits (+5v)

- +5.25v maximum
- +4.75v minimum

(5) Change the positive DVM test lead connection to TP19 on the Logic PCBA.

(6) Acceptable limists (– 5v)

- – 5.25v maximum
- – 4.75v minimum

6.6.2.4 Adjustment Procedure

When the acceptable limits are exceeded, the following adjustments are performed.

(1) Remove power from the disk drive and remove isolation plug J210 from the Servo PCBA.

(2) Apply power to the disk drive.

NOTE

The ON/OFF switch will not be illuminated when J210 is disconnected from the Servo PCBA.

(3) Connect the positive test lead of the DVM to TP4 and the common test lead to TP1 on the Servo PCBA.

(4) Adjust potentiometer R158 on the Servo PCBA to +5v as observed at TP4.

(5) Change the connection of the DVM positive test lead to TP12.

(6) Adjust potentiometer R167 on the Servo PCBA to −5v as observed at TP12.

(7) Remove power from the disk drive and replace isolation plug J210.

(8) Apply power to the disk drive and recheck the +10v and −10v measurements (see Paragraph 6.6.2.2).

(9) Perform recheck of +5v and −5v power supplies under load, i.e., jumper plug J210 reinstalled.

- ☐ Acceptable limits at TP18 on the Logic PCBA
  - +5.05v maximum
  - +4.95v minimum
- ☐ Acceptable limits at TP19 on the Logic PCBA
  - −5.05v maximum
  - −4.95v minimum

(10) If the limits established in Step (9) are exceeded, readjust R158 and R167 to obtain +5v and −5v at TP18 and TP19, respectively.

6.6.2.5 Related Adjustments

When adjustments are made to the +5v and −5v supplies, tests and/or adjustments are required in all procedures described in Paragraphs 6.6.3 through 6.6.3.3.

6.6.3 AC MOTOR SPEED CONTROL

The speed control adjustment for the ac drive motor is made to establish the correct spindle speed (1500 rpm or 2400 rpm) within a ±1 percent tolerance.

6.6.3.1 Test Configuration

(1) Remove power from the disk drive.

(2) Disconnect connector J205 from the Servo PCBA.

(3) Disconnect connectors J405 and J406 from the Motor Control PCBA.

(4) Connect oscilloscope Channel 1 probe to TP22 on the Servo PCBA.

(5) Connect the ground clip of the oscilloscope probe to TP1 on the Servo PCBA.

(6) Set oscilloscope as follows

- Voltage sensitivity to 0.2v per division if the X10 probe is used.
- Select dc input mode.
- Sweep rate to 0.1 msec per division.
- Set to normal trigger mode.
- Use internal sync and set to trigger on negative slope.

6.6.3.2 Test Procedure

(1) Establish test configuration described in Paragraph 6.6.3.1.

(2) Select Channel 1 on the oscilloscope.

(3) Ground U19A-2 (NLDMEG) on the Servo PCBA.

(4) Apply power to the disk drive.

6.6.3.3 Adjustment Procedure

(1) Establish test configuration described in Paragraph 6.6.3.1.

(2) Observing the waveform displayed on Channel 1 (TP22), adjust potentiometer R212 so that the positive-going edge of the pulse occurs between 0.3 msec and 0.6 msec as shown in Figure 6-3. Ensure that oscilloscope is still synced on the negative-going edge of the pulse. Some hysteresis effect, approximately 0.1 msec, may be noted on the positive-going edge due to variations in line frequency.

(3) Remove power from the disk drive.

(4) Replace connector J205 on the Servo PCBA.

(5) Replace connectors J405 and J406 on the Motor Control PCBA.

(6) Remove the ground from U19A-2 on the Servo PCBA.

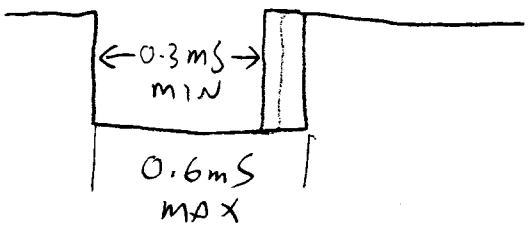


Figure 6-. AC Motor Speed Control Signal Pulsewidth

6.7 POSITIONER SERVO CALIBRATION

Paragraphs 6.8 and 6.9 describe the test configurations, test procedures, and adjustment procedures relevant to both static and dynamic operation of the D3000 Positioner Servo. It is important to note that if static positioner adjustments are performed the dynamic positioner adjustments must also be performed.

To ensure accurate calibration of the positioner, the preliminary tests and adjustments described in Paragraph 6.7.1 must be performed prior to calibration of the positioner.

NOTE

The only ground reference test point to be used for measurement purposes is TP1. All test points referred to are located on the Servo PCBA unless otherwise noted.

6.7.1 POSITIONER PREPARATION FOR STATIC TESTS

The following functions are required to prepare the positioner for calibration.

(1) Remove power from the disk drive.

(2) Disconnect connector J205 from the Servo PCBA.

WARNING

TO PREVENT INJURY TO THE SERVICE ENGINEER DUE TO INADVERTENT ACTIVATION OF THE POSITIONER DRIVE, CONNECTOR J205 MUST BE REMOVED FROM THE SERVO PCBA PRIOR TO ANY SERVO TESTS OR ADJUSTMENTS.

(3) Install Emergency Unload Bypass Jumper at connector J128 on the Logic PCBA.

(4) Apply power to the disk drive. Observe that the SAFE indicator becomes illuminated, and that the bulb in the lamp/lens assembly (see Figure 7-7 and Table 7-7) is illuminated.

(5) Insert a disk cartridge into the disk drive.

(6) Measure +10.7 ±0.8v between TP1 and TP21.

(7) Measure —10.1 ±0.8v between TP1 and TP25.

(8) Measure regulated +5.0 ±0.25v between TP1 and TP4.

(9) Measure regulated —5.0 ±0.25v between TP1 and TP12.

(10) Voltages in Steps (6) through (9) must fall within the limits specified. In the case where voltages measured fall outside these limits, perform the test and adjustment procedures described in Paragraph 6.6.2.

(11) Manually move the positioner carriage back and forth and check that the reticle-to-scale gap across the full length of the scale is approximately 0.127 mm (0.005-inch). Do not load heads onto the platter at this time. A mylar shim can be used for this measurement. The SAFE indicator will extinguish when the shim is in place between the reticle and the scale.

NOTE

The Read/Write PCBA may be removed to facilitate access to the scale. Perform Steps [12] through [14] only if the reticle-to-scale gap does not meet the approximation given in Step [11].

(12) Loosen the horizontal hex-head screw at the base of the receiver post. This will loosen the receiver post and allow it to be raised and lowered when the Allen-head screw located inside the hollow of the receiver post is rotated.

(13) Position the receiver post so that the reticle-to-scale gap is approximately 0.127 mm (0.005-inch).

(14) Partially tighten the Allen-head screws loosened in Step (12).

(15) Withdraw the mylar shim to the point where the SAFE light becomes illuminated. The shim can be left in this partially withdrawn position.

(16) Depress and release the RUN/STOP switch. Manually advance the carriage about one inch from its fully retracted position. The disk drive will come up to speed after 57 seconds and the READY indicator will be illuminated.

NOTE

The READY light may be delayed 3 or 6 minutes, depending on the options installed in the disk drive.

(17) On top load disk drive models, verify that the cleaning brushes make from 2 to 4 complete sweeps across the platters.

(18) Manually load the head onto the disk and check the reticle-to-scale gap, with the mylar shim, as the positioner carriage is manually moved through its full forward and return strokes.

NOTE

Perform Steps [19] through [21] only if the reticle-to-scale gap throughout the length of the scale is not approximately 0.127 mm [0.005-inch] when using the mylar shim.

(19) Loosen the three Allen-head screws that hold the scale to the side of the carriage. The scale will pivot slightly around its locating pin. Position the angle of the scale so that the reticle-to-gap remains approximately 0.127 mm (0.005-inch) as the positioner carriage travels through its full forward and return strokes.

(20) Partially tighten the Allen-head screws loosened in Step (19).

(21) Remove the mylar shim.

Note

The foregoing reticle-to-scale gap adjustments are preliminary. Additional adjustments will be required during static positioner adjustment [Paragraph 6.8].

6.7.1.1 Initial Potentiometer Settings, Servo PCBA

The following procedure defines the initial setting of potentiometers located on the Servo PCBA. It is important to note that the initial potentiometer settings are required only when the Servo PCBA, Positioner, Position Transducer, or Velocity Transducer have been replaced, or when repairs have been made (i.e., parts replaced) in the 10v power supplies or the Positioner Servo circuit.

(1) Velocity Feedback Potentiometer. Rotate potentiometer R55 fully CCW, then adjust 7 turns in the CW direction.

(2) Current Feedback Potentiomter. Adjust potentiometer R111 to the center of its range, i.e., approximately 10 turns from full CCW or CW position.

(3) X + 0 Offset Potentiometer. Adjust potentiometer R22 to the center of its range, i.e., approximately 10 turns from full CCW or CW position.

(4) Velocity Offset Potentiometer. Adjust potentiometer R204 to the center of its range, i.e., approximately 10 turns from full CCW or CW position.

6.8 STATIC POSITIONER ADJUSTMENTS

The following static measurements and adjustments are required to check the integrity of the position transducer signals (amplitude and polarity), the velocity transducer feedback signal, and the voice-coil polarity. The test and adjustment procedures given in Paragraphs 6.8.1 through 6.8.8 should be performed in the order presented.

6.8.1 X + 0 GAIN AND BALANCE

Values are given for all versions of the D3000 with values for 200 tpi models parenthetically stated.

6.8.1.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.7.1.

(2) (200 tpi Only). Install a jumper between TP1 on the Servo PCBA and TP4 on the Temperature And Write Compensation PCBA.

(3) (200 tpi Only). Remove J215 from the Servo PCBA.

(4) Set oscilloscope Channel 1 sensitivity to 0.2v per division.

(5) Connect oscilloscope Channel 1 X10 probe to TP20. Connect ground lead to TP1.

(6) Set oscilloscope horizontal sweep rate to 2 μsec per division.

(7) Set oscilloscope trigger control to Line and Auto.

(8) Manually load the heads onto the disk.

NOTE

A ground reference sweep trace is obtained by centering the trace on a particular graticule line with the vertical input mode switch of the oscilloscope set to ground position.

6.8.1.2 Test Procedure

(1) Manually move the positioner carriage slowly, and at a constant rate, back and forth through its full stroke, i.e., cylinder 000 to cylinder 202 (cylinder 000 to 405 for 200 tpi). Do not unload the heads from the disk.

(2) Monitor TP20 on oscilloscope Channel 1 and observe the Position Reference (X + 0) waveform shown in Figure 6-4 as the positioner is being moved. The peak-to-peak voltage observed throughout the full stroke of the positioner must fall within the acceptable limits listed in Step (3). If the acceptable limits are exceeded, perform the adjustment procedures in Paragraph 6.8.1.3 before continuing this procedure.

(3) Acceptable limits:

- 13.2v (maximum) peak-to-peak
- 10.8v (minimum) peak-to-peak

(4) Monitor TP20 and observe that the variation about the mean voltage throughout the full stroke of the positioner is less than ±1.2v. If the voltage variation envelope is greater than ±1.2v about the mean voltage, perform the scale-flatness adjustment in Paragraph 6.8.1.4.

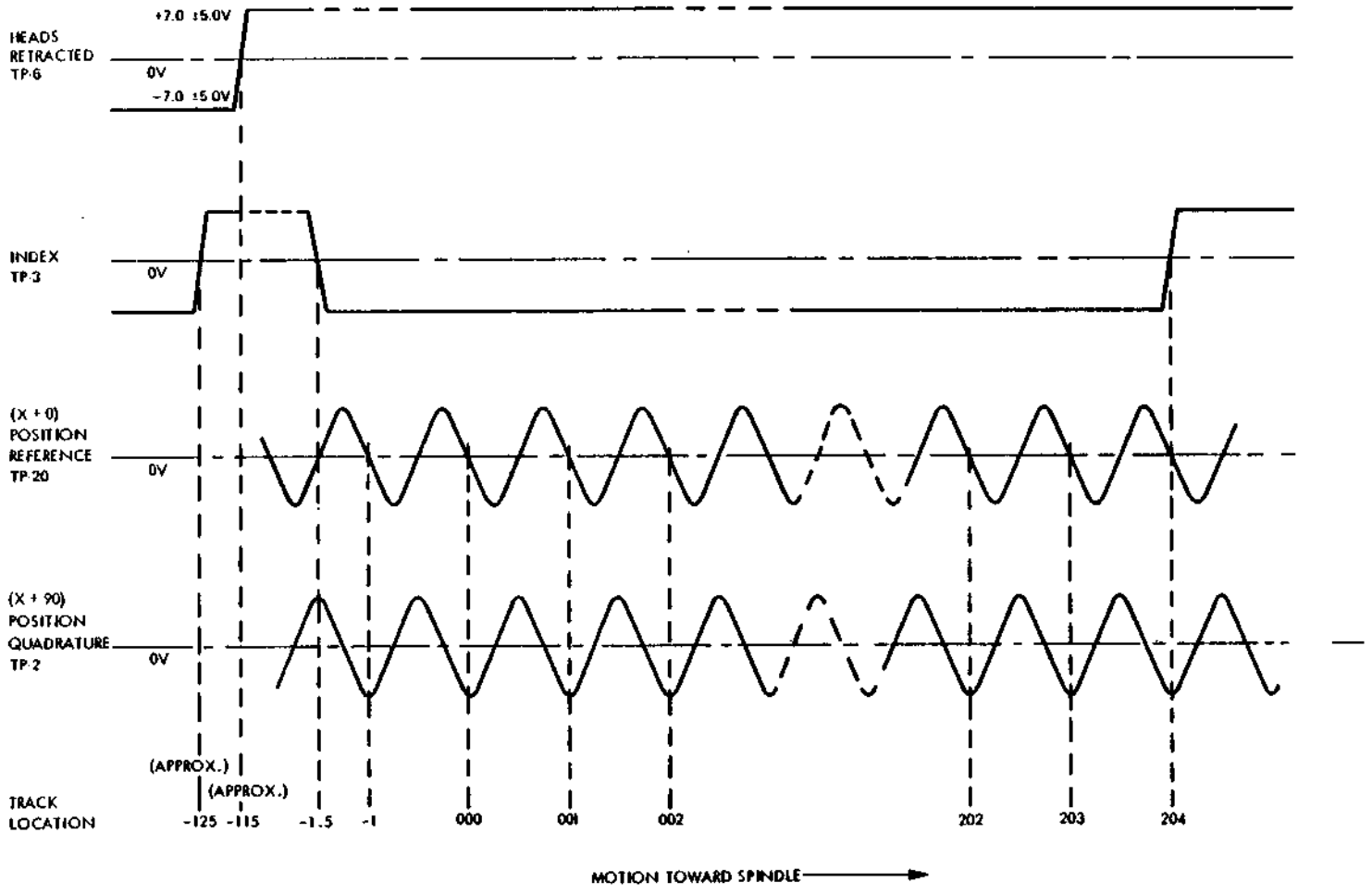


Figure 6-4. Position Transducer Signal Amplifier Outputs

6.8.1.3 Adjustment Procedure

(1) Adjust potentiometer R69 (X + 0 Gain) to attain a 12v peak-to-peak sine wave at TP20 on the oscilloscope screen while the positioner carriage is being slowly moved back and forth through its full stroke by hand.

NOTE

Clockwise rotation of R69 will increase amplitude.

(2) If the 12v peak-to-peak sine wave cannot be attained, perform the signal polarity and quadrature checks in Paragraph 6.8.3.

(3) Adjust potentiometer R70 (X + 0 Balance) to center the waveform equally about ground.

(4) Perform the X + 90 Gain and Balance procedure detailed in Paragraph 6.8.2.

6.8.1.4 Scale-Flatness Adjustment

(1) Loosen the three Allen-head screws that hold the scale assembly to the side of the carriage. The scale will pivot slightly around its locating pin.

(2) Manually move the positioner carriage back and forth slowly (at a constant rate) through its full stroke while monitoring the waveform at TP20 (X + 0) (refer to Figure 6-4).

(3) Adjust the horizontal angle of the scale so that the amplitude of the waveform at TP20 remains constant throughout each full stroke of the positioner carriage.

(4) Tighten the three Allen-head screws loosened in Step (1).

(5) Perform the X + 0 Gain and Balance adjustment procedure detailed in Paragraph 6.8.1.3.

6.8.2 X + 90 GAIN AND BALANCE

The X + 0 Gain and Balance checks and adjustments in Paragraph 6.8.1 must be performed before the X + 90 Gain and Balance tests. Values given are for all versions of the D3000 with values for 200 tpi models parenthetically stated.

6.8.2.1 Test Configuration

(1) Prepare the positioner and oscilloscope as described in Paragraph 6.7.1.

(2) (200 tpi Only). Install a jumper between TP1 on the Servo PCBA and TP4 on the Temperature And Write Compensation PCBA.

(3) (200 tpi Only). Remove connector J215 from the Servo PCBA.

(4) Connect oscilloscope Channel 1 X10 test probe to TP2. Connect ground lead to TP1.

(5) Set oscilloscope Channel 1 sensitivity to 0.2v per division.

(6) Set horizontal sweep rate to 2 μsec per division.

(7) Set oscilloscope trigger control to Line and Auto.

(8) Manually load the heads onto the disk.

NOTE

A ground reference sweep trace is obtained by centering the trace on a particular graticule line with the vertical input mode switch of the oscilloscope set to ground position.

6.8.2.2 Test Procedure

(1) Manually move the positioner carriage slowly, and at a constant rate, back and forth through its full stroke, i.e., cylinder 000 to cylinder 202 (cylinder 000 to 405 for 200 tpi). Do not unload the heads rom the disk.

(2) Monitor TP2 on oscilloscope Channel 1 and observe the X+90 Position Quadrature waveform shown in Figure 6-4 as the positioner is being moved. The peak-to-peak voltage observed throughout the full stroke of the positioner must fall within the acceptable limits listed in Step (3). If the acceptable limits are exceeded perform the adjustment procedure detailed in Paragraph 6.8.2.3.

(3) Acceptable limits:

- 13.2v (maximum) peak-to-peak
- 10.8v (minimum) peak-to-peak

6.8.2.3 Adjustment Procedure

(1) Adjust potentiometer R226 (X+90 Gain) to attain a 12v peak-to-peak sine wave at TP2 on the oscilloscope screen while the positioner carriage is being slowly moved back and forth through its full stroke by hand.

NOTE

Clockwise rotation of R226 will increase amplitude.

(2) Adjust potentiometer R79 (X+90 Balance) to center the sine wave equally about ground. If required, reposition the ground-referenced sweep trace to the center graticule line.

(3) Perform X+0 and X+90 Signal Polarity and Quadrature check detailed in Paragraph 6.8.3.

6.8.3 X+0 AND X+90 SIGNAL POLARITY AND QUADRATURE CHECK

The following procedure will verify the correct polarity of the X+0 and X+90 signals and their correct phase relationship.

6.8.3.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.7.1.

(2) Set the oscilloscope to the chopped mode.

(3) Connect Channel 2 X10 test probe to TP13.

(4) Connect Channel 1 X10 test probe to TP20.

(5) Set Channel 1 sensitivity to 0.2v per division.

(6) Set Channel 2 sensitivity to 0.2v per division.

(7) Position the ground-referenced sweep trace of both channels to the center graticule line.

6.8.3.2 Test Procedure

(1) Observe the signal at TP13 on Channel 2 while manually moving the positioner carriage through its full stroke.

NOTE

Channel 2 output should be a digital signal of approximately 0v to 5v. If the digital signal cannot be observed, repeat the X+90 Balance procedure detailed in Paragraph 6.8.2.

(2) Readjust the sensitivity of Channel 2 to 0.5v per division.

(3) Set Channel Select switch to Add mode (Channel 1 plus Channel 2).

(4) Sync internally off of Channel 1 on the positive portion of the analog signal.

(5) Manually move the positioner carriage back and forth, at a constant rate, through its full stroke.

(6) Observe that the X + 90 digital signal, added to the X + 0 analog signal, appears on the positive and negative peaks of the sine wave as illustrated in Figure 6-5.

(7) While moving the positioner carriage forward (toward the spindle) verify that the added digital signal (X + 90) has its trailing edge on the positive peak of the sine wave (see Figure 6-5).

NOTE

The signal observed might not be balanced about ground due to adding the two signals together.

(8) If the trailing edge of the digital signal is not on the positive peak of the sine wave, or the oscilloscope pattern does not correlate with Figure 6-5, perform the adjustment procedure detailed in Paragraph 6.8.3.3.

6.8.3.3 Adjustment Procedure

CAUTION

IN PERFORMING THIS PROCEDURE, DO NOT LOOSEN THE ALLEN-HEAD SCREW THAT CLAMPS THE THERMAL BLOCK TO THE BASE CASTING.

(1) Loosen the horizontal hex-head screw on the thermal block. This will loosen the receiver post upon which the reticle is mounted.

(2) Check that the reticle arm is approximately at right angles to the scale.

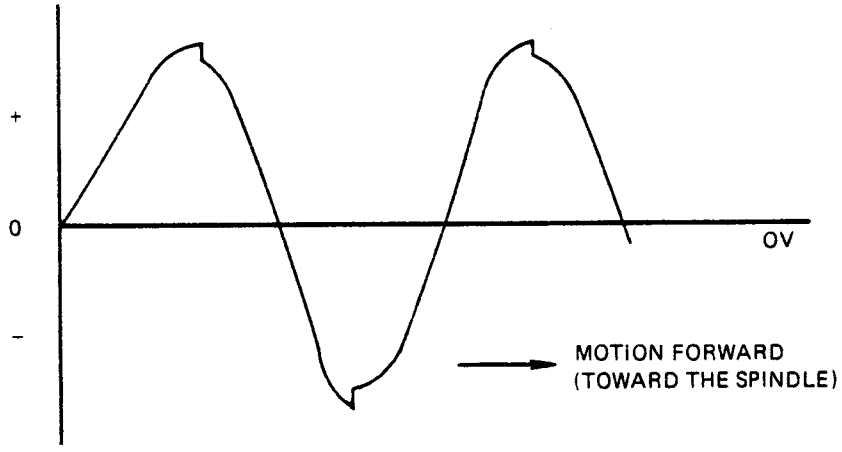


Figure 6-5. X + 0 Analog Signal Added to X + 90 Digital Signal

(3) Manually move the positioner carriage back and forth through its full stroke, while monitoring the waveform at TP13 and TP20. At the same time (using a wide-edge screwdriver in the grooves provided at the top of the receiver post) rotate the reticle CW or CCW until the waveform of Figure 6-5 is achieved.

NOTE

If more than one peak is seen on the oscilloscope screen, choose the peak with the greatest amplitude corresponding to the correct location of the 'Step.'

(4) Partially tighten the hex-head screw, loosened in Step (1), to the point where self-rotation of the receiver post is inhibited.

NOTE

This prepares the receiver post for the Dynamic Reticle-to-Scale Adjustment contained in Paragraph 6.9.3.

(5) Perform the Heads Retracted Signal Check described in Paragraph 6.8.4.

6.8.4 HEADS RETRACTED SIGNAL CHECK

The Heads Retracted Signal Check is made to acertain the approximate position at which the signal occurs and to determine if the voltages generated are within acceptable limits and have the correct polarity.

6.8.4.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.7.1.
(2) Connect Channel 1 test probe to TP6.
(3) Connect Channel 2 test probe to TP14.
(4) Set Channel 1 sensitivity to 0.5v per division.
(5) Set Channel 2 sensitivity to 0.2v per division.
(6) Use automatic or normal sync, internal trigger mode, and trigger on positive slope.
(7) Set sweep rate to 20 msec per division.
(8) Manually load the heads onto the disk.

6.8.4.2 Test Procedure

(1) Move the positioner carriage to its fully retracted position. Note that the spindle speed decreases as the heads are unloaded.
(2) Select Channel 1.
- Check that the ac level of the signal at TP6 is ≤ -2v (refer to Figure 6-4).
- Slowly move the positioner carriage approximately ½-inch toward the spindle and at the same time observe that the signal at TP6 changes in dc level from ≤ -2v to $\geq +2$v.
- Continue to move the positioner carriage slowly toward the spindle all the way to the front stop. Check that the signal voltage remains at $\geq +2$v as shown in Figure 6-4.

NOTE

There may be some crosstalk present on the signal; however, the voltage tolerances specified above must be met.

(3) Select Channel 2.

- Return the positioner carriage to its fully retracted position.
- Observe that the digital signal at TP14 is a high state.
- Slowly move the positioner carriage approximately ½-inch toward the spindle and at the same time observe that the digital signal at TP14 changes from a high to a low state.
- Continue to move the positioner carriage slowly toward the spindle, all the way to the front stop. Note that the signal always remains in the low state.

NOTE

If the limits in Paragraph 6.8.4.2, Steps [2] and [3] are exceeded, refer to the Adjustment Procedure in Paragraph 6.8.4.3.

(4) Perform the Index Balance procedure detailed in Paragraph 6.8.5.

6.8.4.3 Adjustment Procedure

Repeat the tests and adjustment procedures contained in Paragraphs 6.7.1 through 6.8.4.2. In the event that test limits given in Paragraph 6.8.4.2 are exceeded after repeating the foregoing tests and adjustments, replacement of the scale or reticle assembly or the Servo PCBA may be required.

6.8.5 INDEX BALANCE

The index area is located very close to where the heads are either loaded on or unloaded from the ramp. This load/unload position is within 6.35 mm (¼-inch) from the outside rim of the disk.

6.8.5.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.7.1.

(2) Connect Channel 1 probe to TP3.

(3) Position Channel 1 ground-referenced sweep trace to the center line of graticule.

(4) Connect Channel 2 probe to TP7.

(5) Set Channel 1 sensitivity to 0.5v per division.

(6) Set Channel 2 sensitivity to 0.2v per division.

(7) Use automatic or normal sync, internal trigger mode, and trigger on positive slope.

(8) Set sweep rate to 20 msec per division.

6.8.5.2 Test Procedure — Channel 1

(1) Select Channel 1.

(2) Within the first ¼-inch after the heads are loaded onto the disk index area, manually move the positioner carriage back and forth.

(3) Check that the signal at TP3 changes from $\geq +2$v to ≤ -2v (refer to Figure 6-4). Adjust potentiometer R98 (Index Balance) to obtain these values.

NOTE

Clockwise adjustment of R98 will bias the signal more positive.

(4) Continue to adjust R98 until the transition region is approximately centered about ground.

NOTE

If crosstalk is observed, R98 must be adjusted to ensure that it does not exceed the limits specified in Step [3].

(5) Fully retract positioner carriage.

(6) Slowly move the positioner carriage approximately ½-inch closer toward the spindle.

(7) Observe on Channel 1 at TP3 a signal change from $\leq -2v$ to $\geq +2v$ (refer to Figure 6-4).

(8) Moving the positioner carriage further forward toward the spindle through the index area (heads now loaded) will again reverse the signal from $\geq +2v$ to $\leq -2v$.

(9) Check that the signal remains at $\leq -2v$ as the positioner carriage is moved through the full stroke and that this condition is maintained to a point just prior to touching the front end of the positioner assembly at approximately cylinder 203 (cylinder 406 for 200 tpi).

(10) Note that at approximately the point where the positioner carriage touches the front end of the positioner, which is approximately cylinder 204 (cylinder 408 for 200 tpi), the signal reverses once again $\leq -2v$ to $\geq +2v$. Also observe that at each transition point only a single transition from high to low or low to high occurs.

NOTE

If a transition does not occur, adjustment of the transducer assembly position is required. Refer to Paragraph 6.8.5.4 for adjustment procedure.

6.8.5.3 Test Procedure — Channel 2

(1) Select oscilloscope Channel 2.

(2) Fully retract positioner carriage to the back stop.

(3) Slowly move the positioner carriage ½-inch toward the spindle.

(4) Observe on Channel 2 that the digital signal at TP7 changes from a low to a high state.

(5) Observe, as the positioner carriage is moved forward through the index area (head now loaded), the signal changes from a high to a low state.

(6) Observe that the signal remains low as the positioner carriage is moved further toward the spindle. Ensure that this condition is maintained to a point just prior to touching the front end of the positioner assembly.

(7) At approximately the end of the forward stroke of the positioner, the signal reverses again from a low to a high state. Also note that at each transition point only a single transition of the logic state, from low to high or from high to low, occurs.

NOTE

When the foregoing tests are satisfied, perform the Velocity Transducer Phasing procedure detailed in Paragraph 6.8.6.

6.8.5.4 Adjustment Procedure

In the event that the voltage transitions do not occur according to the tests performed in Paragraph 6.8.5.2 and 6.8.5.3, repeat the test and adjustment procedures detailed in Paragraphs 6.7 through 6.8.5.4.

6.8.6 VELOCITY TRANSDUCER PHASING

This test will establish if the connections to the velocity transducer are correctly phased.

6.8.6.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.7.1.
(2) Connect Channel 1 test probe to TP16.
(3) Set Channel 1 gain to 0.02v per division. Ensure that the polarity switch is set to the positive position.
(4) Position Channel 1 ground-referenced sweep trace to the center line of graticule.
(5) Set sweep rate to 20 msec per division.
(6) Use automatic sync mode and internal trigger.

6.8.6.2 Test Procedure

(1) Manually move the positioner carriage such that the heads remain loaded and do not come closer than one inch from the end of the platter.
(2) Select Channel 1.
(3) Monitor signals at TP16. Check that the waveform at TP16 goes negative with respect to ground when the positioner carriage is moved forward toward the spindle.
(4) Return the positioner carriage to its fully retracted position.

NOTE

If the waveform at TP16 does not meet the conditions in Step [3], perform the adjustment procedure in Paragraph 6.8.6.3.

(5) Perform the Positioner Voice Coil Polarity procedure contained in Paragraph 6.8.7.

6.8.6.3 Adjustment Procedure

If the waveform observed in Step (3) of Paragraph 6.8.6.2 at TP16 goes positive with respect to ground when the positioner carriage is moved toward the spindle, proceed as follows.

(1) Perform the Power-Down procedure detailed in Paragraph 6.8.8.
(2) Reverse the wiring to pins 49 and 9 on connector J203 on the Servo PCBA.
(3) Repeat the test procedure contained in Paragraph 6.8.6.2.

6.8.7 POSITIONER VOICE COIL POLARITY CHECK

This test will establish that the electrical connections to the positioner voice coil have the correct polarity.

6.8.7.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.7.1.

(2) Connect the Voice Coil Polarity tester (PERTEC Part No. 103607) onto connector J205.

(3) Maintain the disk drive in the operating mode with the heads loaded onto the disk.

6.8.7.2 Test Procedure

(1) Manually move the positioner carriage forward toward the spindle in a brisk manner. Observe that the red indicator on the voice coil polarity tester becomes illuminated. Also note that the red indicator becomes extinguished and remains extinguished as the positioner carriage is moved away from the spindle.

NOTE

If the red indicator on the voice coil polarity tester remains extinguished when the positioner carriage is moved toward the spindle and becomes illuminated when the positioner carriage is moved away from the spindle, perform the adjustment procedure in Paragraph 6.8.7.3.

(2) Return the carriage to the retracted position.

(3) Remove power from the disk drive.

(4) Disconnect the voice coil polarity tester from connector J205.

6.8.7.3 Adjustment Procedure

(1) Reverse the wiring at J205 between pins 1 and 4, and between pins 2 and 5.

(2) Check operation by repeating the test procedure in Paragraph 6.8.7.2.

(3) Perform the Power-Down procedure detailed in Paragraph 6.8.8.

6.8.8 POWER-DOWN PROCEDURE

It is important that the Dynamic Positioner Adjustments detailed in Paragraph 6.9 and the Performance Checks detailed in Paragraph 6.10 be performed subsequent to performing the Static Positioner Adjustments specified in Paragraph 6.8.

(1) Manually return the positioner carriage to its fully retracted position.

(2) Place the power ON/OFF switch to the OFF position.

(3) Replace the Read/Write PCBA.

(4) Remove the emergency unload connector J128 from the Logic PCBA.

(5) (200 tpi Only). Remove the jumper between TP1 on the Servo PCBA and TP5 on the Temperature And Write Compensation PCBA.

(6) Replace connector J205 and/or connector J215 on the Servo PCBA.

(7) Complete the Dynamic Positioner adjustments detailed in Paragraph 6.9.

6.9 DYNAMIC POSITIONER ADJUSTMENTS

The dynamic tests and adjustments required to ensure proper operation of the Positioner Servo are contained in the following paragraphs. Although these tests and adjustments may be performed independent of the static tests and adjustments, they must be performed when the procedures contained in Paragraph 6.8 are performed.

6.9.1 POSITIONER PREPARATION, DYNAMIC TESTS

The following functions are required to prepare the positioner for calibration.

(1) Remove power from the disk drive.

(2) Verify that connector J205 is connected to the Servo PCBA.

(3) Remove Emergency Unload jumper plug J128 from the Logic PCBA.

(4) Remove the interface connector and terminator board from connectors J101 and J102 located on the Logic PCBA.

(5) Install PERTEC Hand-Held Exerciser Model TE-D01 (or equivalent) into interface connector J101.

(6) (200 tpi Only). Connect a jumper between TP1 on the Servo PCBA and TP5 on the Temperature and Write Compensation PCBA.

(7) (200 tpi Only) Disconnect connector J215 from the Servo PCBA.

(8) Apply power to the disk drive and allow it to come SAFE.

(9) Insert a disk cartridge into the disk drive.

(10) Depress the RUN/STOP switch once and observe that the positioner loads the heads after approximately 33 seconds.

(11) Observe that the disk drive comes to READY in approximately 57 seconds.

NOTE

The READY light may be delayed 3 or 6 minutes, depending on the options installed in the disk drive.

CAUTION

ALL DYNAMIC CALIBRATION TESTS REQUIRE THAT THE DISK DRIVE ROTATE THE DISKS AT THEIR DESIGN SPEED; OPERATION AT ANY OTHER SPEED CAN CAUSE DAMAGE TO DISK RECORDING SURFACES AND HEADS.

6.9.2 DYNAMIC ADJUSTMENTS

6.9.2.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.9.1.

(2) Set the oscilloscope as follows.

- Set Channel 1 sensitivity to 0.2v per division.
- Connect Channel 1 X10 test probe to TP20 (X +0).
- Set Channel 2 sensitivity to 0.01v per division.
- Connect Channel 2 X10 test probe to TP16 (velocity feedback).
- Using a X10 probe, connect oscilloscope External Trigger Input to TP12 (busy time F/F) on the Logic PCBA.
- Set the horizontal sweep rate to 0.5 msec per division.
- Use normal sync, external trigger mode, and trigger slope negative.

(3) Set the disk exerciser to the DN mode.

(4) Set the disk exerciser to perform a one-track repetitive seek from cylinder 000 to cylinder 001.

6.9.2.2 Test Procedure

(1) Select Channel 1.

(2) Observe the amplitude of the waveform at TP20 as shown in Figure 6-6 while performing a one-track repetitive seek.

NOTE

Careful observation of the X + 0 signal at TP20 will show a small disturbance near the forward and reverse waveform peaks. This disturbance is normal and occurs at the point where the Servo switches into the Position mode.

(3) Acceptable limits:

- 13.2v (maximum)
- 10.8v (minimum)

(4) If the acceptable limits are not met, perform the adjustment given in Paragraph 6.9.2.3, Step (1), before continuing this procedure.

(5) Check that the waveform at TP20 is balanced about ground as shown in Figure 6-6.

(6) If the waveform observed in Step (5) is not balanced about ground, perform the adjustment given in Paragraph 6.9.2.3, Step (2), before continuing this procedure.

(7) Check that the start of the waveform is balanced about ground as shown in Figure 6-6.

(8) If the start of the waveform observed in Step (7) is not balanced about ground, perform the adjustment given in Paragraph 6.9.2.3, Step (3), before continuing this procedure.

(9) Select Channel 2.

(10) Observe that the start of the waveform at TP16 is balanced about ground as shown in Figure 6-7.

(11) If the start of the waveform observed in Step (10) is not balanced about ground, perform the adjustment given in Paragraph 6.9.2.3, Step (4), before continuing this procedure.

(12) Set oscilloscope to Chop mode.

(13) Repeat Paragraphs 6.9.2.2, Steps (7) and (10), and observe TP20 (Figure 6-6) and TP16 (Figure 6-7) at the same time, alternately adjusting R22 and R204 so that the start of waveforms at TP20 and TP16, respectively, are balanced about ground.

(14) Select Channel 1.

(15) Move Channel 1 test probe to TP2.

(16) Observe the amplitude of the waveform at TP2 (Figure 6-8) while performing a one-track repetitive seek.

(17) Acceptable limits:

- 13.2v (maximum)
- 10.8v (minimum)

(18) If the acceptable limits are not met, perform the adjustment given in Paragraph 6.9.2.3, Step (5), before continuing this procedure.

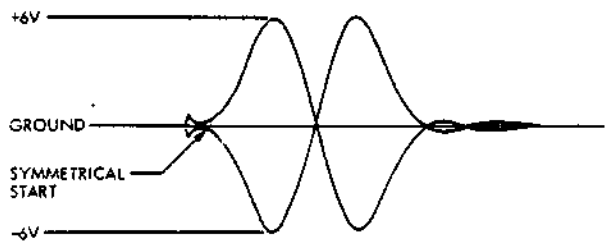


Figure 6-6. X + 0 Waveform, One-Track Repetitive Seek (TP20)

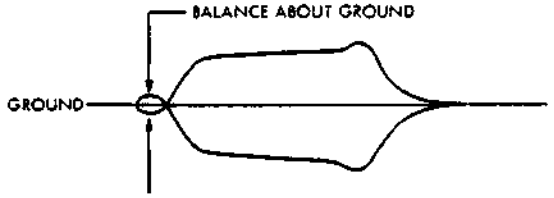
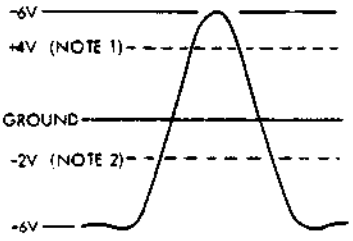


Figure 6-7. Balanced Waveform, One-Track Repetitive Seek (TP16)



NOTE:
1. DO NOT ADJUST WAVEFORM PEAK BELOW THIS LIMIT.
2. DO NOT ADJUST WAVEFORM BASE ABOVE THIS LIMIT.

Figure 6-8. Analog Waveform Limits, One-Track Repetitive Seek (TP2)

(19) Check that the waveform is balanced about ground as shown in Figure 6-8.

(20) If the waveform observed in Step (19) is not balanced about ground, perform the adjustment procedure given in Paragraph 6.9.2.3, Step (6), before continuing this procedure.

(21) Move Channel 1 test probe to TP20.

(22) Observe that the waveform at TP20 is symmetrical about ground as shown in Figure 6-9A; Figure 6-9B is given as an example of unbalanced crossover points.

(23) If the crossover point observed in Step (22) does not occur at ground, perform the Dynamic Reticle-to-Scale Phase Adjustment procedure detailed in Paragraph 6.9.3 before continuing this procedure.

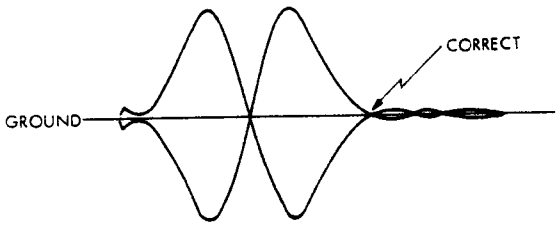
(24) Check that the X + 0 waveform at TP20 meets all requirements shown in Figure 6-6, i.e., waveform amplitude, symmetrical start, waveform balanced about ground, correct crossover point. If the waveform observed does not meet these requirements, repeat Steps (1) through (24) of this procedure.

(25) If the Static Positioner Adjustments (Paragraph 6.8) were performed prior to performing the Dynamic Positioner Adjustments (Paragraph 6.9), tighten the hex-head screw on the thermal block loosened in Paragraph 6.8.3.3, Step (1).

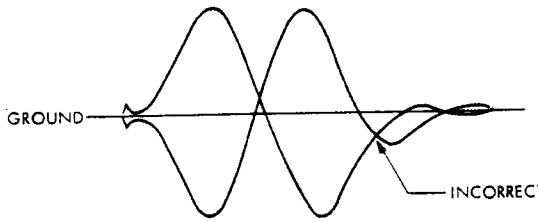
NOTE

Ensure by observing the waveform on TP20, that tightening the hex-head screw on the thermal block has not disturbed or altered the crossover point.

(26) Proceed with the Current Adjustment in Paragraph 6.9.4.



A. CROSSOVER CORRECTLY OCCURING AT GROUND



B. CROSSOVER INCORRECTLY OCCURING BELOW GROUND

Figure 6-9. X + 0 Waveform Crossover

6.9.2.3 Adjustment Procedure

The following adjustments are directly referenced in Paragraph 6.9.2.2 and should be performed only as specified in Paragraph 6.9.2.2.

(1) Observe TP20 and set R69 to attain a 12v peak-to-peak envelope.

(2) Observe TP20 and set R70 so that the waveform is balanced about ground (Figure 6-6).

(3) Observe TP20 and set R22 so that the start of the waveform is balanced about ground (Figure 6-6).

(4) Observe TP16 and set R204 so that the start of the waveform is balanced about ground (Figure 6-7).

(5) Observe TP2 and set R226 so that the amplitude of the waveform is 12v peak-to-peak.

(6) Observe TP2 and set R79 so that the waveform is balanced about ground (Figure 6-8).

6.9.3 DYNAMIC RETICLE-TO-SCALE PHASE ADJUSTMENTS

Adjustment of the reticle is required when the Position mode waveform (Figure 6-9(A)) does not have the crossover point at ground.

CAUTION

ONLY A SLIGHT ADJUSTMENT OF THE ANGLE BETWEEN THE RETICLE AND THE SCALE OF THE POSITION TRANSDUCER IS REQUIRED . OVER-ADJUSTMENT WILL CAUSE LOSS OF POSITION TRANSDUCER SIGNALS AND ALLOW THE POSITIONER TO GO UNCONTROLLED; PERFORM THE SIGNAL POLARITY AND QUADRATURE CHECKS IN PARAGRAPH 6.8.3.

6.9.3.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.9.1.

(2) Establish oscilloscope settings as follows.

- Set Channel 1 sensitivity to 0.2v per division.
- Connect Channel 1 test probe to TP20.
- Set horizontal sweep rate to 0.5 msec per division (or to a time base where the waveform can easily be observed).

6.9.3.2 Test Procedure

(1) Set exerciser for a 000 to 001 track seek.

(2) Set exerciser to DN mode.

(3) Slightly loosen the horizontal hex-head screw at the base of the receiver post. This will allow the receiver post to be rotated horizontally.

6.9.3.3 Adjustment Procedure

(1) Insert a screwdriver blade into the slot at the top of the receiver post and adjust the reticle so that the waveform observed at TP20 is positioned with its crossover point (Figure 6-9(A)) at ground.

(2) Observe the amplitude of the waveform at TP20 (Figure 6-6).

(3) Acceptable limits:

- 13.2v (maximum)
- 10.8v (minimum)

(4) If the acceptable limits are not met, adjust R69 to obtain a 12v peak-to-peak envelope at TP20.

(5) Check that the waveform at TP20 is balanced about ground as shown in Figure 6-6.

(6) If the waveform at TP20 is not balanced about ground, adjust R70 until the observed waveform is balanced about ground.

(7) Check that the start of the waveform at TP20 is symmetrical about ground as shown in Figure 6-6.

(8) If the waveform is not symmetrical about ground, adjust R22 so that the start of the waveform viewed at TP20 is symmetrical about ground.

(9) Select Channel 2 and check that the start of the waveform at TP16 is symmetrical about ground.

(10) If the start of the waveform (as shown in Figure 6-7) is not symmetrical, adjust R204 to obtain the correct waveform.

(11) Tighten the hex-head screw loosened in Paragraph 6.9.3.2, Step (3). Check the waveform at TP20 to ensure that tightening the hex-head screw has not disturbed or altered the crossover point.

6.9.4 CURRENT ADJUSTMENT

Values are given for all versions of the D3000 with values for 200 tpi models parenthetically stated.

The following current adjustment procedure is made to ensure that the positioner carriage will perform a 67-track seek within an average time interval of 35 msec (or 134-track seek within an average time interval of 38 msec for 200 tpi models).

6.9.4.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.9.1.

(2) Set the oscilloscope as follows.

- Set the Channel 1 sensitivity to 0.02v per division.
- Set the sweep rate to 1 msec per division.
- Connect Channel 1 X10 test probe to TP15.

(3) Set the disk exerciser to produce a 67-track (134-track for 200 tpi) repetitive seek from cylinder 000 to cylinder 067 (134 for 200 tpi).

(4) Set the disk exerciser to DN mode.

6.9.4.2 Test Procedure

(1) Select Channel 1

(2) Observe the current waveform at TP15 (Figure 6-10).

(3) Acceptable limits:

- 1.46v (maximum)
- 1.34v (minimum)

(4) If the acceptable limits of the waveform at TP15 are not met, the adjustment procedure detailed in Paragraph 6.9.4.3 must be performed.

6.9.4.3 Adjustment Procedure

(1) Observe the current waveform at TP15.

(2) Adjust potentiometer R111 until the waveform observed has a peak-to-peak amplitude of 1.40v (Figure 6-10).

6.9.5 SEEK-TIME ADJUSTMENT

6.9.5.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.9.1.

(2) Set the oscilloscope as follows.

- Set Channel 1 sensitivity to 0.2v per division.
- Set sweep rate to 5 msec per division.
- Connect Channel 1 X10 test probe to TP16 on the Servo PCBA.

6.9.5.2 Test Procedure

(1) Using the oscilloscope Channel 1 test probe, observe that the waveform at TP16 appears as shown in Figure 6-11.

(2) If the waveform at TP16 does not appear as shown in Figure 6-11, perform the adjustments in Paragraph 6.9.5.3; otherwise, proceed with the Overshoot and Settling Response Tests in Paragraph 6.9.6.

6.9.5.3 Adjustment Procedure

(1) Observe the waveform at TP16.

(2) Adjust potentiometer R55 to obtain an average forward-and-reverse seek time of 35 msec (38 msec for 200 tpi).

NOTE

Average seek time is the average between the forward and reverse strokes; see Figure 6-11.

(3) If the average seek time in Step (2) cannot be attained, perform the Current Adjustment procedure in Paragraph 6.9.4.

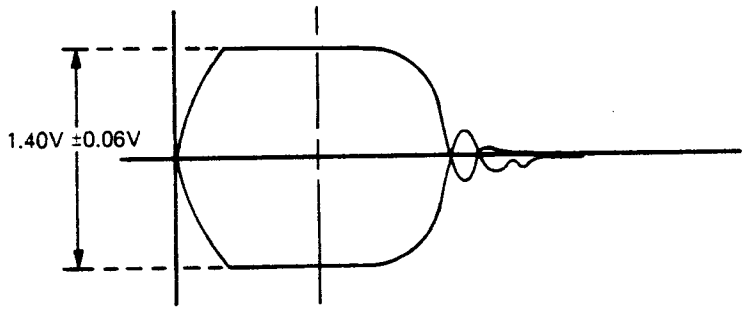
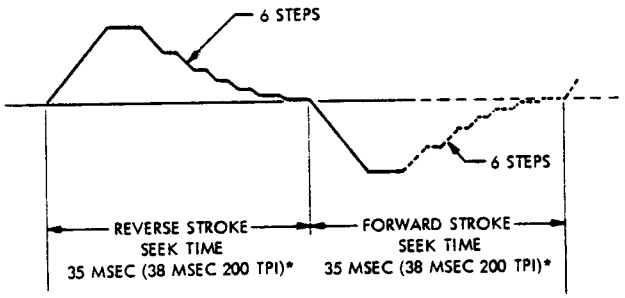


Figure 6-10. Current Waveform After Adjustment of R111



*AVERAGE TIME

Figure 6-11. Velocity Feedback Waveform, TP16

6.9.6 OVERSHOOT TEST PROCEDURE

The following steps are used to measure the overshoot of the positioner.

6.9.6.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.9.1.

(2) Set the oscilloscope as follows.

- Set Channel 1 sensitivity to 0.2v per division.
- Connect Channel 1 test probe to TP20 (X + 0).
- Connect EXT trigger 2 X10 test probe to TP12 on the Logic PCBA (Busy Signal NLBSXG).
- Set sweep rate to 5 msec per division.
- Use normal sync, external.

(3) Set the disk exerciser as follows.

- Set data mode switch to DN.
- Perform a one-track repetitive seek between tracks 000—001.

6.9.6.2 Test Procedure

(1) Observe the waveforms at TP20; refer to Figure 6-12.

(2) If overshoot exceeds ±2v, or excessive undershoot is evident, perform Overshoot Adjustment detailed in Paragraph 6.9.7.

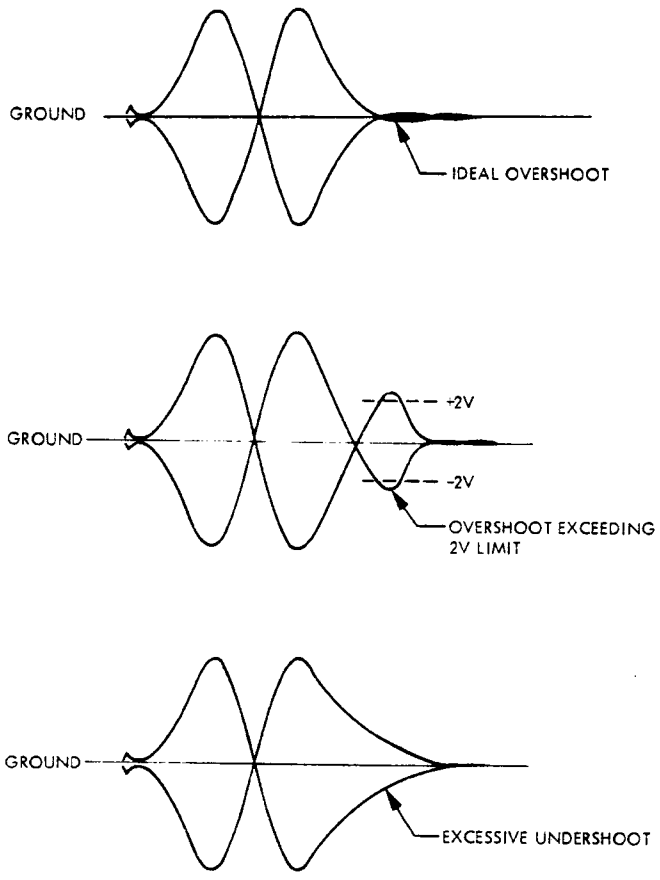


Figure 6-12. X + 0 Waveforms 000—001 Repetitive Track Seek (TP20)

6.9.7 OVERSHOOT ADJUSTMENT PROCEDURE

The following steps are used to adjust the overshoot of the positioner.

6.9.7.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.9.1.

(2) Set the oscilloscope as follows.

- Set Channel 1 sensitivity to 0.2v per division.
- Connect Channel 1 X10 test probe to TP20.
- Set Channel 2 sensitivity to 0.2v per division.
- Connect Channel 2 X10 test probe to TP2.
- Using a X10 probe, connect external trigger input to TP12 on the Logic PCBA.
- Set sweep rate to 1 msec per division.
- Use normal sync, external trigger mode, and trigger slope negative.

(3) Set the disk exerciser to perform a one-track repetitive seek from cylinder 000 to cylinder 001.

6.9.7.2 Adjustment Procedure

(1) Select Chopped mode on the oscilloscope.

(2) Observe waveforms at TP20 (Figure 6-6) and TP2 (Figure 6-8) while performing one-track seek.

(3) While adjusting R79 for minimum overshoot (Figure 6-12), ensure that the positive peak of the waveform at TP2 is >+4v and that the negative excursion is >−2v (Figure 6-8).

6.9.8 INDEX TO QUADRATURE CLOCK RELATIONSHIP

This adjustment is used to correctly establish the relationship between the trailing edge of the Quadrature Clock (SPQCG) with respect to the trailing edge of the Index Logic Signal (SPTIG) as shown in Figure 6-13.

6.9.8.1 Test Configuration — Step 1

(1) Set the oscilloscope as follows.

- Set sensitivity of both channels to 0.2v per division.
- Connect Channel 1 test probe to TP7.
- Connect Channel 2 test probe to TP13.
- Sync internal on Channel 1, use positive trigger slope.
- Set sweep rate to 1 msec per division.
- Set channel select switch to Chopped mode.

(2) Set exerciser to operate in the repetitive restore mode.

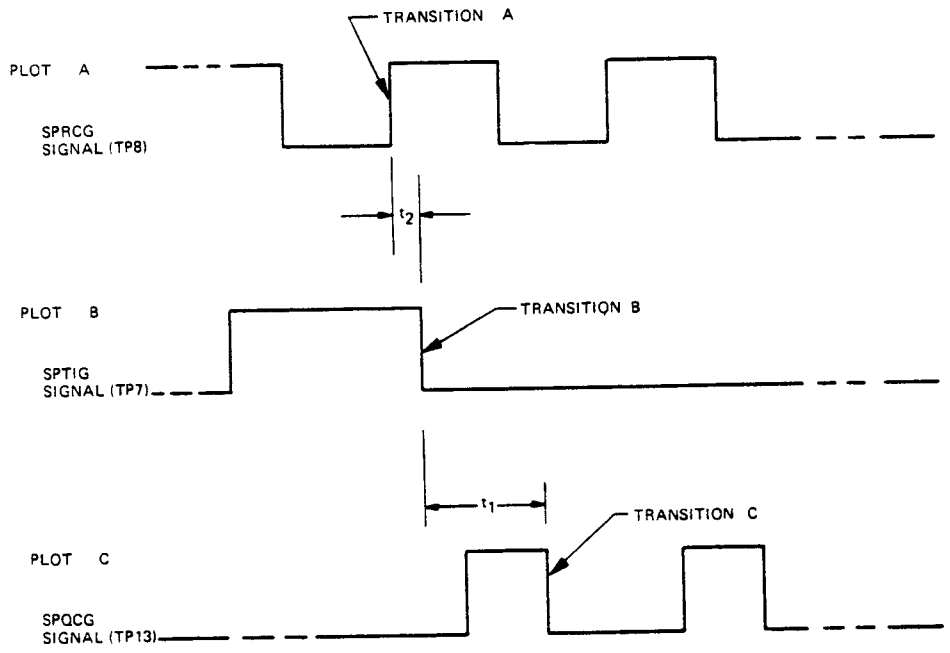


Figure 6-13. SPRCG, SPTIG, SPQCG Signals, Repetitive Restore Mode

6.9.8.2 Test Procedure — Step 1

(1) Observe the relative position of the high-to-low transition of signal SPQCG on Channel 2 (TP13) in relation to the high-to-low transition of signal SPTIG on Channel 1 (TP7). The waveform relationship must be approximately as shown Figure 6-13, Plots B and C.

NOTE

There must be exactly two high-to-low transitions of SPQCG signal after the high-to-low transition of SPTIG signal. However, there can be one or two low-to-high transitions of SPQCG after the high-to-low transition of SPTIG.

(2) Connect Channel 2 test probe to TP8. Observe SPRCG on Channel 2 in relation to the high-to-low transition of SPTIG (see Figure 6-13, Plots A and B).

NOTE

After the high-to-low transition of SPTIG, there must be exactly one low-to-high transition and either one or two high-to-low transitions of SPRCG.

NOTE

When this procedure is performed on 200 tpi models, stable nulls for either of two distinct tracks may result. A CE check should be made after performing an index adjustment. If the CE track has shifted and fixed disk information is not required, readjust the heads. If fixed disk information is required, readjust the index.

(3) The high-to-low transition of SPTIG (Transition B of Figure 6-13) should occur at or after the low-to-high transition of SPRCG (Transition A of Figure 6-13), i.e., time t_2 should be greater than or equal to zero seconds.

(4) If the requirements of Steps (1), (2), and (3) are not satisfied, perform the adjustment procedure outlined in Paragraph 6.9.8.3, then repeat the foregoing steps prior to continuing this procedure. If adjustments to satisfy the above requirements cannot be made, replacement of position transducer scale may be necessary.

(5) Change the oscilloscope settings established in Paragraph 6.9.8.1, as follows.

- Connect Channel 2 test probe to TP13.
- Sync internal on Channel 1, use negative trigger slope.

NOTE

It may be necessary to change the sweep rate to a more desirable setting.

(6) Observe the first high-to-low transition of SPQCG (TP13) with respect to the high-to-low transition of SPTIG (TP7) signal; see Figure 6-14.

NOTE

The high-to-low transition of SPQCG [Transition C of Figure 6-14] should occur after a time delay [t_1] of 200 μsec or greater, after the occurrence of high-to-low transition of SPTIG [Transition B of Figure 6-14]. See Figure 6-13, Plots B and C, and Figure 6-14.

6.9.8.3 Adjustment Procedure — Step 1

(1) Adjust Index Balance potentiometer R98 to position the trailing edge of SPTIG (TP7) to occur prior to the trailing edge of SPQCG (TP13) as shown in Figure 6-13.

(2) Change the oscilloscope settings established in Paragraph 6.9.9.2 as follows.

- Set sweep rate to 50 μsec per division.
- Sync internal on Channel 1, use negative trigger slope.

(3) Continue to adjust potentiometer R98 so that the high-to-low transition of SPTIG occurs approximately 200 μsec or more before the high-to-low transition of SPQCG as shown in Figure 6-14.

NOTE

Change sweep rate if required.

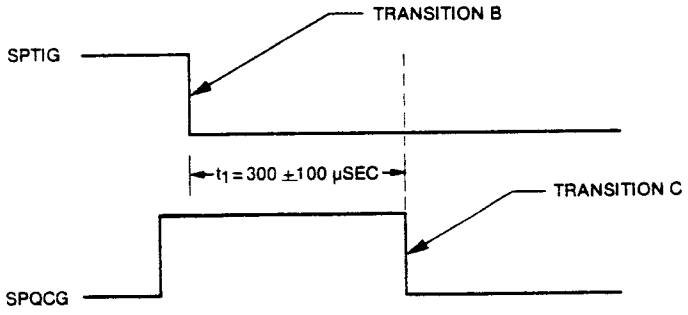


Figure 6-14. Correct Relationship Between SPQCG and SPTIG Signals, Expanded

6.9.8.4 Test Configuration — Step 2

(1) Set oscilloscope as follows.

- Set Channel 1 sensitivity to 0.5v per division.
- Connect Channel 1 test probe to TP3.
- Set sweep rate to 1 msec per division.
- Sync internal on Channel 1, use positive trigger slope.
- Set Channel 1 ground-referenced sweep trace to the center line of graticule.

(2) The exerciser remains operating in the repetitive restore mode.

6.9.8.5 Test Procedure — Step 2

(1) Select Channel 1.

(2) Observe that the Index signal at TP3 has a minimum of ±2.0v transition about ground as shown in Figure 6-15.

(3) If the waveform observed at TP3 is within limits, perform the Overshoot and Settling Response procedure detailed in Paragraph 6.9.9. If the observed waveform does not fall within the specified limits, perform the adjustments in Paragraph 6.9.8.6.

6.9.8.6 Adjustment Procedure — Step 2

(1) Adjust the Index Balance potentiometer R98 to obtain a minimum of ±2.0v transition of the index waveform about ground as shown in Figure 6-15.

(2) Ensure that the relationship between SPQCG and SPTIG established in Paragaph 6.9.8.3, Step (3), is maintained.

(3) Repeat the Index Balance Test Procedure, Paragraph 6.8.5.2.

(4) Select Channel 1.

(5) Fully retract the positioner carriage.

(6) Slowly move the positioner carriage toward the spindle and observe that the steady state of the waveform is >+2v and <—2v (refer to Figure 6-4).

NOTE

If crosstalk is observed, it must not appear within the limits specified in Step [6]. If the limits of Step [6] are exceeded, repeat the adjustment procedure in Paragraph 6.9.8.6.

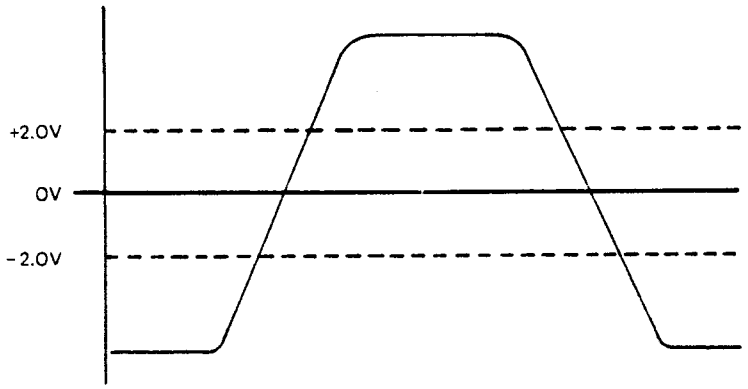


Figure 6-15. Index Signal, TP3, Repe·itive Restore Mode

6.9.9 OVERSHOOT AND SETTLING RESPONSE PROCEDURE

The following steps are used to measure the overshoot and settling response of the positioner.

6.9.9.1 Test Configuration

(1) Prepare the positioner as described in Paragraph 6.9.1.

(2) Set the oscilloscope as follows.

- Set Channel 1 sensitivity to 0.2v per division.
- Connect Channel 1 X10 test probe to TP20.
- Set Channel 2 sensitivity to 0.2v per division.
- Connect Channel 2 X10 test probe to TP12 on the Logic PCBA (Busy Signal NLBSXG).
- Set sweep rate; refer to Table 6-4, Step 1 (Step 7 for 200 tpi).
- Set channel select switch to Chopped mode.
- Set internal sync to Channel 2.

(3) Set disk exerciser as follows.

- Set exerciser to perform repetitive track seek; refer to Table 6-4, Step 1 (Step 7 for 200 tpi).
- Set Data mode switch to R/W.
- Set exerciser to Auto.

Table 6-4

Repetitive Track Seek Settings for Overshoot and Settling Response Tests

Step	Disk Drive Type	Exerciser Track-Seek Range	Oscilloscope Time Base	Seek-Time Limits
1	100 tpi	000 — 001	5 msec/div	< 9 msec
2	100 tpi	100 — 101	5 msec/div	< 9 msec
3	100 tpi	201 — 202	5 msec/div	< 9 msec
4	100 tpi	000 — 067	5 msec/div	<35 msec
5	100 tpi	000 — 202	5 msec/div	<60 msec
6	100 tpi	Increment	2 msec/div	<9 msec
7	200 tpi	000 — 001	5 msec/div	<10 msec
8	200 tpi	200 — 201	5 msec/div	<10 msec
9	200 tpi	404 — 405	5 msec/div	<10 msec
10	200 tpi	000 — 134	5 msec/div	<40 msec
11	200 tpi	000 — 405	10 msec/div	<65 msec
12	200 tpi	Increment	2 msec/div	<10 msec

6.9.9.2 Test Procedure

(1) With the exerciser set to the appropriate track seek, observe both the overshoot and settling response; refer to Figure 6-16.

(2) Check that the overshoot is within ± 2v.

(3) Check that the settling response in the settling band is within ± 0.8v (± 1.2v for 200 tpi).

(4) If either the overshoot or the settling response observed in Steps (2) and (3), are outside the limits specified, perform the adjustments in Paragraph 6.9.9.3.

6.9.9.3 Adjustment Procedure

(1) Move Channel 2 test probe to TP2.

(2) Set channel select switch to Chopped mode.

(3) Using a X10 test probe, connect external trigger input to TP12 on the Logic PCBA.

(4) Use normal sync, external trigger mode, and trigger slope negative.

(5) Set sweep rate according to Table 6-4, Step 1 (Step 7 for 200 tpi).

(6) While observing waveforms at TP2 and TP20 simultaneously (TP2 in Figure 6-8 will be superimposed on TP20 in Figure 6-16), adjust R79 so that the overshoot at TP20 is less than 2v while the waveform at TP2 does not exceed the established limits.

NOTE

For one-track seeks, use Figure 6-8 as a waveform reference to TP2; for longer than one-track seeks, use Figure 6-17.

(7) Repeat the test procedure in Paragraph 6.9.9.2 using Steps 2 through 12 given in Table 6-4.

NOTE

If the adjustment cannot be achieved, replacement of the Positioner Carriage on the Servo PCBA may be required.

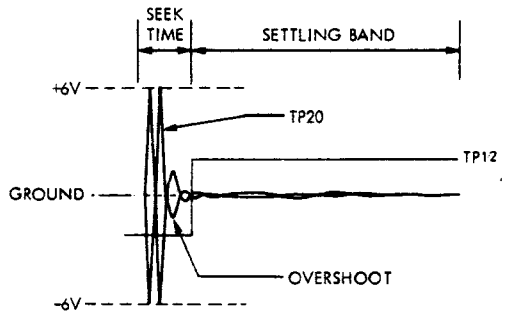
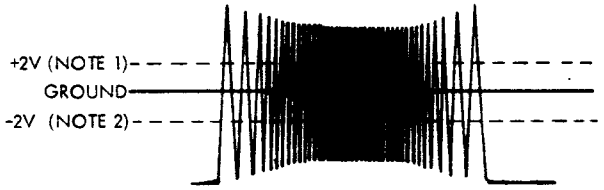


Figure 6-16. X + 0 Overshoot and Settling Response Waveforms



NOTE:
1. POSITIVE ENVELOPE MUST EXCEED +2V.
2. NEGATIVE ENVELOPE MUST EXCEED -2V.

Figure 6-17. X + 90 Waveform for Long Track Seeks

6.10 PERFORMANCE CHECKS

The performance checks detailed in this section should be made after making any positioner adjustments. These checks ensure that the access and settling time of the drive meet the design specifications.

6.10.1 SERVO AND POSITIONER TEST

The tests used to verify the integrity of the position transducer signals, and to confirm the calibration adjustment of the Servo PCBA potentiometers are given in Paragraph 6.9.2 — Dynamic Adjustments, and Paragraph 6.9.9 — Overshoot and Settling Response. These procedures should be performd after making any mechanical or electrical adjustments or alterations to the Servo PCBA or positioner.

6.10.2 SPINDLE SPEED ACCURACY TEST

This test verifies the spindle speed control accuracy and is a functional integrity check of the control loop.

6.10.2.1 Test Configuration

(1) Apply power to the disk drive.

(2) After the SAFE indicator becomes illuminated, insert a disk cartridge into the disk drive.

(3) Actuate the RUN/STOP switch once and observe that the disk drive comes to READY in approximately 57 seconds.

NOTE

The READY light may be delayed 3 or 6 minutes, depending on the options installed in the disk drive.

(4) Connect an electronic counter to TP7 on the Logic PCBA using a X10 oscilloscope probe.

(5) Use TP1 as a ground reference.

(6) Set the counter as follows.

- Period measurement with 1 μsec (1 MHz) time base.
- Trigger at the maximum readable sampling rate (use negative slope, if applicable).

6.10.2.2 Test Procedure

The minimum and maximum readings obtained during a 30-second observation should be within the spindle speed limits as follows.

- 1500 rpm Models
  - 39,600 μsec (minimum)
  - 40,400 μsec (maximum)
- 2400 rpm Models
  - 24,750 μsec (minimum)
  - 25,250 μsec (maximum)

6.10.2.3 Adjustment Procedure

If the spindle speed requirements specified are not satisfied, perform the ac motor speed control adjustment procedure detailed in Paragraph 6.6.3.

6.11 SECTOR PHASE-LOCK-LOOP ADJUSTMENT

The sector phase-lock-loop adjustment establishes the correct relationship between the phase-lock-pulse signal and the Voltage Controlled Oscillator (VCO) countdown signal. This relationship is shown in Figure 6-18.

NOTE

Each signal should be of the same frequency and should correspond on a cycle-to-cycle basis.

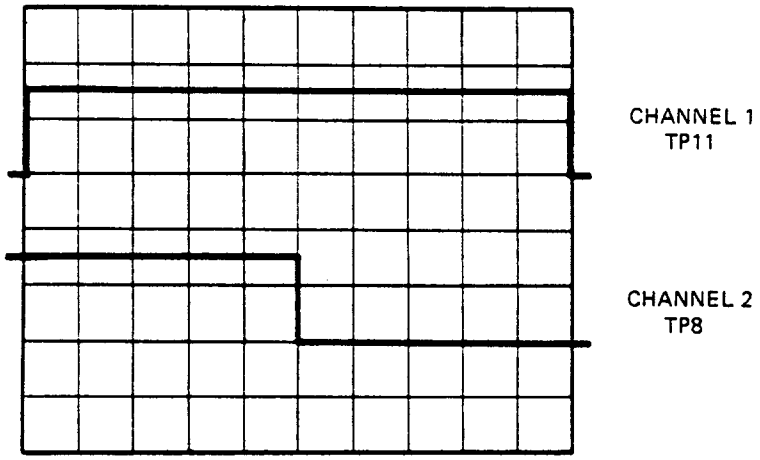


Figure 6-18. Quadrature Relationship Between Sector Phase-Lock-Loop Square Waves

6.11.1 TEST CONFIGURATION

(1) Set oscilloscope as follows.

- Set vertical sensitivity of both channels to 0.2v per cm.
- Set channel select switch to the Chopped mode.
- Trigger internal from Channel 1; use positive trigger slope.
- For 1500 rpm disk drives, set the sweep at 0.5 msec per division; for 2400 rpm disk drives, set the sweep at 0.2 msec per division.

(2) Connect test probe ground clips to TP15 on the Logic PCBA.

(3) Connect Channel 1 test probe to TP11 on the Logic PCBA.

(4) Connect Channel 2 test probe to TP8 on the Logic PCBA.

(5) Apply power to the disk drive. When the SAFE indicator becomes illuminated, insert a disk cartridge. Depress the RUN/STOP switch once and allow the disk drive to come Ready as indicated by the READY indicator being illuminated.

NOTE

A square wave should be observed on Channels 1 and 2 as the disk drive comes up to speed.

6.11.2 TEST PROCEDURE

(1) Adjust Channel 1 trigger to display the low-to-high transition waveform. Adjust the sweep rate and horizontal position controls to position the leading and trailing edge of the waveform exactly 10 divisions apart. Refer to Figure 6-18.

(2) Observe the waveform on Channel 2. The high-to-low transition should occur at the center vertical graticule line with ± ½ of a major division. Refer to Figure 6-18.

NOTE

This relationship is specified for an ambient [room] temperature of 23 ± 5 degrees C [73.4 ± 9 degrees F].

(3) If the relationship established in Steps (1) and (2) is not correct, and the spindle speed accuracy has been verified, perform the adjustment procedure detailed in Paragraph 6.11.3.

6.11.3 ADJUSTMENT PROCEDURE

(1) Adjust the Sector Phase-Lock-Loop centering potentiometer R57 to position the high-to-low transition of the waveform on Channel 2 (TP8) to the center vertical graticule line.

(2) Refer to Figure 6-18 for the correct positioning of the waveform

NOTE

This adjustment should be made at a room temperature of 23 ± 5 degrees C [73.4 ± 9 degrees F].

6.12 READ DECODE CIRCUIT ADJUSTMENTS

Read decode test and adjustment procedures (Read/Write Assembly No. 103751) are contained in Paragraphs 6.12.1 through 6.12 3.

NOTE

The oscilloscope time base must be calibrated either via exterior calibration device or using the 10 MHz oscillator on the Logic PCBA.

6.12.1 READ PULSE NARROW (RPN) PULSEWIDTH ADJUSTMENT

6.12.1.1 Test Configuration

(1) Remove the interface connector and Terminator PCBA from connector J101 and J102 on the Logic PCBA.

(2) Connect a disk exerciser having read/write capability to J101 or J102 on the Logic PCBA.

(3) Apply power to the exerciser and the disk drive. Observe that the READY indicator is illuminated; allow a 5-minute warm up period.

(4) Write an all-zeros pattern via the disk exerciser.

(5) Connect oscilloscope Channel 1 probe to TP25. Connect the test probe ground clip to ground reference TP17.

(6) Set sync to internal, normal mode.

(7) Set oscilloscope to trigger on the position slope of RPN.

6.12.1.2 Test Procedure

(1) Establish test configuration described in Paragraph 6.12.1.1.

(2) Observe RPN waveform on oscilloscope Channel 1 (TP25), shown in Figure 6-19.

(3) Measure RPN pulsewidth at the 50 percent points (on oscilloscope center line).

(4) Acceptable Limits

- 40 nanoseconds (minimum)
- 45 nanoseconds (maximum)

6.12.1.3 Adjustment Procedure

When the acceptable limits are exceeded, the following adjustment is performed.

(1) Establish test configuration detailed in Paragraph 6.12.1.1.

(2) Adjust R157 on the Read/Write PCBA to 42 nanoseconds.

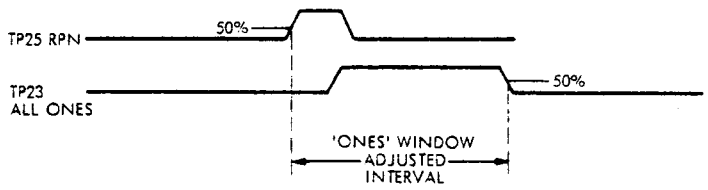


Figure 6-19. Read Pulse Narrow/'Ones' Window

6.12.2 'ONES' WINDOW SETTING

6.12.2.1 Test Configuration

(1) Remove the interface connector and terminator PCBA from connector J101 and J102 on the Logic PCBA.

(2) Connect a disk exerciser having read/write capability to J101 or J102 on the Logic PCBA.

(3) Apply power to the exerciser and the disk drive. Observe that the READY indicator is illuminated; allow a 5-minute warm up period.

(4) Write an all-zeros pattern via the disk exerciser.

(5) Connect oscilloscope Channel 1 probe to TP25. Connect the test probe ground clip to ground reference TP17.

(6) Set oscilloscope Channel 1 sensitivity to 0.10v per division.

(7) Set sync to internal, normal mode.

(8) Set oscilloscope to trigger on the positive slope of RPN.

(9) Connect oscilloscope Channel 2 probe to TP23. Connect the test probe ground clip to ground reference TP17.

(10) Set oscilloscope Channel 2 sensitivity to 0.10v per division.

6.12.2.2 Test And Adjustment Procedure (Long)

(1) Observe 'ones' window on oscilloscope Channel 2 (TP23) as shown in Figure 6-19.

(2) Measure the adjusted internal, i.e., leading edge of RPN TP25 to trailing edge of 'ones' window TP23.

(3) If the pulsewidth is not within ±5 nsec (2400 rpm) or ±8 nsec (1500 rpm) of setting, listed in Table 6-5, adjust R115 until readings are within ±3 nsec (2400 rpm) or ±5 nsec (1500 rpm).

6.12.2.3 Test And Adjustment Procedure (Short)

(1) Write all 'ones' pattern via the disk exerciser.

(2) Observe 'ones' window on oscilloscope Channel 2 (TP23) as shown in Figure 6-19.

(2) Measure the adjusted interval, i.e., leading edge of RPN TP25 to trailing edge of 'ones' window (TP23).

(4) If the pulsewidth is not within ±5 nsec (2400 rpm) or ±8 nsec (1500 rpm) of setting listed in Table 6-5, adjust R113 until readings are within ±3 nsec (2400 rpm) or ±3 nsec (1500 rpm).

Table 6-5
RPN Pulsewidth Values

Speed	Zeros	Ones
1500 rpm	485 nsec	440 nsec
2400 rpm	300 nsec	270 nsec

6.12.3 DATA AND CLOCK PULSEWIDTH

6.12.3.1 Test Configuration

(1) Remove the interface connector and terminator PCBA from connector J101 and J102 on the Logic PCBA.

(2) Connect a disk exerciser having read/write capability to J101 or J102 on the Logic PCBA.

(3) Apply power to the exerciser and the disk drive. Observe that the READY indicator is illuminated; allow a 5-minute warm up period.

(4) Write an all-ones pattern via the disk exerciser.

(5) Connect oscilloscope Channel 1 probe to TP25. Connect the test probe ground clip to ground reference TP17.

(6) Set oscilloscope Channel 1 sensitivity to 0.10v per division.

(7) Set sync to internal, normal mode.

(8) Set oscilloscope to trigger on the positive slope of RPN.

(9) Connect oscilloscope Channel 2 probe to read data TP15 (or read clock TP16). Connect the test probe ground clip to ground reference TP17.

(10) Position sweep trace 1.3 cm below cener line of graticule.

(11) Set oscilloscope Channel 2 sensitivity to 0.10v per division.

6.12.3.2 Test Procedure

(1) Observe Read Data TP15 (or Read Clock TP16) on oscilloscope Channel 2 as shown in Figure 6-20.

(2) Measure and note the pulsewidth.

(3) Acceptable Limits

- 100 nsec (minimum)
- 150 nsec (maximum)

6.12.3.3 Adjustment Procedure

If the acceptable limits detailed in Paragraph 6.12.3.2 Step (3) are exceeded perform the following adjustment.

(1) Establish test configuration detailed in Paragraph 6.12.3.1.

(2) Adjust R153 (Read Data TP15) on R155 (Read Clock TP16) for 125 nsec at the 50 percent amplitude level.

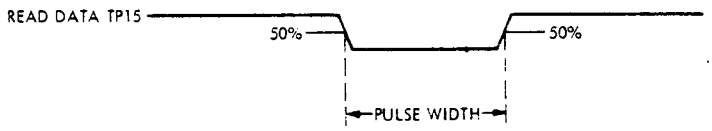


Figure 6-20. Read Clock/Read Data Pulsewidth

6.13 TEMPERATURE COMPENSATION (200 TPI ONLY)

The following paragraphs describe test configurations, test procedures, and adjustment procedures, respectively, for the temperature compensation portion of the Temperature And Write Compensation PCBA.

6.13.1 TEMPERATURE COMPENSATION TESTS AND ADJUSTMENTS

The temperature compensation portion of the Temperature And Write Compensation PCBA operates in conjunction with a thermistor mounted on the positioner baseplate. Thus, a signal is provided which is proportional to temperature and offsets the heads accordingly to compensate for ambient temperature changes.

NOTE

Temperature compensation tests and adjustments must be performed before any mechanical CE alignments are attempted.

NOTE

All test points and adjustment potentiometers referred to in Paragraph 6.13 are located on the Temperature And Write Compensation PCBA unless otherwise specified.

6.13.1.1 Test Configuration

(1) Insert the test disk cartridge.

(2) Operate the disk drive in the Ready mode for a minimum of 20 minutes.

(3) Connect a disk drive exerciser capable of selecting the upper and lower disks and also capable of positioning the heads to any desired cylinder address.

(4) Place a temperature probe within 12.7 mm (0.5 inch) of the thermistor to sense the air temperature.

(5) Place a second temperature probe on the thermistor mounting block to sense the temperature of the metal.

NOTE

Temperature measuring equipment should have a range from 20°C to 31°C (68°F to 87.8°F) with an error limit not greater than ±0.5°C (±1°F).

(6) Using a digital voltmeter, connect the positive test lead to TP4 and the common test lead to TP5 (ground).

6.13.1.2 Test Procedure

(1) Establish the test configuration described in Paragraph 6.13.1.1.

(2) Observe and note each temperature probe reading and take the average of the two temperatures if they are within 10°C (50°F) of each other.

(3) Position the heads to cylinder addresses given in Figure 6-21 that are within the temperature range indicated by the average temperature probe reading as calculated in Step (2).

(4) Observe and note the voltage readings at TP4 for each cylinder address in Step (3).

(5) If any of the voltages noted in Step (4) are out of tolerance (see Table 6-6), perform the adjustment procedure in Paragraph 6.13.1.3 before continuing with this procedure.

(6) Proceed with the Scaling Resistor Verification procedure detailed in Paragraph 6.13.2.

6.13.1.3 Adjustment Procedure

(1) Note the average temperature calculated in 6.13.1.2, Step (2).

(2) Move the DVM positive probe to TP3; maintain the DVM ground lead on TP5.

(3) Adjust R15 to attain a voltage that corresponds to the average temperature used in Step (1). See Figure 6-22.

(4) Perform the Scaling Resistor Verification procedure detailed in Paragraph 6.13.2.

6.13.2 SCALING RESISTOR VERIFICATION

(1) Establish the test configuration described in Paragraph 6.13.1.1, except connect the DVM positive test lead to TP2.

(2) Adjust R16 to + 1.0v.

(3) Move the DVM positive probe to TP4.

(4) Using the disk exerciser, refer to Table 6-7 and check that the voltage at TP4 is within the range specified for each of the cylinder addresses listed.

NOTE

If the voltages on TP4 are not within limits for each cylinder address in Step (4), there may be a component failure in the scaling resistor and/or the cylinder address circuitry.

(5) Perform the Environmental Temperature Adjustment detailed in Paragraph 6.13.3.

6.13.3 ENVIRONMENT TEMPERATURE ADJUSTMENT

NOTE

Location of the heads is not relevant to this adjustment.

(1) Establish the test configuration described in Paragraph 6.13.1.1.

(2) Note the average temperature calculated in 6.13.1.2, Step (2).

(3) Move the DVM positive probe to TP2.

(4) Adjust R16 to the voltage (Figure 6-23) corresponding to the average temperature used in Step (2).

(5) Remove the DVM positive probe from TP2.

(6) Remove the DVM negative probe from TP5.

(7) Remove the disk exerciser.

(8) Deenergize the disk drive.

(9) Remove temperature probes.

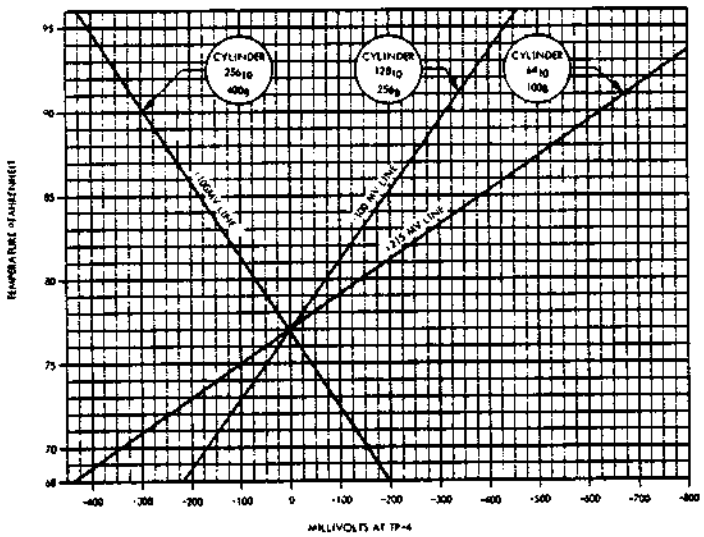


Figure 6-21. Cylinder Address Temperature/Voltage Conversion at TP4

Table 6-6
Voltage Tolerance at TP4

ADDRESS	TOLERANCE
Cylinder $256_{10} = 400_8$	±100 mv
Cylinder $128_{10} = 256_8$	±100 mv
Cylinder $64_{10} = 100_8$	±215 mv

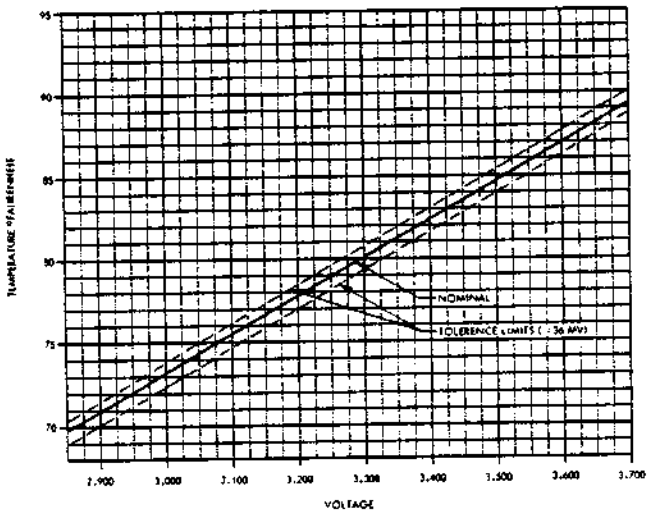


Figure 6-22. TP3 Temperature/Voltage Conversion

Table 6-7
Cylinder Address Voltage Limits at TP4

Cylinder Address	TP4 Voltage
40_8 = 0001000000_2	+1.49 to +1.82v
140_8 = 0011000000_2	+0.98 to +1.20v
240_8 = 0101000000_2	+0.50 to +0.61v
340_8 = 0111000000_2	−0.07 to +0.05v
440_8 = 1001000000_2	−0.51 to −0.41v
540_8 = 1011000000_2	−1.12 to −0.92v
620_8 = 1100100000_2	−1.72 to −1.40v

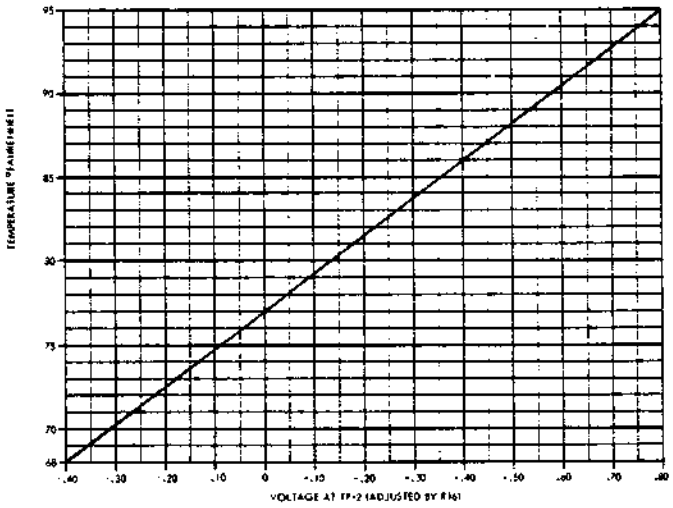


Figure 6-23. TP2 Temperature/Voltage Conversion

6.14 CE ALIGNMENT PROCEDURE

The circumferential and radial alignment of a disk drive is performed using a special CE disk cartridge that can usually be identified by a special top color and/or label. The CE cartridge disk contains two pre-recorded cylinders which are used to adjust the Read/Write head radial alignment and the index to data circumferential alignment.

CE alignment procedures for a front load disk drive differ from that used with a top load model. Primarily, the differences are due to the differences between the top load and front load CE disk cartridge configurations. The alignment tracks used are at different locations and the read data patterns for radial alignment are dissimilar. Therefore, separate CE alignment procedures are given for front load disk drives and top load disk drive. The 200 tpi radial alignment procedure is given separately in order to stress key elements.

Paragraphs 6.14.1 and 6.14.2 provide descriptions of front and top loading CE disk cartridges; Paragraph 6.14.3 describes the environmental stabilization requirements for the CE cartridges.

The test configuration for both top loading and front loading machines is given in Paragraph 6.14.4.

Paragraphs 6.14.5 and 6.14.6 detail the radial and circumferential alignment procedures, respectively, for front loading models. Paragraphs 6.14.7 and 6.14.8 detail the radial and circumferential alignment procedures, respectively, for top loading models.

6.14.1 FRONT LOADING CE DISK CARTRIDGE

The 100 tpi front loading CE disk cartridge contains two pre-recorded cylinders (095 and 100) which are used during adjustment procedures to the head/arm carriage assembly and to the (upper) photoelectric sensor. The 200 tpi CE disk cartridge is identical to the 100 tpi cartridge except that the two pre-recorded cylinders are 190 and 200.

CAUTION

CARE SHOULD BE TAKEN TO ENSURE THAT CYLINDERS 090 THROUGH 110 ON 100 TPI, OR CYLINDERS 180 THROUGH 210 ON 200 TPI, ARE NOT INADVERTENTLY WRITTEN ON; WRITING ON THESE CYLINDERS WILL CAUSE THE PRE-RECORDED DATA TO BE DESTROYED.

6.14.1.1 Cylinder 100 (100 tpi)

Cylinder 100 is used for adjustment of the head/arm location on 100 tpi disk drives. Cylinder 100 consists of an eccentric cylinder with an average radius of cylinder 100. Radial adjustment of the head is carried out by monitoring the read signal envelope at cylinder 100. Due to the amount of eccentricity, when a head is reading the pattern and the head is mis-aligned from the true cylinder radius, then a lobed envelope pattern will be produced. As the head is aligned to the true cylinder radius, a pattern with no lobes, or minimal envelope lobing, will be produced when the IBM or 3M-type CE cartridge is used. When using the CDC-type CE cartridge, the pattern will be as shown in Figure 6-25.

6.14.1.2 Cylinder 200 (200 tpi)

Cylinder 200 is used for adjustment of the head/arm location on 200 tpi disk drives. The alignment pattern for 200 tpi front load is identical to that used on 200 tpi top load disk drives. Refer to Paragraph 6.14.2.1 for description.

6.14.1.3 Cylinder 095 (190 on 200 tpi)

This cylinder has a single flux transition marker recorded approximately 180 degrees from the center line of the index slot. To assist in identifying this marker, a burst of flux transitions occurs 10 μsec after the marker.

Cylinder 095 (190 on 200 tpi) is used for circumferential adjustment of the (upper) photoelectric sensor.

Information recorded on this cylinder is similar to that recorded on the top load CE disk cartridge in cylinder 005.

NOTE

On the 100 tpi front loading CE cartridge, in cylinder 105 there is another cylinder written eccentric to the disk rotational center. Because of its identical appearance to the true radial alignment cylinder [100] it is possible to become confused and misalign the heads on the incorrect cylinder. Care should be used when performing a radial adjustment with front loading cartridges to avoid this misalignment caused by incorrectly using the pattern in cylinder 105.

6.14.2 TOP LOADING CE DISK CARTRIDGE

The 100 tpi top loading CE disk cartridge contains two pre-recorded cylinders 005 and 073 which are used during adjustment procedures to the head/arm carriage assembly and to the upper magnetic transducer.

The 200 tpi CE disk cartridge is identical to the 100 tpi cartridge except that the two pre-recorded cylinders are 010 and 146.

CAUTION

WHEN USING 100 TPI CE PACKS, ENSURE THAT CYLINDERS 004, 005, 006, AND 071 THROUGH 075 ARE NOT INADVERTENTLY WRITTEN ON. WHEN USING 200 TPI CE PACKS, ENSURE THAT CYLINDERS 008 THROUGH 012 and 142 THROUGH 150 ARE NOT INADVERTENTLY WRITTEN ON. WRITING ON THESE CYLINDERS WILL CAUSE PRE-RECORDED DATA TO BE DESTROYED.

6.14.2.1 Cylinder 073 (100 tpi), Cylinder 146 (200 tpi)

For 100 tpi CE packs, cylinder 073 is used for adjustment of the head/arm location; for 200 tpi, cylinder 146 is used for this adjustment. Two circular concentric cylinders, either side of cylinder 073 and cylinder 146, are spaced 0.010-inch apart and are eccentric to the center of rotation of the disk by 0.0015-inch. The cylinders are written with slightly different frequencies. Radial adjustment of the head is carried out by monitoring the beat frequency at cylinder 073 (100 tpi), 146 (200 tpi). A head that is correctly centered over track 073 (100 tpi), 146 (200 pti), gives an oscilloscope trace with an equal 2-lobe fringe pattern. Due to the amount of eccentricity, when a head is reading the pattern and the head is misaligned from the true cylinder radius, then a lobed envelope pattern will be produced.

6.14.2.2 Cylinder 005 (100 tpi), Cylinder 010 (200 tpi)

For 100 tpi CE packs, cylinder 005 is used for circumferential adjustment of the upper magnetic transducer; for 200 tpi, cylinder 010 is used for this adjustment. The cylinder has a single flux transition marker recorded approximately 180 degrees from the center line of the index notch. To assist in identifying this marker, a burst of flux transitions occurs 10 μsec after the marker.

6.14.3 CE CARTRIDGE STABILIZATION

Prior to attempting alignment, the CE cartridge must be conditioned in the same environment in which the disk drive (to be aligned) is located. This conditioning must not be less than 2 hours. In addition to this stabilization period, the CE cartridge must be operated for at least 30 minutes in the disk drive with the disk drive in the Run condition. This allows the cartridge to reach the proper temperature just prior to performing the alignment.

6.14.4 TEST CONFIGURATION — ALL MODELS

The following procedure is used to establish the test configuration for CE alignment of both top and front loading disk drives.

(1) Remove the cover from the disk drive and open the circuit boards to their fully extended positions.

(2) If installed, remove the I/O cable and the terminator PCBA from interface connectors J101 and J102 on the Logic PCBA.

(3) Connect a disk exerciser without read/write capabilities to one of the interface connectors, J101 or J102.

(4) Set the upper platter Write Protect switch to the ON position.

(5) Connect the disk drive to the ac power source and set the ON/OFF switch to the ON position.

(6) When the SAFE indicator becomes illuminated, insert the special CE disk cartridge into the machine.

(7) Depress the RUN/STOP switch once and allow the disk drive to come READY. Allow the disk drive to warm up for at least 30 minutes before proceeding.

(8) Disconnect the emergency unload capacitor connector P206 from the Servo PCBA, thereby de-activating the emergency unload system. If the disk speed slows noticeably due to the loss of ac power or other malfunction, the heads must be manually unloaded by the operator.

NOTE

It is the responsibility of the person performing the CE alignment to perform the emergency unload function when P206 is disconnected.

(9) A dual trace oscilloscope having a 50 MHz vertical bandwidth or greater is required to perform CE alignment procedures.

NOTE

Depending on the type of oscilloscope utilized and its grounding arrangement, it may be necessary to use a differential measurement of the Read/Write PCBA signal in lieu of a single channel method. This will usuallly be the case when a ground loop exists between the scope and the disk drive. Refer to the applicable oscilloscope manual for differential measurement set-up, if necessary.

(10) One X1 probe is required for single-ended measurement method; two X1 probes are required for differential measurement method.

(11) Front load disk drive CE alignment procedures are outlined in Paragraphs 6.14.5 and 6.14.6; top load disk drive CE alignment procedures are outlined in Paragraphs 6.14.7 and 6.14.8.

6.14.5 RADIAL ALIGNMENT — FRONT LOAD

6.14.5.1 Test Procedure (100 and 200 tpi)

The test configuration detailed in Paragraph 6.14.4 must be performed prior to performing this procedure.

(1) Set up oscilloscope as follows.
- Connect oscilloscope vertical input to TP19 on the Read/Write PCBA; use TP18 for ground reference.
- Set vertical sensitivity to 0.1v (50 mv for 200 tpi) per division and select the ac input mode.
- Connect an X10 test probe from the external trigger input of the oscilloscope to TP2 (Index) on the Logic PCBA.
- Use external trigger and normal sync, ac coupled, on the negative trigger slope.
- Set sweep rate to 5 msec per division.

(2) Set exerciser to position the heads to cylinder 100 (200 for 200 tpi).

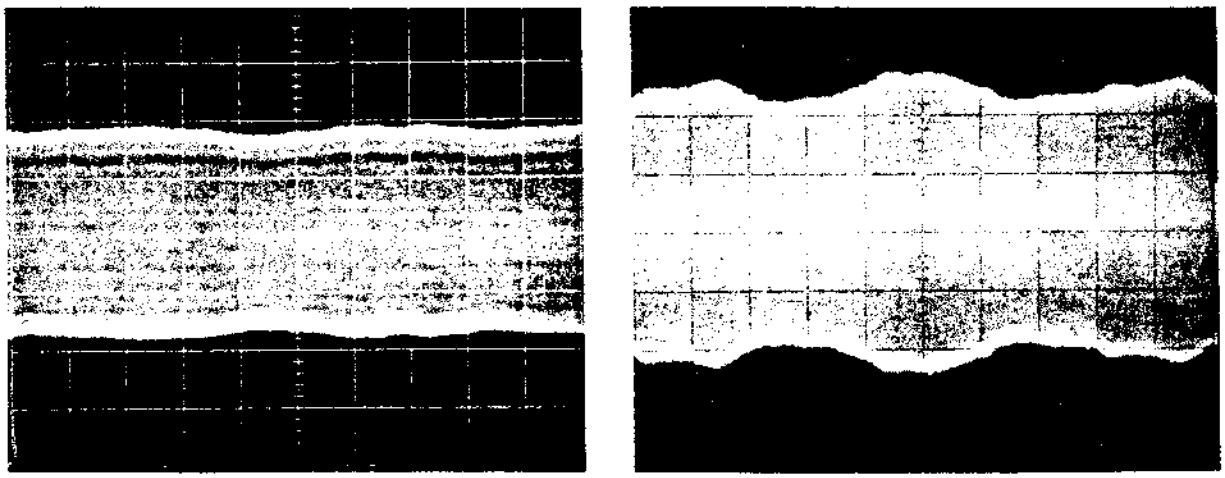
(3) Select head 0 (upper surface of upper disk).

(4) Observe the waveform at TP19 and compare the waveform to the relevant waveform shown in Figure 6-24 (when using the IBM or 3M-type CE cartridge) or Figure 6-25 (when using the CDC-type CE cartridge).

(5) Select head 1 and repeat Step (4).

NOTE

If no waveform or the improper waveform is observed, go directly to the adjustment procedure, Paragraph 6.14.5.2 for 100 tpi and Paragraph 6.14.5.3 for 200 tpi.



IBM CE Cartridge 3M CE Cartridge

Figure 6-24. Approximately Aligned Front Load Disk Drive

(6) Change vertical sensitivity to 20 mv per division and change vertical positioning to observe the edge of the waveform envelope.

(7) For each head selected, observe the edge of the waveform and compare it to the relevant waveform shown in Figure 6-25A or 6-25B.

6.14.5.2 Adjustment Procedure (100 tpi only)

If radial alignment is required, perform the following adjustment procedure.

(1) Maintain the oscilloscope settings established in Paragraph 6.14.5.1.

- ☐ If the IBM or 3M-type CE cartridge is used, observe the waveforms shown in Figure 6-25A or 6-25B and determine which direction the heads must be moved.
- ☐ If the CDC-type CE cartridge is used, observe the waveforms in Figures 6-27A or 6-27B and determine which direction the heads must be moved.

NOTE

If no waveform is observed at TP19, and no malfunction of the disk drive is suspected, a gross adjustment of the heads is required. To determine which direction the heads must be moved, use the exerciser to reposition the heads to cylinder address 90 and change Channel 1 sensitivity to 0.1v per division. Increment the cylinder address, one cylinder at a time, until the correct waveform is observed at TP19; note this address. Refer to Figure 6-29.

(2) Locate the two radial positioning screws on the selected head.

(3) By loosening one screw and tightening the other, position the selected head until the correctly aligned waveform (Figure 6-25A or 6-25B for IBM and 3M-type CE cartridges or Figure 6-27A or 6-27B for the CDC-type CE cartridge) is obtained. Then tighten both screws without disturbing the adjustment.

(4) Align both heads in the same manner.

(5) Using the exerciser, position the heads to cylinder 000, then reposition them to cylinder 105 and observe that the waveform still appears as in Step (4). This ensures that the heads have not been aligned to cylinder 105 which is a duplicate of cylinder 100.

NOTE

If a head cannot be adjusted to obtain the minimal lobe pattern, the head may not be flying correctly. This condition can be caused by either a dirty disk or head, incorrect head load force, or damaged head(s).

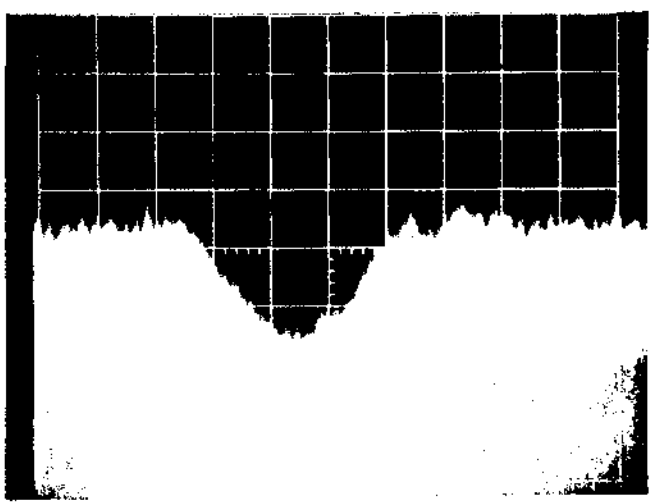
6.14.5.3 Adjustment Procedure (200 tpi only)

CAUTION

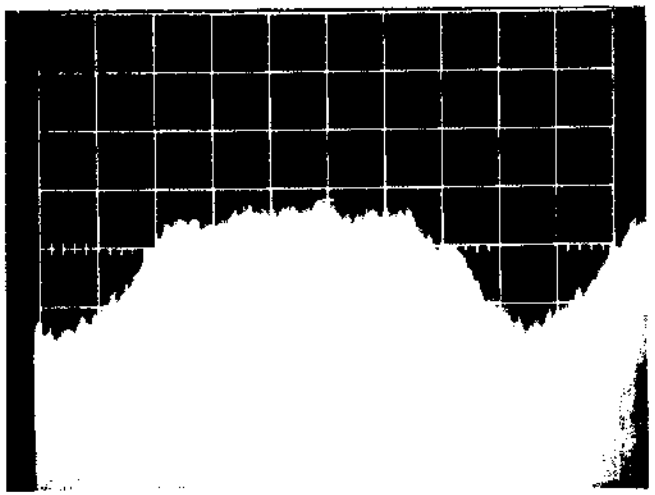
THE POLARITY OF THE COMPENSATION VALUE FOR EACH CE CARTRIDGE IS CRITICAL. IF CARTRIDGE INTERCHANGE IS NOT A PREREQUISITE, PERFORM THE ADJUSTMENT PROCEDURE FOR FRONT LOADING 100 TPI MODELS DESCRIBED IN PARAGRAPH 6.14.5.2 EXCEPT USE FIGURE 6-26 INSTEAD OF FIGURE 6-24 REFERENCED IN THIS NOTE.

(1) Allow the disk drive to stabilize in the Ready mode for 30 minutes (minimum).

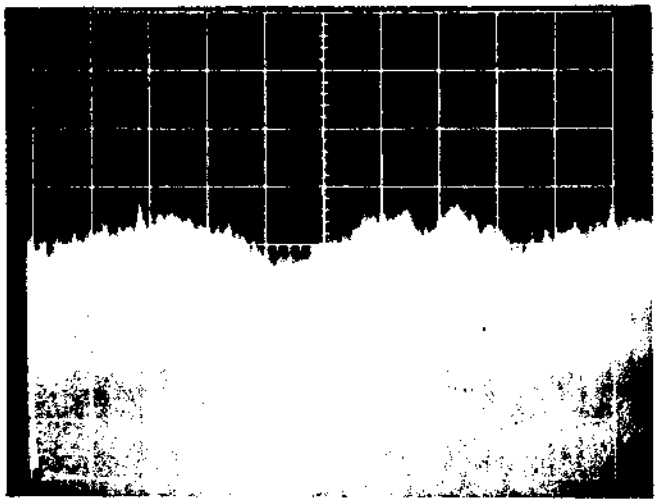
(2) Maintain oscilloscope settings established in Paragraph 6.14.5.1 except change Channel 1 sensitivity to 50—100 mv per division.



Heads Too Far Back

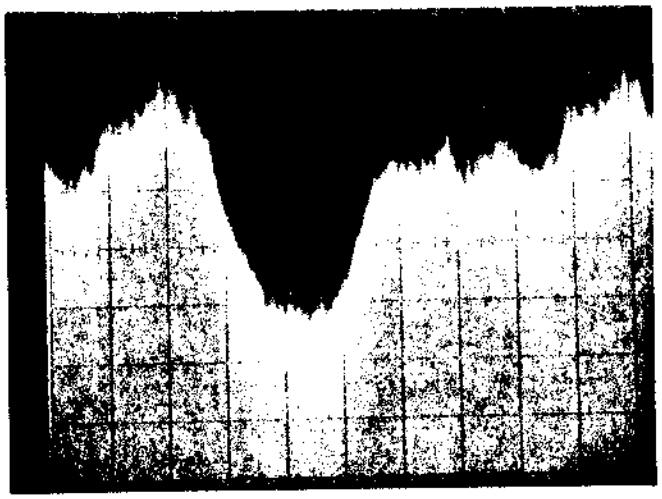


Heads Too Far Forward

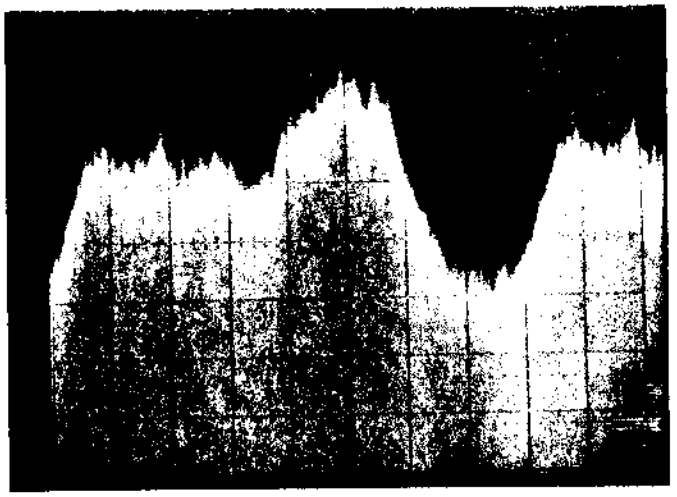


Correct Alignment

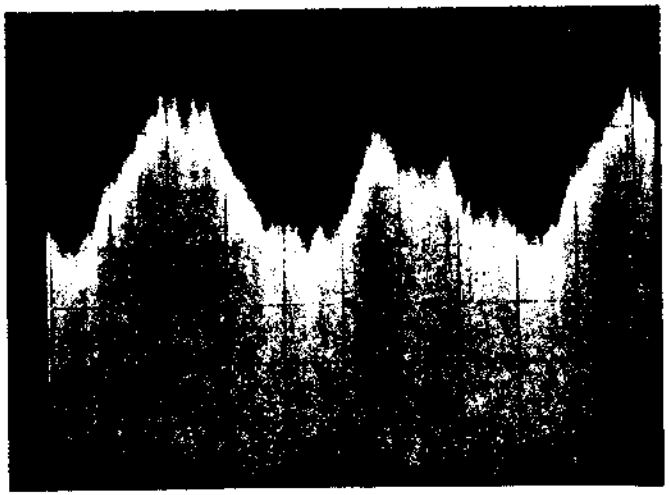
Figure 6-25A. Head Alignment (IBM CE Cartridge), Track 100, Front Load Disk Drives



Heads Too Far Back



Heads Too Far Forward



Correct Alignment

Figure 6-25B. Head Alignment (3M CE Cartridge), Track 100, Front Load Disk Drives

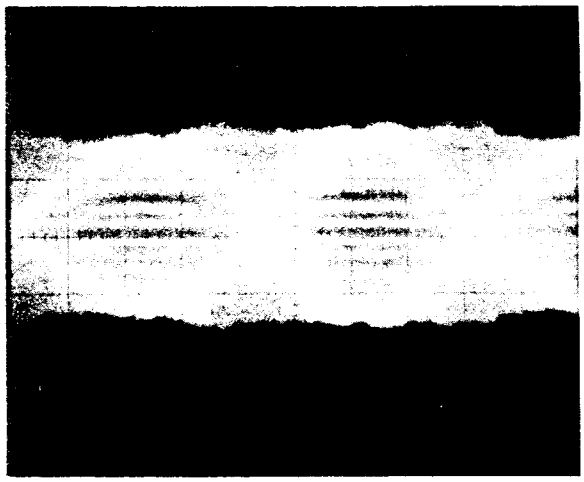


Figure 6-26. Radial Alignment, Head Aligned

(3) Observe the waveforms shown in Figure 6-27A and 6-27B and determine which direction the heads must be moved.

(4) Locate the two radial positioning screws on the selected head.

(5) By loosening one screw and tightening the other, position the selected head until the waveform in Figure 6-27C is obtained. Tighten both screws without disturbing the adjustment.

(6) Align both heads in the same manner.

(7) Note the sign value of the compensation factor which is printed on the CE cartridge.

- If the compensation factor is zero (0), the magnitude of the offset is ± 50 μinch. Perform the radial head alignment described in Steps (1)—(6) and Step (8).
- A positive (+) compensation factor indicates that the CE track was written offset away from the spindle; in this case, the magnitude of the offset is $+50$ to $+150$ μinch.
- A negative (−) compensation factor indicates that the CE track was written offset toward the spindle; in this case, the magnitude of the offset is -50 to -150 μinch.

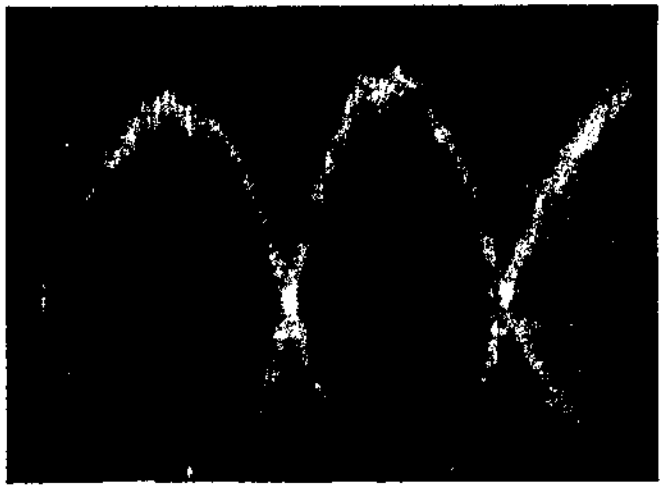
(8) Using the exerciser, position the heads to cylinder 000, then reposition them to cylinder 210 and observe that the waveform still appears as in Figure 6-27C. This ensures that the heads have not been aligned to cylinder 210 which is a duplicate of cylinder 200.

NOTE

If a head cannot be adjusted to obtain the minimal lobe pattern, the head may not be flying correctly. This condition can be caused by either a dirty disk or head, incorrect head load force, or damaged head(s).

A. Heads Too Far Back

B. Heads Too Far Forward



C. Heads Aligned

Figure 6-27. Radial Alignment

6.14.6 CIRCUMFERENTIAL ALIGNMENT — FRONT LOAD (2200 BPI)

6.14.6.1 Test Procedure (100 and 200 tpi)

(1) Set oscilloscope as follows.

- Connect oscilloscope Channel 1 vertical input to TP19 on the Read/Write PCBA.
- Connect oscilloscope Channel 1 ground to TP18 on the Read/Write PCBA.
- Set Channel 1 vertical sensitivity to 0.1v per division.
- Connect oscilloscope Channel 2 X10 probe to TP2 on the Logic PCBA.
- Set Channel 2 vertical sensitivity to 0.2v per division.
- Set Channel Select to Alternate mode.
- Use internal sync and negative sync on the leading edge of index signal on Channel 2.
- Set the sweep rate to 5 μsec.

NOTE

Depending on the type of oscilloscope utilized and its grounding arrangement, it may be necessary to use a differential measurement of the Read/Write PCBA signal in lieu of a single channel method. This will usually be the case when a ground loop exists between the scope and the disk drive. Refer to the applicable oscilloscope manual for differential measurement set-up, if necessary.

- Adjust horizontal position to place start of sweep on left-most vertical graticule line. This will establish a time-zero reference to be used in lieu of actual viewing of the negative transition of the index pulse.

  Take care not to disturb the horizontal position during the measurement. (This technique assumes that the start of the sweep corresponds to the triggering of the sweep. Verify this if in doubt.)

(2) Set exerciser to position heads to cylinder 095 (190 for 200 tpi).

(3) Select head 0.

(4) Observe the waveform at TP19 with respect to the falling edge of the Index signal (time-zero reference).

(5) The first pulse of the waveform at TP19 should occur 30 ±5 μsec from the negative-going edge of the Index signal (time-zero reference). See Figure 6-28.

(6) Select head 1.

(7) Observe the waveform at TP19. The first pulse should occur 30 ±5 μsec from the negative-going edge of the Index signal (time-zero reference).

(8) Alternately switch between heads 0 and 1, and observe the relative displacement of the pulse for each head. The total displacement (separation) between pulse positions must be 10 μsec or less. See Figure 6-29.

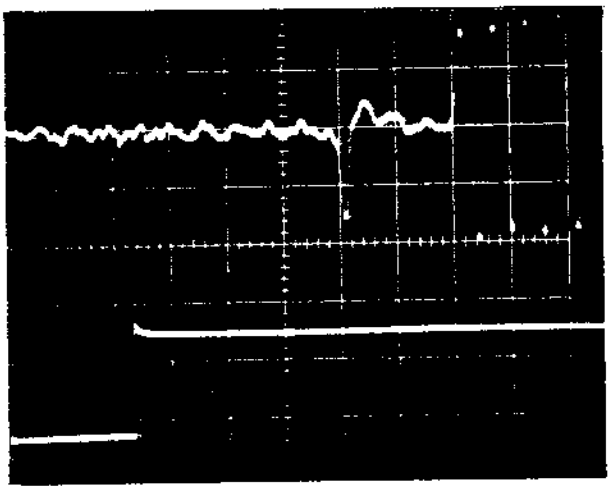


Figure 6-28. Circumferential Alignment, Front Load Drives

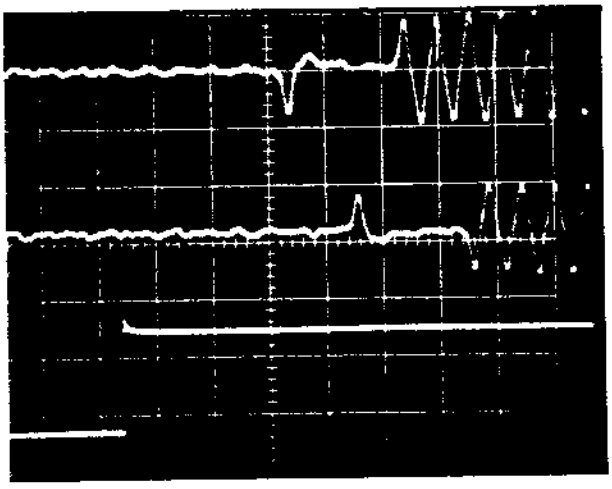


Figure 6-29. Compromise Circumferential Alignment, Front Load Drives

6.14.6.2 Adjustment Procedure (100 and 200 tpi)

If circumferential alignment is required, perform the following procedure.

NOTE

If the separation between pulses, as measured in Step (8) of Paragraph 6.14.6.1, exceeds 10 μsec, remove power from the disk drive and remove the upper two heads. Check for foreign material or burrs on the head seating surfaces. Replace one or both heads if a head problem is suspected. Reinstall heads and perform the radial alignment procedure.

(1) Maintain setup per Paragraph 6.14.6.1, Steps (1) and (2).

(2) Insert a Phillips-head screwdriver into the circumferential alignment adjusting screw located under the cartridge receiver toward the right front of the machine (viewed facing the front of the drive).

NOTE

It may be necessary to lift the receiver slightly until the tool can be inserted.

CAUTION

CARE MUST BE TAKEN WHEN LIFTING THE RECEIVER. LIFTING THE RECEIVER TOO HIGH WILL CAUSE THE SPINNING DISK TO COME INTO CONTACT WITH THE CARTRIDGE HOUSING.

NOTE

Rotation of the tool in the CCW direction increases the pulse delay from Index.

(3) Select either head 0 or 1 and, while observing the waveform at TP19, turn the adjusting screw until the first pulse after the falling edge of Index (Channel 2) falls within the 30 ±5 μsec specification.

(4) Select the other head and ensure that the specification detailed in Step (3) is met. A compromise adjustment may be required to meet the 30 ±5 μsec requirement for both heads. See Figure 6-29.

(5) Turn the Phillips-head screwdriver slightly in the opposite direction of the last turn to cause the adjusting screw to relax the force on the mechanism (i.e., mid-range of the screw backlash).

(6) Recheck heads 0 and 1 to verify that the measurement is still within tolerance. Repeat Steps (3), (4), and (5) as necessary.

(7) Remove the Phillips-head screwdriver and bring the disk drive to the SAFE condition, then remove the CE disk cartridge. Return the disk drive to its former configuration. Do not forget to reset the write protect switch if the protect is not desired, and reconnect P206 on the Servo PCBA.

6.14.7 RADIAL ALIGNMENT—TOP LOAD

Paragraph 6.14.7.1 describes the test procedure for radial alignment to top load 100 tpi and 200 tpi D3000 disk drives; Paragraphs 6.14.7.2 and 6.14.7.3 describe the adjustment procedures for radial alignment of top load 100 tpi and 200 tpi D3000 disk drives, respectively.

6.14.7.1 Test Procedure (100 and 200 tpi)

(1) Set up oscilloscope as follows.

- Connect oscilloscope vertical input to TP19 on the Read/Write PCBA.
- Connect oscilloscope ground to TP18 on the Read/Write PCBA.
- Set vertical sensitivity to 50 mv per division and select the ac input mode.
- Connect a X10 test probe from the external trigger input of the oscilloscope to TP2 (Index) on the Logic PCBA.
- Use external trigger, and normal sync, ac-coupled on the negative trigger slope.
- Set sweep rate to 5 msec per division.

(2) Set the exerciser to position heads as follows.

☐ 100 tpi Models

- Cylinder 73

☐ 200 tpi Models

- Cylinder 146

(3) Select head 0.

(4) Observe the waveform at TP19 and compare it to the waveform shown in Figure 6-30.

(5) Select head 1 and repeat Step (4).

NOTE

If no waveform or the improper waveform is observed, go directly to the adjustment procedure, Paragraph 6.14.7.2 for 100 tpi or Paragraph 6.14.7.3 for 200 tpi.

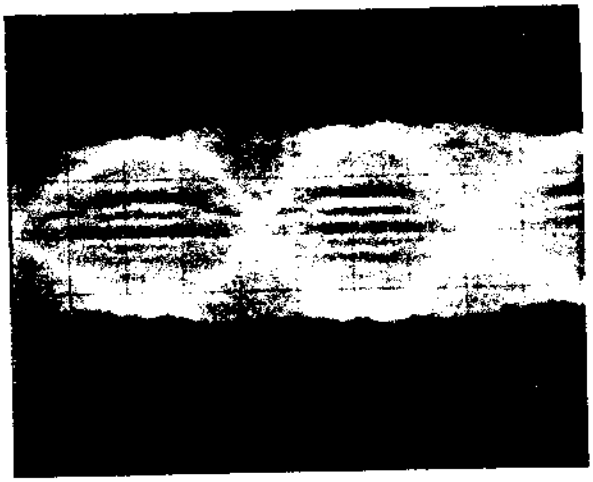


Figure 6-30. Radial Alignment, Head Aligned

6.14.7.2 Adjustment Procedure (100 tpi only)

If radial alignment is required, perform the following procedure.

(1) Set up oscilloscope as follows.
- Connect oscilloscope vertical input to TP19 on the Read/Write PCBA. Use TP18 for ground reference.
- Set vertical sensitivity to 20 mv per division and select the input ac mode.
- Connect a X10 test probe from the external trigger input of the oscilloscope to TP2 (Index) on the Logic PCBA.
- Use external trigger and normal sync, ac-coupled on the negative trigger slope.
- Set sweep rate to 5 msec per division.

(2) Observe the waveforms shown in Figure 6-31 and determine which direction the heads must be moved.

(3) Locate the two radial positioning screws on the selected head.

(4) By loosening one screw and tightening the other, position the selected head until the waveform of Figure 6-31C is obtained. Then tighten both screws without disturbing the adjustment.

(5) Align both heads in the same manner.

(6) Set exerciser to position the heads to cylinder 073.

(7) Select head 0.

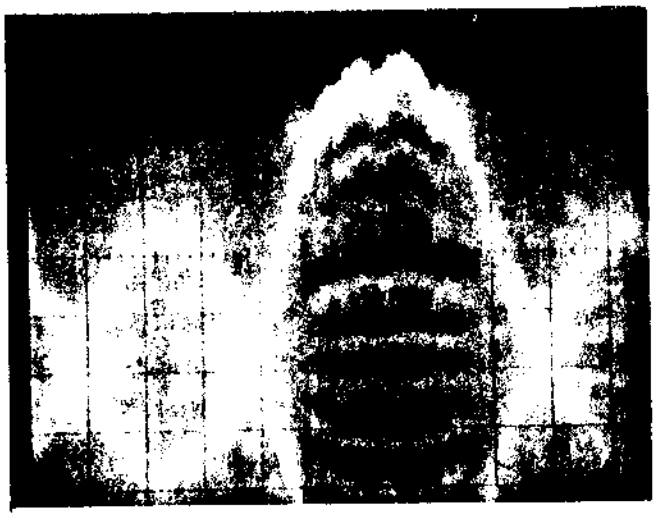
(8) Observe waveform at TP19 and compare it to the waveform shown in Figure 6-31.

(9) Select head 1 and repeat Step (8).

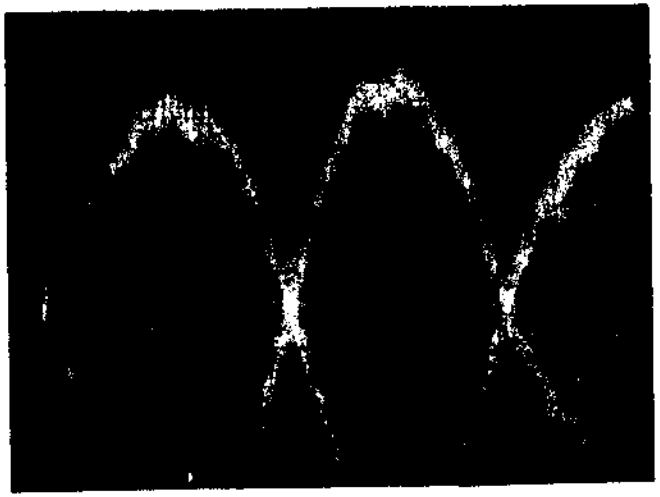
NOTE

If a head cannot be adjusted to obtain the minimal lobe pattern, the head may not be flying correctly. This condition can be caused by either a dirty disk or head, incorrect head load force, or damaged head(s).

A. Heads Too Far Back



B. Heads Too Far Forward



C. Heads Aligned

Figure 6-31. Radial Alignment

6.14.7.3 Adjustment Procedure (200 tpi only)

CAUTION

THE POLARITY OF THE COMPENSATION VALUE FOR EACH CE CARTRIDGE IS CRITICAL. IF CARTRIDGE INTERCHANGE IS NOT A PRE-REQUISITE, PERFORM THE ADJUSTMENT PROCEDURE FOR TOP LOAD 100 TPI MODELS DESCRIBED IN PARAGRAPH 6.14.7.2.

(1) Allow the disk drive to stabilize in the Ready mode for 30 minutes (minimum).

(2) Maintain oscilloscope setting established in Paragraph 6.14.7.1 except change Channel 1 sensitivity to 50—100 mv per division.

(3) Observe the waveforms shown in Figure 6-31 and determine which direction the heads must be moved.

(4) Locate the two radial positioning screws on the selected head.

(5) By loosening one screw and tightening the other, position the selected head until the waveform of Figure 6-31C is obtained. Then tighten both screws without disturbing the adjustment.

(6) Align both heads in the same manner.

(7) Note the sign value of the compensation factor which is printed on the CE cartridge.

- If the compensation factor is zero (0), the magnitude of the offset is ±50 µinch. Perform the radial head alignment described in Steps (1)—(6) and Step (8).
- A positive (+) compensation factor indicates that the CE track was written offset away from the spindle; in this case, the magnitude of the offset is +50 to +150 µinch.
- A negative (—) compensation factor indicates that the CE track was written offset toward the spindle; in this case, the magnitude of the offset is —50 to —150 µinch.

NOTE

If a head cannot be adjusted to obtain the minimal lobe pattern, the head may not be flying correctly. This condition can be caused by either a dirty disk or head, incorrect head load force, or damaged head[s].

6.14.8 CIRCUMFERENTIAL ALIGNMENT—TOP LOAD

6.14.8.1 Test Procedure (100 and 200 tpi)

(1) Set up oscilloscope as follows.

- Connect oscilloscope Channel 1 vertical input to TP19 on the Read/Write PCBA.
- Connect oscilloscope Channel 1 ground to TP18 on the Read/Write PCBA.
- Set Channel 1 vertical sensitivity to 0.1v per division.
- Connect oscilloscope Channel 2 X10 probe to TP2 on the Logic PCBA.
- Set Channel 2 sensitivity to 0.2v per division.
- Set sweep rate to 5 μsec per division.
- Set Channel Select to Alternate mode.
- Use internal sync and negative sync on leading edge of Index signal on Channel 2.

NOTE

Depending on the type of oscilloscope utilized and its grounding arrangement, it may be necessary to use a differential measurement of the Read/Write PCBA signal in lieu of a single channel method. This will usually be the case when a ground loop exists between the scope and the disk drive. Refer to the applicable oscilloscope manual for differential measurement set-up, if necessary.

- Adjust horizontal position to place start of sweep on left-most vertical graticule line. This will establish a time-zero reference to be used in lieu of actual viewing of the negative transition of the index pulse.

  Take care not to disturb the horizontal position during the measurement. (This technique presumes that the start of the sweep corresponds to the triggering of the sweep. Verify this if in doubt.)

(2) Set exerciser to position heads as follows.

☐ 100 tpi Models
- Cylinder 005

☐ 200 tpi Models
- Cylinder 010

(3) Select head 0.

(4) Observe the waveform at TP19 with respect to the falling edge of the Index signal (time-zero reference).

(5) The first pulse of the waveform should occur 30 ± 5 μsec from the negative-going edge of the Index signal (time-zero reference). See Figure 6-28.

(6) Select head 1.

(7) Observe the waveform at TP19. The first pulse should occur 30 ± 5 μsec from the negative-going edge of the Index signal (time-zero reference).

(8) Alternately switch between heads 0 and 1, and observe the relative displacement of the pulse for each head. The total displacement (separation) between pulse positions must be 10 μsec or less. See Figure 6-29.

6.14.8.2 Adjustment Procedure (100 and 200 tpi)

If circumferential alignment is required, perform the following procedure.

NOTE

If the separation between pulses, as measured in Step (8) of Paragraph 6.14.8.1, exceeds 10 μsec, remove power from the disk drive and remove the upper two heads. Check for foreign material or burrs on the head seating surfaces. Replace one or both heads if a head problem is suspected. Reinstall heads and perform the radial alignment procedure.

(1) Maintain test conditions established in Paragraph 6.14.8.1, Steps (1) and (2).

(2) Insert a Phillips-head screwdriver into the circumferential alignment adjusting screw located under the cartridge receiver toward the right front of the machine (viewed facing the front of the drive).

NOTE

Rotation of the tool in the CCW direction increases the pulse delay from Index.

(3) Select either head (0 or 1) and, while observing the waveform at TP19, turn the adjusting screw until the first pulse after the falling edge of Index (Channel 2) falls within the 30 ±5 μsec specification.

(4) Select the other head and ensure that the specification detailed in Step (3) is met. A compromise adjustment may be required to meet the 30 ±5 μsec requirement for both heads. See Figure 6-29.

(5) Turn the Phillips-head screwdriver slightly in the opposite direction of the last to cause the adjusting screw to relax the force on the mechanism (i.e., mid-range of the screw backlash).

(6) Recheck heads 0 and 1 to verify that the measurement is still within tolerance. Repeat Steps (3), (4), and (5) as necessary.

6.15 CARTRIDGE INTERLOCK SYSTEM — FRONT LOAD MODELS

The front load disk drive is protected against physical damage by an electromechanical interlock system. This system, described in Paragraph 3.11, prevents the operator from removing a disk cartridge unless the disk drive is in the Safe condition, the spindle has stopped rotating, and the heads have been fully retracted. Two solenoids limit the opening of the front door until these conditions have been satisfied.

The interlock system also inhibits the start sequence if a disk cartridge has not been properly inserted by the operator. This condition is sensed by the interlock switch. The interlock is actuated by appropriate logic and driver circuits located on the Servo and Logic PCBAs.

CAUTION

BEFORE ATTEMPTING TO START A FRONT LOAD DISK DRIVE THE DOOR MUST BE FULLY CLOSED.

6.15.1 CHECKING THE INTERLOCK SYSTEM

Proper adjustment of the interlock system may be verified as follows.

(1) Prepare the disk drive to receive a disk cartridge as detailed in Paragraph 3.3.

(2) Install an approved disk cartridge as detailed in Paragraph 3.4.1. Depress the RUN/STOP switch.

(3) When the READY indicator is illuminated, pull on the door handle with a pulling force of approximately 10 pounds.

(4) If the unit continues to function normally, as evidenced by continuous illumination of the READY indicator, the interlock system adjustments are within tolerance. If the Ready condition is not maintained, perform the relevant adjustment procedures detailed in Paragraph 6.15.2.

6.15.2 ADJUSTING INTERLOCK SYSTEM

6.15.2.1 Test Configuration

(1) Withdraw the disk drive forward to the full extent of the slides.

(2) Remove the dust cover; refer to Paragraph 2.2, Step (5).

(3) Apply power to the disk drive and allow the disk drive to come SAFE.

(4) Determine if a cartridge is installed in the disk drive by following the unloading instructions contained in Paragraph 3.4.2, Steps (1) through (4).

(5) Remove the cartridge from the disk drive if one is installed.

(6) Remove power from the disk drive.

6.15.2.2 Solenoid Plunger Clearance Test and Adjustment

When a solenoid plunger is manually depressed, the clearance between the right and left door link arms and the end of each solenoid plunger should measure between 1.016 mm to 1.524 mm (0.040 to 0.060 inch). See Figure 6-32.

Solenoid adjustments are made as follows.

(1) Right solenoid. Back off the two solenoid mounting screws and slide the solenoid toward or away from the link arm to decrease or increase the gap as required. Securely tighten solenoid adjusting screws.

(2) Left solenoid. This adjustment is made with the door open using a long shank Phillips screwdriver to loosen the left solenoid adjusting screws.

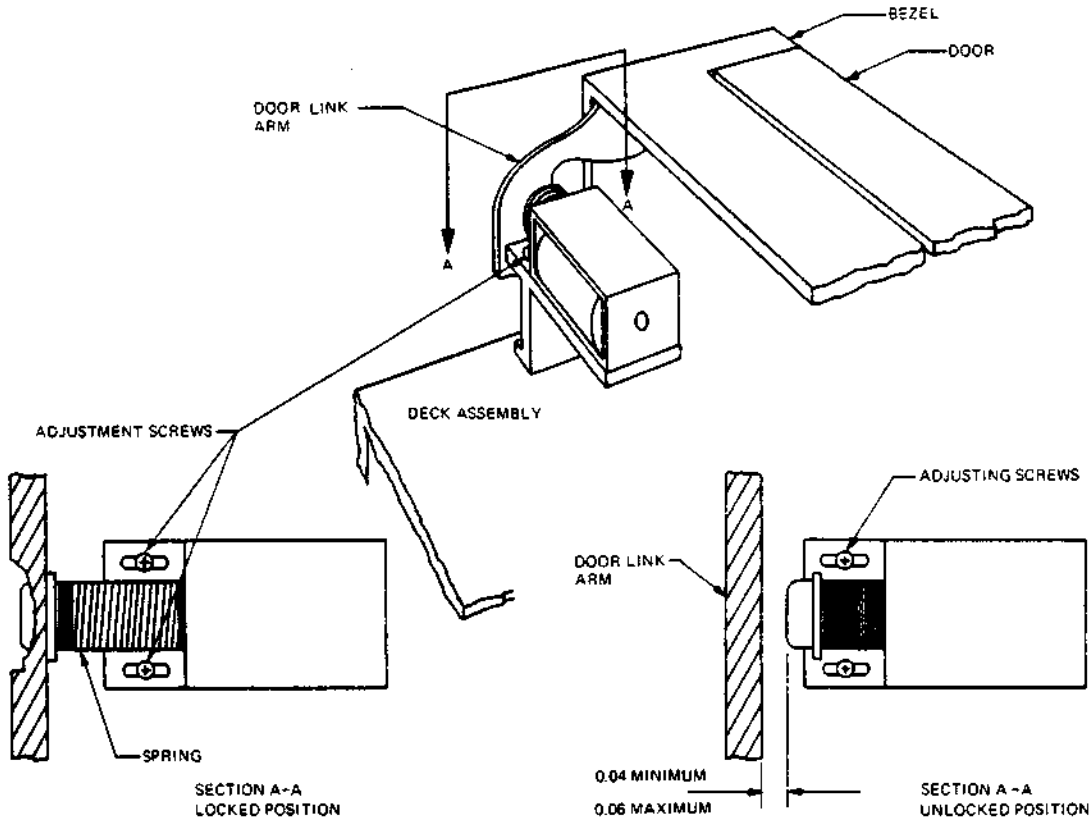


Figure 6-32. Solenoid Location and Clearance

(3) Slide the solenoid toward or away from the link arm to decrease or increase the gap as required. Securely tighten the solenoid adjusting screws.

NOTE

To reach forward adjusting screw, the shank of the screwdriver must pass between the top edge of the bezel and the left edge of the switch bracket. Avoid scratching either surface.

6.15.2.3 Interlock Switch Test

The cartridge interlock switch is a leaf-actuated snap-action switch that is part of the upper sector sensor assembly attached to the top of the lower disk cover. The actuating leaf arm of the switch extends upward through the front center of the cartridge receiver and contacts the cartridge case.

The switch senses the correct location of the cartridge in the disk drive; this ensures that the cartridge is properly located upon the spindle and is ready for operation. The switch is electrically connected to control circuits on the Logic PCBA via connector P109.

To test for correct operation, perform the following.

(1) Remove power from the disk drive.

(2) Elevate the Logic and Servo PCBAs to the maintenance position.

(3) Remove connector P109 from the Logic PCBA.

(4) Connect a suitable continuity indicating device, such as an ohmmeter, to pins 1 and 2 of P109.

(5) Apply power to the disk drive.

(6) When the SAFE indicator becomes illuminated, open the front door and install a disk cartridge.

(7) Slowly close the door and note where the switch establishes continuity.

NOTE

The cartridge must not have completed its travel at this point and should not be completely seated.

(8) Reinstall P109 onto the Logic PCBA.

(9) If the requirements of Step (7) are not met, perform the adjustment procedure contained in Paragraph 6.15.2.4.

6.15.2.4 Interlock Switch Adjustment

(1) Remove the disk cartridge.

(2) Adjust the actuating leaf of the interlock switch by bending the leaf with a pair of long-nose pliers.

(3) Return the disk cartridge into cartridge receiver and perform the test procedure contained in Paragraph 6.15.2.3, Steps (1) through (7).

(4) Open and close the door several times with the disk cartridge in place to ensure reliable operation.

(5) Disconnect the indicating device connected to P109 in Paragraph 6.15.2.3, Step (4).

(6) Reinstall P109 onto the Logic PCBA.

(7) Lower the Logic PCBA from the maintenance position to the normal operating position.

(8) Replace dust cover and return the disk drive into enclosure.

6.16 CARTRIDGE INTERLOCK SYSTEM — TOP LOAD MODELS

The top load disk cartridge is protected against physical damage by an electromechanical interlock system. This system, which is described in Paragraph 3.11, prevents the operator from removing a disk cartridge unless the drive is in the Safe condition, the spindle has stopped rotating and the heads have been fully retracted. It also inhibits the Start sequence when the cartridge has been improperly installed by the operator.

The interlock mechanism is located on the rim of the cartridge adapter assembly and consists of a cartridge lock arm, a snap-action interlock switch, and a solenoid. When properly positioned, the arm and the solenoid prevent cartridge removal. The interlock switch senses when a disk cartridge is properly installed.

In addition to the interlock mechanism, suitable logic and drivers are provided on the Servo and Logic PCBAs to control the system. Electrical connections are made via connector P109 to the Logic PCBA.

6.16.1 CHECKING THE INTERLOCK SYSTEM

Proper adjustment of the interlock system may be verified as follows.

(1) Prepare the disk drive to receive a disk cartridge as outlined in Paragraph 3.3.

(2) Install a disk cartridge as detailed in Paragraph 3.4.3. Depress the RUN/STOP switch.

(3) When the READY indicator is illuminated, apply approximately a 5-pound torque to the cartridge lock arm in the unlocking direction.

(4) If the disk drive continues to function normally, as evidenced by continuous illumination of the READY indicator, the interlock system upper limit adjustments are within tolerance.

(5) Actuate the RUN/STOP switch. When the SAFE indicator is illuminated, remove the disk cartridge and reinstall the lower cover of the cartridge, and then lock the arm.

(6) Actuate the RUN/STOP switch. If the solenoid does not lock in place the interlock system lower limit is within tolerance.

CAUTION

SHOULD THE ARM LOCK, REMOVE THE POWER IMMEDIATELY AND PROCEED TO MAKE CORRECTIVE ADJUSTMENTS.

6.16.2 ADJUSTING THE INTERLOCK SYSTEM

6.16.2.1 Test Configuration

(1) Extend the disk drive fully forward out of the rack; remove the disk cartridge and remove the source of power by disconnecting the line cord.

(2) Remove the dust cover as described in Paragraph 2.2, Step (9). Elevate the Logic PCBA to the maintenance position.

6.16.2.2 Solenoid Stroke Test and Adjustment

Check the stroke adjustment of the solenoid. With the solenoid plunger manually depressed and the lock-arm unlocked, the distance from the end of the plunger to the curved surface of the lock-arm body must be from 0.04 to 0.08 inches as shown in Figure 6-33. If adjustment is required, loosen the adjusting screws and position the solenoid body until the proper clearance is obtained.

6.16.2.3 Lock-Arm Travel Test and Adjustment

Check the lock-arm travel by rotating the lock arm to the locked position; attempt to insert a 0.030-inch thick feeler gauge between the neck of the lock arm and the adapter casting, as shown in Figure 6-34. If the clearance is greater than 0.030-inch, adjust to correct clearance by loosening the retaining screws and sliding the solenoid body laterally across the mounting bosses until the clearance is less than 0.030-inch. After completing the adjustment, determine that the solenoid plunger is not binding against the lock arm body and is free to engage and disengage under its own spring force. Ensure that the stroke adjustment detailed in Paragraph 6.16.2.2 has not changed.

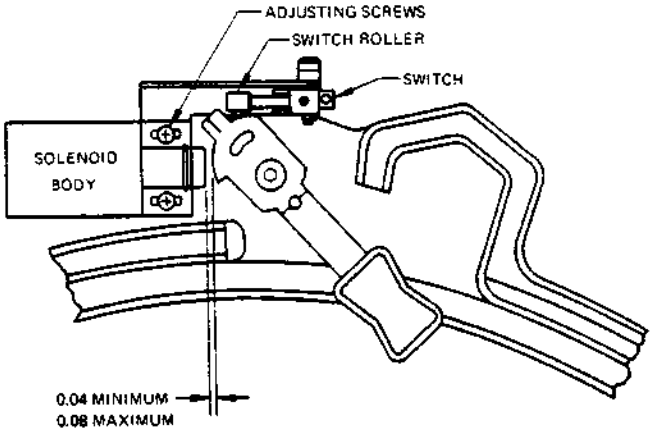


Figure 6-33. Retracted Solenoid Plunger and Lock-Arm Clearance

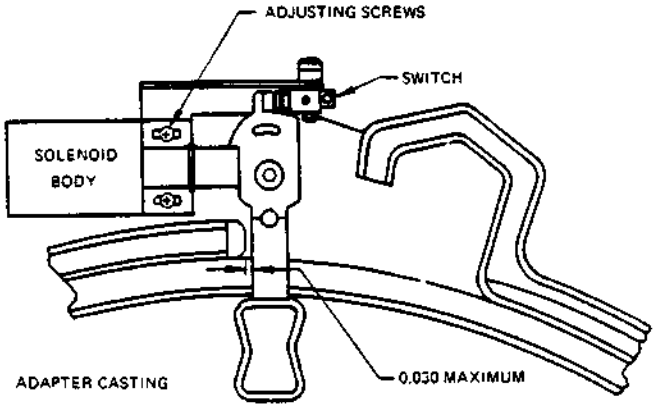


Figure 6-34. Adapter Casting and Lock-Arm Clearance

6.16.2.4 Snap Action Switch Test and Adjustment

(1) Remove power from the disk drive.

(2) Remove P109 from the Logic PCBA.

(3) With a suitable continuity indicating device, monitor the switch closure between pins 1 and 2 in the connector.

(4) Install adapter bowl setup tool, PERTEC Part No. 103619-01, onto the spindle cone. See Figure 6-35.

(5) Manually depress the solenoid plunger and rotate the lock arm to the locked position over the NO-GO position marked on the tool. See Figure 6-36. There should be no switch closure observed between pins 1 and 2.

(6) Retract the lock arm and move the tool to the GO position.

(7) Manually depress the solenoid plunger and rotate the lock arm to the locked position over the GO portion of the tool. Contact closure should be observed between pins 1 and 2.

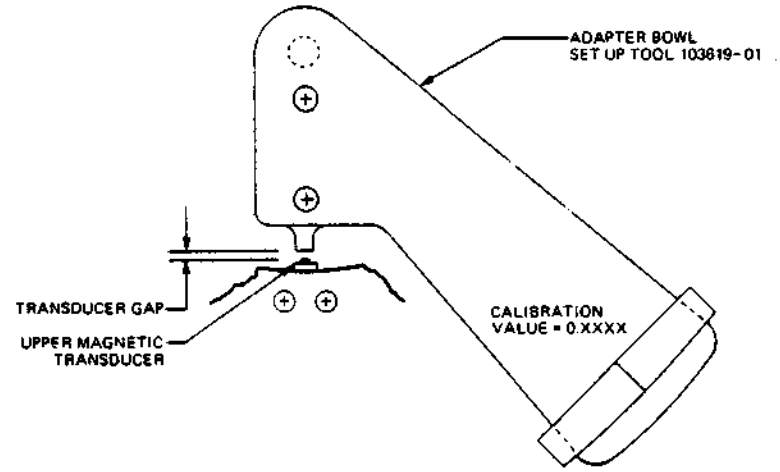


Figure 6-35. Upper Magnetic Transducer Gap

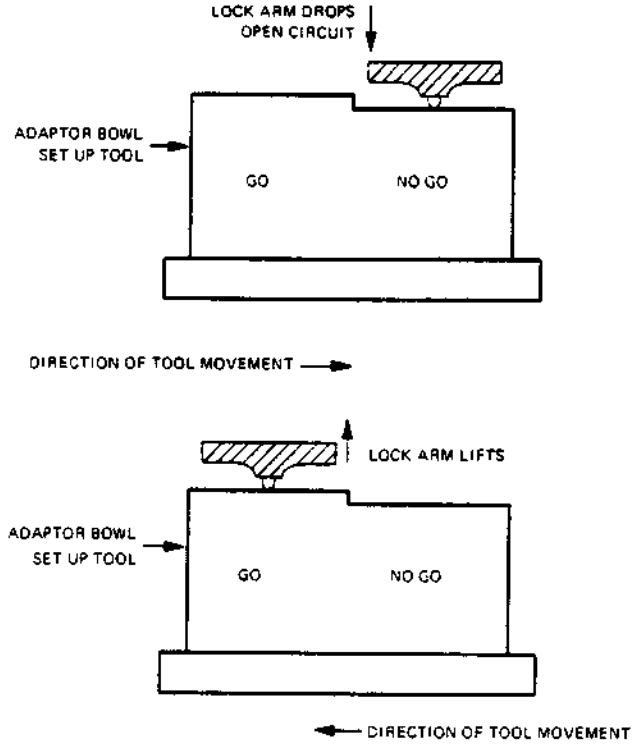


Figure 6-36. GO/NO GO Adjustment Tool, End View

(8) Adjust the closure point, if required, by loosening the No. 2 machine screws securing the switch in place and sliding the switch body vertically until the previously established requirements are met. Remove the tool.

(9) Reinstall P109 onto the Logic PCBA.

(10) Return the Logic PCBA to the normal position.

(11) Reinstall the dust cover and return the disk drive to the enclosure.

6.17 BEZEL AND POWER SWITCH

6.17.1 REMOVAL OF BEZEL

Removal or adjustment of the bezel is made by loosening three socket-head countersunk Allen machine screws securing the assembly to the base assembly.

NOTE

The holes through which the screws pass are slotted to allow for bezel removal without removing screws.

To remove the bezel, proceed as follows.

(1) Back-off the six machine screws enough to clear the bezel supports on each side of the bezel.

(2) Pull the assembly forward and away from the deck assembly.

(3) Access to parts requiring replacement or adjustment is now available.

6.17.2 INSTALLATION OF BEZEL

To install the bezel, proceed as follows.

(1) Ensure that the six machine screws are backed-off enough to clear the bezel support on each side of the bezel.

(2) Carefully position the bezel to the deck assembly and secure the bezel mounting screws.

6.17.3 REMOVAL OF POWER SWITCH BRACKET

Remove the bezel as outlined in Paragraph 6.17.1. Access to three switch bracket screws is now available. Two mounting screws are located below the bracket and one is located to the right side of the bracket. See Figure 6-37.

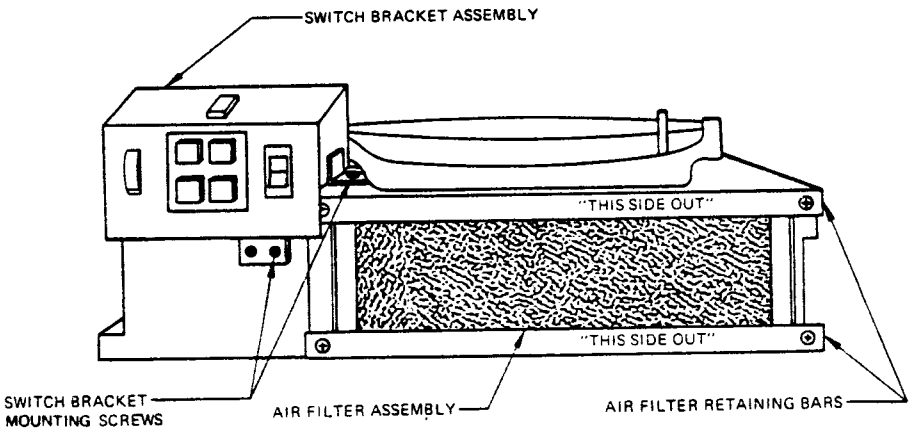


Figure 6-37. Switch Bracket and Air Filter Retaining Screw Locations

6.18 MAGNETIC TRANSDUCER GAP

Magnetic transducers are used in one place on front load models, and are used in two places on top load models. In each case the distance between the transducer pole tip and its respective rotating surface must be precisely controlled to produce acceptable signal levels.

Paragraphs 6.18.1 and 6.18.2 describe the test and adjustment procedures for the upper and lower transducers, respectively, on top loading disk drives. Paragraph 6.18.3 provides test and adjustment instructions for front loading disk drives.

6.18.1 UPPER TRANSDUCER TEST AND ADJUSTMENT — TOP LOAD MODELS

Extend the unit forward out of the rack and install the Adapter Bowl Setup Tool (PERTEC Part No. 103619-01) onto the spindle cone. Exercise care to ensure that cone and tool are clean and free of dirt.

CAUTION

WHEN GAUGING GAP CLEARANCE, ENSURE THAT NO DAMAGE IS MADE TO THE SENSING TIP OF THE TRANSDUCER BY THE FEELER GAUGE.

A feeler gauge is used to measure the gap distance between the transducer pole tip and the tool. See Figure 6-35. Each adapter bowl setup tool will have marked on it a calibration value to be added to the nominal feeler gauge value.

The nominal feeler gauge value is given in Table 6-8. The calibration value for the particular tool is added to the value obtained from the table and rounded to the nearest half mil to obtain the actual feeler gauge thickness to be used. A single feeler gauge blade, or two or more stacked, may be used to obtain the thickness required. Use clean, dry blades.

Table 6-8

Upper Transducer Calibration Data

Adapter Bowl Setup Tool Revision Level	Allowable Nominal Armature Plate Notch Width	Nominal Feeler Gauge Value	Allowable Armature Plate Diameter	Maximum Allowable Armature Plate Runout (TIR*)
A	0.080"	0.019"	5.738 +0.005"	0.010"
B and subsequent	0.080" 0.040" 0.020"	0.009"	5.738 +0.002"	0.003"
	0.080"	0.029"	5.738 +0.005"	0.010"
	2.03mm	0.029	145.745 +0.2mm	0.4mm

*Total Indicated Runout.

If the gap clearance requires adjustment, carefully loosen the No. 4 machine screws which secure the transducer clamp a slight amount. See Figure 6-38. Position the transducer body to the required clearance. Tighten screws and recheck gap clearance. When the gap is adjusted, the circumferential alignment procedure detailed in Paragraph 6.13.9 must be performed.

6.18.2 LOWER TRANSDUCER ALIGNMENT — TOP LOAD MODELS

The gap clearance between the transducer pole tip and the phase-lock ring located on the spindle should be 0.007 ±0.001 inch. See Figure 6-39. A feeler gauge is used to establish the clearance between the transducer pole tip and the center of a phase lock ring segment located on the spindle.

CAUTION

WHEN GAUGING GAP CLEARANCE, ENSURE THAT NO DAMAGE IS MADE TO THE SENSING TIP OF THE TRANSDUCER BY THE FEELER GAUGE.

When the gap clearance requires adjustment, slightly loosen the No. 4 machine screws securing the transducer clamp.

Position the transducer to establish correct gap clearance and retighten clamping screws. Recheck gap clearance.

6.18.3 LOWER TRANSDUCER ALIGNMENT — FRONT LOAD MODELS

The gap clearance between the transducer pole tip and the phase-lock ring, located on the spindle, should be 0.007 ±0.001 inch. See Figure 6-39. A feeler gauge is used to establish the clearance between the transducer pole tip and the center of a phase-lock ring segment located on the spindle.

CAUTION

WHEN GAUGING GAP CLEARANCE, ENSURE THAT NO DAMAGE IS MADE TO THE SENSING TIP OF THE TRANSDUCER BY THE FEELER GAUGE.

When the gap clearance requires adjustment, slight loosen the No. 4 machine screws securing the transducer clamp.

Position the transducer to establish correct gap clearance and retighten clamping screws. Recheck gap clearance.

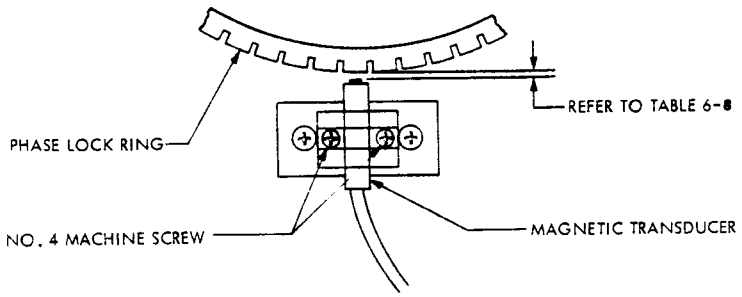


Figure 6-38. Upper Transducer Alignment, Top Load Only

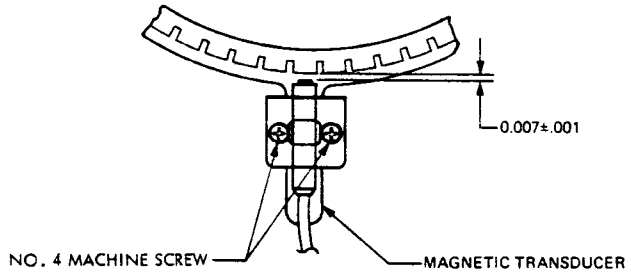


Figure 6-39. Lower Transducer Alignment, Front and Top Load

6.19 DISK DRIVE PULLEY SYSTEM

The disk drive utilizes a flat belt and crowned pulleys to operate the spindle and blower at correct speeds. Operation at 1500 and 2400 rpm is obtained at 50 or 60 Hz by changes of pulley sizes and belt length. Refer to Table 6-9 for identification of belt and pulley combinations.

6.19.1 BELT REMOVAL

Location of pulleys and direction of rotation is indicated in Figure 6-40. To replace a belt, proceed as follows.

(1) Remove three No. 10 machine screws securing the belt guard in place.

(2) Slide the belt guard forward until it drops away from the base.

(3) Insert a large shanked screwdriver between the tension idler plate and the base. Compress the tension idler spring until the belt is released from the motor pulley.

(4) Remove the belt from area.

6.19.2 BELT REPLACEMENT

The following sequence is followed when replacing a drive belt. Refer to Figure 6-40 for threading pattern.

(1) Loop one end of drive belt around spindle pulley. Center the belt on crown of pulley and, by hand, hold the remainder of belt taut until Step (2) is completed.

(2) Feed the remainder of the belt loop under the idler tension roller arm.

NOTE

At this point the outside face of the belt contacts the crown of the tension roller.

(3) Feed the remainder of the belt loop again under the tension roller arm and up toward the blower pulley.

(4) Loop the belt around the blower pulley. Release the loop and extend the remainder of the belt loop to the drive motor pulley.

NOTE

At this point the inside face of the belt contacts the traction area of the blower pulley.

(5) Continue the remainder of the belt loop up to the drive motor pulley. Spread the belt apart to form a loop which can be slid down and around the traction area of the drive motor pulley.

Table 6-9
Pulley and Belt Identification

Disk Speed	Line Frequency	Motor Pulley P/N and Crown Dia.	Blower Pulley P/N and Crown Dia.	Spindle Pulley P/N and Dia.	Belt P/N and Inside Circum.
1500 rpm	60 Hz	102636-01 1.720"	102722-01 1.720"	102635-02 3.470"	102634-01 42.1875"
1500 rpm	50 Hz	102636-02 2.143"	102722-01 1.720"	102635-02 3.470"	102634-02 42.7812"
2400 rpm	60 Hz	102636-02 2.143"	102722-02 2.143"	102635-01 2.686"	102634-01 42.1875"
2400 rpm	50 Hz	102636-03 2.563"	102722-02 2.143"	102635-01 2.686"	102634-02 42.7812"

*Inside circumference +0.125".
• Tension Roller P/N 102609-01; 1.950" Dia.
• Drive Motor P/N 103579-01

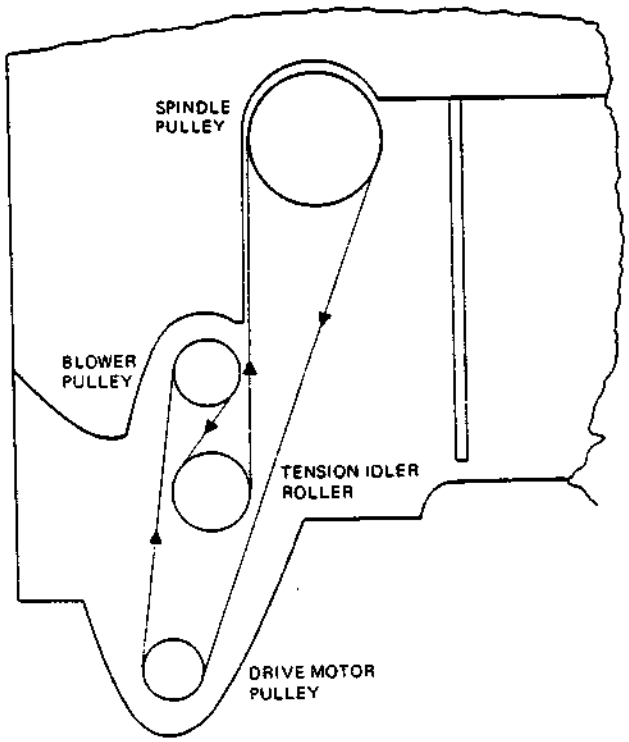


Figure 6-40. Belt Threading Pattern

(6) With a large shank screwdriver (used as a crowbar) pry the tension arm forward by compressing the tension arm spring toward the front of the base. This action will establish enough slack in the belt to allow the belt loop mentioned in Step (5) to be slipped down and around the drive motor pulley. Release pressure on the tension arm.

(7) Inspect the belt for location on all driven surfaces and also determine that the belt does not contact any surface that will cause belt abrasion.

(8) By hand, pull the belt through several revolutions of the drive system in order to allow the belt to seek its normal operating path. This action will also establish the correct tension of the belt between pulley spans.

NOTE

If the belt comes in contact with any structural member, either raise or lower the drive motor pulley on the motor shaft until the belt clears the obstruction.

(9) Inspect the static discharge contact located on the end of the spindle shaft (see Paragraph 6.20).

(10) Reinstall the belt guard.

(11) Return the disk drive into the enclosure.

6.20 STATIC DISCHARGE CONTACT

The static discharge Rulon contact is located on the belt guard. This contact provides a ground path from the spindle shaft to ground. Continuity is maintained by the tension of the metal spring on which the Rulon contact is mounted. Grounding of the spindle shaft thus prevents a buildup of static electricity on the disk surface.

Inspection is made as follows.

(1) Remove three No. 10 machine screws securing the belt guard in place.

(2) Slide the belt guard forward until it is free of the base.

(3) Inspect the static discharge Rulon contact for wear.

NOTE

If the Rulon contact shows signs of excessive wear from the pointed end of the spindle shaft, replace the belt guard [PERTEC Part No. 102748].

(4) Reinstall the belt guard.

(5) Return the disk drive into the enclosure.

6.21 CARE AND HANDLING OF HEADS

Figure 6-41 shows examples of proper care and handling of the magnetic heads. Peak performance of the disk drive cannot be expected unless proper care is taken when handling these heads.

Figure 6-42 shows examples of improper handling of the magnetic heads; these examples are only a few of the ways a head can be damaged by improper care.

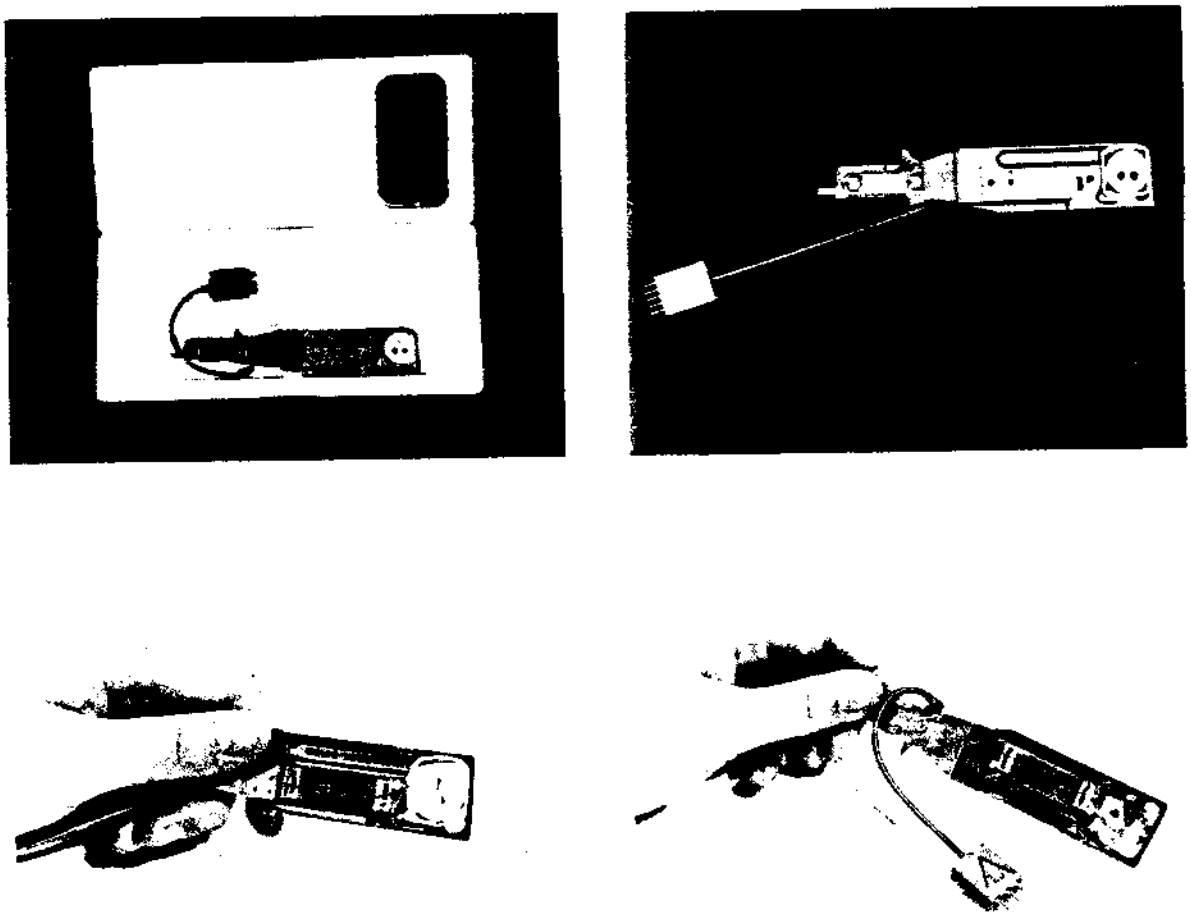


Figure 6-41. Examples of Proper Care and Handling of Heads

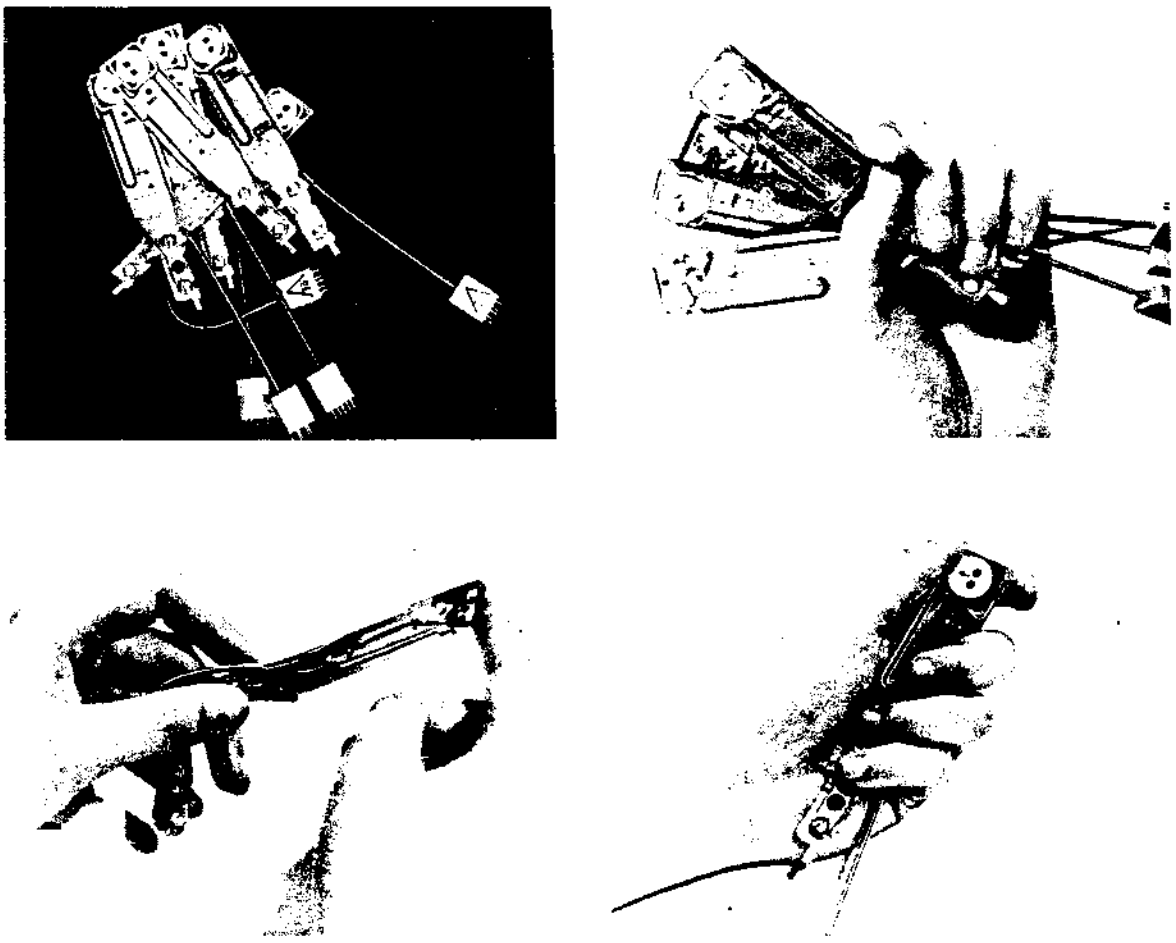


Figure 6-42. Examples of Improper Care and Handling of Heads

6.21.1 LOAD PIN SEATING

Proper seating of the load pin is essential to ensure gimbaling and flying characteristics of the ceramic slider. Examples of correct and incorrect positions of the load pin are shown in Figure 6-43. If any of the incorrect examples exist upon any head or if the gimble spring is damaged, the head assembly must be replaced.

6.22 HEAD REMOVAL AND INSTALLATION

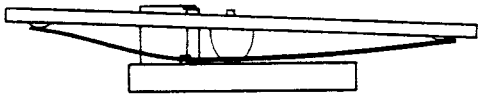
Removal of a head is occasioned by mechanical damage, electrical failure, or for the purpose of cleaning. In the event one head needs attention, it is recommended that all heads be removed from the carriage, inspected, and cleaned. It is also recommended that data stored on the lower platter be transferred to a cartridge prior to any head removal.

6.22.1 HEAD REMOVAL PROCEDURE

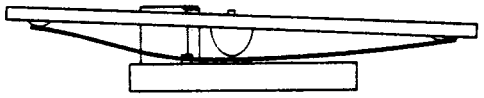
The magnetic head is removed as follows.

(1) Disconnect the disk drive from the source of power.

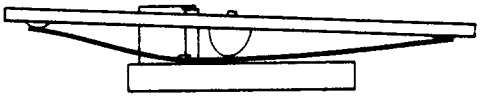
(2) Extend the drive fully forward from the enclosure.



LOAD PIN PROPERLY IN CONTACT WITH SLIDER



LOAD PIN NOT CONTACTING THE SLIDER



LOAD PIN IMPROPERLY SEATED ON FLEXURE ARM

Figure 6-43. Load Pin Seating

(3) Remove the dust cover (refer to Paragraph 2.2).

(4) Disconnect head connectors from the Read/Write PCBA.

NOTE

The steel protective sheath on each connector lead is magnetic and will allow the connectors to be laid on the side surface of the magnet, thus preventing damage to the connectors while removing other components.

(5) Disconnect all connectors from the Read/Write PCBA and remove the PCBA from the disk drive.

(6) Prepare two lint-free pads, approximately 1-inch square and 1/8-inch thick. Lay a lint-free wipe on a clean flat surface on which to lay the heads when they are removed from the carriage.

(7) Refer to Figure 6-44 for parts identification.

(8) Insert between the ceramic sliders of each pair of heads the pads prepared in Step (9); these will protect the ceramic sliders from clashing together as they are being removed.

(9) Loosen the four recessed Allen head setscrews in the clamp plate(s) to a position where the point of each screw is recessed below the surface of the clamp plate.

CAUTION

THE CARRIAGE MUST BE FULLY RETRACTED AND REMAIN RETRACTED WHILE REMOVING HEAD ASSEMBLIES.

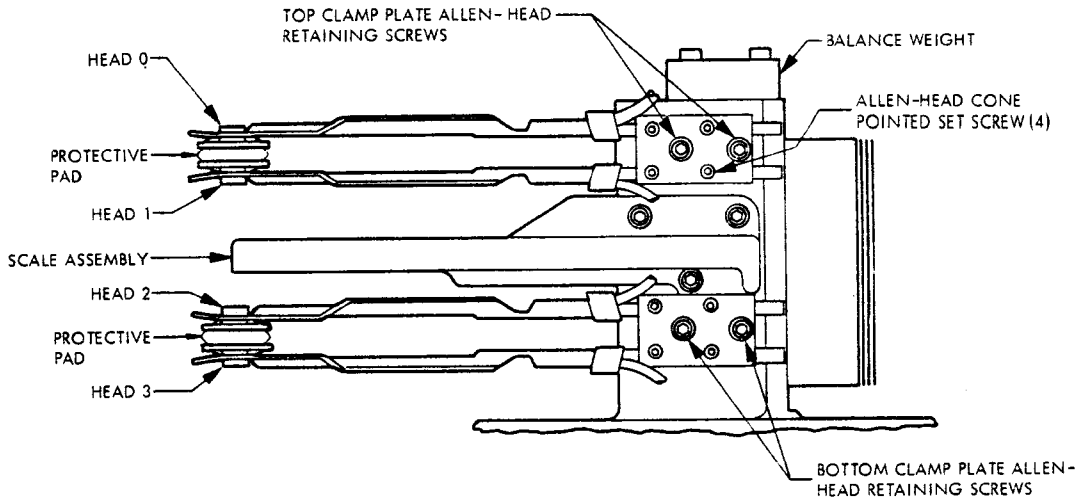


Figure 6-44. Heads Installed on Positioner Carriage (200 tpi)

(10) Loosen the top pair and bottom pair of clamp plate Allen head retaining screws from the clamp plates. Remove the clamp plates, screws, and spacers from the carriage.

(11) Determine that spacers between each pair of heads remain on screw shanks when each clamp plate is removed from carriage; if not, individually remove each spacer from carriage area before proceeding further.

(12) Remove the heads in the following sequence: head 0 (top), head 1 (second), head 2 (third), and head 3 (bottom).

CAUTION

EXERT EVERY PRECAUTION TO PREVENT DAMAGE TO THE GIMBLE SPRING AND THE CERAMIC SLIDER WHILE REMOVING AND HANDLING HEADS.

- Apply to the head end of the support arm sufficient pressure with thumb and forefinger to separate the body of the support arm from the ramp. Push the head arm approximately 3/8-inch straight forward into the disk cavity by applying pressure to the die cast positioning arm while holding positioning arm flat against carriage mounting surface until the arm is free of carriage slots. Again, use extreme caution not to allow the gimble spring or the ceramic slider to come in contact with any other surrounding part.
- When a head is free, place it upon a lint-free wipe in the clean area with the ceramic slider facing up.
- Remove the other heads in succession observing equal precautions for each head.

6.22.2 HEAD INSTALLATION PROCEDURE

Installation of the heads after cleaning or when replacing a damaged head is accomplished as follows.

(1) If required, perform the necessary Steps (1) through (5) of Paragraph 6.22.1.

(2) Prior to installing heads, inspect carriage and the surrounding area for any foreign material that could contaminate heads or interfere with installation. Clean head mounting area with 91-percent isopropyl alcohol.

NOTE

Use only 91-percent isopropyl alcohol to clean disks and heads. Use of any other type of cleaner or solvent, such as carbon tetrachloride or trichlorethylene may result in damage. Do not use contaminated alcohol which could contain any form of residue.

Examine the carriage slots into which the supporting arm of the head is placed for any nicks or burrs that would obstruct installation or alignment.

(3) Examine the ceramic slider of each head for cleanliness. Also inspect gimble spring and slider pivot for proper alignment. Refer to Figure 6-43.

(4) Prepare two lint-free wipe pads, approximately 1-inch square and 1/8-inch thick; these pads will be used to separate each pair of heads to prevent possible damage to the ceramic slider during installation.

(5) Note that there are two V-shaped indentations on the side of the die-cast support arm. Fore and aft head alignment of several thousands of an inch can be made when the pointed screws in the clamp plate engage with the V slots in the support arm. (Figure 6-44 illustrates the support arm used on both the 100 tpi and 200 tpi models.)

6.22.2.1 Installation of Head-to-Carriage Slots

(1) Locate the threaded holes on the carriage used for the clamp plate(s) retaining screws.

CAUTION

CARRIAGE MUST BE FULLY RETRACTED AND REMAIN RETRACTED WHILE INSTALLING HEAD ASSEMBLIES.

NOTE

When installing heads, it is recommended that the bottom head [the lowest] be installed first and then progress up to the top head.

CAUTION

CARRIAGE MUST NOT BE MOVED FROM THE FULLY RETRACTED POSITION UNTIL ALL HEADS ARE SECURED IN PLACE BY THE CLAMP PLATE.

(2) Carefully guide the bottom head into place with the ceramic slider facing upward and insert the die-cast body of the support arm into the carriage slots part of the way.

(3) Visually position the support arm Vs to be approximately on center with the two retainer clamp screw holes.

NOTE

Improper horizontal positioning of the head into the carriage slot(s) may result in improper loading of the head. Make sure that the end-protruding tab of the head support arm is inserted into the carriage slot so that the head-to-carriage distance shown in Figure 6-45 is obtained. Ensure that the head support arm does not contact the loading/unloading ramp during a Restore operation.

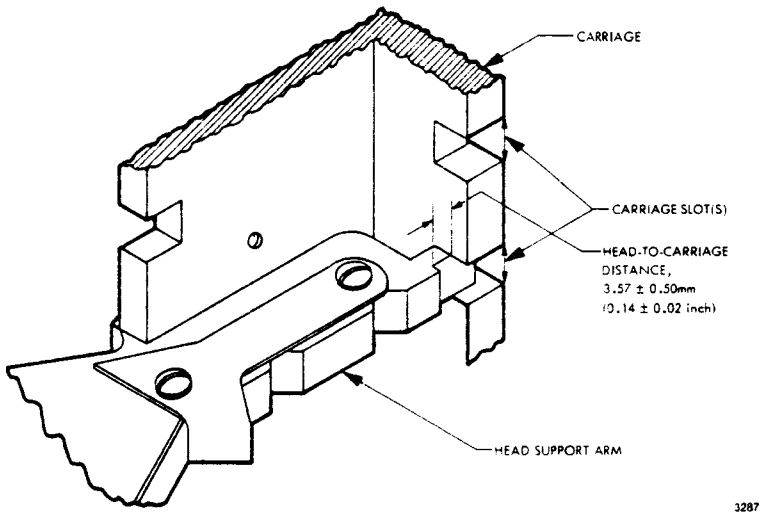


Figure 6-45. Head-to-Carriage Adjustment

(4) Firmly press the support arm back against the carriage surface and at the same time position the flange of the head on the underside of the lower ramp.

CAUTION

DO NOT OVER-STRESS HEAD GIMBLE SPRING DURING INSTALLATION.

(5) Place a lint-free wipe protective pad on the ceramic slider.

(6) In succession, install the other heads as described in the preceding steps.

6.22.2.2 Installation of Clamp Plate(s)

When all heads are in place on the carriage, proceed as follows.

NOTE

As a precaution, before installing the clamp plate[s], determine that all pointed setscrews are recessed below the surface of the clamp plate.

(1) Install the upper pair and lower pair of retaining screws through the holes in each clamp plate and install spacers previously removed over the shank of each screw.

NOTE

Under no circumstances should a clamp plate screw or a spacer be substituted for the original hardware.

(2) Tighten clamp plate retaining screws; torque to approximately 10-12 inch pounds.

CAUTION

WHEN TIGHTENING THE CLAMP RETAINING SCREWS CAUTION MUST BE TAKEN NOT TO OVER-TORQUE THE SCREWS. OVER-TORQUEING CAN CAUSE THREADS IN THE CARRIAGE CASTING TO STRIP OUT.

6.22.2.3 Head Positioning

(1) Starting with the bottom heads (3 and 2), run in each pair of pointed setscrews so that each engages with a side of the V on the support arm to an approximately equal depth. Do not allow points of setscrews to bottom out in the V on the arm.

NOTE

Horizontal position of Head 3 and Head 2 is not critical.

(2) Install Head 1 and Head 0 in like manner.

(3) Inspect installation; install the connectors to Read/Write PCBA.

(4) To correctly position Head 1 and Head 0, a CE alignment must be made. Refer to Paragraph 6.14 for procedure.

(5) After a satisfactory CE alignment is made, return disk drive to original configuration.

6.23 LAMP/LENS ASSEMBLY REMOVAL AND INSTALLATION

The Lamp/Lens Assembly is located between the upper pair of recording heads and the positioner scale, and is mounted to the base assembly. Removal of the Lamp/Lens Assembly is occasioned by mechanical damage to the lens or electrical failure of the lamp.

6.23.1 LAMP/LENS ASSEMBLY REMOVAL

(1) Remove the Phillips head screw anchoring the Lamp/Lens Assembly to the Sensor Receiver Assembly.

(2) Remove tie wraps as necessary to free Lamp/Lens Assembly connecting leads.

(3) Disconnect J203 from the Servo PCBA and extract pins 10 and 12 from J203 with a Molex pin extractor (Mfg. Part No. HT2285); the wires on these pins are connected to the Lamp/Lens Assembly.

(4) Remove the Lamp/Lens Assembly and discard.

6.23.2 LAMP/LENS ASSEMBLY INSTALLATION

(1) Align the Lamp Assembly so that locating pins on the assembly fit into the appropriate holes on the Sensor Receiver Assembly.

(2) Replace the Phillips head screw removed in Paragraph 6.23.1, Step (1).

(3) Insert pins 10 and 12, at the end of the leads connected to the Lamp/Lens Assembly, into mating pin holes of J203 and reinstall J203 onto the Servo PCBA.

(4) Replace tie wraps removed in Paragraph 6.23.1, Step (2).

(5) Perform the positioner servo calibration procedures in Paragraphs 6.8 and 6.9.

6.24 RETICLE REMOVAL AND INSTALLATION

Reticle removal is occasioned by mechanical damage to the component. The reticle is an integral part of the Sensor Receiver Assembly and is located immediately below the positioner scale, vertically in line with the Lamp/Lens Assembly. If the reticle is damaged, the entire Sensor Receiver Assembly (Part No. 104500-01 for 100 tpi, Part No. 104500-02 for 200 tpi) must be replaced.

6.24.1 RETICLE REMOVAL

(1) Remove the Lamp/Lens Assembly according to the procedure in Paragraph 6.13.1, Steps (1) and (2).

(2) Loosen the hexagonal head screw on the thermal compensation block; this will loosen the receiver post so that it can be rotated.

(3) Rotate receiver post clockwise to ensure that reticle is clear of Scale Assembly.

CAUTION

WHEN ROTATING THE RECEIVER POST, ENSURE THAT RETICLE DOES NOT CONTACT ANY PART OF SCALE ASSEMBLY.

(4) Remove tie wraps from wires connecting reticle and J203 on the Servo PCBA.

(5) Disconnect J203 from the Servo PCBA. Extract leads 1—5, 9, 10, and 12 with their pins from J203 using a Molex pin extractor (Mfg. Part No. HT2285).

(6) Remove the Sensor Receiver Assembly.

6.24.2 RETICLE INSTALLATION

The reticle is an integral part of the Sensor Receiver Assembly and is installed in the drive in accordance with the following procedure.

(1) Insert leads 1 through 5, 9, 10, and 12 with their pins on the replacement Sensor Receiver Assembly into the mating pin holes in plug J203 and reinstall onto the Servo PCBA.

(2) With the reticle arm pointing toward the rear of the disk drive, insert the sensor receiver post into the hole provided in the thermal compensation block.

(3) Rotate the Sensor Receiver Assembly counterclockwise until the reticle is directly under the scale. If this cannot be done, adjust the Allen head screw inside the sensor receiver assembly post so that the bottom of the Allen head screw is flush with the bottom of the post.

CAUTION

WHEN ROTATING THE SENSOR RECEIVER ASSEMBLY, ENSURE THE RETICLE DOES NOT CONTACT ANY PART OF THE SCALE ASSEMBLY.

(4) Tighten the hexagonal Allen head screw on the temperature compensation block until it is just possible to rotate the post.

(5) Adjust the Allen head screw inside the sensor receiver post so that the clearance between reticle and the scale is 0.005 inches. A 0.005-inch mylar shim can be used for this purpose.

(6) Replace the Lamp/Lens Assembly according to the procedure detailed in Paragraph 6.23.2.

(7) Replace the tie wraps removed in Paragraph 6.24.1, Step (4).

(8) Perform the positioner servo calibration procedures in Paragraphs 6.7 through 6.9.

6.25 SCALE ASSEMBLY REMOVAL AND INSTALLATION

Removal of the Scale Assembly is occasioned by mechanical damage to the scale frame, or in the event that the glass scale is cracked or broken.

6.25.1 SCALE ASSEMBLY REMOVAL

(1) Remove the top two magnetic heads by following head removal procedure detailed in Paragraph 6.22.1.

(2) Remove the Lamp/Lens Assembly by following the procedure detailed in Paragraph 6.23.1, Steps (1) and (2).

(3) Remove the three Allen head screws that hold the Scale Assembly to the carriage. The Scale Assembly will still be held in place by the locating pin on the carriage.

(4) Remove the Scale Assembly by carefully applying sufficient pressure to disengage it from the locating pin.

CAUTION

WHEN REMOVING THE SCALE ASSEMBLY, ENSURE THAT IT DOES NOT CONTACT THE RETICLE. DO NOT TOUCH ANY PORTION OF THE GLASS SCALE.

6.25.2 SCALE ASSEMBLY INSTALLATION

(1) Align the hole in the frame of the replacement Scale Assembly with the locating pin on the carriage.

CAUTION

WHEN REPLACING THE SCALE ASSEMBLY, ENSURE THAT IT DOES NOT CONTACT THE RETICLE ASSEMBLY.

(2) Press the Scale Assembly firmly against the carriage so the locating pin is firmly seated.

(3) Replace, but do not tighten, the three Allen head screws removed in Paragraph 6.25.1, Step (3).

(4) Replace the Lamp/Lens Assembly removed in Paragraph 6.25.1, Step (2).

(5) Disconnect connector J205 from the Servo PCBA; this removes power from the linear motor so that the heads can be positioned manually.

(6) Apply power to the disk drive and observe that the SAFE indicator becomes illuminated. The carriage can now be manually extended and retracted.

(7) Extend the carriage fully toward the disk drive spindle.

(8) Adjust the Scale Assembly so that the clearance between the reticle and the glass scale is 0.005 inches at both ends of the carriage travel. A 0.005-inch mylar shim can be used for this purpose.

(9) Connect a DVM between TP20 and TP1 (ground) on the Servo PCBA. Measure and note the voltage.

(10) Move the carriage back and forth over its full stroke; the voltage noted in Step (9) should remain constant.

NOTE

If the voltage obtained in Step [10] varies more than ± 10%, rotate the Scale Assembly about the pin until the voltage observed over the full carriage stroke remains within ± 10%.

(11) Tighten the three Allen head screws on the Scale Assembly.

(12) Replace the two heads removed in Paragraph 6.25.1 Step (1) by following the head installation procedure detailed in Paragraph 6.22.2.

NOTE

Do not replace J205 at this time.

(13) Perform the static and dynamic positioner procedures given in Paragraphs 6.8 and 6.9, respectively.

6.26 AIR FILTER

The filter assembly consists of two parts, the pre-filter, which is a fine-meshed open-cell foam material covering the air intake area of the absolute filter, and the absolute filter. The absolute filter consists of a labyrinth of small metallic separators, forming the filter path between the filter media.

The absolute filter is encased within a plastic frame for ease of handling and to prevent damage to the internal structure.

Handle the absolute filter by the edges of the plastic framework. Use caution not to compress the sides or center of the filter as puncturing of the filtering media could result, thereby lessening the effectiveness of the filter.

6.26.1 PRE-FILTER CLEANING

(1) Remove the bezel as described in Paragraph 6.17.1.

(2) The pre-filter is removed by lifting one corner of the meshed material and gently pulling it away from the front surface of the absolute filter.

NOTE

The pre-filter may be washed in soap and water and reused. The pre-filter must be absolutely dry and free from any cleaning residue before replacing it on the front of the absolute filter.

6.26.2 REMOVAL OF ABSOLUTE FILTER

The following procedure is used to remove the pre-filter.

(1) Refer to Paragraph 6.17.1 for the procedure to remove the bezel.

(2) Remove bezel and observe two retaining bars marked THIS SIDE OUT (see Figure 6-37. Remove the two retaining bars that are purposely curved to hold the absolute air filter under tension against the base casting.

(3) Withdraw the absolute filter from the air duct cavity in the base by grasping the two edges and pulling straight forward. After removing, inspect for any plastic chips or other matter remaining in the air duct cavity.

(4) Discard the used absolute filter.

NOTE

Always replace the absolute filter rather than attempting to clean it.

6.26.3 REPLACEMENT OF ABSOLUTE FILTER

Before installing a new absolute filter, inspect the plastic framework for any contamination. Especially inspect for plastic flashing clips or excess plastic that could be shaved off the edges by the air duct during installation. If the filter is not easily inserted into the air duct or its shape is distorted, there is a likelihood that the filter is defective and should not be used.

CAUTION

TOBACCO ASHES AND TOBACCO SMOKE WILL CONTAMINATE THE AIR SYSTEM AND THE ABSOLUTE FILTER. HANDLE THE FILTER IN THE CLEANEST ENVIRONMENT AVAILABLE.

Inspect the air duct leading up to the blower for any other matter that could have passed through the filter system. Clean with a lint-free cloth, if required. Replace the filters and secure the assembly into place. Be sure the retaining bars are correctly installed with the THIS SIDE OUT showing (see Figure 6-37).

6.27 POWER SUPPLY

The power supply is a removable module located in an area on the underside of the base assembly.

6.27.1 POWER SUPPLY REMOVAL

The power supply chassis may be removed as follows.

(1) Disconnect power.

WARNING

VOLTAGES MAY BE PRESENT IN THE POWER SUPPLY AREA WHICH ARE CONSIDERED DANGEROUS TO LIFE. THE EMERGENCY UNLOAD AND MOTOR START CAPACITORS MAY REMAIN CHARGED FOR A CONSIDERABLE LENGTH OF TIME, EVEN THOUGH POWER HAS BEEN REMOVED. OBSERVE EXTREME CAUTION.

(2) Extend the unit out of the cabinet and remove the dust cover (refer to Paragraph 2.2, Step (9).

(3) Position the Logic and Servo PCBAs to the maintenance position.

(4) Disconnect the power switch cable connector J501.

(5) Disconnect the power supply cables P212 and P213 at the Servo PCBA.

(6) Remove the high voltage cover from the Motor Control PCBA and disconnect P401, P402, P403, or P404.

(7) Remove the belt guard (refer to Paragraph 6.19.1, Steps (1) and (2).

(8) On 200 tpi models, the Read/Write PCBA and Temperature Compensation PCBA, with retaining hardware, should be removed as needed prior to power supply removal.

(9) Remove 8 (or 9, depending upon the model) No. 10 screws which secure the power supply chassis to the base. Carefully lower the power supply chassis out and away from the base.

CAUTION

AVOID SQUEEZING ANY CABLES BETWEEN THE BASE AND CHASSIS DURING REMOVAL AS DAMAGE TO THE CABLING CAN RESULT.

6.27.2 POWER SUPPLY INSTALLATION

Installation of the power supply is accomplished as follows.

(1) Verify that power is removed from the drive.

WARNING

VOLTAGES MAY BE PRESENT IN THE POWER SUPPLY AREA WHICH ARE CONSIDERED DANGEROUS TO LIFE. THE EMERGENCY UNLOAD AND MOTOR START CAPACITORS MAY REMAIN CHARGED FOR A CONSIDERABLE LENGTH OF TIME, EVEN THOUGH POWER HAS BEEN REMOVED. OBSERVE EXTREME CAUTION.

(2) Extend the unit out of the cabinet and remove the dust cover (refer to Paragraph 2.2, Step (9).

(3) Position the Logic and Servo PCBAs to the maintenance position.

(4) Check connections at power transformer primary and ensure that it is connected for the correct line voltage (refer to Figure 4-14 for line voltage connections).

(5) Secure the power supply in place using the screws removed in Step (9) of Paragraph 6.27.1.

(6) Inspect all wiring extended through casting to upper deck area for crushed or abraded wires.

(7) Install the belt guard.

(8) Reconnect all cables disconnected in Steps (4) through (6) of Paragraph 6.27.1.

(9) On 200 tpi models, remount the Temperature Compensation PCBA and retaining hardware.

(10) Lower the Logic and Servo PCBAs into operating position.

(11) Inspect the interior of the disk drive for any items or parts that could interrupt operation.

(12) Return the disk drive to normal operating condition.

6.28 DRIVE MOTOR

6.28.1 DRIVE MOTOR REMOVAL

Refer to Figure 6-46

(1) Pull the disk drive forward to the full extent of the slides; remove the dust cover as described in Paragraph 2.2.

(2) Raise the Servo and Logic PCBA units to the maintenance position.

(3) Remove the cover from the Motor Control PCBA.

(4) Carefully remove cable ties from the cable bundle terminating at connectors on the Motor Control PCBA and to the point where wiring to the drive motor breaks out of the cable bundle.

CAUTION

DO NOT CUT OR NICK ANY WIRES IN THE CABLE BUNDLE.

(5) Disconnect connectors P405 and P406 from the Motor Control PCBA and separate out the cable to the drive motor.

(6) Remove the belt guard; remove belt from motor pulley only (refer to Paragraph 6.19.1).

(7) Remove the motor pulley from the motor shaft.

(8) Use a thin-shank Phillips head screwdriver to remove four motor mounting screws from the motor mounting plate. Refer to Figure 6-47.

(9) Remove the drive motor from the mounting plate and from the disk drive.

6.28.2 DRIVE MOTOR INSTALLATION

From the top side of the disk drive, proceed as follows. Refer to Figure 6-46.

(1) Position the motor so the motor cable exists from the motor frame as shown in Figure 6-46.

(2) From beneath the disk drive, install four motor mounting screws through the motor mounting plate. See Figure 6-47. Secure motor to plate.

(3) Install the drive motor pulley on the motor shaft.

(4) Replace belt as noted in Paragraph 6.19.2.

(5) From the top side of the disk drive, route the motor cable as shown in Figure 6-46. Install connectors P405 and P406 to the Motor Control PCBA.

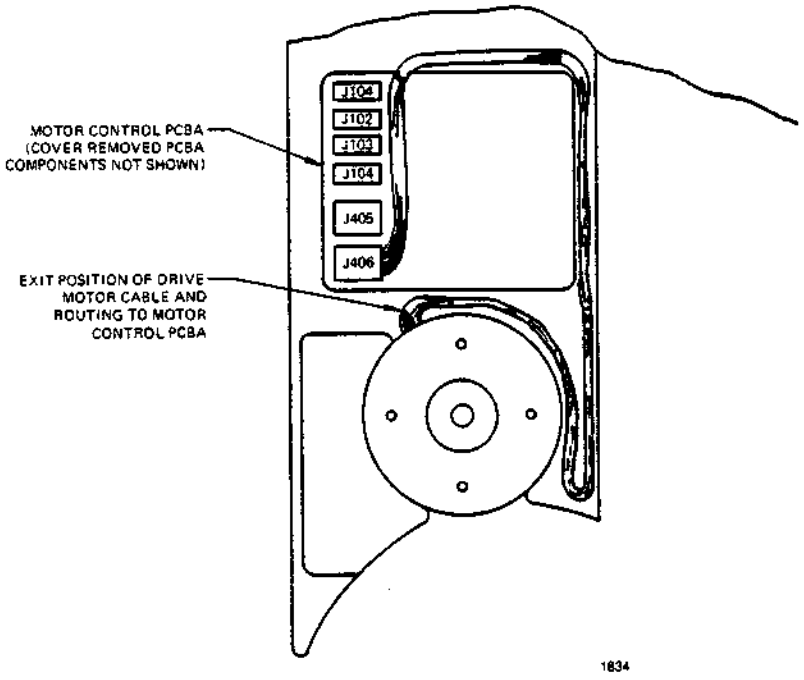


Figure 6-46. Drive Motor Cable Routing

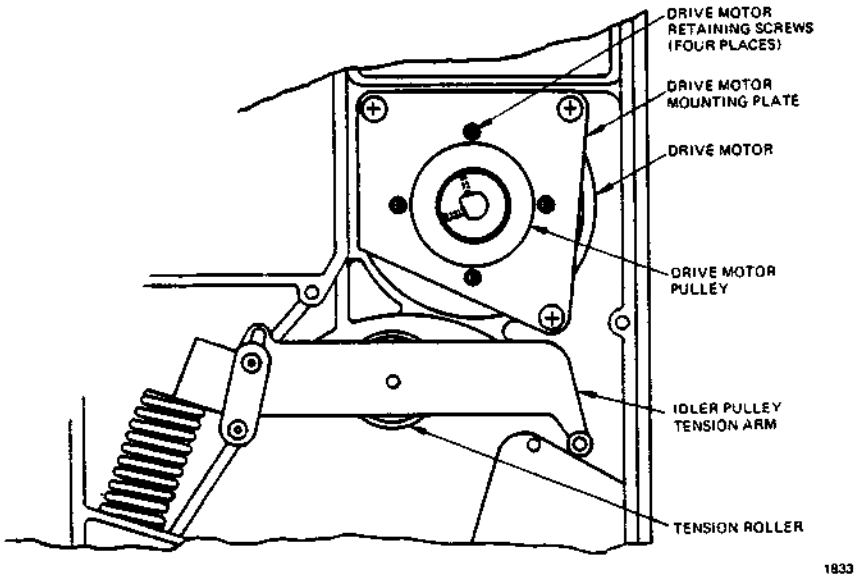


Figure 6-47. Drive Motor Replacement

(6) Retie the motor cable into the existing cable bundle.
(7) Secure the motor cable to the motor frame with tie wrap.
(8) Replace the cover on the Motor Control PCBA.
(9) Lower the Servo and Logic PCBA into operating position.
(10) Reinstall dust cover and return disk drive into enclosure.

6.29 MAINTENANCE TOOLS

The following is a list of tools required to maintain the disk drive. All tools, except the Pertec aligning and adjustment tools, may be obtained from local sources.

(1) Hex socket key set, 1/16- through 5/32-inch sizes.
(2) Thickness gauge.
(3) Open-end wrenches, sizes 3/16-, 1/4-, 5/16-, and 3/8-inch.
(4) Long-nose pliers.
(5) Phillips screwdriver set.
(6) Standard blade screwdriver set (heavy shank).
(7) Soldering aid.
(8) Soldering iron.
(9) Small diameter (3/16-inch shank, 8-inch long) No. 1 Phillips screwdriver.
(10) Lint-free wipes, e.g., Microwipes TX500.
(11) Lint-free cloth.
(12) Cotton swabs.
(13) Isopropyl alcohol (91 percent).
(14) Torque wrench, 0 — 15 in-lbs.
(15) Molex pin extractor (Mfg. Part No. HT2285).
(16) Loctite Sealant, Grade C.
(17) Voice Coil Polarity Tester, PERTEC Part No. 103607.
(18) Adapter bowl setup tool, PERTEC Part No. 103619-01.
(19) Conductive lubricant, 7 oz can, PERTEC Part No. 665-006, or equivalent.
(20) Four 6-inch mini-ball clip leads.
(21) 5/16-inch ignition open-end wrench.