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#### 4.6.3 Pawl Bracket Assemblies

Only the detent pawls and pawl return springs in the pawl bracket assemblies are field replaceable. The remainder of the pawl bracket assembly must be replaced completely.

##### 4.6.3.1 Removal and Replacement

1. Turn off power.
2. Remove detent cover, drive tire (see 4.5.2.2), drive disk (see 4.5.3.2), and voice coil assembly (see 4.6.2.1).  
*Note:* Do not put the voice coil on a dirty surface where the magnet can attract magnetic particles.
3. Remove pawl bracket holding screw (see Figure 2-34). FR. E17 1-2 The eccentric adjuster is a loose piece that is secured by the bracket; do not drop it, therefore, as bracket is withdrawn.
4. If only detent pawls or return springs are to be changed, lubricate new parts with Molykote 'G' Rapid at spring loops and pivot point, and on yoke contacting face. After cleaning original parts lubricate in the same way.
5. Mount pawl brackets on pivot stud of voice coil assembly. The upper bracket with offset pivot fits nearest the voice coil. Put eccentrics in recesses of detent plate.
6. Position voice coil assembly, with brackets, on to detent plate. Locate dowels in the detent plate and locate eccentrics in bracket slots. Fit and hand-tighten screws for voice coil assembly and pawl brackets.
7. Adjust voice coil assembly (see 4.6.2.2).

##### 4.6.3.2 Voice Coil Magnet Cleaning

Pieces of attracted debris can be removed by picking them off the voice coil magnet with adhesive tape. Do not put the voice coil on a dirty surface where the magnet can attract pieces of magnetic debris.

#### 4.7 R/W HEAD ARM ASSEMBLY

##### 4.7.1 Checks, Adjustments, and Removals

###### 4.7.1.1 Height Check

1. Turn off power.
2. Remove top cover.
3. Check that carriage is fully retracted and heads are unloaded.
4. Remove disk cartridge.
5. Place head clearance gage, part 5831638, on machined pad at the disk side of the cable clamp pillar (Figure 2-35). Jaws of tool should be behind the heads.

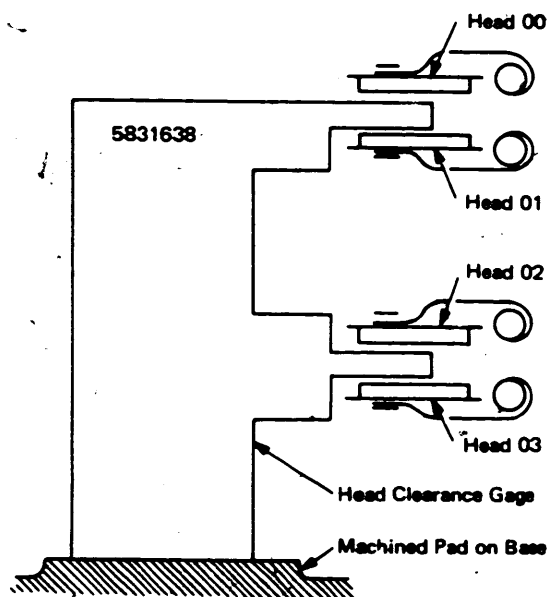


Figure 2-35. R/W Head Clearance Check. [07558A]

6. Carefully move carriage and check that the heads clear the jaws of the tool. If a head does not clear the jaws, change the head arm (see 4.7.1.4 and 4.7.1.5) and recheck. If the new head does not clear the jaws, check adjustment of head-load spring shaft (see 4.8.4.1).
7. Remove tool, then refit disk cartridge and top cover.

#### 4.7.1.2 Head Damage

The routine inspection for damage to R/W heads is described in 3.2.2. A faulty head can give read/write errors or can cause damage to a disk; typical symptoms of faulty heads are:

1. A rapid accumulation of oxide on a particular head.
2. Regularly spaced radial, circular, or spiral scratches on the disk surface.
3. Tinkling noises, caused by the head bouncing on the disk.

In all cases, the faulty head must be changed (see Figure 2-4). FR. B17 1-2 On replacement, align the new head (see 4.7.1.3) and clean the disk.

#### 4.7.1.3 Head Alignment

*Alignment of Heads 00 and 01:* The two upper R/W heads need to be aligned so that they can accept any disk cartridge. The two lower R/W heads keep a constant relationship with the fixed disk.

1. Turn off power.
2. Remove disk cartridge.
3. Install CE cartridge, part 2537301 (see 2.3.3.2).
4. Turn on power.
5. Remove the top cover and observe that R/W heads are loaded to track 000.
6. Operate the switches on the CE panel to move heads to track 073 (see 2.2).
7. Set CE mode-select switch to HD0.
8. Set the Tektronix 453 oscilloscope (using X1 probe) as follows:

*Channel 1:* Y-W1 K6J12 (linear read signal 1; see ALD page FN260).

*Channel 2:* Y-W1 K6J10 (linear read signal 2; see ALD page FN260).

*Trigger Positive:* Y-W1 D6G03 (index pulse; see ALD page FN445).

*Mode:* Add.

*Channel 1:* Normal. 50 millivolts per division (ac input).

*Channel 2:* Inverted. 50 millivolts per division (ac input).

*Time/Division:* 5 milliseconds per division.

*Note:* Before commencing alignment, run the CE cartridge for 15 minutes to allow it to reach the temperature of the 5444.

9. Slacken clamp screw of the upper head arms. Turn back, by *one-quarter of a turn*, the adjustment screws of the two upper head arms. (Figure 2-36Fr. B05)
10. Push R/W heads 00 and 01 back to the adjustment screws and tighten clamp screw to 4 lb in. (4,6 kg cm) with torque wrench, part 2597969, and 6-flute adapter, part 2597971.
11. Screw in on the adjustment screw of head arm 00; as the R/W head approaches track 073, the oscilloscope display loops appear (see Figure 2-36Fr. B05). Continue to screw in carefully until the loops are similar in size, 3.8 to 4.2 divisions in length. Use the horizontal sweep control to place the two loops across eight divisions.
- Note:* The head arm adjustment screw only pushes the arm forward. If track 073 is overshoot, return to step 9.
12. Set CE mode-select switch to HD1. Screw in on the adjustment screw of head arm 01 and set the equal length loops as in step 11.
13. Remove CE cartridge.

*Alignment of Heads 02 and 03:* If the data on the fixed disk has to be retained, refer to the error recovery procedure in 1.5.

*Align heads 02 and 03 as follows:*

1. Slacken clamp screw of the lower head arms. Fully turn back the adjustment screws of the two lower head arms.

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FRAME     B05

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### Head Arm Arrangement

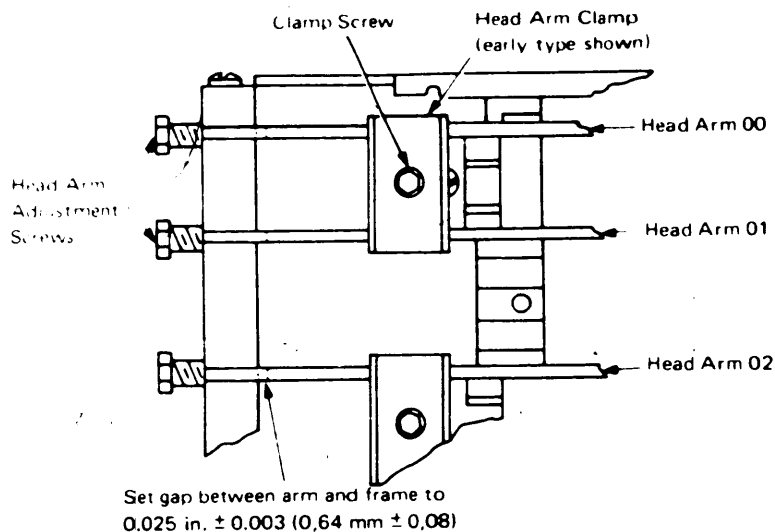


Figure 2-36. Head Arm Alignment, using CE Cartridge Track 073 [07559A]

2. Insert a 0.025 in. (0.64 mm) feeler gage between rear of arms and carriage casting (see Figure 2-36), then tighten the clamp screw to 4 lb in. (4.6 kg cm) with torque wrench, part 2597969, and 6-flute adapter, part 2597971.
3. After tightening, turn forward head arm adjustment screws to just touch the head arms. Check that gap is still 0.025 in.  $\pm$  0.003 (0.64 mm  $\pm$  0.08).
4. Refit top cover.

#### 4.7.1.4 Removal

If R/W heads 02 and 03 are to be removed and the data on the fixed disk to be retained, transfer the data to a disk cartridge before head removal. Refer to 1.5.

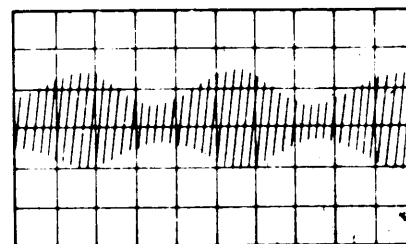
#### CAUTION

In the following steps, do not touch the face of the R/W head. Do not touch the disk with the head arm.

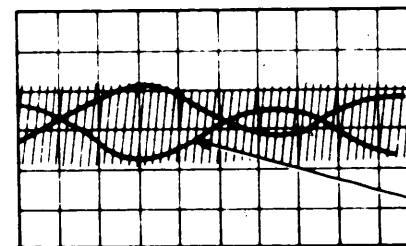
1. Turn off power.
2. Remove disk cartridge and top cover.
3. Remove clamp and unplug head connector at gate Z (Figure 2-37).

### Oscilloscope Displays (5 ms/division)

#### Off track 073



#### Head approaching track 073



4. Release head cable shield from clamp pillar and from carriage cable clamp.
5. Take off appropriate head arm clamp (see Figure 2-36).
6. Take out head sideways from carriage, holding by the head support arm.

#### 4.7.1.5 Replacement

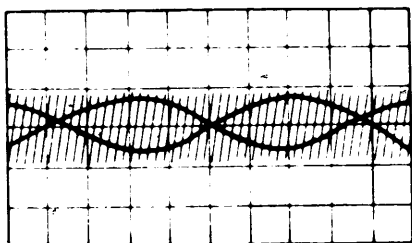
#### CAUTION

In the following steps, do not touch the face of the R/W head. Do not touch the disk with the head arm.

1. Route the cable in the new R/W head arm as shown in Figure 2-38. Open the leaf spring *not more than 0.2 in. (5 mm)* to insert cable.
2. Slide head into carriage from the side. Insert locating tongue (see Figure 2-37) of arm in a slot near head arm adjustment screw. Loosely fit head arm clamp. *Note:* Make sure that the head-load springs are correctly located on the metal dimple and pass under the arm extension as shown in Figure 2-37.
3. Secure ends of head cable shield in the carriage clamp and clamp pillar (see Figure 2-37).

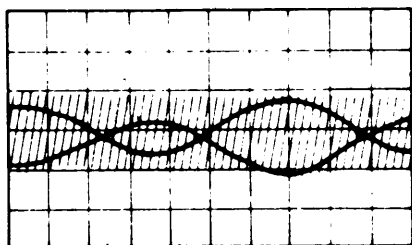
Figure 2-38

Correct alignment



Loops are of equal length

Track 073 overshoot



Other loop much larger  
Go back to start.

the loop  
much larger

from

figure

y the

f the

arm.

shown

than

ating

head

clamp.

s are

under

clamp

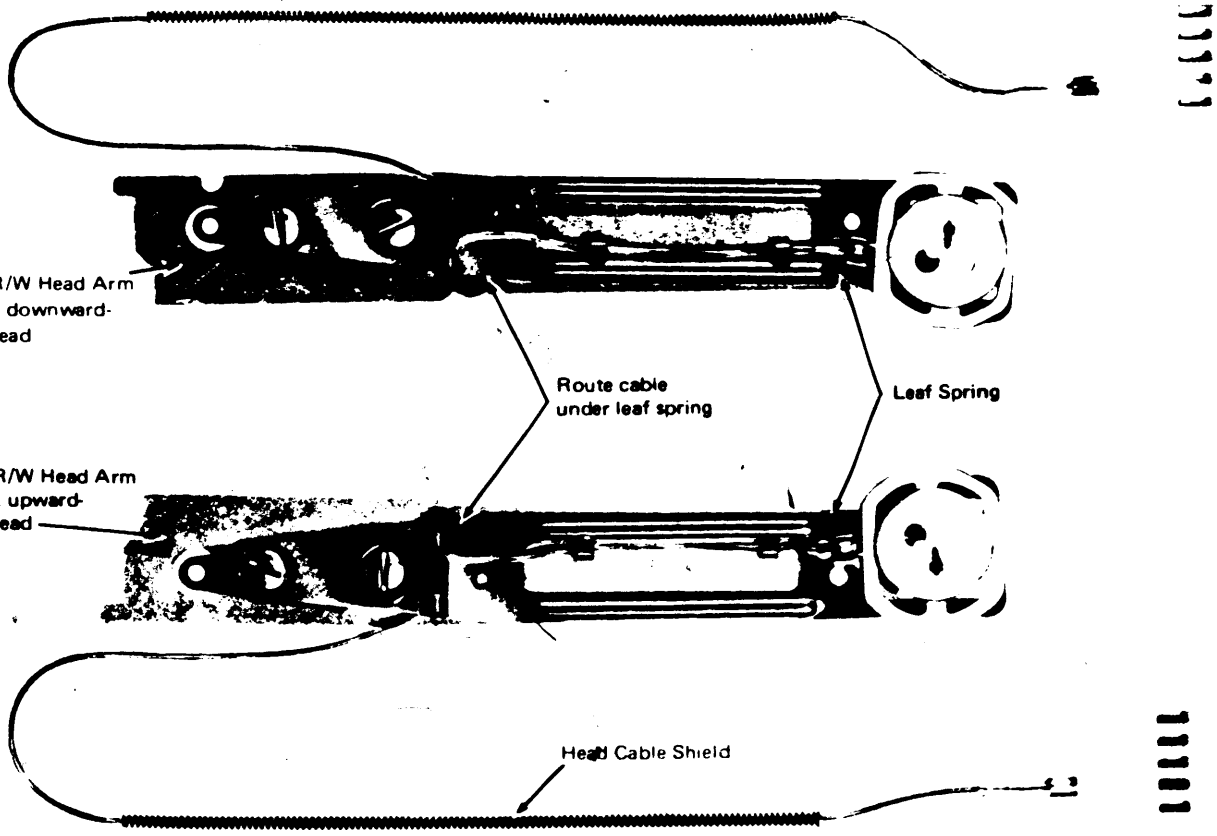
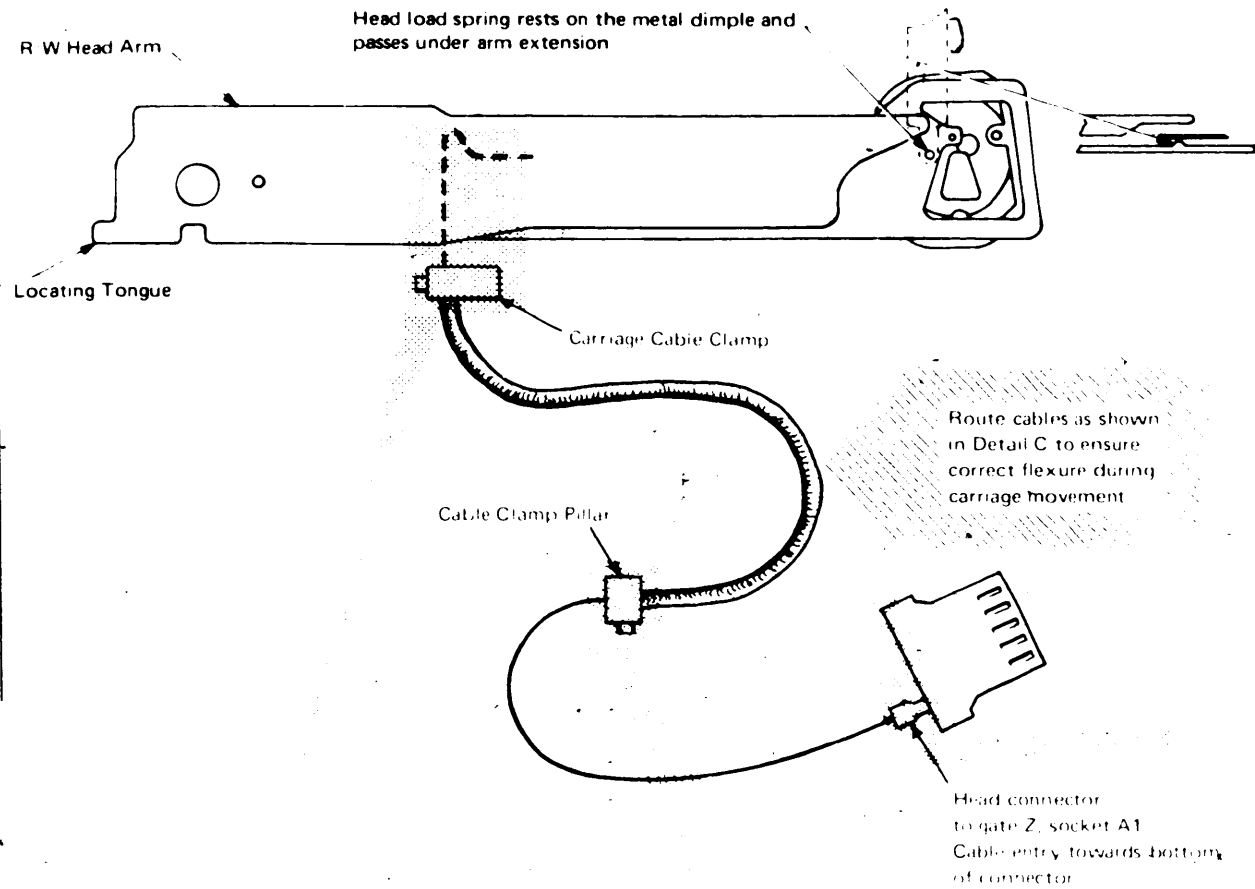


Figure 2-38. Cable Routing in R/W Head Arm [07575A]





Detail B. Cable Runs at R/W Head Arms and Clamps

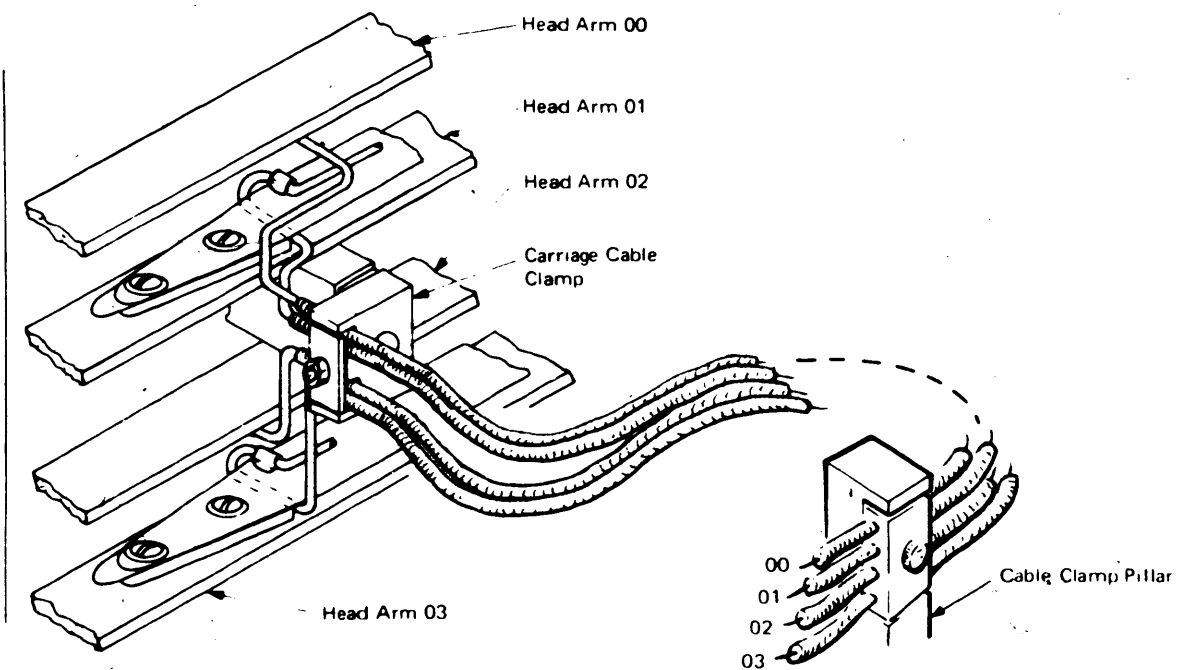
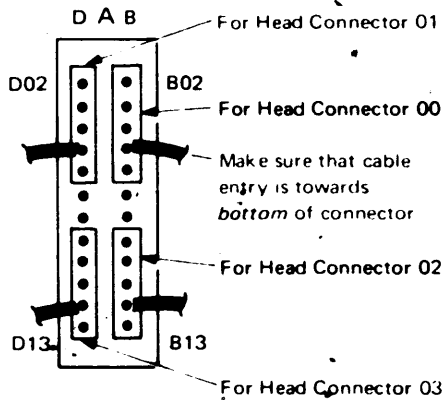


Figure 2-37. Cable Connections for R/W Head Arm [07560A]

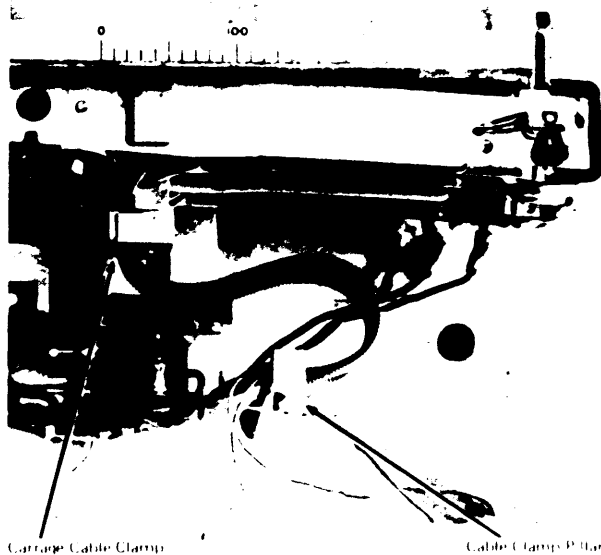
Detail C. Cable Routing for



Detail A. Gate Z, Socket A1



Detail C. Cable Routing for Flexure



**CAUTION**

In the next step, check that the head cables are positioned exactly as shown in Figure 2-37, Detail C, to prevent them breaking.

4. Plug head connector into socket A1 of gate Z (see Figure 2-37), then check that the head cables do not touch the disk at any carriage position. Refit the head plug clamp at gate Z.
5. Carry out the height check and alignment procedures (see 4.7.1.1 and 4.7.1.3).
6. Install disk cartridge and refit top cover.

**4.7.2 Cleaning R/W Heads**

For the methods of cleaning R/W heads, see 3.2.2.2 and 3.2.2.3.

**4.8 HEAD-LOAD MECHANISM**

**4.8.1 Head-Load Cable**

**4.8.1.1 Adjustment**

1. Turn off power and remove top cover.
2. Check that carriage is fully retracted.
3. Remove cover from head-load assembly.
4. Insert a lint-free tissue between each pair of R/W heads.
5. Slacken cable adjuster locknut (Figure 2-39)Fr. B09 Ensure that cable cap is seated in cable adjusting bush.

**CAUTION**

The action in the following step brings the heads together and must, therefore, be done with care and not repeated more than necessary.

6. Gently push in plunger of head-load solenoid until it bottoms.
7. The gap between the plastic pad on the head-load lever and the carriage frame should be 0.230 in., +0.005, -0.000 (5.84 mm +0.13), see Figure 2-39Fr. B09. Check by inserting the 'GO' arm of head-load gage, part 2536600, between head adjusting screw and trip arm.  
*Note:* Make sure that the head-load cable is not deflected during the check.

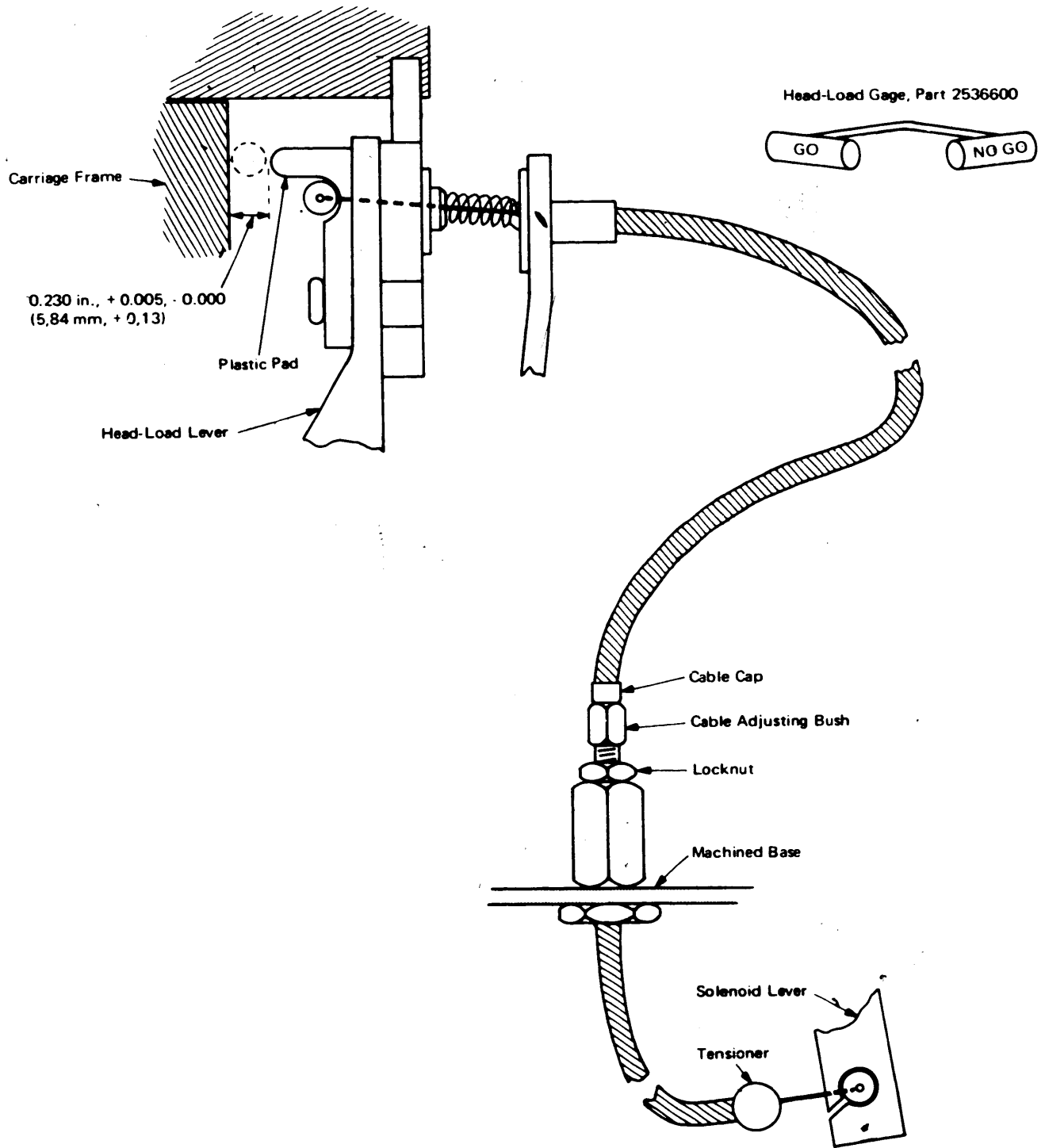


Figure 2-39. Head-Load Cable Adjustment [07561A]

8. Adjust gap with the cable adjusting bush and check that 'NO GO' arm cannot be inserted. After adjustment, tighten adjuster locknut.
9. Remove tissues from R/W heads.
10. Refit cover to head-load assembly. Refit top cover.

#### 4.8.1.2 Removal and Replacement

1. Turn off power.
2. Remove top cover and check that carriage is fully retracted.
3. Remove cover from head-load assembly.
4. Insert a lint-free tissue between each pair of R/W heads.
5. Slacken cable adjuster locknut (see Figure 2-39)Fr. B09 Screw in the cable adjusting bush. Slip outer cable from tensioner and lift cable nipple out of solenoid lever. Take care not to bring the heads forcibly together.
6. Disconnect other end of cable from head-load lever.
7. Unscrew complete adjuster and remove cable assembly.
8. Fit cable assembly in reverse order to removal.
9. Carry out the adjustment (see 4.8.1.1). Ensure that cable cap seats correctly in cable adjusting bush, or, otherwise, partial head loading will result.
10. Remove tissues from R/W heads.
11. Refit cover to head-load assembly. Refit top cover.

### 4.8.2 Head-Load Solenoid and Lever

#### 4.8.2.1 Adjustment

1. Turn off power.
2. Remove top cover and check that carriage is fully retracted.
3. Remove cover from head-load assembly.
4. Insert a lint-free tissue between each pair of R/W heads.
5. Adjust lever stop bracket (Figure 2-40)Fr. B11 by its securing screws to obtain a clearance of 0.015 in.  $\pm$  0.010 (0,38 mm  $\pm$  0,25) between bracket and lever with no slack on the head-load cable. Press *lightly* on the solenoid plunger to take up cable slack.
6. Remove tissues from R/W heads.
7. Refit top cover to head-load assembly. Refit top cover.

#### 4.8.2.2 Removal and Replacement

1. Turn off power.
2. Remove top cover and cover from head-load assembly.
3. Disconnect head-load solenoid cable.
4. Remove circlip from pivot pin and push out pin (see Figure 2-40)Fr. B11 Make sure that pin is not dropped.
5. Remove solenoid securing screws (2) and withdraw unit.
6. Install solenoid in reverse sequence to removal.
7. Check adjustment (see 4.8.2.1).

### 4.8.3 Solenoid Switches

#### 4.8.3.1 Service Check

1. Turn off power.
2. Remove top cover and cover from head-load assembly.
3. Check that carriage is fully retracted.
4. Insert lint-free tissue between each pair of R/W heads.
5. Check that both solenoid switches (see Figure 2-40)Fr. B11 transfer when solenoid plunger is 1/10 in. (2,5 mm) from the bottomed position.
6. Adjust as necessary (see 4.8.3.2).
7. Remove tissues from R/W heads.
8. Refit covers.

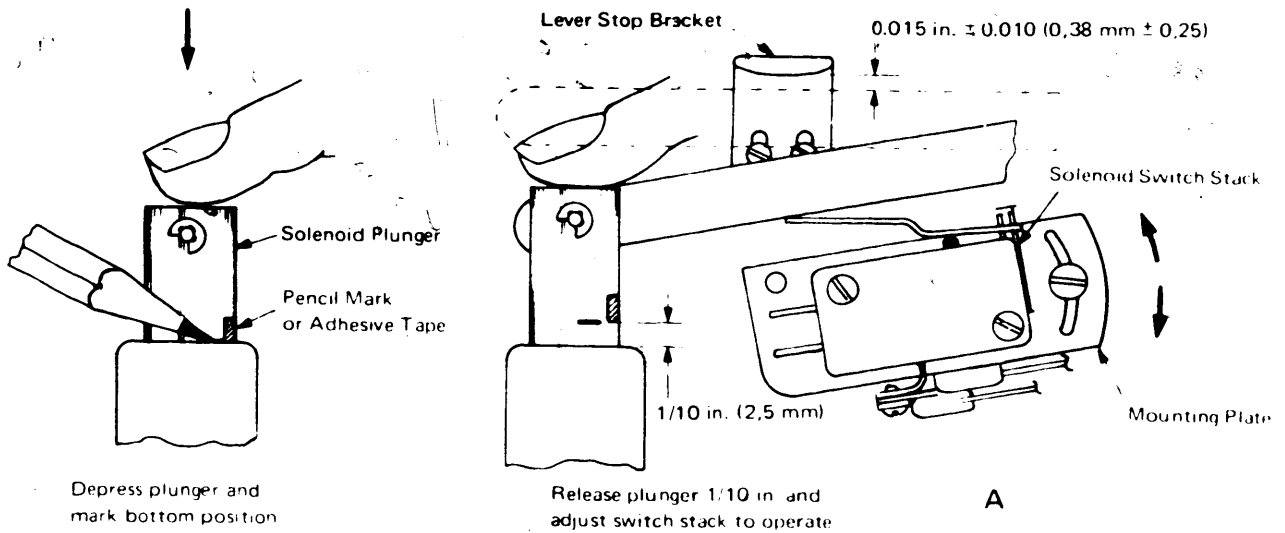
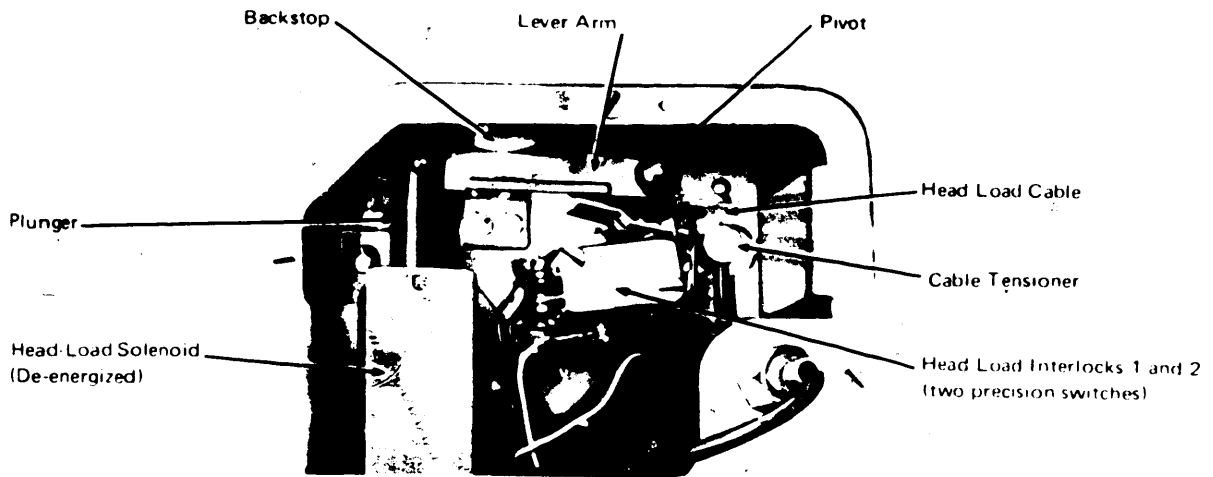
#### 4.8.3.2 Adjustment

1. Turn off power.
2. Remove top cover.
3. Set carriage to fully retracted position.
4. Remove head-load assembly cover plate. Protect the heads.
5. Insert lint-free tissue between each pair of R/W heads.

#### CAUTION

The action in the following steps brings the heads together and must, therefore, be done gently and not repeated more than necessary.

6. Slowly depress solenoid plunger until it bottoms (see Figure 2-40)Fr. B11
7. Mark bottom position of plunger with a pencil or piece of adhesive tape.
8. Allow the plunger out 1/10 in. (2,5 mm).



View on Arrow A - Positioning of Common Lead Terminals

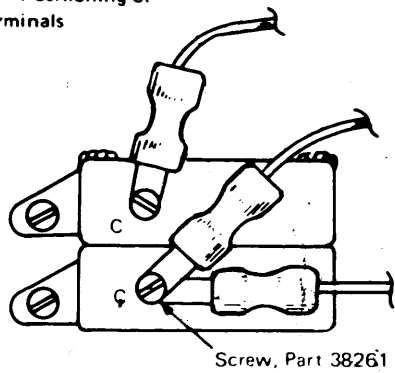


Figure 2-40. Head-Load Solenoid Switch Adjustment [07576A]

9. Loosen switch mounting bracket screw in its slot and swing the assembly until both switches transfer with the solenoid plunger still 1/10 in. (2,5 mm) from the bottom position.
10. Let the plunger gently come fully out, then depress it again to check the operating position.
11. Remove adhesive tape.
12. Remove tissues from R/W heads.
13. Refit cover to head-load assembly.
14. Refit top cover.

#### 4.8.3.3 Removal and Replacement

1. Turn off power.
2. Remove top cover and head-load assembly cover.
3. Remove screw securing switch mounting plate (see Figure 2-40)Fr. B11
4. Note lead connections and disconnect leads from edge connector EC4 and from switches.
5. Lift mounting plate, together with both switches, from base.
6. Remove faulty switch from mounting plate.
7. Assemble switches in reverse sequence to removal.  
*Note:* When connecting the leads to the common positions on the switches, locate the terminals as shown in Figure 2-40 Fr. B11 (view on arrow A) using screw, part 38261, for the double connection.
8. Adjust switches (see 4.8.3.2).
9. Remove tissues from R/W heads.
10. Refit cover to head-load assembly.
11. Refit top cover.

#### 4.8.4 Head-Load Spring Shafts

##### 4.8.4.1 Adjustment in Machine (Using Gage, Part 2600555 or 5831639)

1. Attempt to recover data from the fixed disk before removing heads (see 1.5).
2. Turn off power and remove disk cartridge.
3. Remove top cover and detent cover.
4. Hook back detent yoke, to disengage detent pawls.
5. Ensure that carriage is fully retracted then remove head arm assemblies (see 4.7.1.4).
6. Remove cable clamp pillar (Figure 2-41)Fr. B13 Locate disk-clearance and head-load spring gage, part 2600555 or 5831639, on the machined pad and secure with captive screw.
7. Remove knock-off trip (Figure 2-42)Fr. B13

8. Remove cover over power transistors (see Figure 2-47)Fr. B15
9. Take out head-load cable from cable guide and from head-load lever.
10. Set links in the sequence 02, 03, 01, and 00. (02 is the master shaft carrying the head-load lever.) Refer to Figure 2-41Fr. B13

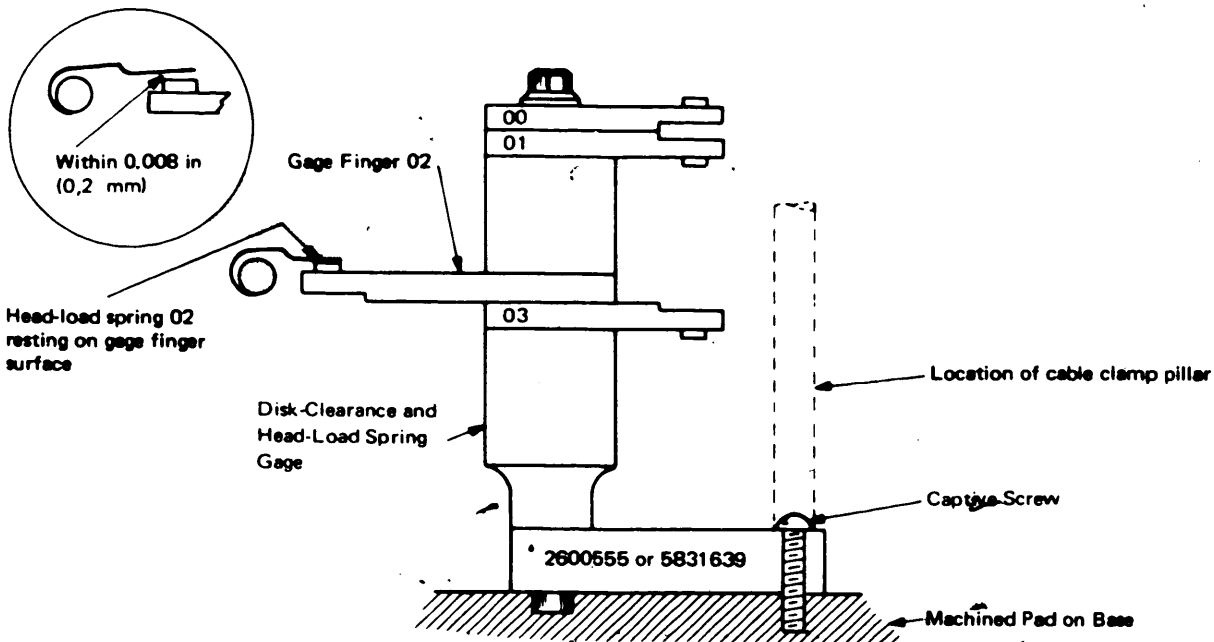
#### CAUTION

In the following steps, make sure that the head-load springs are clear of the fixed disk surface before moving the carriage.

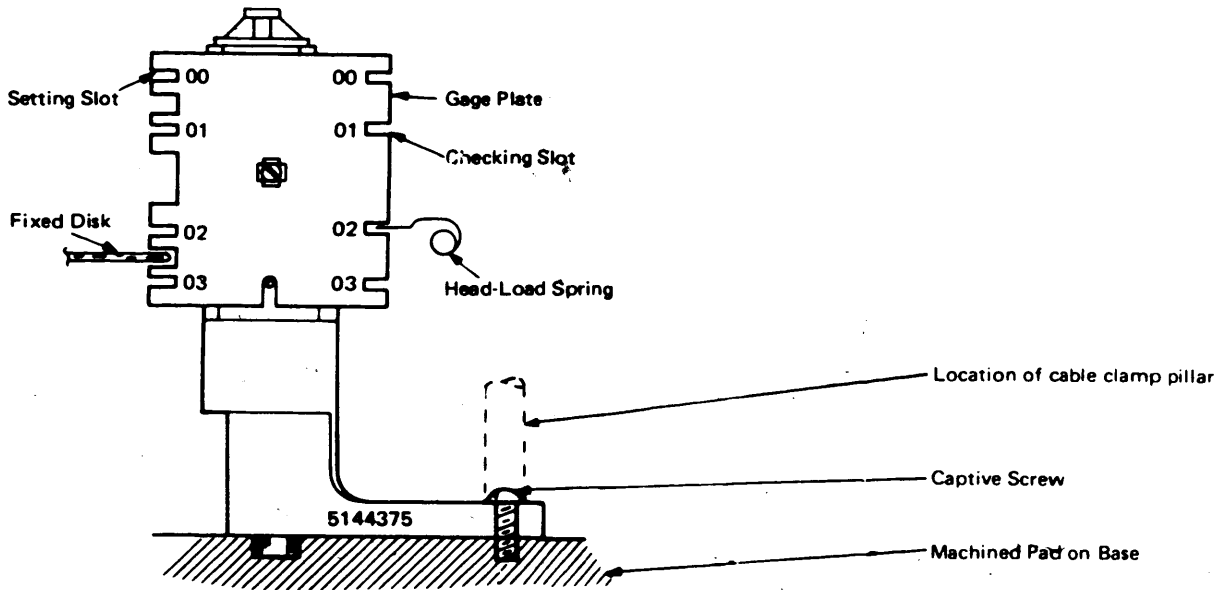
*Note:* Each link is dependent upon the other and, therefore, all links must be checked if one is adjusted.

- a. With head-load lever resting against side of carriage frame and central in the cast recess, head-load spring 02 should just touch the 02 gage surface. Loosen clamp screw on head-load lever to obtain this condition, then tighten screw and check that head-load spring is within 0.008 in. (0,2 mm) of the 02 gage surface.
- b. Insert a folded-card wedge between cable guide and head-load lever. Keep the lever touching the carriage frame and push the carriage forward to track 100.
- c. With head-load lever still touching carriage frame, loosen clamp screw of link 02 and set this link vertical. Tighten screw to 8 lb in. (9,2 kg cm) with torque wrench, part 2598187. Check that end play of shaft 02 does not exceed 0.003 in. (0.076 mm).
- d. Swing gage arm 02 clear and position arm 03.
- e. Loosen clamp screw of link 03 and move carriage back until load spring of head 03 rests flat on the 03 gage surface. Adjust link 03 to touch link 02 then tighten clamp screw of link 03.
- f. Move carriage out to track 100 and tighten clamp screw to 8 lb in. with torque wrench, part 2598187.
- g. Retract carriage. Check that head-load spring 03 is within 0.008 in. (0,2 mm) of the 03 gage surface and that end play of shaft 03 does not exceed 0.003 in.
- h. Repeat steps d through g, but for link 01.  
*Note:* Adjust all head-load springs whether blank arms are fitted in the lower positions or not.

Setup Using Gage, Part 2600555 or 5831639



Setup Using Gage, Part 5144375



**Preliminary Setup:**

1. Head-load lever resting against carriage frame.
2. Head-load spring resting on gage finger 02 surface.
3. Link 02 in vertical position.

Sequence for Adjustment: 02, 03, 01, 00.

Figure 2-41. Head-Load Spring Shafts – Link Adjustment [07562A]

End View of C

Head-load lever against carriage

Note the touching points

Link 02 vertical

Side View

Link

Link

Tighten 8 lb in. (9,2 kg)

Link

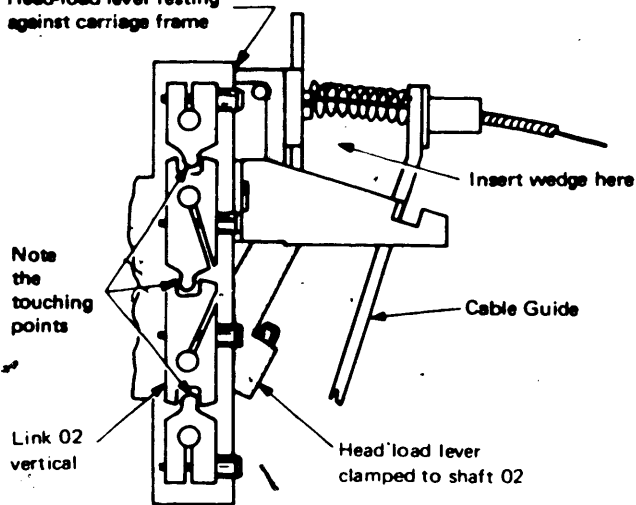
Link

Link Clamp Screw

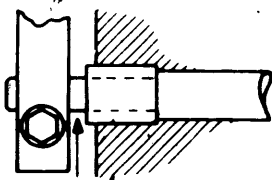
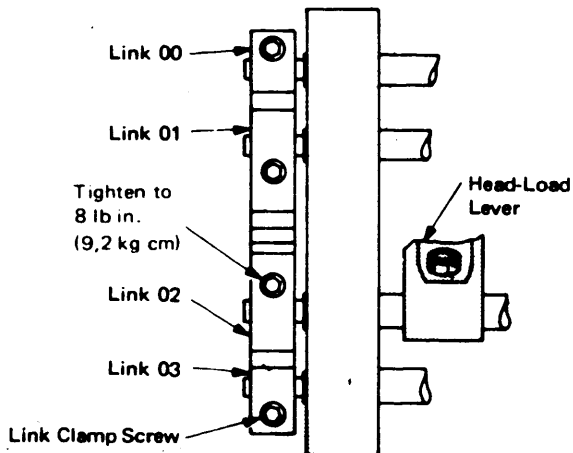
Up to 0.00

## End View of Carriage

Head-load lever resting against carriage frame



## Side View



Up to 0.003 in. (0,076 mm) end play on all shafts

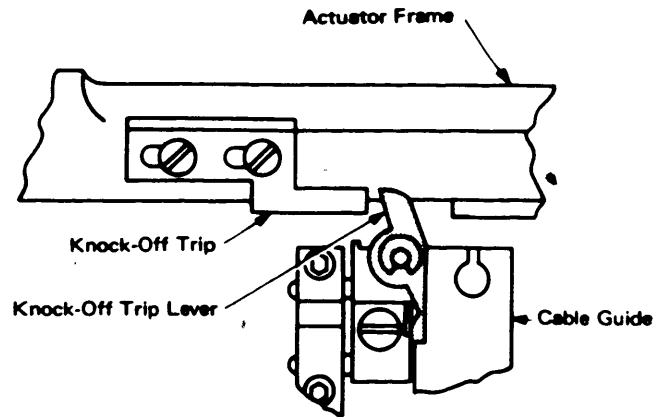


Figure 2-42. Knock-Off Trip and Trip Lever [07563]

- i. Repeat steps d through g, but for link 00. When checking with gage, head-load spring 00 tends to drop; hold spring up so that link 00 is touching as shown in Figure 2-41.

11. Remove gage and re-install head-load cable.
12. Refit power transistors cover.
13. Check setting of head knock-off trip (see 4.8.5).
14. Refit head arm assemblies (see 4.7.1.5).
15. Release detent yoke, to engage detent pawls.
16. Refit detent cover and top cover.
17. Install disk cartridge.
18. Re-initialize fixed disk.

## 4.8.4.2 Adjustment in Machine (Using Gage, Part 5144375)

1. Attempt to recover data from the fixed disk before removing heads (see 1.5).
2. Turn off power and remove disk cartridge.
3. Remove top cover and detent cover.
4. Hook back detent yoke, to disengage detent pawls.
5. Ensure that carriage is fully retracted then remove head arm assemblies (see 4.7.1.4).
6. Remove cable clamp pillar (see Figure 2-41). Locate disk clearance and head-load spring gage, part 5144375, on the machined pad and secure with captive screw.
7. Remove knock-off trip (see Figure 2-42).
8. Remove cover over power transistors (see Figure 2-47) Fr. B15



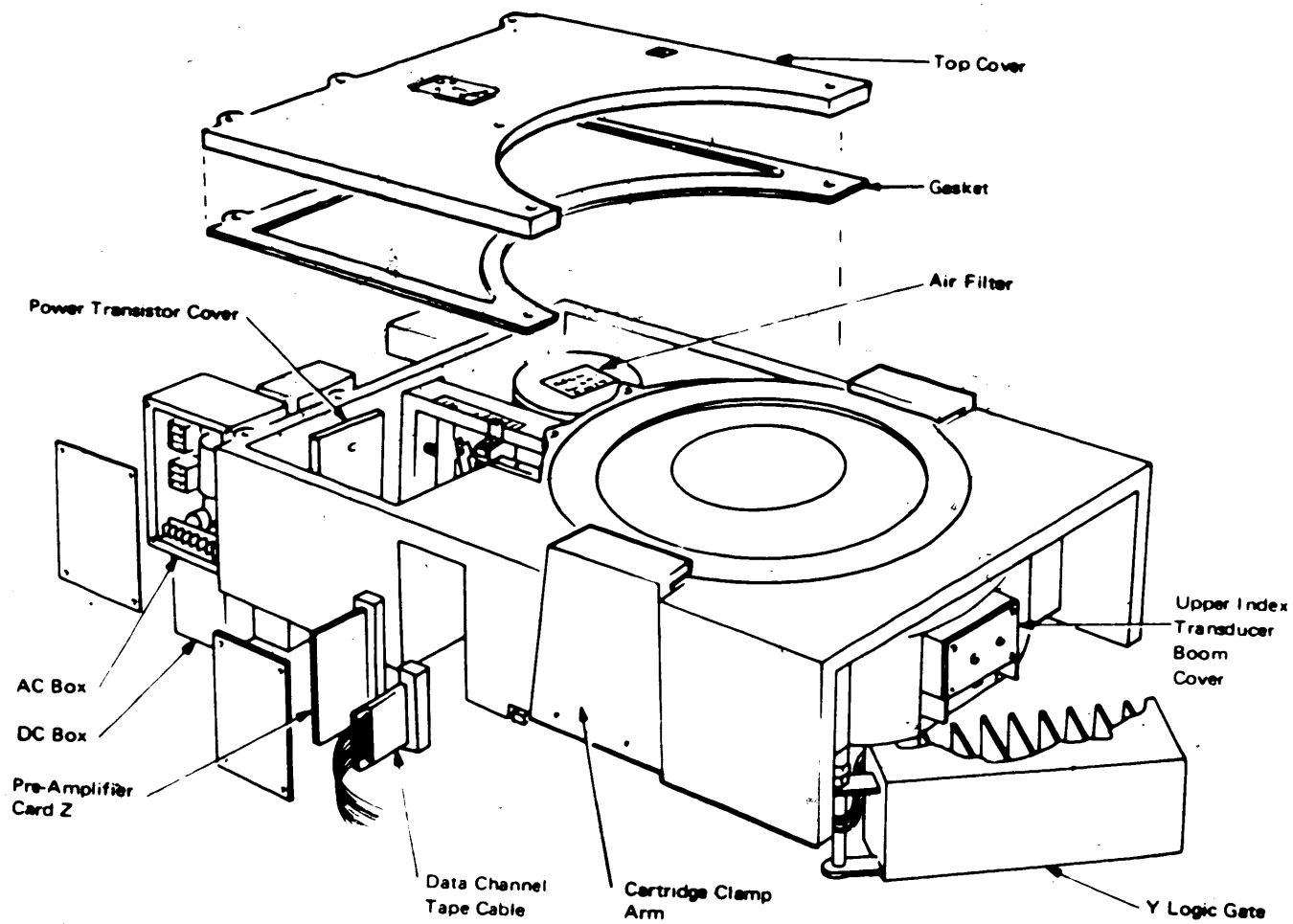


Figure 2-47. Front Top View of 5444 - Locations [07566A]

Duplicated Illustration

9. Take out head-load cable from cable guide and from head-load lever.
10. Set links in the sequence 02, 03, 01, and 00. (02 is the master shaft carrying the head-load lever.) Refer to Figure 2-41 Fr. B13

### CAUTION

In the following steps, make sure that the head-load springs are clear of the fixed disk surface before moving the carriage.

*Note:* Each link is dependent upon the other and, therefore, all links must be checked if one is adjusted.

- a. Move carriage forward until key of torque wrench, part 2598187, can be inserted into socket heads of link clamp screws. Check that, at same time, head-load springs can be covered by gage plate of gage, part 5144375.  
*Note:* The head-load springs must not overlap the fixed disk.
- b. Loosen clamp screws of all four links and clamp screw of head-load lever.
- c. Feed the setting slots of gage plate over the four head-load springs.
- d. With head-load lever resting against side of carriage frame and central in the cast recess, tighten clamp screw of head-load lever.
- e. With head-load springs still located by gage plate, set link 02 vertical and tighten the link clamp screw to 8 lb in. (9,2 kg cm) with torque wrench, part 2598187. Check that end play of shaft 02 does not exceed 0.003 in. (0,076 mm); see Figure 2-41 Fr. B13
- f. Adjust link 03 to touch link 02 (see Figure 2-41 Fr. B13 and lightly tighten clamp screw of link 03. Check that end play of shaft 03 does not exceed 0.003 in. then tighten the clamp screw to 8 lb in. with torque wrench, part 2598187.
- g. Repeat step f for link 01. Ensure that link 01 touches link 02 in the correct place (see Figure 2-41) Fr. B13
- h. Repeat step f for link 00. Ensure that link 00 touches link 01 in the correct place (see Figure 2-41) Fr. B13
- i. Retract carriage to disengage head-load springs from gage plate.
- j. Remove gage plate and re-assemble it to its

- pillar so that checking slots are presented to head-load springs (see Figure 2-41).
- k. Move carriage forward and check that head-load springs pass freely through checking slots of gage plate; during this check, link 00 must be supported so that it touches link 01 (as shown in Figure 2-41) Fr. B13 and head-load lever must rest against carriage casting. If head-load springs do not pass through checking slots or are distorted by the slots, repeat steps a through k.
11. Remove gage and re-install head-load cable.
12. Refit power transistors cover.
13. Check setting of head knock-off trip (see 4.8.5).
14. Refit head arm assemblies (see 4.7.1.5).
15. Release detent yoke, to engage detent pawls.
16. Refit detent cover and top cover.
17. Install disk cartridge.
18. Re-initialize fixed disk.

#### 4.8.4.3 Adjustment out of Machine (Using Gage, Part 2600555 or 5831639)

1. Remove actuator from 5444 (see 4.4.1 and 4.4.1.1).
2. Install actuator on base plate, part 5144386, and secure with the three actuator holding screws.
3. Hook back detent yoke to disengage detent pawls.
4. Remove knock-off trip (see Figure 2-42) Fr. B13
5. Assemble disk-clearance and head-load gage, part 2600555 or 5831639, to base plate and secure with captive screw.
6. Set links in the sequence 02, 03, 01, and 00. (02 is the master shaft carrying the head-load lever.) Refer to Figure 2-41) Fr. B13

### CAUTION

In the following steps, make sure that the head-load springs are clear of the fixed disk surface before moving the carriage.

*Note:* Each link is dependent upon the other and, therefore, all links must be checked if one is adjusted.

- a. With head-load lever resting against side of carriage frame and central in the cast recess, head-load spring 02 should just touch the 02 gage surface. Loosen clamp screw on head-load lever to obtain this condition, then tighten screw and check that head-load spring is within 0.008 in. (0,2 mm) of the 02 gage surface.

- b. Insert a folded-card wedge between cable guide and head-load lever to keep lever touching carriage frame.
  - c. With head-load lever still touching carriage frame, loosen clamp screw of link 02 and set this link vertical. Tighten screw to 8 lb in. (9,2 kg cm) with torque wrench, part 2598187. Check that end play of shaft 02 does not exceed 0.003 in. (0,076 mm).
  - d. Swing gage arm 02 clear and position arm 03.
  - e. Loosen clamp screw of link 03 and move carriage back until load spring of head 03 rests flat on the 03 gage surface. Adjust link 03 to touch link 02 then tighten clamp screw of link 03.
  - f. Move carriage out to track 100 and tighten clamp screw to 8 lb in. with torque wrench, part 2598187.
  - g. Check that head-load spring 03 is within 0.008 in. (0,2 mm) of the 03 gage surface and that end play of shaft 03 does not exceed 0.003 in.
  - h. Repeat steps d through g, but for link 01.  
*Note:* Adjust all head-load springs whether blank arms are fitted in the lower positions or not.
  - i. Repeat steps d through g, but for link 00. When checking with gage, head-load spring 00 tends to drop; hold spring up so that link 00 is touching as shown in Figure 2-41 Fr. B13
7. Remove gage from base plate.
  8. Refit and set knock-off trip (see 4.8.5).
  9. Release detent yoke to engage pawls.
  10. Remove actuator from base plate.
  11. Re-install actuator in 5444 (see 4.4.1 and 4.4.1.2).

#### 4.8.4.4 Adjustment out of Machine (Using Gage, Part 5144375)

1. Remove actuator from 5444 (see 4.4.1 and 4.4.1.1).
2. Install actuator on base plate, part 5144386, and secure with the three actuator holding screws.
3. Hook back detent yoke to disengage detent pawls.
4. Remove knock-off trip (see Figure 2-42) Fr. B13
5. Assemble disk-clearance and head-load gage, part 5144375, to base plate and secure with captive screw.
6. Set links in the sequence 02, 03, 01, and 00. (02 is the master shaft carrying the head-load lever.) Refer to Figure 2-41 Fr. B13

#### CAUTION

In the following steps, make sure that the head-load springs are clear of the fixed disk surface before moving the carriage.

*Note:* Each link is dependent upon the other and, therefore, all links must be checked if one is adjusted.

- a. Move carriage forward until key of torque wrench, part 2598187, can be inserted into socket heads of link clamp screws. Check that, at same time, head-load springs can be covered by gage plate of gage, part 5144375.  
*Note:* The head-load springs must not overlap the fixed disk.
- b. Loosen clamp screws of all four links and clamp screw of head-load lever.
- c. Feed the *setting* slots of gage plate over the four head-load springs.
- d. With head-load lever resting against side of carriage frame and central in the cast recess, tighten clamp screw of head-load lever.
- e. With head-load springs still located by gage plate, set link 02 vertical and tighten the link clamp screw to 8 lb in. (9,2 kg cm) with torque wrench, part 2598187. Check that end play of shaft 02 does not exceed 0.003 in. (0,075 mm), see Figure 2-41 Fr. B13
- f. Adjust link 03 to touch link 02 (see Figure 2-41) Fr. B13 and lightly tighten clamp screw of link 03. Check that end play of shaft 03 does not exceed 0.003 in. then tighten the clamp screw to 8 lb in. with torque wrench, part 2598187.
- g. Repeat step f for link 01. Ensure that link 01 touches link 02 in the correct place (see Figure 2-41) Fr. B13
- h. Repeat step f for link 00. Ensure that link 00 touches link 01 in the correct place (see Figure 2-41) Fr. B13
- i. Retract carriage to disengage head-load springs from gage plate.
- j. Remove gage plate and re-assemble it to its pillar so that *checking* slots are presented to head-load springs (see Figure 2-41) Fr. B13
- k. Move carriage forward and check that head-load springs pass freely through checking slots of gage plate; during this check, link 00 must be supported so that it touches link 01 (as shown

CONTINUED ON  
FRAME      C01

6. In Figure 2-41) Fr. B13 and head-load lever must rest against carriage casting. If head-load springs do not pass through checking slots or are distorted by the slots, repeat steps a through k.
7. Remove gage from base plate.
8. Refit and set knock-off trip (see 4.8.5).
9. Release detent yoke to engage pawls.
10. Remove actuator from base plate.
11. Re-install actuator in 5444 (see 4.4.1 and 4.4.1.2).

#### 4.8.4.5 Removal

1. Turn off power.
2. Remove top cover.
3. Remove disk cartridge.
4. Remove detent cover and hook back detent yoke to disengage detent pawls.
5. Remove the appropriate R/W head arm (see 4.7.1.4) as follows:
  - a. For head-load spring shaft 00 or 01, remove head arms 00 and 01.
  - b. For shaft 02 or 03, remove actuator assembly (see 4.4.1.1) to prevent damage to the fixed disk. In addition, for shaft 02, remove *all* head arms; for shaft 03, remove head arms 02 and 03.
6. Loosen link clamp screw and take off link. (Note which link belongs to which shaft.)
7. Because shaft 02 carries the head-load lever, loosen the lever clamp screw and remove the lever.
8. Holding carriage steady, pull out shaft towards center of disk.

#### 4.8.4.6 Replacement

1. Smear a thin film of IBM no. 20 grease on bearing ends of head-loading spring shaft.
2. Push in shaft until its shoulder bears on bush. When shaft is fully home, wipe away excess grease with a lint-free tissue.
3. On shaft 02, install head-load lever and secure with the clamp screw.

4. Adjust head knock-off trip (see 4.8.5).
5. Fit the link and commence adjustment (see 4.8.4.1 or 4.8.4.2).

*Note:* On all models, the head-load springs must be checked with the head-load spring gage, even if blank arms are fitted in the lower positions.

#### 4.8.5 Knock-Off Trip Adjustment

Whenever the head-load lever is released from the master 02 head-load spring shaft, readjust the knock-off trip.

1. After fitting and clamping the head-load lever, check that the support spring and cable guide are vertical to the carriage casting (Figure 2-43) Fr. C02 to allow the head-load cable to run straight between the head-load lever and the cable guide. Ensure that the ear on the cable guide engages fully in the support spring.
2. With the carriage positioned at track 000, the trip lever should have  $0.040 \text{ in.} \pm 0.005$  ( $1.02 \text{ mm} \pm 0.127$ ) clearance to the trip. Adjust the trip by loosening its screws to obtain this clearance.

#### 4.9 AUXILIARY ELECTRONICS

The auxiliary electronics are mounted on six solid logic technology (SLT) cards that are plugged into one half of the Y logic board. The data channel and tape cable entries occupy the remaining sockets in the board.

##### CAUTION

Turn off power before removing or replacing SLT cards.

#### 4.9.1 Fault Finding

The method of fault finding is based on the MAP package that is contained in the using system. The basic method of fault correction in the 5444 is by card replacement.

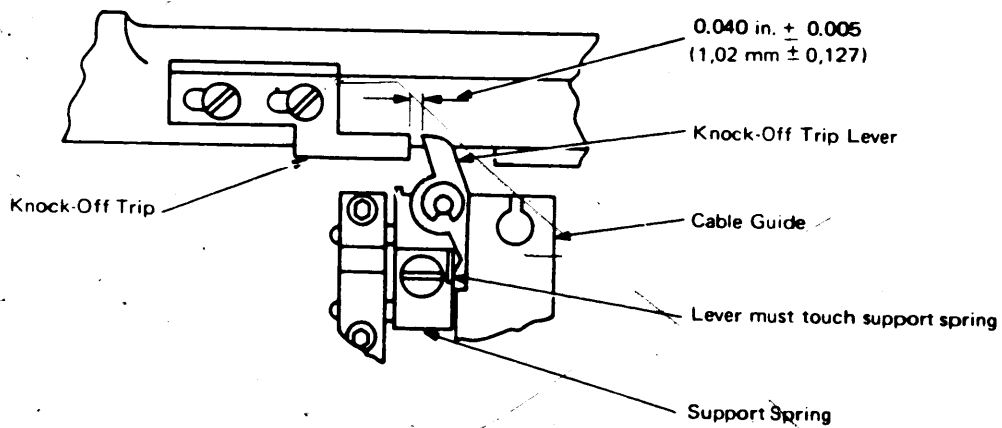
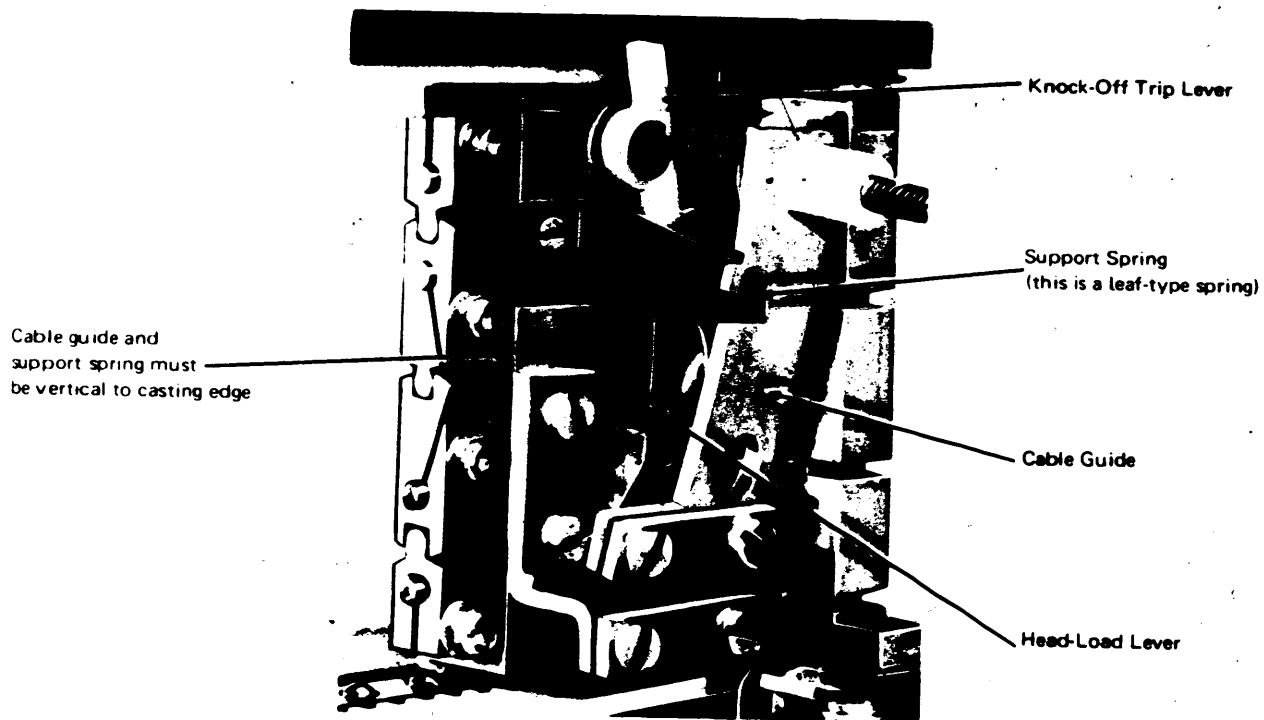


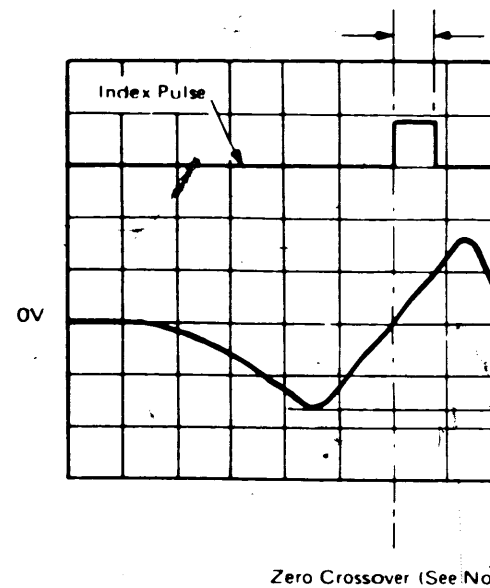
Figure 2-43. Knock-Off Trip Adjustment [07577]

#### 4.9.2 Index Transducer Checks

Output waveforms of the upper and lower index transducers are similar. Measure the waveforms and index pulses (Figure 2-44). If the negative peak value for a transducer is below that shown:

1. Check setting of transducer and readjust as necessary (see 4.2.3.1 and 4.2.3.2, or 4.2.4.1).
2. Re-measure waveform and index pulse.
3. If negative peak value is still incorrect, change transducer (see 4.2.3.3 or 4.2.4.2).

If the positive-going edge of the index pulse does not coincide with the waveform zero crossover point, change the index amplifier card (see ALD page FN445).



#### 4.9.3 Detent Voice Coil Control

Voice coil control circuits are on cards Y-W1 E6 and Y-W1 F6. Driver power transistors Q3 through Q6 are located on the casting behind the voice coil. Typical waveforms are shown in Figure 2-45.

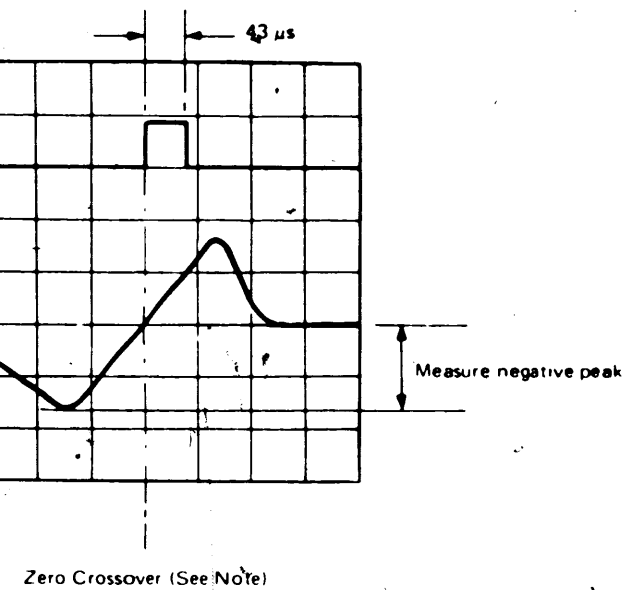
#### CAUTION

Do not disturb the pick SS potentiometer on the voice coil control card. This potentiometer is preset and sealed at the factory.

| Index Transducer | Output Waveform |                     | Pin |
|------------------|-----------------|---------------------|-----|
|                  | Measure at      | Negative Peak Value |     |
| Upper            | Pin Y-W1 D6D13  | More than 1.3V      | P   |
| Lower            | Pin Y-W1 D6J07  | More than 1.66V     | P   |

Note: Positive-going edge of index pulse must coincide with zero crossover.

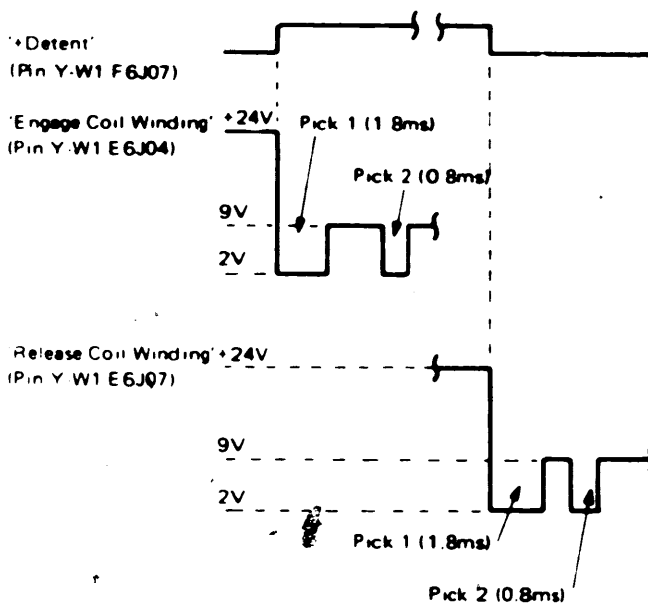
Figure 2-44. Index Transducer Waveform Check [07564]



| Waveform            | Index Pulse (See Note) |              |
|---------------------|------------------------|--------------|
| Negative Peak Value | Measure at             | Width        |
| More than 1.3V      | Pin Y-W1 D6B03         | Approx 43 μs |
| More than 1.66V     | Pin Y-W1 D6B02         | Approx 43 μs |

coincide with zero crossover point of waveform

ck [07564]



Note: For details, refer to ALD page FN495

Figure 2-45. Detent Voice Coil Waveforms [07565]

## Section 2. Features

No features are fitted to the 5444.



CONTINUED ON  
FRAME \_ C06 \_

**POWER**

**SUPPLIES**

**C06**

# 5. Power Supplies

## Section 1. Basic Unit

### 5.1 GENERAL

All power supplies to the 5444 are fed from the using system to terminal block TB1 in the ac box, and TB3 in the dc box (see Figure 2-48). Supplies at TB1 and TB3 are as follows. Fr. C12

**TB3** DC Input in DC Box (ALD page ZA250)

|     |                   |
|-----|-------------------|
| 1   | +6V               |
| 2   | 4V                |
| 3   | 30V               |
| 4   | +24V Regulator    |
| 5,6 | Logic ground      |
| 7   | +24V Driver       |
| 8   | 24V Driver common |
| 9   | +24V File start   |
| 10  | Jumper points     |

**TB1** AC Input in AC Box (ALD page ZA200)

|   |              |
|---|--------------|
| 1 | Line voltage |
| 3 | Line neutral |

AC Box Ground to TB3. (ALD page ZA200)

Brush motor supply

### DANGER

Power to the 5444 may not be automatically disconnected when the enclosure has been opened and the cartridge removed. Unless the complete system is powered down, some terminal blocks remain live.

### 5.2 AC POWER

The ac power is as follows:

Average ac current: 1.0 ampere maximum.

Peak ac current: 3.5 amperes maximum.

### 5.3 PROTECTIVE DEVICES

No fuses or manual cutouts are provided in the 5444. A thermal cutout operates on drive motor overtemperature condition and automatically resets when the motor cools down.

### 5.4 18V REGULATORS

Two 18V regulated supplies, positive and negative, are produced by a voltage regulator card sharing level converters. The supplies are:

+18V dc, 600 milliamperes maximum (Transistor Q1)

-18V dc, 300 milliamperes maximum (Transistor Q2)

The metering points are:

+18V: Y-W1 N6D04.

Ground: Any D08,

-18V: Y-W1 N6D10.

#### 5.4.1 Checking

No servicing or adjustment is possible on the 18V regulator other than checking that +24V and -30V

inputs are a regulator the fault p Q2 (-18V casting.

### 5.5 SEPAR

The major and the e grounded.

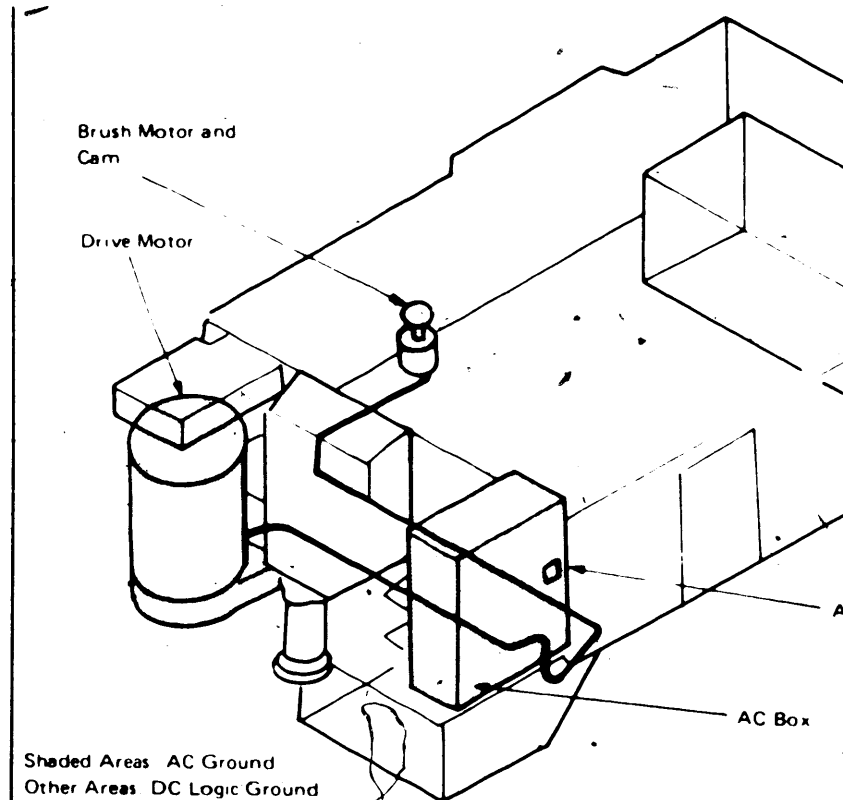


Figure 2-46. AC Grounded Areas [08432]

are  
level

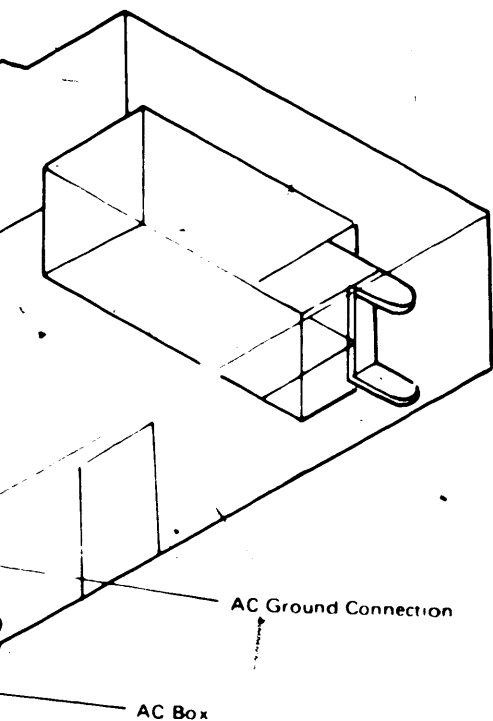
)  
2)

inputs are present. The output should be  $18V \pm 0.5V$ . If a regulator card appears defective, change the card or, if the fault persists, check the transistors Q1 (+18V) and Q2 (-18V), which are mounted on the machine front casting.

### 5.5 SEPARATED GROUNDS

The majority of the 5444 is dc grounded (Figure 2-46) and the enclosure of the using system is usually ac grounded.

18V  
30V



### CAUTION

Make sure that the 5444 is electrically isolated from its enclosure at all times.

#### 5.5.1 Identification

Two separated grounds are provided on the 5444:

1. DC logic ground, which is common to the logic supplies at TB3-5.
2. AC ground, which is common to the exterior frame of the enclosing system (see Figure 2-46).

The two grounds must not come into contact with each other, or else read/write errors may occur.

#### 5.5.2 Checking Leakage Between Grounds

1. Switch off power at using system.
2. Disconnect ac cable between 5444 and system.
3. Check that dc resistance between pin 5 on TB3 and the ac box is more than 500 kilohms.
4. Reconnect ac cable between 5444 and system.
5. Turn on power.

#### 5.5.3 Drive Belt

The drive belt that connects the drive motor to the drive spindle is nonconducting. Do not replace it by a conducting belt.

### Section 2. Features

The 5444 has no features.

CONTINUED ON  
FRAME     C10

# LOCATIONS

C10

# 6. Locations

## 6.1 PHYSICAL COMPONENTS

Figures 2-47, 2-48, and 2-49 show the location of physical components in the S444.

## 6.2 ELECTRICAL SYSTEM COMPONENTS

ALD pages ZZ230 and ZZ240 give the location of electrical system components in the S444.

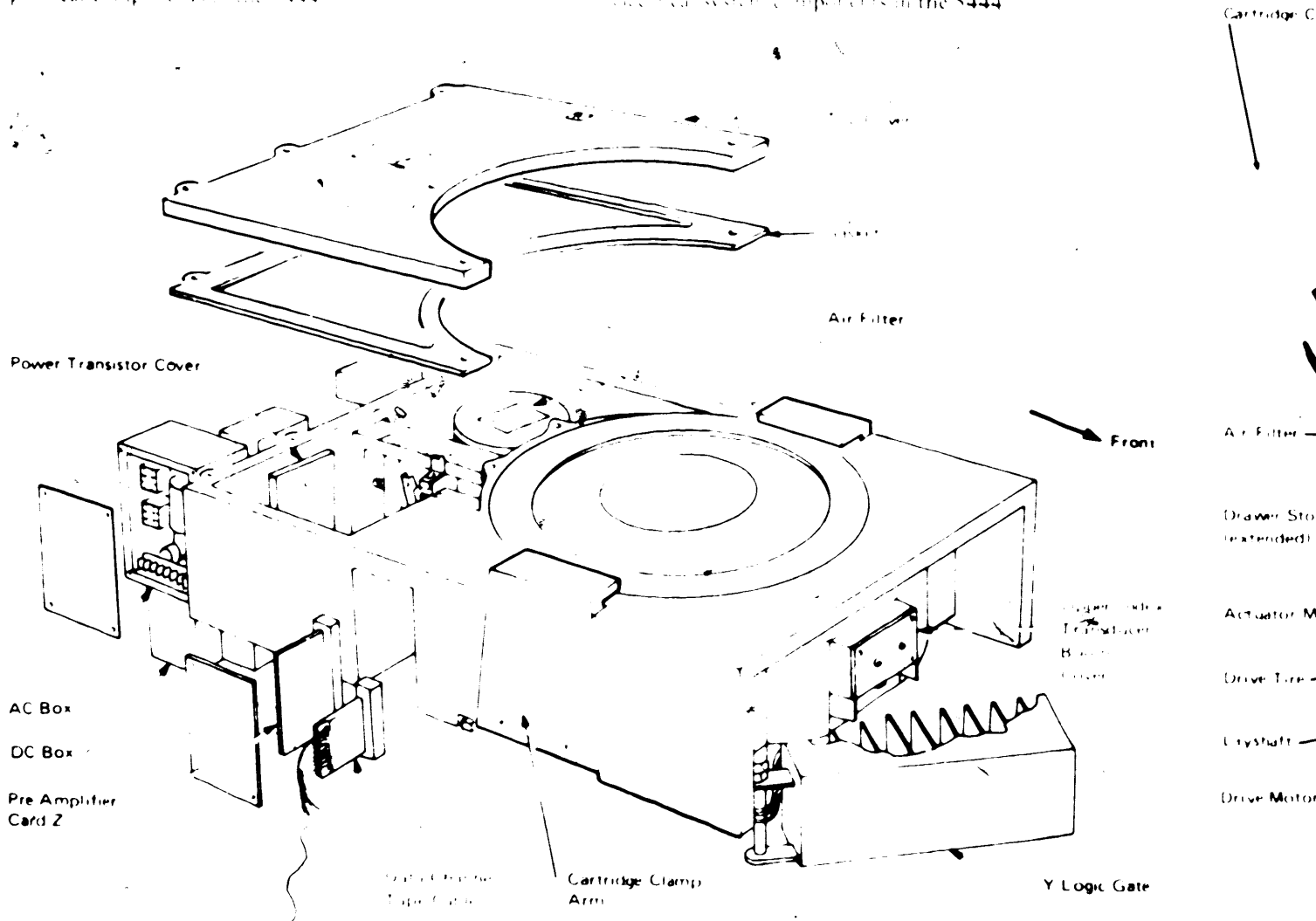


Figure 2-47. Front Top View of S444. Locations. (107566A)

Figure 2-48

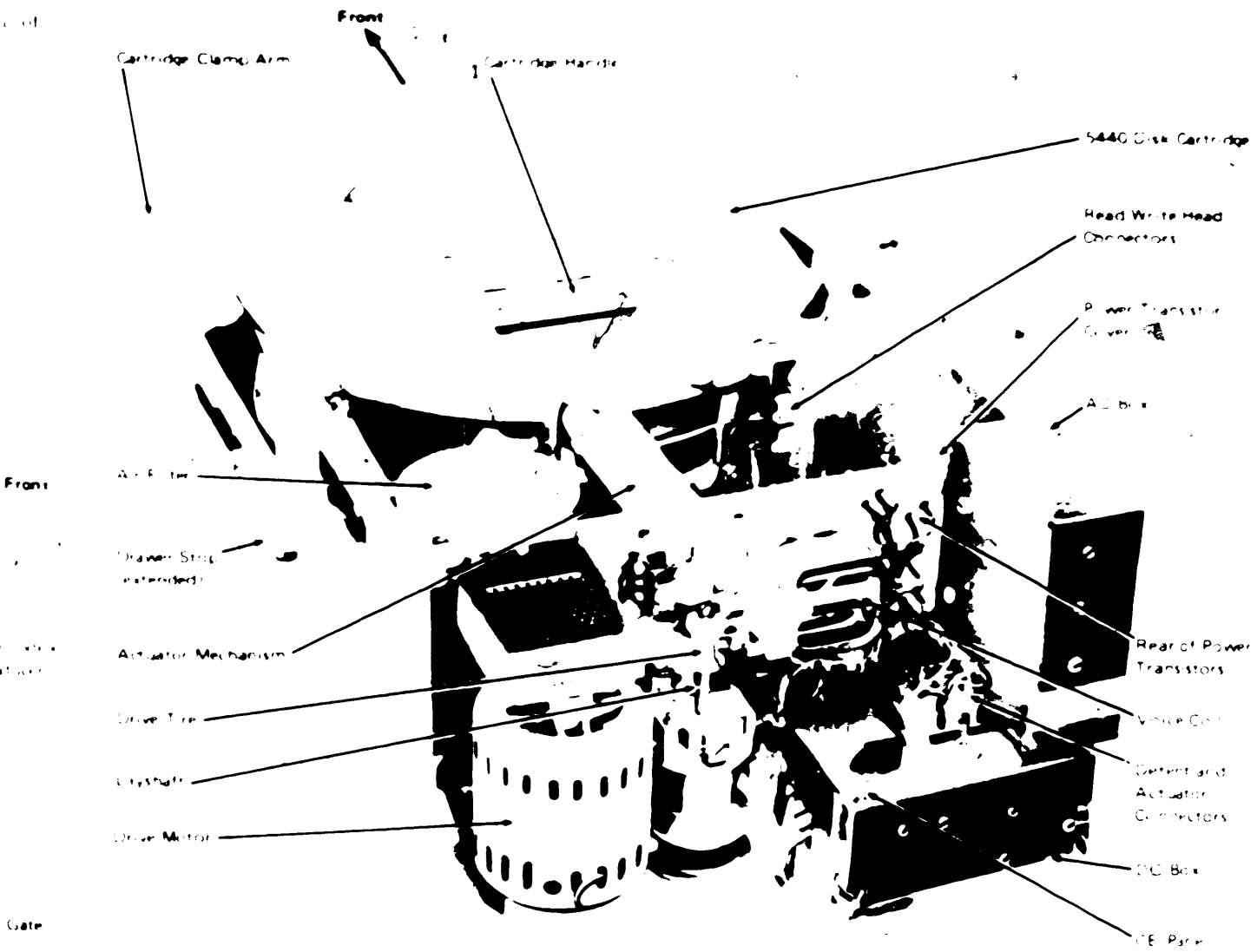


Figure 2-48. Rear Top View of S440 Disk Drive (1/68)



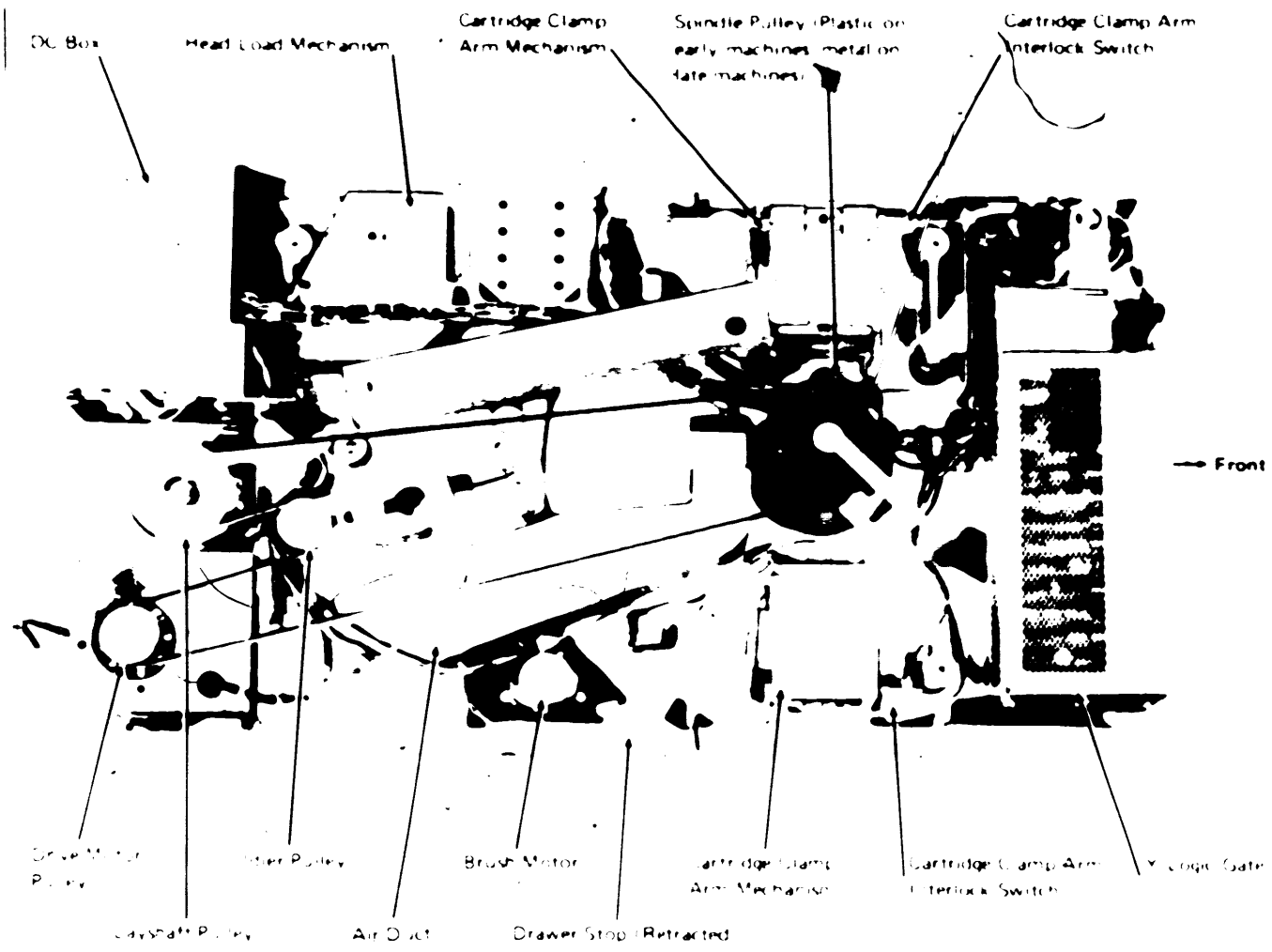


Figure 2-49. Endview View of S444 - Locations - (7583A)

**WORLD**

**TRADE**

**OR**

**US DIFFERENCES**

**C14**

# Appendix B. World Trade or U.S. Differences

## B.1 POWER REQUIREMENTS

The 5444 is available in use with either a 50-Hz or a 60-Hz power supply. The machine index card states the power supply to which the machine has been built.

### B.1.1 Power Supply (50 Hz)

The 50-Hz power supply is as follows:  
 220-235V ac  $\pm 10\%$ , single phase  
 Peak current (starting): 3.5 amperes  
 Average current: 1.0 ampere

### B.1.2 Power Supply (60 Hz)

The 60-Hz power supply is as follows:  
 208-230V ac  $\pm 10\%$ , single phase  
 Peak current (starting): 3.5 amperes  
 Average current: 1.0 ampere

## B.2 COMPONENTS

When the power supply voltage is changed, change the components listed in Figure B-1.

| Power Supply Changed  | Components to be Changed   |
|-----------------------|--|
| Voltage and frequency | 1 <i>Brush motor</i> (see 4-3-3). For 50-Hz systems, fit brush drive assembly shown in Figure 2-24, Part A. For 60-Hz systems, fit brush drive assembly shown in Figure 2-24, Part C.<br><i>Note:</i> For early 60-Hz machines (see Figure 2-24, Part B), fit unidirectional brush drive assembly, part 5144330.<br><br>2 <i>Drive motor and drive motor pulley</i> (see 4-2-6). |
| Voltage only          | <i>Drive motor and drive motor pulley</i> (see 4-2-6).<br><br>For change from 208V to 230V, 60 Hz, apply FBM 2598203.<br>For change from 230V to 208V, 60 Hz, apply FBM 2598204.<br>For change from 220V to 235V, 50 Hz, apply FBM 2598205.<br>For change from 235V to 220V, 50 Hz, apply FBM 2598206.   |

*Note:* Order FBMs from the IBM sales representative.

Figure B-1. Power Supply Change - Components to be Changed  
 107569A1

**ACCESS TO**

**5444**

**IN IBM**

**SYSTEM/3**

**C16**

# Appendix C. Access to 5444 in IBM System/3

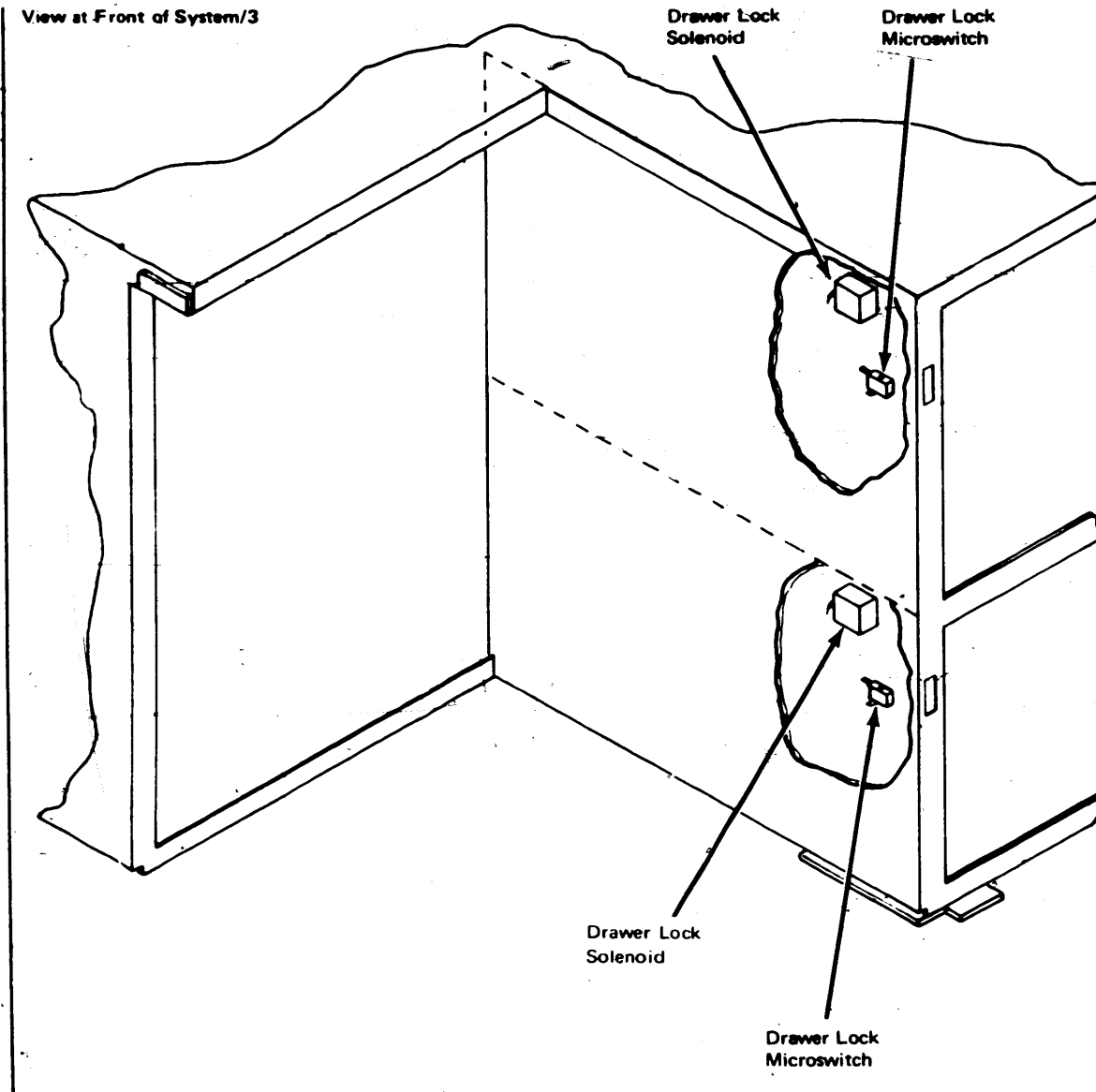


Figure C-1. Disk Enclosure Locations for IBM System/3 [07572A]

C.1 D  
Figure  
of IBM

C.2 D

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1. Ins  
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2. To  
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th

Note:  
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False L  
Part 25

Figure

## C.1 DISK ENCLOSURE LOCATIONS

Figure C-1 shows the location, within the disk enclosure of IBM System/3, of drawer lock components.

## C.2 DRAWER LOCK BYPASS PROCEDURE

### CAUTION

If the disk cartridge is to be removed, be sure that the head cleaning brushes and the read/write heads are fully retracted.

1. Insert a small tool, approximately  $\frac{1}{2}$  in. (13 mm), into the lock access hole located on left side of enclosure. Use a prizing motion to lift the lock while unlatching the drawer.
2. To power up the 5444 with the drawer open, activate drawer lock microswitch (see Figure C-1) by inserting the false latch, part 2590976 (Figure C-2).

*Note:* The drawer lock components form part of the using system *not* of the 5444.

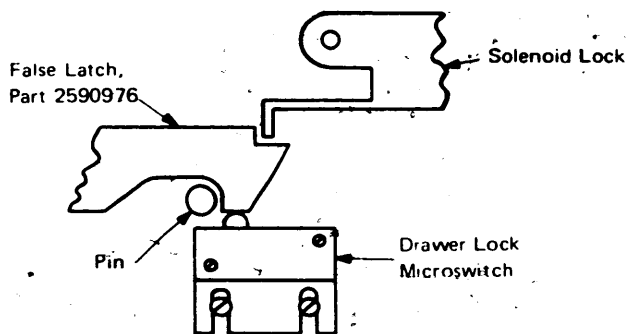


Figure C-2. False Latch Setup [07570A]

CONTINUED ON  
FRAME D01

Access to 5444 in IBM System/3

C-1

**INCHES  
CONVERSION INTO  
MILLIMETERS  
AND  
CENTIMETERS**

**D01**

# Appendix D. Inches Conversion into Millimeters and Centimeters

| Inches | Millimeters |
|--------|-------------|
| 0.001  | 0.025       |
| 0.002  | 0.051       |
| 0.003  | 0.076       |
| 0.004  | 0.102       |
| 0.005  | 0.127       |
| 0.006  | 0.152       |
| 0.007  | 0.178       |
| 0.008  | 0.208       |
| 0.009  | 0.229       |
| 0.010  | 0.254       |
| 0.020  | 0.508       |
| 0.030  | 0.762       |
| 0.040  | 1.016       |
| 0.050  | 1.270       |
| 0.060  | 1.524       |
| 0.070  | 1.778       |
| 0.080  | 2.032       |
| 0.090  | 2.286       |
| 0.100  | 2.540       |
| 0.200  | 5.080       |
| 0.300  | 7.620       |
| 0.400  | 10.160      |
| 0.500  | 12.700      |
| 0.600  | 15.240      |
| 0.700  | 17.780      |
| 0.800  | 20.320      |
| 0.900  | 22.860      |

| Inches | Centimeters |
|--------|-------------|
| 1.000  | 2.540       |
| 2.000  | 5.080       |
| 3.000  | 7.620       |
| 4.000  | 10.160      |
| 5.000  | 12.700      |
| 6.000  | 15.240      |
| 7.000  | 17.780      |
| 8.000  | 20.320      |
| 9.000  | 22.860      |

Figure D-1. Conversion Table - Inches to Millimeters and Centimeters [07573]



# **DEFINITIONS**

**D03**

# Appendix E. Definitions

## E.1 ABBREVIATIONS

|         |                                |
|---------|--------------------------------|
| AC.ac   | alternating current            |
| ALD     | automated logic diagram        |
| C       | common                         |
| CE      | customer engineer              |
| cm      | centimeter                     |
| DC.dc   | direct current                 |
| EC      | edge connector                 |
| EMF     | electromotive force            |
| FBM     | field bill of material         |
| g       | gramme                         |
| HDI     | head-to-disk-interference      |
| hp      | horsepower                     |
| Hz      | hertz                          |
| MAP     | maintenance analysis procedure |
| mm      | millimeter                     |
| ms      | millisecond                    |
| NC      | normally closed                |
| NO      | normally open                  |
| NRZ     | non-return to zero             |
| ns      | nanosecond                     |
| Rd      | read                           |
| R W     | read write                     |
| SLD     | solid logic (dense)            |
| SIT     | solid logic technology         |
| TAP     | timing analysis program        |
| TB      | terminal block                 |
| $\mu$ s | microsecond                    |
| V       | volt                           |

References such as FN240 and ZA220 are ALD pages.

## E.2 GLOSSARY

*Beat Frequency* The frequency that is produced by the intermodulation of two frequencies.

*Circumferential Adjustment* The adjustment of the upper index transducer to ensure that the index pulse from the transducer is in an identical position relative to the read/write heads when the disk cartridge is transferred between 5444's.

*Data Rate* The nominal rate at which data can be transmitted from a 5444.

*Direct Access Storage* The type of storage where information may be stored or retrieved directly without prior sequential search.

*Micronch* One millionth of an inch ( $1 \times 10^{-6}$  inch)

*Micron* One millionth part of a meter ( $1 \times 10^{-6}$  meter) Equivalent to .394 micronches.

*Period* The time between consecutive pulses.

*Reluctance* The ratio that the magnetomotive force acting around a magnetic circuit bears to the flux that produces this force.

*Runout* The total up-and-down vertical movement at the disk edge during one revolution.

*SLD-100* A specification for voltages that are used in solid logic dense construction.

*Tracking Adjustment* An adjustment to ensure that the read/write heads move in a true radial line across the disk surfaces.