

CHAPTER 5

MAINTENANCE

5.1 RECOMMENDED TOOLS AND TEST EQUIPMENT

Table 5-1 lists the recommended tools and test equipment to be used with the standard tools for proper maintenance of the RK05 Disk Drive.

5.2 PREVENTIVE MAINTENANCE

When the disk drive is operated in a normal office environment on a one-shift basis, perform the preventive maintenance (PM) procedures as indicated in Table 5-2. An abnormally dirty environment or a high incidence of cartridge exchange may require more preventive maintenance than the amount indicated in the schedule. During the PM procedures, unless specifically indicated, do not alter any adjustments on drives that are performing satisfactorily.

NOTE

Any time the plenum cover is removed, the head alignment must be checked.

5.2.1 500-Hour PM Procedure

The preventive maintenance procedure to be performed after 500 hours is as follows:

1. Remove the disk cartridge from the drive.
2. Open the rear door of the rack and unplug the drive ac line cord.
3. Inspect the read/write heads for excessive dirt or oxide. If necessary, clean the heads with the wand and Tex pads supplied with the Head Cleaning Kit.
4. Restore the drive to normal operation.

5.2.2 1,500-Hour PM Procedure

The preventive maintenance procedure to be performed after 1,500 hours is as follows:

1. Remove the disk cartridge from the drive.

2. Open the rear door of the rack and unplug the drive ac line cord.
3. Inspect and clean the read/write heads, if required (Paragraph 5.2.1, Step 3).
4. Vacuum the prefilter outer face (Figure 5-1). If there is excessive dirt on the prefilter, remove the filter and clean it with a mild liquid detergent (e.g., Ivory) and warm water. Using the vacuum cleaner exhaust, air-dry the filter completely before installation.

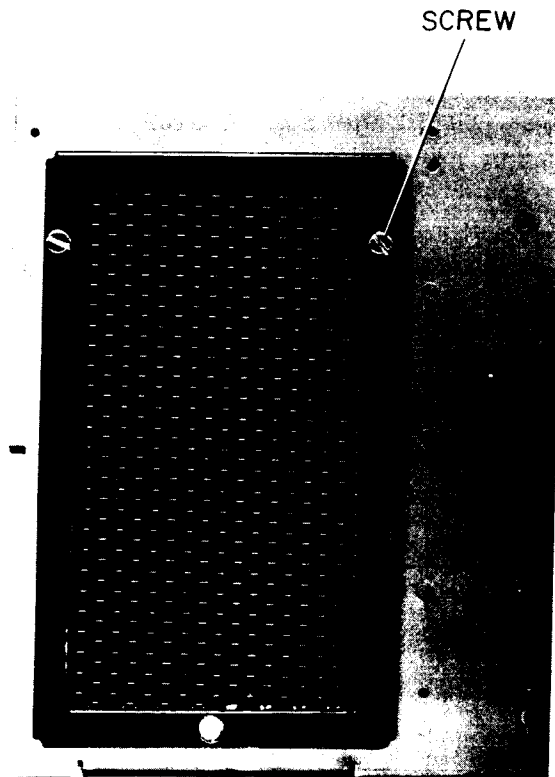


Figure 5-1 Prefilter

Table 5-1
Recommended Tools and Test Equipment

Equipment	Manufacturer and Model/Part No.
Multimeter	Triplet 310 or Simpson 360
Oscilloscope	Tektronix 453 or equivalent
Oscilloscope probes	
Voltage	Tektronix P6010
Current	Tektronix P6019 clip-on (with passive terminator)
Screwdriver, Phillips, small	Vaco P-1 or equivalent
Wire wrap tool (24-gauge)	DEC H811
Unwrapping tool (24-gauge)	DEC H812
Wire wrap tool (30-gauge)	DEC H811A
Unwrapping tool (30-gauge)	DEC H812A
Module Extender Board*	DEC H982
Torque wrench (55 oz-in., for head clamping screws)	29-20995
Wrench set (10-piece)	29-13519
Torque wrench (65 lb-in., for securing positioner to baseplate)	29-20906
Extension bar, 6 in.	29-20907
Hex-head wrench 3/16 in.	29-20908
Head insertion tool	29-20994
Head cleaning kit includes Tex pads (29-19557) and wand (29-19558)	22-00007
Inspection mirror	29-19663
Isopropyl alcohol (1 pint-91%)	29-19665
0.005-in. blue shim stock	29-19664
Alignment cartridge	RK05K-AC

*Not to be used for G180 module

**Table 5-2
Preventive Maintenance Schedule**

Frequency		Area	Action	Reference (Paragraph)
Months	Hours			
2	500	Read/Write Heads	Clean—heavy operation (e.g., extensive cartridge exchange with frequent starts and stops). Frequent use of virgin cartridges.	5.2.1
3	750	Spindle Belt Tension	Check	5.2.3
3	750	Prefilter	Clean	5.2.2
3	750	Spindle	Clean Check for bearing noise	5.2.2 5.2.2
4	1,000	Read/Write Heads	Clean—medium operation	5.2.1
6	1,500	Read/Write Heads	Clean—light operation (e.g., minimum cartridge exchange with infrequent starts and stops)	5.2.2
12	3,000	Prefilter	Replace	
12	3,000	Absolute Filter	Replace	5.2.4
24	6,000	Linear Positioner	Inspect flexstrip for cracks in copper leads. Check ease of forward and backward motion. Check for excessive lateral motion. Check velocity profile (64-cylinder seek waveform).	5.4.2
24	6,000	Read/Write Heads	Check head alignment.	5.4.5
30	7,500	Spindle Ground	Check contact with ohmmeter.	
60	15,000	Spindle Ground	Remove spindle and replace ground assembly.	5.3.4
60	15,000	Spindle Drive Belt	Replace and clean pulleys.	5.3.5.3
60	15,000	Blower	Remove and clean impeller.	5.3.6
120	30,000	Spindle	Replace	5.3.4
120	30,000	Spindle Motor	Replace	5.3.5
120	30,000	Blower Motor	Replace	5.3.7
120	30,000	Linear Transducer	Clean scale, reticle, and lens w/91% isopropyl alcohol.	

5. Remove the flexible magnet from the spindle and clean the armature plate with a clean cloth moistened with 91% isopropyl alcohol. Using the sticky side of masking tape, remove any metallic particles from the armature plate. Reinstall the flexible magnet.
6. Restore the drive to normal operation and check for excessive spindle bearing noise while the spindle is rotating. Replace the spindle (Paragraph 5.3.4) if excessive noise occurs.
3. Inspect and clean the read/write heads, if required (Paragraph 5.2.1, Step 3).
4. Replace the prefilter.
5. Replace the absolute filter (Paragraph 5.2.4).
6. Check the spindle drive belt tension by squeezing the belt slightly so that the distance AB (Figure 5-2) is reduced by approximately 1/8 of an inch. When the belt is released, the tension spring should restore the motor mounting plate enough to maintain tension on the belt. If it does not, replace the belt (Paragraph 5.3).

5.2.3 3,000-Hour PM Procedure

The preventive maintenance procedure to be performed after 3,000 hours is as follows:

1. Remove the disk cartridge from the drive.
2. Open the rear door of the rack and unplug the drive ac line cord.
7. Restore the drive to normal operation.

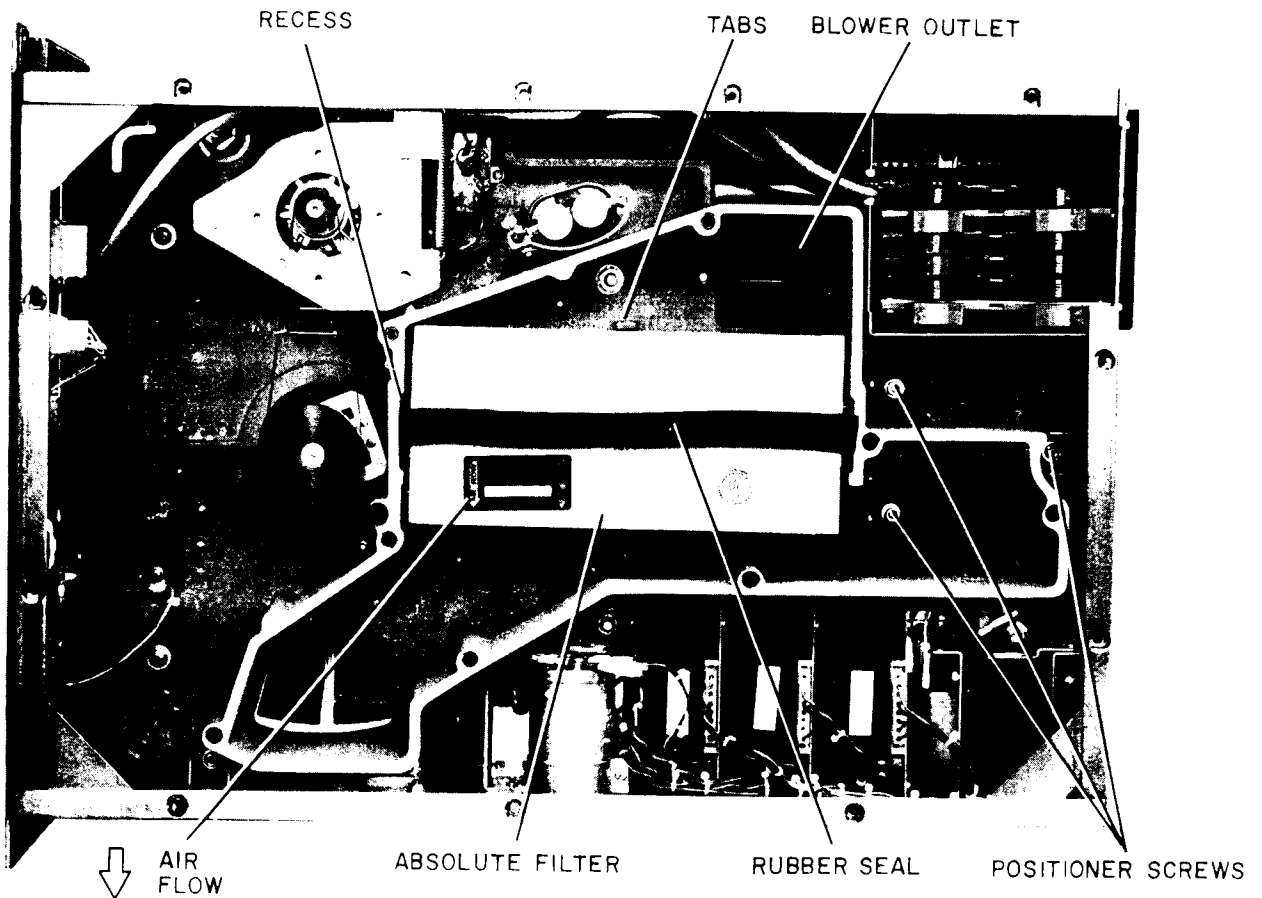


Figure 5-2 Absolute Filter Removal

5.2.4 Absolute Filter Removal and Replacement

Removal and replacement procedures for the absolute filter are as follows:

1. Open the rear door of the rack and unplug the drive ac line cord.
2. Slide the drive out of the rack until it locks in the extended position.
3. Remove the bottom and plenum covers (Figure 5-2).
4. Remove the absolute filter.
5. Install a new filter with the arrow (air flow) pointing away from the blower outlet. Ensure that the filter is positioned between the two tabs, and that the rubber seal is in the baseplate recess.
6. Replace the plenum and bottom covers.
7. Slide the drive into the rack, connect the ac line cord, and close the rear door.
8. Check read/write head alignment (Paragraph 5.4.5).

5.3 CORRECTIVE MAINTENANCE

5.3.1 Linear Positioner

5.3.1.1 Positioner Removal – The procedure for removal of the linear positioner is as follows:

1. Remove the disk cartridge from the drive.
2. Open the rear door of the rack and unplug the drive ac line cord.
3. Slide the drive out of the rack until it locks in the extended position.
4. Remove the top, bottom, and plenum covers.
5. Disconnect P5 (Figure 5-3) from the power supply chassis.
6. Remove the position transducer wires from TB1 pins 1 through 9 and TB2 pins 8 and 9.
7. Disconnect the head connectors from the electronic module.

8. Remove the absolute filter (Paragraph 5.2.4).
9. Remove the three screws beneath the baseplate that attach the positioner to the baseplate (Figure 5-2).
10. Carefully maneuver the positioner off the locating pins on top of the baseplate and lift the positioner straight up from the baseplate.

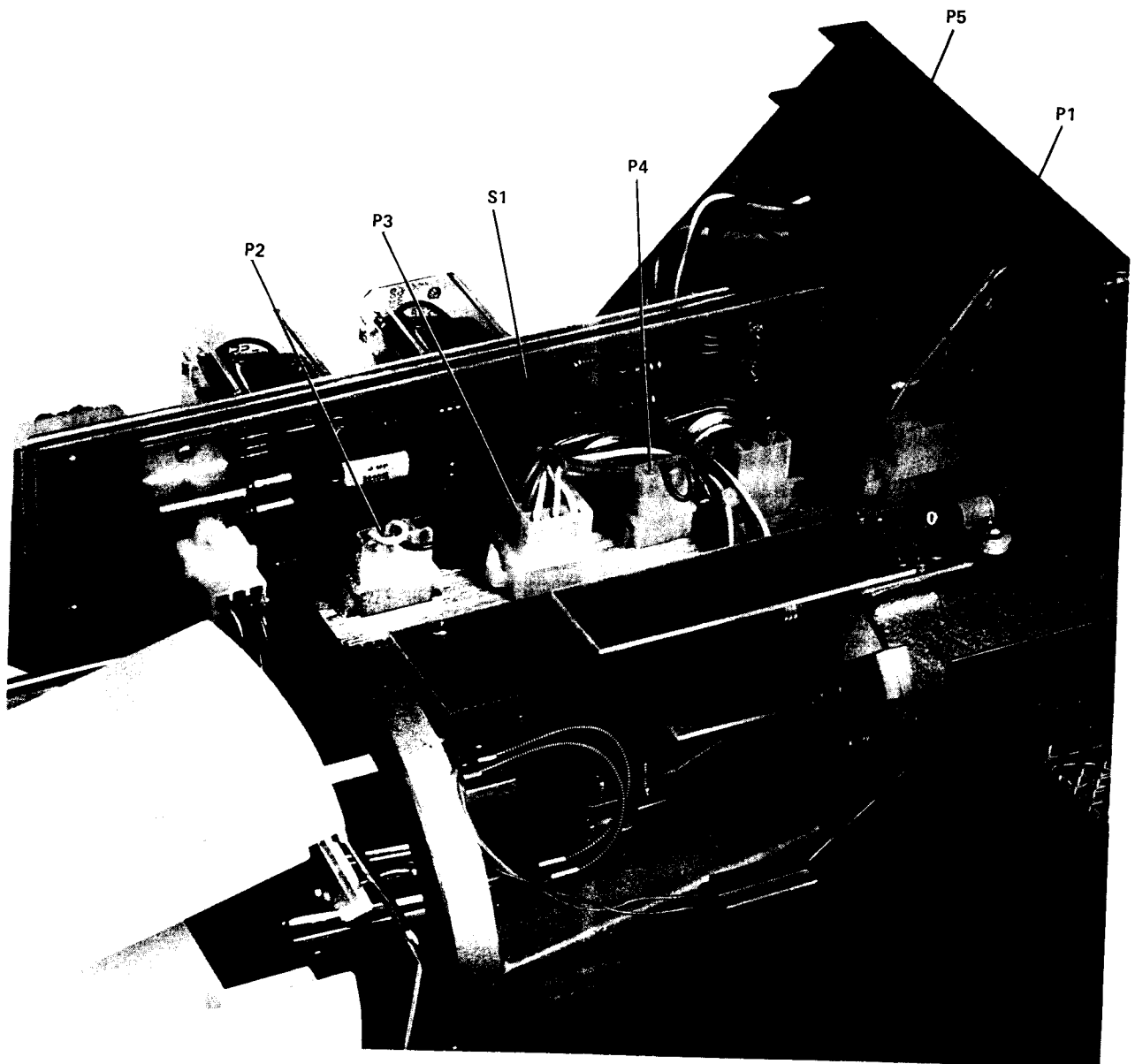
5.3.1.2 Positioner Replacement – The procedure for replacement of the linear positioner is as follows:

1. Carefully place the positioner on the three locating pins on top of the baseplate. Ensure that the two front pins rest against the front surface of the motor housing and the third diamond-shaped pin is in the center hole of the mounting face.
2. Insert the three positioner holding screws (Figure 5-2) through the bottom of the baseplate and finger-tighten the screws.
3. Ensure that the positioner is located securely against the front locating pins by tightening the holding screws with a torque wrench (set to 65 pound-inches) while applying forward pressure to the rear of the positioner.
4. With a feeler gauge, ensure that clearance between the front of the motor housing and the baseplate is less than .002 inch. If not, loosen the positioner-holding screws and repeat Step 3.
5. Connect the position transducer wires to TB1 and TB2 (Figure 5-4).

NOTE

Refer to the chassis wiring diagram for TB1 and TB2 connection color code.

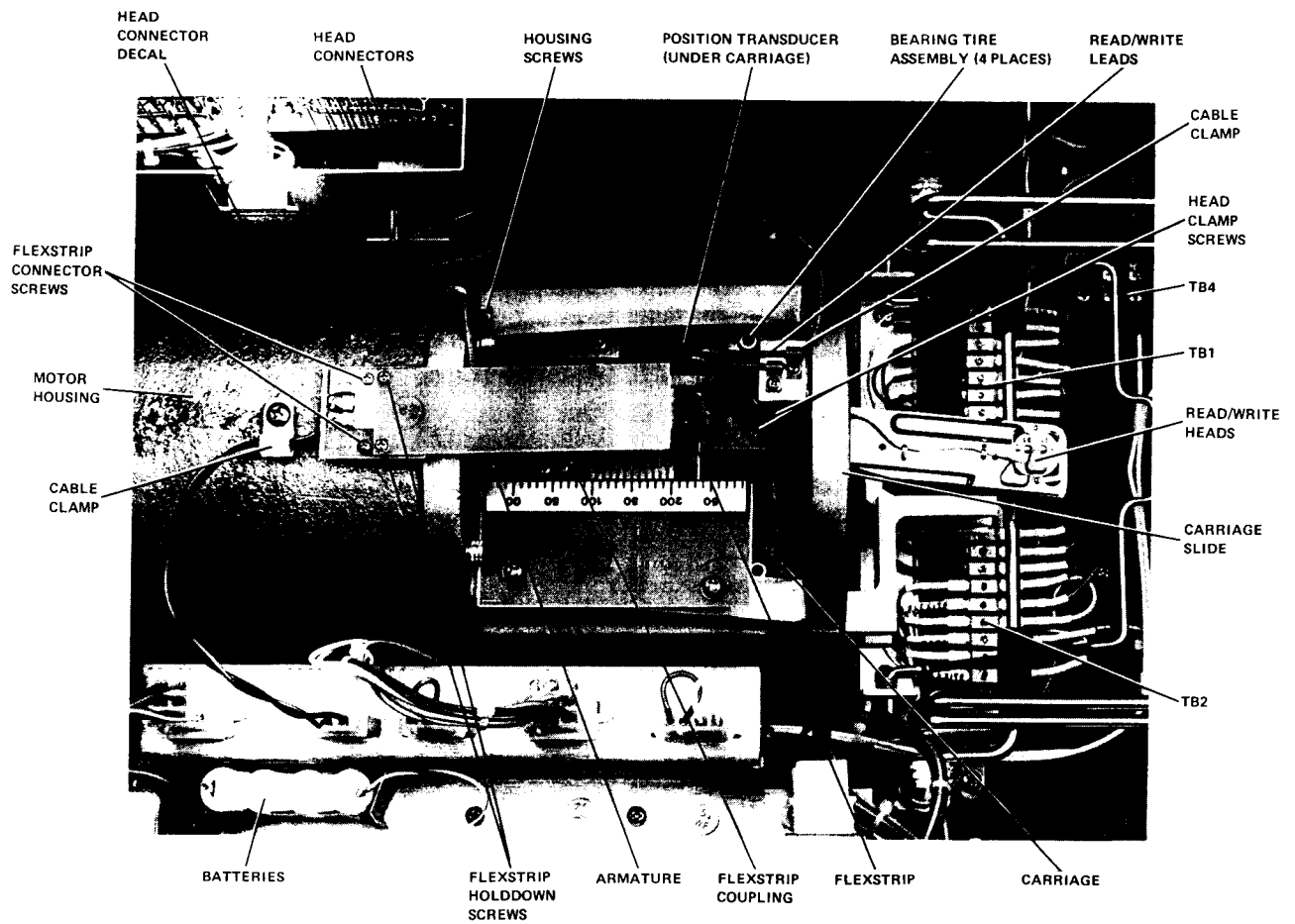
6. Plug P5 (Figure 5-3) into the power supply chassis.
7. Connect the head leads to the electronic module. Refer to the pin number decal on the logic assembly and schematic CS-G180 for the correct plug locations.
8. Install the absolute filter with the arrow (air flow) pointing away from the blower outlet (Figure 5-2). Ensure that the filter is positioned between the two tabs and that the rubber seal is in the baseplate recess.



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Figure 5-3 Internal Power Supply Connections

9. Replace the plenum and bottom covers.
10. Connect the ac line cord and check the read/write head alignment (Paragraph 5.4.5).
11. Replace the top cover.
12. Close the rear door, install a test cartridge, and exercise the drive.
13. Check read/write head alignment (Paragraph 5.4.5).



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Figure 5-4 Top View of RK05 with Cover Removed

5.3.2 Carriage

5.3.2.1 Carriage Removal – The procedure for removal of the carriage is as follows:

1. Remove the linear positioner (Paragraph 5.3.1.1).
2. Remove the read/write heads (Paragraph 5.3.3.1).
3. Remove the four flexstrip connector and flexstrip holddown screws (Figure 5-4). Do not disconnect the flexstrip coupling from the armature.
4. Remove the cable clamp screw from the top of the motor housing.
5. Remove the home switch and bracket from the carriage slide.
6. Remove the five screws securing the carriage slide to the motor housing.
7. Slowly pull the carriage and slide straight out from the motor housing.
8. Slide the carriage and armature out from the back of the carriage slide, ensuring that the transducer block does not contact the glass scale.

5.3.2.2 Carriage Replacement – The procedure for replacement of the carriage is as follows:

1. Carefully insert the armature and carriage into the carriage slide, ensuring that the transducer block does not contact the glass scale.
2. Insert the armature and carriage slide into the motor housing, ensuring that the dowel pin on the housing goes into the V-groove on the carriage slide.
3. Replace the five screws that secure the carriage slide to the motor housing (Figure 5-4).
4. Loop the flexstrip onto the top of the motor housing and replace the four flexstrip connector and hold-down screws.
5. Replace the cable clamp.
6. Replace the home switch and bracket on the carriage slide.
7. Stand the positioner up on the motor housing end, and adjust the home switch as follows:
 - a. Pull the carriage out from the motor housing until the switch actuator on the carriage is free from the switch.
 - b. Hold a steel scale across the machined face of the carriage slide and stand another scale on the machined face (near the head mounting holes) of the carriage.
 - c. Slowly move the carriage in towards the motor housing until the home switch clicks. At this point, the vertical steel scale on the carriage face should indicate $2.050 \pm .020$ inches.
8. Replace the read-write heads (Paragraph 5.3.3.2).

IMPORTANT: THE SWITCH CHECK AND ADJUSTMENT MUST BE MADE ON THE BACKWARD CLICK OF THE HOME SWITCH, AND NOT WHILE THE CARRIAGE IS MOVING FORWARD.

9. With a piece of blue plastic shim stock, check for .005 in. clearance between the transducer glass scale and the reticle. If the clearance is incorrect, loosen the transducer block mounting screws and reposition the block to obtain the correct clearance.
10. Replace the linear positioner (Paragraph 5.3.1.2).
11. Perform the servo system timing adjustment (Paragraph 5.4.2).
12. Check the read/write head alignment (Paragraph 5.4.5).

5.3.2.3 Carriage Bearing Assembly Removal – The procedure for removing the carriage bearing assembly is as follows:

1. Remove the linear positioner (Paragraph 5.3.1.1).
2. Remove the carriage from the linear position (Paragraph 5.3.2.1).
3. Using a 3/8-in. nut driver, loosen the bearing shaft nut (Figure 5-5) one-half turn.
4. Hold the 3/8-in. bearing shaft nut and remove the retaining nut from the other end of the shaft.
5. Remove the bushing from the shaft and unscrew the bearing shaft.
6. Remove the bearing.

NOTE

Replace all four bearings at the same time.

5.3.2.4 Carriage Bearing Assembly Replacement – The procedure for replacing the carriage bearing assembly is as follows:

1. Examine the bearing for a groove running around the outer diameter of the tire. If the groove is absent (Figure 5-5a), insert the bearing into the bearing pocket, with the widest machined surface of the bearing toward the threaded hole in the pocket. If the groove is present (Figure 5-5b), insert the bearing into the bearing pocket, with the groove nearest the threaded hole.

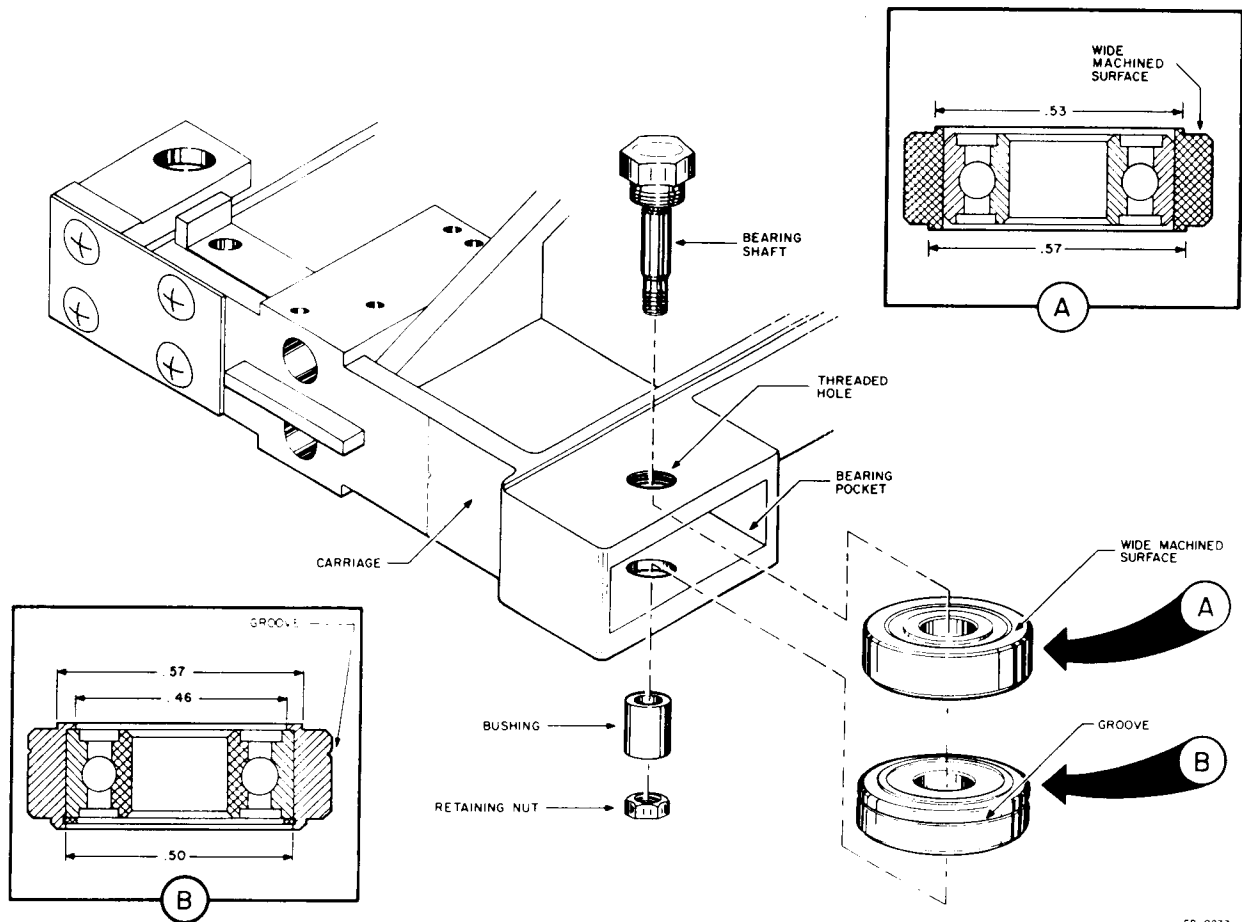


Figure 5-5 Carriage Bearing Assembly Removal

2. Insert the bearing shaft into the threaded pocket hole and through the center hole in the bearing.
3. Turn the 3/8-in. bearing shaft nut just a few turns to start the shaft threads into the pocket hold threads. Do not tighten the shaft at this time.
4. Insert the bushing on the other end of the shaft and replace the retaining nut.
5. Hold the 3/8-in. bearing shaft nut and tighten the retaining nut until the bushing moves the bearing close to the pocket top. Then tighten the 3/8-in. bearing shaft nut until the bearing moves close to the pocket bottom.
6. Continue alternate nut tightening as described in Step 5, above, until the bearing shaft and retaining nuts are secure.
7. Replace the carriage in the linear positioner (Paragraph 5.3.2.2).
8. Replace the linear positioner (Paragraph 5.3.1.2).
9. Check the read/write head alignment (Paragraph 5.4.5).

NOTE

When performing Steps 5 and 6, do not allow the bearing assembly to touch the top or bottom of the carriage pocket.

5.3.2.5 Transducer Block Removal and Replacement – The procedure for removal and replacement of the transducer block is as follows:

1. Remove the linear positioner (Paragraph 5.3.1.1).
2. Remove the clamp attaching the position transducer leads to the carriage slide.
3. Remove the two screws attaching the transducer block to the carriage slide and carefully maneuver the transducer block out of the slide, ensuring that the block does not scratch the glass scale.
4. Install the new transducer block on the carriage slide with the previously removed hardware.
5. Replace the transducer leads in the clamp and attach the clamp to the carriage slide.
6. With a piece of blue plastic shim stock, ensure that the clearance between the transducer glass scale and the reticle is .005 inch. If the clearance is incorrect, loosen the transducer block mounting screws and reposition the block to obtain the correct clearance.
7. Replace the linear positioner (Paragraph 5.3.1.2) and perform the servo system timing adjustment (Paragraph 5.4.2).
8. Align the read/write heads (Paragraph 5.4.5).

5.3.3 Read/Write Heads

5.3.3.1 Head Removal, without Head Insertion Tool – The procedure for removing the read/write heads without using a head insertion tool is as follows:

1. Remove the disk cartridge from the drive.
2. Open the rear door of the rack and unplug the drive ac line cord.
3. Slide the drive out of the rack until it locks in the extended position.
4. Remove the top cover.
5. Disconnect the head connectors (Figure 5-4) from the electronic module.
6. Disconnect P5 (Figure 5-3) from the power supply chassis.

7. Remove the head clamp and head adjusting screws.
8. Retract the carriage to unload the heads and carefully remove the upper head (Figure 5-6a).
9. Extend the carriage and remove the lower head (Figure 5-6b).

5.3.3.2 Head Replacement, without Head Insertion Tool – The procedure for replacement of the read/write heads without using a head insertion tool is as follows:

1. Extend the carriage and insert the lower head tailpiece into the carriage (Figure 5-6b).
2. Retract the carriage to the home position so that the lower head is supported by the lifting block on the duckbill.
3. To install the upper head, it is necessary to straighten the head from its natural position. Carefully install the upper head as follows:
 - a. Insert the end of the tailpiece slightly into the carriage hole (Figure 5-6a).

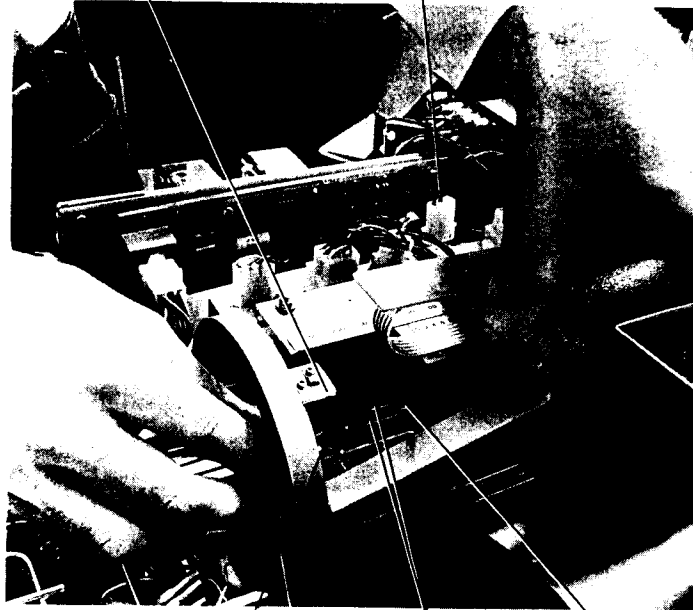
CAUTION

Exercise extreme care while performing Step b., below. If the yield point of the spring is exceeded during the straightening process, the loading force on the head will change.

- b. Simultaneously press down at the front of the tailpiece and lift the front of the suspension spring while pushing the head backward. This process tends to straighten the head suspension spring for easier insertion into the carriage hole. Do not over-bend the suspension spring, and avoid touching the ceramic surfaces of the head pads during installation.
4. Replace the head clamp and adjusting screws (Figure 5-6a) and lightly tighten the clamp screws with the heads located approximately .030 inch from the fully seated position.
 5. Replace the read/write head cables in the clamp on the carriage slide and connect the head connectors to the electronic module. Refer to the decal on the chassis for the correct lead connections.

CARRIAGE (HELD RETRACTED)

P5



UPPER HEAD
TAIL PIECE

CLAMP SCREW
HOLES

ADJUSTING
SCREW HOLES

a. Upper Head Removal and Installation

CLAMP



LOWER HEAD

LOWER HEAD
TAIL PIECE

CARRIAGE
HELD EXTENDED

b. Lower Head Removal and Installation

Figure 5-6 Read/Write Head Replacement without Head Insertion Tool

6. Plug P5 into the power supply chassis.
7. Check the read/write head alignment (Paragraph 5.4.5).
8. Perform the index/sector timing adjustment (Paragraph 5.4.4).
9. Replace the top cover.
10. Close the rear door.

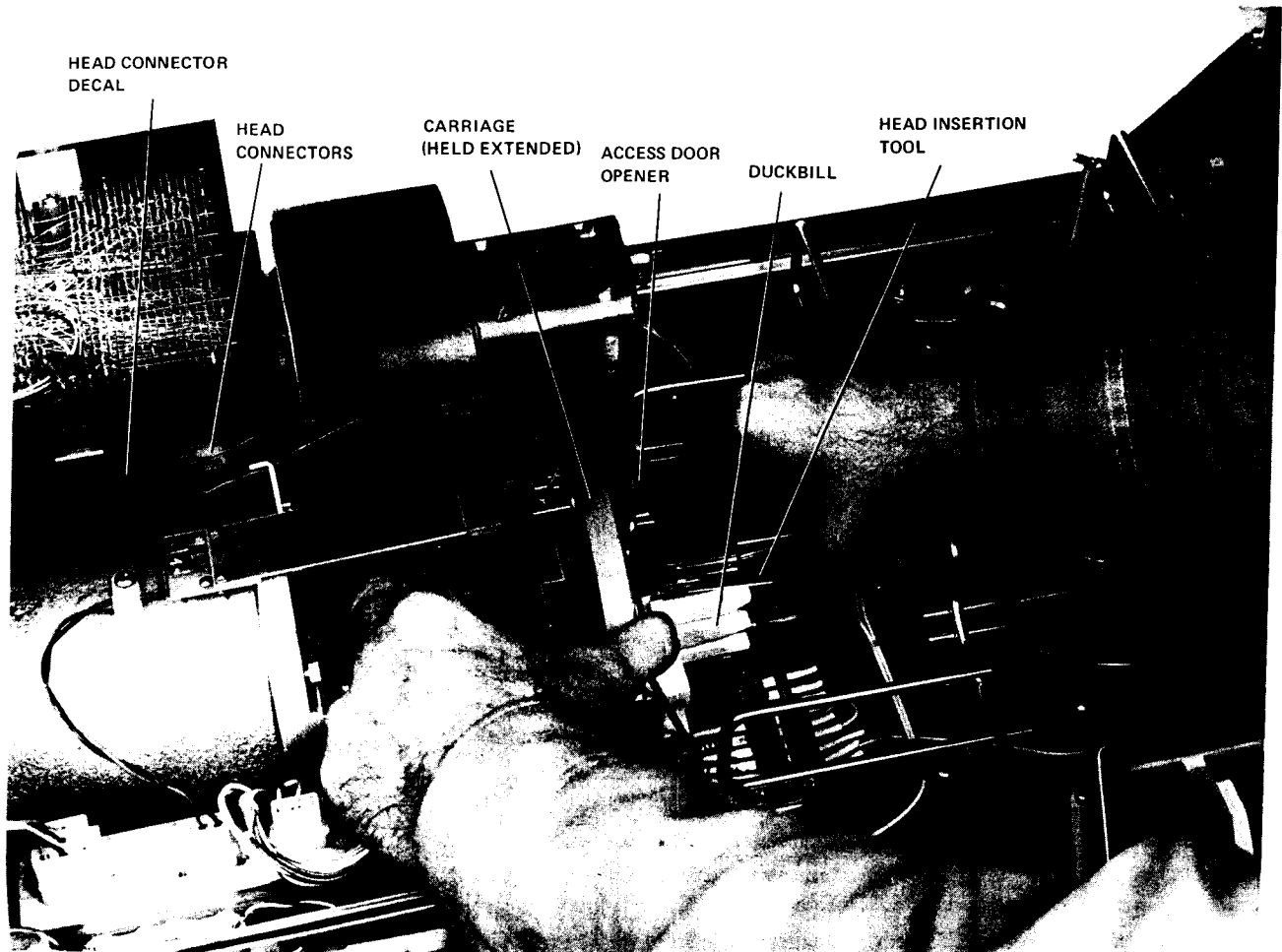
5.3.3.3 Head Removal, with Head Insertion Tool – The procedure for removing the read/write heads using a head insertion tool is as follows:

1. Remove the disk cartridge from the drive.
2. Open the rear door of the rack and unplug the drive ac line cord.
3. Slide the drive out of the rack until it locks in the extended position.
4. Remove the top cover.
5. Disconnect the head connectors (Figure 5-7) from the electronic module.
6. Disconnect P5 (Figure 5-3) from the power supply chassis.
7. Remove the head clamp and head adjusting screws.
8. Reach through the front opening of the positioner and install the head insertion tool.
9. Holding the carriage retracted with the right hand, grasp the head insertion tool and the heads with the left hand.
10. Squeeze the head insertion tool and carefully work both heads out of the carriage.

5.3.3.4 Head Replacement, with Head Insertion Tool – The procedure for replacing the read/write heads using a head insertion tool is as follows:

1. Place both the upper and lower heads into the head insertion tool with the pads separated and the tailpieces oriented so that both heads may be inserted into the carriage simultaneously.
2. Place the center section of the lower head suspension arm, with the pad facing up and to the right, in the lower slot of the head insertion tool.

3. Slide the lower head forward into the head insertion tool, forcing the tailpiece to a straightened position so that the front end of the tailpiece is within the slot of the tool and the head spring retaining screws rest against the thin portion of the center section of the head insertion tool.
4. Install the upper head in the upper slot of the head insertion tool as in Step 2, above, but with the pad facing down.
5. Push both heads solidly against the rear wall of the head insertion tool.
6. Disconnect the positioner power cable from J5 of the power supply assembly.
7. Screw a pair of head adjusting screws slightly into the rear holes of the carriage. *Clamping screws must not be in place.*
8. Secure the access door opener to the front of the positioner in a fully-lifted position so as not to obstruct the area in front of the positioner.
9. Grasp the head/head-insertion-tool assembly with the right hand (Figure 5-7), with the thumb on top of the head insertion tool and the index and middle fingers on the bottom of the head insertion tool. Holding the carriage forward with the left hand, carefully insert the head tailpiece shafts into the mating carriage holes. It may be necessary to manipulate the tailpieces slightly to provide the alignment required for easy insertion. *Do not force the tailpieces into the alignment.*
10. With the heads pushed into the tailpieces approximately .060 in. from the fully-seated position, remove the head insertion tool. Install clamping screws and tighten lightly.
11. Secure the head cable spring shields by clamps at the front of the positioner. Refer to the decal on the chassis for the correct lead connections.
12. Plug P5 into the power supply chassis.
13. Check the read/write head alignment (Paragraph 5.4.5).
14. Perform the index/sector timing adjustment (Paragraph 5.4.4).
15. Replace the top cover.
16. Close the rear door.



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Figure 5-7 Read/Write Head Replacement with Head Insertion Tool

5.3.4 Spindle

5.3.4.1 Spindle Removal – The procedure for removing the spindle is as follows:

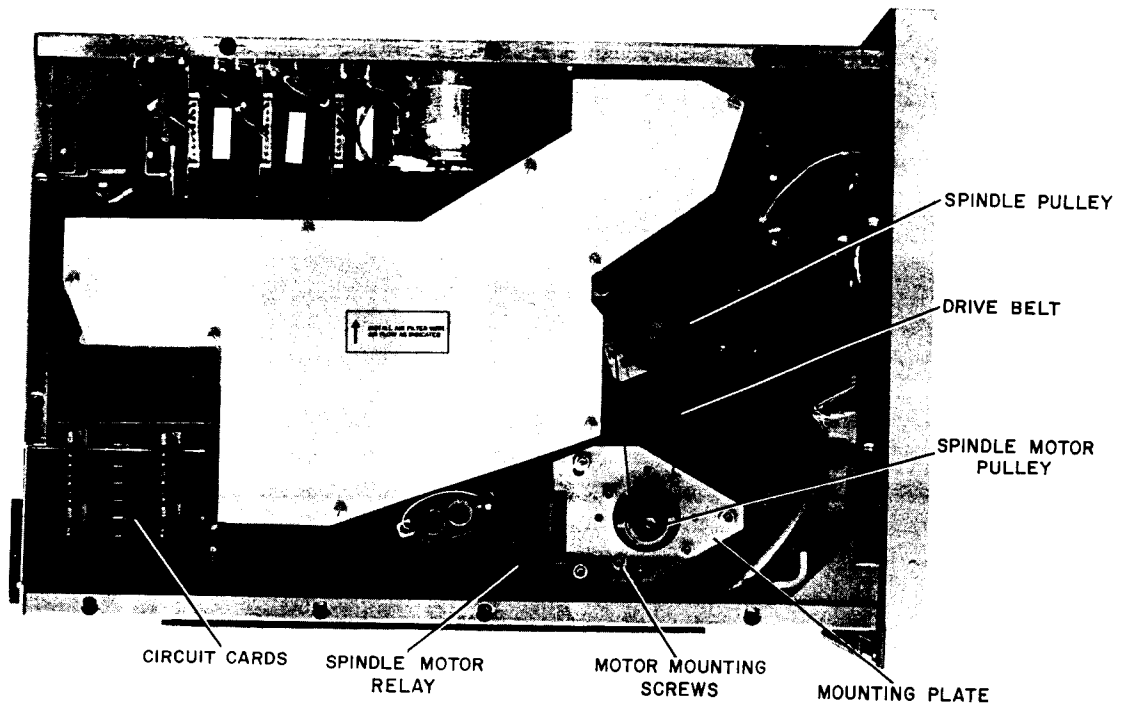
1. Remove the disk cartridge from the drive.
2. Open the rear door of the rack and unplug the drive ac line cord.
3. Slide the drive out of the rack until it locks in the extended position.
4. Remove the top and bottom covers.

5. Remove the drive belt (Figure 5-8a) by first pushing the spindle motor mounting plate toward the spindle to relieve belt tension, and then slipping the belt off the pulleys.

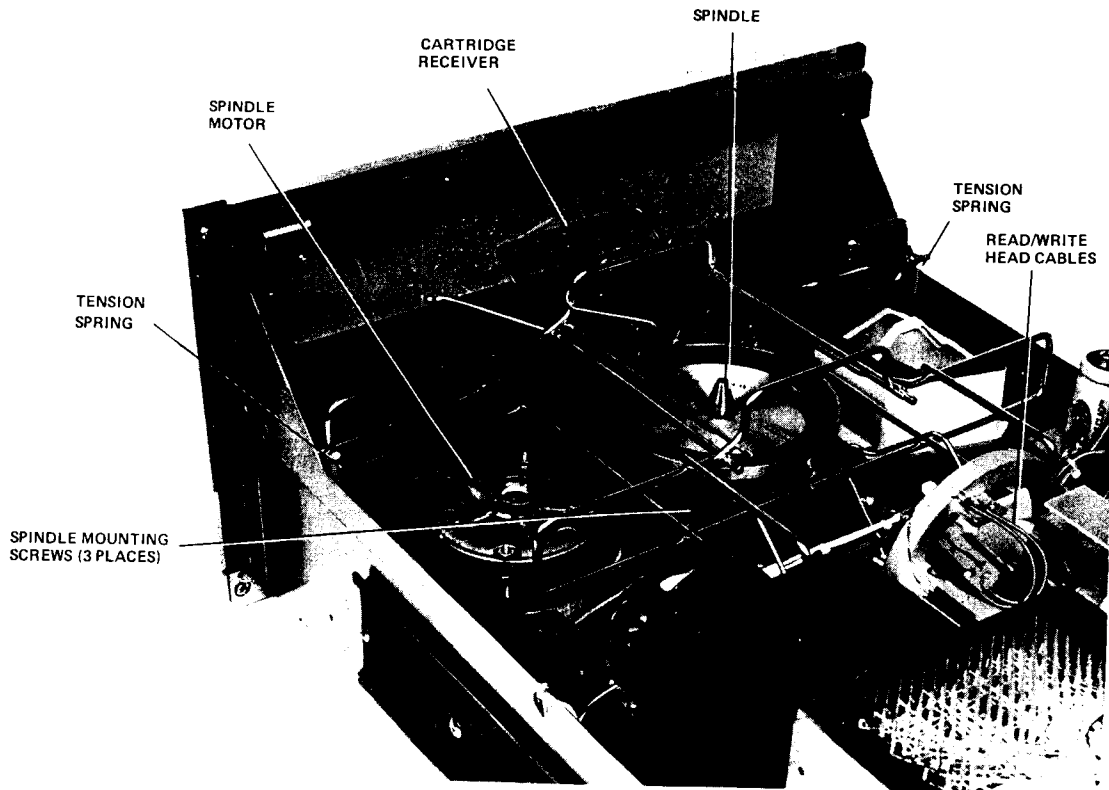
CAUTION

Do not remove the duckbill when performing Step 6, below, because read/write head damage could occur when the cartridge receiver is raised.

6. Remove the tension springs from the cartridge receiver (Figure 5-8b) and raise the receiver as high as possible.



a. Drive Belt



b. Spindle

Figure 5-8 Spindle Replacement

7. Remove the flexible magnet from the spindle armature to expose the access hole in the spindle plate.
8. Position the access over each of the spindle retaining screws and remove them. Do not apply any force to the spindle armature plate (.000150-in. runout).
9. Lift the spindle free from the drive baseplate.

5.3.4.2 Spindle Replacement – The procedure for replacing the spindle is as follows:

1. Raise the cartridge receiver as high as possible and install the spindle on the baseplate with the previously removed hardware. Avoid damaging either the baseplate mounting surfaces or the spindle flange; this could cause the spindle to seat as much as several thousandths of an inch out of its proper position.
2. Lower the cartridge receiver and attach the tension spring (Figure 5-8b).
3. Push the spindle motor mounting plate (Figure 5-8a) toward the spindle and slip the drive belt around the pulleys.
4. Connect the ac line cord and check the read/write head alignment (Paragraph 5.4.5).
5. Replace the top and bottom covers.
6. Slide the drive into the rack and close the rear door.

5.3.4.3 Spindle Ground (Carbon Brush) Removal and Replacement – The procedure for removing and replacing the carbon brush assembly is as follows:

1. Open the rear door of the rack and unplug the drive ac line cord.
2. Slide the drive out of the rack until it locks in the extended position.
3. Remove the bottom covers and remove the two screws that attach the carbon brush assembly to the spindle (Figure 5-9).
4. Mount the new brush assembly on the spindle and ensure that the curved brushes are centered on the spindle hub and that the brush assembly is not cocked or twisted. Full contact between the curved surfaces of the brushes and shaft is necessary to prevent brushes from squealing.

5. Tighten the brush assembly mounting screws and replace the bottom covers.
6. Slide the drive into the rack, reconnect the ac line cord, and close the rear door.

5.3.5 Spindle Drive Motor

5.3.5.1 Motor Removal – The procedure for removing the spindle drive motor is as follows:

1. Remove the disk cartridge from the drive.
2. Open the rear door of the rack and unplug the drive ac line cord.
3. Slide the drive out of the rack until it locks in the extended position.
4. Remove the top and bottom covers.
5. Disconnect the spindle motor leads from TB4 (Figure 5-4), and from the spindle motor relay (Figure 5-8a).
6. Remove the drive belt (Figure 5-8a) by pushing the spindle motor mounting plate toward the spindle to relieve belt tension, and then slipping the belt off the pulleys.

NOTE

The spindle motor mounting plate contains two sets of holes, one for 50-Hz operation, the other for 60-Hz operation. Before performing Step 7, below, note which set of holes is being used, to ensure correct replacement of the motor (Figure 5-9).

7. Remove the four screws attaching the motor to the mounting plate and remove the motor through the top of the baseplate.

5.3.5.2 Motor Replacement – The procedure for replacing the spindle drive motor is as follows:

1. Insert the spindle motor through the top of the baseplate (Figure 5-8a) and attach the motor to the mounting plate with the previously removed hardware.
2. Push the spindle motor mounting plate toward the spindle and slip the drive belt around the pulleys.

FOR 50 Hz OPERATION,
MOVE MOTOR MOUNTING
SCREWS TO THESE HOLES (4)

CARBON BRUSH ASSEMBLY
MOUNTING SCREWS

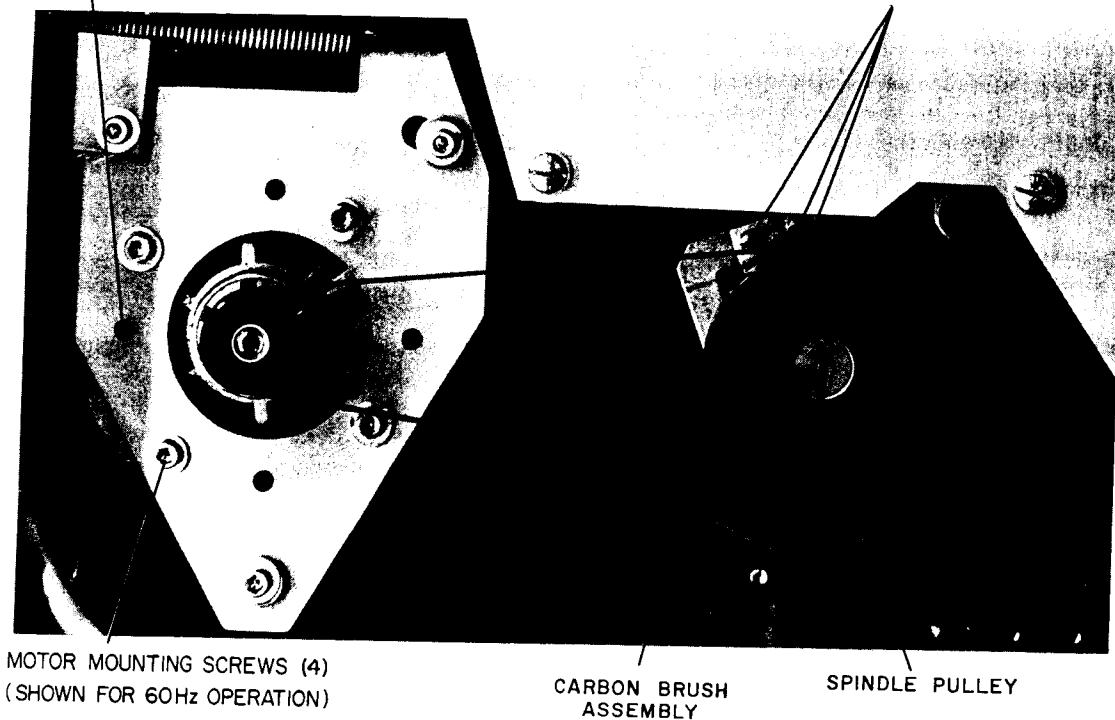


Figure 5-9 Carbon Brush Replacement

3. Connect the spindle motor leads to TB4 (Figure 5-4) and to the spindle motor relay (Figure 5-8a). Refer to the chassis wiring drawing for TB4 and the spindle motor relay connection color code.
4. Check the read/write head alignment (Paragraph 5.4.5).
5. Replace the top and bottom covers.
6. Slide the drive into the rack and connect the ac line cord.
7. Close the rear door.
2. Open the rear door of the rack and unplug the drive ac line cord.
3. Slide the drive out of the rack until it locks in the extended position.
4. Remove the bottom cover.
5. Push the spindle motor mounting plate (Figure 5-8a) toward the spindle to relieve belt tension, and then slip the belt off the pulleys.
6. Clean the spindle and drive motor pulleys with a clean cloth moistened with 91% isopropyl alcohol.
7. Install a new drive belt by pushing the spindle motor mounting plate toward the spindle and slipping the drive belt around the pulleys. *Do not stretch the belt!*
8. Replace the bottom cover.

5.3.5.3 Drive Belt Removal and Replacement – The procedure for removing and replacing the drive belt is as follows:

1. Remove the disk cartridge from the drive.

9. Slide the drive into the rack and connect the ac line cord.
10. Close the rear door.

5.3.6 Blower Motor

5.3.6.1 Blower Removal – The procedure for removing the blower is as follows:

1. Remove the disk cartridge from the drive.
2. Open the rear door of the rack and unplug the drive ac line cord.
3. Slide the drive out of the rack until it locks in the extended position.
4. Remove the top and bottom covers.
5. Disconnect the blower leads from TB4 (Figure 5-4).
6. Remove the four blower mounting screws and carefully remove the blower and shroud from the baseplate. Be careful not to damage the foam seal while removing the blower.

5.3.6.2 Blower Replacement – The procedure for replacing the blower is as follows:

1. Carefully insert the shroud inlet ring into the foam seal (Figure 5-10) and secure the blower and shroud to the baseplate with the previously removed hardware.
2. Connect the blower leads to TB4.
3. Replace the top and bottom covers.
4. Slide the drive into the rack and connect the ac line cord.
5. Close the rear door.

5.3.7 Power Supply Removal

Close tolerances between the power supply package, the baseplate assembly, and the chassis make it necessary to remove the frontmost (+15 Vdc) regulator before removing the RK05 power supply and assembly. The procedure is as follows:

1. Loosen the two captive screws that hold the frontmost regulator in place.
2. Remove that regulator.
3. There should now be enough room to maneuver the power supply free and remove it.

5.3.8 Cartridge Cleaning

Professional cartridge cleaning is recommended wherever practicable. However, it may occasionally become necessary for qualified DEC Field Service personnel to clean cartridges in a troubleshooting or emergency maintenance situation. Application of this procedure by unqualified personnel will void warranty on that cartridge and on any drive in which that cartridge is operated.

5.3.8.1 Cartridge Cleaning Procedure – The procedure for such emergency cleaning of cartridges is as follows:

1. Lay the cartridge bottom up on a clean, hard surface, such as a cleared desktop or table. In this position the cartridge will tend to be somewhat unstable, and may require support.
2. Remove the screws that hold the cartridge top and bottom plastics together, using only enough downward force on the screwdriver to hold it in the screwhead. Excessive force can strip the threads of the plastic.
3. Pick up the disk by the hub, being careful not to hit the access door with the edge of the disk when lifting it out of the cartridge.

CAUTION

Do not loosen the four screws in the hub holding the clamping ring and filter ring to the disk; this would permit the disk (and data) to move in relation to the centering cone of the hub, which would cause the data to become unrecoverable.

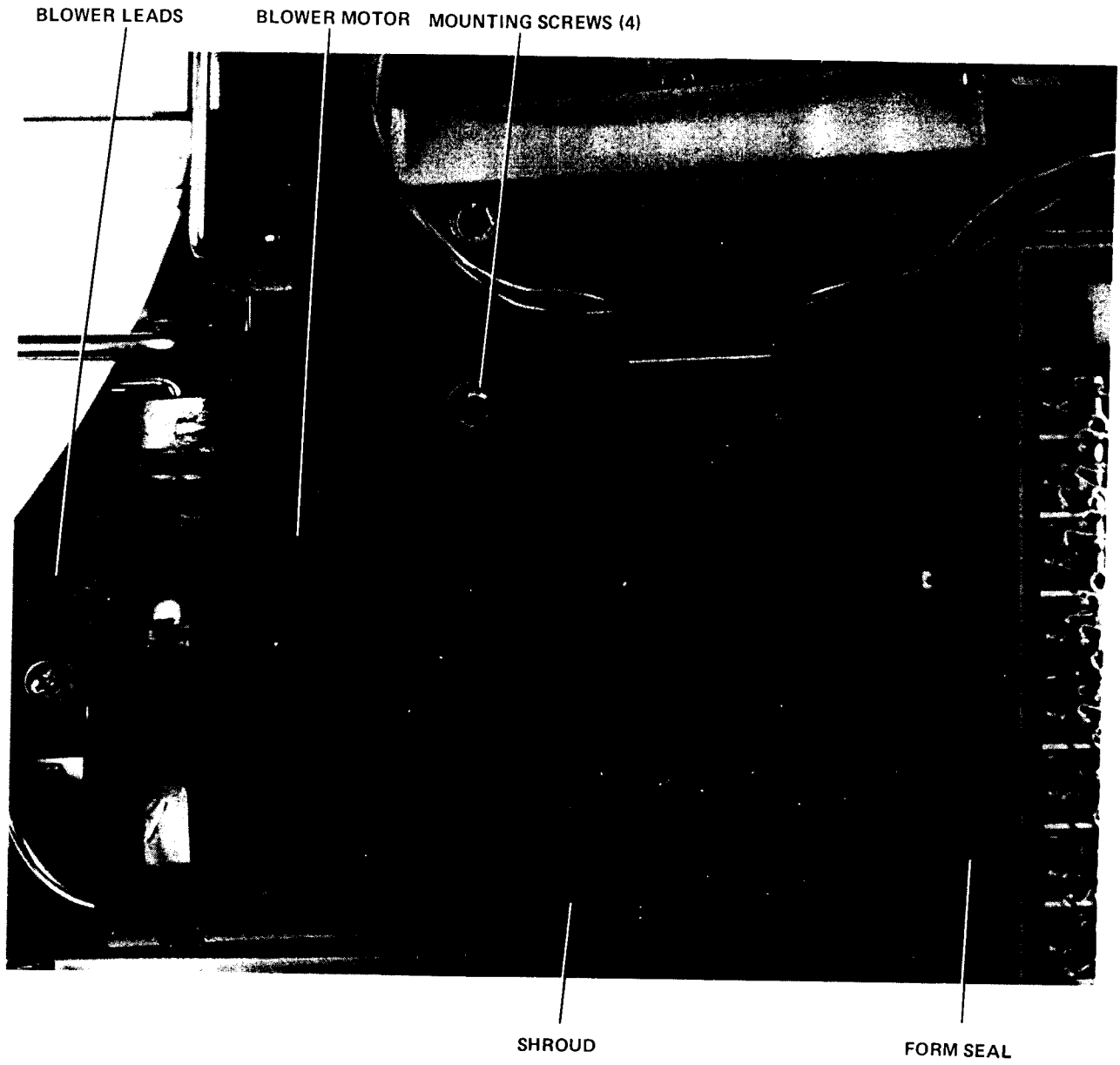


Figure 5-10 Blower Motor Removal

6858-4

4. Inspect the oxide surface of the disk for the following:
 - a. "Comet tail" scratches – Ding marks with tapering scratches caused by particles embedded in the disk and then knocked out.
 - b. "Full circle" scratches – Scratches caused by particles that remain stuck to the heads. This condition requires that the heads be cleaned.
 - c. Single spot marks, dings, or scratches, with no associated circular scratches – These are usually the result of dimples or bumps on the disk, or of the air inlet door being pushed into the surface of the disk.
 - d. Black (burned) or dark brown streaks of oxide.
 - e. Fingerprints.

NOTE

A large number of small, shiny streaks all over a well-used disk is evidence of normal head/disk interference.

5. Inspect the hub for the following:
 - a. Bent, nicked, or dirty sector slots in the sector ring.
 - b. Bent, nicked, or dirty mating cone or mating ring-plate.
6. Inspect the top plastic for the following:
 - a. Broken clear plastic seal on the access door.
 - b. Retaining button that retracts when the access door is opened.
 - c. Worn retaining button in center of the top.
 - d. Properly closing access door.
 - e. Signs of rubbing by the disk.
 - f. Spring load on the retaining button.
7. Inspect the bottom plastic for the following:
 - a. Broken rivets on the air inlet door.

- b. Signs of rubbing by the disk.
- c. Fingerprints on the air inlet door.

8. Lay the disk on a spread-out Kimwipe on a desk or tabletop. Press down on the hub with one hand to prevent the disk from tipping. With the other hand, wipe the surface of the disk with a Texpad or Kimwipe soaked in 91% isopropyl alcohol. Wipe with small circular motions as you move around the circumference of the disk.

CAUTION

Use only 91% isopropyl alcohol for this purpose. Water, trichloroethylene, and other solvents will attack the epoxy binder of the oxide.

9. Wipe the disk dry with a dry Kimwipe *before* the alcohol evaporates. If the alcohol is permitted to evaporate by itself, residue spots on the oxide will result. If it is necessary to rub an individual shiny spot or streak on the oxide, it should be done very gently; the surface of the disk could be bent by pressing down too hard.
10. Turn the disk over, holding it by the hub only. Do not handle the disk by its edges; this results in the deposit of finger oils that could be transferred to the oxide surface by further wiping.

CAUTION

Dry lint may be blown off gently by mouth. Do not spit on the disk. Do not use ordinary plant air, which may contain an unacceptable level of water or oil; canned air, however, is generally acceptable.

11. Wipe off the insides and outsides of both the top and bottom plastics, taking care not to leave any lint. Remove any portions of the clear plastic door seal that may break off during use of the cartridge.
12. Reassemble the cartridge. Locate the original threads in the top plastic screw holes by rotating the screw *backward* one or two revolutions before driving it. Use a minimum of downward force on the screwdriver to avoid damaging the plastic threads and creating plastic chips inside the cartridge.

5.3.8.2 Adverse Disk Conditions – The disk will probably cause damage to the heads if used in the following conditions:

1. The center retaining button shows signs of rubbing on the hub cone of the disk. This creates particles inside the cartridge during operation and allows the disk to rattle around inside the cartridge during handling.
2. The air inlet door is loose, or has broken rivets.
3. There are signs of disk rubbing on the insides of the cartridge.
4. The disk has nonremovable scratches or dings which stick up above the smooth oxide surface.
5. The disk causes continual tinging sounds after the usual single short ting that accompanies loading.
6. The disk continually deposits oxide on the heads.

CAUTION

If known good disks deposit oxide on the heads, the heads themselves may be at fault.

7. The disk has a hard and locatable error.

Cartridges displaying the above conditions can probably be used once more, if necessary, to recover critical data, but should be refurbished immediately thereafter, lest the heads crash and get destroyed.

Disks have been known to transfer data reliably despite having aluminum exposed through the oxide; conversely, disks have been known to crash heads despite having no visible scratches. The ultimate test of an acceptable disk must be whether it transfers data reliably while leaving the heads clean.

5.4 ALIGNMENT, CHECKS, AND ADJUSTMENTS

5.4.1 Alignment Cartridges

5.4.1.1 RK05K-AC Alignment Cartridge – This Digital Equipment Corporation alignment cartridge represents the preferred method for RK05 alignment procedures. It provides three tracks (principal track 105, plus spare tracks 85 and 125) of constant frequency data with alternate sectors recorded at displacements of +0.0025 and -0.0025 inches, respectively, from the ideal track locations. Figure 5-11 shows how to read the vernier when locating the desired track.

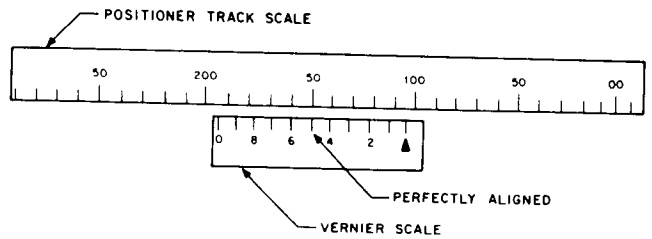


Figure 5-11 How to Read a Vernier

To determine the vernier scale reading:

1. Take the whole number value of the nearest positioner track scale marking to the right of the vernier scale triangle (▲).
2. Take the value of the vernier scale marking that aligns perfectly with a positioner track scale marking.
3. Add these two values to find the vernier reading.

In Figure 5-11, the nearest positioner track scale marking to the right of the triangle is 100; the vernier scale value that aligns perfectly with a positioner track scale marking is 5. Therefore, the vernier is set to Track 105 (100 + 5).

When a head is aligned to specifications, the readback signal shows equal amplitudes for both sectors (shown when the oscilloscope displays only two sectors, and triggered by the SECTOR signal). The degree of amplitude inequality in alternating sectors indicates the departure from exact alignment.

Sector timing data is included on all three tracks to indicate head gap location relative to sector pulse detection. This data is represented by a single pulse (70 μs nominal) triggered by the INDEX pulse 10 μs prior to the onset of head alignment data.

The RK05K-AC alignment cartridge also indicates the degree of runout on the spindle. When the oscilloscope is triggered on INDEX and a complete revolution of the disk is displayed, the head may appear to be aligned at some sector locations and misaligned at others. This condition indicates the degree of wobble of the spindle. Figure 5-12 shows a display with negligible runout; Figure 5-13 shows a spindle with considerable runout. The amount of wobble can be determined by the amplitude differences occurring in any adjacent pair of sector boundaries using the same equations used for head alignment.

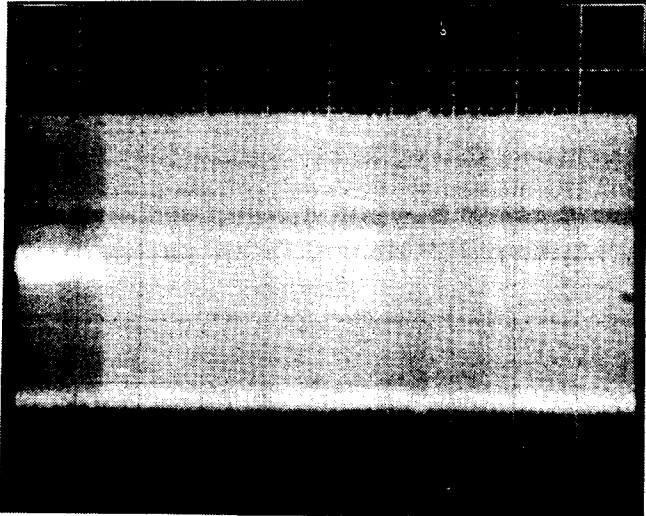


Figure 5-12 Negligible Runout

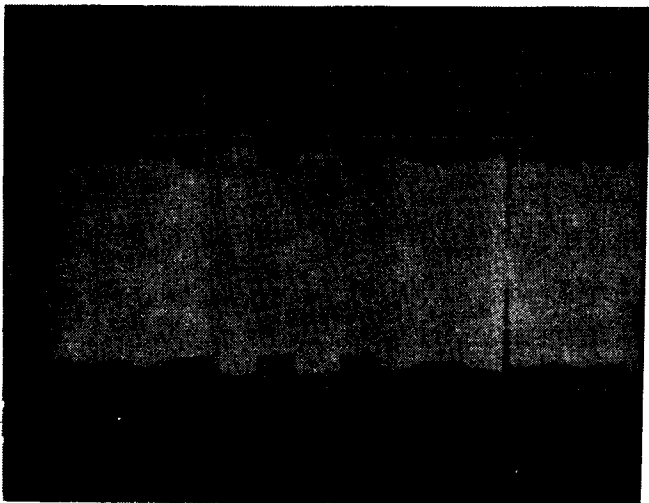


Figure 5-13 Considerable Runout

NOTE

If the condition shown in Figure 5-13 exists, ensure that the mating of spindle and disk is clean. Improper mating can cause such runout.

Specifications for the RK05K-AC Alignment Cartridge are as follows:

Alignment and Sector Timing Tracks – primary track – 105; backup tracks – 85, 125, (use only if track 105 is unusable)

Recorded Frequency – nominal 720 kHz

Number of Sectors – 12

Alignment Accuracy, track 105 – ± 200 microinches

Sector Timing – single pulse $70 \pm 10 \mu\text{s}$ following INDEX pulse

5.4.1.2 2315 CE Test Cartridge Shim Installation – (To be used *only* when an RK05K-AC Alignment Cartridge is not available). Before a 2315 CE test cartridge can be used for any RK05 alignment procedure, a .005-inch shim must be installed in the disk hub. Because the 2315 cartridge is recorded at low density and the RK05 uses a high-density cartridge, this shim is required to accentuate the wobble of the low-density cartridge and allow it to be used for high-density alignments. To install the shim properly, trim a piece of .005-inch shim stock as indicated in Figure 5-14 and attach it to the disk hub as follows:

1. Locate sector 00 by holding the cartridge upside down and observing the sector slots in the metal lip of the disk hub. Rotate the disk clockwise inside the plastic case until two slots close together are located (sector 11 and index slots). Continue to rotate the disk clockwise, stopping at the next slot (sector 00).
2. Position the shim 180 degrees from the sector 00 slot. Ensure that the narrow portion of the shim is in the spindle cavity and that the shim does not reach the bottom of the cavity.
3. Tape the shim in position.

5.4.2 Servo System Timing Checks and Adjustments

The servo system timing adjustments are precisely set at the factory and should *not* be routinely adjusted or fine-tuned as part of any PM procedure. If a positioner malfunction is suspected, all waveforms related to each phase of servo operation should be examined; based on these, the possible trouble should be diagnosed before any servo adjustments are attempted. Because some of the servo check tolerances differ from the adjustment tolerances, reference should be made to the check tolerances in Table 5-3 before adjustments are attempted.

NOTE

Settings within the tolerances listed in Table 5-3 should *not* be adjusted.