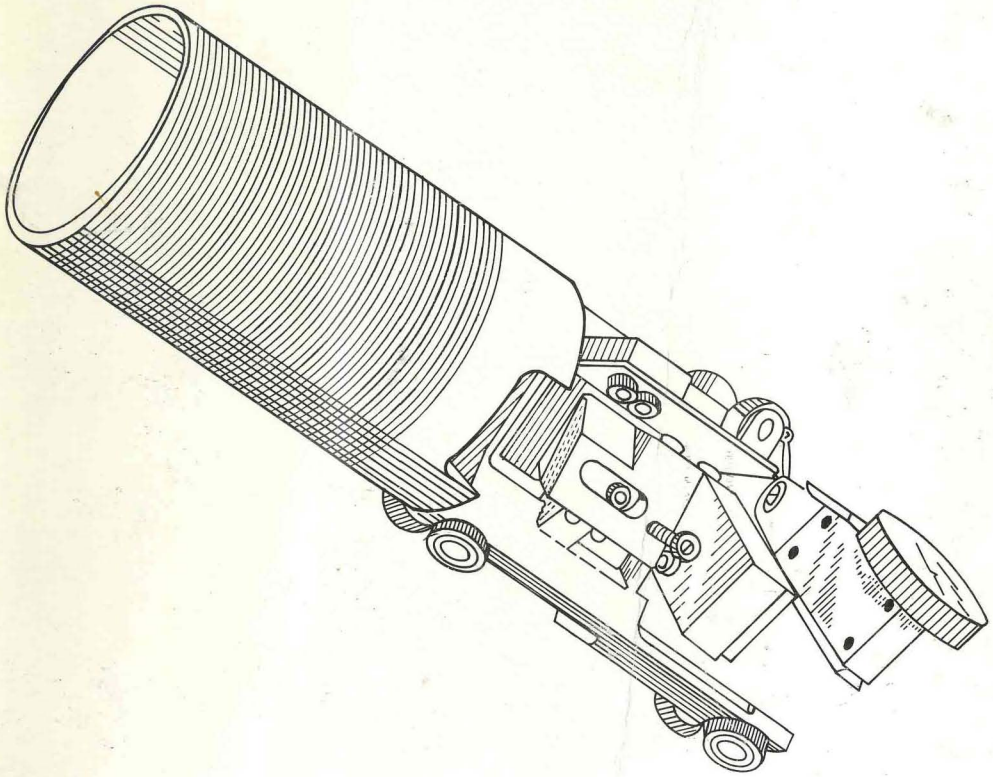


DICK BAILEY.

RM 02 / RM 03

ALIGNMENT PROCEDURES



digital

RM 02 / RM 03

ALIGNMENT PROCEDURES

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CHAPTER 1

RAILS AND CARRIAGE REPLACEMENT AND ALIGNMENT

The Purpose of this chapter is as follows: The chapter is to be used as a *reference guide only*, for those individuals who have already received the special tools training. *Not* as a substitute for the training or to be used as a self-taught procedure!

ESTIMATED TIME TO PERFORM THIS TASK:

1st time = 6–8 hrs later 4–6 hrs

Tools & Parts Required:

RM03 District Tool Kit	
RM02/03 Spares Kit & Tools	
RM03 FTU (tester) with FCO RM03-S-13	
RM03 Data Pack	RM03-P
RM03 Alignment Pack	30-13992-02
Tex Pads (6)	29-19557
head cleaning solution	29-19665
OR, Freon Spray	29-20985
.005" non-metallic feeler guage	29-19664
2 1/2" X 1/4" Standoff	90-06870
Lint free cloth	purchase locally
.0015" Feeler guage	Part of F.E.'s tool kit
5-6" long set of allen wrenches	
5/32" x 1/4 bit for torque wrench	
7/64" x 1/4 bit for torque wrench	
Carriage and Coil Assy	29-22910
Lower Carriage Rail	29-23028
Upper Carriage Rail	29-23029
Clean Air Spray	Purchase locally at photo-shop.

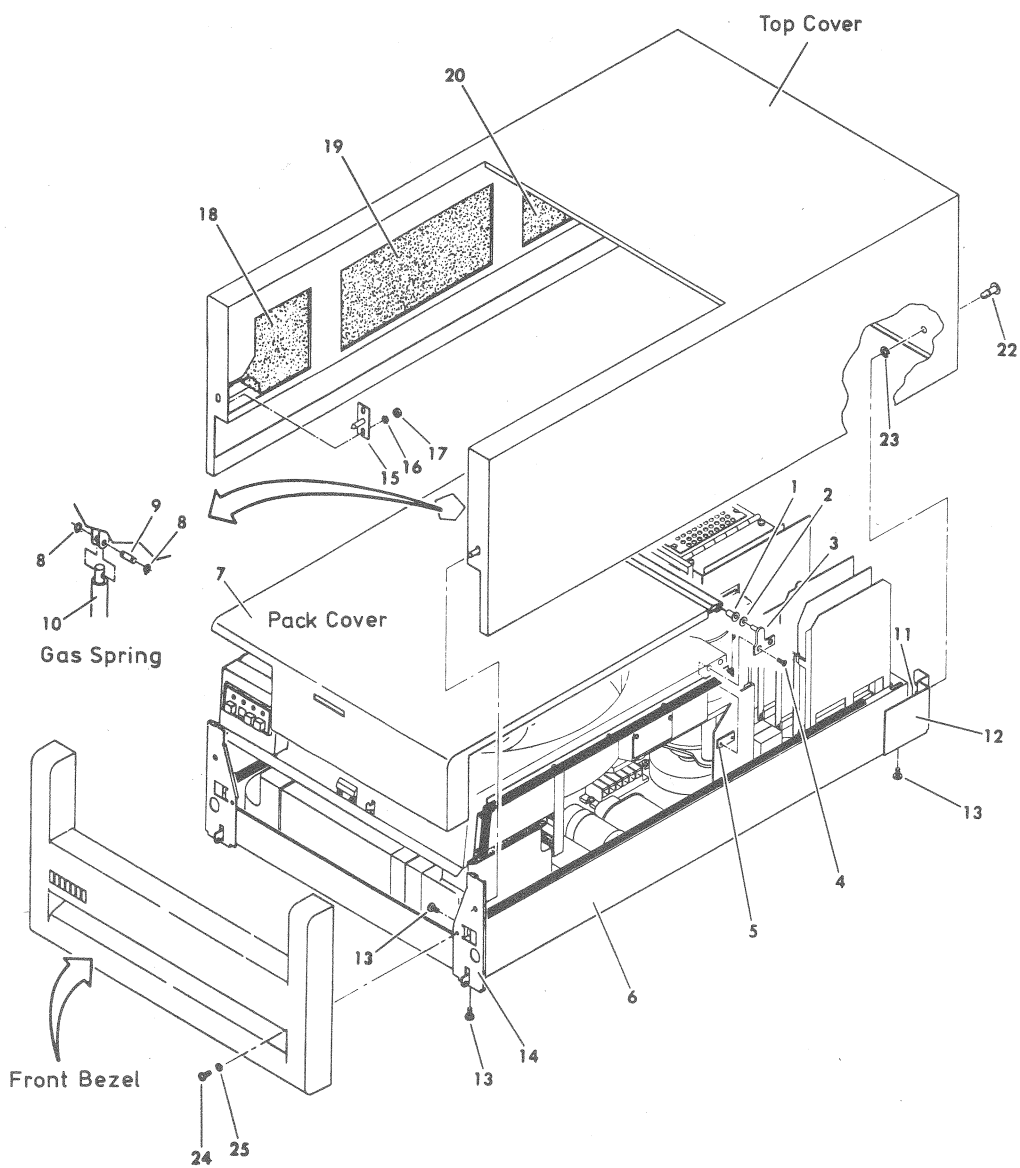
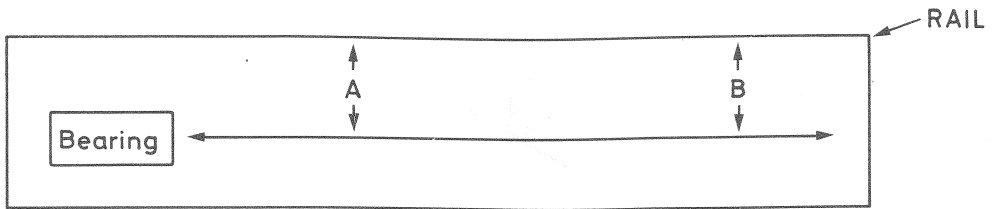


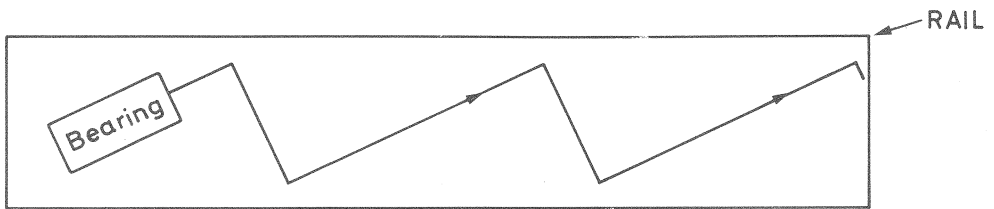
Fig. 1-1
 Final Assembly

A short word on what this procedure is attempting to do. After replacing the carriage rails, it is necessary to adjust the spring loaded bearing for true tracking. This means the bearing is going straight forward on the rail and straight backwards on the return motion. The bearing path will be parallel to the rail edge as pictured below.

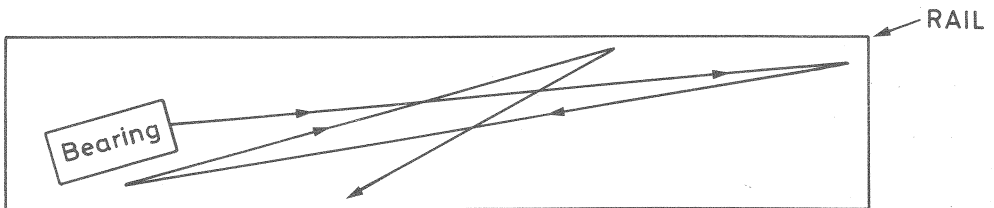


A = B
CORRECT

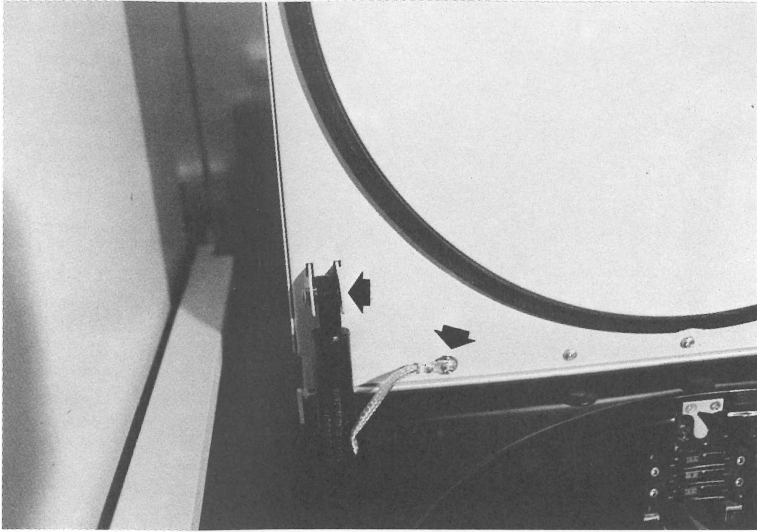
If the bearing is not tracking straight, it can establish a sawtooth or elliptical pattern. This will cause wear of the rail surface, damage to the bearing, and eventually unreliable seeks.



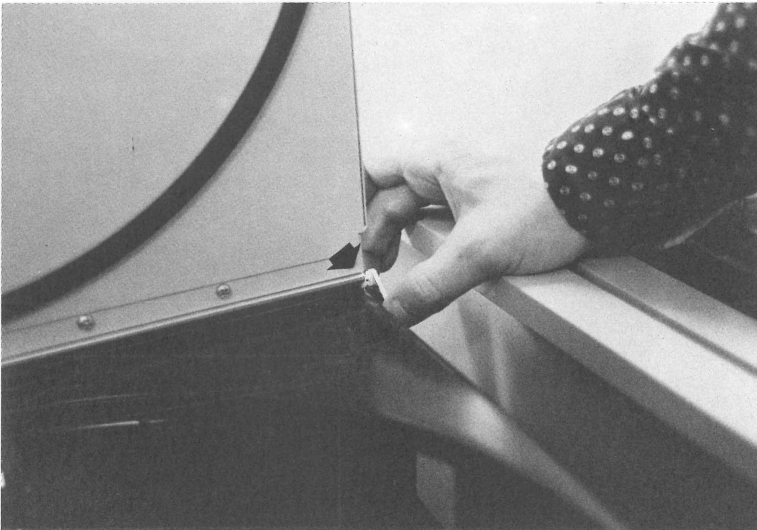
INCORRECT
GROSS MISALIGNMENT



INCORRECT
MOST COMMON MISALIGNMENT



*Fig. 1-2
Remove Lever*



*Fig. 1-3
Remove the top cover by removing the right or the left hand retaining ring from the shock absorber, remove the ground strip from top cover (Fig. 1-2). Remove the right hand hinge pin (Fig. 1-3). Remove top cover*



Fig. 1-4
Remove the front cover



Fig. 1-5
Lift the logic chassis assembly to the maintenance position.



Fig. 1-6
Remove all the cables from logic chassis and remove chassis (Fig. 1-6/1-7/1-8).



Fig. 1-7

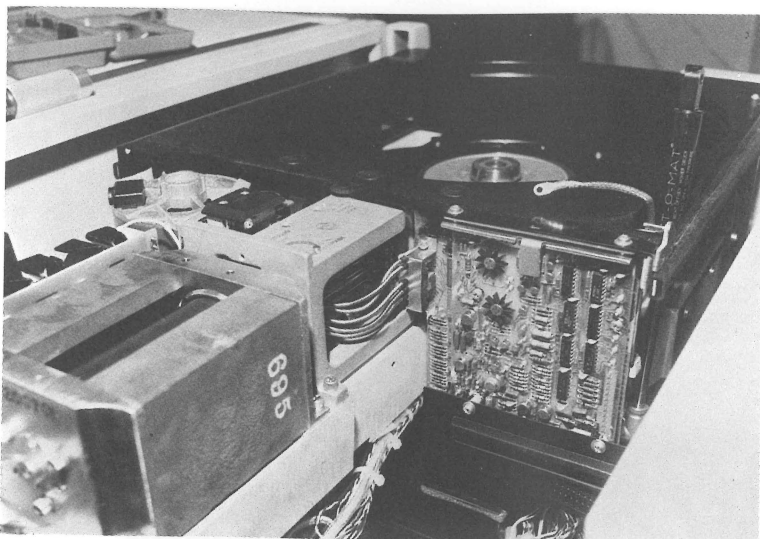


Fig. 1-8

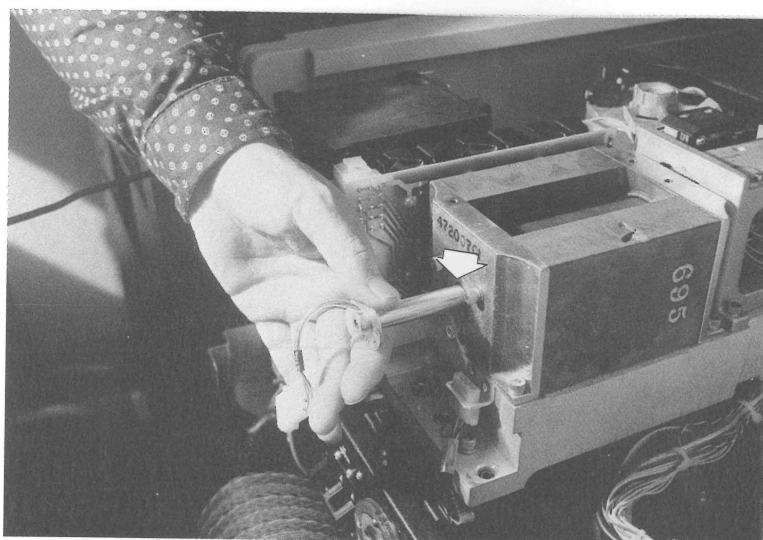


Fig. 1-9
Remove Transducer

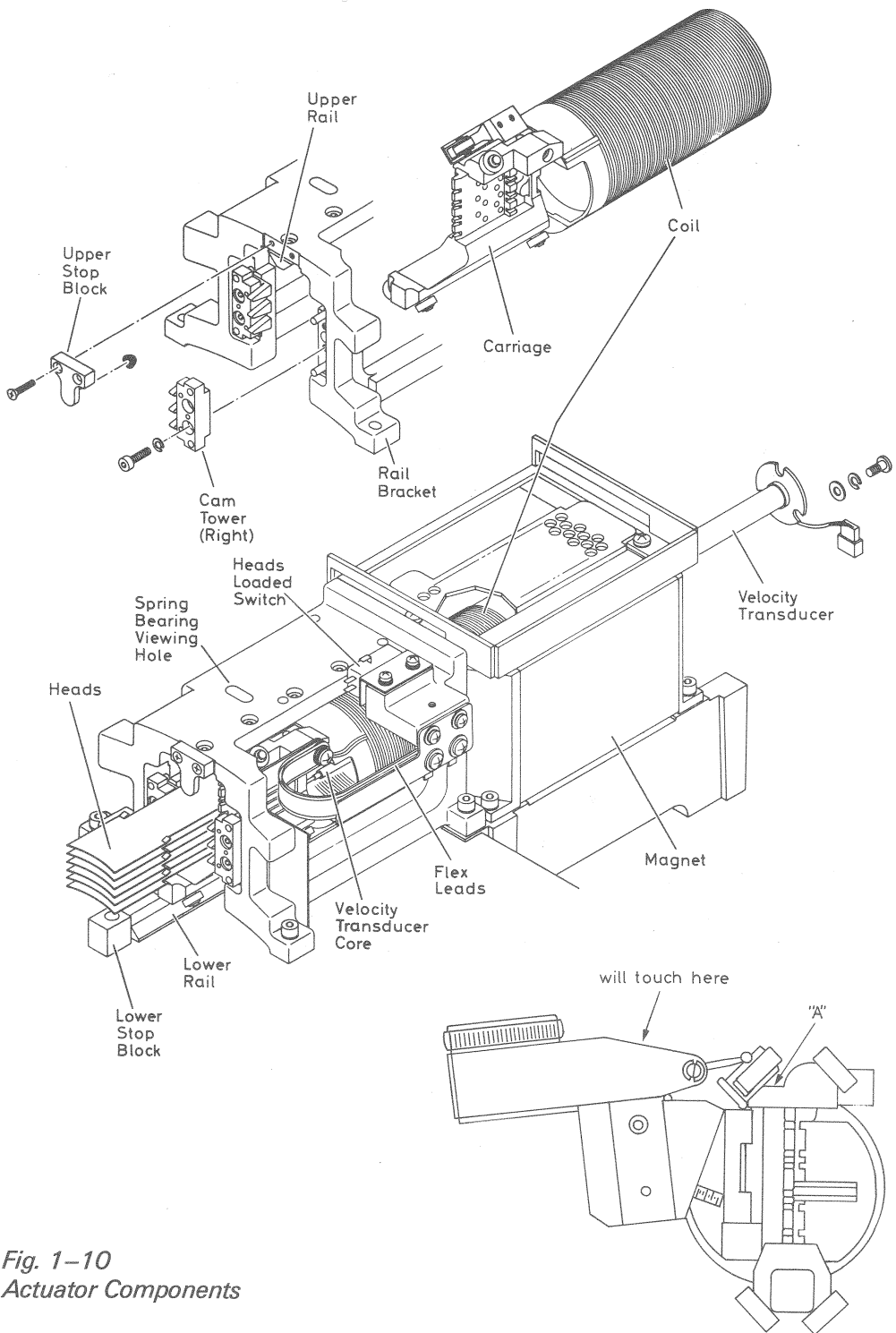
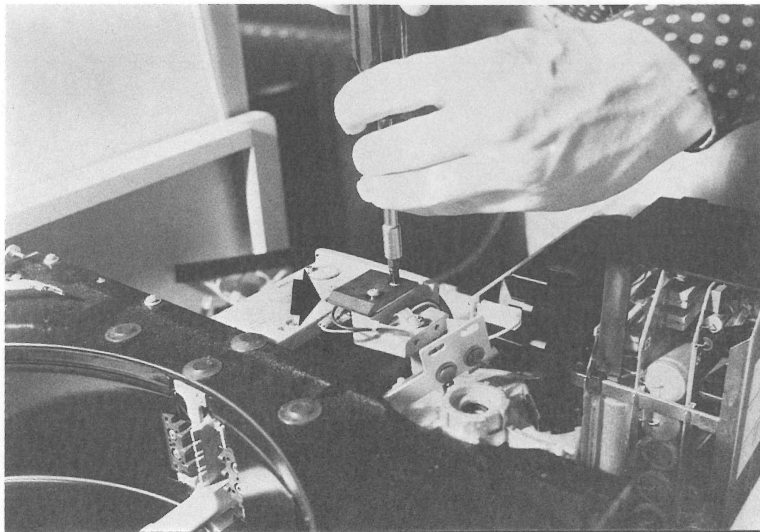


Fig. 1-10
Actuator Components



*Fig. 1-11
Remove upper carriage stop.
Remove head assemblies and flex lead assembly.*



*Fig. 1-12
Remove heads loaded switch
Install shipping pin in track alignment hole to lock carriage in heads loaded position.*

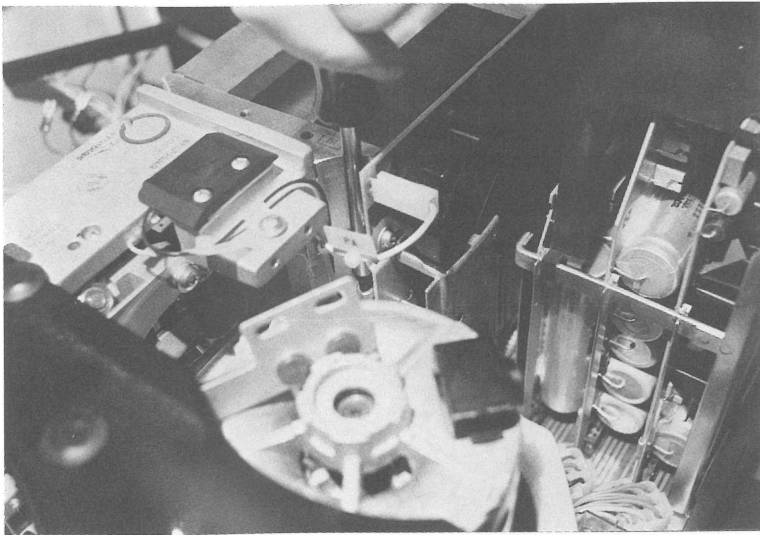


Fig. 1-13
Remove magnet assembly (Fig. 1-13/1-14)



Fig. 1-14

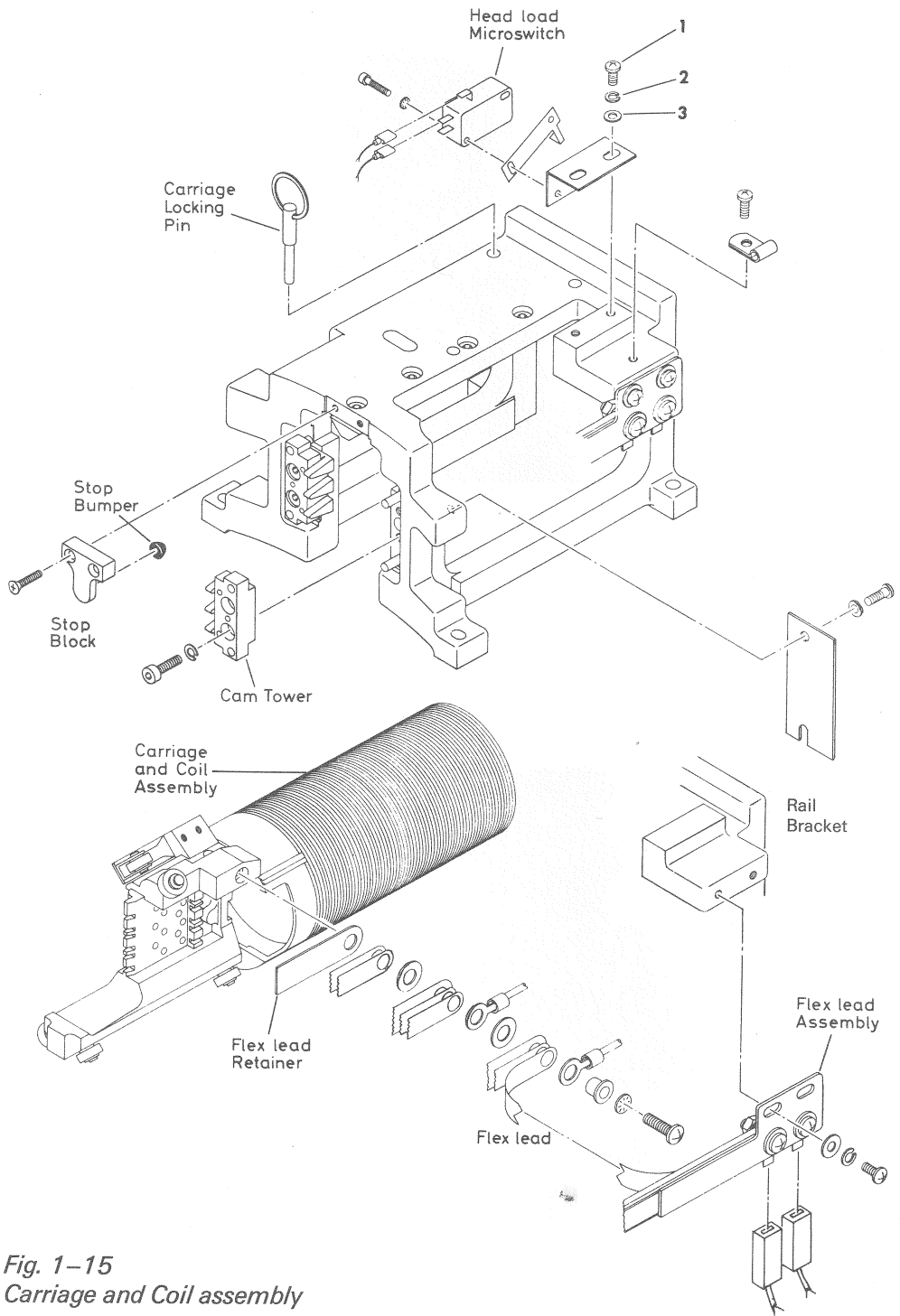


Fig. 1-15
Carriage and Coil assembly

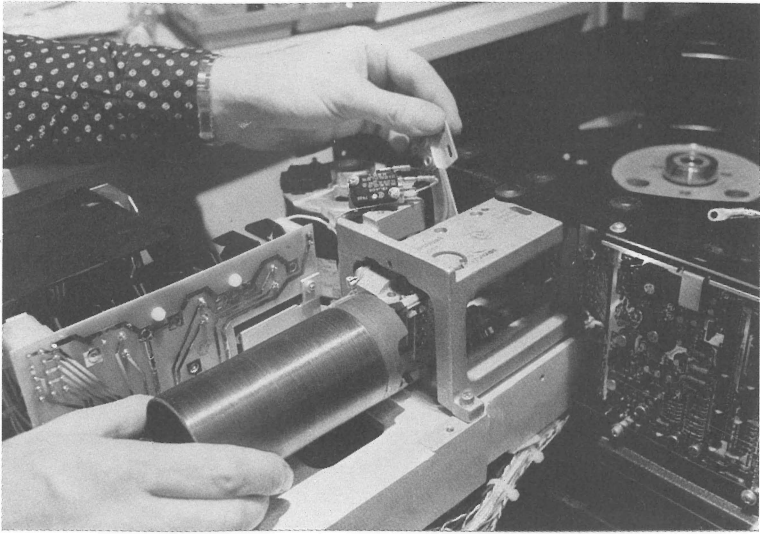


Fig. 1-16
Remove shipping pin and carefully slide carriage assembly toward the rear of the drive. Remove carriage assembly

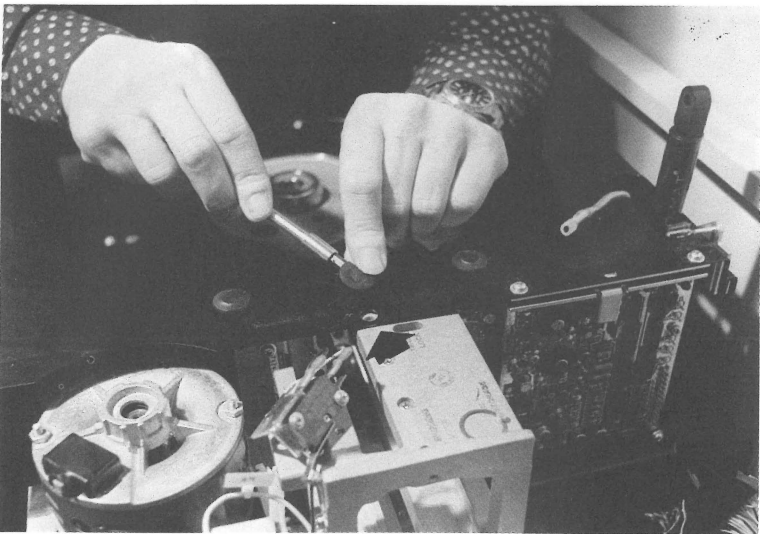


Fig. 1-17
Remove the two rubber buttons to have access to the carriage rail screws and remove upper carriage rail

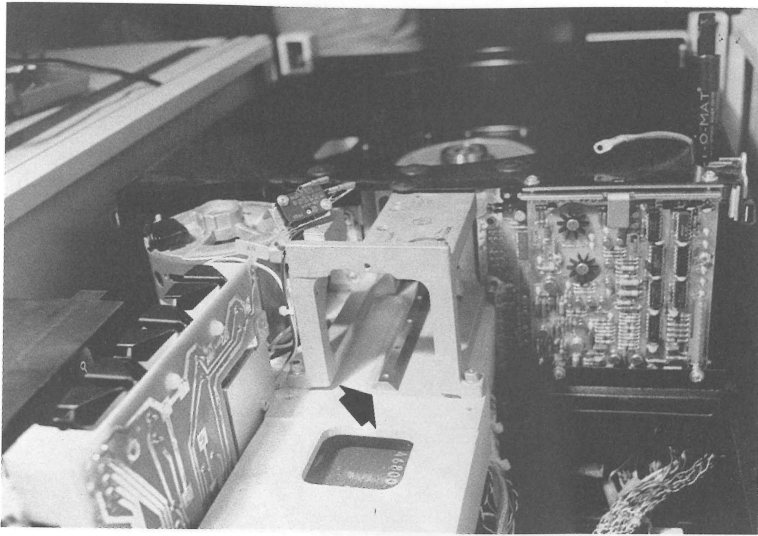


Fig. 1-18
Lower carriage Rail



Fig. 1-19
If you have to replace the lower carriage rail (Fig. 1-18) lift the drive deck by removing the two screws in the shroud (Fig. 1-19)

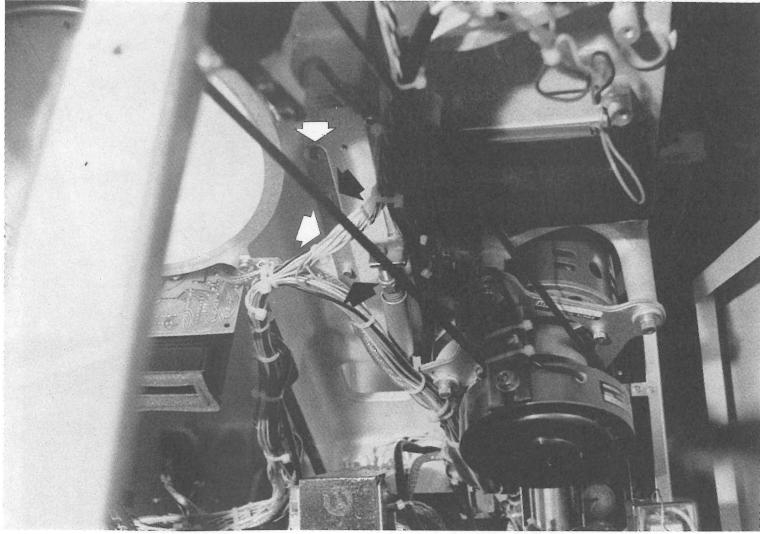
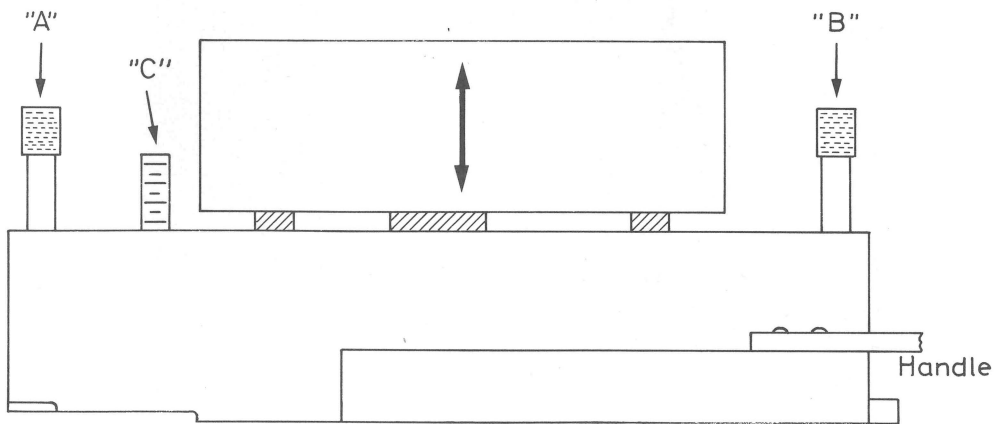


Fig. 1-20

Remove carriage rail by removing the six screws. Install new carriage rail using only the middle four screws, and torque screws to 10 ± 2 in. lbs. Lower drive deck.



"C" = $\frac{1}{8}$ "

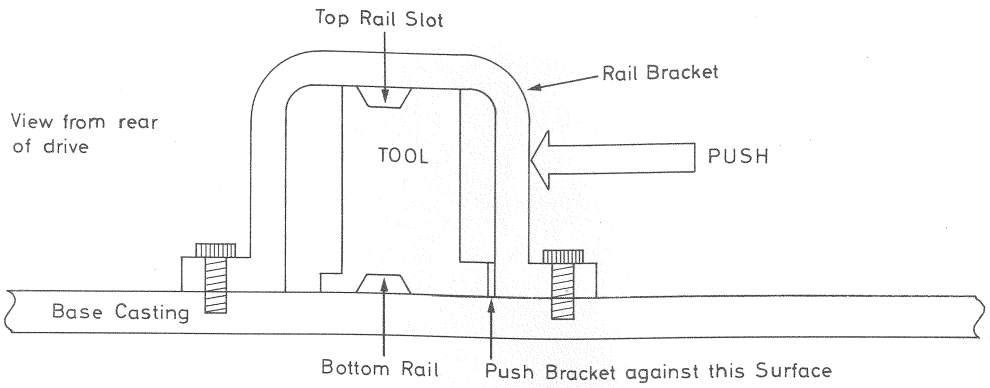


Fig. 1-21
Carriage alignment tool inserted

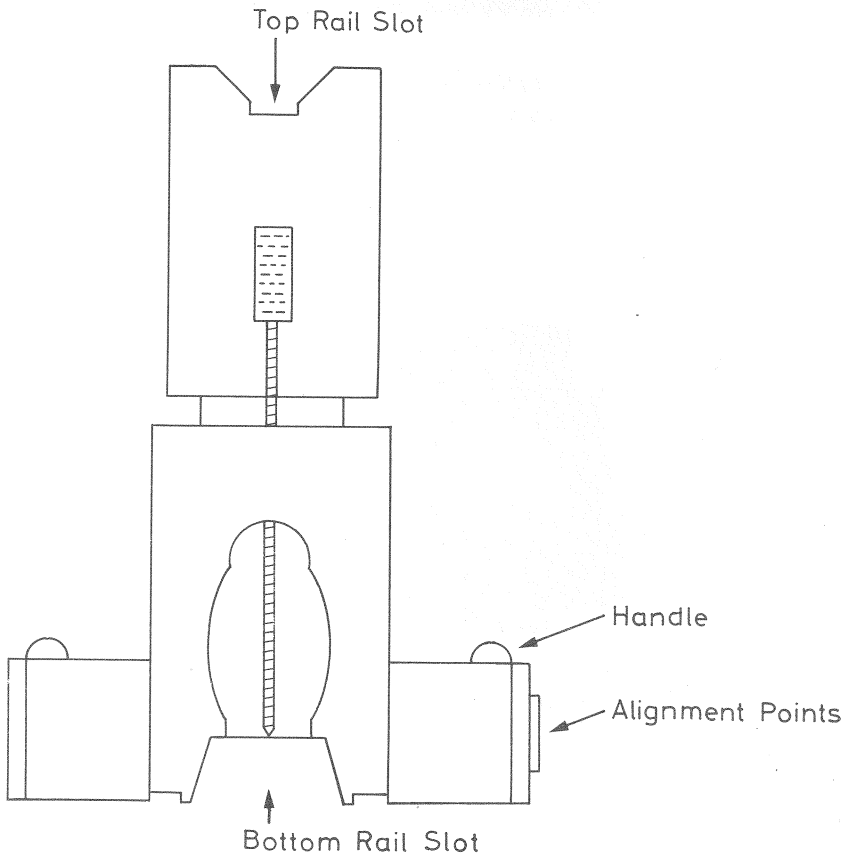


Fig. 22
Carriage alignment tool

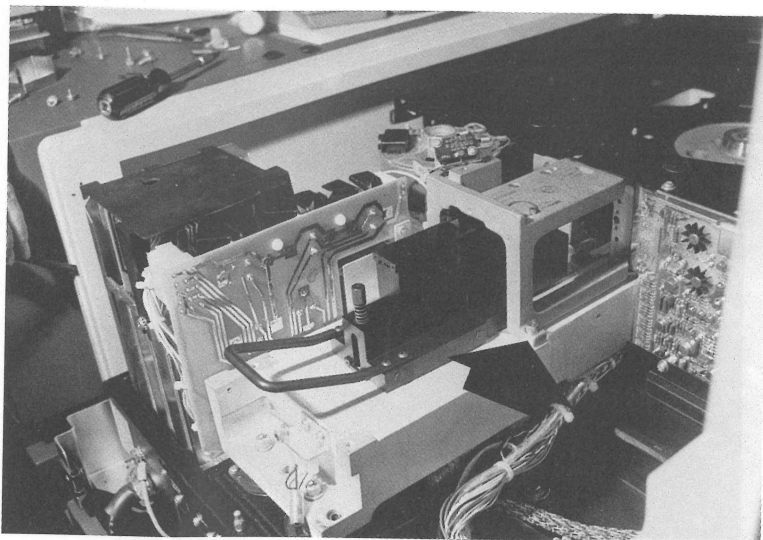


Fig. 1-23

Replace upper carriage rail, do not tighten the screws. Make sure that the hole in the rail aligns with the hole for the shipping pin. Install rail alignment fixture. Make sure tool is installed as shown in Fig. 1-21.

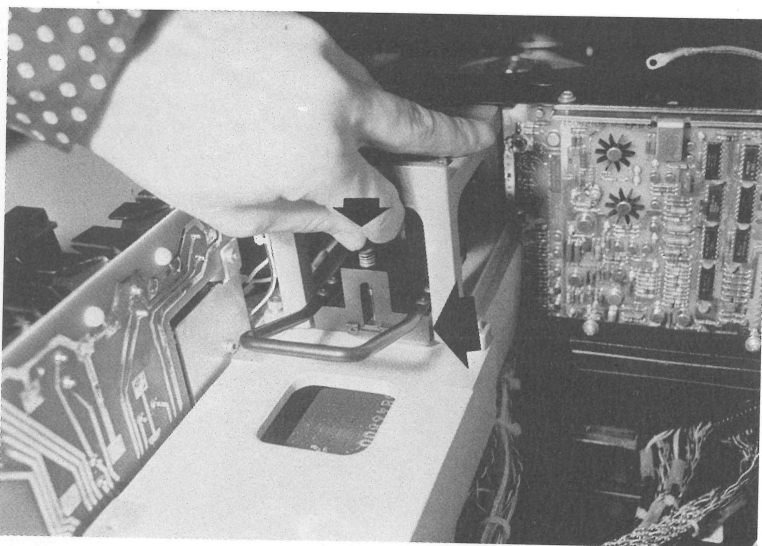


Fig. 1-24



Fig. 1-25

Tighten fixture to lower rail with the two thumb screws, one in front and one in back of the fixture (Fig. 1-24/ 1-25). Make sure that the distance between tool and rail bracket assembly is between 0.001 and 0.003 inch (Fig. 1-24). If adjustment is necessary loosen either the four screws of the lower rail (Fig. 1-20) or the four allen screws from the rail bracket assembly (Fig. 1-24).

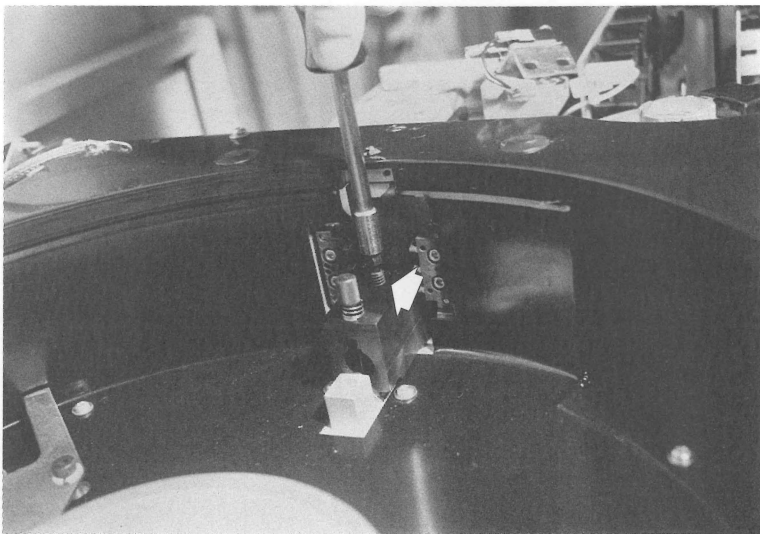


Fig. 1-26

Raise the top part of rail alignment tool by turning allen screw on front of the fixture. To ensure proper seating of the top rail to the fixture, tap on the rail bracket while raising the fixture.



Fig. 1-27
Make sure that rail touches rail bracket



Fig. 1-28
Torque upper rail screws to 10 ± 2 in. lbs. Remove rail alignment tool and reinstall the remaining two screws of the lower carriage rail.



Fig. 1-29
Change tachometer rod from old carriage assembly to the new one. The tachometer rod has to be centered.

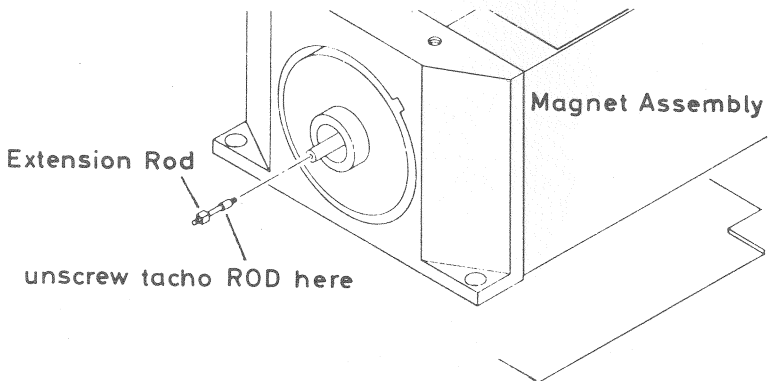


Fig. 1-30

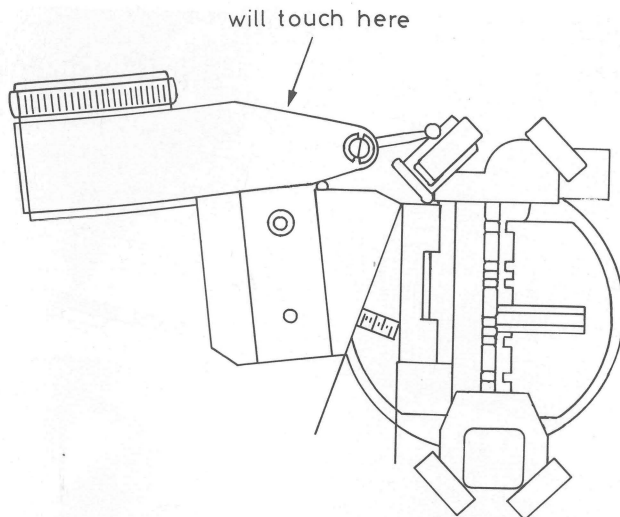


Fig. 1-31

Fig. 1-31/1-32/1-33 Show how to install the bearing alignment tool. Install the bearing alignment tool by inserting stud through third head hole from the bottom of the carriage and tightening hold down rod. Indicator probe must rest on outer bearing race. This is an initial set up. Remove the tool from the carriage.

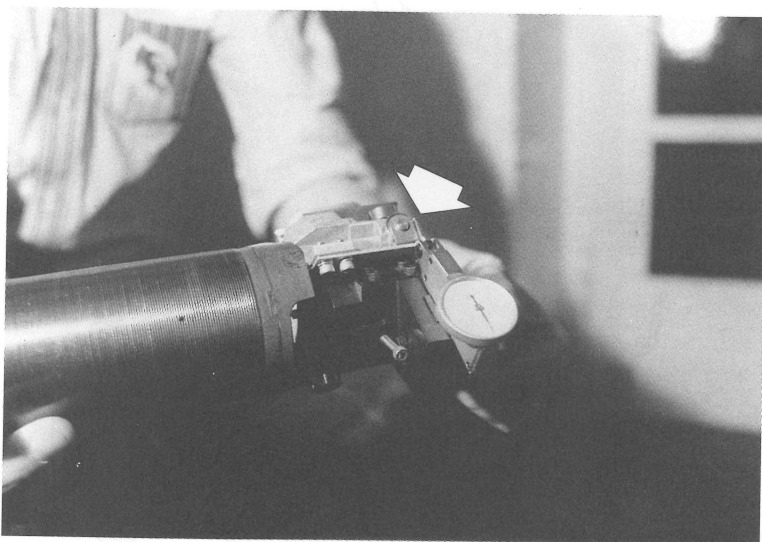


Fig. 1-32

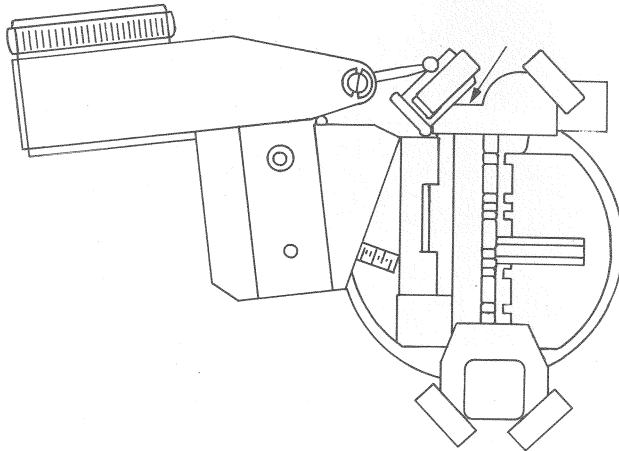
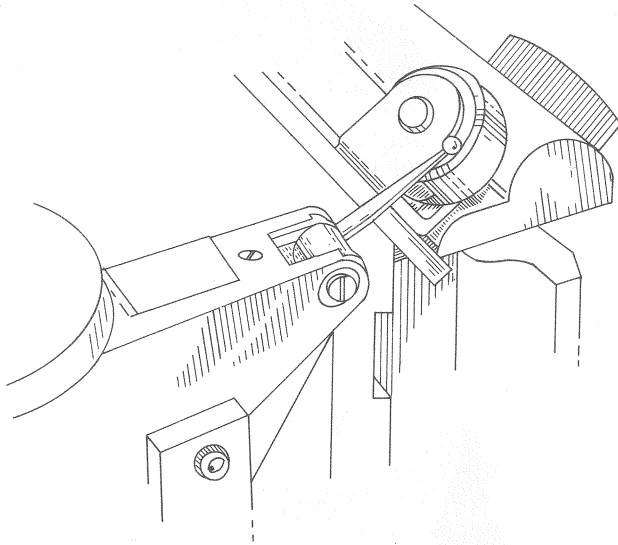
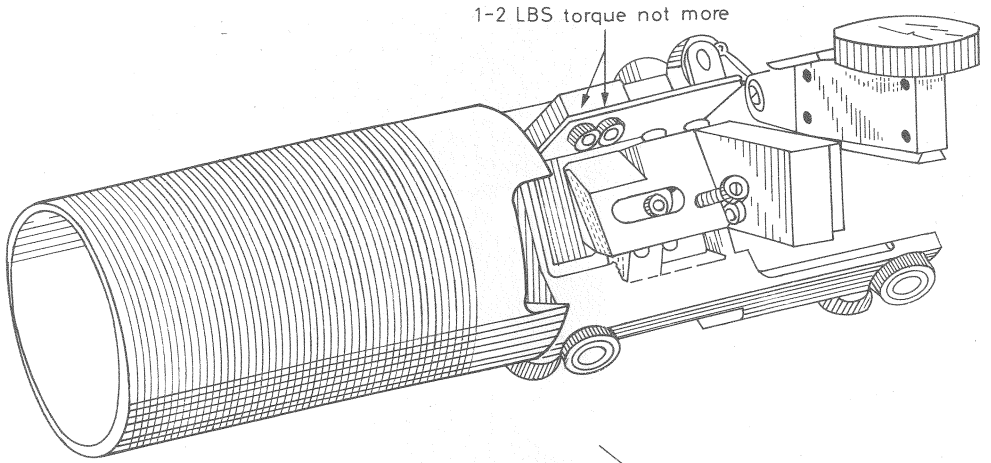


Fig. 1-33

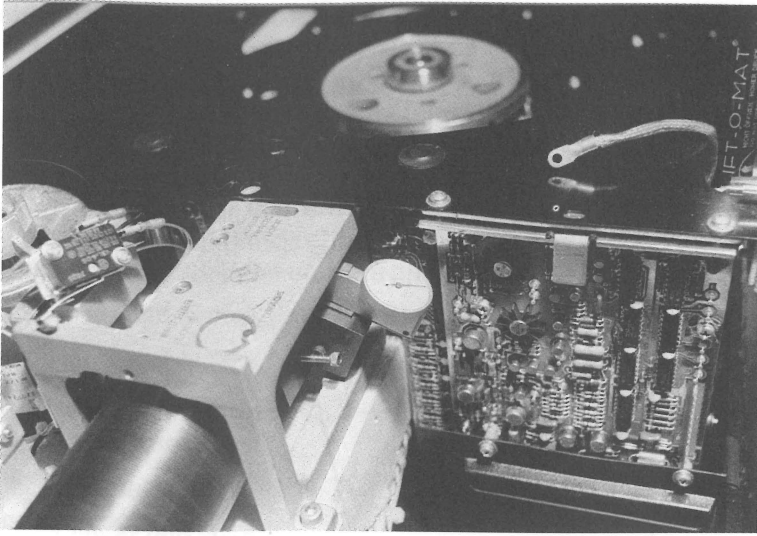


Fig. 1-34

Fig. 1-34/1-35 Place carriage onto rails and reinstall bearing alignment tool.

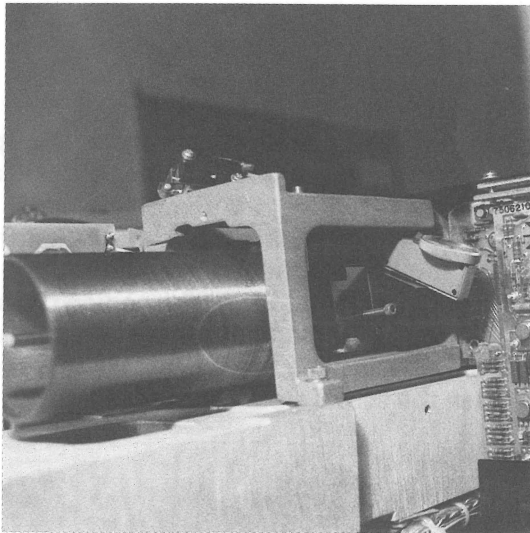


Fig. 1-35

To raise the bearing insert a small screw driver from the front and insert the blade between the carriage assembly and the spring bearing pivot point.

CAUTION: Make sure that the probe is on the outer race edge of the bearing after making each of the two previous adjustments.

With the carriage and coil fully retracted push the coil towards the spindle and observe the movement of the needle. If the dial is clockwise the bearing is climbing up the rail and you need to lower the spring bearing. If the dial is going counter clockwise, the bearing is falling and you need to raise the spring bearing.

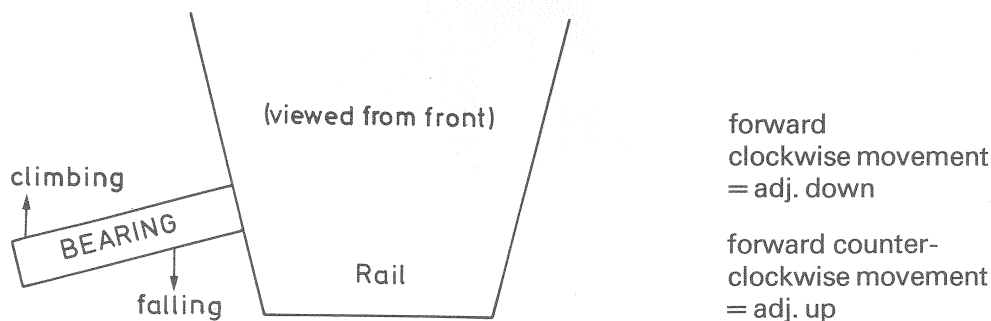


Fig. 1-36

Carefully install carriage assembly. Install bearing alignment tool as described in (Fig. 1-31/1-32/1-33). Actuate carriage. Bearing run out should not exceed .001 per inch of travel.

If the spring bearing screws are too tight, prying on the spring bearing will only deform the spring. After moving the carriage back and forth several times, the spring bearing will return to its original shape. To check for this condition note the reading on the scale before you adjust the spring bearing, perform the adjustment and re-note the scale reading. Move the carriage back and forth several times and check that the scale reading does not change. If the screws are too tight the scale will read approximately the same as before you adjust the spring bearing. If the last reading is greater (clockwise or to the right of the original reading) then the screw are too loose.

If adjustment is necessary, loosen front screw of spring loaded bearing (Fig. 1-33) and adjust up or down to achieve minimum runout.

Tighten screw and recheck bearing. Remove alignment tool.

Tighten the two screws in the shroud assembly (Fig. 1-19).

Reinstall the two rubber buttons (Fig. 1-17).

Reinstall magnet assembly (Fig. 1-13/1-14). Make sure that the coil does not touch the magnet assembly (refer to maintenance manual for adjustment).

Reinstall heads loaded switch (Fig. 1-12).

Install flex lead assembly (Fig. 1-10/1-11).

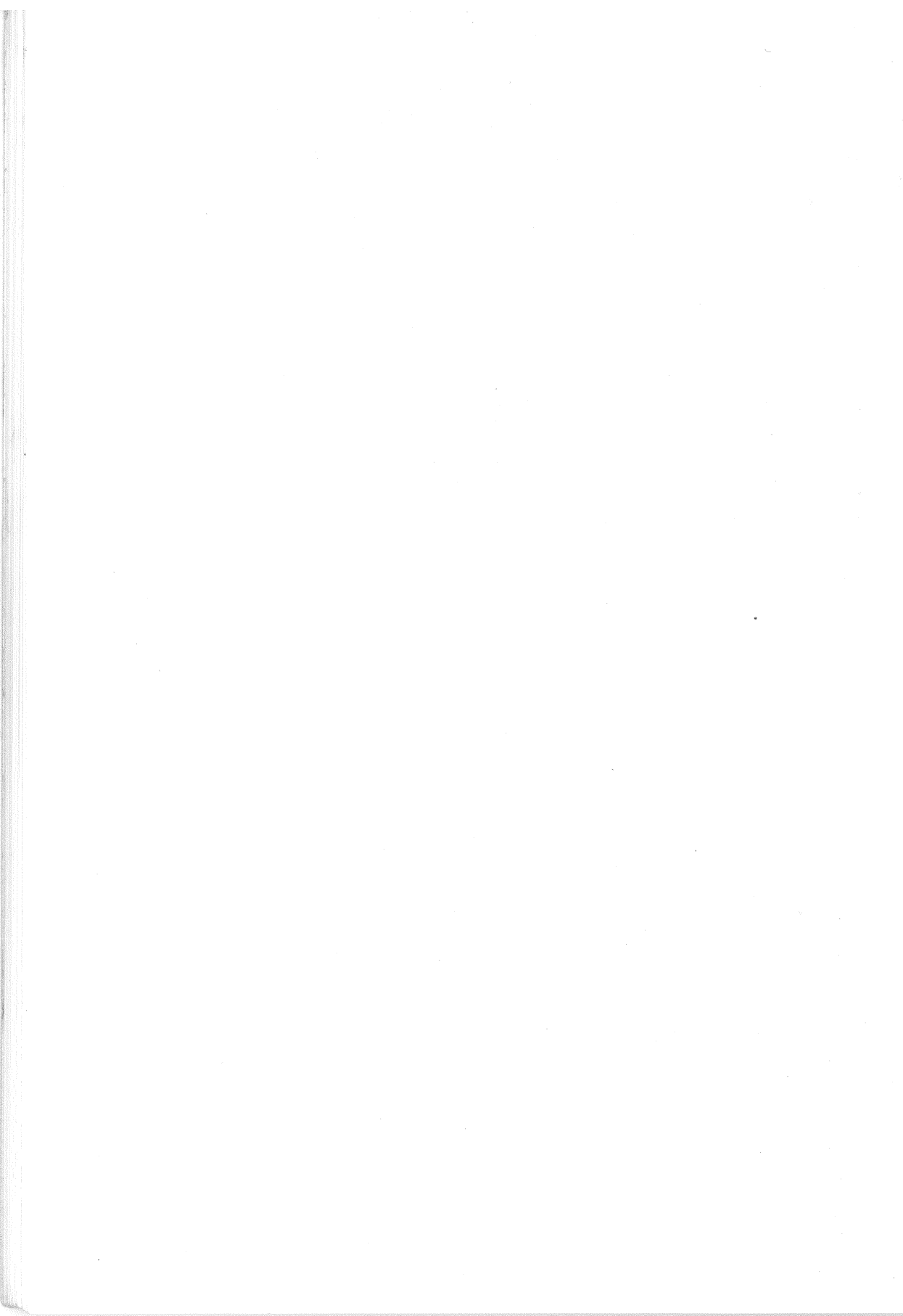
Reinstall transducer assembly (Fig. 1-9/1-10). Make sure that the tacho rod does not touch the transducer.

Reinstall logic chassis (Fig. 1-6/1-7).

Reinstall front cover (Fig. 1-4).

Reinstall top cover (Fig. 1-2/1-3).

Perform spindle alignment.



CHAPTER 2

SPINDLE TO CARRIAGE ALIGNMENT

Spindle adjustment must be performed any time the hardware securing the spindle to the deck has been loosened.

1. Remove head arm assembly number 3 and 4 (the two bottom heads.).
2. Install carriage alignment arm in slot on carriage just vacated by head arm assembly number 3. Secure alignment arm to carriage and tighten attaching hardware until torque is $4 \pm 1/2$ inch-pounds.
3. Extend carriage until alignment arm is aligned as shown in figure 1-32.
4. Using non-metallic feeler gauge, check that distance between alignment arm and spindle is as specified. If adjustment is required, go to step 5. If specification is met go to step 11.
5. Retract carriage and rotate spindle until holes in top of spindle align with mounting hardware.
6. Remove screws and washers securing spindle to deck. Install screws (without washers) and just snug screws tight.
7. Extend carriage until alignment arm is positioned as shown in figure 1-32.
8. Using a plastic faced hammer, gently tap spindle until dimension between alignment arm and spindle is as specified in figure 1-32.
9. Tighten one screw at a time and check dimension after tightening each screw.
10. When last screw is tightened remove first screw tightened and install washer on it. Then reinstall screw, tighten it, and recheck dimensional requirement. Repeat this procedure for the second and third screws.
11. Remove alignment arm, and follow head inspection procedure in Chapter 3. Reinstall head arm assemblies.
12. Perform static ground spring adjustment and head arm alignment procedures.

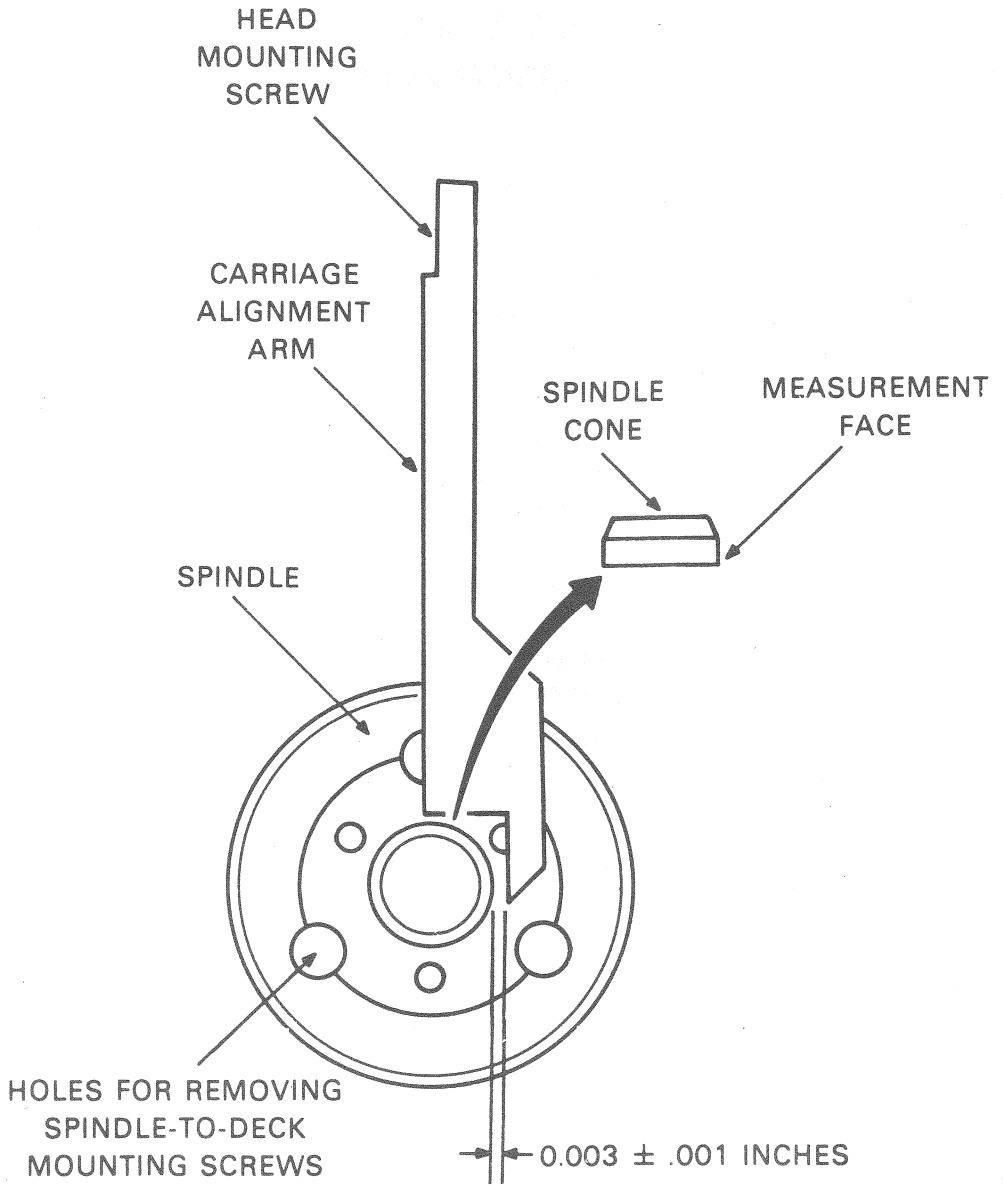


Fig. 1-32
 Spindle/Carriage alignment

CHAPTER 3

HEAD INSPECTION PROCEDURE

HEAD ARM ASSEMBLIES

General

The drive has a positive pressure filtration system that eliminates the need for periodic inspection and cleaning of heads. The heads should be inspected for the following reasons only:

1. A problem is traced to a specific head or heads; for example, excessive data errors.
2. Head to disk contact is suspected. This may be indicated by an audible ping, scratching noise, or a burning odor when the heads are over the disk area.
3. Concentric scratches are observed on the disk surfaces.
4. Contamination of pack is suspected (possibly due to improper storage of the pack).
5. The pack has been physically damaged (possibly due to dropping or bumping).

CAUTION

Do not attempt to operate the media on another drive until full assurance is made that no damage or contamination has occurred to the media.

Do not attempt to operate the drive with another media until full assurance is made that no damage or contamination has occurred to the drive heads or to the shroud area.

Head Inspection

CAUTION

Do not smoke when inspecting or cleaning heads. Use extreme care not to damage the head.

Do not touch the head pad or gimbal spring with fingers or tools.

If head must be laid down, do not allow the head pad or gimbal spring to touch anything.

RM Ø2, Ø3 Disk Subsystem

Remove suspected head (see Service Manual Paragraph 3.32). Refer to figure 3-1, observe the head arm assembly, and perform the suggested remedy as follows:

1. If reddish-brown oxide deposits exist on the head, replace or clean the head-arm assembly.
2. If head appears scratched, replace or clean the head arm assembly.
3. If head appears damaged, replace the head arm assembly.
4. If the gimbal spring (it holds the head pad to the arm) is bent or damaged, replace the head arm assembly.

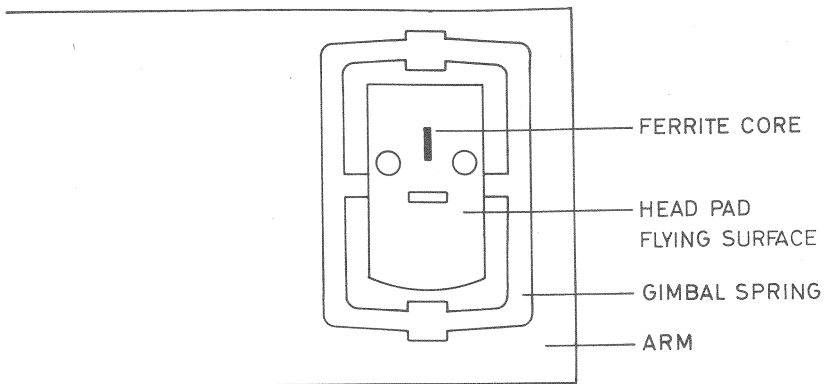


Fig. 3-1
Typical Head Arm Components

Head Cleaning

CAUTION

Head cleaning is a delicate procedure which is not recommended. It should not be undertaken unless it is absolutely necessary, and then it should be performed by properly trained personnel only.

Refer to figure 3-2 if head cleaning is required and perform the following procedure. Use care not to damage any part of the head arm assembly.

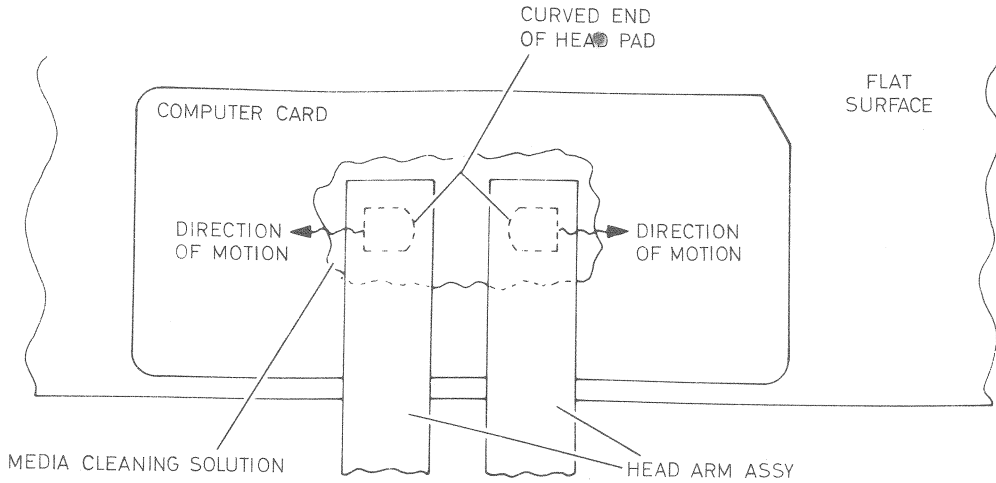


Fig. 3-2
Head Cleaning Motion

CAUTION

In the following step, hold the can of dust remover upright (vertical). If the can is not held upright, liquid propellant will be sprayed on the head.

1. Use super dry dust remover (see list of Maintenance Tools and Materials) to blow off all loose particles from the head pad (flying surface), from the edge of the head pad, and from the holes in the head pad. Hold the nozzle 6 to 12 mm (1/4 to 1/2 in) from the head pad. Spray with a back and forth motion across the head pad, making certain to hold the can only in a vertical position.
2. Clean a smooth, flat working surface, for example a glass or formica table top.
3. Place a new, unpunched, clean computer card with the back side up (printing down) on the clean, flat working surface as shown in figure 3-2.

CAUTION

Care should be taken to avoid excess cleaning solution. Excess solution on the head cable may remove the plasticizer and make the cable stiff. A stiff cable reduces the flexibility of the head pad and could cause broken wires.

4. Moisten a small area in the center of the card with media cleaning solution. (Refer to the list of maintenance tools and materials).

CAUTION

Inspect the media cleaning solution for contamination, rust, dirt, etc. do not use contaminated solution.

5. Very carefully place the head pad flying surface on moistened area and move head pad from moistened area to dry area in a zig-zag motion as shown in figure 3-2. Move head in a direction away from curved end of head pad. If it is moved in the opposite direction the sharp edge of the curved end will cut into the computer card and prevent movement and proper cleaning.
6. Blow off the head again using the Super Dry Dust Remover as in step 1.

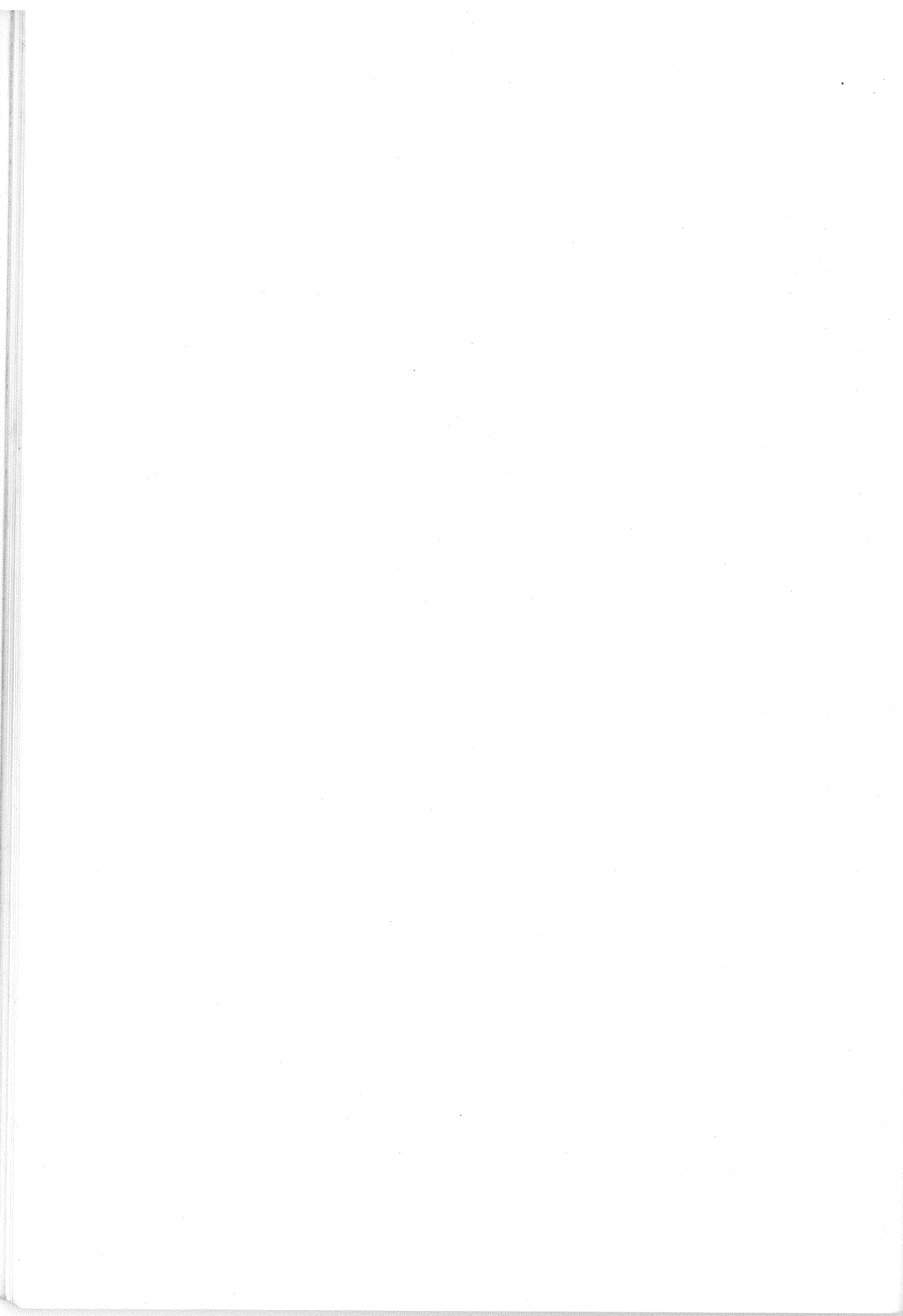
NOTE

Discoloration of media cleaning solution and computer card indicate that oxide particles are being removed from head pad flying surface.

7. Repeat steps 3, 4, 5, and 6 using a clean computer card and clean media cleaning solution each time until no discoloration on card is present.
8. After discoloration has ceased, inspect head to determine that oxide deposits were removed. If deposits remain but show signs of being removed, repeat cleaning procedure until deposits are removed.
9. If oxide deposits cannot be removed, replace head arm assembly.
10. If oxide deposits were removed and head passes inspection according to the Head-Arm Replacement Criteria, reinstall head.
11. Follow replacement procedure (see RMØ2, Ø3 Disk Subsystem Service Manual Paragraph 3.32) to install cleaned head or a replacement head as required.

A head arm assembly requires replacement if any of the following conditions exist:

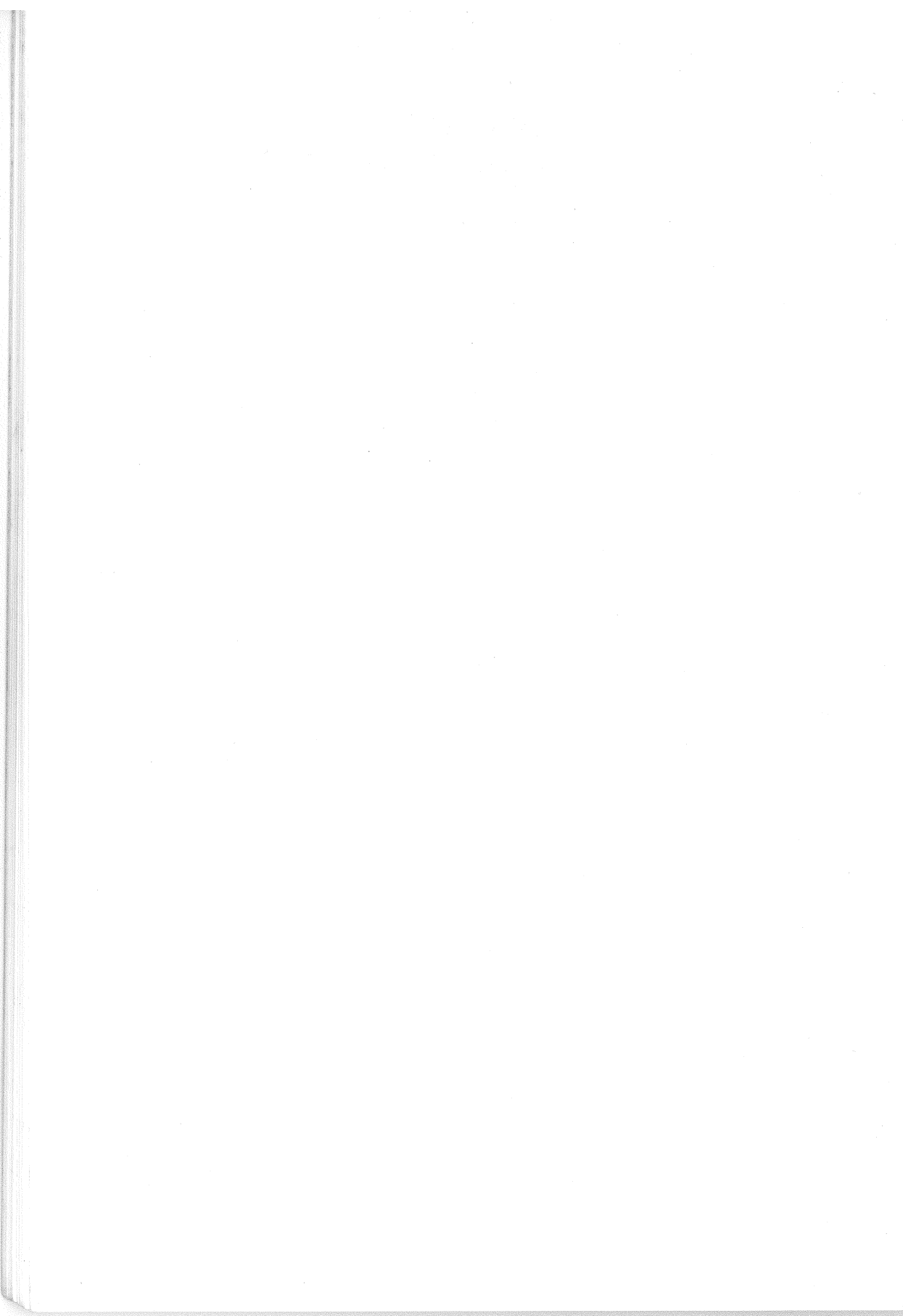
1. Consistent oxide buildup on the same head, indicating repeated head to disk contact.
2. Appreciable oxide buildup that cannot be removed.
3. Scratches on the head flying surface.
4. Imbedded particles in the head pad flying surface.
5. Bent or damaged gimbal spring.
6. Any apparent physical damage to head-arm assembly.



CHAPTER 4

VOLTAGE AND TACHOMETER ADJUSTMENTS

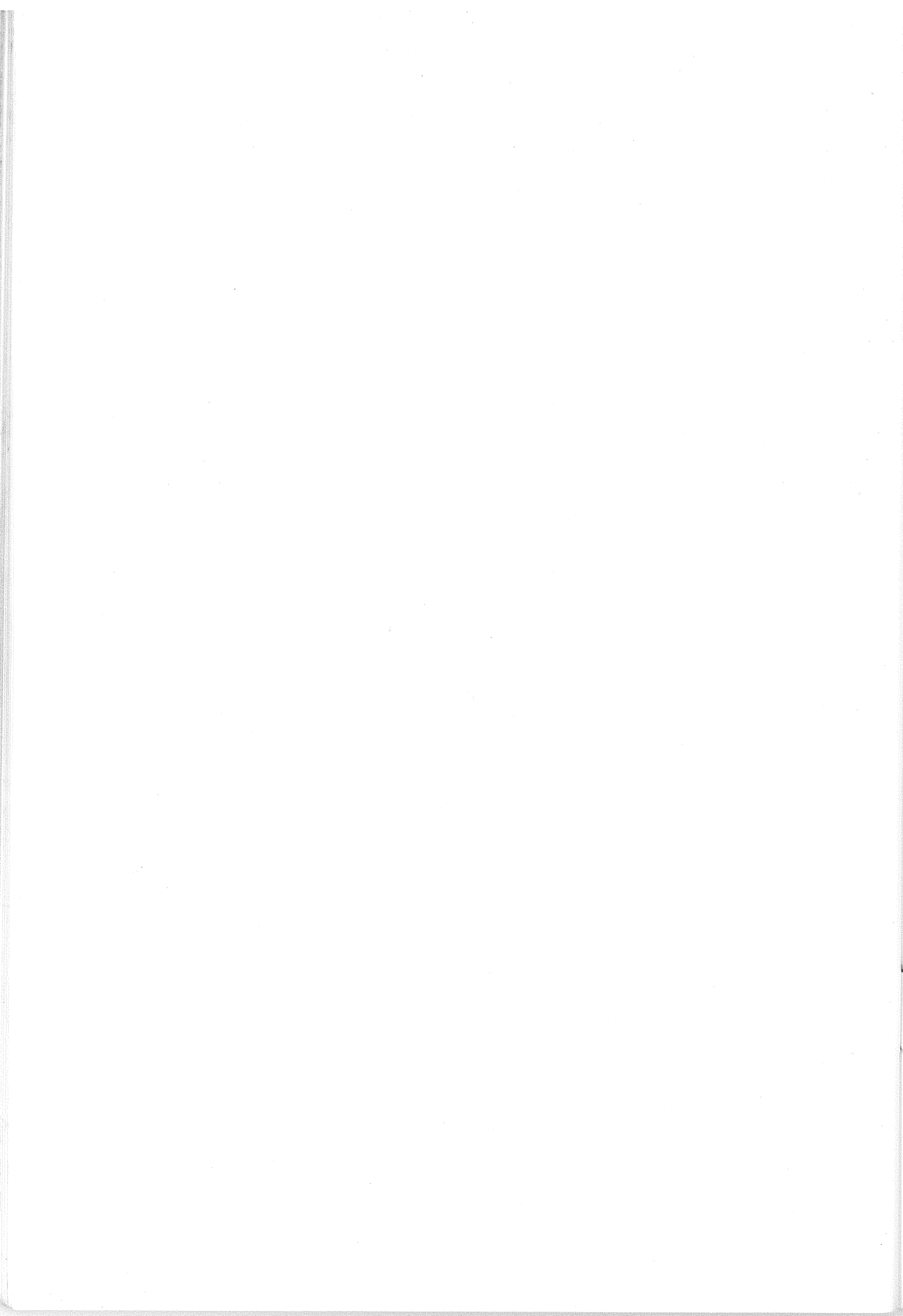
Refer to the RM02, 03 Disk Subsystem Service Manual, Chapter 4.



CHAPTER 5

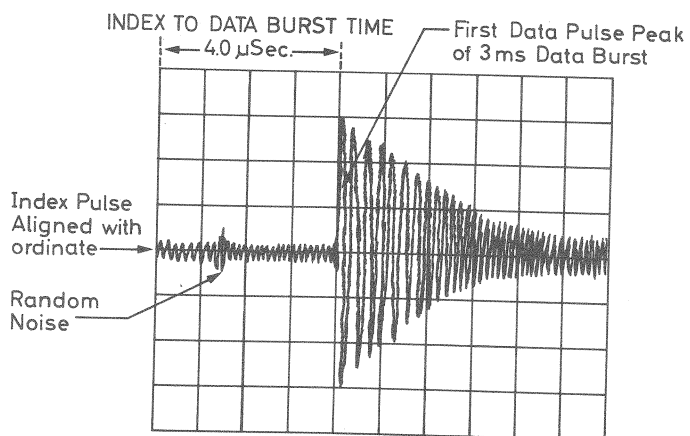
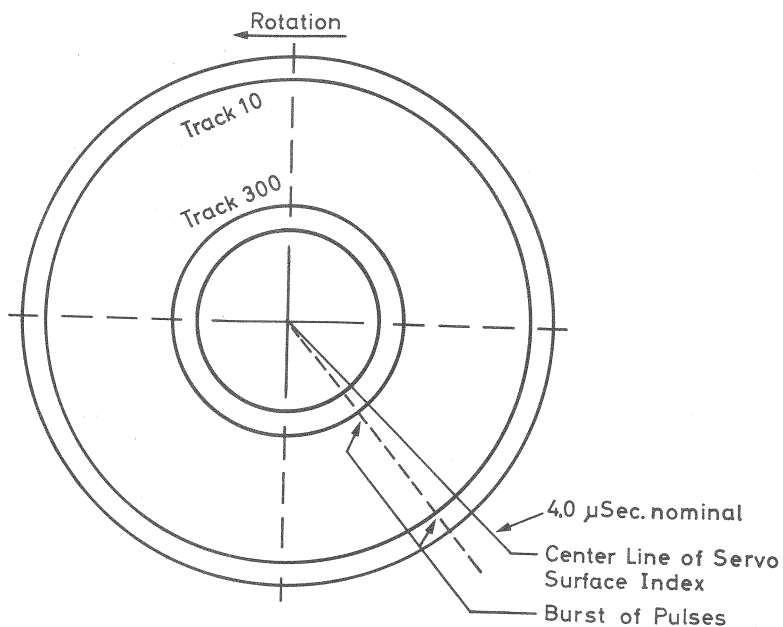
HEAD ALIGNMENT PROCEDURE

Refer to the RM02, 03 Disk Subsystem User's Guide or to the RM02, 03 Disk Subsystem Service Manual for installation of the FTU and head alignment procedures.



CHAPTER 6

INDEX TO DATA BURST MEASUREMENT



EQUIPMENT NEEDED

- RM02/03 C.E. pack 30-13992-02
- 3 scope probes and grounds
- scope with .5 μ sec per division or better
- 4" jumper wire to be used on CDC backplane pins
- standard tools (ie; screwdriver etc.)
- RM02/03 FTU (Field Test Unit)

DRIVE SERIAL _____ C.E. PACK SERIAL _____
 DRIVE SERIES CODE _____ DATE OF TEST _____
 HOUR METER READING _____ CUSTOMER _____

HEAD	CYL 12 ₈	CYL 310 ₈	CYL 454 ₈	CARRIAGE WAY
0	_____ μ sec	_____ μ sec	_____ μ sec	_____ μ sec
1	_____ μ sec	_____ μ sec	_____ μ sec	_____ μ sec
2	_____ μ sec	_____ μ sec	_____ μ sec	_____ μ sec
3	_____ μ sec	_____ μ sec	_____ μ sec	_____ μ sec
4	_____ μ sec	_____ μ sec	_____ μ sec	_____ μ sec

HD
 Scatter _____ μ sec _____ μ sec _____ μ sec _____ μ sec

1. Connect the FTU to the 9762 drive under test (RM02 or RM03)
2. Load a CE pack on the drive and start the drive. Be sure to write protect the drive. NOTE: this starts the thermal stabilization period.
3. Set up the scope as follows:

NAME	PROBE	CARD	TEST POINT	DRIVE LOGICS
-RAW DATA	CH 1	A3A02	F	263
+RAW DATA	CH 2	A3A02	G	263
INDEX	EXT TRIG	A2B08	C	182

Test Point "Z" = Grd point on A3A02 & A3A03 cards
 A2B08 = Access Control and Index/Sector decode
 A3A02 = HD Select and Read Amplifier

Volts per division = .5 volts (.05 with 10:1 probes)
 Time per division = .5 μ sec
 Sweep = Add
 Channel 2 = Invert
 Coupling = AC
 Trigger = External Positive

4. Set up the tester for the following:

Write Inhibit = ON
 Access Mode = Direct
 WRT-RD Select = RD
 HD Select = Manual

5. **Thermal Stabilization time should be a minimum of 15 minutes.
 Do a direct seek to cylinder 12₈.
6. GRD the „-READ GATE“ line A2A04 pin 13B on the back plane. (Ref 042)
 Test points A and Z are grd and also Backplane pins 1A & 34A
 NOTE: This GRD must be removed each time you seek other wise you will get a FAULT
7. Position the Index pulse at time "0" and select HD "0" via the tester.
 RECORD your reading and sequence thru the remaining HDS, recording your readings each time.
8. Remove the GRD applied in STEP 6 and do a direct seek to cylinder 310₈.
 (switches 128, 64, and 8 on)

9. Reapply the GRD as in STEP 6 and sequence thru all the HDs, recording the readings as in STEP 7.
10. Remove the GRD as in STEP 8 and do a direct seek to cylinder 454₈.
(switches 256, 32, 8, and 4 on)

NOTE: Do NOT try to access above cylinder 330₁₀. This is a C.E. pack and contains half the normal data pack cylinders.
11. Reapply the GRD as in STEP 6 and sequence thru all the HDs, recording the reading as in STEP 7.

YOUR READINGS SHOULD NOW LOOK SOMETHING LIKE THE FOLLOWING:

HEAD	CYL 12 ₈	CYL 310 ₈	CYL 454 ₈	CARRIAGE WAY
0	3.7 μsec	3.6 μsec	3.5 μsec	-.2 μsec
1	*2.4	*2.2	2.1	-.3
2	2.5	2.2	*2.0	*-.5
3	*3.9	*4.0	*4.1	*+.2
4	3.4	3.3	3.3	-.1
HD	3.9	4.0	4.1	-.5
Scatter	-2.4	-2.2	-2.0	+2
HD	3.9	4.0	4.1	-.5
Scatter	-2.4	-2.2	-2.0	+2
	1.5	1.8	2.1	.7

* = maximum and minimum values.

12. The present tolerance as defined by CDC for INDEX TO BURST is

4 ± 4 μ sec for the 3600 RPM RM03

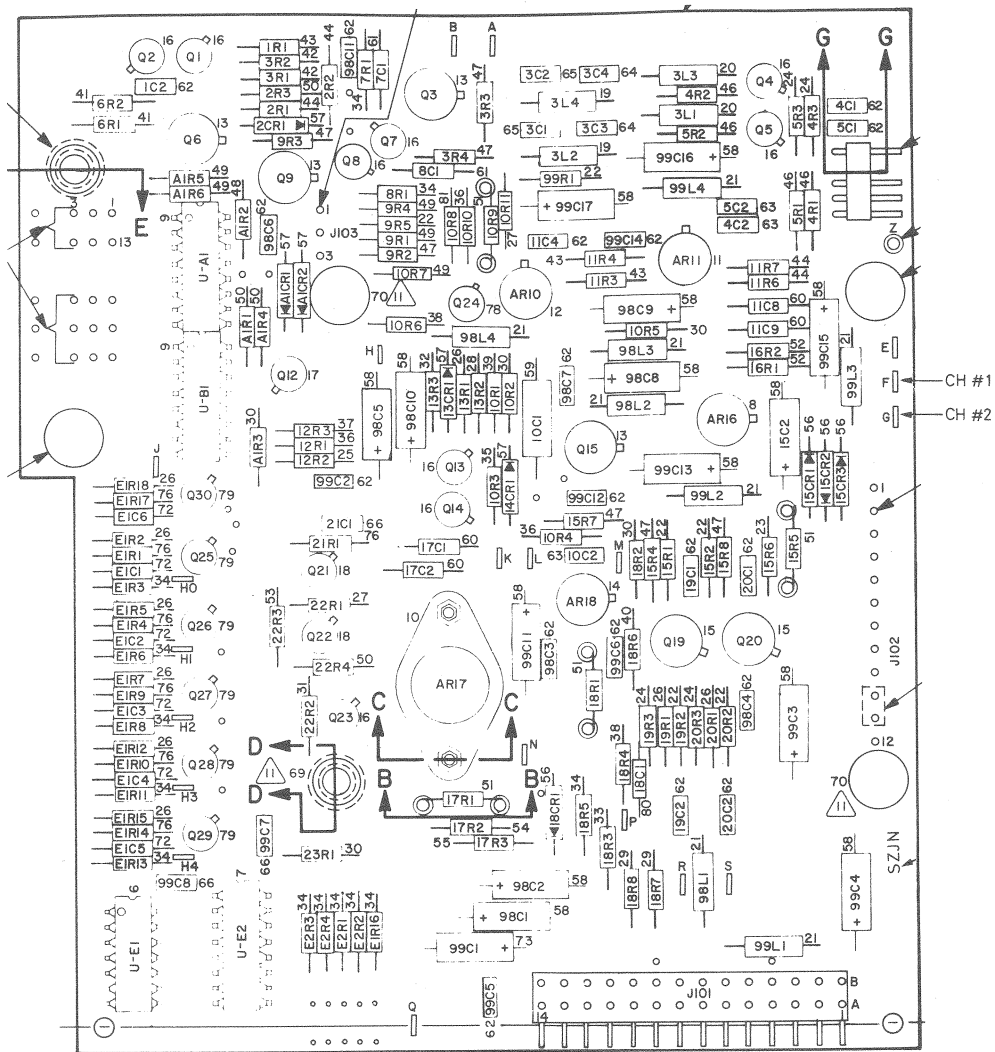
6 ± 6 μ sec for the 2400 RPM RM02

This would give you a Head scatter tolerance of 8 μ sec on the RM03. This can be checked by taking the largest and smallest number from each of the cylinders (12_g, 310_g, 454_g) and subtracting the smaller from the larger. This number must not exceed 8

Any carriage not meeting this INDEX TO BURST may have the following:

1. a spindle alignment problem
2. a head skewed to one side caused by one of the following:
 - a. head seating problem to the carriage and coil
 - b. head assembled wrong at the factory
 - c. the carriage and coil head mounting surface being out of tolerance
3. an upper to lower rail alignment problem

A quick mechanical check for head skew can be made by mounting an upper and lower head to the carriage and coil. The edge of the glass heads should line up – if not you definitely have a head skew problem. The amount of skew seen though is quite small, less than a 64th of an inch and the electrical check is by far the best.



A3A02 (-ZJN)

