IBM

Field Engineering
Maintenance Manual

Selectric® I/O Keyboard Printer

S225-1726-7

How To Use This Manual

PURPOSE

This manual provides maintenance information for the Selectric ® I/O Keyboard Printer, and it is intended primarily for the IBM customer engineer as a reference for servicing the printer.

PREREQUISITE MANUAL

Users of this manual should have a thorough knowledge of the theory of operation of the printer. This information can be obtained from *IBM Field Engineering Theory of Operation, Selectric I/O Keyboard Printer,* S225-6595.

ORGANIZATION

This manual is divided into five major fields of information, presented in the following chapters:

Chapter 1. Service Reference Data
Chapter 2. Preventive Maintenance
Chapter 3. Adjustments
Chapter 4. Removals
Chapter 5. Contacts

Text and Illustrations

Text and illustrations are located side by side in Chapters 3, 4, and 5 to provide a quick correlation. The text immediately to the left of each figure briefly describes the adjustment, while the notes in the text furnish additional service information.

How to Find a Subject

The first page of each major field and the first page of the detailed index is located by a tab. To further aid the user in finding specific information, the List of Illustrations is in alphabetic order.

Cautions

A caution preceding an adjustment or removal procedure gives special instructions that should be followed to prevent damaging the printer.

Circled Numbers

A circled number in an illustration keys an individual adjustment to the corresponding text.

Adjustment Levels

Early, intermediate, and late style adjustment procedures are indicated by level numbers: Level 1, Level 2, and Level 3. These level numbers are the adjustment levels only; they should not be confused with the different part levels as shown in *IBM Selectric I/O Keyboard Printer Illustrated Parts Catalog,* S124-0054, and *IBM Selectric Printer for Communication Terminals Illustrated Parts Catalog,* S123-1008. The part level can change without any change in the adjustment level.

- The adjustment level is identified by the figure caption, in most cases.
- The adjustment level changes within an adjustment sequence, if the change to the mechanism is a minor change.

Adjustment Level Sequences

- A separate and complete adjustment level sequence is used to describe extensive changes in a mechanism.
- Horizontal lines drawn across the page indicate the end of each adjustment level sequence.

Alternate Procedures

When adjusting or removing, review the corresponding service reference data for a possible alternate procedure.

CE SAFETY PRACTICES

All Customer Engineers are expected to take every safety precaution possible and observe the following safety practices while maintaining IBM equipment:

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if you MUST work alone.
2. Remove all power AC and DC when removing or assembling major components, working in immediate area of power supplies, performing mechanical inspection of power supplies and installing changes in machine circuity.
3. Wall box power switch when turned off should be locked or tagged in off position. "Do not Operate" tags, form 229-1266, affixed when applicable. Pull power supply cord whenever possible.
4. When it is absolutely necessary to work on equipment having exposed operating mechanical parts or exposed live electrical circuity anywhere in the machine, the following precautions must be followed.
   a. Another person familiar with power off controls must be in immediate vicinity.
   b. Rings, wrist watches, chains, bracelets, metal cuff links, shall not be worn.
   c. Only insulated pliers and screwdrivers shall be used.
   d. Keep one hand in pocket.
   e. When using test instruments be certain controls are set correctly and proper capacity, insulated probes are used.
   f. Avoid contacting ground potential (metal floor strips, machine frames, etc. – use suitable rubber mats purchased locally if necessary).
5. Safety Glasses must be worn when:
   a. Using a hammer to drive pins, riveting, staking, etc.
   b. Power hand drilling, reaming, grinding, etc.
   c. Using spring hooks, attaching springs.
   d. Soldering, wire cutting, removing steel bands.
   e. Parts cleaning, using solvents, sprays, cleaners, chemicals, etc.
   f. All other conditions that may be hazardous to your eyes. REMEMBER, THEY ARE YOUR EYES.
6. Special safety instructions such as handling Cathode Ray Tubes and extreme high voltages, must be followed as outlined in CEM's and Safety Section of the Maintenance Manuals.
7. Do not use solvents, chemicals, greases or oils that have not been approved by IBM.
8. Avoid using tools or test equipment that have not been approved by IBM.
9. Replace worn or broken tools and test equipment.
10. Lift by standing or pushing up with stronger leg muscles—this takes strain off back muscles. Do not lift any equipment or parts weighing over 60 pounds.
11. All safety devices such as guards, shields, signs, ground wires, etc. shall be restored after maintenance.
12. Each Customer Engineer is responsible to be certain that no action on his part renders product unsafe or exposes hazards to customer personnel.
13. Place removed machine covers in a safe out-of-the-way place where no one can trip over them.
14. All machine covers must be in place before machine is returned to customer.
15. Always place CE tool kit away from walk areas where no one can trip over it (i.e., under desk or table).
16. Avoid touching mechanical moving parts (i.e., when lubricating, checking for play, etc.).
17. When using stroboscope—do not touch ANYTHING—it may be moving.
18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) approximately 3 inches from end. Tie chains are not recommended.
20. Before starting equipment, make certain fellow CE's and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machine while performing and after completing maintenance.

KNOWING SAFETY RULES IS NOT ENOUGH
AN UNSAFE ACT WILL INEVITABLY LEAD TO AN ACCIDENT

USE GOOD JUDGMENT – ELIMINATE UNSAFE ACTS

229-1264-1

Artificial Respiration
GENERAL CONSIDERATIONS

1. **Start Immediately, Seconds Count**
   Do not move victim unless absolutely necessary to remove from danger. Do not wait or look for help or stop to loosen clothing, warm the victim or apply stimulants.
2. **Check Mouth for Obstructions**
   Remove foreign objects—Pull tongue forward.
3. **Loosen Clothing—Keep Warm**
   Take care of these items after victim is breathing by himself or when help is available.
4. **Remain in Position**
   After victim revives, be ready to resume respiration if necessary.
5. **Call a Doctor**
   Have someone summon medical aid.
6. **Don't Give Up**
   Continue without interruption until victim is breathing without help or is certainly dead.

Rescue Breathing for Adults
Victim on His Back Immediately

1. **Clear throat** of water, food, or foreign matter.
2. **Tilt head back** to open air passage.
3. **Lift jaw up** to keep tongue out of air passage.
4. **Pinch nostrils** to prevent air leakage when you blow.
5. **Blow** until you see chest rise.
6. **Remove your lips** and allow lungs to empty.
7. **Listen** for snoring and gurglings, signs of throat obstruction.
8. **Repeat mouth to mouth breathings** 10-20 times a minute.

Continue rescue breathing until he breathes for himself.


Thumb and finger positions


Final mouth to mouth position

Reprint Courtesy Mine Safety Appliances Co.

IBM Field Engineering

Maintenance Manual

Selectric® I/O Keyboard Printer

S225-1726-7

Eighth Edition (November 1970)

This is a major revision of, and obsoletes, S225-1726-6. In this edition the format has been changed to place the text and the illustrations adjacent to each other.

Significant new material has been added throughout, and existing material has been changed extensively; therefore no vertical lines or bullets appear in the margins, and the manual should be reviewed in its entirety.

Changes are periodically made to the information herein; before using this publication in connection with the operation of IBM systems or equipment, refer to the latest Field Engineering Supplement that is applicable and current.

This manual has been prepared by the IBM Systems Development Division, Publications Center, Department E01, P. O. Box 12275, Research Triangle Park, North Carolina 27709. A form for reader's comments is provided at the back of this publication. If the form has been removed, comments may be sent to the above address.

CONTENTS

Abbreviations

B/M	bill of material
Bksp	backspace
CE	customer engineer
CR	carrier return
EC	engineering change
I/O	input/output
LC	lowercase
N/C	normally closed
N/O	normally open
OLSA	Off-Line Selectric ® Analyzer
O/P	operating point
O/S	operating strap
U/C	uppercase

This chapter presents service procedures and flowcharts for troubleshooting various machine operations.

BACKSPACE (Figure 1-1)

1.1 Interposer to release lever clearance.
1.2 Keylever pawl to interposer clearance and bite.
1.3 Backspace latch to bail clearance.
1.4 Backspace rack rest position.
1.5 Backspace rack throw.
1.6 Possible binds:
  a. Feedroll mounting arm hits the tab overthrow stop.
  b. Dust covers and card holders.
  c. Anvil and front carrier shoes.
  d. Rear carrier shoe.
  e. Escapement cord off pulley.
  f. Pinion gear.
1.7 Tab lever to seated pawls clearance.
1.8 Worn escapement pawl may allow carrier to come to rest on backspace pawl under powered operation, even though throw is adequate. Replace escapement pawl and rack.
1.9 The operational cams now in production have a wide ratchet, long bearing, and clutch wheel set out from the cam. These cams work better and last longer.
1.10 When the operational interposer restore bail requires readjustment to ensure positive overthrow of the interposers on their latching surface, it is no longer necessary to form the lugs on the early style operational interposer restoring bail. A small retaining clip may be placed on the operational interposer restoring bail in the area where each interposer contacts the restore bail when being restored. This clip will provide approximately 0.015" more interposer restoring motion. The clip is PN 1110093 and is described as a feed roll retainer clip used on standard typebar machines. This clip may be obtained through any local branch office stockroom.
1.11 When failures in the operational area are encountered and it is suspected that interposer springs are failing to properly trip the operational cams, all the interposer springs should be replaced. Occasional malselection may occur if the space interposer is tripped off, travels to the rear, but does not trip the space cam. If the next pulse to the printer is to the print magnets, this pulse will start to activate the print magnets and then the interposer will trip the space cam opening C-5 and, therefore, cut the pulse to the print magnets. This will cause such a short duration of pulse on the print magnets that a malselection will result due to improperly selected latches.
1.12 Backspace cam pawls may be checked for wear during inspection or on service calls by using this method: hold the carrier and repeatedly operate the backspace. Worn pawls will slip on the cam and ratchet and can be heard immediately.
  The operational cam pawls should be checked frequently for wear. They should be replaced approximately every 15 months in machines experiencing normal usage.
1.13 Form the dividers in the interposer guide. Check for binds and for proper operation of all interposers.

SPACING (Figure 1-2)

2.1 Interposer to release lever clearance.
2.2 Keylever pawl to interposer clearance and bite.
2.3 Space latch to bail clearance.
2.4 If lockout link has lateral motion, the lockout shaft may flip over. Install two clips (PN 138464) to limit motion.
2.5 Pawl mounting stud to escapement torque bar clearance.
2.6 Torque bar to release lug clearance, rest position.
2.7 Escapement trip link length for trigger throw and restoration.
2.8 Trigger disengagement from torque bar.
2.9 Escapement cam timing.
2.10 Tap escapement shaft bearings to improve alignment and relieve binds.
2.11 Check main spring tension at right margin. See 1.11.
2.12 Spacebar lockout adjustments, especially early style.
2.13 Space interposer spring in middle hole. See 1.10.
2.14 Intermittent space failures can be caused by excessive cycle clutch overthrow or incorrect print escapement cam timing.
2.15 See 1.9.
2.16 Extra space cam cycles may cause dropped characters or malselection. Test for a tendency toward extra space cycles by either following procedure:
  a. Do a print/space operation (repetitively print a character followed by a space) with a test line having a multiple of four printing locations. If the space cam is 180° off from its starting position at the end of the line, a space has been added or dropped.
  b. Backspaee repeatedly at the left margin and check that the cam rotates only 180° with each backspace operation.

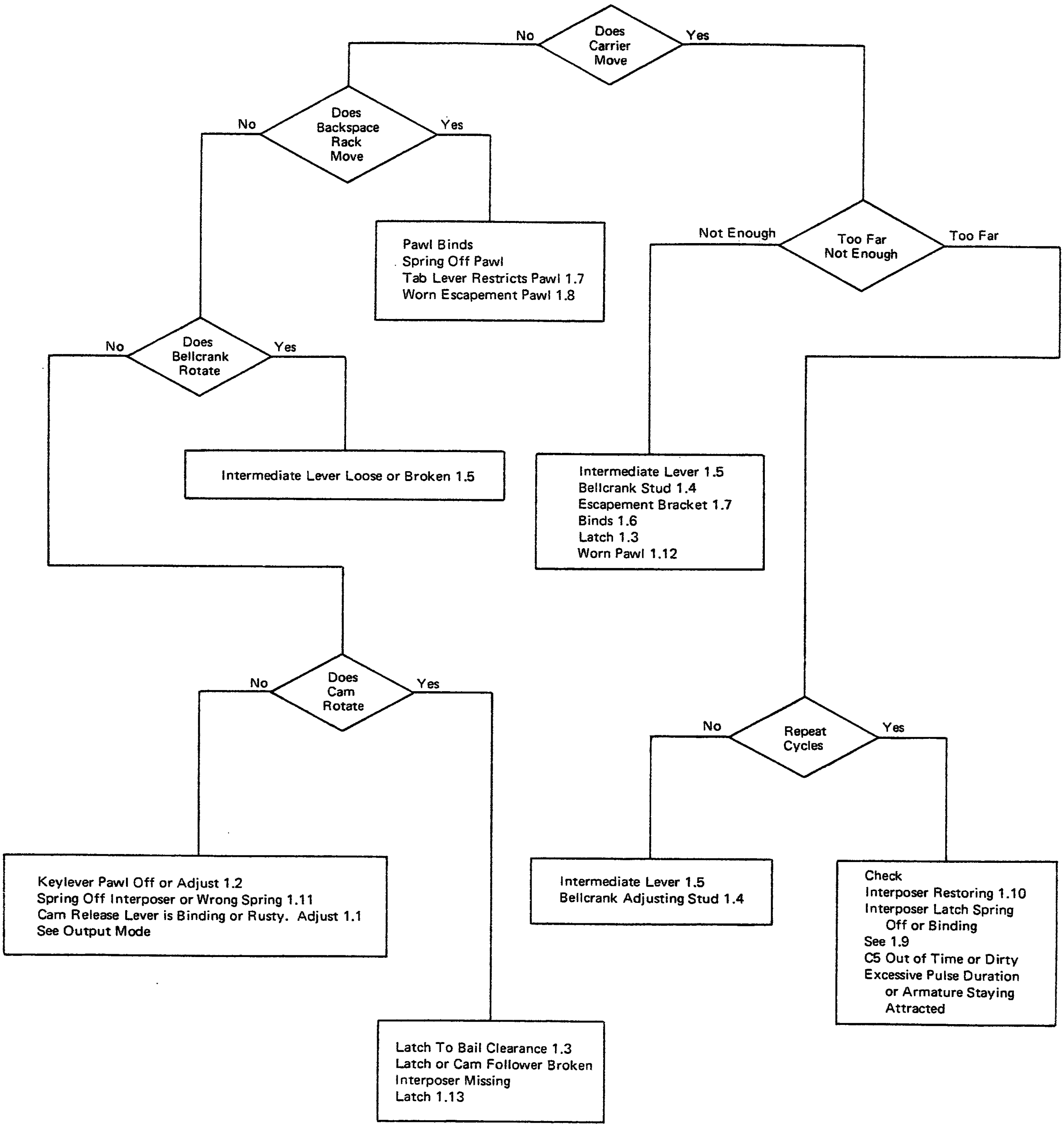


Figure 1-1. Backspace

2.17 See 1.10.

2.18 See 1.11.

2.19 Both 75" and 100" mainsprings are in the field. The 100" mainsprings are marked on the spring cage. Tension is the same, but the 100" spring improves tab and escapement.

2.20 When escapement shaft bearings are oiled, tap the shaft to promote bearing alignment and lubrication.

2.21 Extra spaces or keyboard lockup on space operation may result from a warped spacebar keyboard interposer on early 2740/2741 printers. Compare latch-to-keeper clearance with spacebar interposer latched down, and with adjoining interposer latched. Replace spacebar interposer if it is warped enough to cause 0.004" difference in the clearance.

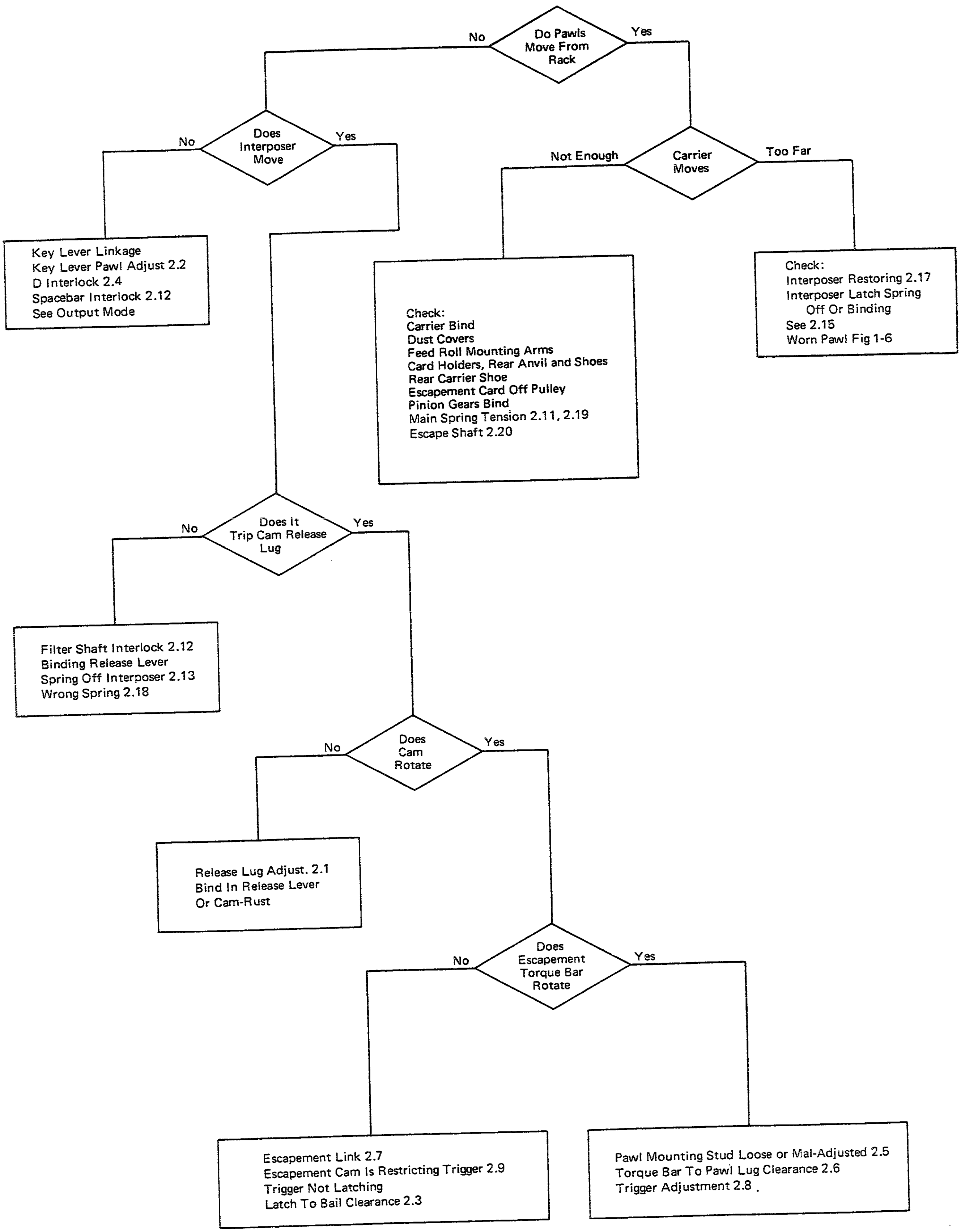


Figure 1-2. Spacing

PRINT ESCAPEMENT (Figure 1-3)

3.1 Pawl mounting stud to escapement torque bar clearance.
3.2 Cycle clutch nylon cam adjustment.
3.3 Torque bar to release bar clearance, rest position.
3.4 Trigger disengagement from torque bar.
3.5 Trigger to torque bar clearance, at rest.
3.6 Filter shaft to unlatched interposer clearance with filter shaft gear play taken up toward the interposer.
3.7 Main spring tension at right margin.
3.8 Possible binds:

a. Feedroll mounting arm hits the tab overthrow stop.
b. Dust covers and card holders.
c. Anvil and front carrier shoes.
d. Rear carrier shoe.
e. Escapement cord off pulley.
f. Pinion gear.
g. Escapement shaft bearings.

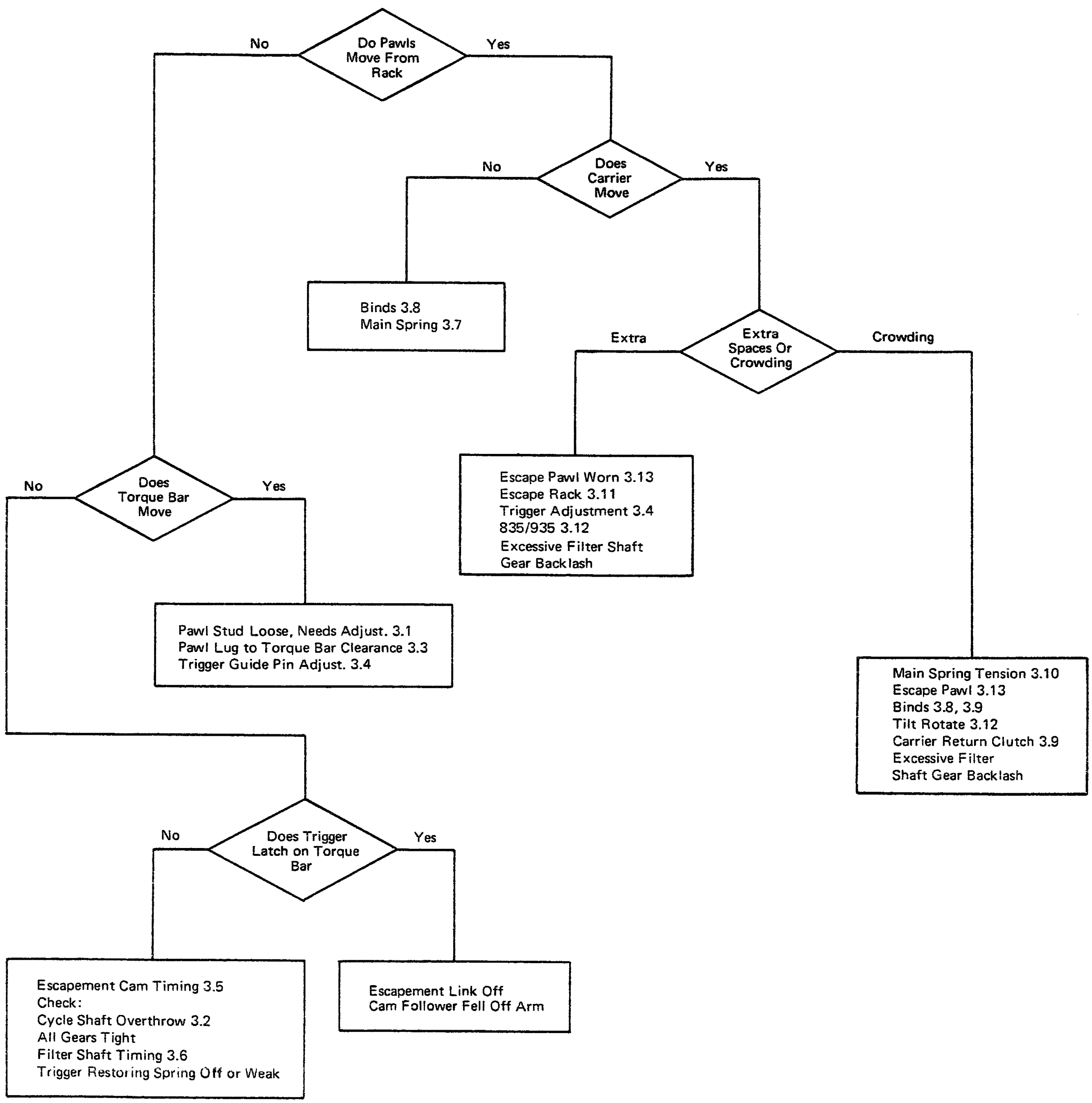


Figure 1-3. Print Escapement

3.9 Under no circumstances should the carrier return spring clutch be lubricated with grease or oil. The only recommendation made by Engineering for lubrication in this area is a very light film of oil to be placed on the outside surface of the spring clutch to prevent rust.

If the carrier return spring clutch becomes contaminated with grease or oil, several intermittent carrier return problems will result:

a. Uneven left margin due to failure of spring clutch to disengage on its arbor.
b. Sluggish tab or print escapement due to the contamination not allowing the spring clutch to fully release the pinion.
c. Oscillating carrier motion when machine is idling due to contamination causing spring clutch to engage and disengage erroneously.

3.10 See 2.19.

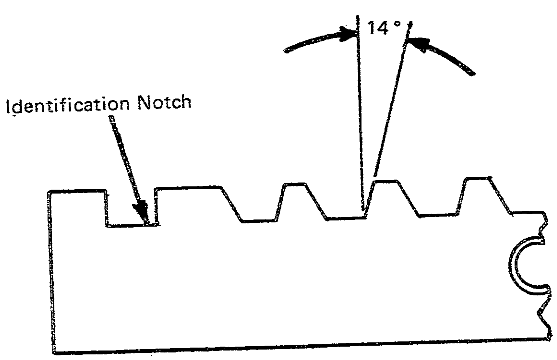


Figure 1-4. Notched Escapement Rack

3.11 The angle of inclination for the Selectric I/O production escapement rack teeth has been reduced to 14°. This change increases the escapement pawl to escapement rack holding angle. The 14° escapement rack has a milled notch (Figure 1-4) on the left end.

Part Number	Description
1124083	Rack, 10P, 11 in.
1124109	Rack, 12P, 11 in.
1128032	Rack, 10P, 15 in.
1128037	Rack, 12P, 15 in.

Escapement racks should be installed parallel to the print shaft (Figure 1-5). Set the Hooverometer to the No. 2 scribe line. The correct distance is achieved when the handle of the Hooverometer rests with its mid-point against the front edge of the escapement rack.

3.12 See 2.21.

3.13 Figure 1-6 illustrates a worn escapement pawl, which should be replaced immediately.

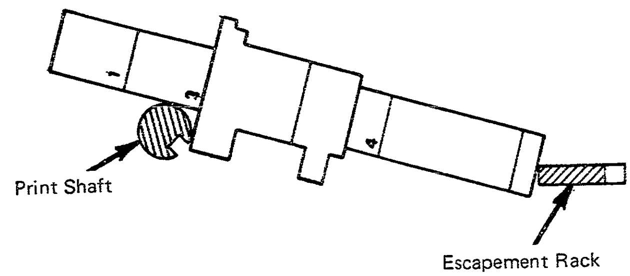


Figure 1-5. Escapement Rack Position

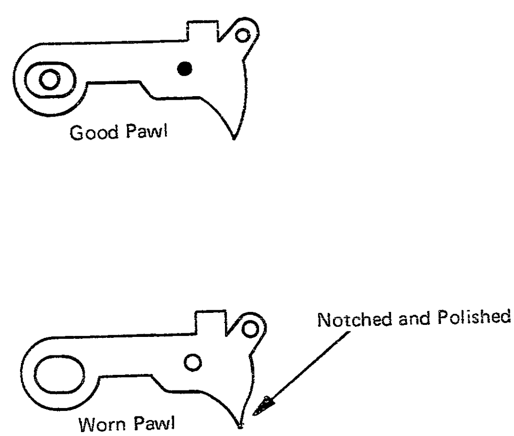


Figure 1-6. Escapement Pawl

SHIFT OR ENTER (Figure 1-7)

4.1 Operational shaft end play.

4.2 Shift ratchet rotation when released, power off. See 4.10.

4.3 Interlock to shift ratchet clearance.

4.4 Uppercase armature to release arm clearance. See 4.9.

4.5 Cycle clutch nylon cam adjustment.

4.6 Latched interposer to filter shaft clearance. Recheck 4.3 if filter shaft is retimed.

4.7 Shift backup roller clearance.

4.8 The shift mechanism may lock when shifted to an uppercase position, preventing release to lowercase from the keyboard. This is caused by an accumulation of grease on the shift release arm stud and the uppercase armature. When the shift release arm travels to an uppercase position, the grease accumulation pulls the uppercase armature along with it. The armature is then latched in uppercase position, holding the shift mechanism in uppercase. Any attempt to unlock it from the keyboard is futile since the lowercase armature must first be activated to unlatch the uppercase armature.

On the next inspection or when this trouble occurs, the shift release arm and uppercase armature should be cleaned thoroughly of all grease.

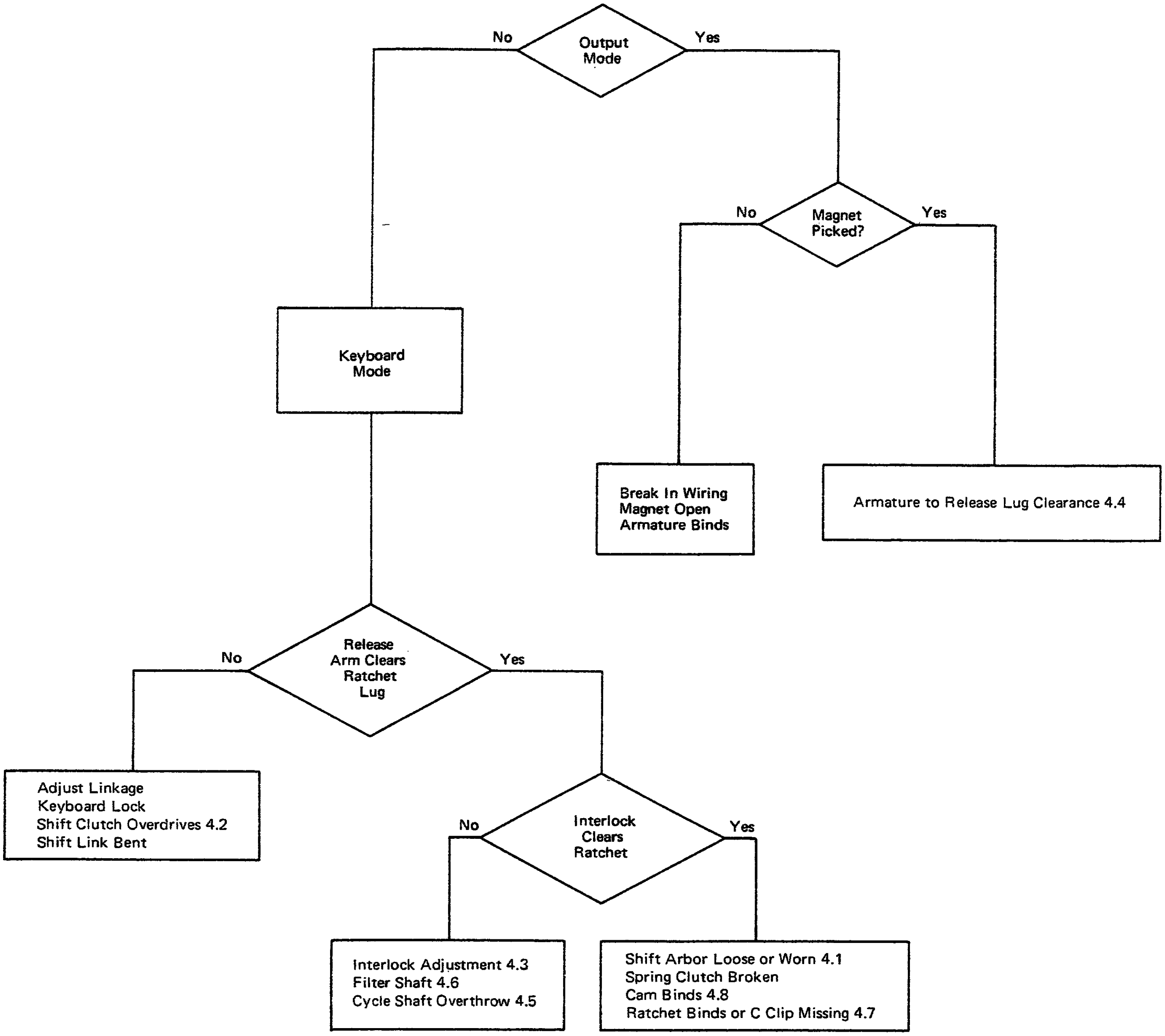


Figure 1-7. Shift or Enter

4.9 The following procedure should be used for quick reassembly of the shift clutch:

a. Install shift clutch spring; allow the retaining plate screws to remain loose.
b. Place shift cam in uppercase position and hold in detented position.
c. Install clutch ratchet (uppercase position) so that its lug is toward the front of the machine ahead of the release arm lug.
d. Manually rotate the ratchet (clockwise) until the shift release arm lug now lies directly under the middle of the clutch ratchet lug. The shift clutch spring and retaining plate will slip to a new position as this is accomplished.
e. Remove the clutch ratchet and, without disturbing the setting, tighten one screw in the retaining plate. Do not allow the cam to become undetented.
f. Now reinstall the clutch ratchet, using the same spring hole as was previously used, and arrest it with the shift release arm (manually lock down the shift keybutton).
g. Set the overthrow stop and check shift action.

4.10 A rubbing noise in the shift mechanism may be caused by a loose cam brake or by a rough shift arbor rubbing on the shift cam. The left end of the arbor may be polished in the following manner: Remove the shift ratchet retainer, shift ratchet (notice which hole the spring is in), and shift spring clutch. Loosen the setscrews in the arbor and move it to the right on the operational shaft and tighten the setscrews. Turn the machine on and polish the end of the arbor with a stone or crocus cloth. Parts must be free of emery dust before relubricating and assembling.

4.11 If the shift arm roller is worn, check the surface of the shift cam for a rough finish and replace if necessary. In the majority of cases reported to date, wear of the roller has been caused by a rough cam.

4.12 If the machine is locked up because the shift clutch spring loop is caught between the arbor and the cam, check the backup roller adjustment. A maladjusted shift backup roller allows the right operational shaft bearing to be cammed in, thus increasing the clearance between the shift arbor and cam. This condition can be observed by watching the bearing for movement to the left when shifting to upper case.

4.13 The pusher end of the large spring hook may be used as a wrench to adjust the shift backup roller eccentric shaft.

4.14 The shift spring drive and proper brake adjustment can be checked manually, holding the detent roller away from the cam and operating the shift. After completion of either shift cycle, allow the detent roller to contact the cam. The detent roller should not rotate the cam in either direction more than approximately 1/32". Adjustments made to meet this requirement will help ensure troublefree operation.

4.15 Some premature tape wear may be traced to the shift arm not moving in a true vertical plane. Check the adjustment of the shift arm brace to assure that the shift arm does not lean front or rear, allowing the rotate tape to ride the pulley flange. Ensure that the shift arm pulley maintains at least 1/16" clearance to the tilt pulley bracket.

4.16 A spacer, PN 1090050, is now being installed under the shift stop screw to position the head of the screw farther from the side frame. It will allow more thread engagement of the shift arm screw in the shift arm.

4.17 Shift interlock arm assembly "failure to release" may result from a slight burr on the interlock spring in the area where it contacts the ratchet. The burr may be removed easily with a file or flexstone.

4.18 The shift clutch ratchet has been redesigned to accommodate a new C7 cam for 1052 and 1053 Selectric I/O printers. This redesign eliminates the breakage problem encountered with the early level C7 cam.

4.19 If the shift release link is adjusted too long, it will restrict the shift release arm motion. This results in shift failures when shifting to uppercase in output mode.

The lowercase armature may stay attracted to the core due to oil or residual magnetism. This will prevent latching in uppercase and, therefore, cause a simultaneous shift to lowercase and print operation.

TAB MECHANISM (Figure 1-8)

5.1 Interposer to release lever clearance.
5.2 Keylever pawl to interposer clearance and bite.
5.3 See 2.4.
5.4 Tab lever to set tab stop clearance, at rest.
5.5 Tab latched; escapement pawl to rack clearance.
5.6 Tab lever latching overthrow.
5.7 Possible binds:
   a. Feedroll mounting arm hits tab overthrow stop.
   b. Dust covers and card holders.
   c. Anvil and front carrier shoes.
   d. Rear carrier shoe.
   e. Escapement cord off pulley.
   f. Pinion gear.
   g. Mainspring tension at right margin. See 2.18.
   h. Pawl mounting stud on escapement torque bar.

5.8 When spacing in the area of 12-15 spaces between set tab stops, it is possible for tab rebound to occur. Most often, the carrier will rebound 1/2 space and land on the backspace pawl. No permanent resolution is available for this problem. Watch your CEM's.

Tab under power and check for any binding or hesitation of the tension pulley slide. Be sure that the carriage-return clutch spring is clean and correctly adjusted.

The following temporary fixes may be used:

a. Increase the tension on the right cord pulley to maximum.
b. Break off the backspace pawl if this function is not used. See 3.5.
c. If the machine has the 100" mainspring, and if the customer does not operate the carrier within five spaces of the extreme right side, install the spring-loaded carrier shoe B/M 1272015. If the customer operates within five spaces of the extreme right side, install a new style tab torque bar to avoid interference.

CARRIER RETURN (Figure 1-9)

6.1 Clutch unlatching clearance at left margin.
6.2 Carrier return spring must be in good condition and clamped. CR shoe rest clearance must be correct.
6.3 CR latch overthrow, with platen and feedrolls installed.
6.4 Interposer to release lever clearance.
6.5 Possible binds:
   a. Feedroll mounting arm hits tab overthrow stop.
   b. Dust covers and card holders.
   c. Anvil and front carrier shoes.
   d. Rear carrier shoe.
   e. Escapement cord off pulley.
   f. Pinion gear.
   g. Carrier return latch rubbing sideframe (may have been bent during eccentric adjustment).

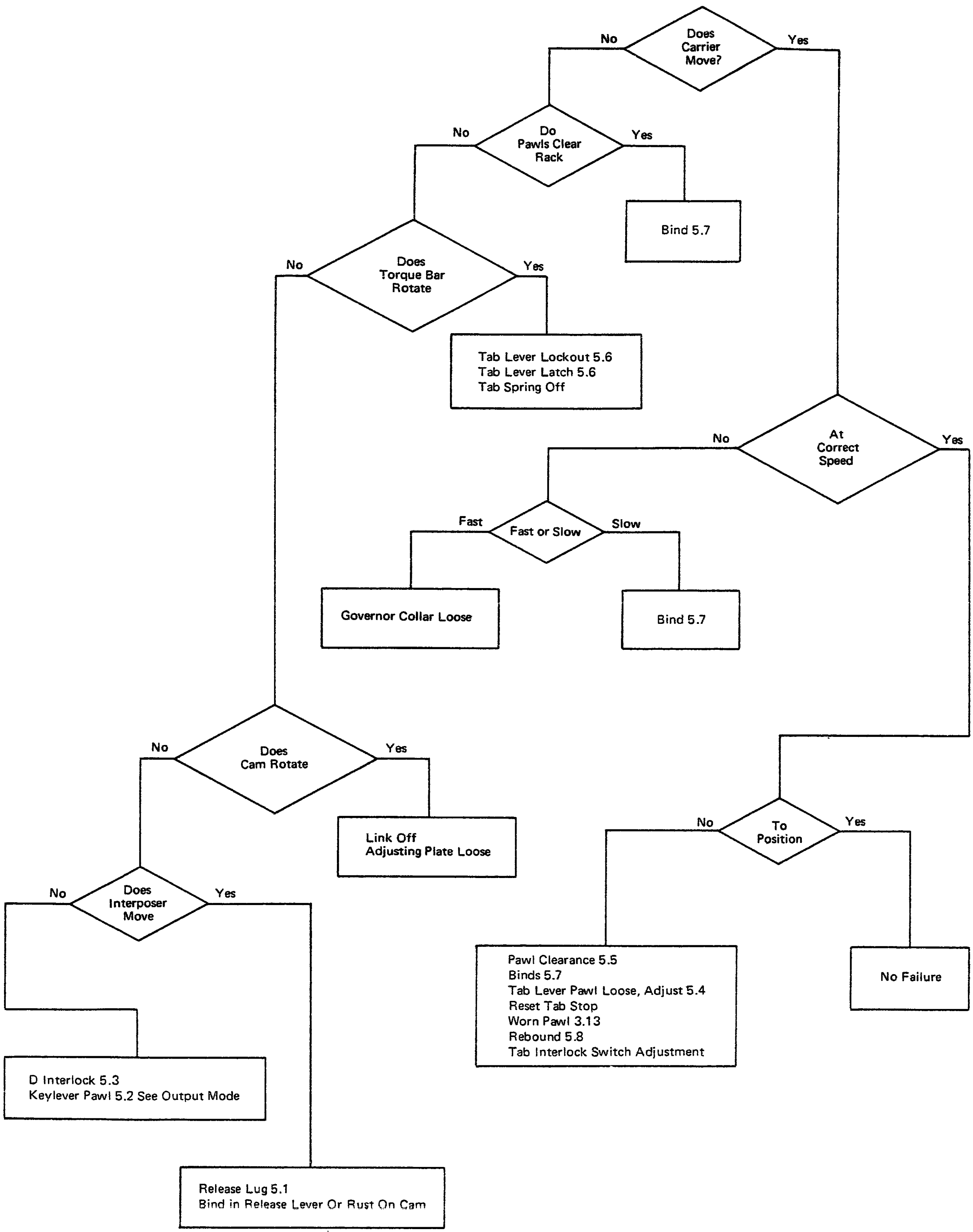


Figure 1-8. Tab Mechanism

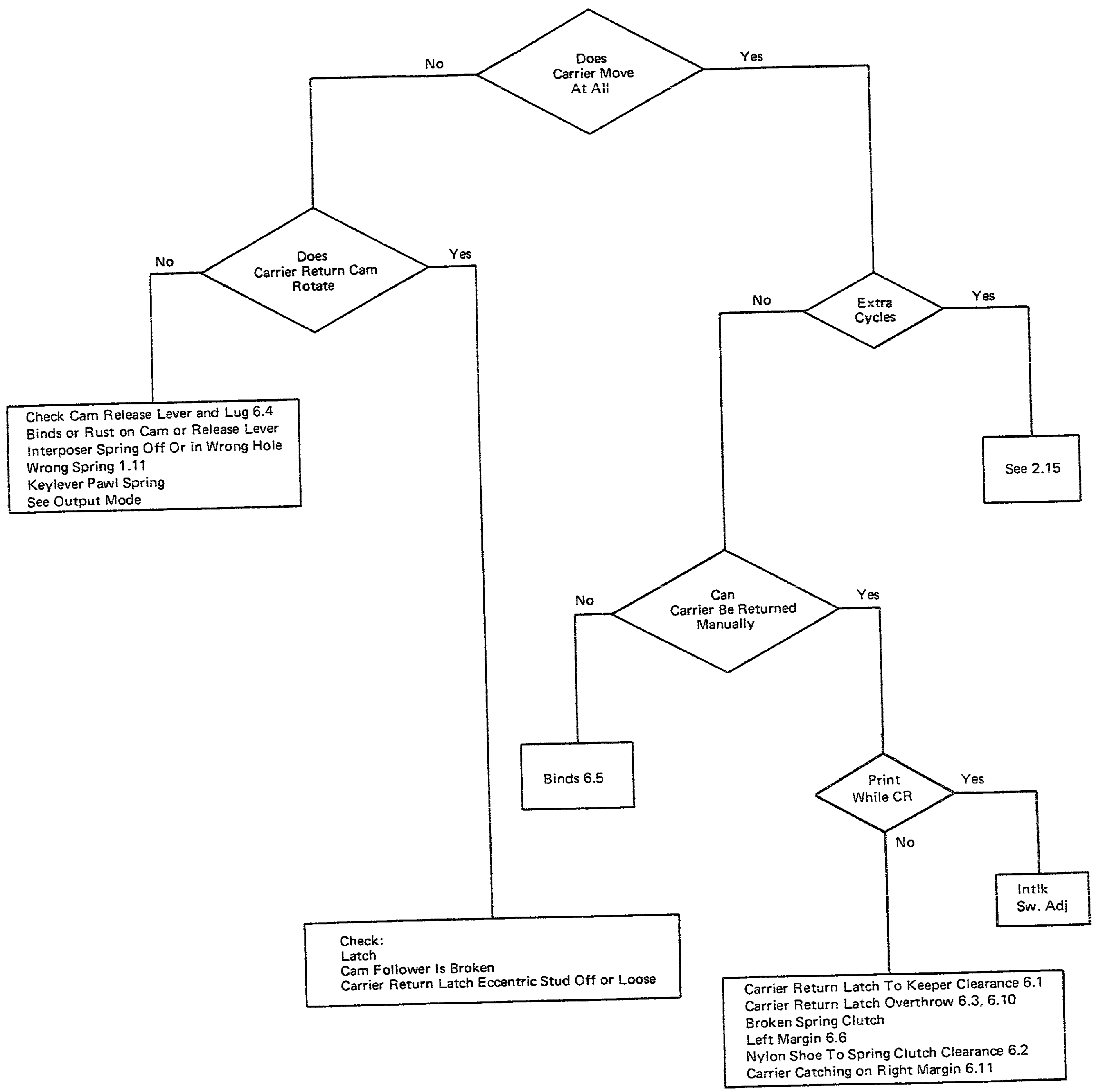


Figure 1-9. Carrier Return

6.6 An uneven left margin may be caused by:
a. The clutch unlatching link being too short.
b. The overbank adjustment.
c. A worn escapement pawl (Figure 1-6).
d. Carrier return spring oily, dirty, or rusty (see 3.9).

6.7 The tab governor spring clutch must be free of rust, dirt, and excess oil. Too much oil will cause the clutch to bind or drag.

The carrier return pinion and spring clutch must also be free of rust, dirt, and oil. Excess oil will cause sluggish tab and escapement operation.

6.8 Adjust the extension spring for 1/2 pound of tension on the carrier, while holding the carrier against a carrier-return operation. If the torque limiter spring appears to ride off the right side of the arbor, replace the extension spring with a spring PN 1115382 and readjust.

6.9 Some partial carrier return failures can be traced to a rounded edge on the CR latch. If this problem is experienced, replace the latch.

6.10 Pawl to rack clearance with clutch latched. CR clutch should drive before pawls pull free of rack.

6.11 Carrier return from beyond the right margin may trip at the right margin if this bellringer bellcrank catches on the line lock bracket. Form the tip of the bellcrank slightly (and carefully) to ride the slope of the line lock bracket.

INDEX (Figure 1-10)

7.1 Pawl to stop clearance.
7.2 Pawl throw at cam high point.
7.3 Check cam follower weld.
7.4 Replace right platen bushing if worn or binding.
7.5 Use special index lever and operational shaft stabilizer with forms feed devices using heavy forms.

OPERATIONAL AREA IN OUTPUT MODE (Figure 1-11)

8.1 Interposer unlatching clearance.
8.2 Possible causes of repeat cycles:
a. Interposer unlatching clearance.
b. Interposer failing to restore. (See 1.10.)
c. Operational latch binding, or spring off.
d. Release lever slipping off or failing to latch cam wheel.
e. C-contact out of time or dirty.
f. Excessive magnet pulse duration.

8.3 Figure 1-12 shows the operational interposer clevis and armature link. Each time one of the operational magnets is energized, the armature pulls on this link, which in turn pulls the interposer from its rest position and activates it. Each one of these links must be adjusted for proper unlatching clearance. A problem has been encountered where the locknut, when tightened against the clevis, tends to loosen very rapidly due to a burr on the bottom of the clevis. The illustration shows this burr and how the locknut contacts it, giving it a very small locking surface.

The Customer Engineer will usually make his adjustment, tighten the locknut, and find his adjustment has changed several days later. This is due to the limited engagement of the nut on the clevis (Figure 4-12). When making this adjustment, check the clevis to be sure no burr is on the bottom; if there is, remove the clevis and file the burr away.

8.4 Repeat cycles or failure to release an interposer may be caused by the threaded portion of the link biting into the armature causing an improper link adjustment. (See note, Figure 4-12.)

OPERATIONAL AREA NOTES

9.1 No repeat functions are on the I/O printer, consequently, the operational keylever pawls require only the bottom lug. The top lug (repeat lug) should be broken off.

9.2 If the slot in the nylon cord drum opens or breaks, a new slot may be made with a spring hook which has been heated.

9.3 The operational interposer height may be adjusted by using the following procedure:
a. Hold the clutch release arm so that the cam repeats.
b. Turn the interposer adjusting screw clockwise, until the mechanism begins to operate (carrier begins to move).
c. Back the adjusting screw out until the mechanism stops operating, then back it out an additional half-turn.

9.4 Excessive up and down play at the left end of the operational shaft requires the replacement of the sleeve in the torque limiter hub and the cycle clutch pulley hub.

9.5 If a buzzing noise is heard after an operation, the clutch is not latching on the check pawl or the check ring is out of adjustment.

9.6 Do not use the anvil as a fulcrum to pry out snap-in dust shields. Doing so may push it out of adjustment.

9.7 On an early style operational magnet assembly, an operational magnet coil can be replaced without removing the magnet assembly from the machine:
a. Take off the terminal blocks and loosen the appropriate armature backstop.
b. Remove the armature spring and swing the armature aside.
c. Tap the coil with a screwdriver and hammer to break it loose.
d. Work the old coil out to the right-rear or front.
e. Replace the coil using a small amount of cement

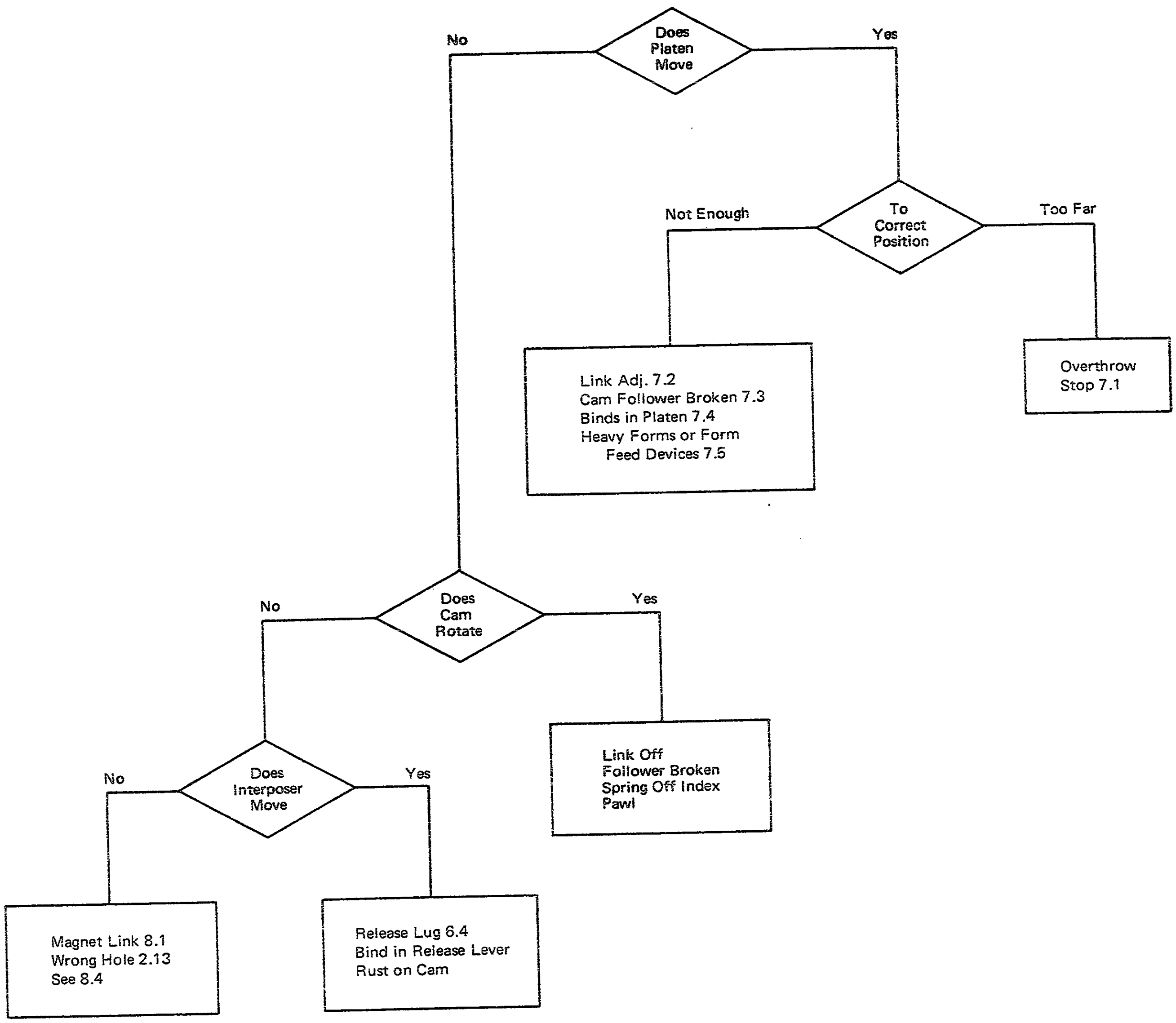


Figure 1-10. Index

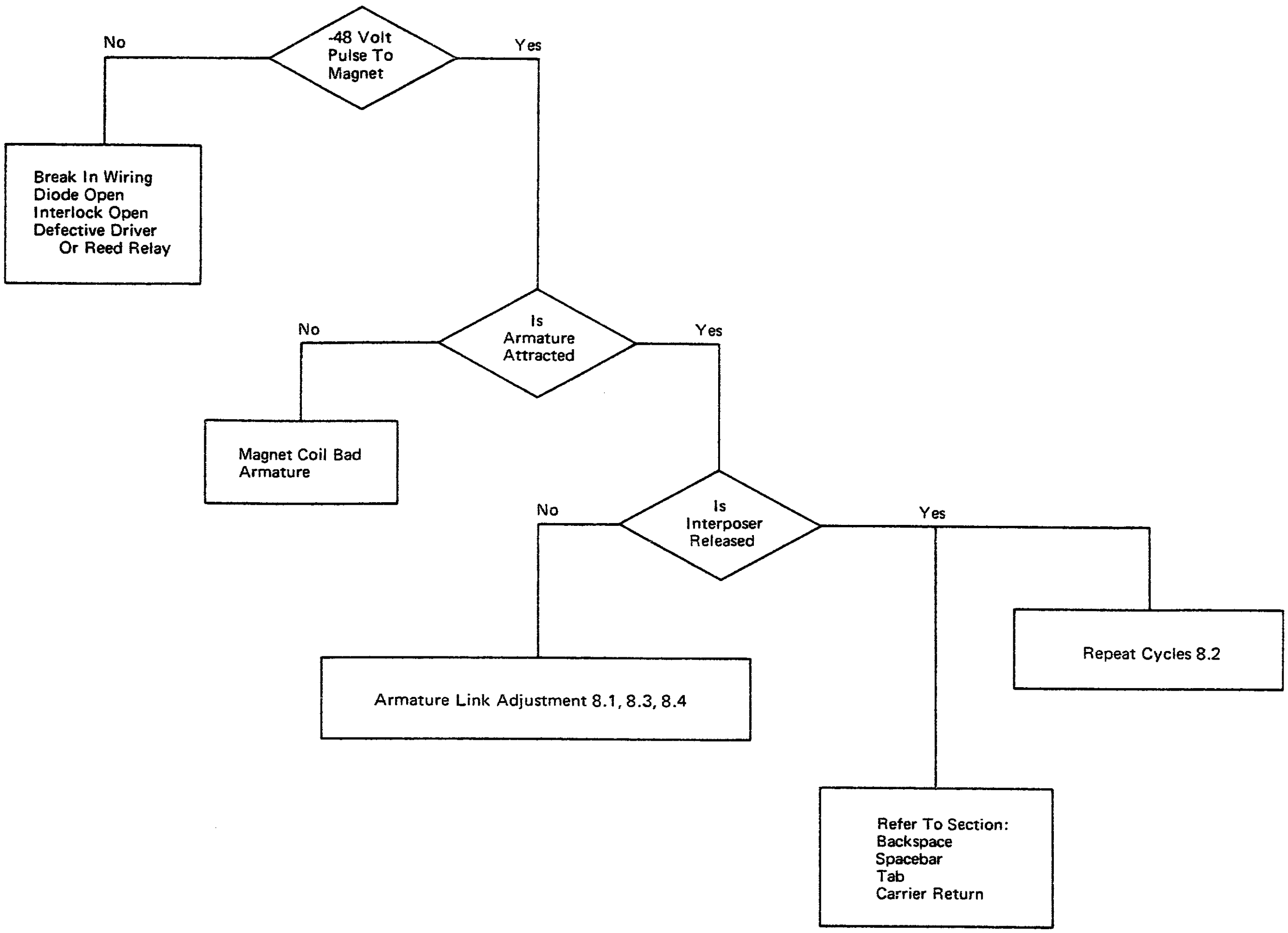


Figure 1-11. Operational Area in Output Mode

to hold it in place, and draw the leads through with a spring hook.

f. Reassemble, and adjust the armature backstop.

On the late style operational magnet assembly, the two banks of magnets are independently demountable from the bracket. This provides easy access to the magnet coils and to the mechanism between banks by removing the front bank of three magnets. Disconnect the wiring and the three pull links, and remove the work-leg, to remove the three-magnet assembly.

MALSELECTION AND RIBBON FEED NOTES (Figure 1-13)

10.1 Typehead to rotate pulley relationship (coarse homing).

10.2 Latch to stop clearance, at rest (-5 latch).

10.3 Rotate arm vertical at zero rotate selection (half-cycle).

10.4 Match the home detenting with:
   a. The -5 latch selected.
   b. The positive latches selected.

10.5 The detents should seat fully with no side play.

NOTE: The link presently being used, and being provided for field usage, has a fixed clevis, elastic spacer, and elastic stop nut. See parts catalog.

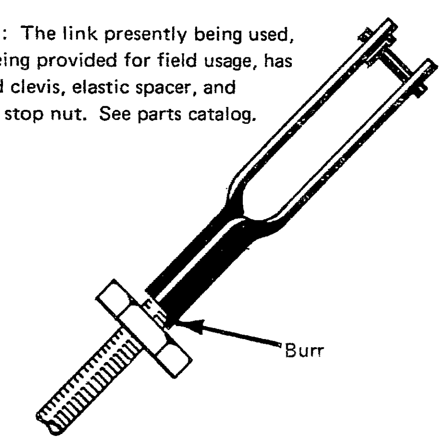


Figure 1-12. Burred Clevis

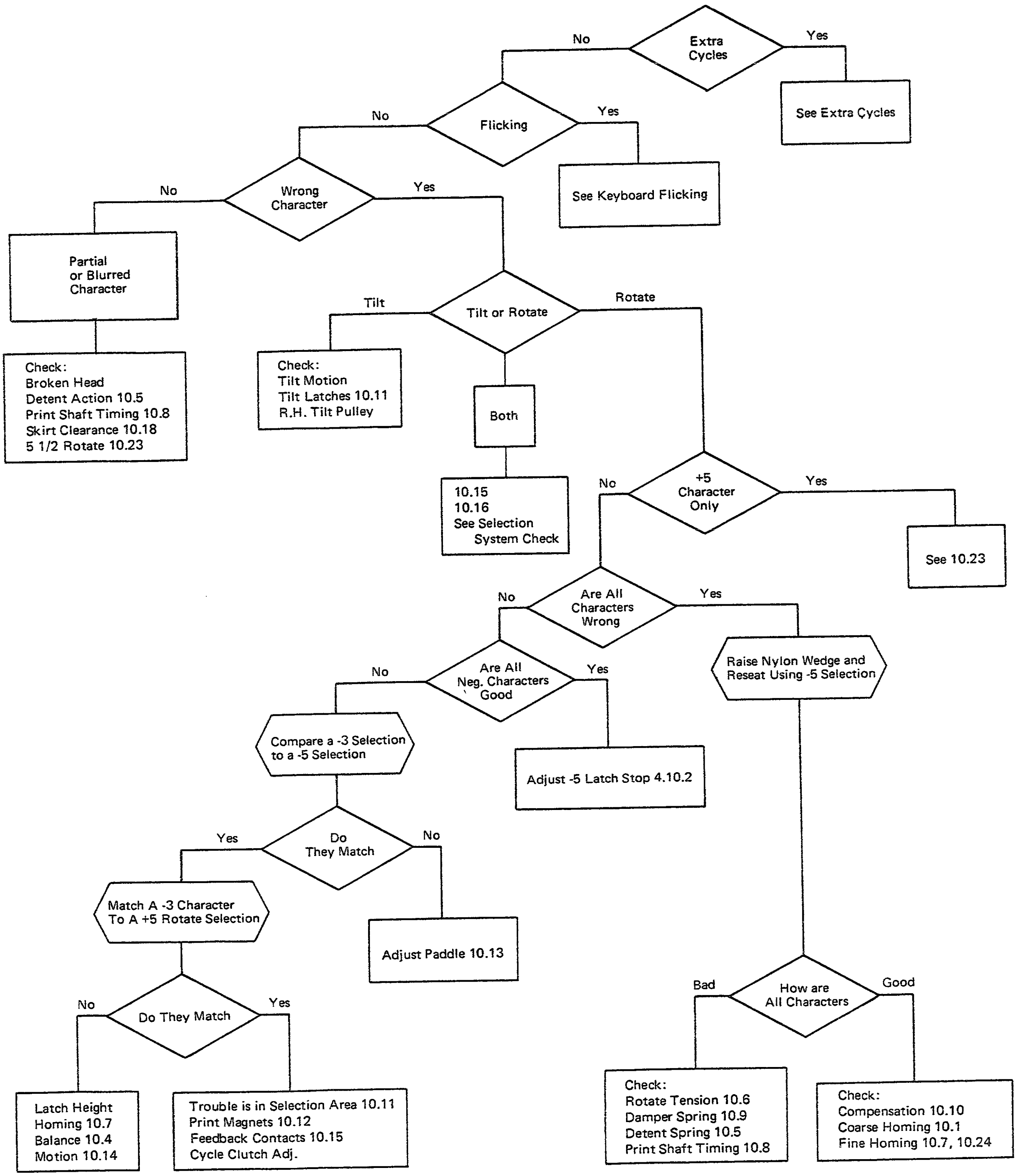


Figure 1-13. Malselection

10.6 Check rotate spring tension with -5 half-cycled and typehead removed.
10.7 Match detenting at -5 and home selection (fine homing).
10.8 Time print shaft.
10.9 Damper spring must fully compress and must not bind on paper bail stud.
10.10 Overcompensation may occur whenever the system receives a sudden shock which unloads the rotate arm; when the detent enters the wrong typehead notch prior to rotate completion; or when the detent enters the wrong notch after rotate completion. If the wedge drops too far (overcompensates), check:

a. Excessive head play.
b. Shift timing adjustments.
c. Fine timing and skirt clearance.
d. Binding or sticking rotate spring.
e. Binding rotate eccentric arm shoulder.
f. Binding or sticking damper spring.
g. Popping selector latches due to maladjusted latch-links.
h. Filter shaft timing.
i. Binding typehead due to the tilt ring spacer being off center.
j. Rotate spring tension.
k. Transport cord pulley too far to rear, interfering with shift arm.

If the wedge does not drop far enough (undercompensates), check:

a. Wedge is dirty, oily, or serrated. The wedge should be cleaned with IBM cleaning fluid. If the wedge becomes scored or serrated, it may be reversed.
b. Rotate arm eccentric adjustment.

10.11 See 1-13.
10.12 See 1-14.
10.13 Make all rotate selections equal to -5 rotate.
10.14 Rotate arm length sets amount of rotation (+5 to -3).
10.15 Random malselection may result if the C-5 contacts open during a print operation.

What actually happens is that a pulse of between 30 and 40 milliseconds is placed on the print magnets, and the armature is attracted and trips the cycle clutch mechanism. At this period in time, due to some malfunction, the C-5 contact opens. This, being an interlock contact, interrupts the pulse to the print magnets. The cycle clutch has been activated and the machine will take a cycle; however, the intended character will not be selected. Either selection of an extra cycle or malselection will occur since the armature has restored and has not selected the proper latches.

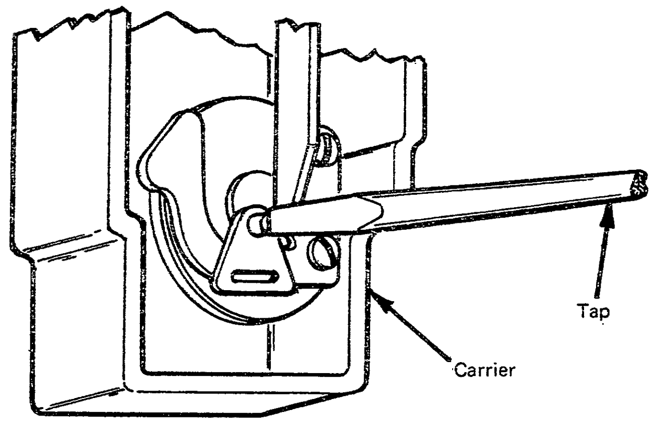


Figure 1-14. Loosen Rotate Pulley

C-5 may open because the contacts are adjusted too far to the right. The C-5 contacts are operated by a cam follower which is curved until it reaches the flat portion that operates the contact operating strap. If the contacts are adjusted too far to the right, they will contact the curved portion of the cam follower and will open erroneously. C-5 may also open because of extra space cam cycles. See 2.16.

10.16 Random parity and selection errors can be caused by loose or broken selector latch extensions (see 13.4). Excessive cycle clutch overthrow can cause the same indications by allowing the pusher tails to latch on the armatures and fail to release.
10.17 An easy method of freeing the rotate pulley from the lower ball socket after loosening the setscrew is to tap a screwdriver placed on the lower end of the ball socket.

The end play of the lower ball socket *must* be maintained when the setscrew is tightened.

10.18 Current-production detent-actuating levers have improved stability, resulting in reduced breakage and loss of typehead skirt clearance. Since the new level parts are not interchangeable with the former level, field replacement of former support screws or detent actuating levers will require that all three parts be replaced. See parts catalog for B/M number.
10.19 On gearless tilt machines, the right tilt pulley has a different adjustment than machines prior to gearless tilt.
10.20 Overcompensation may be attributed to worn or rounded edges on the bronze motor pulley teeth or to worn pawls on machines equipped with nylon motor pawls.

Slippage of the driving clutch pawls could relax the selection system sufficiently to induce roller drop.

10.21 In most cases, it is not necessary to loosen the rotate pulley for typehead homing on I/O printers without shift.

Homing may be accomplished easily by adjusting the shift arm screw, since these units do not utilize shift operation.

10.22 Some cases of malselection result in printing a " " character which makes it difficult to determine the tilt and rotate selection.

The tilt and rotate selection may be easily determined if a standard ET type element is substituted to analyze the failure. The standard ET type elements print a different character for each tilt and rotate selection.

10.23 Occasional malselections at the +5 rotate band on the typehead can be caused by:

a. Variations of cycle shaft speed. A sudden increase in momentum of the cycle shaft may cause the typehead to rotate beyond the +5 detenting position. If the motor clutch pawl slips off a tooth of the pulley during the beginning of a +5 rotate operation, the cycle shaft will slow up for an instant; when the pawl reengages in the next tooth of the motor pulley, there will be a sudden surge felt throughout the cycle shaft system. This surge will cause over-rotation of the typehead.

b. Selectric I/O printers operating in an open-ended mode (1052/1053/1062) may also experience this problem, due to the fact that they are being pulsed at a constant rate of 14.89 characters per second whereas the printer is operating at a mechanical rate of 15.5 characters per second. This difference in speed is a built-in safety margin, but, due to this difference in speed, the cycle clutch may try to latch up at the end of a cycle and then be unlatched again by the next incoming pulse. The cycle spring clutch will be opened just far enough to allow the shaft and clutch to slip slightly. When the cycle spring starts driving again, the shaft will turn with an increased momentum and the over-rotating condition will result.

Several solutions to this problem are possible. Installing capacitor start motor B/M (see parts catalog) eliminates the centrifugal clutch. An improved typehead ball joint (see CEM No. 9) tightens up the specification on typehead play and also helps alleviate the possibility of typehead over-rotation.

If an excessively bad case of +5 and one-half rotate is encountered, the following adjustment procedures (not normal specifications) may be used:

(1) The rotate spring tension may be increased to favor the high side of normal specifications

(2) The skirt clearance should be adjusted so as to favor the low side of the spec.

(3) The typehead homing may be readjusted so as to increase the negative or clockwise direction of the typehead as the detent enters.

(4) The condition called out in 15.9 may also result in +5 and one-half rotate. If the cycle shaft does not detent properly on its check pawl, it will tend to rotate backward, closing the spring clutch and causing it to drive prematurely. If, at the same time, the cycle clutch is activated, an increased momentum will be felt throughout the cycle shaft system, resulting in the typehead over-rotating.

(5) The motor belt must be kept within its specifications for tightness, also.

(6) The selector latch to bail clearance should be held to a minimum in order to prevent the bail from giving too much shock to the system as it is driven down.

This over-rotating condition will be most predominant on machines operating in an open-ended mode; i.e., printers which do not use C1 and C2 to gate incoming pulses.

10.24 The following describes a quick method of print shaft timing:

a. Loosen the print shaft gear and manually half-cycle a -5 tilt 2 character. Stop turning just as the check pawl drops in at half-cycle position.

b. Rotate the print shaft in the forward direction, observing the rotate detent enter and start to leave the typehead notch. Stop turning when the detent is halfway up the slope leaving the notch.

c. Continue the hand cycle until the typehead tooth just touches the rotate detent.

d. Tighten the print shaft gear and check for shaft end play. If the print shaft is burred, remove the gear from the shaft while it is loose and reengage in a different tooth to provide a good bite for the setscrews.

10.25 If the stencil lockout latch is adjusted too low, the ribbon feed cam follower cannot follow the low dwell of the cam and the ribbon fails to feed on the next cycle.

EXTRA CYCLES

Extra, unwanted cycles occur with no latch selection, and result in +5 rotate, 3 tilt character selection (usually a period). The most common causes follow in the order of probability:

11.1 Cycle clutch latch link pawl bite insufficient.
11.2 Cycle clutch latch link pawl restoring overthrow inadequate or excessive. Check both lobes of the restoring cam.
11.3 Cycle clutch latch worn or has incorrect bite.
11.4 Cycle trip bail binding.

FLICKING

Flicking results in malselection or gives the appearance of an extra cycle. Flicking is caused by the keybutton being driven down with only enough impact to operate the cycle bail. The cycle clutch engages and the print cycle occurs with the interposer only partway down, not latched. The character printed is most likely to be +5 rotate, 3 tilt (usually a period) because the filter shaft will cam the interposer up rather than engage it. To reduce flicking:

12.1 Minimize unlatching clearance of cycle clutch latch link pawl. Check pawl bite.
12.2 Add a light spring (Figure 1-15) to reduce cycle bail bouncing.
12.3 Do *not* change the interposer latch springs to reduce flicking.

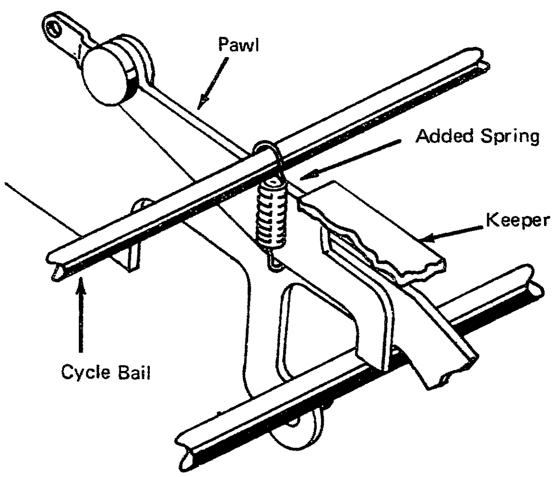


Figure 1-15. Cycle-Bail Damper Spring

SELECTION SYSTEM CHECK

13.1 Keylever interposer rest position vertical clearance to filter shaft vane.
13.2 Selector latch interposer to selector bail clearance. Affects latch link adjustment.
13.3 When working with selection latches, check that latch extension and latch springs are secure and that latch extension to latch pusher clearance is correct. Check the bail downstop clearance if the check latch has jumped the bail.

Latches should restore under the bail smoothly and fully in one motion under slow hand-cycling. If one restoration is jerky, it shows a tendency of the latch to pop off the bail, and the whole linkage may have to be replaced.

Popping latches may be caused by:

a. Selector latch links too short or too long.
b. Selector latches not vertical.
c. Excessive lost motion in the selector bails.
d. Pusher to latch extension clearance.

13.4 Malselection can be caused by loose or broken selector latch extensions (sometimes referred to as black latch extensions).

All production machines incorporate a selector latch extension that has a larger structural surface and a rounded corner hole to prevent breakage, and to ensure positive positioning of the extension.

The new extensions may be recognized by their larger size (Figure - 1-16).

13.5 Malselection or parity errors may be caused by the latch pushers contacting their latch extensions when unselected and held by the selection magnet armature. To check this clearance (affected by magnet assembly vertical position and by pusher-to-latch extension rest clearance), turn machine power off, trip the clutch, and hand crank a few degrees into a cycle. The pusher cam follower should be on the low dwell of the pusher cam. Check for the clearance shown in Figure 1-17.

Examine the link between the check latch and the check interposer for binding in the elongated hole. Spread the clevis slightly if there is a bind.

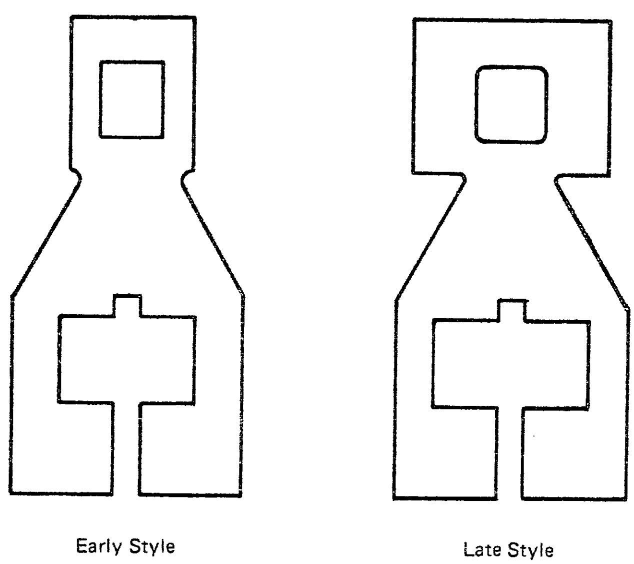


Figure 1-16. Latch Extensions

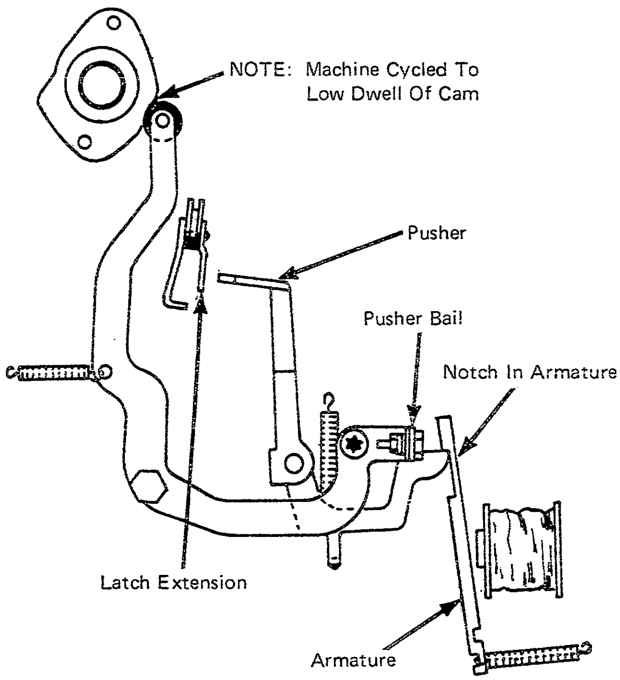


Figure 1-17. Inactive Pusher Clearance

PRINT AREA IN OUTPUT MODE (Figure 1-18)

14.1 Correct pusher-to-latch extension clearance, at rest.

14.2 Armatures clean, in good condition, and not binding. Armature stops free of lubricant.

14.3 Cycle trip bail extension clearance to knock-off eccentric.

14.4 Pusher tail to armature clearance, at rest.

14.5 On early style selection magnets, check backstop position and attracted armature to core clearance. See 14.7.

14.6 If problems are encountered with cycle clutch tripping when only one armature is used, check the cycle clutch trip mechanism to determine if it is the old style. The old style trip mechanism (trip lever) is connected directly to the cycle clutch trip bail. The new style trip lever is spring-loaded and the cycle clutch trip bail link is connected to a latch lever which releases the trip lever.

14.7 If an extra cycle condition is not alleviated by the normal routine of print magnet, keyboard, and vyvle clutch adjustments, the cycle clutch trip bail (sometimes known as the knock-off bail) should be inspected. If the cycle clutch trip bail does not provide sufficient knock-off motion to the center armatures, extra cycles will result. In isolated instances the cycle clutch trip bail has been found to be warped or out of alignment in the center portion.

Check the cycle trip bail knock-off by pressing and holding a center armature, and hand cycle the machine through an operation and observe the manually-held armature. This armature should rise slightly at the knock-off point. If there is no rise, adjust the knock-off eccentrics to the minimum clearance. A center armature should again be pressed and checked for knock-off. If knock-off is still not present, the cycle trip bail should be replaced.

14.8 Latch lever to trip lever bite.

14.9 Latch lever to trip lever clearance.

14.10 Trip lever to latch clearance.

14.11 Repeated characters near right margin may be caused by bouncing end-of-line contact.

CYCLE CLUTCH NOTES

15.1 Check for cycle shaft end play. If none is found, tap the end of the shaft lightly to align bearings and parts. Recheck for end play.

15.2 Check clutch latch for height and for parallelism with clutch sleeve.

15.3 Check cycle clutch spring and collar adjustment.

15.4 Check cycle clutch latch bite and restoring overthrow. The following procedure is a method of adjusting the restoring cam roller (the keeper *must* be adjusted for proper latch bite before adjusting the roller):

a. Loosen the restoring cam roller nut and allow the roller to drop free.
b. Hand cycle the machine until the roller is on the high dwell of the cam.
c. Place the pusher end of a large spring hook between the cycle clutch latch pawl and the keeper. Insert through hole in right side of keyboard and over switch leads to hold it in place.
d. Holding the roller firmly against the cam, tighten the locking nut.
e. Remove the spring hook and the check latch pawl to keeper clearance on the cam lobe providing the smaller clearance.

15.5 If the above sequence of adjustments does not produce correct cycle clutch operation, check for the following conditions:

a. A new style, heavier cycle clutch spring is available for field replacement of a worn spring clutch. It may be identified by its bronze color. A complete new cycle shaft assembly should be used when making this change since the new assembly is preadjusted and includes the following new parts: (1) spring, (2) collar, (3) restore cam, (4) sleeve. The new shaft is black.
b. Lack of spring clutch lubrication (use No. 23).

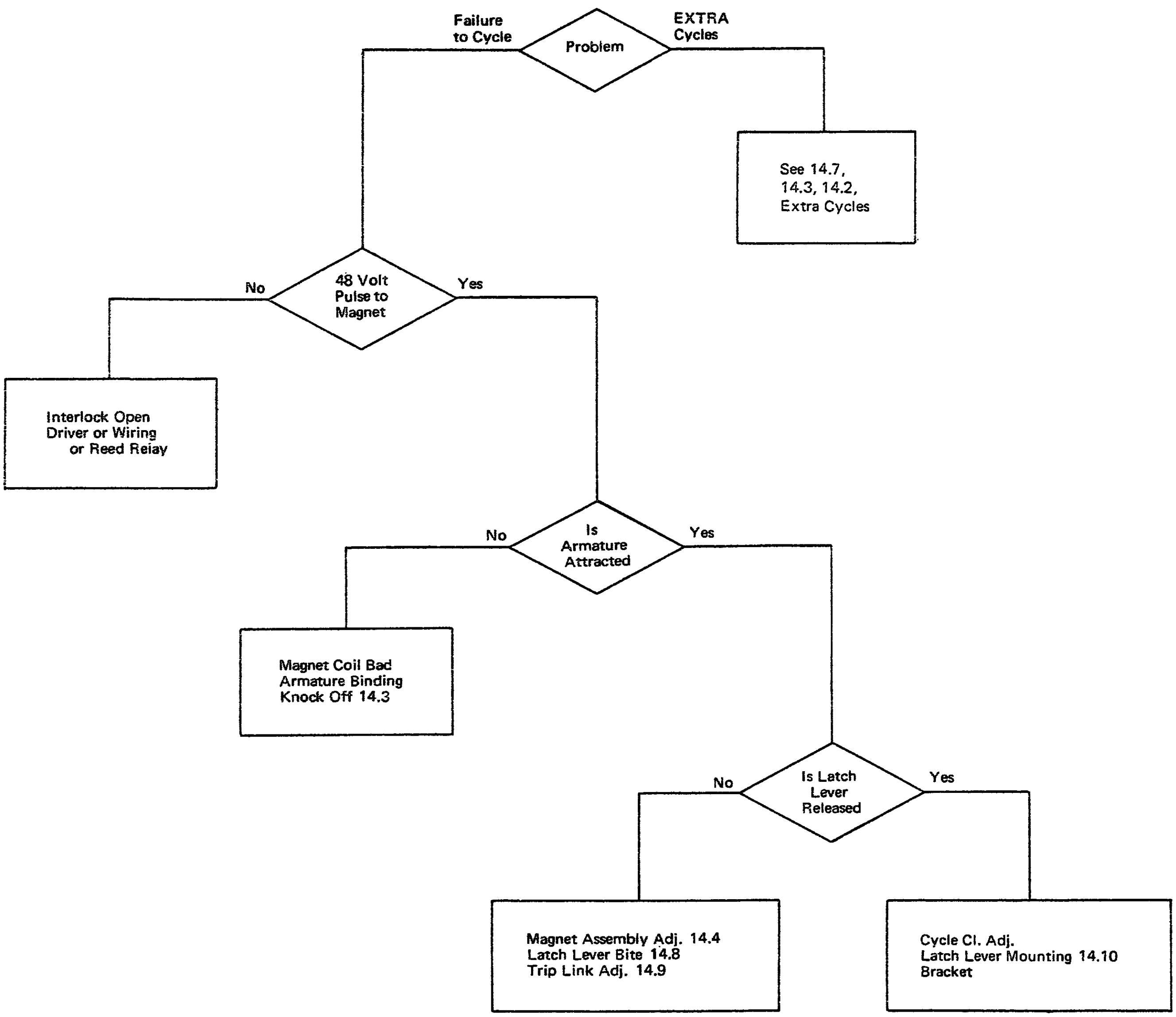


Figure 1-18. Print Area in Output Mode

c. Binds in the operational shaft or shift clutch assembly.
d. Bind or lack of lubrication or lack of proper backlash in the drive gears (remove, clean, and lubricate).
e. Bind in the print shaft or carrier and rocker.
f. Excessive cycle clutch restoring overthrow causing the latch to rub on the low dwell of the sleeve.
g. Before replacing the cycle clutch spring, check the edge condition of the cycle pulley arbor. A rounded edge is easily detectable by re-inserting the bare cycle shaft into the machine and observing the junction of both arbors. If a rounded arbor is found, replace hub and pulley assembly.
h. Worn cycle clutch latch, or the bond between metal clutch stop and the rubber shock absorber on clutch latch is breaking loose.

15.6 The cycle clutch pulley can be oversized. Check for this condition by holding the carrier against a return. If the belt thumps and the motor vibrates back and forth, the pulley may be oversized.

Remove the belt from the motor pulley and wrap it around the cycle clutch pulley to determine if the cogs on the belt match the cogs on the pulley. An oversized pulley should be replaced.

15.7 When removal of the cycle shaft is necessary on any Selectric I/O printer, the cycle clutch pulley should also be removed and the center bearing drilled. This will improve the lubrication of the cycle clutch pulley and increase center bearing life. Remove the felt wick from the lubrication hold and drill a No. 32 hole through the upper part of the bronze bearing. Remove all drillings from the inside of the bearing and lubrication hole. The felt wick should be replaced to keep dirt out of the bronze bearing.

CAUTION
The center bearing is an oil-impregnated bearing and should not be flushed with cleaning fluid.

Before and after assembly, the center bearing should be lubricated with No. 10 oil. The pulley should be inserted in the bearing before replacing the felt wick.

15.8 When the cycle clutch restore cam breaks or warps, immediate replacement is required. A time-saving method of replacing this cam, when cycle shaft removal is unnecessary, is as follows:

a. Remove the two locking screws and clips from the white nylon restore cam.
b. Cut the white nylon restore cam with a pair of dykes or wire cutters and remove the sections of the cam from the shaft.
c. Using a fine hacksaw or coping saw blade, cut a new cycle clutch restore cam as shown in Figure 1-19.

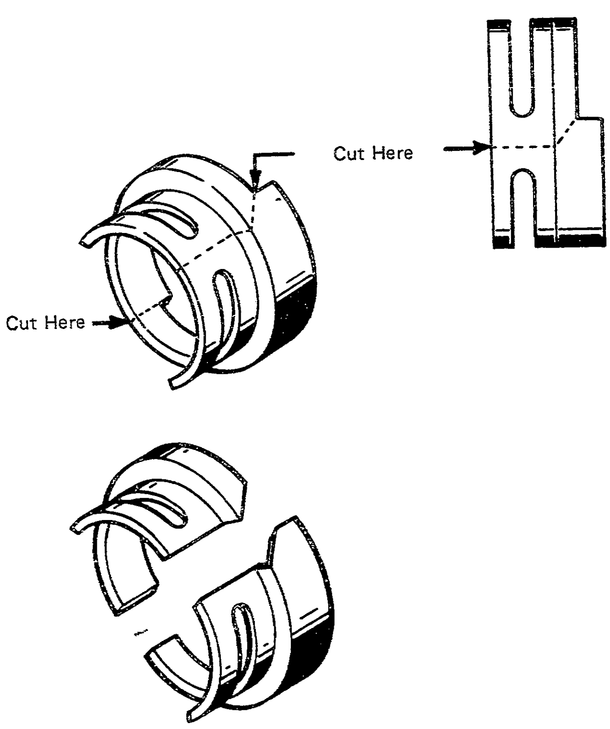


Figure 1-19. Restore-Cam Quick Replacement

d. De-burr the two sections of the restore cam, place them on the cycle shaft (one at a time), and install their locking screws and clips.
e. Adjust the overthrow of the cycle shaft. This adjustment must be checked on both lobes of the cam since the cam is now split and each lobe is independently adjustable. It will only be necessary to loosen one setscrew to adjust the overthrow on that particular lobe. When both sides are the same, tighten the setscrews.

This method of replacing a restore cam will save approximately one hour and fifteen minutes in the field. It should be remembered that this fix is a temporary one and the white nylon restore cam should be replaced the next time the cycle shaft is removed for spring clutch replacement or pulley replacement.

15.9 Some cycle clutch spring wear has been traced to the check pawl bouncing back out of its detented position on the cycle shaft ratchet when the cycle shaft latches up.

This failure will usually occur at one point on the cycle shaft; the shaft will latch on one cycle and fail to latch on the next cycle. This is easily observed.

Present production machines have an improved stud, spring, pawl, and clip assembly (Figure 1-20). This assembly is available for field use (see SA CEM or parts catalog). If the cycle shaft will not reliably detent, even after the check pawl assembly has been replaced, it will then be necessary to replace the entire cycle shaft assembly.

15.10 Slow or sluggish cycle operation may be due to the cycle clutch spring slipping or the sleeve binding. This condition may be detected during repeated +5 tilt 3 selection. The following areas should be checked if this occurs:

a. Excessive cycle shaft end play.
b. Oil on spring (the proper lubrication for the spring is No. 23 grease). Any oil on the spring will allow slippage; the spring must be removed and thoroughly cleaned with IBM cleaning fluid. Care should be taken to remove all traces of oil from the cycle shaft reservoir area and also from the cycle pulley hub. The whole assembly should be relubricated thoroughly with No. 23 grease.
c. Incorrect adjustment of cycle clutch spring. Opening of the spring too soon will cause slippage.

The cycle clutch spring should be adjusted for clearance between the spring and pulley hub. Excessive clearance will not allow enough engagement of the spring on the hub, causing slippage. Too little clearance will cause the spring to bind against the pulley hub and overload the clutch release train, giving rise to sluggish keyboard reaction as well as noisy idling.

The cycle clutch collar should be adjusted for end play of the clutch sleeve. Too little play of the sleeve can result in erroneous readings of the cycle shaft end play (where the sleeve play substitutes for the shaft play) and cause a direct mechanism drive connection between cycle pulley and shaft. This latter condition will prevent a complete closure of the cycle spring and result in slippage.

d. Worn spring (see 15.5).

15.11 Breakage of the cycle clutch latch has been caused by forming the hardened part to track the restoring roller on the restoring cam. The latch is now soft in the area of the restoring roller extension and will not break when formed.

15.12 Check the shift mechanism to be sure that it detents reliably and does not interfere with cycle clutch operation.

TAPES

16.1 The most common causes of rotate tape breakage are:

a. Rotate detent clearance. (Is the detent actuating lever roller in place?)
b. Print shaft timing.
c. Shift interlock adjustments.
d. Shift arm moving out in straight line.
e. Defective rotate arm or shift arm pulley.
f. Any bind that affects free rotation of the head.
g. Loose or missing tape guide.
h. Burrs on any area where the tape travels.
i. Negative latch clearance is insufficient.
j. Latch links adjusted too long.
k. Latches slip from under the bail during operation (links too short).
l. Foreign material obstructing the travel of the tape.
m. Interference between the tilt and rotate pulleys.
n. See 10.23.

16.2 Most common causes of tilt tape breakage are as follows:

a. Detent to tilt ring clearance.
b. Burrs on the tilt pulley (especially where the tape comes out of the pulley).
c. Any bind that affects free motion of the tilt ring.
d. Foreign material in the sector gears.
e. Print shaft timing (affects the rotate mechanism more).
f. Tilt pulley spring missing or broken. (Spring eye must face the rear of the machine.)
g. Interference between tilt and rotate pulleys.
h. Excessive wear in the right tilt pulley stud.

16.3 When tape breakage or malselection occurs, a curled end or a ragged leading edge on a tilt tape will indicate one of the following:

a. Shift arm not parallel to the carrier.
b. Rotate or tilt arm not parallel to the carrier.

Should it be necessary to move the rotate and tilt arm (using their mounting bracket) further to the rear of the machine, it may be necessary to file a small amount of material from the power frame edge in the area of the tilt tape, in order to ensure no interference. Should it be necessary to move the arms toward the front, check for interference with the following:

a. The rotate eccentric stud on the paper bail spring.
b. The rotate arm itself on the damper spring stop.
c. The tilt tape rubbing across the head of the carrier shoe eccentric stud when the carrier is at the extreme left.

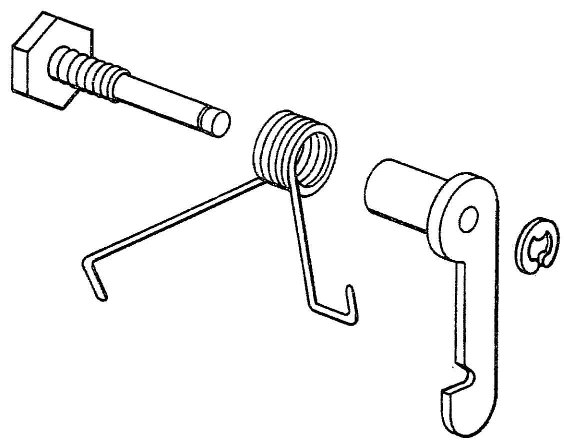


Figure 1-20. Cycle-Shaft Check-Pawl Assembly

16.4 All current production Selectric I/O printers have a spring-loaded left tilt arm. This feature prevents accidental disengagement of the tilt tape from its pulleys whenever slack is introduced into the system. For example, if the operator should manually tilt the typehead while removing or installing the head, the spring-loaded arm will automatically maintain the tape's position on its pulleys.

A similar spring is used on the shift arm to protect the rotate spring.

16.5 The rotate tape should twist "top to the front" as it leaves the left side of the carrier.

16.6 When installing the new style (crimped) tapes, it may be difficult to insert the "T" end through the rear of the rocker. To facilitate installation, the tape should be inserted eyelet first through the front of the carrier, then pulled through until the "T" can easily be inserted.

16.7 The tape wiper on the left side of the carrier must be removed. It causes flexing of the tapes that can result in malselection and eventually tape breakage.

16.8 When installing a rotate tape, it is necessary to remove the tilt pulley spring. The tilt tape slackens and usually falls off the pulley. This can be prevented by placing a rubber band around the tilt tape near its anchor pin on the right side of the carrier, and then hooking the rubber band to the right margin stop. This will hold tension on the tilt tape to keep it on the pulley, and will also hold the tape on the anchor pin clear of the path for the new rotate tape.

16.9 An improved tilt pulley and bellcrank has become available. This pulley/bellcrank will provide a more reliable tilt operation and will eliminate accidental disengaging of the tape at the pulley anchor, and will also eliminate breakage of the tilt tape due to flexing at the tape anchor point.

All former gearless tilt tapes and tilt pulleys have been made obsolete. When replacement parts are necessary, a complete conversion to the current level will be required (Figure 1-21).

Since the new pulley is heavier, it may be necessary to use two spacer washers to provide sufficient clearance between the pulley and the yoke in tilt 3 position. The mounting stud should be lubricated with IBM No. 23 grease and the felt washer kept dry. The purpose of this washer is to keep erasures out of the pivot bushing.

KEYBOARD LOCKUP

17.1 The most common causes for keyboard lockup are:

a. The cycle clutch latch link pawl does not clear the keeper with an interposer latched down.
b. Filter shaft timing or excessive backlash of the idler gears.
c. Cycle shaft overthrow adjustment.
d. Latch motion restricted by restoring roller.
e. Cycle clutch adjustments, latch binding.
f. Character interrupter adjustment.
g. The linelock interposer binds in the selector compensator (clean and lubricate).

TRANSMIT ERRORS

18.1 The transmit contacts may be dirty. Clean with IBM cleaning fluid, then wipe dry with clean bond paper.

18.2 Check transmit contact air gaps.

18.3 The C1 and C2 contacts must not bridge (N/O and N/C make at the same time).

18.4 If the contact actuators bind, they should be replaced with the new style. The material used in manufacturing the contact actuators has been changed from a clear translucent nylon to a cloudy, yellowish, fiber nylon. The finish of the actuator plates has been changed from nickel to chrome to provide more reliable operation of the actuators. When replacing an old style actuator with a new style actuator, the actuator plate must also be changed. Only new style actuator plates are available for field replacement. All part numbers remain the same.

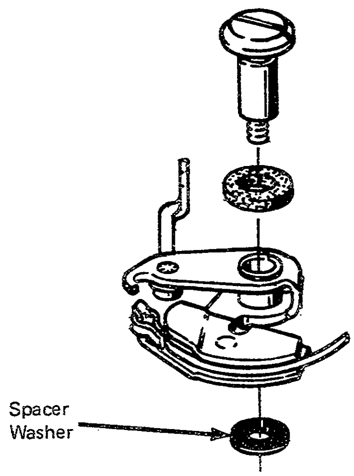


Figure 1-21. Rotate Pulley and Stud Assembly

MACHINE LOCKUP

19.1 Possible causes of machine lockup are:

a. Cycle clutch spring dry, broken, or out of adjustment.
b. Idler gear binding.
c. Print sleeve and bearings dry or worn.
d. Binds in carrier and rocker.
e. Print cam follower binding.
f. Oversized cycle clutch pulley and hub (see 15.5).
g. Shift cam backup roller adjustment (see 4.8).
h. Binds in operational or shift mechanisms.
i. Shift clutch out of adjustment.
j. Center bearing dry or binding (see 15.7).
k. Excessive backlash of filter shaft gear.

19.2 Remove typehead and recheck for lockup. If none occurs, check print shaft timing and all motion adjustments.

FAILURE TO START

20.1 If motor attempts to drive, check:

a. Centrifugal clutch binding. If any problem is traced to the centrifugal clutch or to the shaded pole motor, replace them with a new capacitor start motor assembly (motor, pulley, and 4 mfd capacitor). This motor will start the Selectric I/O printer under any normal load conditions with normal line voltage.

b. Cycle clutch pulley oversized. See 15.6.
c. Dry or binding center bearing.
d. Binding operational shaft.
e. Dry or binding shift clutch.

20.2 If motor fails to drive, check:

a. Thermal cutout open.
b. Dry motor bearings.

20.3 Drive belts may break on machines receiving heavy usage, or machines over a year old. The next time the cycle shaft is removed for replacement or adjustment, the motor belt should be replaced, regardless of its age or condition.

CONTACT ASSEMBLIES

21.1 When cleaning these assemblies, check these conditions:

a. The contacts must not bridge or bounce.
b. The contacts must be clean, especially the N/C contacts, as they tend to build up a residue.
c. The contacts should be cleaned with IBM cleaning fluid and wiped dry with clean bond paper.

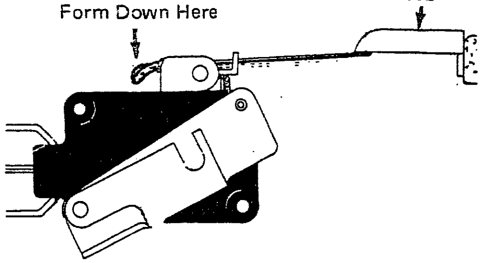


Figure 1-22. Tab-Switch Overthrow Stop

CAUTION
Do not use files, abrasives, or burnishing tools to clean the contacts.

21.1 If the contacts become oily due to oil bleeding from the blue steel straps, the contact assemblies may be replaced. I/O printer contacts now use nickel-plated straps to prevent this problem, and they may be obtained under the original part numbers.

21.3 If the actuating wire pops out from under the torque bar actuating arm, form the rear section of the actuating wire to provide an overthrow stop for the wire (Figure 1-22).

21.4 To prevent dirt, oil, and grease from entering C5 and C6 contacts, a shield has been provided. This shield may be field-installed only if a new mainspring assembly is used, since the old mainspring assembly would interfere with its installation.

These shields should be used whenever a service call or machine malfunction arises due to contact contamination.

21.5 Contact timings may be set with a meter. To detect contact bounce or a marginal bridging condition, a scope must be used.

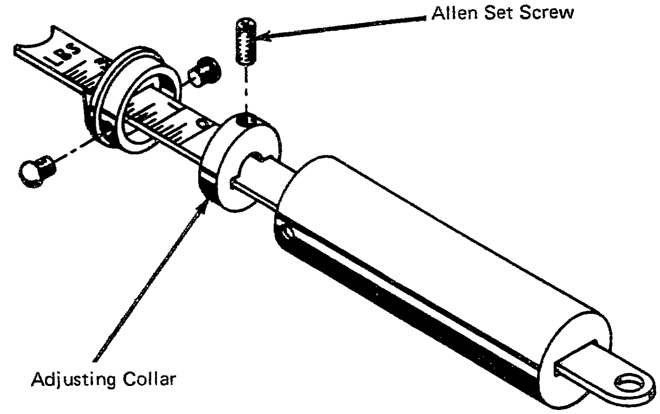


Figure 1-23. Spring Scale Calibration

SELECTRIC I/O PRINTER TOOLS AND REFERENCE MATERIAL

NOTE: See SA CEM No. 100 for tools; see SA CEM No. 410 for manuals.

22.1 Many adjustments made in the field require the use of the spring scale. Reports indicate that inaccurate scale readings have resulted from incorrect zero adjustment before measurements are made. The zero adjustment can be made by removing the two screws that fasten the end cap, and removing the end cap. This exposes an adjustable collar secured by a No. 4 Allen screw (Figure 1-24). The zero adjustment can be made by loosening the Allen screw and repositioning the collar on its shaft. The hook may have to be removed from the scale to allow the shaft to move far enough to expose the Allen screw; however, the hook should be replaced when checking the zero adjustment. Correct adjustment is checked by holding the scale in the upright position (hook hanging down) and observing that the scale reads exactly 0.

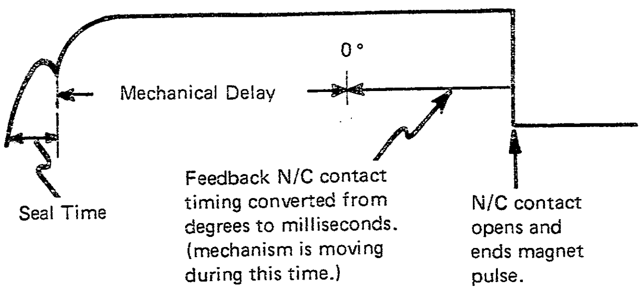


Figure 1-24. Magnet Pulse Waveform

PREVENTIVE MAINTENANCE

NOTE: Refer to Chapter 2 of this manual for inspection and lubrication procedures.

23.1 The following maintenance items require special attention:

a. Motor and motor pulley.
b. Cycle clutch spring and arbor.
c. Driven pulley hub and bearing (see 15.7).
d. Operational cam bearings.
e. Operational shaft and shift cam bearings.
f. Shift clutch spring and arbor.

These items should be lubricated every eight weeks for extra shift usage.

NOTE: Lubrication must be applied judiciously to eliminate migration or "spin-off" into electrical contact areas.

23.2 Two lubricants replace all previously used lubricants for the Selectric I/O printer. The first is IBM No. 23. This is supplied in 1/2-ounce tubes and in 1-pound cans. It should be used wherever Sil-X or a grease was previously recommended. IBM No. 23 in the 1-pound can may be used, with the grease gun and the special nozzle, on the cycle clutch grease hole located between the -5 cam and the right positive cam. The tube can be used, as is, for this purpose.

The second lubricant, IBM No. 10, should be used wherever an ET No. 6 or IBM No. 9 oil was previously specified. The new IBM No. 10 oil can be identified by a red cap on the can.

23.3 On machines prior to improved lubrication operational shaft, the torque limiter can be lubricated without disassembly. Put grease in the arbor grooves and hold the carrier against a return. The screw action of the slipping limiter draws grease back under the spring. Remove excess grease.

23.4 To prevent interference from margin set levers during cover installation, center the carrier and move the margins in until the levers can be tucked back under the ribbon mechanism.

23.5 To replace a margin set lever, force the pin out to the left with a pair of needle-nosed pliers. Grip the pliers with one jaw on the right end of the pin and the other jaw on the left side of the left lever pivot. Reinstall the pin in the same manner, but in the opposite direction.

OLSA

24.1 There are times, because of customer requirements or other considerations, when on-line service time must be held to a minimum. OLSA (Off-Line Selectric Analyzer) provides the facility for servicing the Selectric I/O printer off-line.

Many customer engineers have replaced a Selectric I/O in a system with a spare machine and have then found that the I/O will apparently perform satisfactorily on OLSA. This section of the manual describes rigorous diagnostic procedures possible with OLSA. Several of the main items are:

a. Using OLSA as an exerciser.
b. Diagnosing mechanical problems.
c. OLSA servicing aids for the Selectric.
d. Scoping procedures for OLSA and the I/O.

24.2 To use OLSA effectively, obtain as much information about the failure as possible:

a. Before disconnecting the Selectric I/O printer from the system, be sure that the trouble is in the printer.
b. Use every available moment of on-line time to diagnose the symptoms.
c. Endeavor to duplicate the failure under known conditions.
d. Obtain printouts, when available, showing the I/O printer malfunction.
e. Use error indications and CE test panels, when available, to help determine what area in the Selectric might be causing the trouble.
f. Ask (especially on keyboard machines) whether it fails only on output, only on input, or on both.
g. Listen for erratic rather than rhythmic print clutch operation. Also, listen for excessive noise in one area or during any one operation. The machine should not be slower in performing any one operation than in others.

If failure areas, failure conditions, and failure symptoms are known, OLSA may be used to:

a. Duplicate the conditions that brought on the failure.
b. Pinpoint the failing mechanism or component.
c. Determine when the malfunction has been corrected.

OLSA SERVICE HINTS

NOTE: Refer to the OLSA Instruction/Reference Manual for instructions on how to connect your Selectric I/O to OLSA.

25.1 Hand cycling operation is as follows:
a. Turn motor switch off.
b. Set desired operation on function switch.
c. Set desired character on tilt rotate switch.
d. Push Start.
e. Use hand cycle wheel on Selectric I/O.

Suppose that your printer is intermittently failing to space. Print escapement is satisfactory, so the trouble is in the operational area. Set function switch to print/space and push start on OLSA. Every other machine cycle will be a space cycle.

Hand cycle and observe:
a. Space magnet armature pick.
b. Space interposer unlatching clearance and movement to rear.
c. Cycle release arm trips.
d. Space operational latch is pushed under operational cam follower bail.
e. Space clutch pawls drop into ratchet and cam turns.
f. Escapement torque bar pulls escapement pawls from rack.
g. Carrier moves one space.
h. Escapement trigger relatches on escapement torque bar lever.

Any interruption in this sequence of events will cause a failure to space.

25.2 A one-armature test will check the ability of the magnet assembly to trip the cycle clutch with only one print magnet energized.
a. Function switch: Print Alternate
Tilt and rotate: Print T3, R0
Print alternate: T1, R+5
(On print cycles, R-5 only will be energized. On print alternate cycles, T-2 only will be energized.)
b. Function switch: Print
Tilt and rotate: T3, R+3
Each machine cycle, only the R2A armature will be energized.
If the machine will fail with only the R2A armature attracted but will work with the T2 and R-5 armatures, see 14.7. If neither test will run, hand-cycle through the operation and follow the print area in the output mode flow chart (Figure 1-11).

25.3 An all-armature test will check the print area for extra cycles, caused by magnet assembly failures.
Function switch: Print/Space
Tilt and rotate: T0, R-5
A failure will appear as a T3, R+5 character (usually a period) in place of a space. Check magnet assembly adjustments, particularly armature knock-off and trip lever to latch lever bite.

25.4 Use OLSA tilt and rotate switches, and dynamically half-cycle while checking detent and alignment adjustments.

25.5 Contact failures in the Selectric I/O may cause extremely difficult-to-diagnose malfunctions in on-line applications but will not be detected by OLSA circuitry.

Contacts *must* be correctly timed, in proper adjustment, clean, and bounce-free.

Contact timing can be checked with a meter while hand-cycling the machine. Contacts timed under hand power show little or no change when later checked dynamically.

Contact bridging (make-before-break) can also be checked with a meter, but this can be regarded only as a preliminary check. When checking for bridging, it may be necessary to remove contact wiring to eliminate back circuits. To check for bridging, connect meter leads between N/O point and N/C point of contact assembly. Slowly hand-cycle the machine and watch for a short indication on the meter. Check N/O air gap and N/C contact rise if a bridging condition is indicated.

Contact bounce must be checked dynamically with a scope. Bounce is seen on the scope as a "noisy" or "broken up" signal rather than the clean, sharp rise time and stable up level of a normal contact signal. See 30.3.

Bounce may be caused by insufficient tension on the contact straps, or by loose pile up screws in the contact assembly.

Dirty contact points will cause much the same indication on the scope as bounce. Contacts should be cleaned with IBM cleaning fluid and clean, lint-free paper. Never use an abrasive cleaning tool on Selectric contacts.

Contact bridging may show up under dynamic conditions, and appears as noise just after make time and just before break time.

SAFETY

26.1 Safety regulations require that all electronic equipment must be provided with a chassis ground and that this chassis ground must be returned to earth ground through the third (green) wire of the ac line cord.

IBM safety regulations forbid any deviation from the above and, therefore, the practice of "floating" the scope must not be employed.

OLSA's power supply has been designed so that its reference point (or chassis ground) can be determined by the needs of the user. This eliminates any need to "float" a scope.

SCOPING PROCEDURES WITH OLSA

27.1 Internally wired in OLSA are 47Ω resistors in series with the print select magnets. It is the voltage drop across these resistors that will show print magnet characteristics on the scope.

With machines using + polarity, put the scope probe in the magnet common jack and the ground lead in the print magnet test jack (T1, R-5, CK, etc.).

With machines using - polarity, put the scope probe in the print magnet test jack and the ground lead in the magnet common jack.

The scope wave form then will always appear as a rising signal.

27.2 To scope any other Selectric I/O magnet, it is required that a 47 ohm resistor be temporarily wired in series with the magnet pick coil. Attach an alligator clip to one end of the resistor and a pin connector to the other. This device can be kept with the OLSA. To use, remove the magnet pick coil wire from its edge connector and clip it to the resistor. Insert the pin connector on the other side of the resistor into the edge connector in place of the wire. Scope across the two pins on the epoxy block.

To scope contact points, put scope probe on point to be observed and connect the ground lead to the power supply common jack on OLSA.

27.3 Since OLSA magnet pulses are under control of feedback contacts in the Selectric, it is possible to scope the magnet pulses and to calculate how much time is required to perform any mechanical action initiated by the magnet pulse.

Seal time can be observed on the scope (Figure 4-25). Feedback timings should be checked with a meter to ensure that they are correct according to your machine specifications. Timings in degrees can be converted to milliseconds by referring to the conversion chart (Figure 1-25).

SELECTRIC I/O SPECIFICATIONS

28.1 Magnets and Solenoids:

Component	*Maximum Pick Time*
Keyboard Lock Solenoid	55 ms
Ribbon Shift Magnet	12 ms
All Other Magnets	10 ms

NOTE: Backspace on 2741 with typamatic feature, 8 ms.

28.1 Clutch Operating Speeds:

Mechanism	*Maximum Mechanical Delay*
Print Cycle Clutch	10 ms
Operational Cycle Clutch	14 ms
Shift Clutch	7 ms

SELECTRIC I/O MODES OF OPERATION

29.1 In closed loop, character rate is under control of I/O feedback signals. A character will not be sent to the I/O until feedback contacts have signaled that the previous cycle is almost complete and the printer is ready for another character.

29.2 In the open-ended mode of operation, the character rate is fixed, independent of the I/O feedback signals. This rate is usually set at 14.8 characters per second, or a character every 67.5 ms.

The Selectric I/O can run wide open at the rate of 15.5 characters per second, or a character every 64.5 ms. This 3-millisecond difference is the safety factor allowed in the event of a slow printer cycle.

OSCILLOSCOPE INTERPRETATIONS

The following oscilloscope trace pictures cover every area of the Selectric I/O printer. Wherever scoping is necessary, refer to these photos for comparative analysis.

DEGREES TO MILLISECONDS											
1	0.36	31	11.10	61	21.84	91	32.58	121	43.32	151	54.06
2	0.72	32	11.46	62	22.20	92	32.94	122	43.68	152	54.42
3	1.07	33	11.81	63	22.55	93	33.29	123	44.03	153	54.77
4	1.43	34	12.17	64	22.91	94	33.65	124	44.39	154	55.13
5	1.79	35	12.53	65	23.27	95	34.01	125	44.75	155	55.49
6	2.15	36	12.89	66	23.63	96	34.37	126	45.11	156	55.85
7	2.51	37	13.25	67	23.99	97	34.73	127	45.47	157	56.21
8	2.86	38	13.60	68	24.34	98	35.08	128	45.82	158	56.56
9	3.22	39	13.96	69	24.70	99	35.44	129	46.18	159	56.92
10	3.58	40	14.32	70	25.06	100	35.80	130	46.54	160	57.28
11	3.94	41	14.68	71	25.42	101	36.16	131	46.90	161	57.64
12	4.30	42	15.04	72	25.78	102	36.52	132	47.26	162	58.00
13	4.65	43	15.39	73	26.13	103	36.87	133	47.61	163	58.35
14	5.01	44	15.75	74	26.49	104	37.23	134	47.97	164	58.71
15	5.37	45	16.11	75	26.85	105	37.59	135	48.33	165	59.07
16	5.73	46	16.47	76	27.21	106	37.95	136	48.69	166	59.43
17	6.09	47	16.83	77	27.57	107	38.30	137	49.05	167	59.79
18	6.44	48	17.18	78	27.92	108	38.66	138	49.40	168	60.14
19	6.80	49	17.54	79	28.28	109	39.02	139	49.76	169	60.50
20	7.16	50	17.90	80	28.64	110	39.38	140	50.12	170	60.86
21	7.52	51	18.26	81	29.00	111	39.74	141	50.48	171	61.22
22	7.88	52	18.62	82	29.36	112	40.10	142	50.84	172	61.58
23	8.23	53	18.97	83	29.71	113	40.45	143	51.19	173	61.93
24	8.59	54	19.33	84	30.07	114	40.81	144	51.55	174	62.29
25	8.95	55	19.69	85	30.43	115	41.17	145	51.91	175	62.65
26	9.31	56	20.05	86	30.79	116	41.53	146	52.27	176	63.01
27	9.67	57	20.41	87	31.15	117	41.89	147	52.63	177	63.37
28	10.02	58	20.76	88	31.50	118	42.24	148	52.98	178	63.72
29	10.38	59	21.12	89	31.86	119	42.60	149	53.34	179	64.08
30	10.74	60	21.48	90	32.22	120	42.96	150	53.70	180	64.44

CHARACTER RATE VS. CYCLE TIME (REFERENCE ONLY)				
10.0 - 100	13.2 - 75.8	13.8 - 72.5	14.4 - 69.5	15.0 - 66.7
10.5 - 95.2	13.3 - 75.2	13.9 - 72.0	14.5 - 69.0	15.1 - 66.2
11.0 - 90.9	13.4 - 74.6	14.0 - 71.4	14.6 - 68.5	15.2 - 65.8
12.0 - 83.3	13.5 - 74.0	14.1 - 70.9	14.7 - 68.0	15.3 - 65.4
13.0 - 76.9	13.6 - 73.5	14.2 - 70.4	14.8 - 67.5	15.4 - 65.0
13.1 - 76.3	13.7 - 73.0	14.3 - 69.9	14.9 - 67.1	15.5 - 64.5

Figure 1-25. Time Conversion Charts

30.1 Print Magnets (Figure 1-26 through 1-28).

OLSA Function: Print Space
Tilt and Rotate: T3/R+3
Scope: Mag Common
Ref: R2A Test Jack
Time Base: 5 ms/cm
Vert Amp: 2 volt/cm
Sync: + Int

Time from start of pick to C2 N/C opens 25.0 ms

Magnet seal time 6.0 ms

C2 N/C opens at 35° = 12.5 ms

18.5 ms

Total Mechanical Delay 6.5 ms

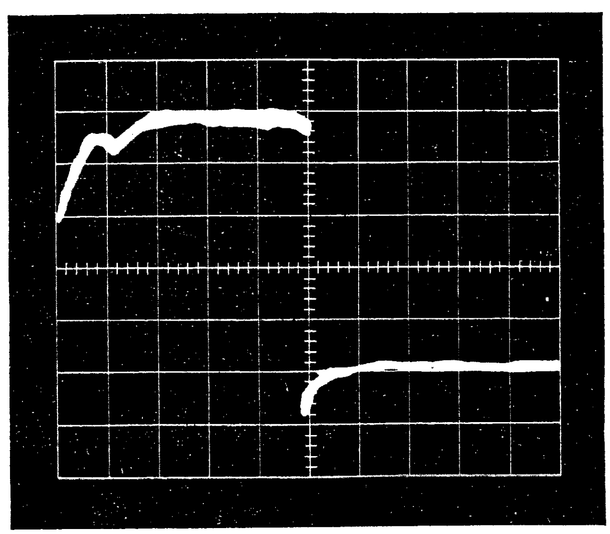


Figure 1-26. Print Magnet R2A (One Armature Picked)

OLSA Function: Print Space
Tilt and Rotate: T0 R-5
Scope: Mag Common
Ref: R2A Test Jack
Time Base: 5 ms/cm
Vert Amp: 2 volt/cm
Sync: + Int

Time from start of pick to C2 N/C opens		26.0 ms
Magnet seal time	5.0 ms	
C2 N/C opens at 35° =	12.5 ms	
		17.5 ms
Total Mechanical Delay		8.5 ms

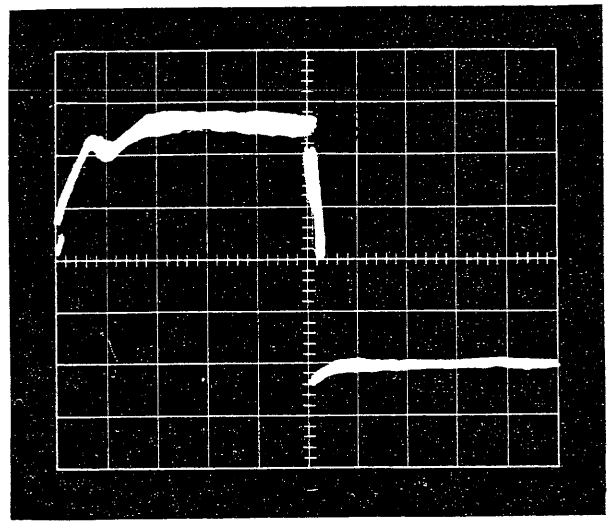


Figure 1-27. Print Magnet R2A (All Armatures Picked)

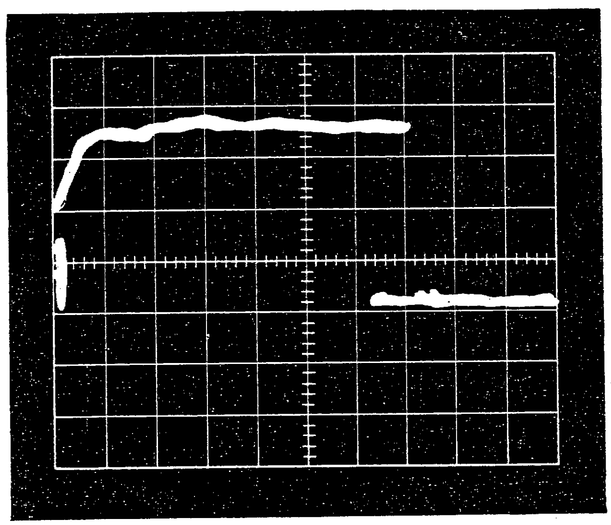


Figure 1-28. Sluggish Print Armature Caused by Maladjusted Trip-Lever Bite

30.2 Operational Magnets (Figure 1-24 through 1-29).

OLSA Function: Print CR
Scope: Across resistor in series with magnet coil
Time Base: 10 ms/cm
Vert Amp: 1 volt/cm
Sync: + Int

Time from pick to carrier return intlk* opens		82.0 ms (avg.)
Magnet seal time	8.0 ms	
C/R intlk opens at 190°	67.9 ms	
		75.9 ms
Average Mechanical Delay		6.3 ms

*Use C-6 if available on your printer.

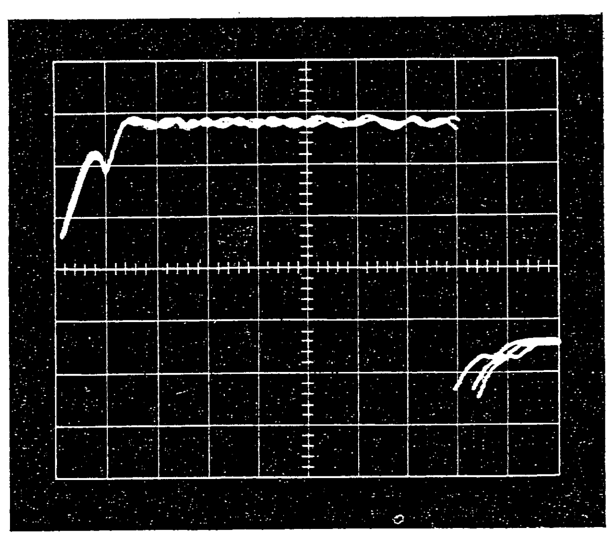


Figure 1-29. Carrier Return/Index

OLSA Function: Print Space
Scope: Across resistor in series with magnet coil
Time Base: 5 ms/cm
Vert Amp: 1 volt/cm
Sync: + Int

Time from start of pick to C5 N/C Opens		37.0 ms
Magnet seal time	8.0 ms	
C5 N/C opens at 55°	19.7 ms	
		27.0 ms
Total Mechanical Delay (see Figure 1-30)		9.3 ms

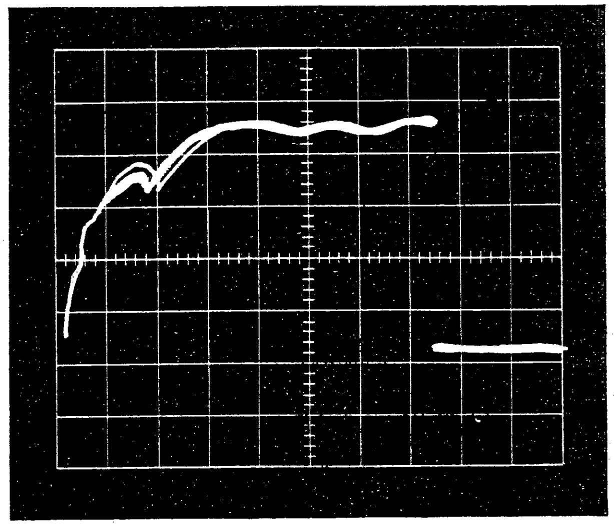


Figure 1-30. Space/Backspace/Tab

Time Base: 5 ms/cm

Time from start of pick to feedback		42.5 ms
Magnet seal time	6.5 ms	
Feedback contact opens at 55°	19.7 ms	
		26.2 ms
Total Mechanical Delay (see Figure 1-30)		16.3 ms

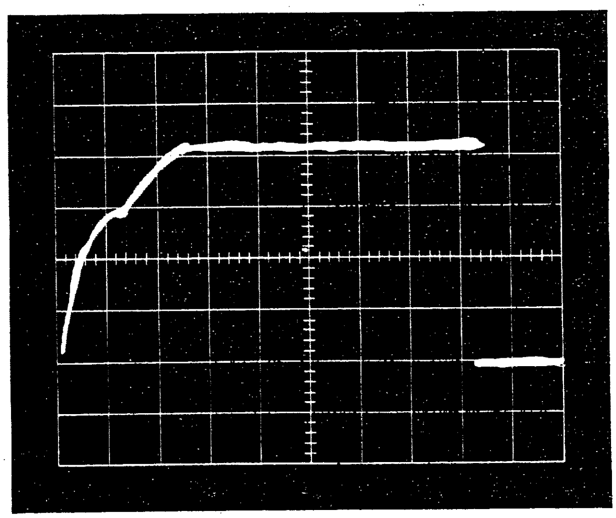


Figure 1-31. Excessive Mechanical Delay

Scope: Across resistor in series with magnet coil

Set OLSA to single cycle. Operate the printer in short bursts with the START pushbutton. Observe the variation of pulse length. The example shows a variation in pulse length of about 12 ms for the eight printer cycles recorded.

The distance in time between the teeth of the dog clutch ratchet is 14 ms. Normal operational cycles will vary in time, depending upon where the clutch pawl enters the clutch ratchet. This variation, however, should never exceed 14 ms; any more variation would indicate worn pawls or ratchets.

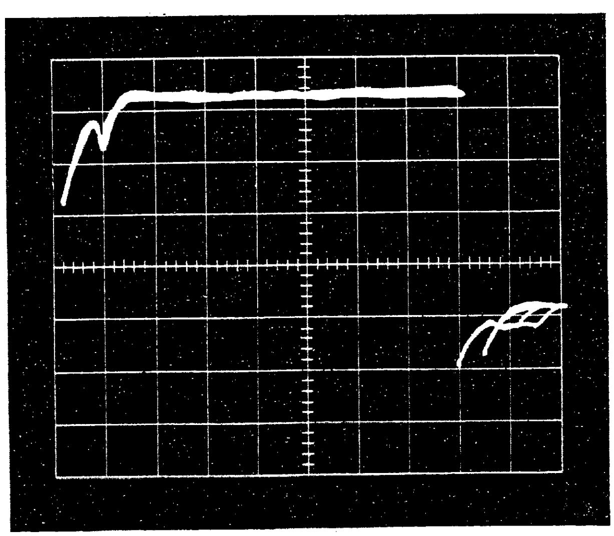


Figure 1-32. Dog-Clutch Pawl and Ratchet Check

Scope: Across resistor in series with magnet coil
Time Base: 10 ms/cm
Vert Amp: 2 volts/cm
Sync: + Int

Time from start of pick to feedback		25.0 ms
Magnet seal time	6.0 ms	
C4 makes at 35°	12.5 ms	
		18.5 ms
Total Mechanical Delay		6.5 ms

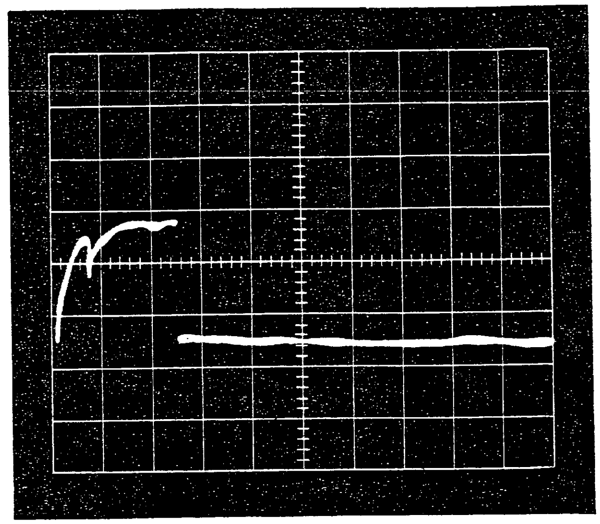


Figure 1-33. Lowercase Magnet

Scope: Across resistor in series with magnet coil
Time Base: 10 ms/cm
Vert Amp: 2 volts/cm
Sync: + Int

Time from start of pick to feedback		28.0 ms
Magnet seal time	10.0 ms	
C3 makes at 35°	12.5 ms	
		22.5 ms
Total Mechanical Delay		5.5 ms

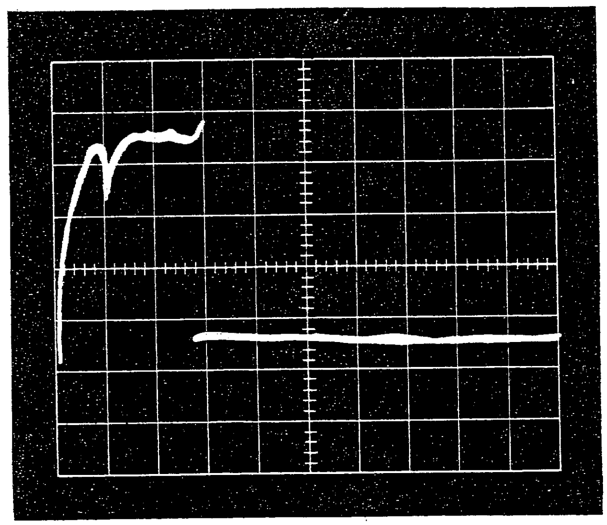


Figure 1-34. Uppercase Magnet

30.3 Print Feedback Contacts (Figure 1-35 through 1-38).

Machine Cycle = 65 ms
Scope: C2 N/O contact point
Ref: Power supply common
Time Base: 10 ms/cm
Vert Amp: 2 volts/division (with 10x attenuated probe)

Rise of C2 N/O to next C2 N/O = One Machine Cycle

Scope: C2 o/p
Ref: Power supply common
Time Base: 10 ms/div
Vert Amp: 5 volt/cm with 10x attenuated probe

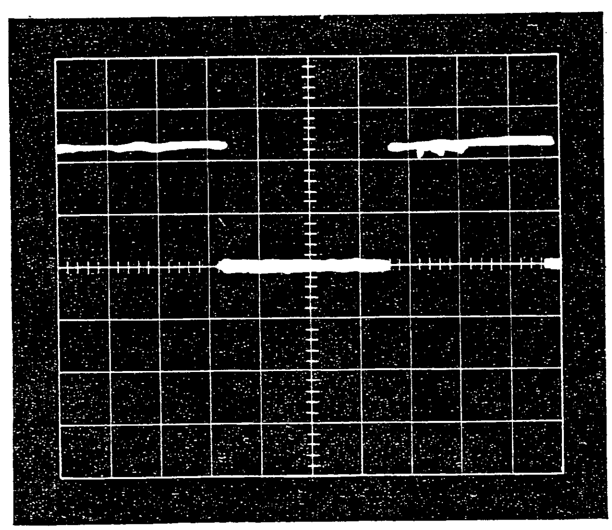


Figure 1-35. Machine Speed Check

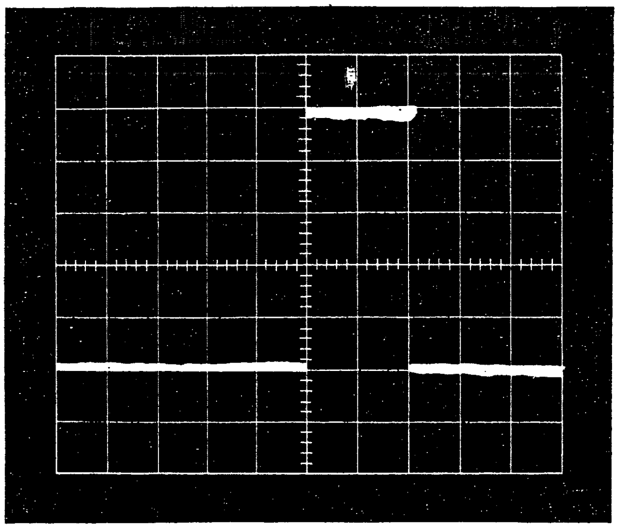


Figure 1-36. C1 N/O Point

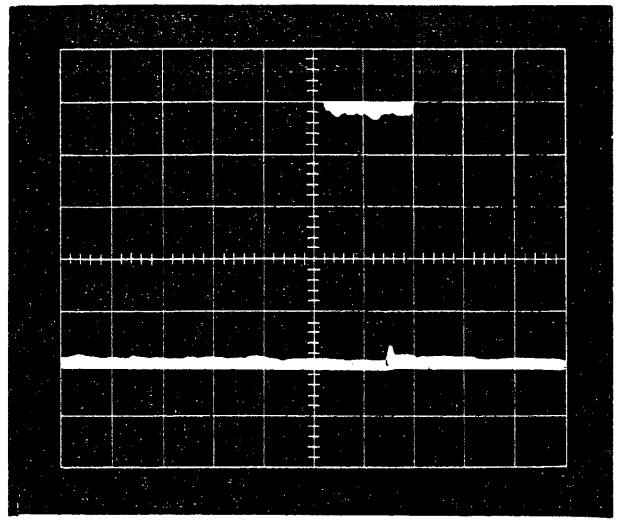


Figure 1-37. Bouncing C1 N/O Point

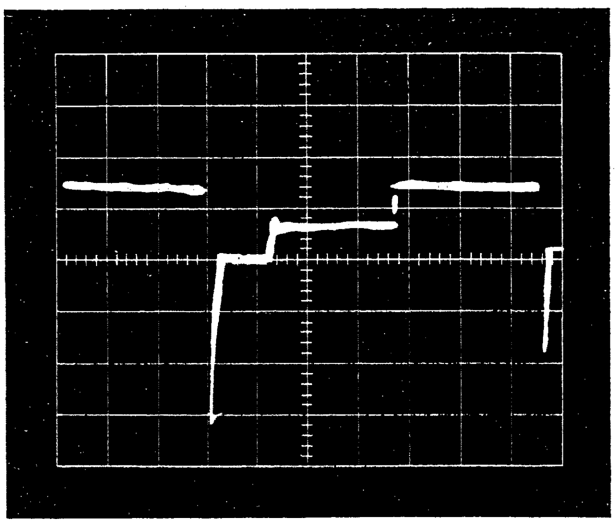


Figure 1-38. C2 O/P with OLSA

Figure 1-38 shows the oscilloscope pattern seen on C2 operating point when the Selectric® I/O printer is attached to OLSA. This is a normal signal reflecting inductive spikes generated by OLSA relays. These spikes do not originate in the printer.

30.4 Explanation of Mechanical Delay

Dropping characters, malselection, or extra cycles can result from excessive mechanical delay, depending upon the mechanism affected and the amount of excessive delay.

Magnet seal time (Figure 1-30)	3.0 ms	
C5 N/C opens at 55° converted to ms	19.7 ms	
		27.7 ms

27.7 ms is the total time excluding mechanical delay time.

Therefore – Total Pulse Length =	37.0 ms	
Subtracting seal time + C5 N/C time	-27.7 ms	
Will equal the mechanical delay		9.3 ms

9.3 ms is within Machine Specifications (14 ms max.)

Magnet seal time (Figure 1-31)	6.5 ms	
C5 N/C opens at 55° converted to ms	19.7 ms	
		26.2 ms

26.2 ms is the total time, excluding mechanical delay time.

Therefore – Total Pulse Length	42.5 ms	
Subtracting seal time + C5 N/C time	-26.2 ms	
Will equal the mechanical delay		16.3 ms

16.3 ms is in excess of Machine Specifications (14 ms max.)

The 9.3 ms is within Machine Specifications, but 16.3 ms is excessive. If this printer were to be run in an open-ended application, the closure of C5 N/C would signify that the printer is ready for another character. The C5 N/C contacts on this printer close at 130° or 46.5 ms after the cycle starts.

Normal Mechanical Delay	9.3 ms	
Magnet seal time (Figure 1-31)	8.0 ms	
0° to 130°	46.5 ms	
		63.8 ms

This printer, then, would be able to accept the next character in 63.8 ms or, for this one cycle, at better than the 15.5 character rate.

Excessive Mechanical Delay	16.3 ms
Magnet seal time (Figure 4-32)	6.5 ms
0^{o} to 130^{o}	46.5 ms
	69.3 ms

This printer, then, would be able to accept the next character in 69.5 ms or, for this one cycle, at the 14.4 character rate. In an open-ended application, the character would be presented to the printer in 67.5 ms (14.8 characters per second), before the printer is ready to accept it. Since the C5 contacts would still be open, part of the new incoming pulse would be lost.

I/O COMPONENT LOCATION

31.1 Print selection and operational magnet assemblies and their corresponding terminal block locations are shown in Figure 1-39.

SCOPING REQUIREMENTS, C-CONTACT (6400)

NOTE: The contacts should be adjusted according to the timing chart (Figure 1-40) for proper make and break times. The following timing is the result of adjusting the contacts by the manual "degree" method. The purpose of scoping the contacts is to observe the contact bounce and transfer time.

The tab and carrier return interlock timing can be adjusted by scoping the interlock contact relation to its respective feedback contact (C-contact). Isolate interlock contacts from C-contacts when scoping C-contact to interlock relationship. N/O points can be used for triggering while scoping contacts.

32.1 C1 N/O contact makes for 24 ms ± 2 ms. (C1 is not used in the Ledger Printer.)

32.2 C2 (primary printer) makes for 32 ms ± 2 ms. C2 (ledger printer) makes for 20 ms ± 2 ms.

32.3 C3 and C4 N/O contacts each make for 39 ms ± 5 ms.

32.4 C5 N/O contact makes for 22 ms ± 2 ms.

32.5 C6 N/O contact makes for 40 ms ± 5 ms.

32.6 C1, C2, C3, C4, C5, C6 contact transfer time is $0^{o} \pm 4^{o}$ or 0 ms ± 1.5 ms.

32.7 The time from the break of the N/O C-contacts to the end of the N/C C-contact bounce shall not exceed 12^{o} or 4 ms.

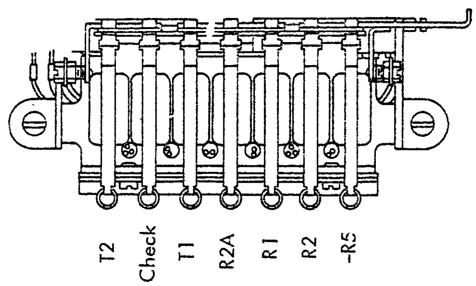
32.8 A transmitting contact makes at least 5^{o} or 1.8 ms before its respective C-contact N/O makes, and breaks at least 5^{o} or 1.8 ms after its respective C-contact N/O breaks. Contact bounce must not exceed 2 ms after C-contact N/O makes.

32.9 Tab interlock switch transfers at least 8 ms before C5 N/O breaks and remains closed for the duration of the tab operation.

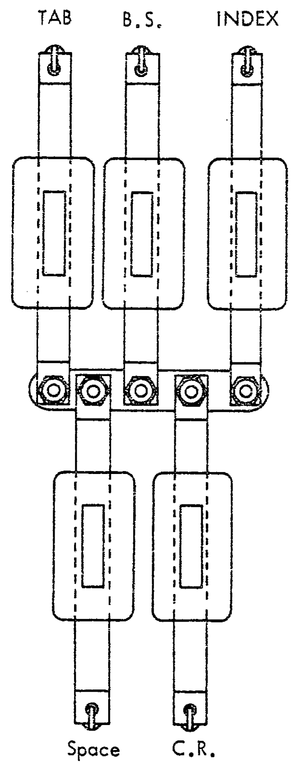
32.10 Carrier return interlock N/O contact makes at least 10 ms before C6 N/O breaks and remains closed for the duration of the carrier return operation.

MACHINE TIMING

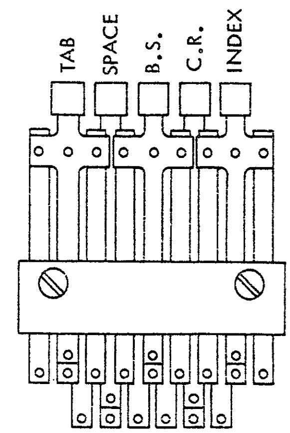
33.1 Figures 1-41 through 1-47 are for the reference only. For correct timing by machine type, see particular adjustment section.



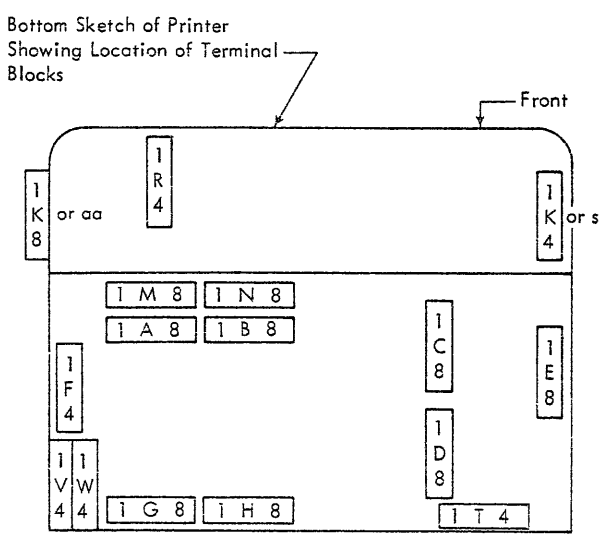
Print Selection Magnet Assembly



Operational Magnets



Operational Magnet Contacts



Keyboard Selectric I/O Printers

NOTE: No Selectric I/O Printer has all illustrated terminal blocks. The terminal blocks present appear in this configuration and are designated by indicated lettering.

NOTE: Terminal lettering may appear in either small or capital letters on printer wiring diagrams.

Figure 1-39. Selection and Transmit Components

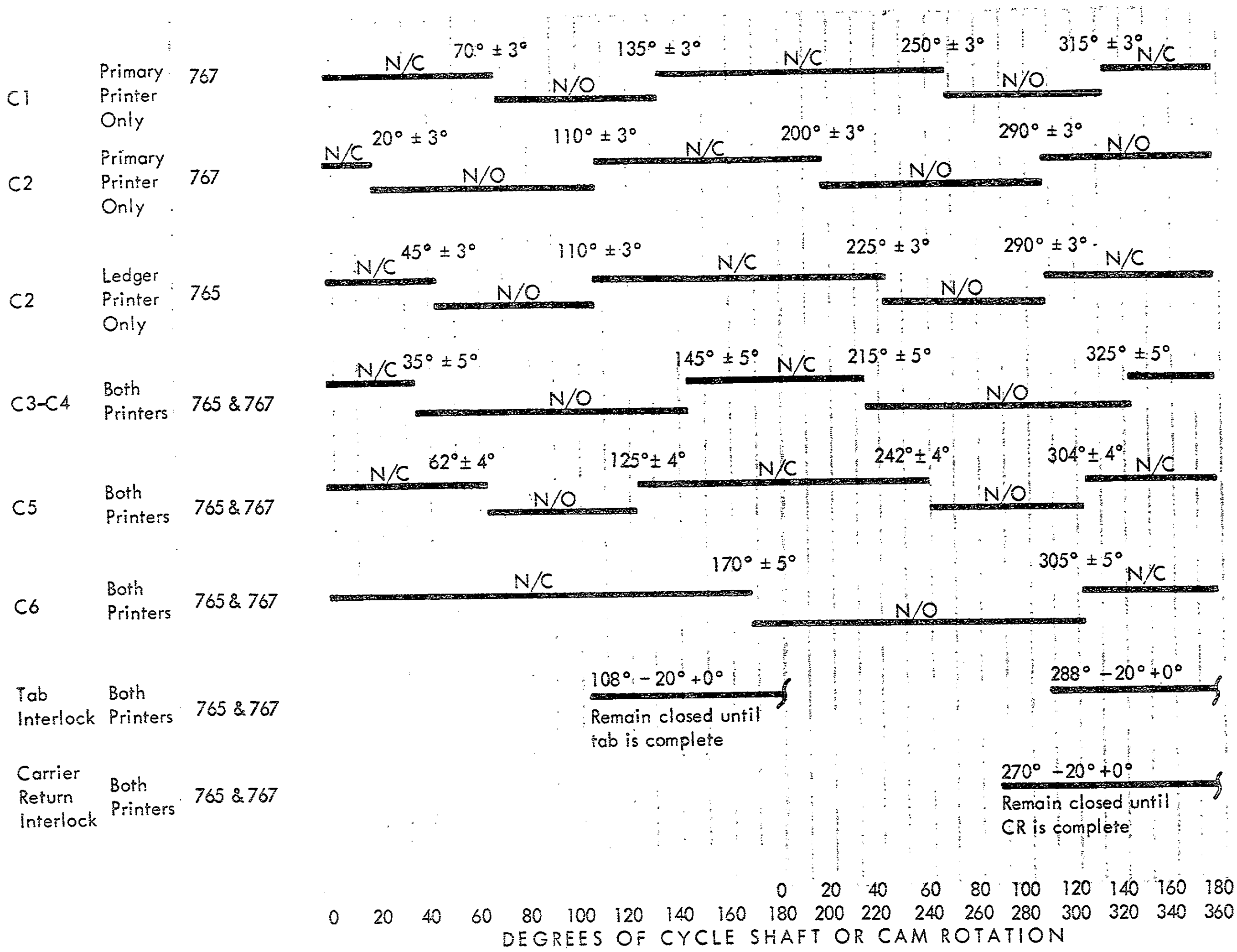


Figure 1-40. 6400 Feedback and Interlock Contact Timing

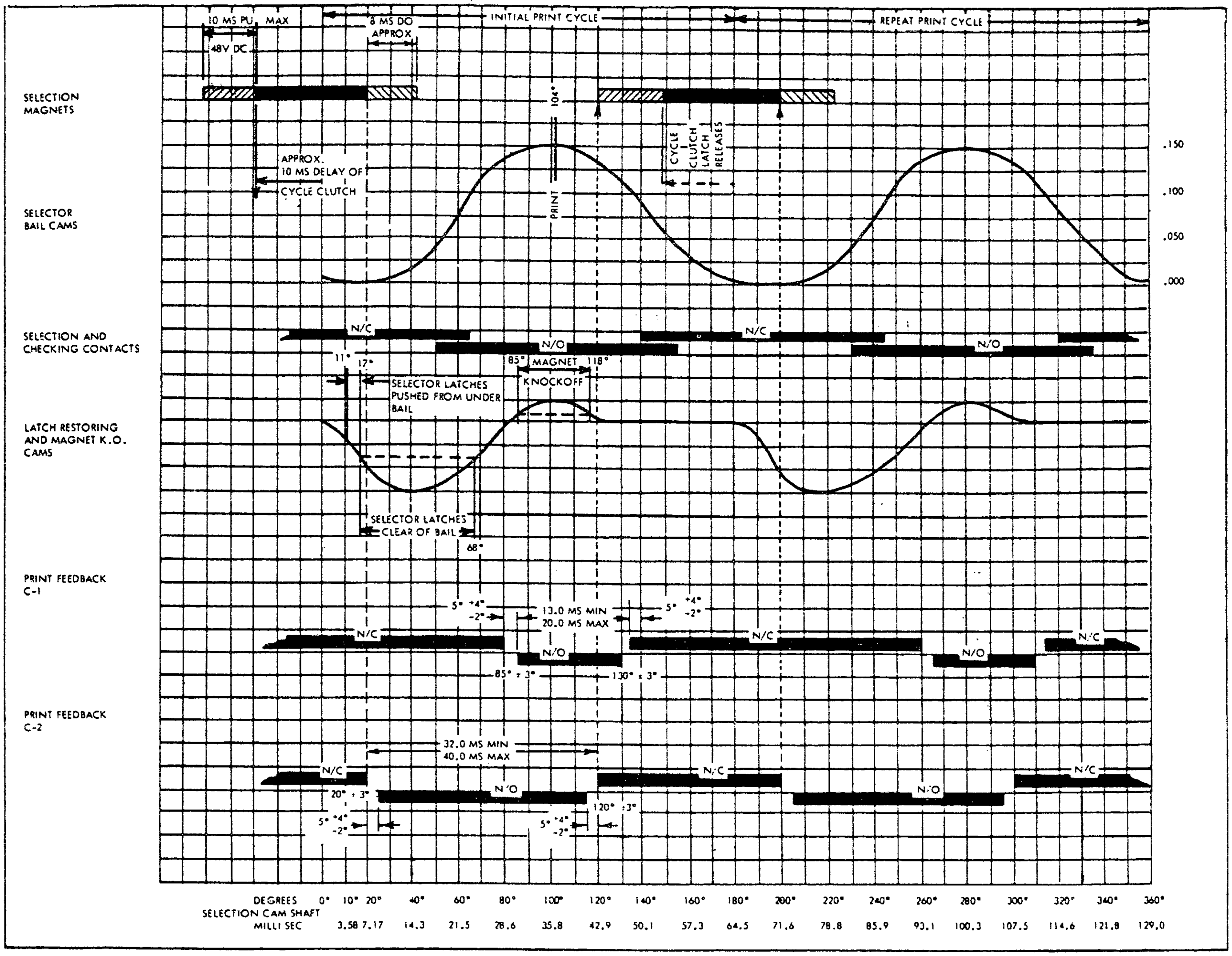


Figure 1-41. Print Selection Timing

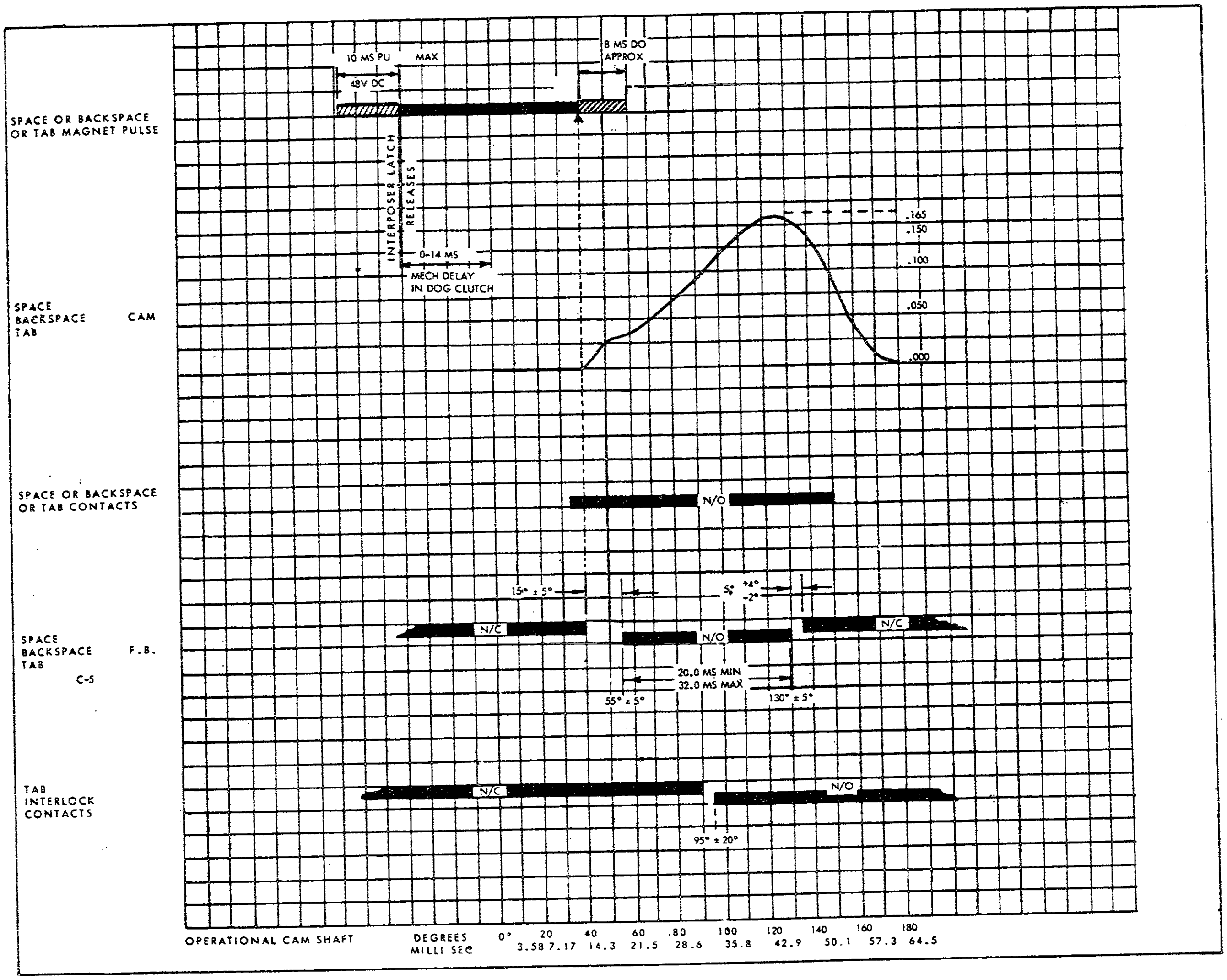


Figure 1-42. Space, Backspace, and Tab Timing

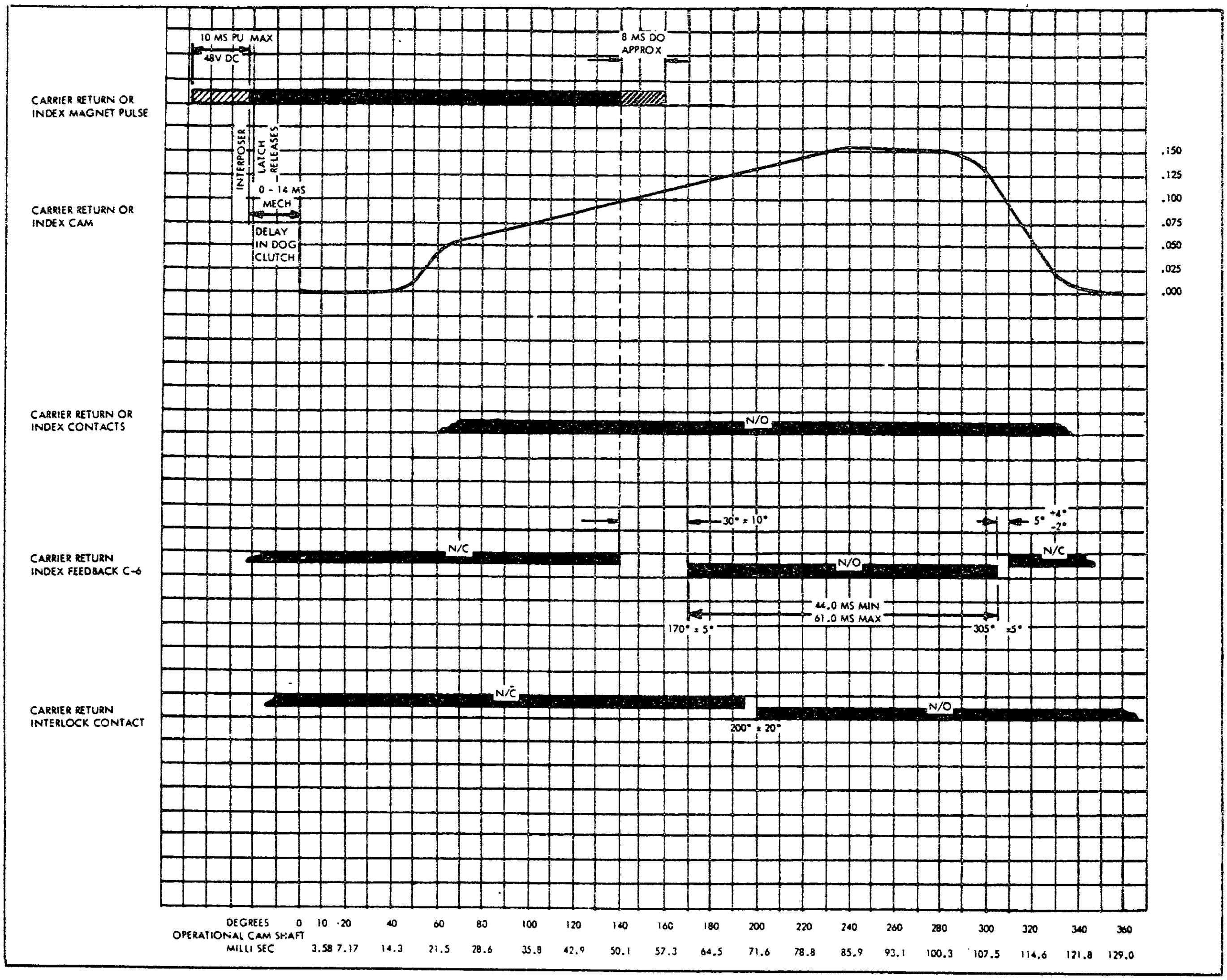


Figure 1-43. Carrier Return and Index Timing

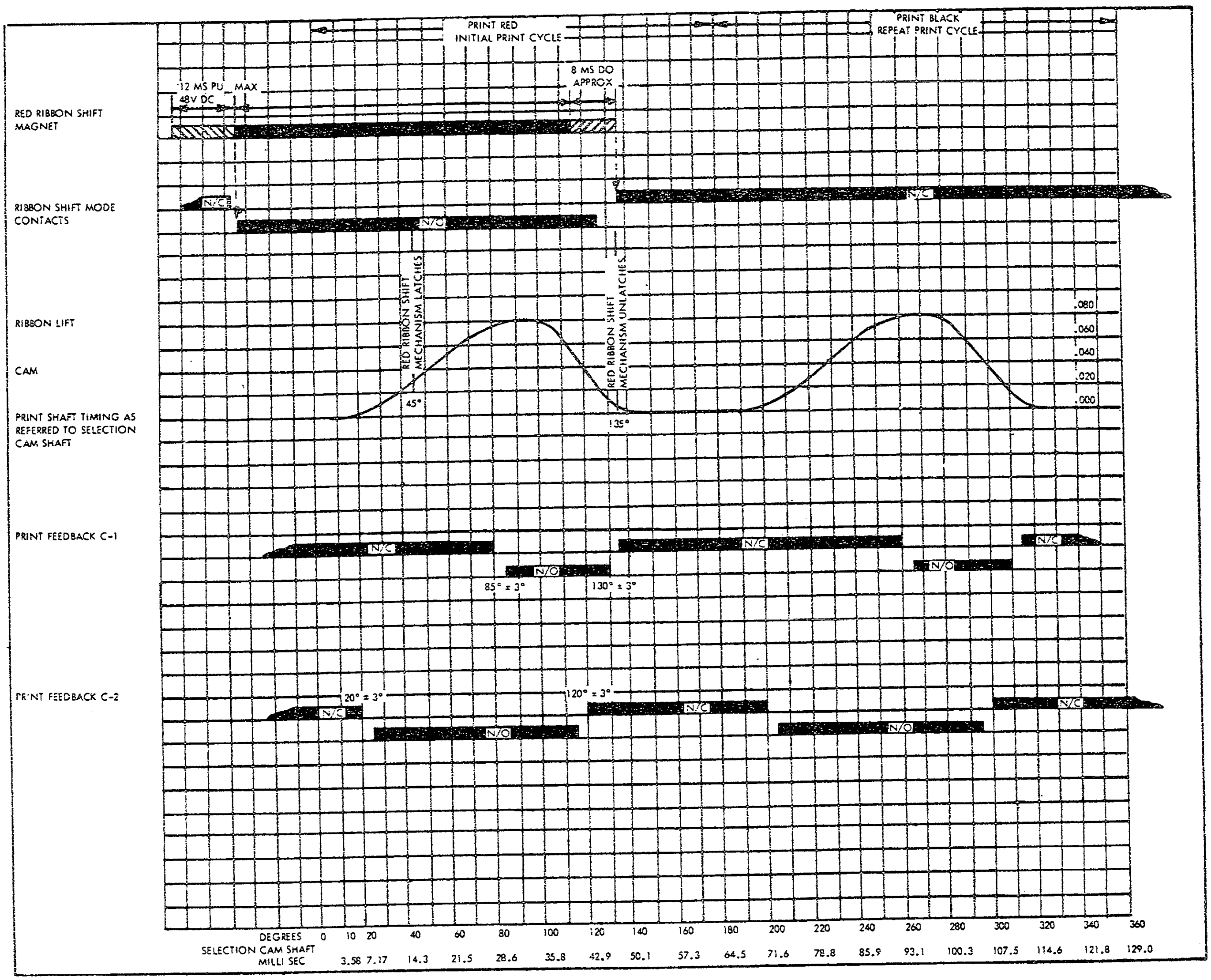


Figure 1-44. One-Magnet Red-Ribbon-Shift Timing

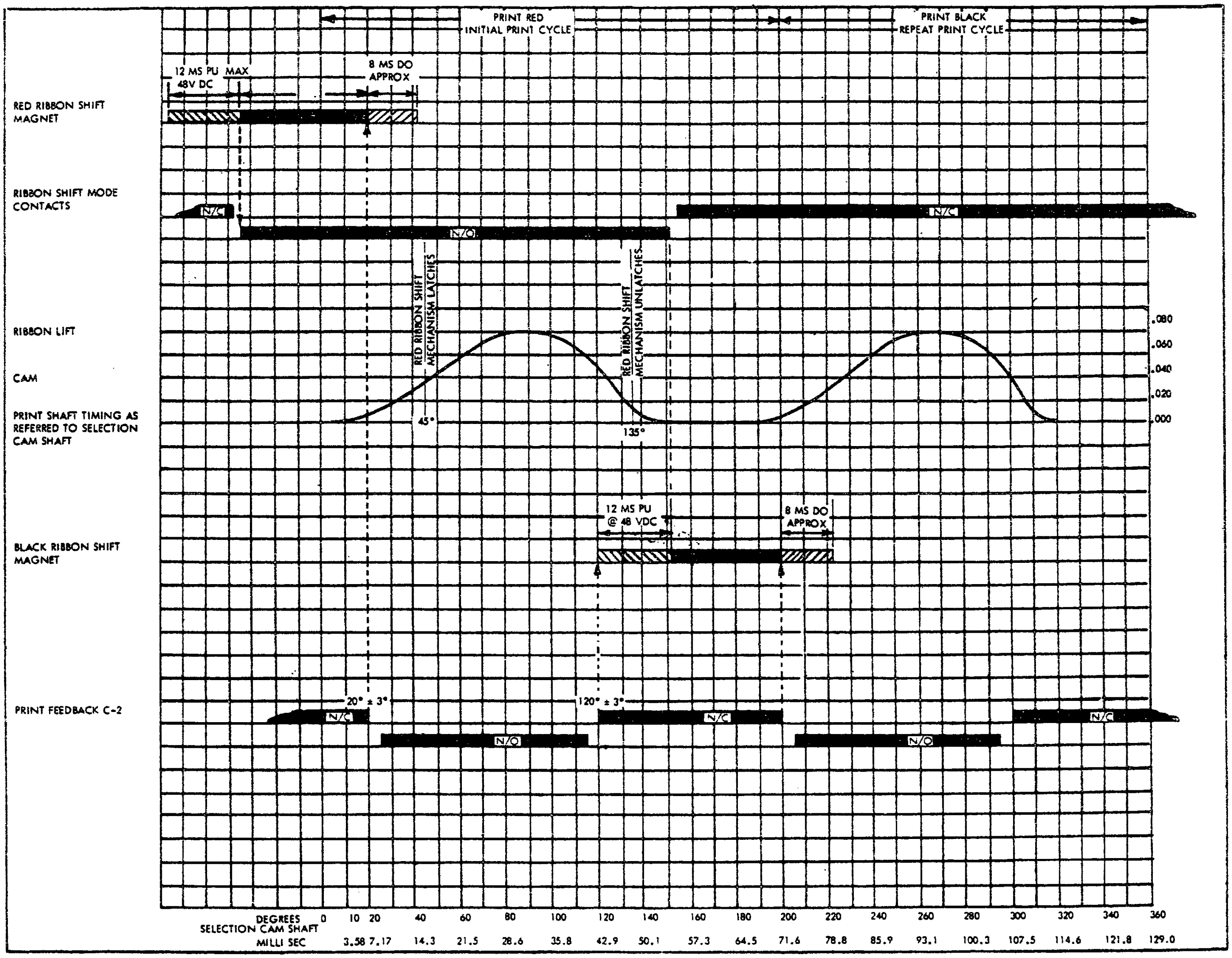


Figure 1-45. Two-Magnet Red-Ribbon-Shift Timing

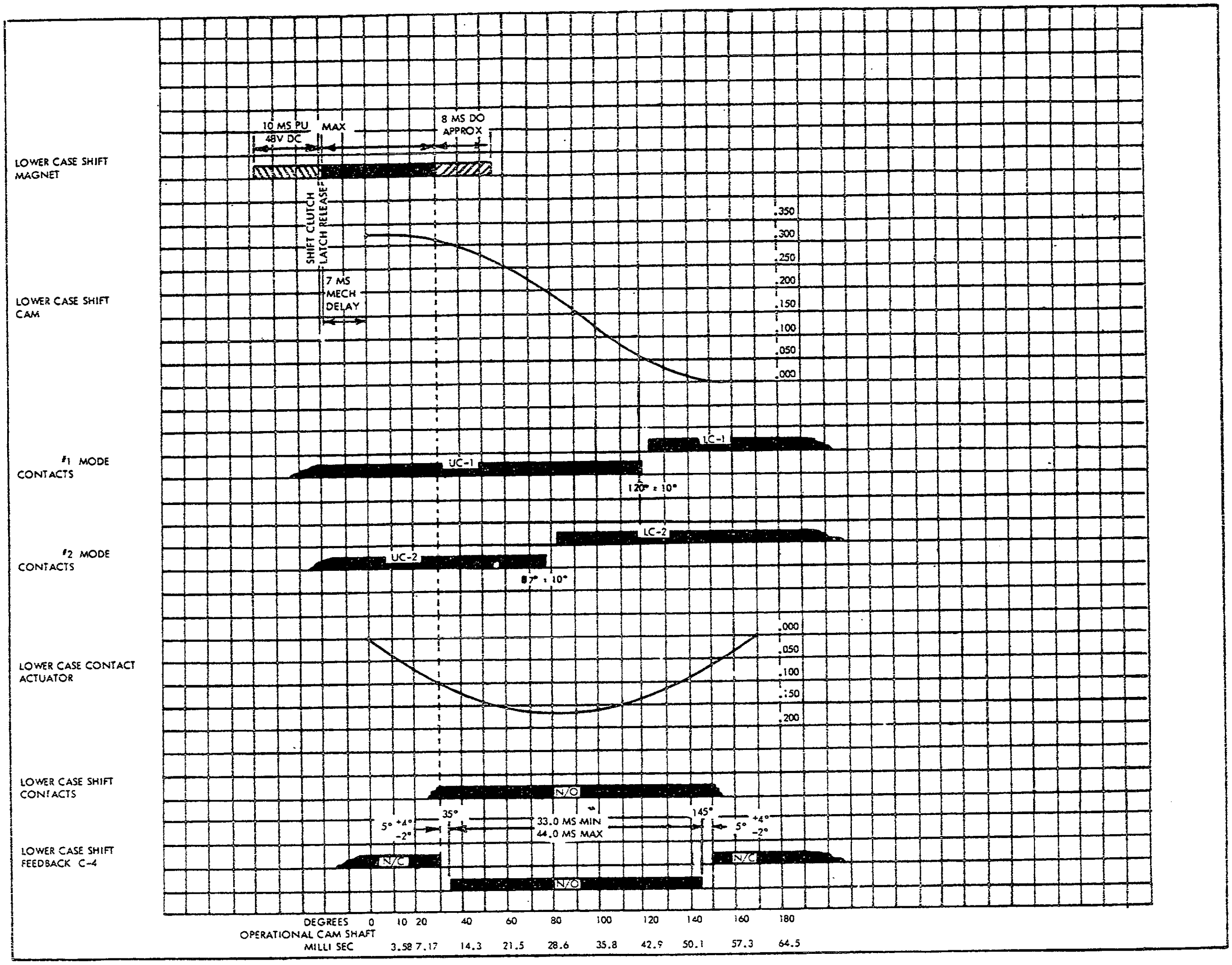


Figure 1-46. Lowercase Shift Timing

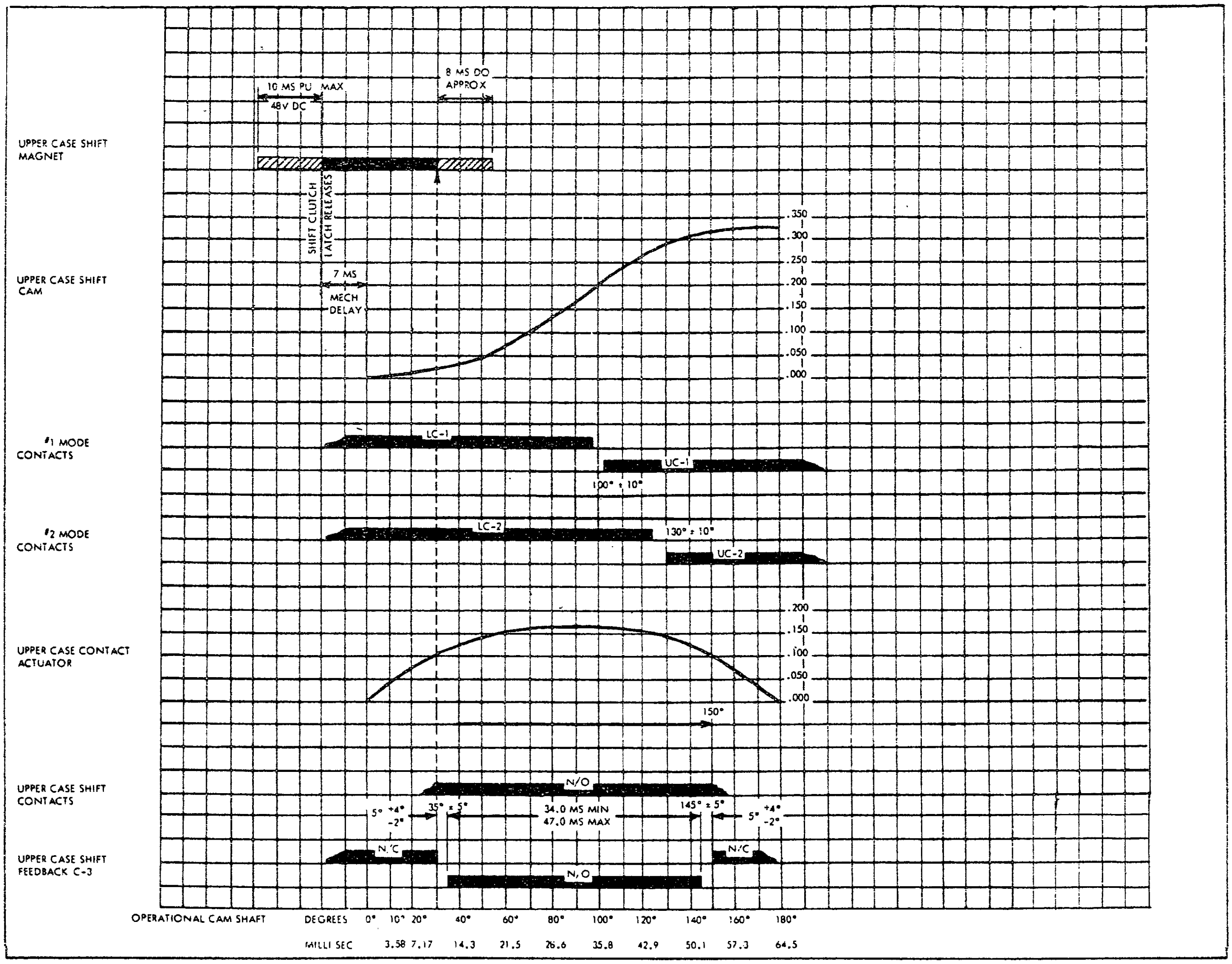


Figure 1-47. Uppercase Shift Timing

INSPECTION FREQUENCY

An effective preventive maintenance (PM) routine can be established by using the inspection frequency guide (Figure 2-1) and the inspection procedures described in this manual.

Machines with single-shift usage should be cleaned and inspected every three months. Machines used in more than a single-shift operation should be inspected proportionately more often according to the amount of printer usage.

Machine Usage	Frequency of Inspections
1st Shift (0-8 hrs)	Every 3 Months
2nd and 3rd Shift (8-24 hrs)	Every Six Weeks

Note: Machines with power on 24 hours daily must be inspected every six weeks.

Figure 2-1. Inspection Frequency

INSPECTION PROCEDURES

The following procedures have proven effective in providing minimum downtime of the printer.

Operating and Cleaning

Discuss the operation of the printer with the operator at the time of each inspection. Note any printer problems. Run a diagnostic printer check and observe the printout. During this printout, listen for any unusual printer noise that would indicate worn parts, maladjustments, or lack of lubrication.

Remove and clean the platen, deflector, feed rolls, and printer covers. Exercise care in removing the cover so that the shift contacts on the right-hand side of the printer are not damaged.

Clean the printer by brushing out any foreign particles and wiping off any accumulated dust, grime, or grease. Excess grease should be wiped from the printer, particularly in the areas close to the contacts, magnets, or armatures.

Lubrication

Scheduled Lubrications

Each inspection must include a thorough lubrication of the printer and replacement of any worn parts. Areas that are operating properly and that show no signs of potential trouble should not be disturbed. Operate, lubricate, inspect, and adjust only if necessary; then perform a final operation check.

Lubricate the printer, using Figures 2-2 through 2-8 as a guide. The points designated alphabetically require IBM No. 23 grease, and the points designated numerically require IBM No. 10 oil. Boxed letters or numerals indicate important points that must be lubricated at each inspection time. Other points should be checked and lubricated as needed.

The following mechanisms require special attention and therefore should be inspected and lubricated on every service call as well as at each inspection time. Preventive maintenance in these areas during a service call will prevent critical machine downtime at a later date.

Motor pulley clutch (Level 1 only)
Cycle clutch
Center bearing
Operational cams, shaft, bearings, and pawls
Shift clutch
Cam follower rollers
Latches and bail
Escapement cord drum and pinions
Shift arm roller
Idler gears ("wobble" and end-play)
Rotate and tilt pulleys (free and clean)
Rotate and tilt tapes (no kinks or nicks)

CAUTION
Capacitor start motors may lock up if lubricated. This is due to the method of manufacture of the motor bearings. Free graphite is present on the bearings and may be flushed into the area between the motor shaft and bearings causing a bind. Bound up motors should be replaced, as cleaning is not always successful. Lubricate the motors with a few drops of IBM No. 10 oil one year from the date of installation and not more often than once a year thereafter.

On machines having heavy usage, the following parts should be replaced every year:

Upper/lower ball sockets
Ball joint ("dog bone")
Escapement pawl
Cords (black)
Typehead
Print shaft wipers
Drive belt
Red ribbon shift tape

In addition, the following mechanisms should be updated at the next inspection, to the specified level:

Capacitor start motor
Lubrication bill of material mechanism
"Beat-the-shift" shift mechanism

Lubrication Improvement

A major change was made in the Selectric® I/O Printer in November 1965. This change is termed the "lubrication improvement" and it includes changes to the cycle shaft, operational shaft, and the shift areas. These improved printers have a larger center bearing, and therefore, the improved parts are not compatible with machines manufactured prior to November 1965. These large-center bearing machines can be identified by the round torque limiter hub.

On the older machines, the small-center bearing operational (shaft) lubrication mechanism can be installed to update the operational and shift areas without updating the cycle shaft. The small-center bearing cycle shaft B/M can be installed to update the cycle shaft without updating the operational shaft. The plastic cycle-clutch pulley and hub however, must be replaced by the metal cycle clutch pulley and hub.

To simplify the removal of the old plastic cycle-clutch pulley and hub, cut it so that it will slip by the rotate bellcrank. (The new metal cycle-clutch pulley and hub supplied with the bill of materials can be easily installed.)

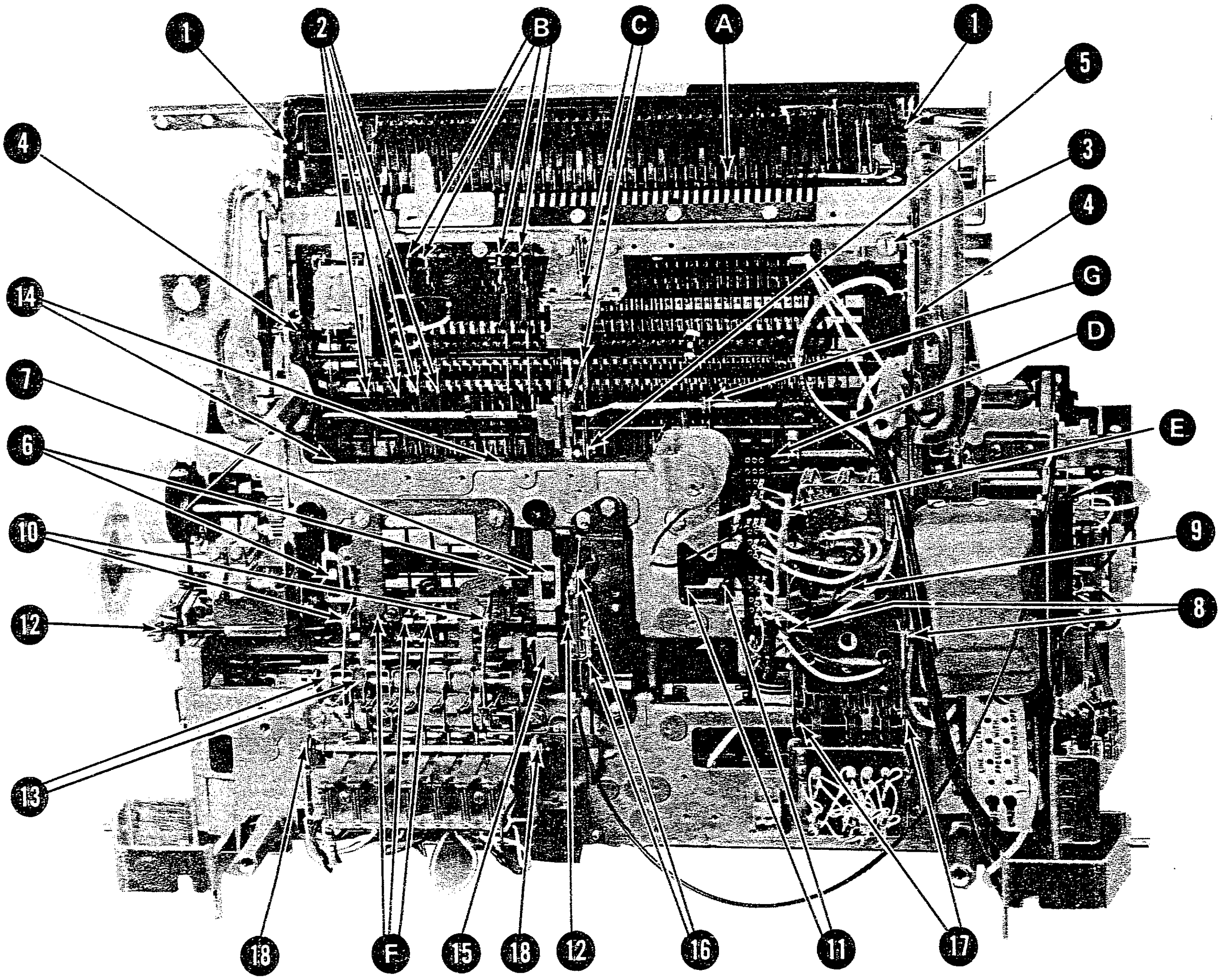
Adjustment Check Schedule

Every fourth inspection (once each year on single-shift printers), make a major adjustment check of the printer by checking each of the four major areas of the printer listed under "Adjustment Inspection Guide", following in this chapter. This can be accomplished by scheduling sufficient time on every fourth inspection to include all four major inspection checks in addition to normal operating and cleaning and lubrication procedures. The latest engineering changes (ECs) should be installed at this time also.

After performing these adjustment checks, run a diagnostic test or use the Off Line Selectric® Analyzer (OLSA) to thoroughly check the printer. As a final check, run the customer's application of the printer and ascertain that it is operating correctly.

An alternate procedure must be used for the printer when the time schedule will not permit all of the adjustments to be checked during one inspection. This alternate procedure is designed to check only one of the four major areas of the printer at each inspection; therefore, four inspections will be required to thoroughly check all printer adjustments. Install the engineering changes, as required, during each inspection. Check the customer's application of the printer and be sure that it is operating correctly before leaving the installation.

Regardless of the procedure used, sufficient time must be devoted to maintaining accurate records. Record the date and the areas that have been adjusted. Take the time to do this, as it is essential. With accurate records, the status of the machine can readily be determined, and time will be saved on the next inspection or service call.



IBM No. 10 Oil

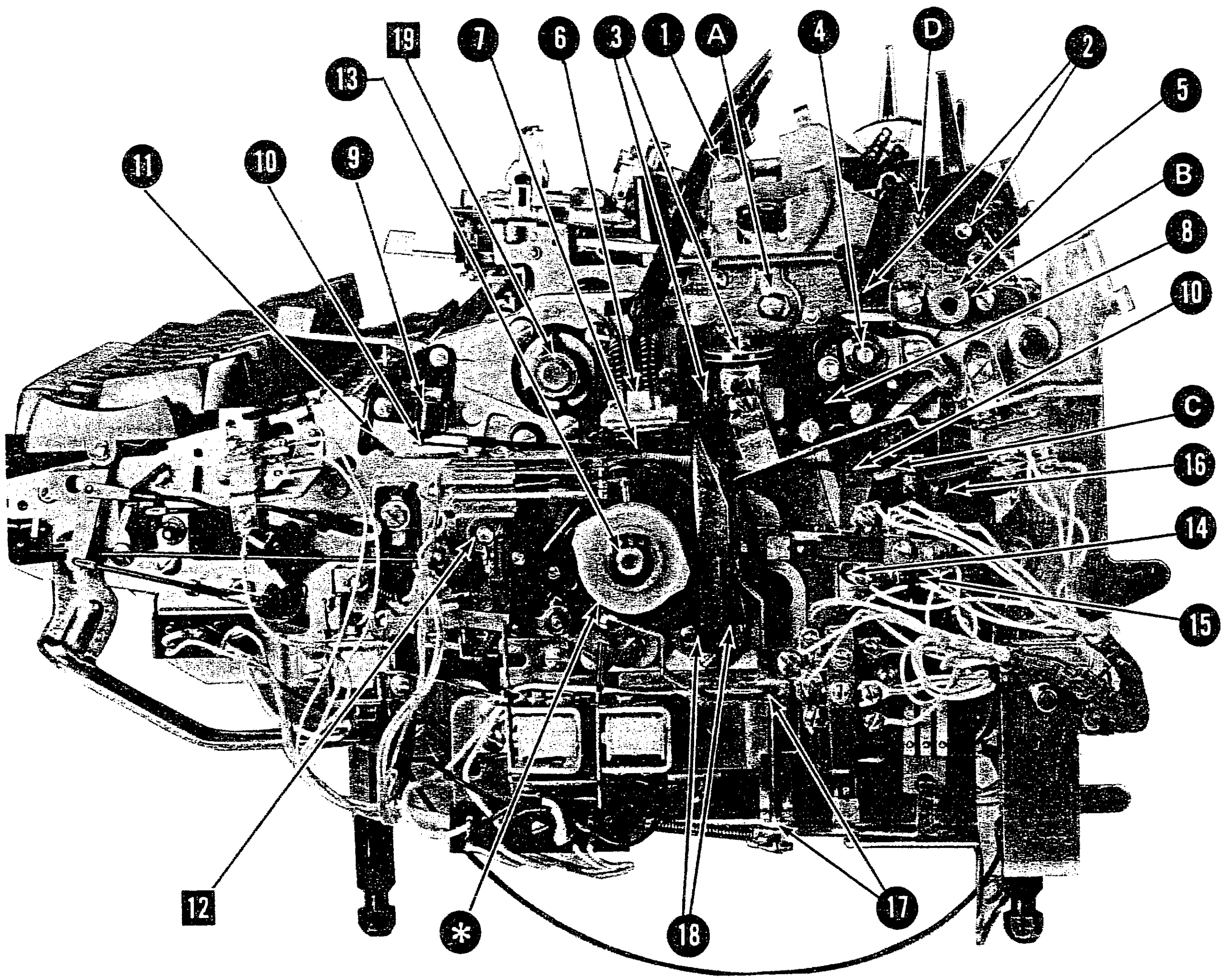
1. Power-tab key-lever bail pivots
2. Clevis and link pivots
3. Keyboard-lockout bellcrank pivots
4. Keyboard-lockout bail pivots
5. Cycle-clutch pawl and link pivots
6. Selector bail roller pivots
7. Negative-five bail roller pivot
8. Actuating-arm pivots
9. Operational pull links
10. Pusher bail-arm pivots
11. Carrier-return actuating-arm pivot
12. Rotate-link pivots
13. Pusher-arm pivots
14. Selector-latch bail pivots
15. Negative-five link bearing
16. Cycle-clutch trip pivots
17. Contact-latch pivots
18. Cycle-clutch trip-bail pivot points

IBM No. 23 Grease

A. Keyboard-lockout-comb sliding surface*
B. Interposer sliding surfaces
C. Cycle-clutch latch surfaces
D. Filter-shaft surface
E. Operational-arm pivots
F. Selector-latch surfaces
G. Keyboard-lockout bail roller and lever pivot

*Every six months

Figure 2-2. Bottom View of Printer



IBM No. 10 Oil

1. Platen-release pivot*
2. Paper-release-lever pivots
3. Rotate and tilt pulley bearings
4. Tab-rack support bearing
5. Copy-control eccentric pivot*
6. Pulley-assembly pivots
7. Right-hand cord pulley bearing
8. Escapement torque-bar pivot
9. Carrier-return unlatching-bellcrank pivot
10. Carrier-return unlatching-link pivot
11. Bellringer bail pivot
12. Filter-shaft bearing
13. Operational-shaft bearing
14. Carrier-return latch-keeper pivot
15. Index-link pivot
16. Carrier-return-link pivots
17. Cam follower pivots
18. Shift arm pivot
19. Print shaft bearing

IBM No. 23 Grease

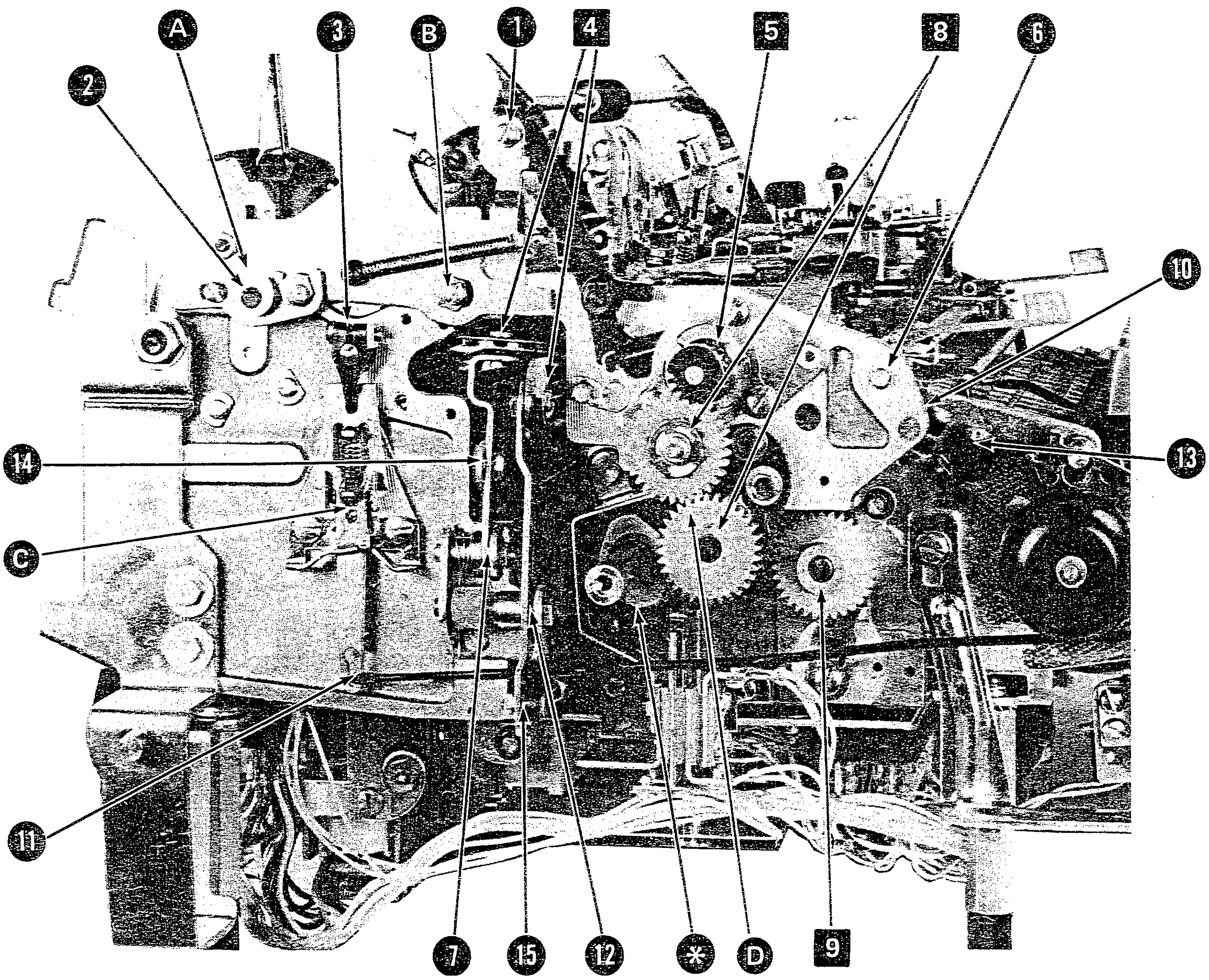
A. Guide-bracket sliding surface*
B. Copy-control eccentric surface*
C. Carrier-return latch keeper
D. Paper release lever

Boxed numbers and letters indicate the most important lubrication points; these must be lubricated at each inspection.

All other points should be checked and lubricated, as needed, at each inspection.

*C7 cam surface should be kept free of any lubricants.

Figure 2-3. Right Side of Printer



IBM No. 10 Oil

1. Platen-release pivot
2. Copy-control eccentric pivot
3. Tab-rack support bushing
4. Rotate and tilt pulley bearings
5. Print-shaft bearing
6. Left-hand margin-rack bushing
7. Tilt-arm pivot
8. Idler-gear bearings (lightly)
9. Filter-shaft bearing
10. End-of-line bail
11. Tab set/clear link pivots
12. Rotate arm pivot
13. Bellringer bail pivot
14. Tilt-link pivot
15. Rotate link

IBM No. 23 Grease

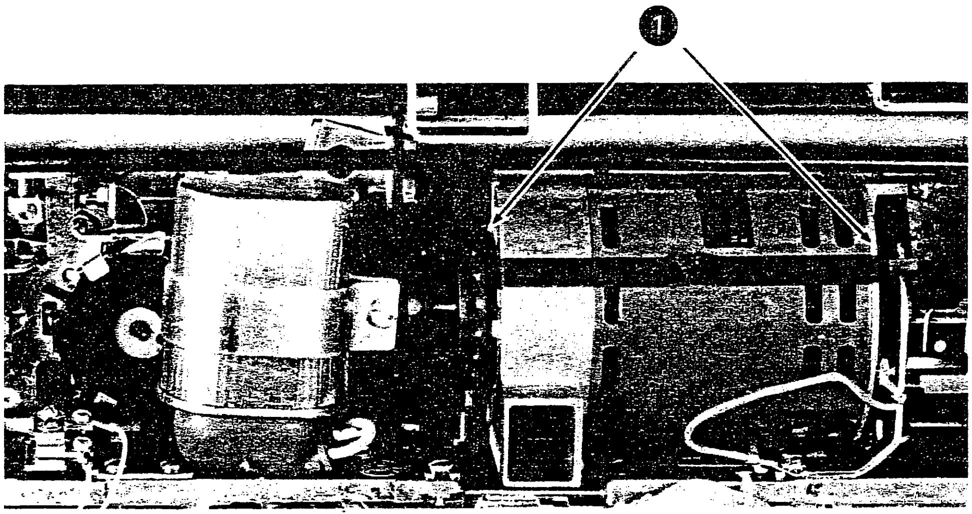
A. Copy-control eccentric surface
B. Guide-bracket sliding surface
C. Tab set/clear bellcrank
D. Idler gear teeth

Boxed numbers and letters indicate the most important lubrication points; these must be lubricated at each inspection.

All other points should be checked and lubricated, as needed, at each inspection.

*C1 and C2 cam surfaces should be kept free of any lubricants.

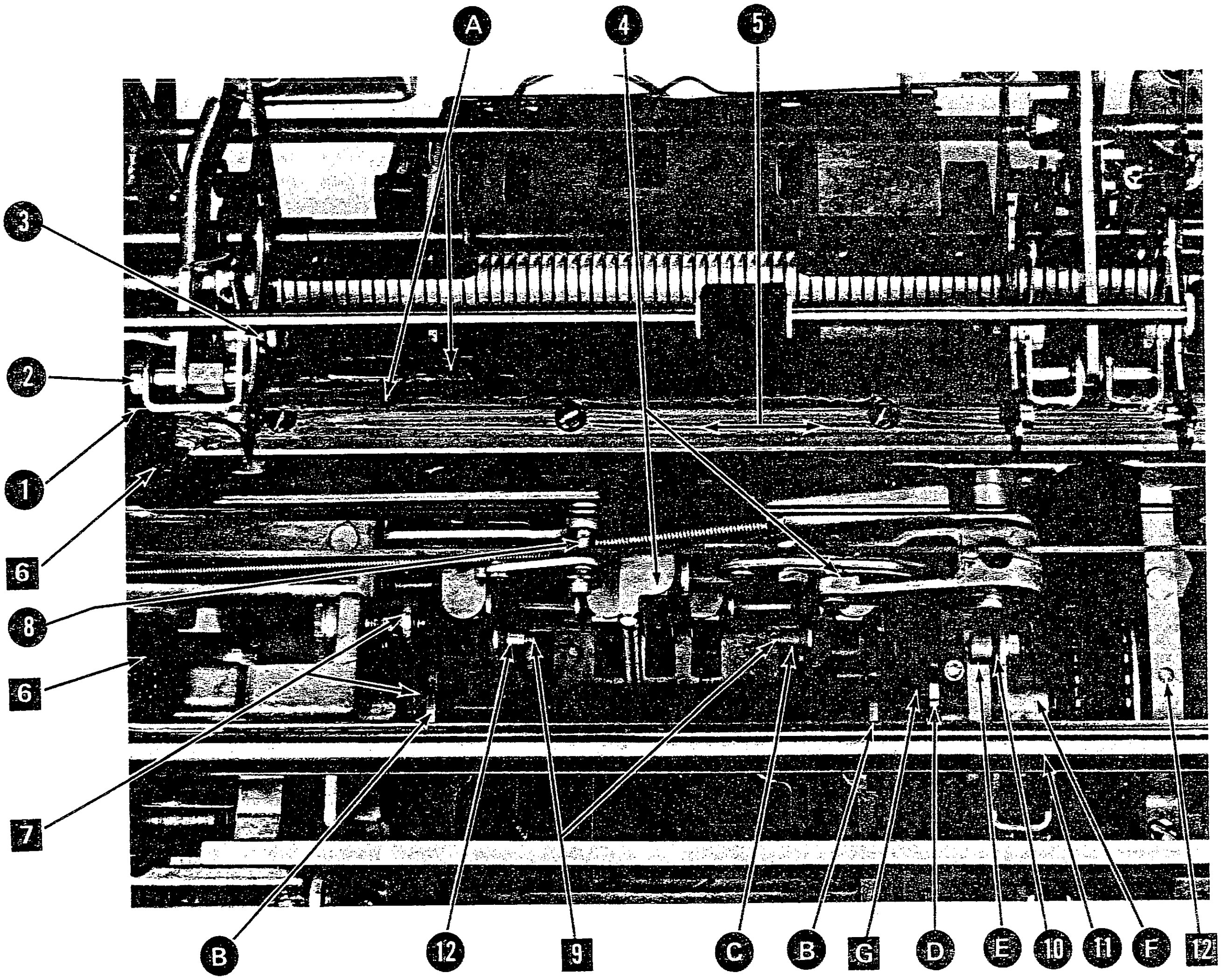
Figure 2-4. Left Side of Printer



IBM No. 10 Oil

1. Motor bearings (all)
   The motor must *not* be lubricated until one year after installation and not more than once a year thereafter.
2. Motor clutch pulley
   Lubricate the 'Level 1' pulley only.

Figure 2-5. Back of the Printer (Level 2)



Boxed numbers and letters indicate the most important lubrication points; these must be lubricated at each inspection.

All other points should be checked and lubricated as needed, at each inspection.

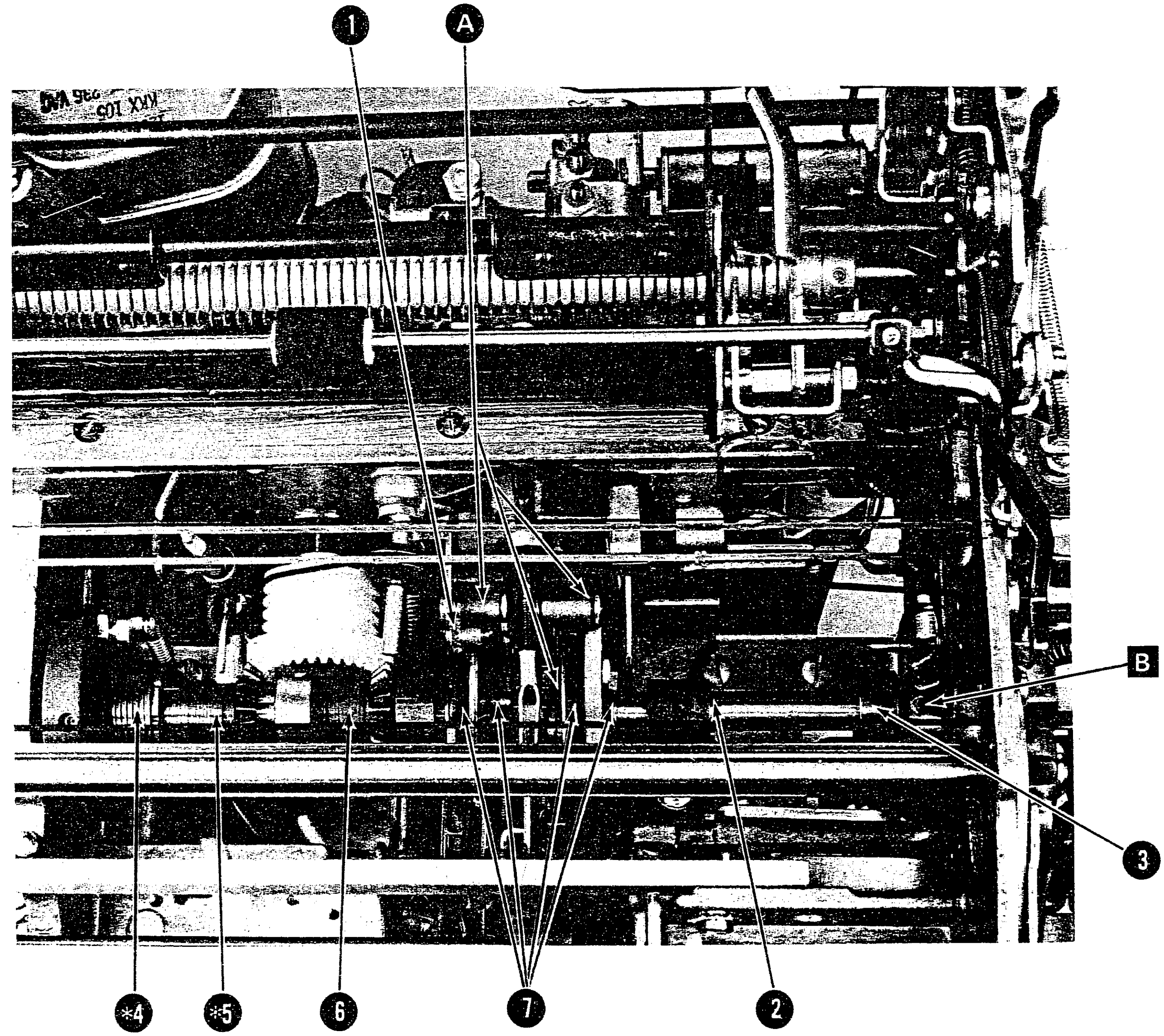
IBM No. 10 Oil

1. Tab-torque-bar pivot
2. Escapement-torque-bar pivot
3. Feed-roll bearings
4. All selector-latch and differential-mechanism pivots
5. Surface of the escapement rack
6. Carrier-return pulleys
7. Cycle-clutch check latch and bearing
8. Tilt bellcrank
9. Latch-pusher roller and pivot studs
10. Restore-roller pivot
11. Cycle-clutch latch pivot
12. Center bearing

IBM No. 23 Grease

A. Torque bars (light film)
B. Selector-cam surface and roller
C. Pusher-bail cam surface and arm rollers
D. Negative-five cam surface
E. Cycle-clutch restoring cam and roller
F. Cycle-clutch sleeve surface
G. Cycle clutch (inside)

Figure 2-6. Differential Mechanism



Boxed numbers and letters indicate the most important lubrication points; these must be lubricated at each inspection.

All other points should be checked and lubricated, as needed, at each inspection.

IBM No. 10 Oil

1. C-5 cam follower roller
2. Operational-shaft stabilizer (sintered iron)
3. RH operational-shaft bearing

*4. Torque-limiter spring (do not lubricate; this spring is oil-impregnated or self-lubricating)

*5. Carrier-return pinion (do not lubricate; oil on this spring will cause erratic escapement, erratic carrier return, or uneven margins)

6. Tab governor spring (oil sparingly)
7. Operational cams

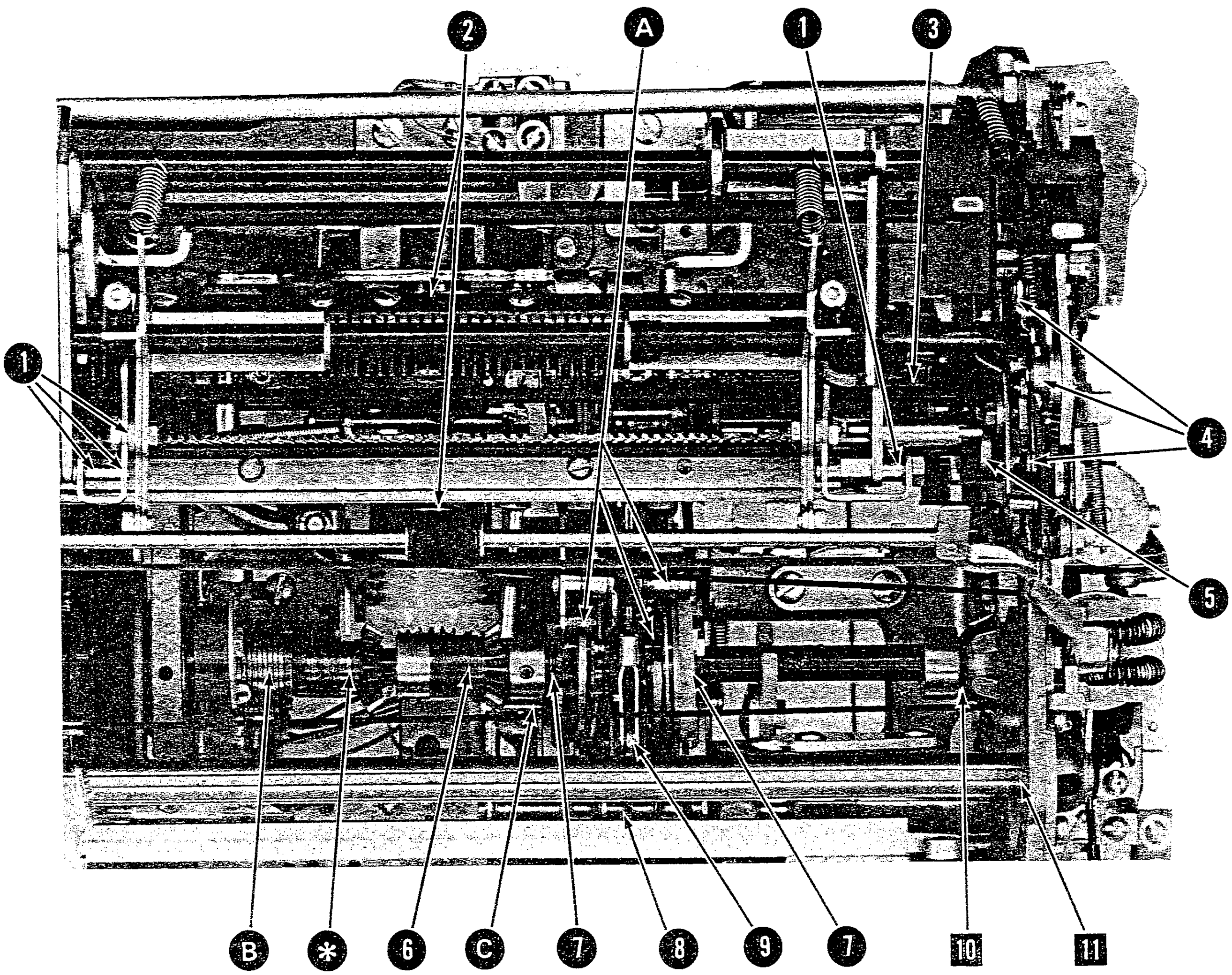
IBM No. 23 Grease

NOTE: Perform A and D with printer idling.

A. Operational-cam surfaces, rollers, and drive ratchets

B. Shift clutch (use IBM No. 23 grease only; if any oil is used at this point, it will thin the grease in the shift clutch and cause premature wear)

Figure 2-7. Improved Lubrication Machines



Boxed numbers and letters indicate the most important lubrication points; these must be lubricated at each inspection.

All other points should be checked and lubricated as needed, at each inspection.

IBM No. 10 Oil

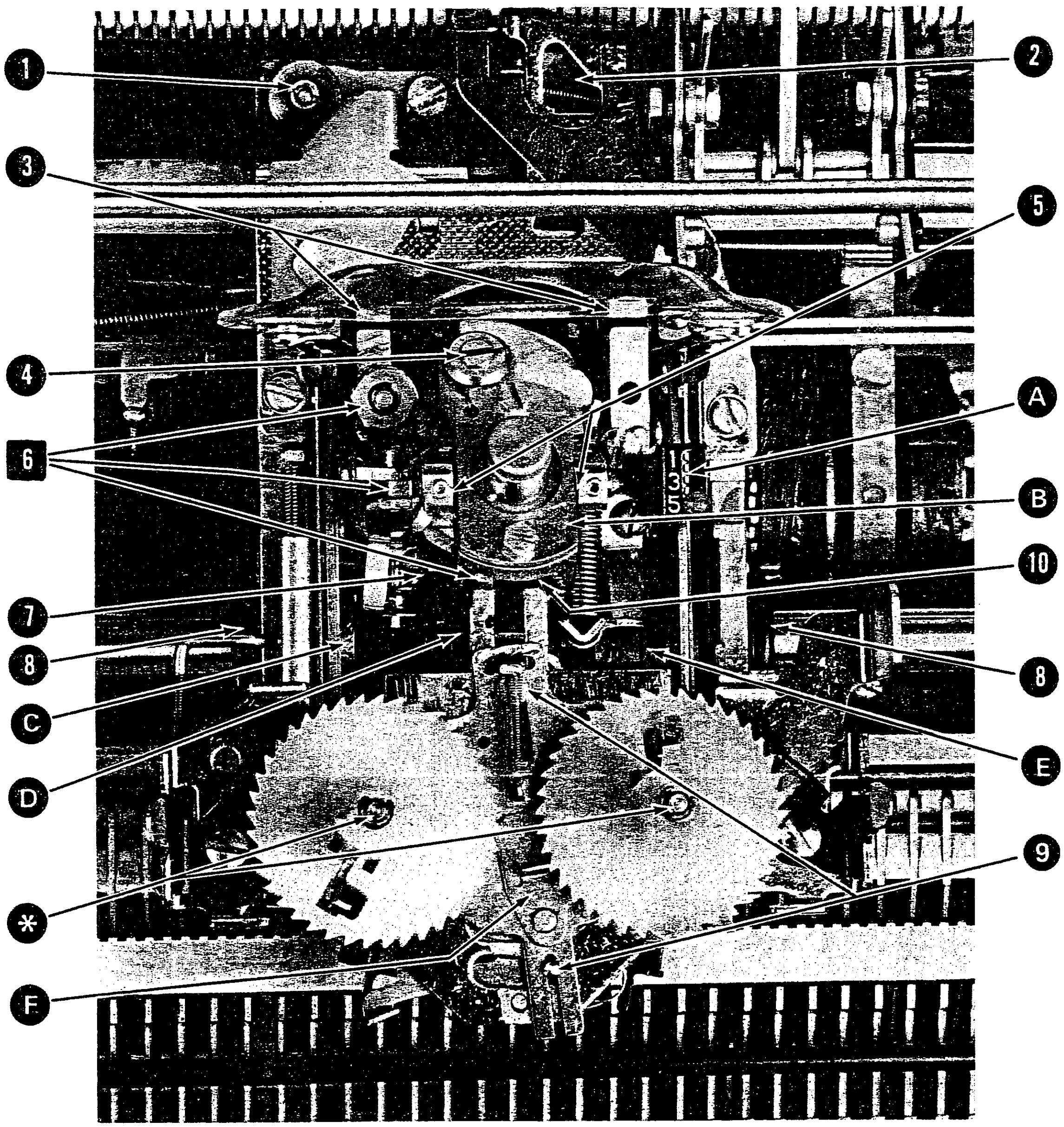
1. Feed-roll bearings
2. Escapement-shaft bearing
3. Power-tab bellcrank-link ends and pivots
4. Index pawl
5. Tab-torque-bar pivot
6. Tab governor spring (oil lightly when reassembling the mechanism)
7. Operational cam pivot (ratchet) (use IBM No. 23 grease when parts are removed or replaced)
8. Escapement-cam-follower roller
9. Escapement clevis
10. Operational-shaft bearing
11. Print-shaft bearing

* Do not lubricate CR pinion spring.

IBM No. 23 Grease

A. Operational-cam surfaces, rollers, and drive ratchets.
B. Torque-limiter spring clutch (do not allow grease to contact the CR pinion spring)
C. Actuating arm and check-pawl contact surface

Figure 2-8. Operational Mechanism (Old Style)



Boxed numbers and letters indicate the most important lubrication points; these must be lubricated at each inspection.

All other points should be checked and lubricated, as needed, at each inspection.

IBM No. 10 Oil

1. Tab-lever pivot
2. Tab-lever latch pivot (do not lubricate the latch surface)
3. Rocker pivots
4. Tilt-bellcrank pivot
5. Tilt-ring pivots
6. Detent pivots
7. Typehead detent-cam-follower pivot
8. Print-shaft wipers
9. Ribbon feed and reverse plate
10. Lower ball socket

IBM No. 23 Grease

A. Velocity-control-plate pin
B. Tilt ring and ball joint
C. Ribbon-lift cam surface
D. Ribbon-feed and detent cam surface
E. Print-cam surface
F. Ribbon-feed pawl

*Keep cartridge and spindle free of all lubricants.

Figure 2-9. Carrier Mechanism

ADJUSTMENT INSPECTION GUIDE

First Inspection

Motor and Drive

1. Belt–Not frayed, cracked, loose, or taut; tracks evenly on its pulleys with minimum belt noise.
2. Drive gears–No binds, minimum backlash. Check at several points in a print cycle by rotating the print shaft.

   NOTE: Lubricate the motor only once each year.

Cycle-Clutch

1. Shaft end play–Shim for from 0.001" to 0.006" (0.001" preferred).
2. Spring and collar–Hand-cycle the printer with all the selection magnets energized. The spring should stop driving the cycle shaft at from 170 degrees to 175 degrees (approximately 15 degrees before the cycle shaft latches at rest). The collar is set laterally to provide from 0.010" to 0.015" sleeve end play. The sleeve must release without any hesitation.
3. Overthrow–0.007".
4. Filtershaft–Escapement cam in low dwell (check shift interlock also).

Print Selection Mechanism

1. Adjust for from 0.005" to 0.012" clearance between the latching surfaces of the pusher tails and the armatures. Check with the machine at rest and the backlash removed against the cycle-clutch check pawl.
2. Adjust for from 0.001" to 0.010" clearance between the tips of the pusher tails and the bottom of the notch in the armatures.
3. Allow at least 0.002" clearance between the pusher and its latch extension for all nonselected pushers. Check at 15 degrees ± 5 degrees of a print cycle. This is when the pusher cam followers are in the low dwell of their pusher cams.

   NOTE 1: An *unselected* pusher must *not* contact its latch extension at any time in the print cycle.

   NOTE 2: A *selected* pusher must push its latch out from under the bail before the bail is driven down.

4. Trip bail–Parallel to the armatures so that it provides equal tripping motion.
5. Knock-off clearance–From 0.003" to 0.008".
6. Cycle clutch trip–From 0.005" to 0.015" clearance between the latch lever and the trip lever lug. Adjust the trip link.
7. Inhibitor–Allows the cycle clutch to trip when any armature is pressed; prevents the cycle clutch from tripping when the restoring roller is manually pressed.

Second Inspection

Carrier

1. Carrier shoe–Adjust for from 0.002" to 0.006" vertical motion of the carrier, measured at the rear of the carrier.
2. Line-gage holder–Clears the platen and does not bind the ribbon lift.
3. Carrier movement–Smooth and free throughout the writing line.
4. Rocker shaft–Minimum end play without binding (0.001").
5. Detents–Locks the typehead firmly in the printing position; no binds or loose play.
6. Print sleeve–Minimum end play without binding (0.001").

Ribbon

1. Lift–The underscore should strike 1/16" from the bottom edge of the ribbon, with the lift lever in the highlift position.
2. Feed plate–Positive reverse; positive feed of two teeth in addition to a 0.010" overthrow.

Tilt Alignment

1. Tape–Free of grease, binds, and kinks.
2. Latches–Reset simultaneously with cycle-clutch check pawl.
3. Detenting–
   a. Detent enters slightly to the rear of its notch and causes from 0.005" to 0.015" rise to the rear of the tilt ring when checked manually.
   b. Detent does not catch on the tip of a tooth, with the play removed both front and rear.
   c. Tilt zero equals tilt three.
4. Tilt ring–Neither loose nor binding; detents held firmly in the printing position.

Rotate Alignment

1. Tape–Free of grease, binds, and kinks.
2. Detenting–Detents approximately 0.015" from the center of the notch in the negative direction with the head play removed in a clockwise direction. Check the latched home, "I/O home", +5, -1, -3, and -5 rotate positions.
3. Band width–Detenting from the best character to the worst character should not exceed 0.030" (0.015" with solid rotate arm).
4. Compensator roller (compensator arm only)–Free to drop at a -5 position. If excessive or erratic droppage (more than one-half of its slot) can not be corrected by adjustment procedures, install the solid rotate arm bill of material.
5. Rotate spring tension–With the typehead removed, half-cycle a -5 lowercase character and check for 1-7/8 lb

rotate spring tension on the shift arm just as it recontacts the side frame. The tape system must be free of any binds.

NOTE: Reseat the compensator roller after this check.

6. Skirt clearance–From 0.023" to 0.035", checked in a tilt-two position. Adjust for a 0.001" minimum motion of the detent cam follower roller, with the tilt and rotate detents fully seated.

Third Inspection

Operational Magnet Unit

Armature pull links–Interposers trip with from 0.002" to 0.010" overthrow between the interposers and their latching surfaces.

Operational Shaft

End play–Minimum of 0.002".

Operational Cams

1. Cams–Positive release and positive relatching.
2. Cam pawl–From 0.005" to 0.015" clearance from the ratchet. Replace the pawl annually or when it is worn.

Shift

1. Cam and clutch spring–No rust; proper lubrication with IBM No. 23 grease.
2. Clutch–Positive release; full detenting in upper and lowercase, under power.

Contacts

1. Use only IBM Cleaner (P/N 450608) and strips of bond paper to clean the gold-plated contacts; do not burnish or file these gold-plated contacts.
2. Using IBM Cleaner (P/N 450608) and strips of bond paper is also the recommended procedure for cleaning the tungsten contacts. The tungsten contacts (silver colored), however, can be burnished if extreme caution is used to prevent bending the contacts. The slightest bend in a contact can change its tension and cause intermittent contact failure.

Printer Cables and Wiring

Check all printer cables and general printer wiring for cracks, nicks, bent pins, and loose connections.

Engineering Changes (ECs)

Install the latest applicable engineering changes.

Keyboard

1. Filter shaft–Check for 0.005" to 0.010" clearance to interposers with the backlash removed in the forward direction.
2. Keylevers–No binds.
3. Keylever travel–Adjust front guide comb or individual keylevers for 0.010" to 0.020" upward travel of the keylevers after the keylever pawl resets.
4. Adjust the cycle-clutch keeper bracket for 0.030" to 0.035" overlap of the cycle-clutch latch on the step of the cycle-clutch sleeve.
5. Check the cycle-clutch release point.
6. Check for proper operation of all operational keys.

Fourth Inspection

Escapement

1. Carrier–Escapes are smooth and positive, throughout the full length of the writing line, for character escapement, spacebar operation, and tabulation.
2. Cords–
   a. If either cord is worn or frayed, replace both.
   b. Cord tension should bring the nut on the inside of the right-hand pulley to within 1/8" to 1/4" from its bracket. Do not bind the pulley against the side frame.
3. Escapement gear–
   a. Check for from 0.002" to 0.006" backlash of the carrier-return pinion and the tab pinion gears to the escapement gear. The crown gear surfaces should be even, with no binds.
   b. The carrier-return pinion must be free of any lubrication.
4. Mainspring tension–From 1/2 to 3/4 lb tension, measured as the carrier escapes through the linelock load at the extreme right-hand margin.
5. Escapement trigger–Should disengage from its torque bar when the escapement pawl has cleared the rack by from 0.010" to 0.015". This ensures that escapement will occur immediately *after* printing.

Carrier Return

1. Escapement pawl clearance–From 0.005" to 0.020" pawl clearance, with the latch held down by the keeper.
2. Shoe–From 0.010" to 0.020" clearance from the carrier-return spring.
3. Overbank–From 0.001" to 0.005" clearance between the stop latch on the carrier and the left-hand margin stop. Check for even left margins, with both long and short carrier returns.

Tab

1. Tab lever–Overthrows the tab-lever latch by from 0.005" to 0.010", without overthrowing into the tab rack. Check at both ends and in the middle of the printer.
2. Carrier return/tab interlock–A carrier-return operation must unlatch the tab lever.
3. Overthrow/retaining plate–Must allow from 0.001" to

0.002" clearance between the torque bar and the escapement bracket.

4. Tab-interlock switch—Remains transferred until a set tab stop unlatches the tab lever.

Backspace

1. Backspace pawl—From 0.005" to 0.015" clearance between the working surfaces of the backspace pawl and the backspace rack.
2. Intermediate lever—Hand-cycle the backspace to the high point of the cam and observe that the *escapement pawl* just fails to drop into the preceding tooth.

Index and Paper Feed

1. Platen-overthrow stop—Hand-cycle the index cam to its high point and see that there is from 0.002" to 0.010" clearance of the platen-overthrow stop to the index pawl.
2. Index-selection cam—Should provide both single and double line space action. The index pawl must clear the platen ratchet, with all parts at rest. Check in both the single and double linespace positions.

MOTOR AND DRIVE

Motor Drive Belt and Pulley

CAUTION
Keep the motor wires and the line cord clear of the drive belt.

1. Position the motor mounting brackets so that the motor and belt produce a minimum amount of noise.
   The motor shaft must be perpendicular to the drive belt for even belt tracking.
   NOTE: The belt must never be so tight that a constant strain is on the motor. The belt must never be so loose that it will jump a cog on the motor pulley. This can be checked by producing a maximum load on the motor; operate the shift mechanism while holding the carrier with a carrier return in operation.
2. Adjust the pulley left or right so that the drive belt will fully engage both pulleys without rubbing either flange.

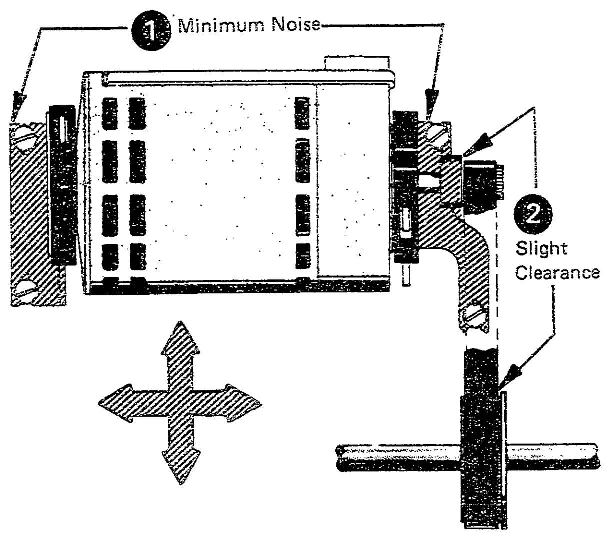


Figure 3-1. Motor and Drive Belt

Adjustments

Motor Clutch Pulley (Level 1 Only)

CAUTION
Do not shorten the centrifugal motor clutch pawl springs. This would allow the pawls to engage at too high a motor speed, and cause chipping of the lugs on the motor pulley.

1. Adjust the motor clutch assembly on the motor shaft so that the drive belt will fully engage both pulleys without rubbing either flange.
2. Position the retaining clip for from 0.005" to 0.015" end play.
3. Form the pawl stop so that the pawl tip clears the highest portion of the pulley ratchet by from 0.010" to 0.020".

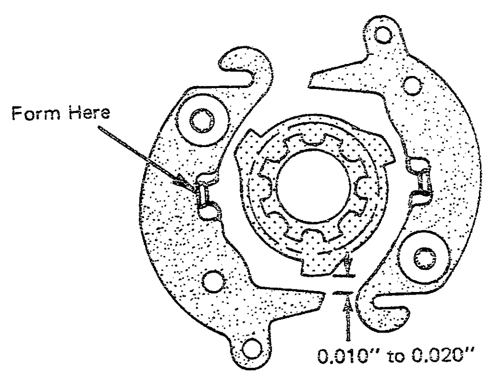


Figure 3-2. Motor Clutch Pulley (Level 1 Only)

Idler Gears (All Levels)

Adjust the lower idler-gear bracket and the upper idler-gear stud so that from 0.001" to 0.005" backlash exists between the mating gears. The lower gear should be adjusted first.

NOTE 1: Any shifting of the cycle-shaft bearing plate directly affects the gear mesh to the lower idler gear.

NOTE 2: Check the timing and end play of the filter shaft and the print shaft.

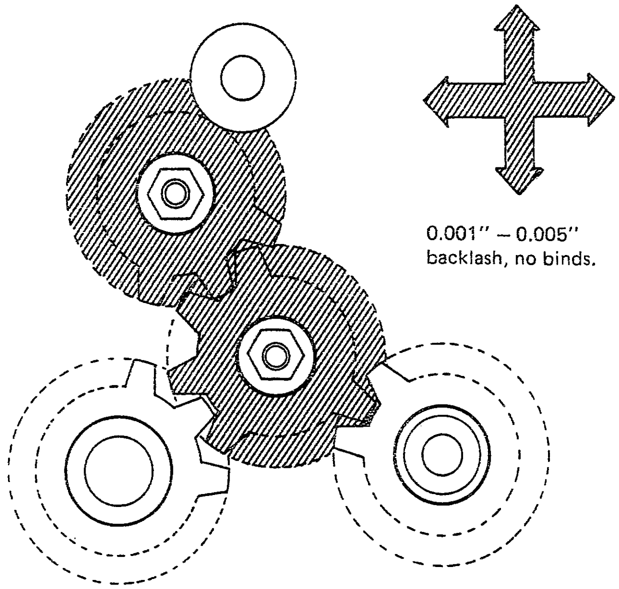


Figure 3-3. Idler Gears (All Levels)

KEYBOARD

Filter Shaft

CAUTION
Excessive clearance causes malselection of and delays the operation of the interposers. The selector latches are not pulled forward until after having been pulled down slightly by the latch bail. This results in excessive wear and a noisy operation as the latches are snapped forward from under the bail. If the filter shaft timing is changed, check the shift interlock cam, the escapement cam, and the spacebar interlock cam.

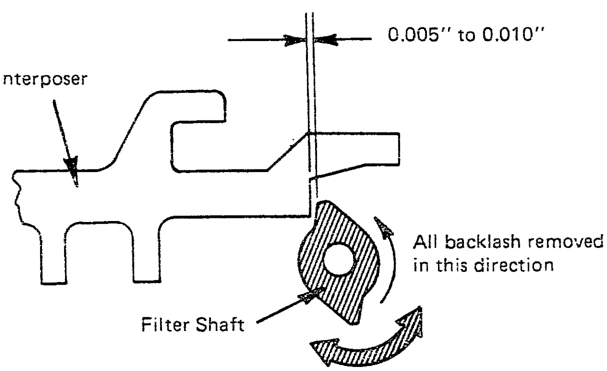


Figure 3-4. Filter Shaft

Adjust the filter shaft by rotating it to the correct position after loosening the filter-shaft gear.

With the cycle shaft at rest and all backlash of the gear train removed in a forward direction, the working surface of the filter shaft should clear a pressed interposer by 0.005" to 0.010".

Tighten the filter-shaft gear with 0.002" to 0.004" end play of the filter shaft within the LH filter-shaft bearing.

NOTE: The mounting of the LH filter-shaft bearing allows 0.11" lateral play of the bearing. Do not confuse this lateral play of the bearing with the filter-shaft end play.

Rear Interposer Guide Comb

CAUTION
The selector compensator tube is mounted to the rear of the interposer guide comb by four clamps and must move up and down with the guide comb when the guide-comb adjustment is made. Be sure to loosen the guide-comb mounting screws completely before attempting to move the guide comb. Do not hammer the guide comb into position, as this can cause the compensator tube to shift with respect to the guide comb. The vertical position of the tube on the guide comb is set with respect to the stop strap riveted along the bottom of the guide comb, and should not be disturbed.

Adjust the interposer guide comb up or down so there is 0.020" to 0.030" clearance between the bottom edge of the interposers and a vane of the filter shaft. Check the clearance at several points along the filter shaft.

The four interposer guide screws are accessible by inserting the medium screwdriver between the letter keylevers, beneath the front row of keybuttons.

NOTE: The purpose of this adjustment is to prevent "bridging". "Bridging" is a form of malselection caused by two or more interposers being pressed in front of the filter shaft and driven forward at the same time. Proper adjustment of the rear interposer guide comb allows only one interposer to be positioned in the path of the filter shaft at one time. An easy method of checking the guide-comb adjustment is to latch one interposer down, depress an adjacent interposer until it is locked out by the selector compensator, and then slowly hand cycle the machine. The filter shaft should contact the interposer that is latched down and miss the adjacent interposer by at least 0.005". This check should be performed at several places along the filter shaft.

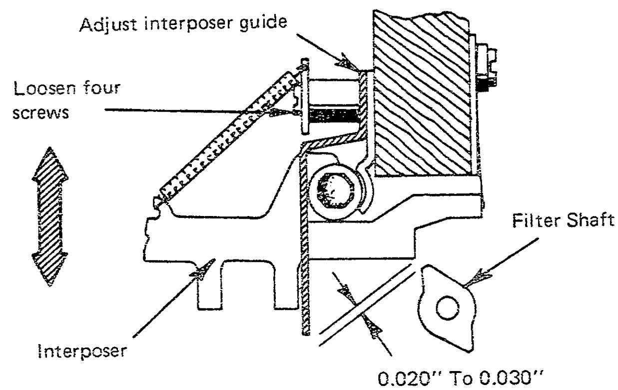


Figure 3-5. Rear Interposer Guide Comb

Bail Parallel

Loosen the cycle-clutch-bail upstop and move it up out of the way of the cycle bail.

Adjust the LH bail anchor plate forward or backward in its oversized mounting holes so that the selector bails will be parallel to the lugs on the interposers.

Adjust the bail anchor plate up or down so that the cycle bail will be parallel within 0.004" to the two outside interposer-release lugs.

NOTE: The selector bails must be parallel to the interposer lugs so that the same travel will be given to the bails by the various interposers. A loss of motion to the selector latches could result from an unparallel condition. The cycle bail must be parallel so that the interposer-latch springs can be adjusted evenly.

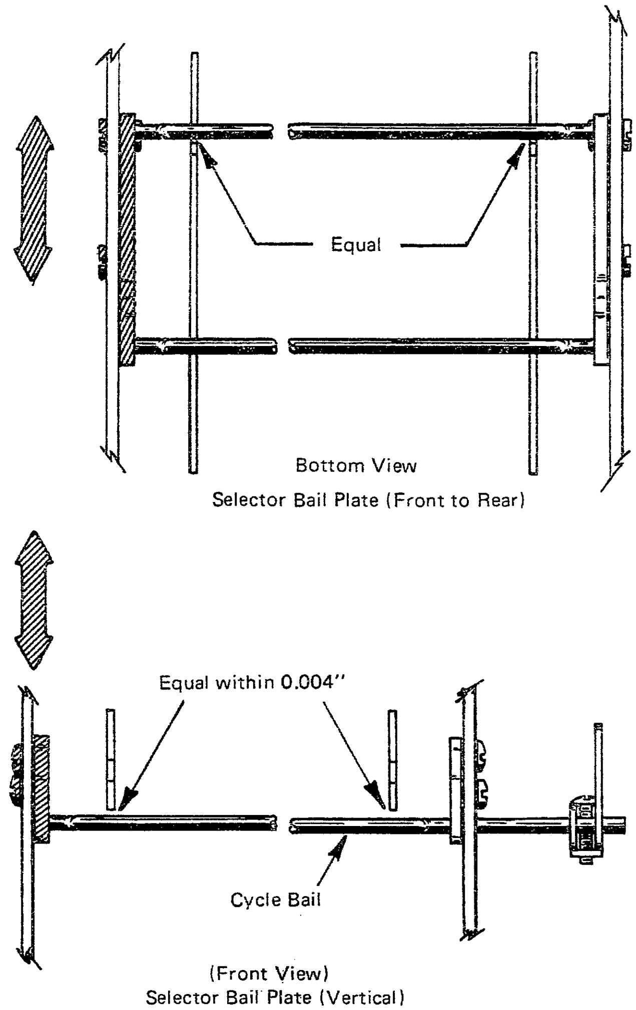


Figure 3-6. Bail Parallel

Interposer-Latch Springs (Preliminary)

With the "H" interposer latched down, adjust the LH end of the RH section of latch springs so that approximately 0.015" travel of the interposer remains before it bottoms. Check this clearance by pulling the interposer down with a spring hook.

NOTE: This adjustment results in the interposer ends having to travel 0.100" to 0.110" downward before latching.

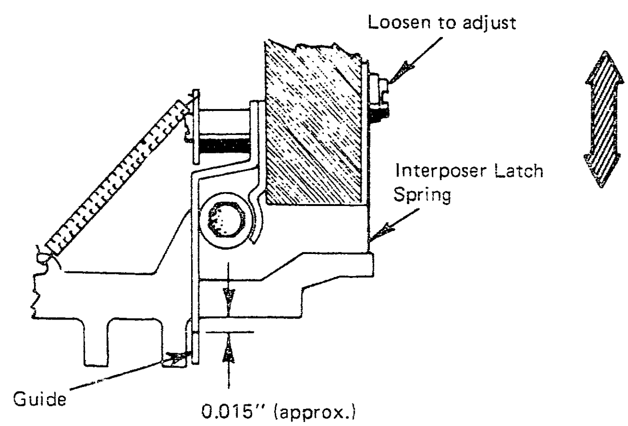


Figure 3-7. Interposer-Latch Spring

Cycle-Clutch Latch Bite

Adjust the cycle-clutch keeper bracket forward or backward so that the cycle-clutch latch overlaps the step on the cycle-clutch sleeve by 0.030" to 0.035" (thickness of the metal plate).

The overlap can readily be observed from the bottom of the machine. Insufficient overlap could allow the cycle-clutch sleeve to kick past the latch and cycle again. Excessive overlap would slightly delay the unlatching action of the latch and create a sluggish action.

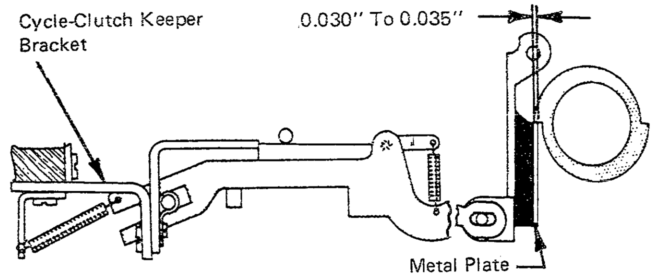


Figure 3-8. Cycle-Clutch Latch Bite

Cycle-Clutch Latch Restoring (Level 1)

Adjust the restoring lever so that the latch pawl overthrows the keeper by 0.030" to 0.045".

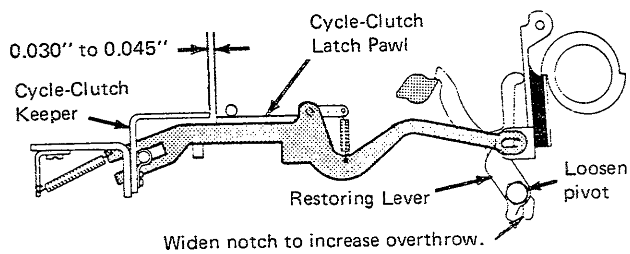
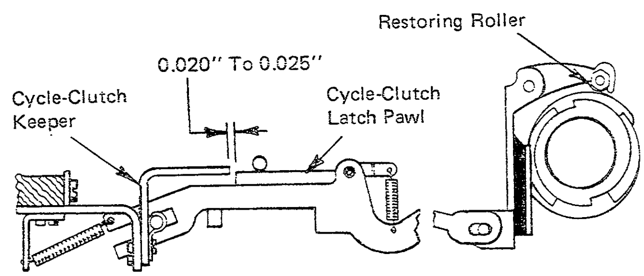


Figure 3-9. Cycle-Clutch Latch Restoring (Level 1)

Cycle-Clutch Latch Restoring (Level 2)

Position the restoring roller so that the latch pawl overthrows the keeper by 0.020" to 0.025" with the restoring cam on its high point. Check on both restoring cam lobes and adjust on the lobe providing the least motion.



Do not overthrow into sleeve.

Figure 3-10. Cycle-Clutch Latch Restoring (Level 2)

Cycle-Clutch Release Point

Adjust the cycle-clutch keeper vertically for 0.002" to 0.008" clearance between the pawl and the keeper with the "H" interposer latched down. The clearance must be observed at the point of unlatching because it increases as the latch moves forward.

NOTE: Too much clearance indicates that the clutch is being released too early in the travel of the interposer. Erroneous selection can occur when a "flicking" action on the keylevers causes the cycle clutch to be released without latching an interposer down. As a result, the filter shaft will not drive an interposer forward and the hyphen or underscore will be printed.

Without enough clearance, the clutch may not be released when an interposer is latched down. This would lock the keyboard.

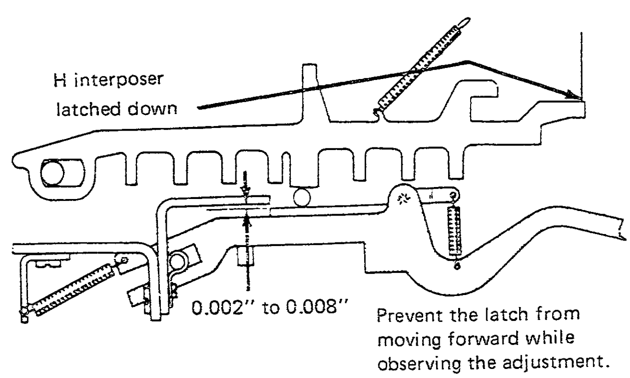


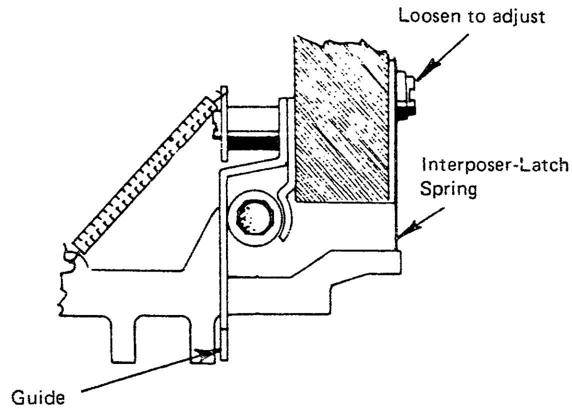
Figure 3-11. Cycle-Clutch Release Point

Interposer-Latch Springs, Final

Position each end of both the left and right interposer-latch-spring sections vertically so that the 0.002" to 0.008" latch pawl to keeper clearance is maintained with various interposers latched down.

> *NOTE:* Adjusting the interposer-latch springs by this method provides a simultaneous interposer latching with respect to cycle-clutch release for all interposers. It also compensates for any nonparallel alignment between the rear interposer guide comb and the cycle bail.

Adjusting the latch springs as low as possible achieves a lower cycle-clutch release point. This helps minimize "flicking".



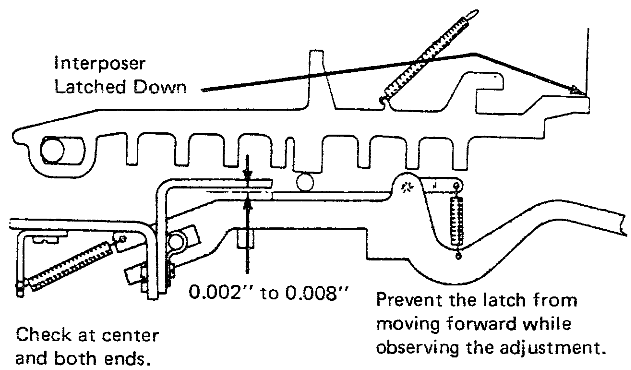


Figure 3-12. Interposer-Latch Springs, Final

Cycle-Clutch Latch-Pawl Bite

Adjust the cycle-clutch-bail upstop to provide 0.030" to 0.035" bite between the latch pawl and its keeper (1/2 the thickness of the keeper).

The bail stop is mounted with two nuts and two screws. These nuts and screws also control the position of the character-interrupter bail plate. To adjust the cycle-clutch-bail upstop, loosen both nuts and the front screw. Do not loosen the rear screw.

> *NOTE:* Insufficient bite increases the possibility of a repeat cycle. Too much bite will affect the touch of the keyboard.

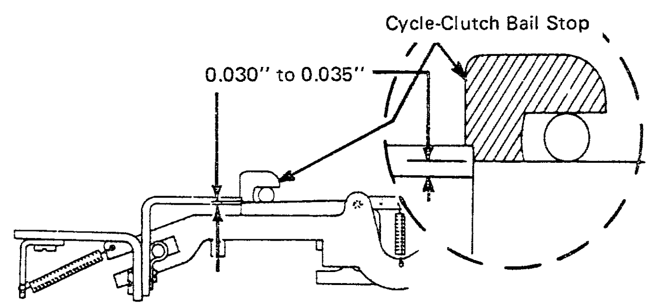


Figure 3-13. Cycle-Clutch Latch-Pawl Bite

Front Keylever Guide Comb

Position the guide comb vertically to allow the keylevers to travel 0.010" to 0.020" after the keylever pawl resets. This should result in a clearance of 0.016" to 0.024" between the keylever pawl and the interposer. An individual keylever may be adjusted by opening or closing the horseshoe slot on the keylever.

NOTE: Movement of the front keylever guide comb will affect the adjustment of the operation keylevers.

The interposer should not bottom in the rear interposer-guide-comb slots when the keylever bottoms in the front keylever guide comb. This could cause a keyboard touch problem and possibly keylever pawl breakage.

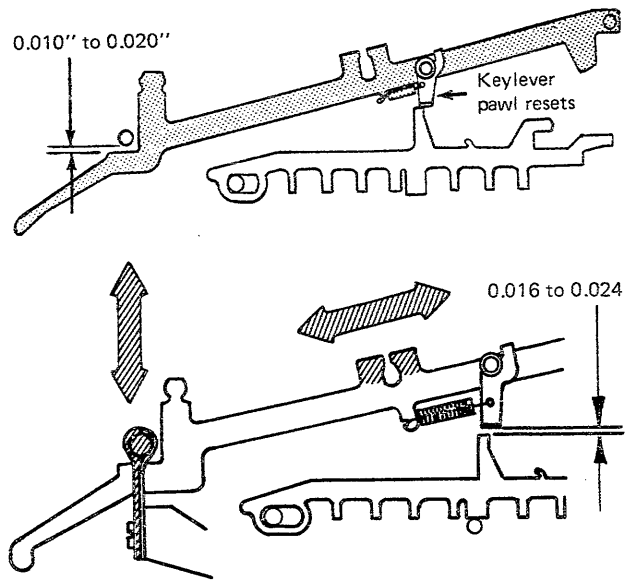


Figure 3-14. Front Keylever Guide Comb

Selector Compensator (Level 1)

Remove the power cable and unlock the keyboard (turn power switch ON if present). With the extreme RH interposer latched down and held against the right side of its guide slot, turn the adjusting screw (or slider) until the extreme RH ball is trapped between the interposer and the adjusting screw (or slider). Follow the same procedure for the left side.

NOTE: Do not let this adjustment cause the interposer to move.

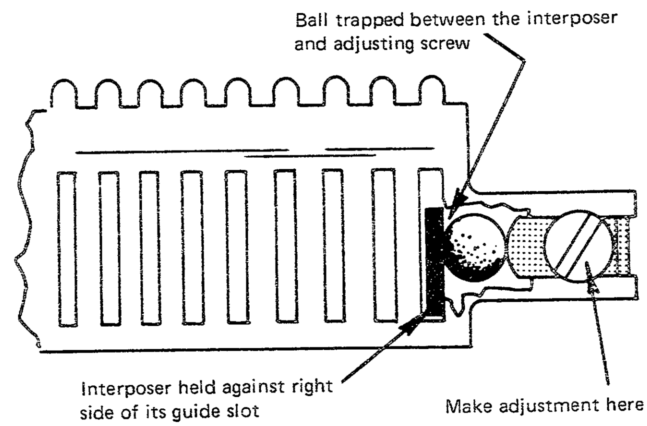


Figure 3-15. Selector Compensator (Level 1)

Selector Compensator (Level 2 and Level 3)

Remove the power cable and unlock the keyboard (turn power switch ON if present). Loosen locking setscrews in the LH and RH blocks (nylon on Level 2).

Latch the extreme RH interposer down.

Tighten the RH adjusting plug so that the end ball will trap the interposer in the latched position when the interposer latch is manually disengaged.

While holding the latch spring away from the interposer, back out the adjusting plug slowly until the interposer restores freely—then back out 1/6 turn more (one flat on the hexagon nut is 1/6).

Repeat the same procedure on the LH side.

Tighten the locking setscrews.

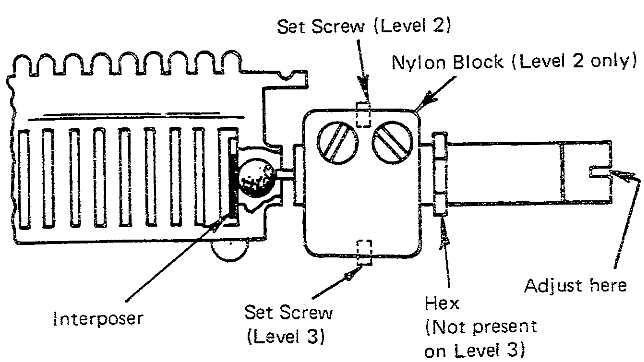


Figure 3-16. Selector Compensator (Level 2 and Level 3)

SELECTION MECHANISM

Selection-Latch Bail

CAUTION
Do not adjust unless it is absolutely necessary. This bail is set during manufacture and should not require readjustment unless the plate becomes loose or unless parts replacement is necessary.

NOTE: The following vertical and horizontal adjustments are interactive.

1. Vertical: Adjust the LH bail shaft mounting plate up or down for equal pressure of the left and right bail rollers against their cams. Check this by testing the drag on strips of paper inserted between the rollers and the cams.
2. Horizontal: Adjust the RH bail-shaft mounting plate forward or backward until the bail shaft is parallel to the cycle-clutch shaft. Use the Hooverometer to set the RH end of the bail shaft the same distance from the cycle shaft as the LH end.

NOTE: As a final check for the selection-latch bail, hand-cycle the machine using a zero-tilt, latched-home zero-rotate character (all latches removed from under the bail). Both latch bail rollers should maintain contact with their respective cams throughout the cycle.

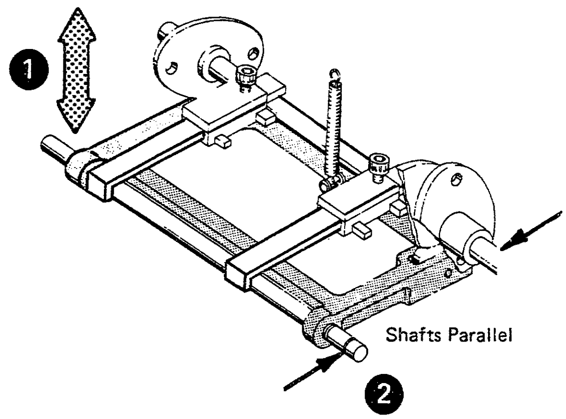


Figure 3-17. Selection-Latch Bail

Differential Guides

Adjust the rotate and tilt differential guides left or right so that the vertical links and selection latches in the system hang in a true vertical position. The rotate-differential guide is attached to the top of the differential mounting bracket by two screws just behind the balance lever. The screws are accessible from the rear with the motor removed. The tilt-differential guide (not present on all machines) is attached to the bottom of the differential mounting bracket and is easily accessible from the bottom of the machine.

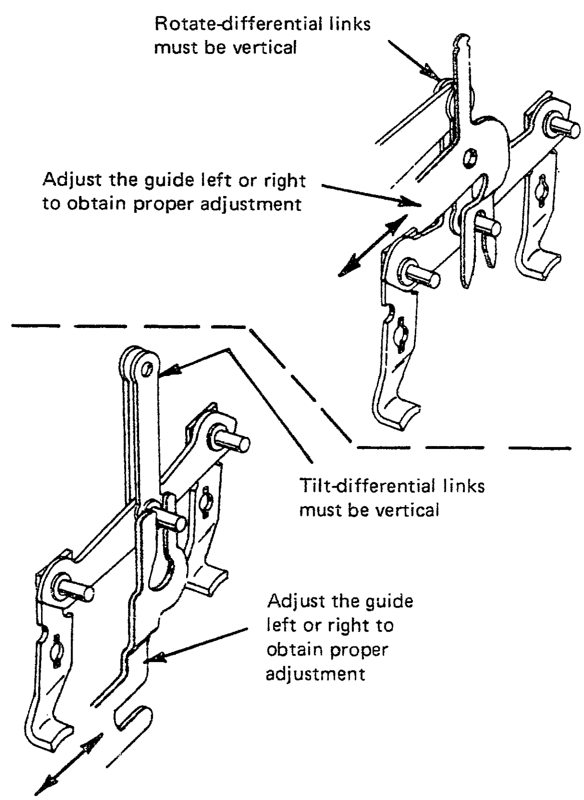


Figure 3-18. Differential Guides

Latch Bail Guide

Adjust the latch-bail guide attached to the lower left corner of the differential mounting bracket so that all the tilt-selector and all the positive-rotate latches hang vertically in the latch-bail guide.

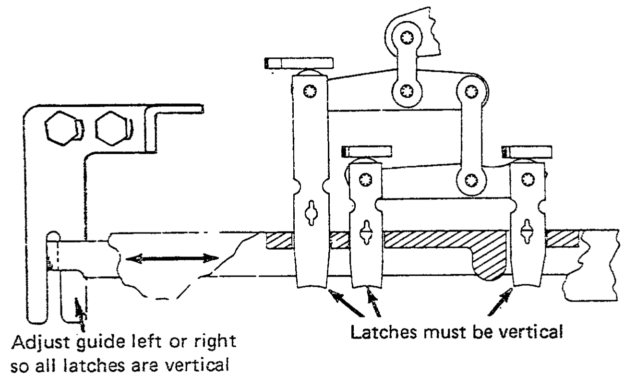


Figure 3-19. Latch-Bail Guide

Latch-Bail Overthrow Stop

With the latch bail on the high point of the positive cams, adjust the overthrow stop for a clearance of from 0.005" to 0.015".

NOTE: Excessive overthrow of the bail will allow a selected latch to jump over the top of the bail and prevent the bail from restoring.

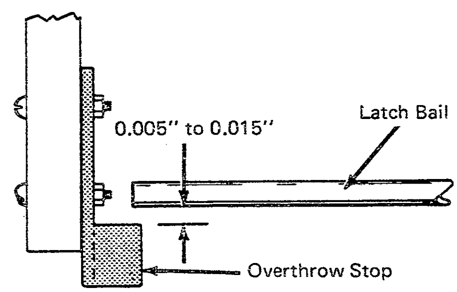


Figure 3-20. Latch-Bail Overthrow Stop

Latch-Interposer Stop (Level 1)

Form the latch-interposer stops to obtain 0.001" to 0.005" clearance between each latch interposer and its respective selector bail with the bail held to the rear.

NOTE: Selection timing will be directly affected by an erroneous latch-interposer stop adjustment.

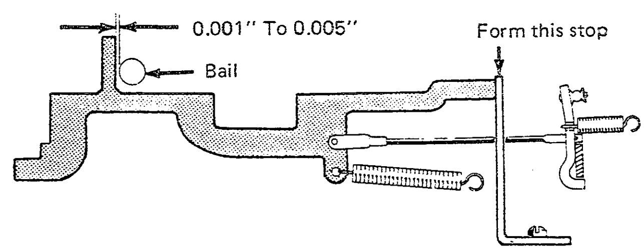


Figure 3-21. Latch-Interposer Stop (Level 1)

Latch-Interposer Stop (Level 2)

Form the latch-interposer stops to obtain 0.001" to 0.005" clearance between each latch interposer and its respective selector bail with the bail held to the rear. Adjust the left-to-right position of the front interposer-mounting bracket so the latch links will exert a straight pull on the selector latches.

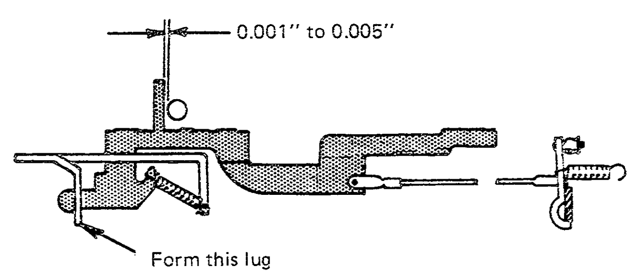


Figure 3-22. Latch-Interposer Stop (Level 2)

-5 Latch Link

With the machine at rest, adjust the -5 latch link so that the -5 latch will overlap its stop screwhead by from 0.052" to 0.062".

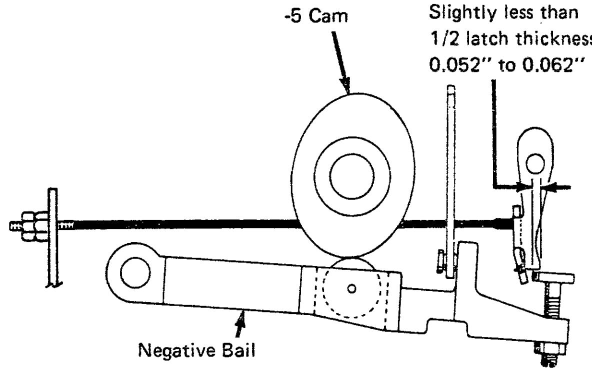


Figure 3-23. -5 Latch Link

Tilt and Positive Latch Links

With the machine at rest, adjust the tilt and positive latch links so that their latches will overlap the latch bail flush to 0.010" overhang.

NOTE: Links adjusted too long or too short can cause malselection.

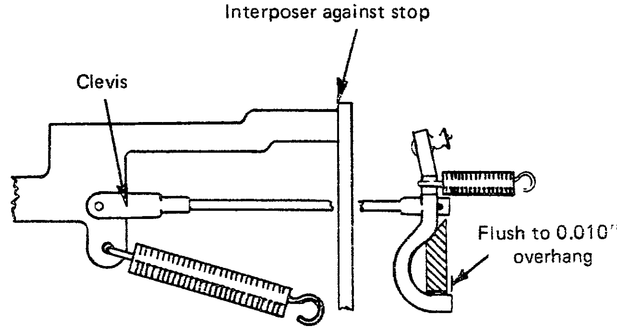


Figure 3-24. Tilt and Positive Latch Links

Check-Latch Upstop

With the positive cams at the low point, form the upstop so that the latch clears the bail by 0.020" to 0.025".

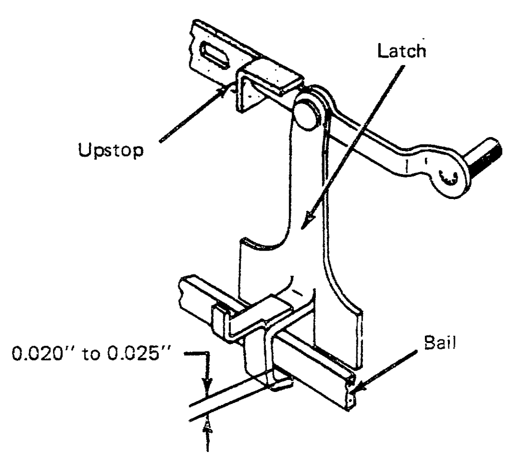


Figure 3-25. Check-Latch Upstop

Check-Latch Return Arm

Position the check-latch return arm to hold the pivot arm against the upstop.

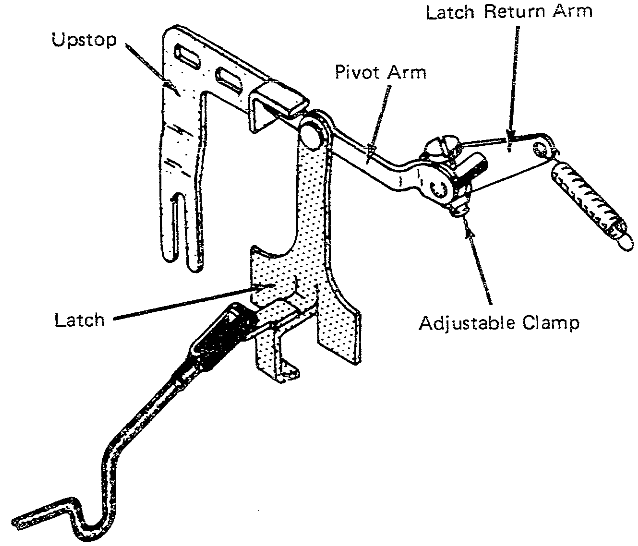


Figure 3-26. Check-Latch Return Arm

Check-Latch Link

With the machine at rest, adjust the check-latch link so that the check latch is 0.001" to 0.010" from being completely under the latch-selection bail.

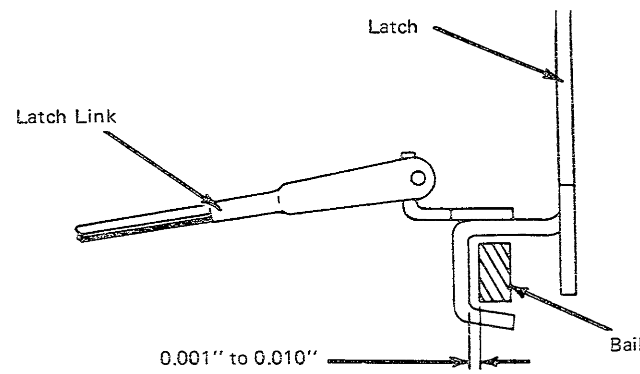


Figure 3-27. Check-Latch Link

LATCH PUSHER ASSEMBLY

Latch Pusher Plate

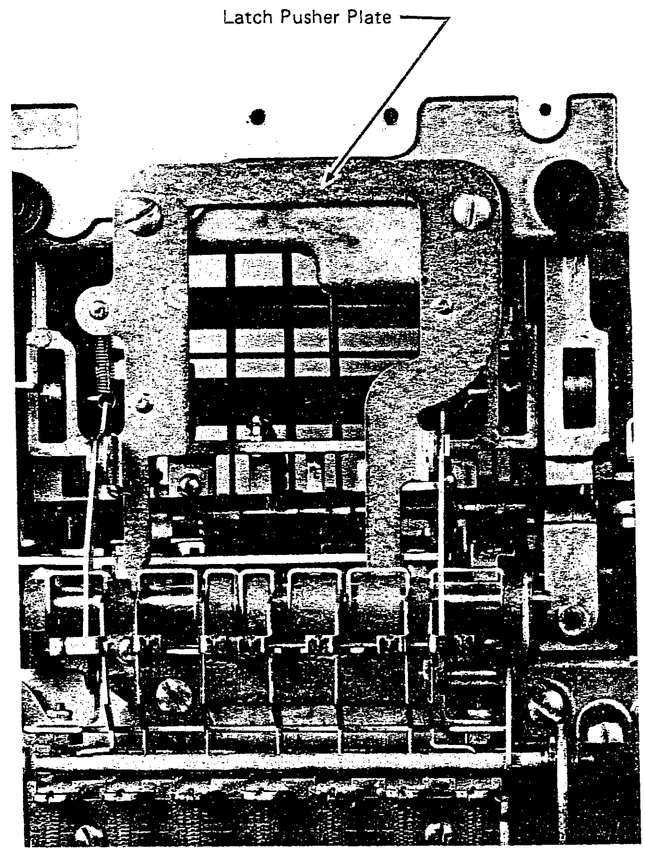
CAUTION
Do not adjust or remove the latch pusher plate unless absolutely necessary. This adjustment is interrelated with the differential guide, latch bail stop, selector latch links, and the print magnet armature to pusher adjustments. Each will have to be adjusted and checked until all are correct.

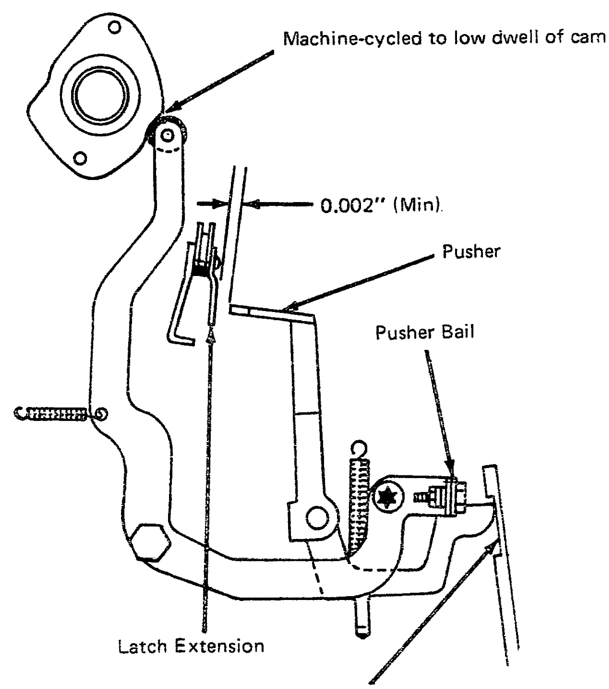
NOTE: For individual clearances, see "Latch Pusher Clearance".

1. When the latch pusher assembly must be removed, scribe the pusher plate to power frame relationship. If the original relationship can be maintained, the adjustments will not be altered by removal.
2. If the original relationship is lost, position the pusher plate as close as possible for a 0.002" clearance between the pushers and the latch extensions, with the machine cycled until the cam follower is in the low dwell of the restoring cam.

   NOTE 1: Malselection will occur if an unselected pusher contacts its latch extension during a print cycle.

   NOTE 2: Malselection can also be caused by worn selection-pusher cam-follower rollers. The old-level (barrel shape) roller has been replaced with a new-level sintered-iron roller. A worn roller on the latest-level pusher arm can be replaced without replacing the arm.





CAUTION
Refer to text before making adjustment.

Figure 3-28. Latch Pusher Plate

Pusher-Bail Eccentrics (Level 1 Only)

Adjust so that the top edge of the follower arms are flush with the pusher bail.

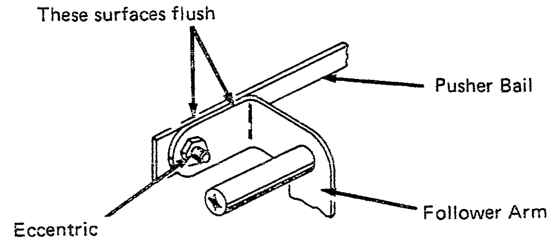


Figure 3-29. Pusher-Bail Eccentrics (Level 1 Only)

Latch Pusher Clearance

CAUTION
During a print cycle, the *unselected* latch pushers must maintain at least 0.002" clearance to their latch extensions, or malselection could result.

With the cycle clutch latched and the backlash removed against the check pawl, form the pushers to clear their latch extensions by the following tolerances:

R2A with links	from 0.040" to 0.050"
R2A without links	from 0.030" to 0.040"
T2, T1, R2, R1, R5	from 0.025" to 0.035"

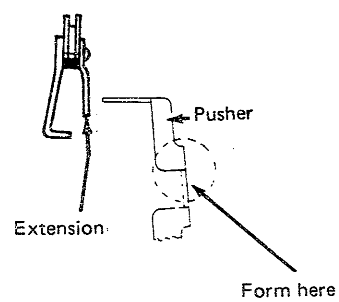


Figure 3-30. Latch Pusher Clearance

Check-Latch Pusher

With the cycle clutch latched and the backlash removed against the check pawl, form the check-latch pusher to clear the selection bail by 0.020" to 0.030". This clearance must be observed with the latch-selection bail lowered slightly.

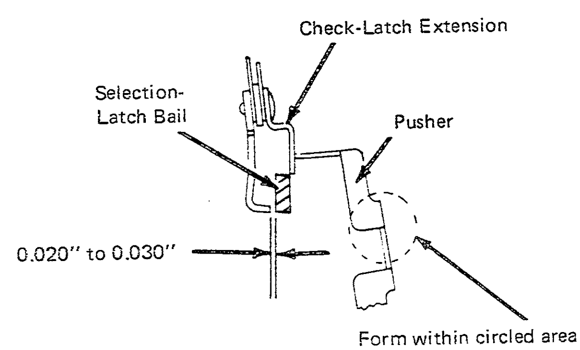


Figure 3-31. Check-Latch Pusher

PRINT MAGNET ASSEMBLY (LEVEL 1)

NOTE: When making the complete magnet assembly adjustments, remove the magnet unit. To prevent interference from the trip bail, turn the high points of the pivot eccentrics to the top.

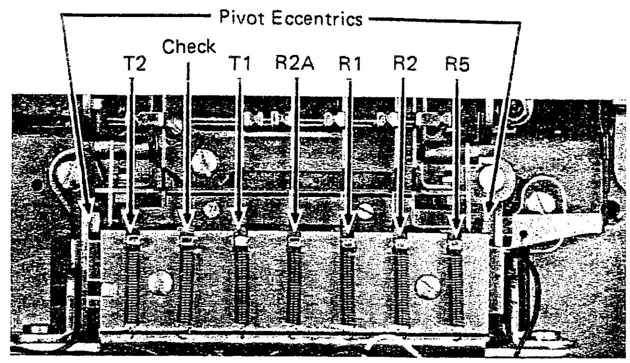


Figure 3-32. Print Magnet Assembly (Level 1)

Pivot Plate (Level 1)

Adjust the pivot plate for a clearance of from 0.001" to 0.006" between the yoke and armatures, with the armatures manually attracted. This clearance should be measured at the outside armatures (T2 and R5).

Guide Plate (Level 1)

Position the guide plate as follows:

1. Vertically: to provide equal spring tension on all armature springs.
2. Horizontally: so that all armatures are centered in the guide slots.

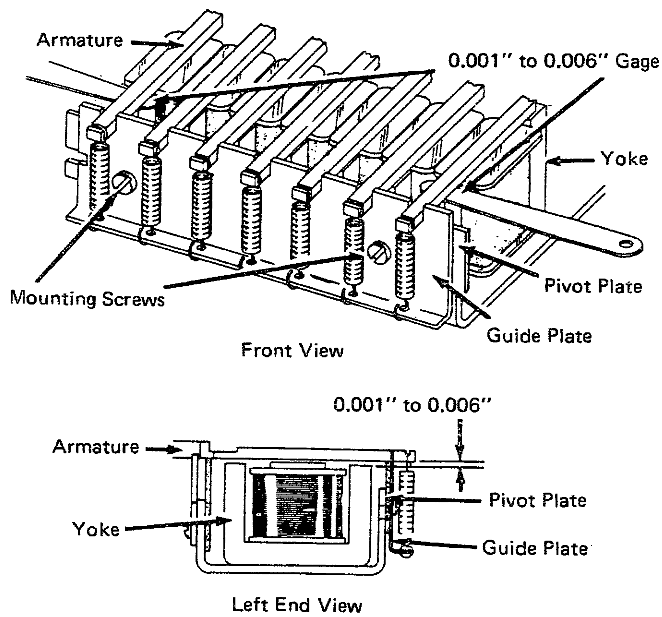


Figure 3-33. Pivot and Guide Plates (Level 1)

Armature Stop (Level 1)

With the armature manually attracted, adjust for a clearance of from 0.004" to 0.008" between the armatures and yokes. These clearances should be measured at the outside armatures (T2 and R5).

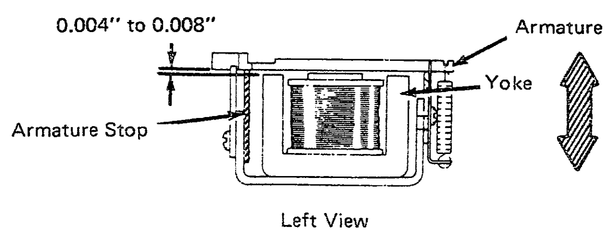


Figure 3-34. Armature Stop (Level 1)

Armature Guide Plate (Level 1)

Position the armature guide horizontally so that the armatures are centered in the guide slots.

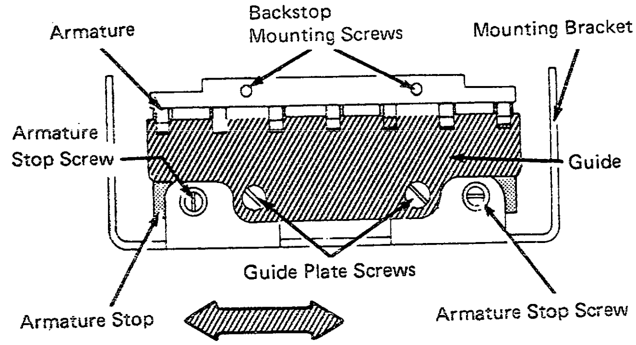
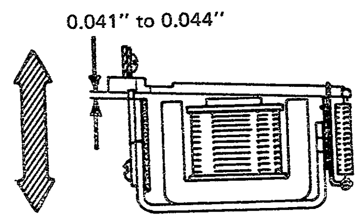


Figure 3-35. Armature Guide Plate (Level 1)

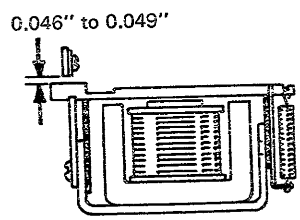
Armature Backstop (Level 1)

Position the backstop vertically for a clearance of from 0.041" to 0.044" between the *armature stop* and the armatures with the armatures *at rest.*

> *NOTE:* A quick method of adjustment is to set the clearance between the *backstop* and the outside armatures (T2 and T5) for from 0.046" to 0.049" with the armatures *attracted.* This will provide the specified clearance.



Specified Clearance



Method of Adjustment

Figure 3-36. Armature Backstop (Level 1)

Pivot Eccentrics (Level 1)

NOTE: Pivot eccentric adjustment is a preliminary adjustment. For final adjustment, see "Trip Link" under "Cycle Clutch Trip Mechanism".

Adjust the pivot eccentrics so that the cycle-clutch trip bail is parallel to the armatures. The following procedure may be used:

1. Disconnect the trip link.
2. Manually seal the T2 and R5 armatures. Both armatures should touch the trip bail. If they do not, adjust the pivot eccentrics so that they do.
3. Apply slight pressure to the knock-off extension or the trip-link extension, to hold the bail in contact with the armatures.

   NOTE: The high point of the pivot eccentrics *must* be toward the *top* (paper-feed area) of the machine. If the pivot eccentrics are not positioned to the top, the print magnet armatures will contact the trip bail too soon, causing sluggish operation or failure to trip the cycle clutch.

4. After completing step 3, while holding the trip bail against the armatures, check the center armatures to be sure they touch the trip bail or clear it by a maximum of 0.002". Excess clearance can cause extra cycles.

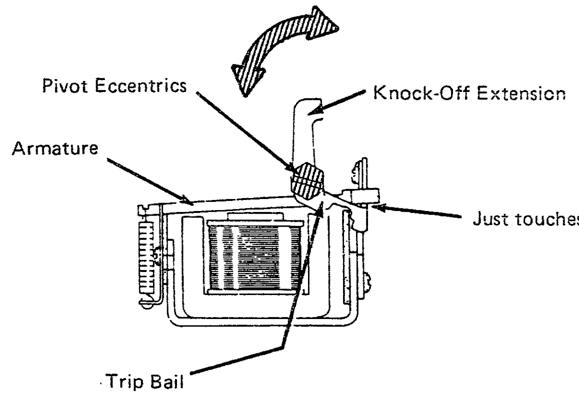


Figure 3-37. Pivot Eccentrics (Level 1)

Magnet Unit Position (Level 1)

NOTE: The cycle-clutch overthrow stop must be correct before this adjustment is made.

Position the magnet unit under its two mounting screws for from 0.005" to 0.010" clearance between the pusher tails and armature latching surfaces (with the armatures at rest).

This adjustment ensures that the pusher does not contact its latch extension when the pusher is against its armature during a print cycle. If a nonoperated pusher touches its latch extension, malselection will result.

NOTE: Magnet unit and mounting bracket adjustments are interacting; both requirements must be satisfied.

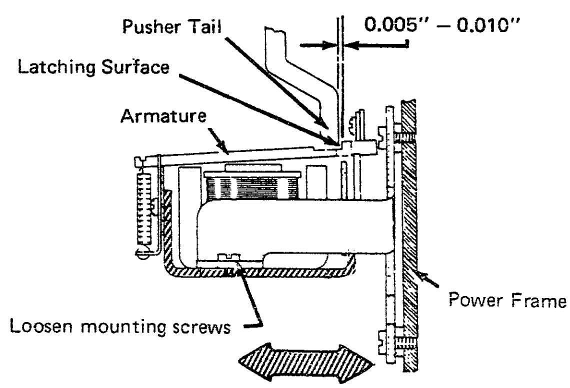


Figure 3-38. Magnet Unit Position (Level 1)

Mounting Bracket Positions (Level 1)

This adjustment must be made with the cycle-clutch trip bail tripped and the pusher tails rotated just past their latching surface. Position the mounting bracket under its four mounting screws for from 0.001" to 0.010" clearance between the end of each pusher tail and its attracted armature.

NOTE: Magnet unit and mounting bracket adjustments are interacting; both requirements must be satisfied.

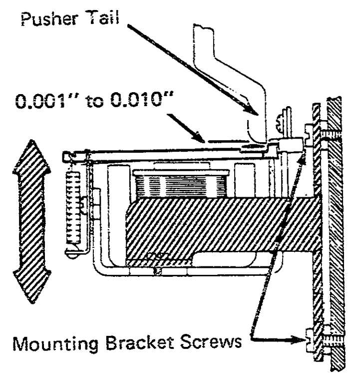


Figure 3-39. Mounting Bracket Positions (Level 1)

Knock-Off Eccentrics (Level 1)

Adjust (with the T2 and R5 armatures manually attracted) to clear the trip-bail extensions by from 0.003" to 0.008".

Excess clearance will cause extra cycles because the armatures are not being knocked off. The armatures must be knocked off, since residual magnetism may be present.

Lack of clearance will cause failure to cycle because the trip bail will not be able to rotate to trip the cycle clutch.

NOTE: The magnet unit is shimmed away from the power frame to allow the knock-off extension to be within range of the knock-off eccentric and to keep the magnet unit parallel to the pushers. These shims (spacers) vary in thickness and must be put back in the same location from which they were removed, whenever the magnet unit is replaced.

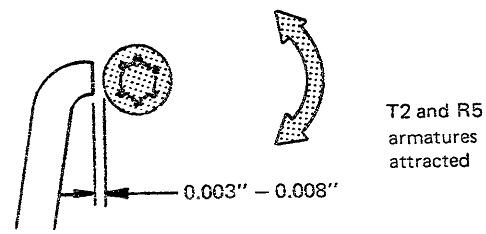


Figure 3-40. Knock-Off Eccentrics (Level 1)

PRINT MAGNET ASSEMBLY (LEVEL 2)

NOTE: The Level 2 magnet assembly may be identified by the absence of pivot eccentrics and the single knock-off extension.

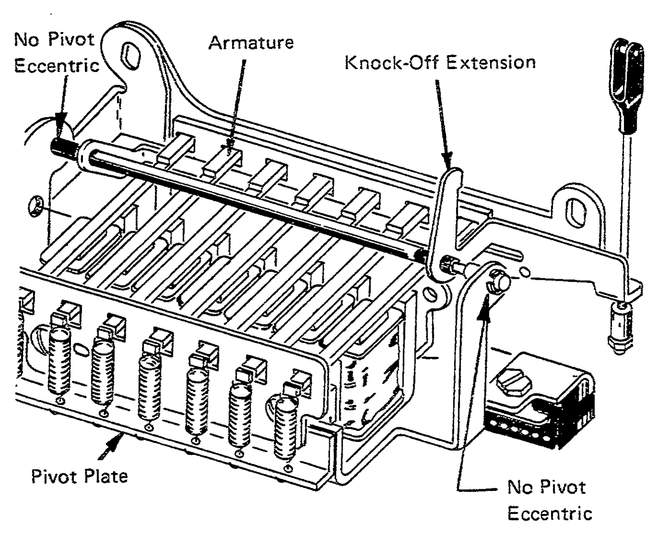


Figure 3-41. Print Magnet Assembly (Level 2)

Pivot Plate (Level 2)

Adjust for a clearance of from 0.002" to 0.004" between the lower yoke and armatures with the armatures manually attracted. This clearance should be measured at the outside armatures (T2 and R5).

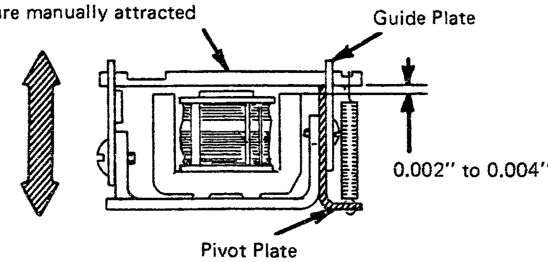


Figure 3-42. Pivot Plate, Left-End View (Level 2)

Guide Plate (Level 2)

The position of the guide plate is predetermined by holes which fit over stamped projections on the pivot plate.

Armature Stop (Level 2)

With the armature manually attracted, adjust the armature stop for a clearance of from 0.003" to 0.006" between the armature and the upper yoke.

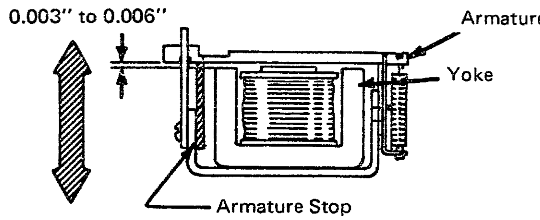


Figure 3-43. Armature Stop (Level 2)

Trip Bail (Level 2)

Adjust the cycle-clutch trip bail so that it is parallel to the armatures. The following procedure may be used:

1. Disconnect the trip link.
2. Loosen the screw.
3. Manually seal the T2 and R5 armatures.
4. Apply slight pressure to the knock-off extension so that both armatures just touch the trip bail. If they do not, form the left trip bail support to obtain this condition.
5. Tighten the screw.

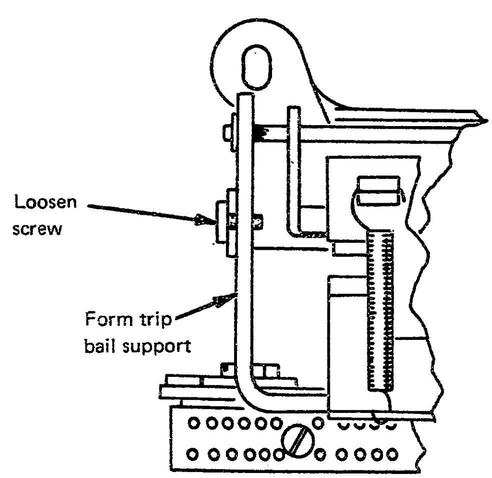


Figure 3-44. Trip Bail (Level 2)

Mounting Bracket Position (Level 2)

This adjustment must be made with the cycle-clutch trip bail tripped and the pusher tails rotated just past their latching surface. Position the mounting bracket, under its four mounting screws, for from 0.001" to 0.010" between the end of each pusher tail and its attracted armature.

NOTE: Magnet unit and mounting bracket adjustments are interacting; both requirements must be satisfied.

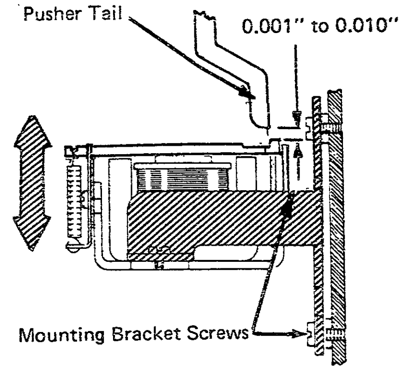


Figure 3-45. Mounting Bracket Position (Level 2)

Magnet Unit Position (Level 2)

NOTE: The cycle-clutch overthrow stop must be correct before this adjustment is made.

Position the magnet unit, under its two mounting screws, for a clearance of from 0.005" to 0.012" between the pusher tails and armature latching surfaces (with the armatures at rest).

This adjustment ensures that the pusher does not contact its latch extension when the pusher is against its armature during a print cycle. If a nonoperated pusher touches its latch extension, malselection will result.

NOTE: Magnet unit and mounting bracket adjustments are interacting; both requirements must be satisfied.

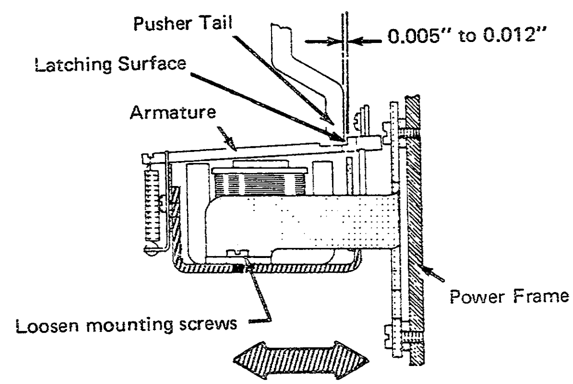


Figure 3-46. Magnet Unit Position (Level 2)

Knock-Off Eccentric (Level 2)

NOTE 1: The Level 2 magnet assembly can be identified by the absence of pivot eccentrics, and by the single knock-off extension.

NOTE 2: The magnet unit is shimmed away from the power frame to allow the knock-off extension to be within range of the knock-off eccentric and to keep the magnet unit parallel to the pushers. These shims (spacers) vary in thickness and must be put back in the same location from which they were removed whenever the magnet unit is replaced.

With T2 and R5 magnet manually attracted, adjust the knock-off eccentric for a clearance of from 0.003" to 0.008" from the knock-off extension.

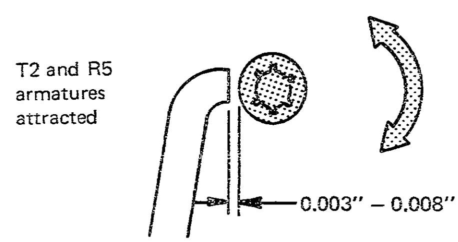


Figure 3-47. Knock-Off Eccentric (Level 2)

PRINT MAGNET ASSEMBLY (LEVEL 3)

NOTE: The Level 3 magnet assembly can be identified by the presence of two pivot eccentrics, the single knock-off extension, and the wide armatures with latching holes for the pusher tails.

Armature Pivot Plate and Upstop

Loosen the pivot plate and upstop mounting screws, hold the R5 and T2 armatures against the three magnet pole pieces, and then adjust the pivot plate and armature upstop so that they just touch the armatures. Tighten the screws.

Pivot Eccentrics (Level 3)

Adjust the cycle-clutch trip bail parallel to the armatures, using the same procedure as described under "Pivot Eccentrics (Level 1)".

NOTE: The high point of the eccentrics should be toward the top (paper-feed area) of the machine.

Magnet Unit (Level 3)

With the machine at rest, position the magnet unit, under its two mounting screws, for a clearance of from 0.005" to 0.012" between the pushers and their latching surface in the armature windows.

CAUTION
During a print cycle, the *unselected* latch pushers must maintain at least 0.002" clearance to their latch extensions, or malselection could result.

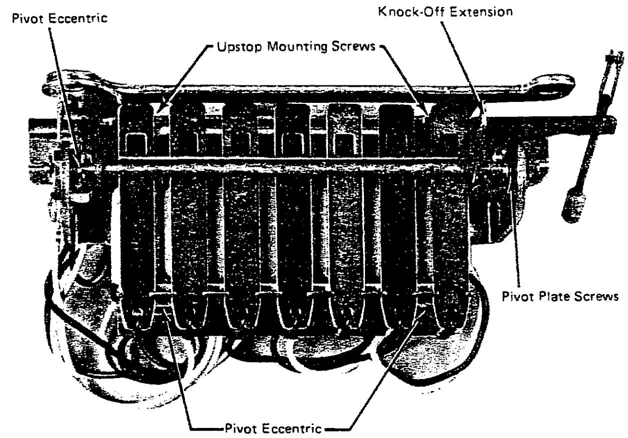


Figure 3-48. Print Magnet Assembly (Level 3)

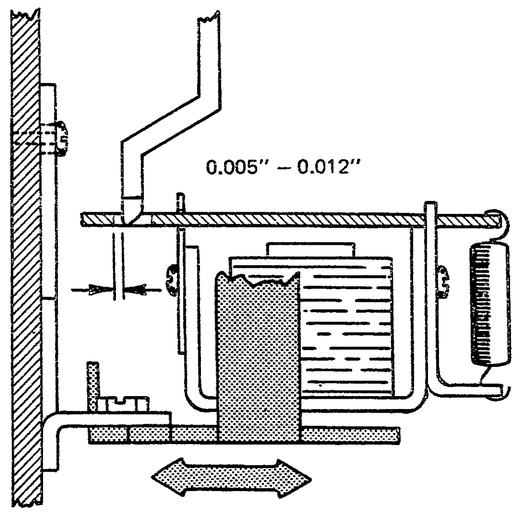


Figure 3-49. Magnet Unit (Level 3)

Mounting Brackets (Level 3)

Position the mounting brackets under the four mounting screws so that, when any armature is held attracted, there will be a clearance of from 0.001" to 0.010" between the end of the pusher and the armature.

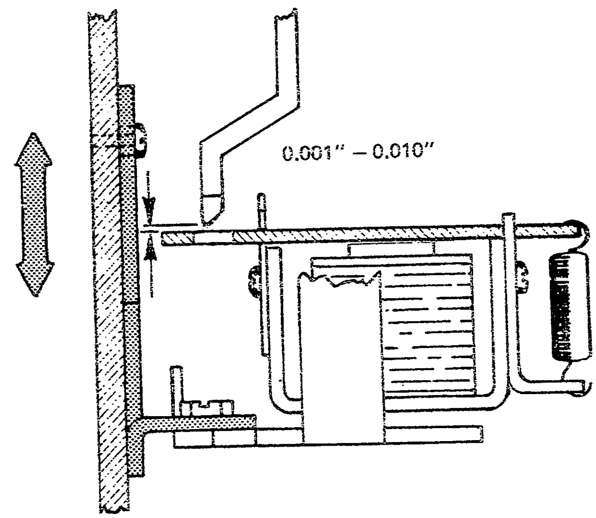


Figure 3-50. Mounting Bracket (Level 3)

Knock-Off Eccentric (Level 3)

With the T2 and R5 magnets manually attracted, adjust the knock-off eccentric for a clearance of from 0.003" to 0.008" from the knock-off extension.

NOTE: The magnet unit is shimmed away from the power frame to allow the knock-off extension to be within range of the knock-off eccentric and to keep the magnet unit parallel to the pushers. These shims (spacers) vary in thickness and must be put back in the same location from which they were removed, whenever the magnet unit is replaced.

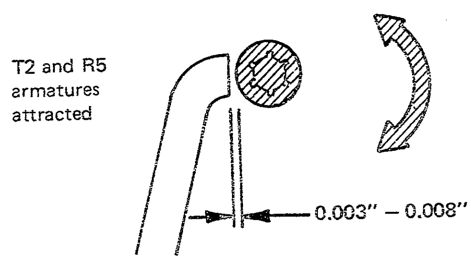


Figure 3-51. Knock-Off Eccentric (Level 3)

CYCLE-CLUTCH TRIP MECHANISM (LEVEL 1)

NOTE: Check the clutch-latch bite before proceeding.

Trip Link

Hold a print magnet armature attracted and adjust the cycle-clutch trip-link clevis to move the cycle-clutch latch 0.002" to 0.007" away from the clutch sleeve.

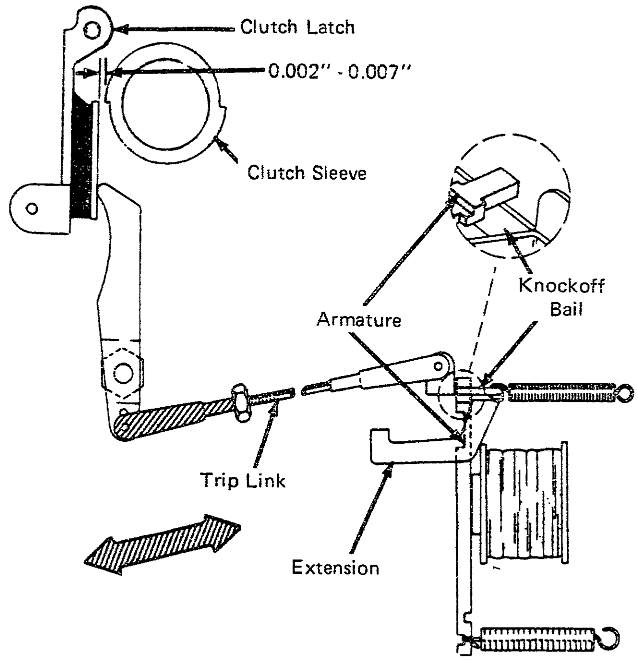


Figure 3-52. Cycle-Clutch Trip Link (Level 1)

CYCLE-CLUTCH TRIP MECHANISM (LEVEL 2)

NOTE: Check the clutch-latch bite before proceeding.

Latch Stop (Unit Removed)

Position the latch stop so the latch lever overlaps the trip-lever lug by 0.040" to 0.045".

Insufficient bite could cause extra cycles since the trip lever may slip off the latch lever. Excessive bite may cause failure to cycle since there is a limited amount of motion available from the armatures to pull the latch lever down.

NOTE: Not adjustable on late style mechanisms.

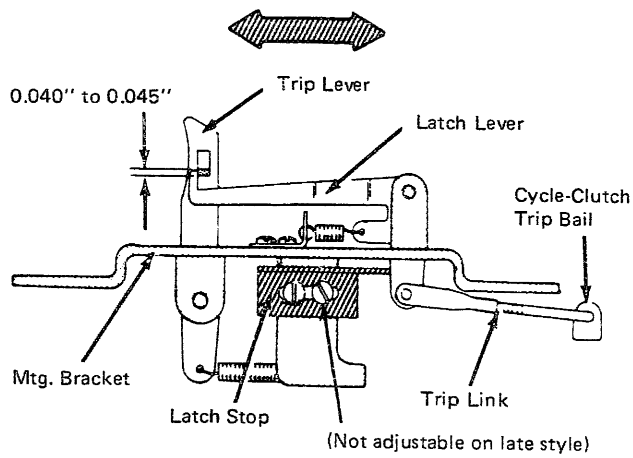


Figure 3-53. Latch Stop

Trip-Lever Mounting Bracket (Unit Installed)

Adjust the trip-lever mounting bracket front-to-rear so the trip lever clears the cycle-clutch latch by 0.003" to 0.010".

Excessive clearance may cause extra cycles since the trip lever is restored by the cycle-clutch latch restoring motion. Insufficient clearance may cause extra cycles due to the cycle-clutch latch bouncing off the trip lever.

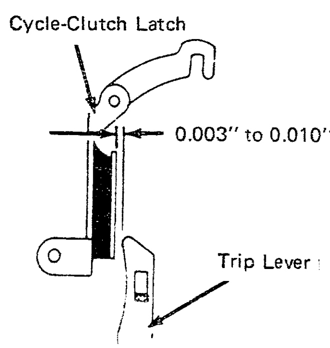


Figure 3-54. Trip-Lever Mounting Bracket

Trip Link

With either the T2 or R5 armature manually attracted, adjust the link so that the latch lever clears the trip-lever lug by from 0.005" to 0.015".

NOTE: If necessary, refine the pivot eccentric adjustment to obtain equal latch-level overthrow from the T2 and R5 armatures.

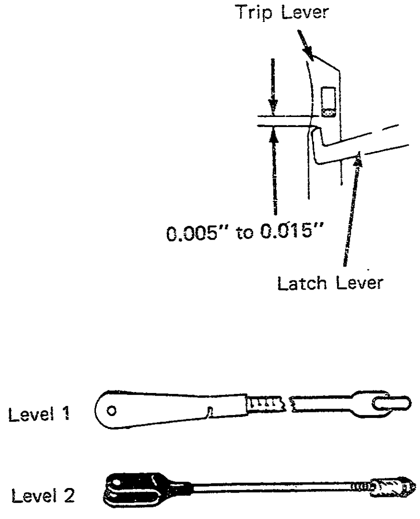


Figure 3-55. Trip Link

Inhibitor

Adjust the inhibitor trip lever so the bottom edge of the inhibitor pawl is flush with the bottom edge of the cycle-clutch latch, with all parts at rest.

This adjustment provides a 0.040" to 0.045" bite of the inhibitor pawl on the cycle-clutch latch, to prevent extra cycles.

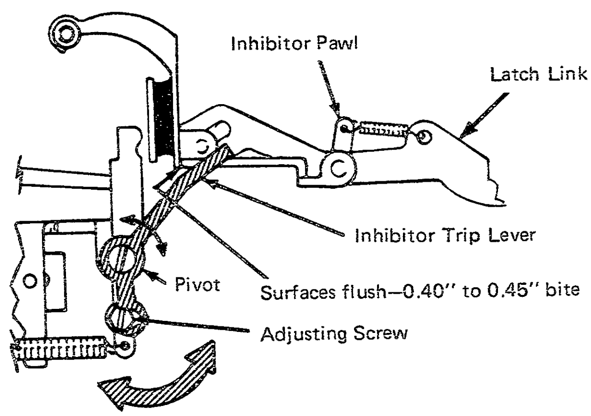


Figure 3-56. Inhibitor

KEYBOARD-LOCK MECHANISM

Switch Link

With the On/Off switch in the OFF position, adjust the switch link so the On/Off keybutton matches the slope of the keyboard.

NOTE: Adjusting the link too long can cause the switch to turn off due to the spring load in the off direction and due to the load from the lockout shaft.

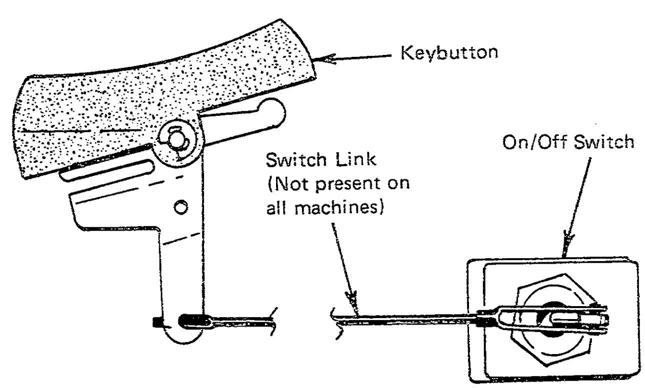


Figure 3-57. Switch Link

Lockout-Bail Link

Position the clevis approximately half way on the threads of the link.

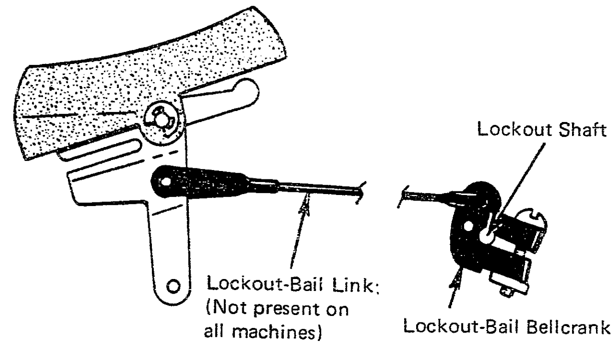


Figure 3-58. Lockout-Bail Link

Lockout-Bail Bellcrank

With the On/Off switch in the OFF position, rotate the lockout bail relative to the lockout-bail bellcrank so the cycle-clutch-pawl stop overlaps the cycle-clutch pawl by 1/3 to 1/2.

NOTE: Excessive overlap between the pawl stop and cycle-clutch pawl can cause keyboard lockup.

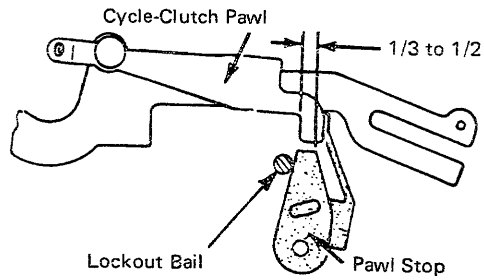


Figure 3-59. Lockout-Bail Bellcrank

Keyboard-Lock Bellcrank Link

Adjust the link so the bellcrank is fully bottomed in the selector compensator without choking off the action of the lockout bail.

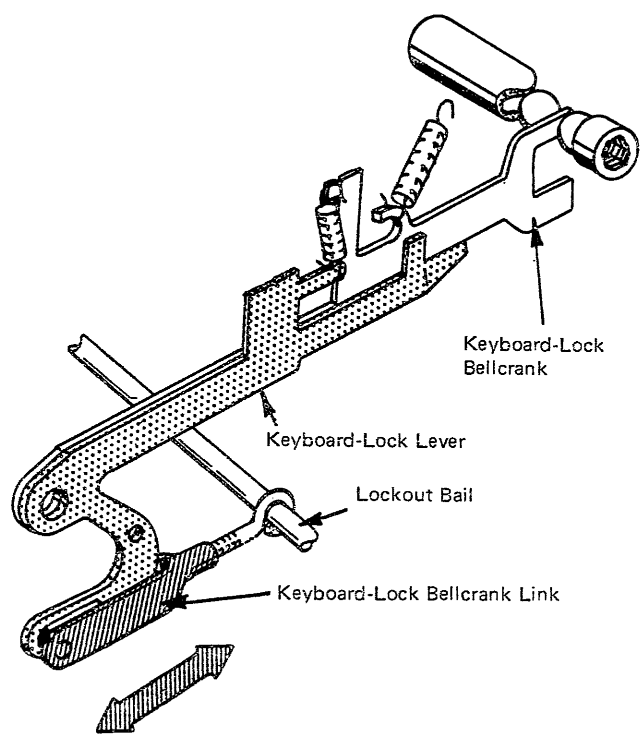


Figure 3-60. Keyboard-Lock Bellcrank Link

Operational Lockout-Shaft Link

With the On/Off switch in the ON position, adjust the operational lockout-shaft link so the flat portion of the lockout shaft is toward the top of the machine and parallel to the bottom power frame.

CAUTION
Be sure the switch lever operates easily and that the operational keys are positively locked and unlocked in the two switch positions; and that the keyboard lockout bail is not restricted by the adjustment.

NOTE: A maladjusted link may cause the operational interposers to lock or be slow in releasing.

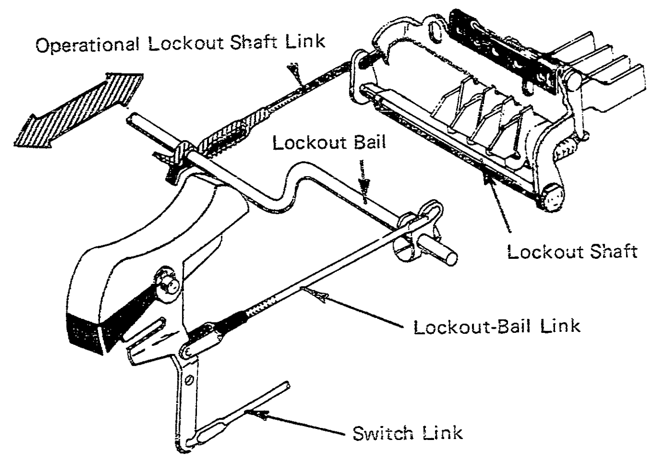


Figure 3-61. Operational Lockout-Shaft Link

KEYBOARD-LOCK MECHANISM (SOLENOID OPERATED)

Solenoid Adjustment

Screw the plunger spring on the plunger to cover all threads.

With the plunger engaged, screw the adjustable core in until the plunger shoulder begins to lift off the plunger guide, then back off 1/4 turn.

Position the solenoid directly beneath the lockout lever.

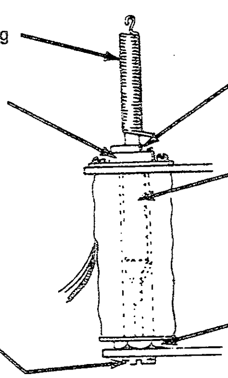


Figure 3-62. Solenoid Adjustment

Eccentric Stop

With the lockout lever resting against the eccentric stop, adjust the eccentric stop so the plunger shoulder clears the plunger guide by 0.078" to 0.094".

The lockout lever may be installed as shown or inverted, depending on whether the keyboard is to be locked when the solenoid is energized or deenergized.

NOTE: The adjustment of the plunger spring may require refinement so the eccentric stop adjustment falls within the range of the eccentric.

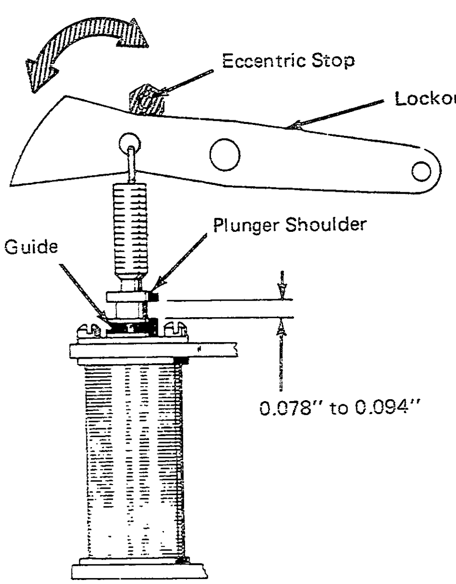


Figure 3-63. Eccentric Stop

Keyboard-Lock Link (Level 1 and 2)

With the keyboard unlocked, adjust the keyboard-lock-link clevis so the operational keylevers clear the lockout adjusting comb by 0.005" to 0.015". See figures.

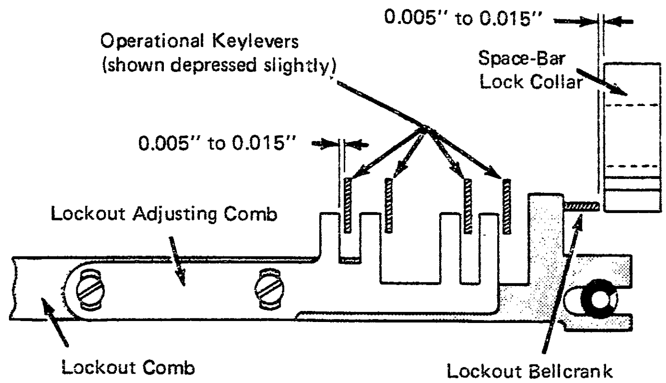


Figure 3-64. Adjusting Comb (Level 1), Keyboard Unlocked

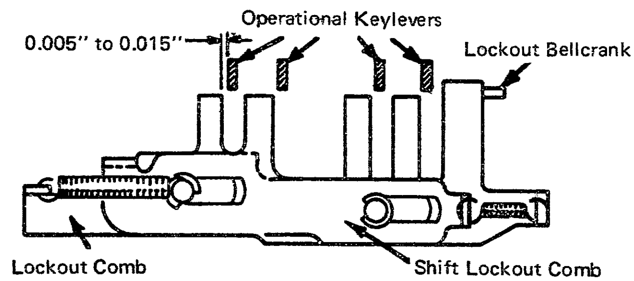


Figure 3-65. Adjusting Comb (Level 2), Keyboard Unlocked

Spacebar Lock Collar (Level 1)

1. Position left or right to clear the lockout bellcrank by 0.005" to 0.015" with the keyboard unlocked.

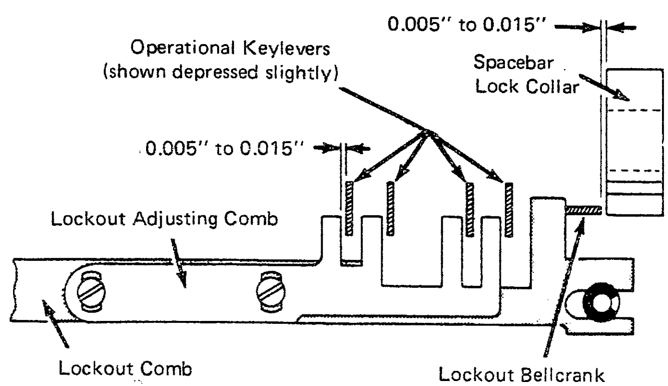


Figure 3-66. Spacebar Lock Collar (Level 1), Keyboard Unlocked

2. Position the spacebar lock collar radially, so the leading edge on the step of the collar clears the lockout bell-crank by 0.005" to 0.015" with the keyboard locked.
3. Position the lockout adjusting comb vertically to clear the bottom of the operational keylevers by 0.010" to 0.025" with the keyboard locked.

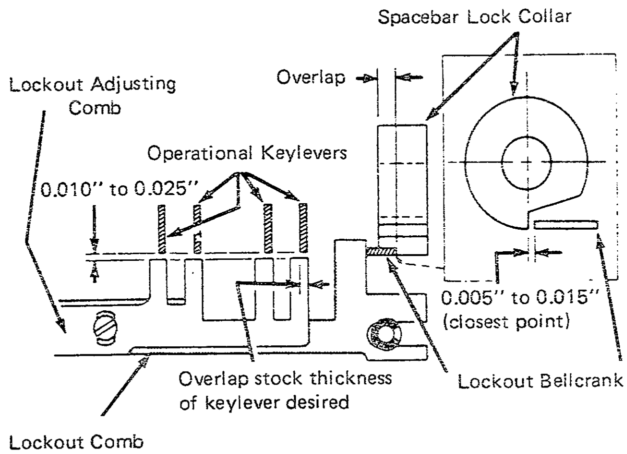


Figure 3-67. Spacebar Lock Collar (Level 1), Keyboard Locked

Shift-Lock Link

Adjust the shift-lock-link clevis to reliably unlatch the shift lock when the keyboard-lock solenoid is operated.

NOTE: Check to ensure that the shift lock can be latched with the keyboard lock deactivated.

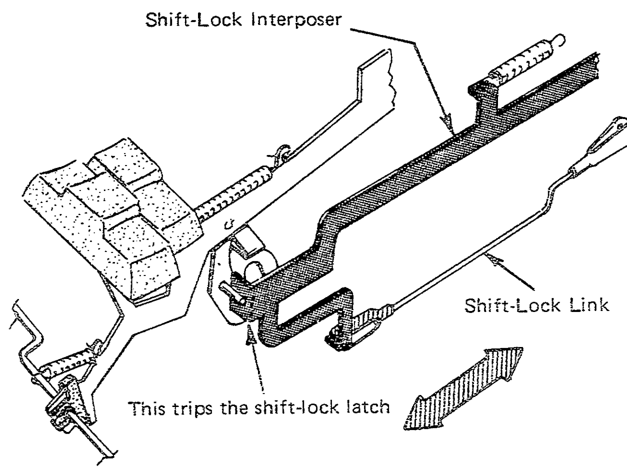


Figure 3-68. Shift-Lock Link

Shift-Lock Magnet (835 and 935 Printers)

Adjust the magnet assembly so that, when energized, it will reliably unlatch the shift lock.

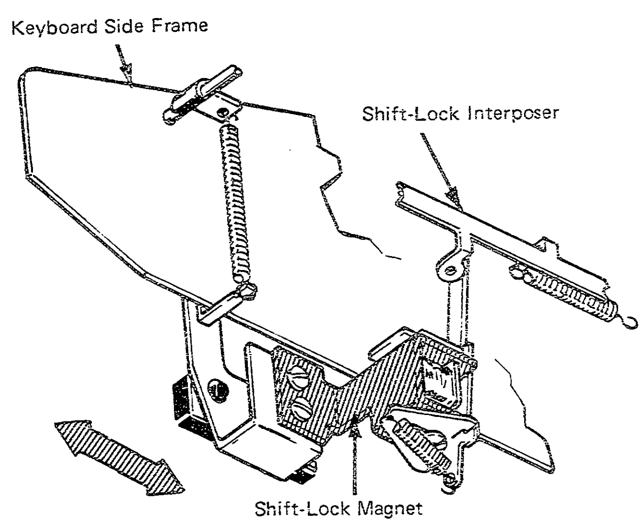


Figure 3-69. Shift-Lock Magnet (835 and 935 Printers)

Keyboard Interposer-Lock Assembly

Adjust the keyboard interposer-lock assembly by loosening the four mounting screws and moving the assembly up or down for 0.003" to 0.015" clearance between the bottom of the interposer and the keyboard interposer-lock assembly when the keyboard interlock assembly is activated.

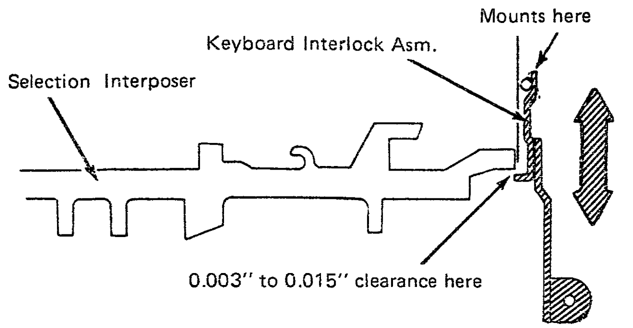


Figure 3-70. Keyboard Interposer-Lock Assembly

Keyboard Interposer-Lock Link

Adjust the keyboard interposer-lock link so there is 0.010" to 0.020" clearance between the interposer and the interposer lock when operating the printer from the keyboard.

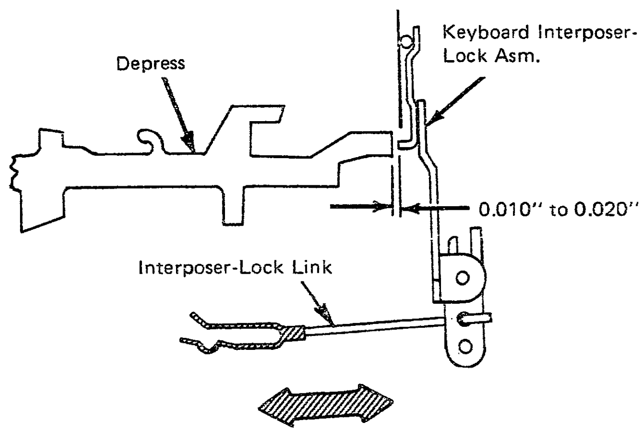


Figure 3-71. Keyboard Interposer-Lock Link

Cycle-Clutch Pawl Stop

Adjust the pawl-stop mounting bracket so the cycle-clutch pawl stop clears the cycle-clutch pawl by 0.010" to 0.020" with the keyboard locked. Best results are obtained on the high side of the adjustment.

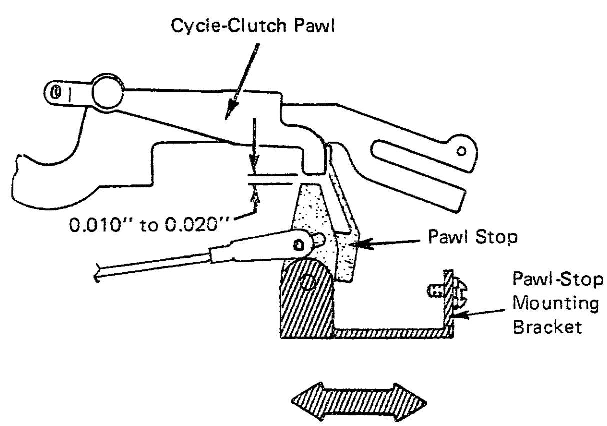


Figure 3-72. Cycle-Clutch Pawl Stop

Pawl-Stop Link

Adjust the pawl-stop link so that the cycle-clutch pawl stop overlaps 1/3 to 1/2 the cycle-clutch pawl with the keyboard-lock mechanism in the lock position.

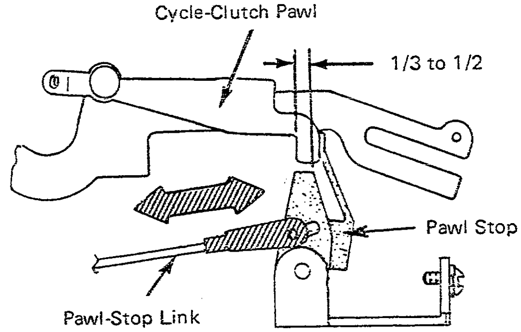


Figure 3-73. Pawl-Stop Link

SHIFT MECHANISM

Shift-Cam Backup Roller

NOTE: This roller does not need adjusting unless the shift backup plate has been removed or the eccentric is loose.

1. Remove the shift-clutch mechanism, including the shift arbor. Loosen the special setscrew holding the backup-roller eccentric. This screw is accessible only through a hole in the shift cam, with the cam in the lowercase position.

CAUTION
If the bearing extends beyond 0.004" of the end of the cam, a coil of the shift-clutch spring may wedge between the arbor and the cam, causing the machine to lock up.

If the bearing does not extend at all beyond the cam, the arbor will rub against the cam, creating a noise and a drag on the cam.

2. Adjust the backup-roller eccentric left or right so that from 0.001" to 0.004" of the cam bearing extends beyond the cam. The eccentric should be kept in the bottom of its orbit.

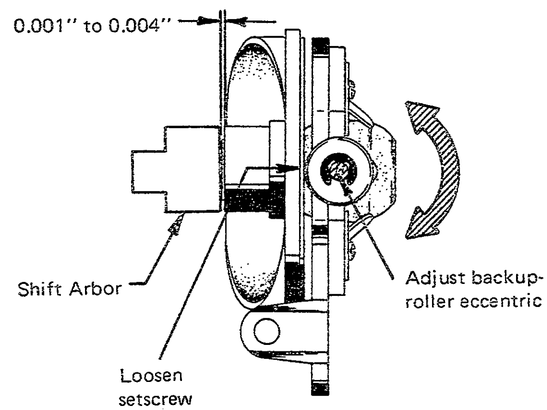


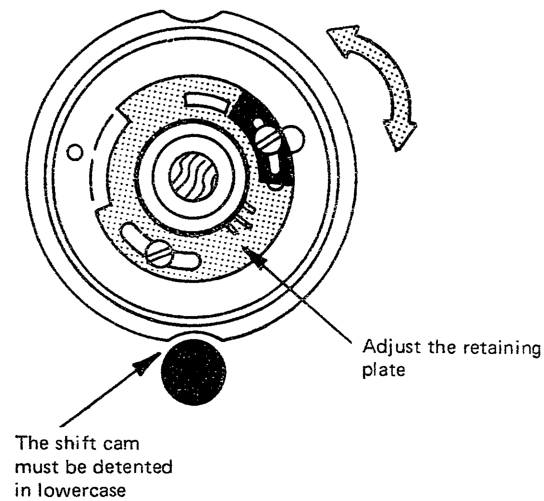
Figure 3-74. Shift-Cam Backup Roller (Rear View)

Shift-Clutch Spring (Level 1)

NOTE: The retaining plate determines the amount of shift-spring expansion at rest.

With the machine OFF and the shift cam detented in lowercase, adjust the retaining plate so that the shift ratchet will rotate a distance of from 0.028" to 0.050" when the ratchet is released by the shift-release arm.

NOTE: If sufficient adjustment cannot be obtained with the retaining plate, the right end of the clutch spring may be placed in another hole in the ratchet. The adjustment can then be refined with the plate.



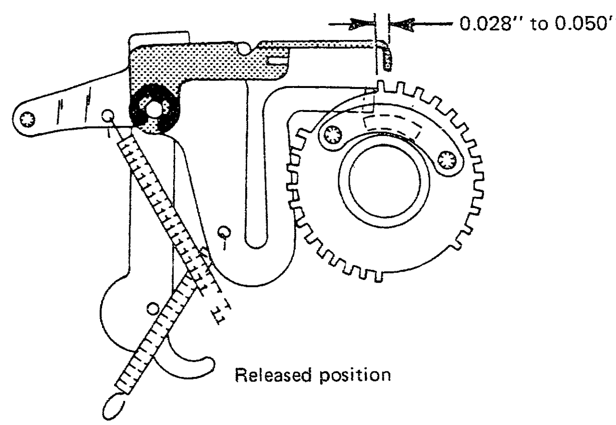


Figure 3-75. Shift-Clutch Spring (Level 1)

Shift-Clutch Spring (Level 2)

NOTE: The shift-clutch ratchet determines the amount of shift-spring expansion on Level 2 shift mechanisms.

1. Remove the C-7 cam.
2. Position the grip clip laterally for from 0.002" to 0.008" end clearance.
3. Loosen the screw(s) in the shift-clutch ratchet.
4. With the machine OFF and the shift cam detented in lowercase, adjust the shift ratchet so that it will rotate a distance of from 0.045" to 0.065" when it is released by the shift-release arm. Remove any play from the shift ratchet, in a clockwise direction.

NOTE: This rotation can be observed by the overlap of the shift-release arm on the lug of the ratchet. The shift-release arm is approximately 0.062" thick.

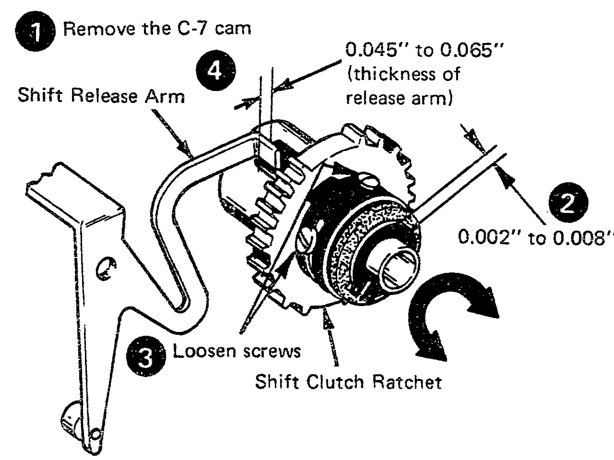


Figure 3-76. Shift-Clutch Spring (Level 2)

Shift-Cam Stop

1. Adjust the stop so that the shift clutch has from 0.010" to 0.030" rotary motion between the shift-cam stop and the shift-release arm, with the mechanism detented in lowercase.

   This adjustment ensures that the shift cam will not be allowed to travel past the detented position.
2. Maintain a clearance from the bottom of the shift-cam stop to the shift-clutch spring.

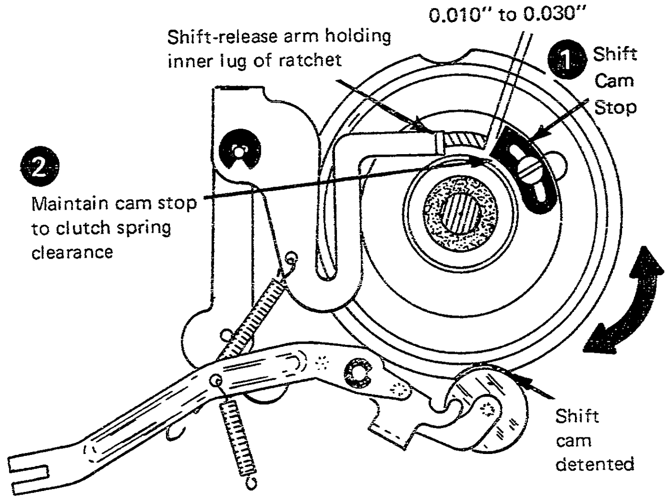


Figure 3-77. Shift-Cam Stop

Shift-Cam Brake

CAUTION
Excess braking action will prevent the cam from detenting.

Insufficient braking action will result in a noisy shift operation and possible parts breakage. This adjustment is the most likely cause of shift-cam-stop breakage.

Adjust the shift-cam brake so that the shift cam will stop in the center of the detent position (0.015") when shifting from upper to lowercase, with the detent roller *held away* from the cam.

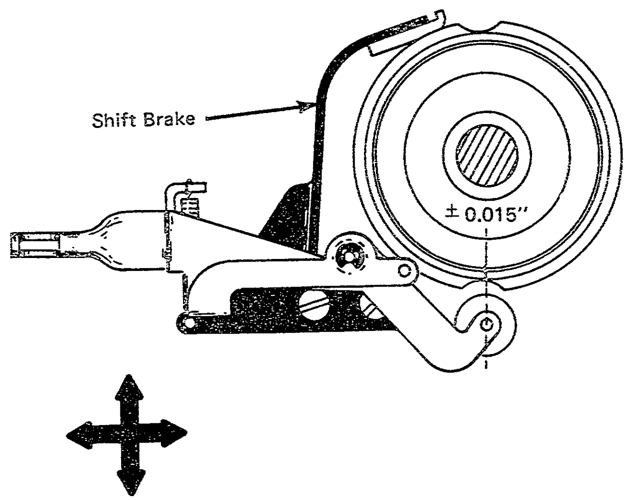


Figure 3-78. Shift-Cam Brake

Shift Release

1. Adjust the shift bellcrank to operate with equal overcenter motion for the full travel of the shift keylever.
2. Adjust the shift-release link, with the keylever bottomed, so the shift-release arm will clear the shift-clutch ratchet stop by 0.010" to 0.030".

   NOTE: A balance between the two releasing points ensures the proper adjustment.

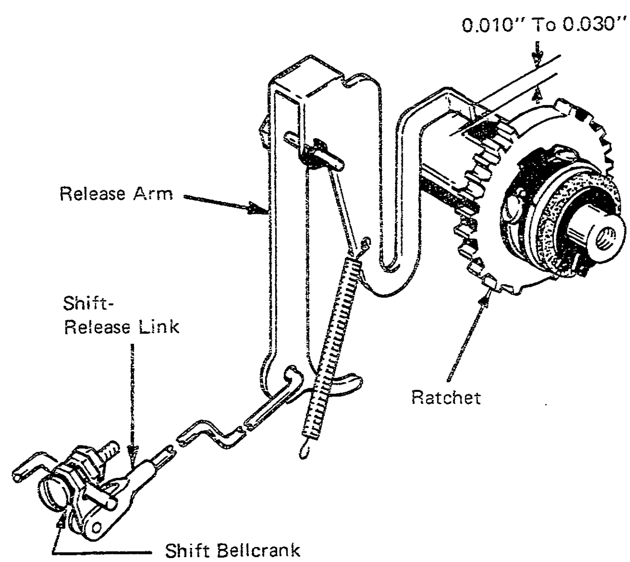


Figure 3-79. Shift Release

Shift Lock

Adjust the shift-lock bracket up or down so the shift lock engages just as the shift release occurs or slightly afterward. The lock should never engage before the shift release occurs. Keep the lock bracket vertical during the adjustment.

The shift lock must be released easily by pressing either shift keybutton.

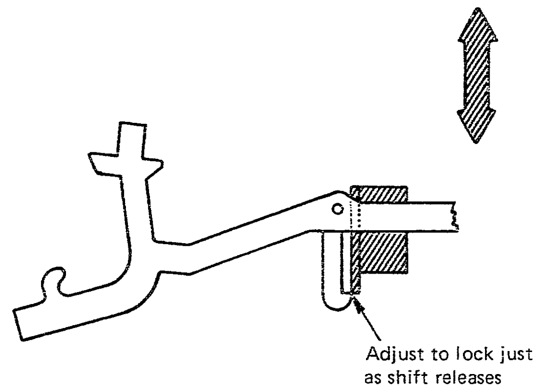


Figure 3-80. Shift Lock

Shift Interlock (Level 1, 15-Inch Machines)

With the shift interlock on the high point of the cam, adjust the interlock by its adjusting screw so that the tip just "bottoms" between two teeth on the shift-clutch ratchet.

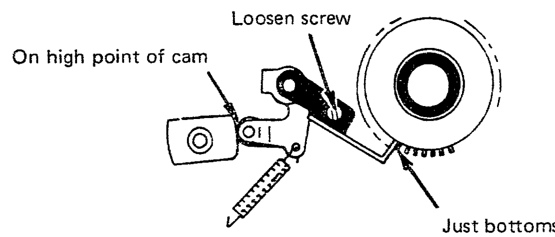


Figure 3-81. Shift Interlock (Level 1, 15-Inch Machines)

Shift Interlock (Level 2, 15-Inch Machines)

With the shift interlock on the low dwell of the cam, loosen the locking screw. Position the interlock until the tip just "bottoms" on the shift ratchet before the first tooth or between the next two teeth.

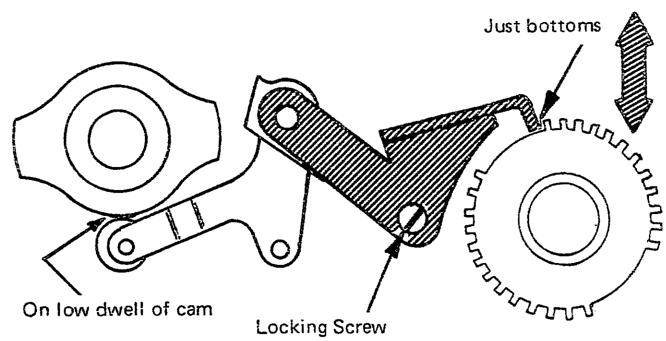


Figure 3-82. Shift Interlock (Level 2, 15-Inch Machines)

Shift Interlock (11-Inch Machines)

With the shift interlock on the high point of the cam, form the interlock so the tip just bottoms between two teeth on the ratchet.

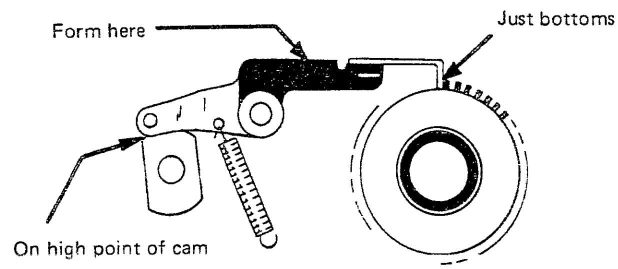


Figure 3-83. Shift Interlock (11-Inch Machines)

Shift-Interlock Cam (11-Inch Machines and Level 1, 15-Inch Machines)

With the cycle clutch latched at rest and the backlash of the cycle shaft and filter shaft removed in the operating direction, advance the cam until a clearance of 0.030" to 0.060" (0.020" to 0.030" on improved-lube shift machines) exists between the tip of the interlock and the top of the highest tooth on the shift-clutch ratchet.

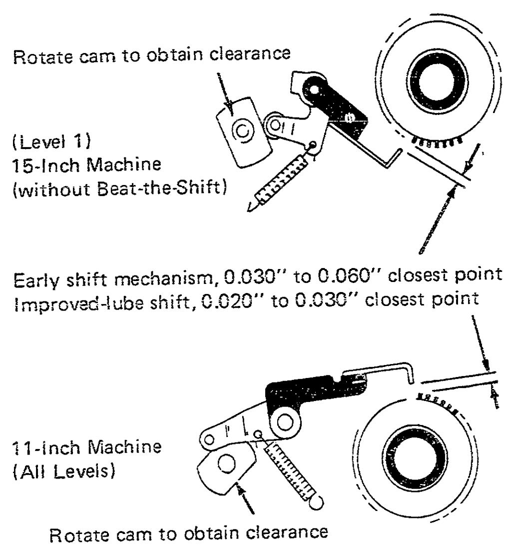


Figure 3-84. Shift-Interlock Cam (11-Inch Machines and Level 1 15-Inch Machines)

Shift-Interlock Cam (15-Inch Machines With Cycle-Clutch Interlock)

Release the shift ratchet and hand-cycle the shift cam until the cycle-clutch interlock is fully activated. Trip the cycle clutch by pressing a key, and remove all play in the filter-shaft drive by rotating the top flute of the filter shaft toward the front of the machine. Then adjust the shift-interlock cam so the follower roller is just ready to leave the high point of the cam. This adjustment must be checked using both steps of the cycle-clutch sleeve.

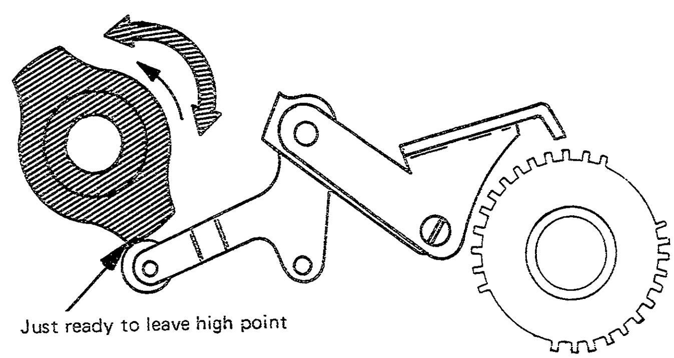


Figure 3-85. Shift-Interlock Cam (15-Inch Machines with Cycle-Clutch Interlock)

Shift-Interlock Cam (Level 2, 15-Inch Machines Without Cycle-Clutch Interlock, and 767 Machines)

With the cycle clutch latched and the play in the filter-shaft drive removed by rotating the top flute of the filter shaft toward the front of the machine, adjust the shift-interlock cam so the follower roller is just ready to leave the high point of the cam. This adjustment must be checked using both steps of the cycle-clutch sleeve.

Character Interrupter (11-Inch Machines and Machines Without Beat-the-Shift)

1. Vertical Clearance: With the shift cam detented in lowercase and the cycle clutch latched, adjust the character-interrupter bail plate in its elongated slot so the character-interrupter pawl clears the bottom of the link by 0.010" to 0.020".
2. Horizontal Clearance: With the shift cam detented and the cycle clutch latched and the shift-interlock bail held forward, adjust the character-interrupter bail plate so the character-interrupter pawl clears the front of the cycle-clutch link by 0.020" to 0.030". For the 767 (6400) printer, adjust for 0.005" to 0.010".

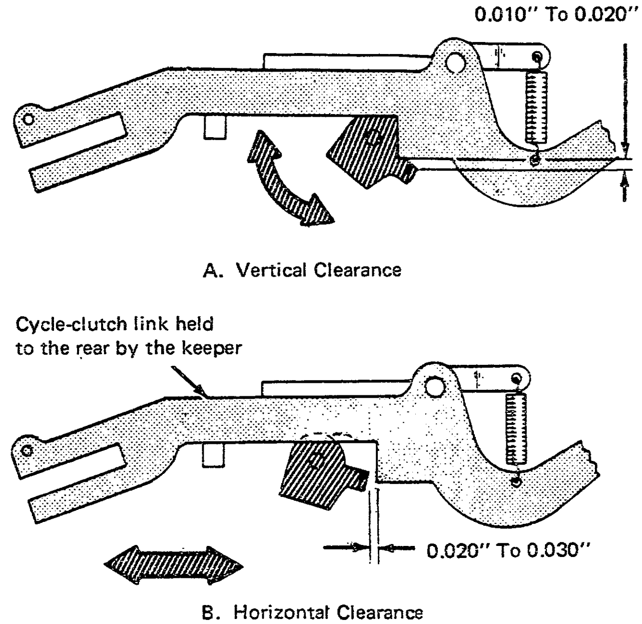


Figure 3-86. Character Interrupter

Shift-to-Print Interlock (15-Inch Printers With Beat-the-Shift)

1. Raise or lower the shift-interlock plate so the shift-interlock arm clears the step on the cycle-clutch sleeve by 0.005" to 0.015". Keep the plate vertical and parallel to the cycle-clutch mounting bracket to ensure proper restoring of the interlock arm.
2. Adjust the shift-interlock stop to position the shift-interlock arm 0.030" to 0.040" from the step on the cycle-clutch sleeve.
3. With the shift-detent roller fully detented, check for at least 0.030" between the end of the input-cable sheath and the cable-loop pivot at the cycle-clutch end. Adjust the cable sheath in the clamp at the cycle-clutch end, if necessary.
4. Release the shift ratchet and hand-cycle the shift cam so the shift-detent roller is completely out of the shift-cam detent. Adjust the input-cable sheath in the clamp at the shift-cam-detent end of the cable for 0.020" to 0.030" between the front edge of the interlock arm and the bottom of the step on the cycle-clutch sleeve.
5. Recheck the shift-interlock cam adjustment.

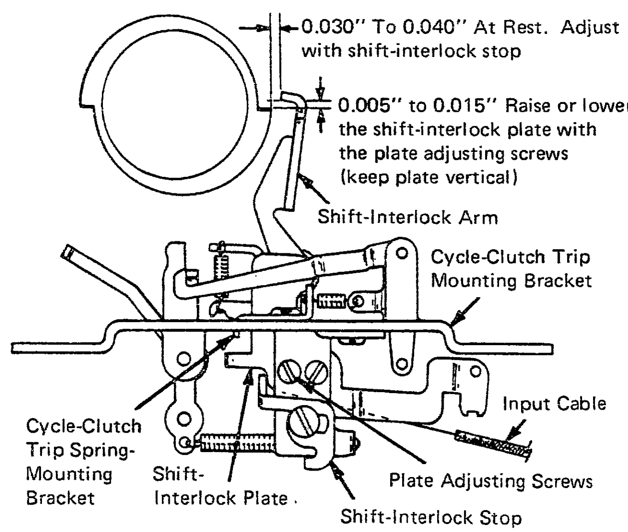


Figure 3-87. Shift-to-Print Interlock

SHIFT MAGNET ASSEMBLY

NOTE: The shift mechanism adjustments must be correct before the following adjustments are attempted.

Hinge Plates

With the armature manually attracted, adjust its hinge plate for a clearance of from 0.001" to 0.003" clearance from the armature.

NOTE: Excessive clearance will cause slow operation. Insufficient clearance will bind the armature and cause sluggish and erratic operation.

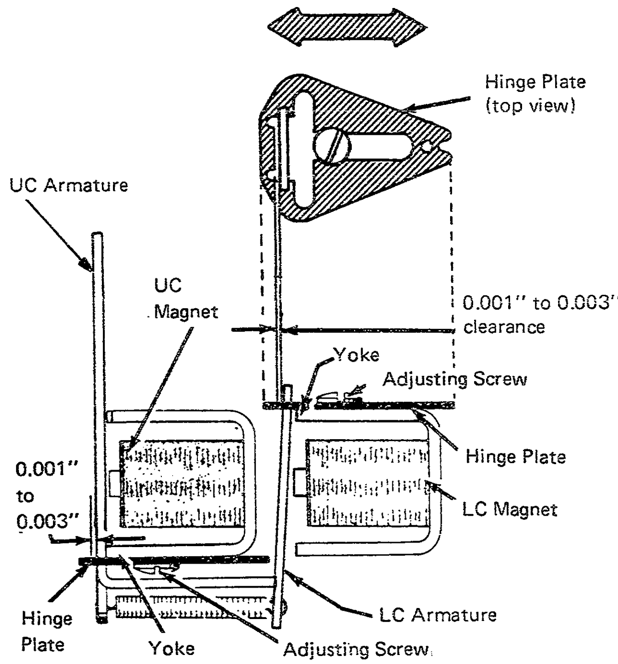


Figure 3-88. Hinge Plates

Armature-to-Core Clearance

NOTE: Early machines (Level 1) use armature stops (not shown).
Late machines (Level 2) use armature residuals (non-adjustable).

1. Level 1 only: Adjust the armature stop (not shown) so that a manually attracted armature has a clearance of from 0.003" to 0.007" to the yoke.

   NOTE: When loosening the uppercase (UC) armature-stop screws, do not distrub the armature backstop adjustment.

2. Level 2: Position the residuals to fit firmly and squarely with the surface of the yokes. The design of the residual provides the necessary armature-to-core clearance.

   NOTE 1: Insufficient clearance may limit the armature motion enough to prevent the shift mechanism from operating.

   NOTE 2: If an armature is allowed to touch the core, it may be held by residual magnetism.

   NOTE 3: Excessive clearance may provide too wide a gap for the magnetic field to reliably attract the armature.

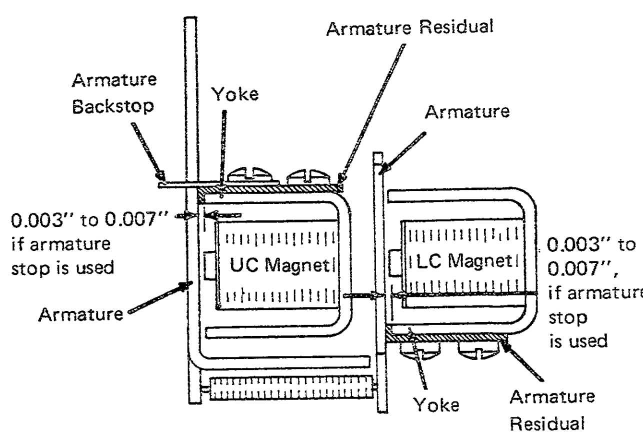


Figure 3-89. Armature-to-Core Clearance

UC (Uppercase) Magnet Assembly

1. Position the assembly so that its mounting screws are centered in the elongated holes.
2. Position the UC magnet assembly so that its hinge plate is parallel with the shift-magnet-assembly mounting bracket.

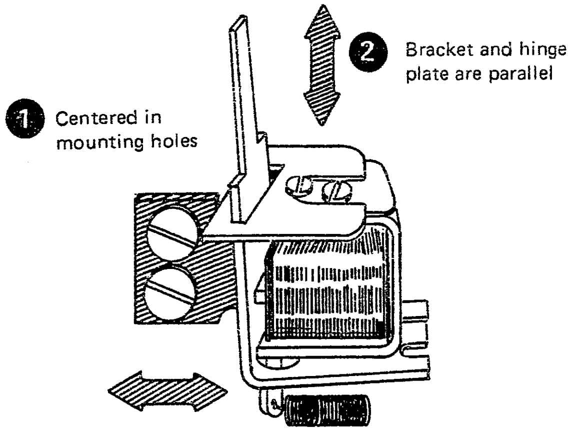


Figure 3-90. UC Magnet Assembly

LC Magnet Assembly

1. Front to Rear: Adjust so that the LC armature (attracted) clears the UC armature (at rest) by from 0.002" to 0.006". This clearance ensures unlatching of the uppercase armature.

   NOTE: Do not form the bracket. (See "Adjustment Procedure" following.)
2. Up or Down: Adjust so that the UC armature (attracted) clears the LC armature (at rest) by from 0.002" to 0.006". (See "Adjustment Procedure" following.)

   NOTE: If the clearance is excessive, the UC armature may not allow the shift-release arm to hold the shift mechanism in uppercase.
3. Adjustment Procedure: The LC magnet assembly can be adjusted in one operation by inserting a 0.030" gage between the LC armature and the lower yoke. Manually attract the UC armature and position the LC magnet snug horizontally against the gage while positioning vertically for the 0.002" to 0.006" latching clearance. Tighten the LC magnet mounting screws and check the unlatching clearance.

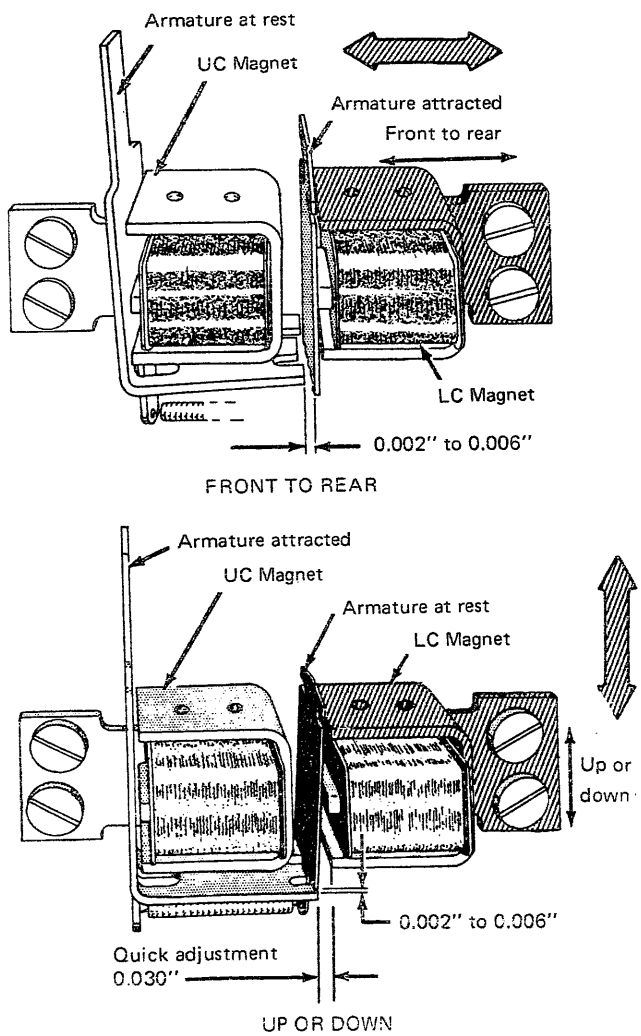


Figure 3-91. LC Magnet Assembly

Magnet-Assembly Mounting Bracket

Position the magnet-assembly mounting plate (UC armature attracted) so that the release arm clears the shift-ratchet lug by 0.005" to 0.015".

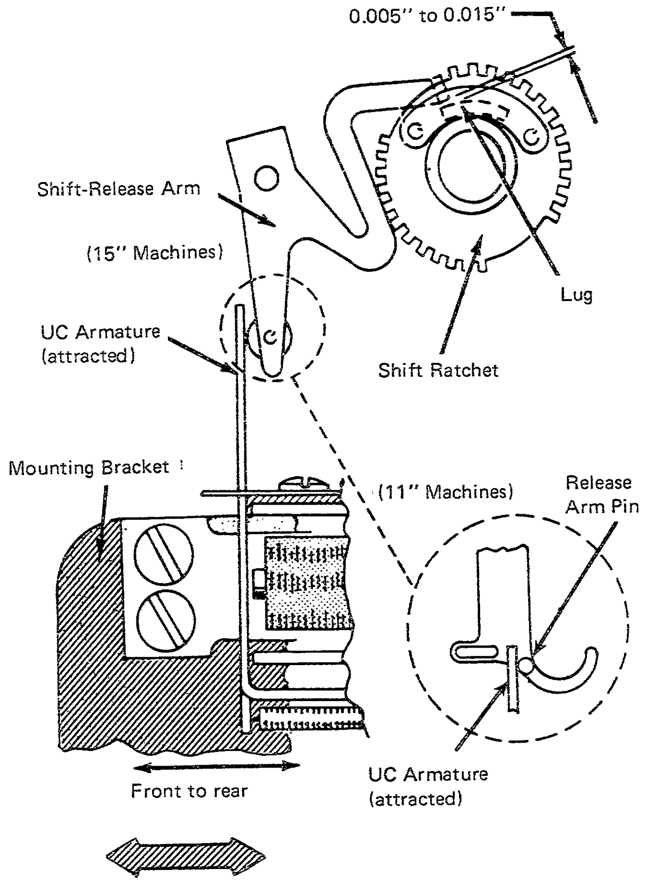


Figure 3-92. Magnet-Assembly Mounting Bracket

UC Armature Backstop

Position the backstop (UC armature at rest) so the UC armature clears the release-arm follower by 0.005" to 0.015".

The clearance between the UC armature and shift-release arm allows the armature to be in motion prior to picking up the load of the release arm. With no clearance the armature may fail to pick.

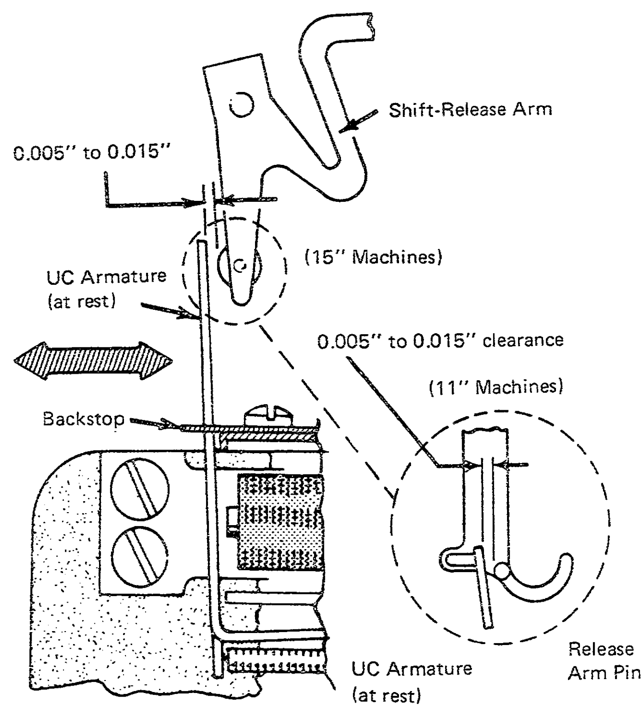


Figure 3-93. UC Armature Backstop

CYCLE CLUTCH

Cycle-Shaft End Play (All Levels)

CAUTION
Excessive end play will allow the cycle shaft to move to the left and allow a loop of the cycle-clutch spring to drop between the two hub members of the clutch, causing a machine lock-up.

Place shims between the left bearing and the check ratchet until the cycle shaft has from 0.001" to 0.006" end play. For the optimum adjustment, check this end-play with the cycle-clutch spring and sleeve removed. (Snap-in shims can be used to prevent removing the bearing plate, when adding the shims.)

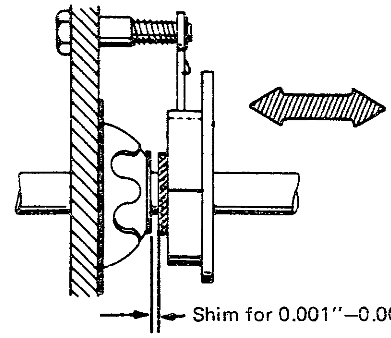


Figure 3-94. Cycle-Shaft End Play

Cycle-Clutch Latch Bracket (All Levels)

1. Loosen the two latch-mounting screws and pull the latch to the top of its adjustment.
2. Snug the screws "lightly".
3. Turn the print or cycle shaft in a print direction. (This will force the cycle-clutch sleeve down on the cycle-clutch latch.) Using the Hooverometer, check the latch height until it is correct (No. 3 scribe line).
4. Tighten the cycle-clutch latch mounting screws.

   NOTE: The latch must remain parallel to the sleeve. If the bracket is too low, the latch will be slow and sluggish. If the bracket is too high, the sleeve will tend to cam the latch forward and cause repeat cycles.

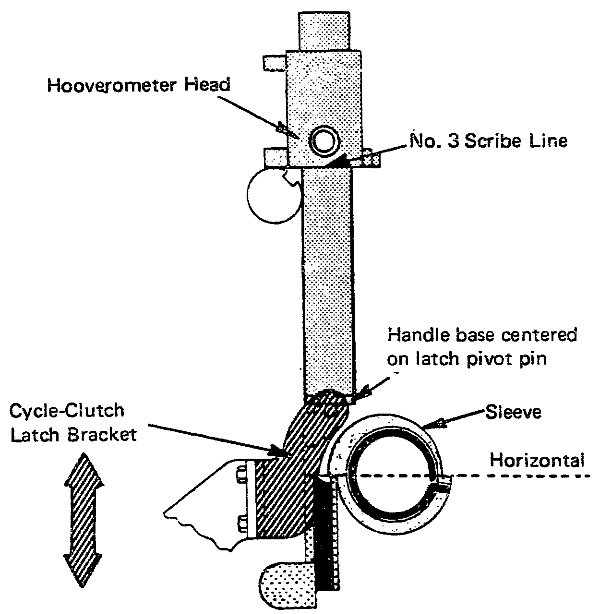


Figure 3-95. Cycle-Clutch Latch Bracket

Cycle-Clutch Spring and Collar (Level 1)

1. Loosen both overthrow-stop screws.
2. Loosen the collar and position the spring for a spring-to-pulley clearance of from 0.004" to 0.012". (To aid in positioning the spring, rotate the sleeve slightly to the rear, to expand the coils.)
3. Lateral collar position: Maintain from 0.010" to 0.015" end play of the sleeve.
4. Preliminary rotational collar position: The adjusting-screw screwhead should be approximately in line with the high point of the -5 cam.
5. Final rotational collar position: Adjust the collar so that when a zero tilt, -5 rotate character (with all tilt and rotate magnets energized) is hand-cycled, the cycle-clutch spring will begin to slip (expand) when the cycle shaft is from 1/16" to 3/32" from its rest position, measured on the surface of the check ratchet.

NOTE: A rotation of the cycle shaft of from 1/16" to 3/32" will cause the print shaft gear to turn approximately one tooth. The adjustment can easily be read by one of the following methods.

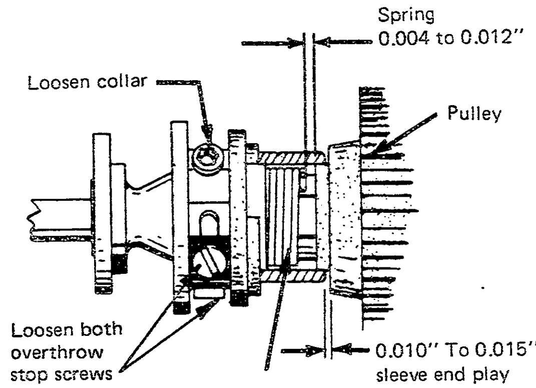


Figure 3-96. Cycle-Clutch Spring and Collar (Level 1)

Print Shaft Gear Method (Level 1)

1. Hand-cycle a zero tilt, -5 rotate character until the cycle clutch begins to slip.
2. Pencil-mark the print-shaft bearing, in line with a tooth on the gear.
3. Release the cycle clutch again by attracting a selection-magnet armature.
4. Slowly hand-cycle the machine until the check pawl just drops into a tooth on the check ratchet. The print-shaft gear should have rotated a distance of from two-thirds to one tooth. If the print-shaft gear rotates more than one tooth, the top of the collar must be moved toward the rear; if it rotates less than one-half tooth, the top of the collar must be moved toward the front.

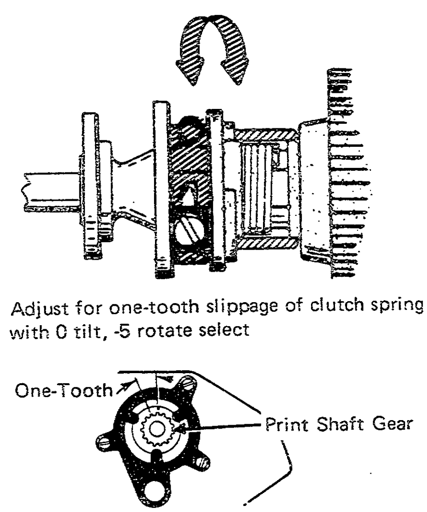


Figure 3-97. Print-Shaft Gear Method (Level 1)

Degree Wheel Method (Level 1)

With the machine at 0 degrees (with the cycle clutch latched at rest), select a zero tilt, -5 rotate character and hand-cycle the machine slowly. The cycle-clutch spring should slip and stop driving at from 170 degrees to 175 degrees.

Cycle-Clutch Spring and Collar (Level 2)

1. Loosen the collar and position the spring and collar to the left, against the -5 cam.
2. Maintain the sleeve end play for from 0.006" to 0.020" from the cycle-clutch hub.

   NOTE: The Level 1 collars without the spring-lug notch for the left end of the spring can not be used on lubrication-improvement cycle shafts, but the later level collars can be used on the Level 1 cycle shafts.

3. Preliminary rotational collar position: The adjusting screwhead should be approximately in line with the high point of the -5 cam.
4. Final rotational collar position: Adjust the collar so that when a zero tilt, -5 rotate character (with all tilt and rotate magnets energized) is hand-cycled, the cycle-clutch spring will begin to slip (expand) when the cycle shaft is from 1/16" to 3/32" from its rest position, measured on the surface of the check ratchet.

   NOTE: A rotation of the cycle shaft of from 1/16" to 3/32" will cause the print-shaft gear to turn approximately one tooth. The adjustment can easily be read by one of the following methods.

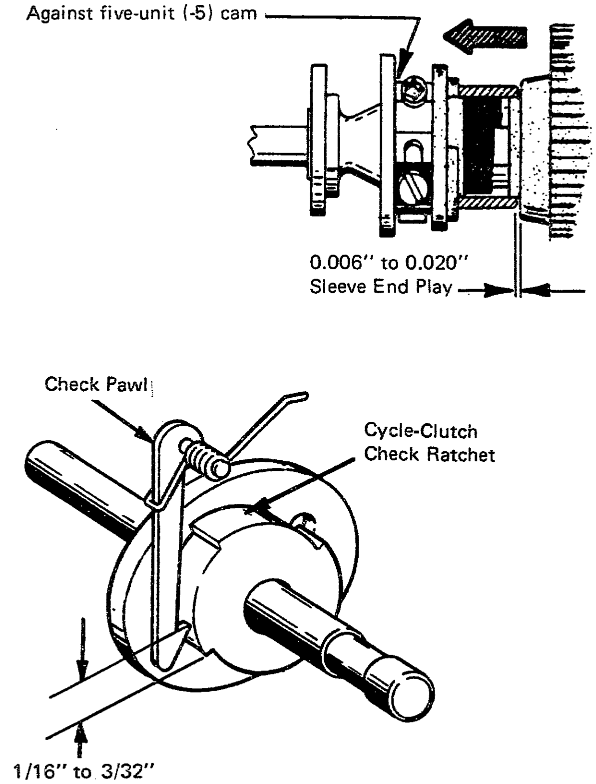


Figure 3-98. Cycle-Clutch Spring and Collar (Level 2)

Print Shaft Gear Method (Level 2)

1. Hand-cycle a zero tilt, -5 rotate character until the cycle clutch begins to slip.
2. Pencil-mark the print-shaft bearing, in line with a tooth on the gear.
3. Release the cycle clutch again by attracting a selection-magnet armature.
4. Slowly hand-cycle the machine until the check pawl just drops into a tooth on the check ratchet. The print-shaft gear should have rotated a distance of from two-thirds to one tooth. If the print shaft gear rotates more than one tooth, the top of the collar must be moved toward the rear; if it rotates less than two-thirds tooth, the top of the collar must be moved toward the front.

Degree Wheel Method (Level 2)

With the machine at 0 degrees (and the cycle clutch latched at rest), select a zero tilt, -5 rotate character and hand-cycle the machine slowly. The cycle clutch spring should slip and stop driving at from 170 to 175 degrees.

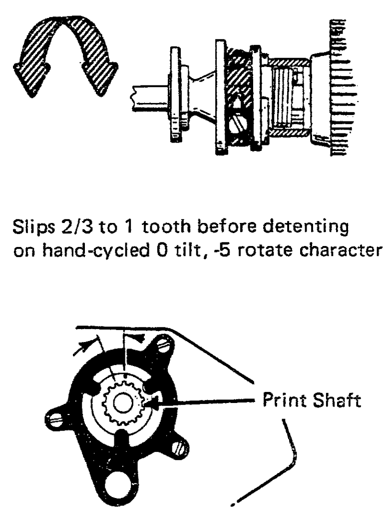


Figure 3-99. Print-Shaft Gear Method (Level 2)

Cycle-Clutch Overthrow Stop (All Levels)

With the cycle clutch latched and the cycle shaft backed up against the check pawl in its rest position, advance or retard the overthrow stop on the cycle-clutch collar so that it will allow the cycle shaft to overthrow its latched position by from 0.007" to 0.015" on both latch surfaces.

NOTE: After adjusting the cycle-clutch overthrow stop, check the cycle-clutch-sleeve end play, as the overthrow stop may bind against the sleeve. Also check the latch-pusher-plate adjustment (Figure 3-28).

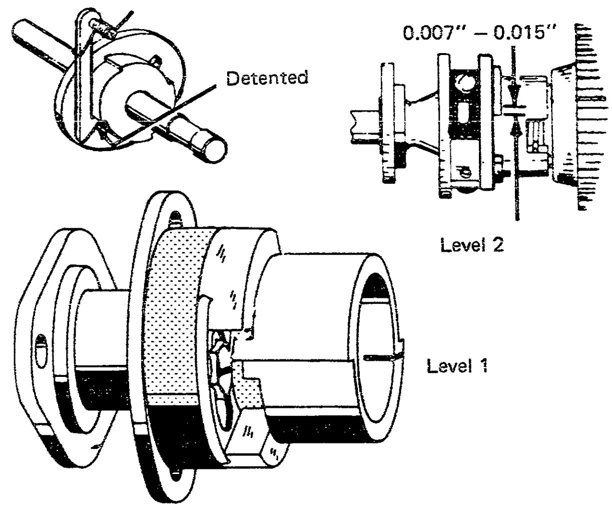


Figure 3-100. Cycle-Clutch Overthrow Stop (All Levels)

CARRIER AND ROCKER

Tilt-Tube End Play (Level 1)

On gear tilt (Level 1) machines, the tilt pulley is adjusted up or down on the tilt tube so that there is from 0.002" to 0.004" end play in the tilt tube.

NOTE 1: The tilt pulley is attached to the tilt tube by a setscrew and key against a flat surface on the tilt tube. The setscrew is accessible through a hole in the left side of the carrier. Move the carrier to the right and remove the tilt-pulley spring and tilt-detent spring. The tilt-detent spring stud can then be removed through the hole in the carrier. The hole in the carrier and rocker will make the tilt-pulley setscrew accessible with a fluted wrench.

NOTE 2: The height of the tilt-sector gear is established by shimming between the gear and the top of the yoke. The height is set to obtain the proper backlash between the tilt-sector gear and the tilt-ring gear. Reinstall the shim if disassembly is necessary.

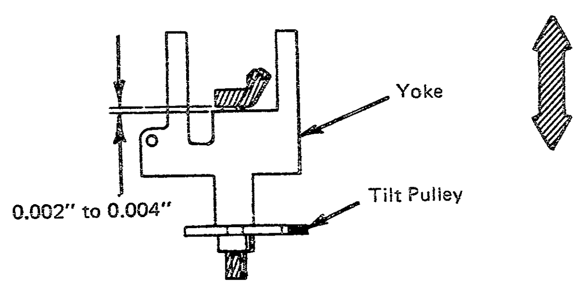


Figure 3-101. Tilt-Tube End Play (Level 1)

Rotate-Shaft End Play (Level 1)

On gear tilt (Level 1) machines, adjust the rotate pulley up or down on the rotate shaft so that there is from 0.001" to 0.004" end-play in the shaft. See the following paragraph for adjustment procedures.

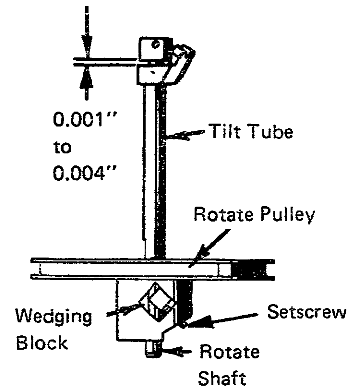


Figure 3-102. Rotate-Shaft End Play (Level 1)

Rotate-Shaft End Play (Level 2)

On gearless-tilt (Level 2) machines, adjust the rotate pulley up or down on the rotate shaft so that there is from 0.001" to 0.004" end play in the shaft, relative to the yoke.

The rotate pulley is secured to the rotate shaft by a wedging block and a setscrew. With the machine in upper-case and the carrier either centered over the cycle shaft or at the extreme left position, the rotate-pulley setscrew can be loosened from the bottom of the machine.

CAUTION
Do not force the typehead against the tension of the tape in an effort to break the pulley loose. Tape breakage or other parts damage may result.

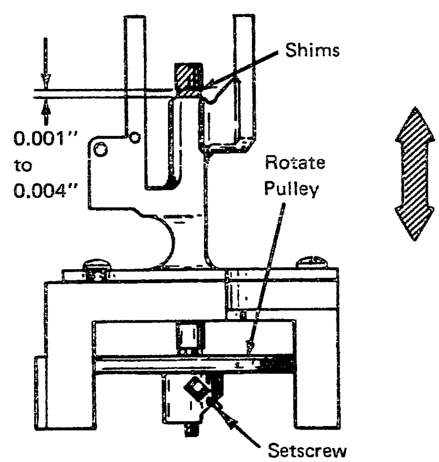


Figure 3-103. Rotate-Shaft End Play (Level 2)

With the setscrew loose, the grip of the wedging block on the shaft can be freed by tapping the lower end of the shaft lightly with a screwdriver and a small hammer.

NOTE: The height of the lower ball socket is controlled by a shim located between the lower ball socket and the yoke. The height, relative to the tilt ring, must be controlled in order to ensure proper operation of the ball joint. If disassembly of the rocker is ever necessary, the shim must be reinstalled.

Upper Ball Socket (All Levels)

1. Shim the tilt-ring spacer at the front and rear for minimum up or down play of the upper ball socket in the tilt ring.
   Excessive vertical play will affect the vertical alignment and impression.
2. Center the tilt-ring spacer around the upper ball socket. Use the following method:
   a. Slightly loosen the screws that hold the tilt-ring spacer.
   b. Insert the four-flute or six-flute No. 6 bristo wrench (used for print-shaft gear) into the notch and run it completely around the ball socket. It should pass without binding at any point.
   c. With the wrench at the front, tighten the front screw; with the wrench at the rear, tighten the rear screw.

   This method will allow for a slight variation in thickness (from one typehead to another) of the part of the typehead that fits over the upper ball socket.

   NOTE 1: Check for binds by manually operating the shift arm out and in.

   Binds in the upper ball joint are most easily found by removing the tilt ring and upper ball socket as a unit. If it is necessary to remove the tilt ring, refer to "Tilt Ring Removal" in Chapter 4. With the tilt ring removed, rotate the upper ball socket and ascertain that the unit is free of any binds.

   NOTE 2: Adjustments 1 and 2 must be checked if the upper ball socket, tilt ring, or tilt-ring spacer is ever replaced by new parts.

   NOTE 3: If the fit of the upper ball socket in the *bore* of the tilt ring is in excess of 0.002" on a troublesome machine, replace the tilt ring assembly.

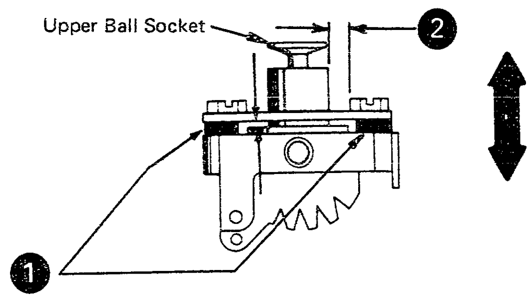
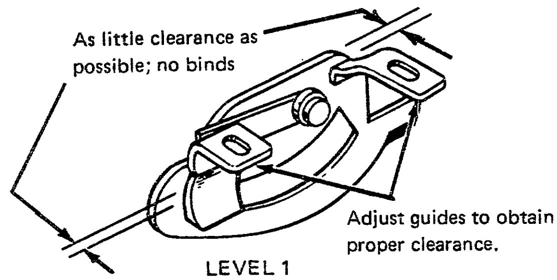


Figure 3-104. Upper Ball Socket (All Levels)

Rotate Detent Guides (All Levels)

Adjust the front and rear guides so that the rotate detent will operate freely, with no side play. Adjust the front guide first.

NOTE: Excessive play in the detent will result in poor horizontal alignment because the detent cannot positively position the typehead.



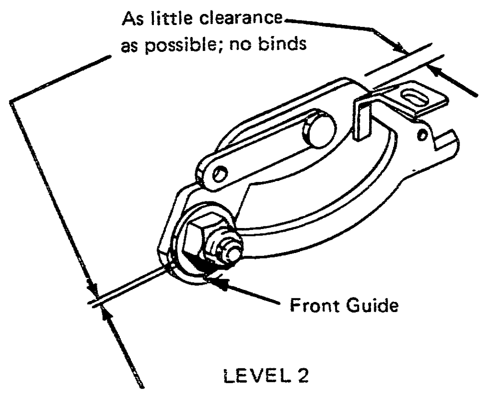


Figure 3-105. Rotate Detent Guides (All Levels)

Tilt Detent (All Levels)

Adjust the guide and pivot screw so that the tilt detent will operate freely, with no side play.

NOTE: Excessive side play in the tilt detent will cause poor vertical alignment. A bind in the tilt detent will affect both vertical and horizontal alignment because it will retard or restrict the seating of the tilt detent, which, in turn, will retard or restrict the seating of the rotate detent.

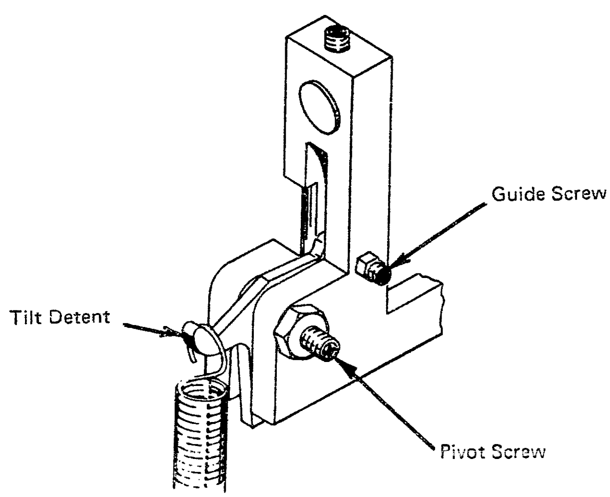


Figure 3-106. Tilt Detent (All Levels)

Tilt-Ring Side Play (All Levels)

NOTE: The tilt ring is centered between the yoke and over the lower ball socket at the plant. If tilt ring removal or replacement is necessary, half-cycle the machine to a tilt-two position. Insert a feeler gage between the left side of the tilt ring and the yoke to determine the clearance before the tilt ring is removed. The tilt ring should then be replaced to that same clearance.

1. Check to see that there is no side play, and that there are no binds. Establish the side clearance as indicated in the preceding note.
2. Loosen the setscrews and remove all side play of the tilt ring (with the feeler gages inserted) by firmly pushing the pivot pins into the tilt ring. Do not allow the tilt ring to bind, as it must pivot freely.

   NOTE 1: If the original tilt-ring position is lost; center the tilt ring in the yoke, with no side play and no binds.

   NOTE 2: Side play in the tilt ring will cause poor horizontal and vertical alignment and will also affect the impression.

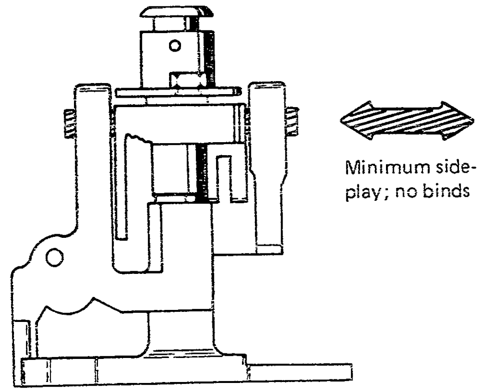


Figure 3-107. Tilt-Ring Side Play (All Levels)

Yoke Position (All Levels)

NOTE 1: This adjustment is set at the plant and *should not* be readjusted unless it becomes loose or is absolutely necessary.

NOTE 2: The carrier and rocker, alignment, and print mechanism adjustments must be correct before making this adjustment.

NOTE 3: This adjustment affects the tilt-ring homing, the typehead homing, and the detent-cam and actuating-lever adjustments (skirt clearance). Be sure to check these adjustments after changing the position of the yoke.

Position the yoke under its mounting screws so that the density of the left and right sides of a printed character will be uniform.

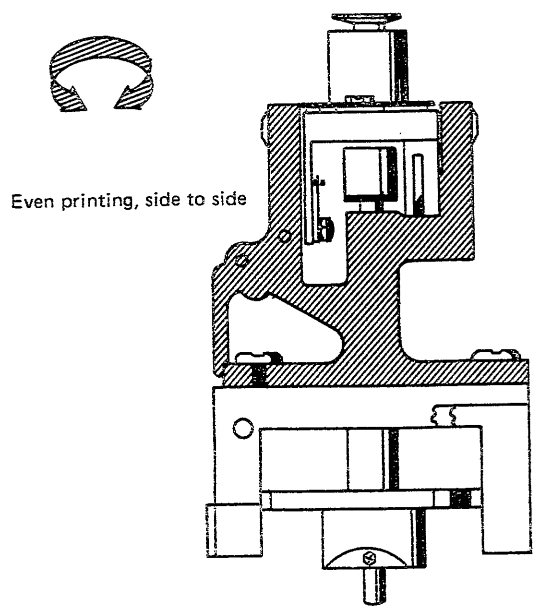


Figure 3-108. Yoke Position (All Levels)

Rocker Shaft (All Levels)

Loosen the setscrew and position the rocker shaft, laterally, for from 0.002" to 0.004" side play in the rocker (0.002" preferred). Excessive side play in the rocker will cause poor horizontal alignment by allowing the rocker to shift its position.

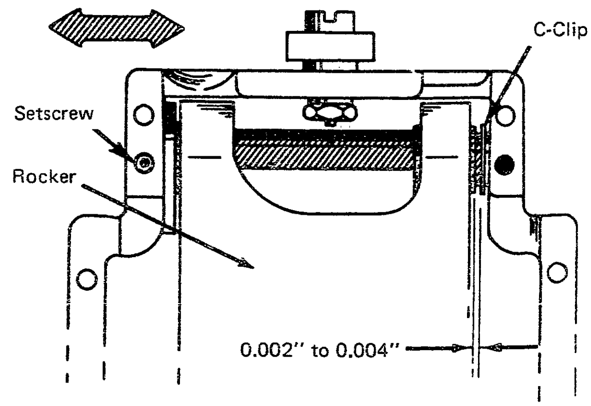


Figure 3-109. Rocker Shaft (All Levels)

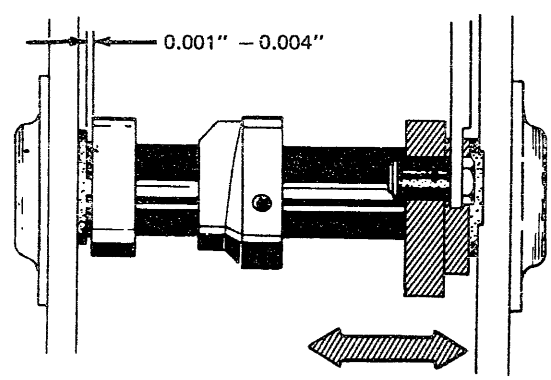
Print-Sleeve End Play (All Levels)

Adjust the print-sleeve end play for from 0.001" to 0.004" (0.002" preferred), with no binds.

NOTE 1: On Level 1 print mechanisms (without the impression-control lever), adjust the *print cam* laterally without moving the ribbon-lift cam.

NOTE 2: On Level 2 print mechanisms (with the impression-control lever), adjust the *ribbon lift cam* laterally, without moving the print cam. After making this adjustment, check the ribbon-lift-cam timing.

Level 1: Note the cam follower



Level 2: Note absence of the cam follower

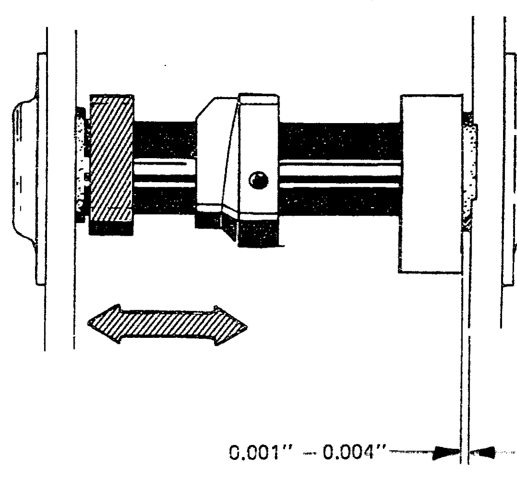


Figure 3-110. Print-Sleeve End Play (All Levels)

Detent-Cam-Follower Bracket

NOTE 1: This bracket is set at the plant with a dial indicator and *should not* require readjustment unless it becomes loose.

NOTE 2: A maladjusted bracket could prevent the typehead from being fully detented (locked in a print position) at the time of printing. This generally shows up as poor vertical alignment because the tilt detent seats after the rotate detent and it withdraws before it.

1. Position the bracket so that the bottom of the upper pin is aligned with the No. 1 scribe line, with the Hooverometer resting on the print sleeve.
2. Position the bracket, front to rear, for a clearance of from 0.005" to 0.015" between the lower pin and the print sleeve. Maintain a 0.005" clearance on troublesome machines, but do not allow the pin to catch in the print-sleeve keyway.

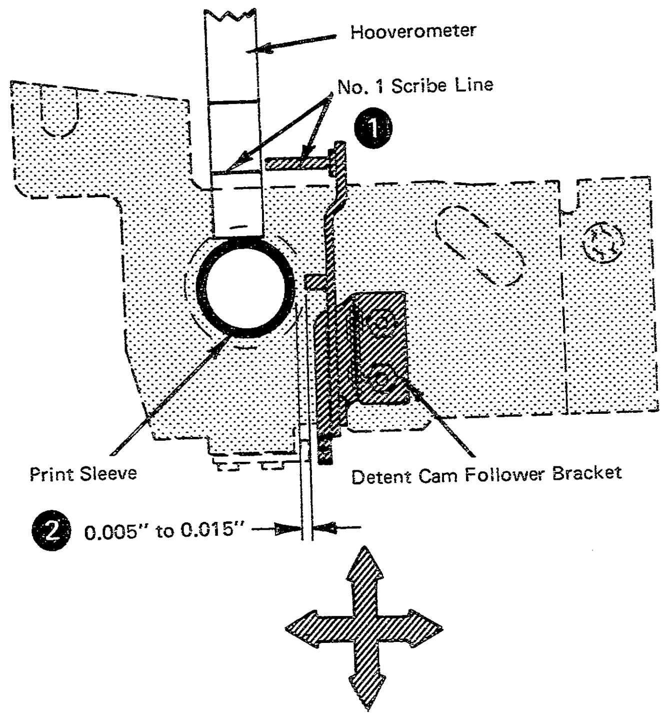


Figure 3-111. Detent-Cam-Follower Bracket

Detent Cam (All Levels)

CAUTION
Excessive clearance will allow the detents to enter their notches too early and withdraw too late, resulting in erroneous printing, compensator-roller droppage (early level), or parts breakage.

With the machine half-cycled, adjust the ribbon-feed-detent cam for a clearance of 0.001" to 0.005" between the detent roller and the detent-actuating lever.

NOTE: This clearance allows the tilt detent to fully seat in the detent notch of the tilt ring.

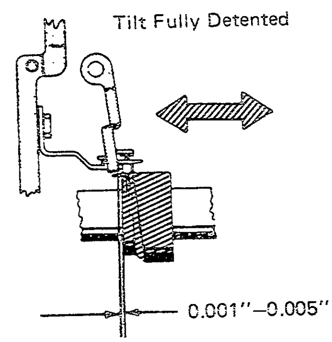


Figure 3-112. Detent Cam (All Levels)

Detent-Actuating-Lever Support (All Levels)

1. Level 1: (Gear Tilt not shown) With the cycle shaft latched at rest, rotate the detent actuating lever support about its mounting stud for a 0.025" to 0.035" skirt clearance between the rotate detent and a tooth on the typehead. Check this clearance by manually tipping the typehead into a tilt-two position.
2. Level 2: (Gearless Tilt) With the cycle shaft latched at rest, adjust the detent actuating lever support up or down for a 0.023" to 0.035" skirt clearance between the rotate detent and a tooth on the typehead. Check this clearance by manually tipping the typehead into a tilt-two position.

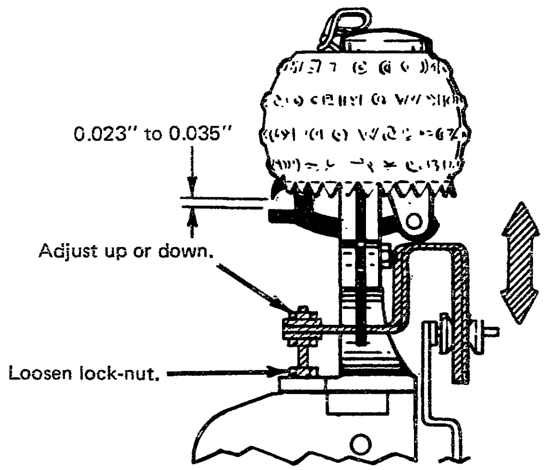


Figure 3-113. Detent-Actuating-Lever Support (All Levels)

TILT ALIGNMENT

Print-Shaft Timing (Preliminary)

NOTE: This establishes the coarse timing of the detent entry and withdrawal for both tilt and rotate.

CAUTION
Maladjustment can cause a print lockup or parts breakage.

1. With the cycle clutch latched at rest, loosen the print-shaft gear. Rotate the print shaft until the keyway of the print shaft is approximately in line with the end of the ribbon-lift-pivot-screw hole on the left side of the carrier.
2. Maintain an end play of from 0.002" to 0.004" for the print shaft, with respect to its left-hand bearing.

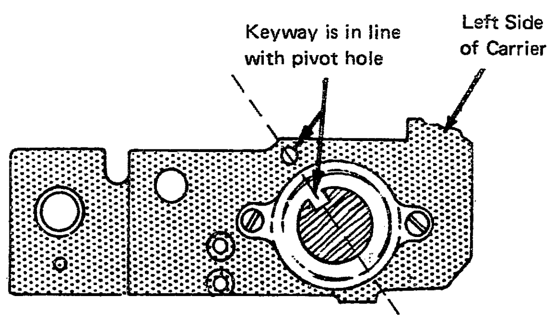


Figure 3-114. Print-Shaft Timing (Preliminary)

Tilt-Selection Latches

CAUTION
These latches will crack or break if they are excessively formed.

Form the stop lugs above the tilt latches to obtain from 0.005" to 0.008" clearance between the positive bail and the two tilt latches when the positive cams are on their low points.

Check for this clearance by observing the relatching of the latches under the bail. The latches should reset just as the cycle-clutch check pawl resets at rest.

A tolerance of 0.003", in movement of the bail, is permitted from the time the first latch resets to the time the last latch resets.

NOTE: The tendency of the stop lugs to return to their original positions can be overcome by overforming the stop lugs slightly and then forming them back to the desired position.

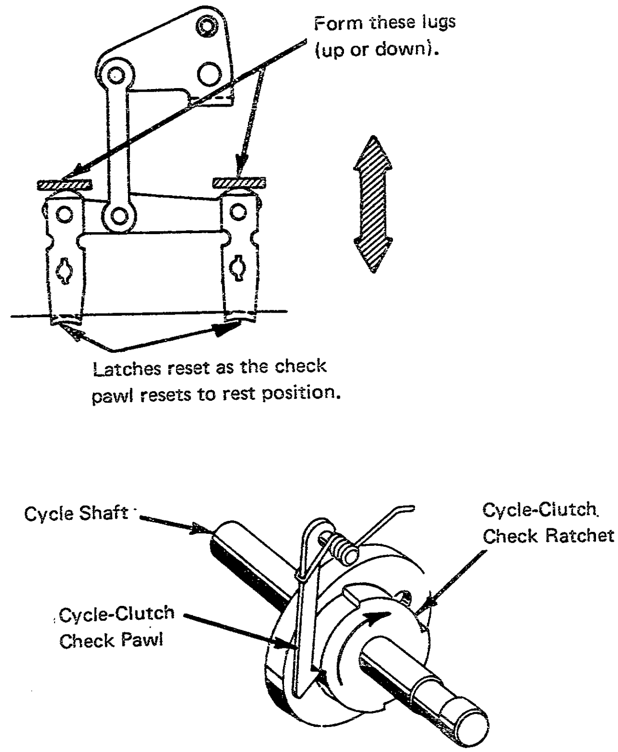


Figure 3-115. Tilt-Selection Latches

Tilt-Arm Motion

NOTE: Remove the typehead before proceding.

1. Adjust the tilt link up or down in the tilt arm so that a half-cycled tilt-three character and a half-cycled tilt-zero character detent the same.
2. With the machine half-cycled, withdraw the tilt detent from its notch by manually positioning the detent actuating lever to the left.
3. Press lightly on the rear of the tilt ring (platen side) to remove any play and allow the detent to slowly re-enter its notch. Observe the amount of motion to the tilt ring or to the point where the detent reenters its notch.
4. Hand-cycle a tilt-three character and compare its detenting with the tilt-zero character. The two must be equal.

   It is possible, at this point, for the detenting of both tilt-three and tilt-zero to be equal but detenting incorrectly. However, once the tilt mechanism detents equally, the tilt-homing adjustment will position the tilt ring for correct detenting.

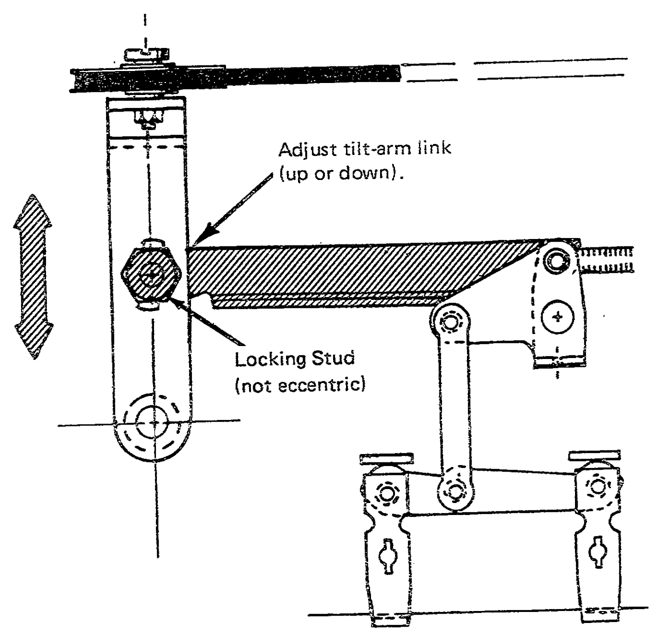


Figure 3-116. Tilt-Arm Motion

Tilt Homing

NOTE: The tilt-arm motion adjustment must be correct before making the tilt homing adjustment.

Remove the typehead and half-cycle a zero-tilt character in the machine. Withdraw the tilt-detent actuating lever to the left. Press lightly on the rear of the tilt ring (platen side) to remove any tilt-ring play, and allow the detent to reenter the notch. Adjust the right-hand tilt pulley so that the detent reenters slightly to the rear of its notch and produces at least 0.006" to 0.011" of rise in the rear of the tilt ring.

Check the other tilt positions. If any tilt positions provide less than 0.006" rise to the rear of the tilt ring, refine the right-hand tilt-pulley adjustment.

Check all tilt positions; this time, press slightly on the front of the tilt ring (operator side) to remove any tilt-ring play, and allow the detent to slowly reenter its notch. Observe that the tilt detent enters far down the forward slope of the detent notch, but not so far that it catches or contacts the top of a tooth.

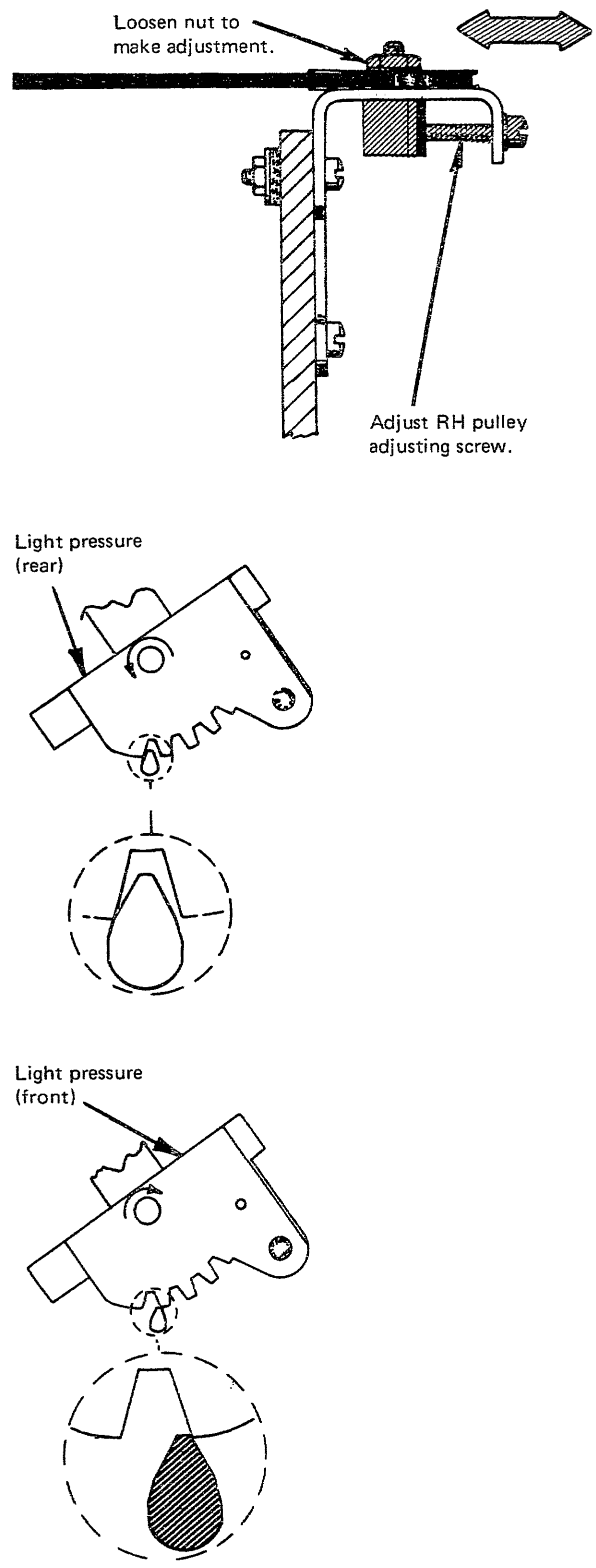


Figure 3-117. Tilt Homing

ROTATE ALIGNMENT (LEVEL 1 AND LEVEL 2)

NOTE: The preliminary print-shaft timing, rotate-spring tension, rotate-cage spring, positive rotate-selection latches, and the -5 rotate-selection latch adjustments described in the following paragraphs are the same for both levels and are therefore described together.

Beginning with "Rotate-Arm Vertical", the remaining rotate adjustments are different according to level and are therefore described separately.

Preliminary Print-Shaft Timing (Level 1 and Level 2)

NOTE: This adjustment establishes the coarse timing of the detent entry and withdrawal for both tilt and rotate.

CAUTION
Maladjustment can cause print lockup or parts breakage.

1. With the cycle clutch latched at rest, loosen the print-shaft gear. Rotate the print shaft until the keyway of the print shaft is approximately in line with the end of the ribbon-lift-pivot-screw hole on the left side of the carrier.
2. Maintain end play of from 0.002" to 0.004" for the print shaft, with respect to its left-hand bearing.

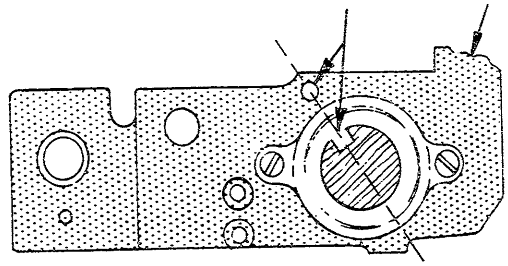


Figure 3-118. Preliminary Print-Shaft Timing (Level 1 and Level 2)

Rotate-Spring Tension (Level 1 and Level 2)

NOTE 1: Read the scale on its inward movement. Incorrect tension will result if the scale is read while pulling out on the shift arm.

NOTE 2: (Optional) – Instead of placing the hook end of the spring-tension gage over the shift arm, use the opposite end and push out on the top of the shift arm from inside the printer.

Remove the typehead and half-cycle a -5 lowercase character. Adjust the rotate-cage spring in the rocker for from 1-7/8 to 1 pounds tension measured with a spring scale on the shift arm.

Move the shift arm back and forth several times to overcome any static friction. Read the scale just before the shift arm contacts its stop screw on its inward travel.

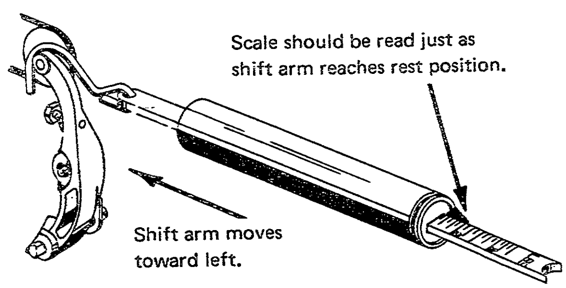


Figure 3-119. Rotate-Spring Tension (Level 1 and Level 2)

Rotate-Cage Spring (Level 1 and Level 2)

The cage can be turned clockwise to increase the tension by pulling the cage toward the left with a spring hook. The spring-drum retainer automatically snaps into position to retain the adjustment.

If tension is to be decreased, the retainer must be pulled forward to allow the cage to rotate counterclockwise. Care must be taken to decrease the tension slowly so that the cage does not spin freely. Spring damage could result otherwise.

NOTE: Following the rotate-spring tension adjustment, half-cycle an uppercase +5 character and pull out on the shift arm to determine whether the rotate spring is wound too tight. If it is, release slightly or replace the spring.

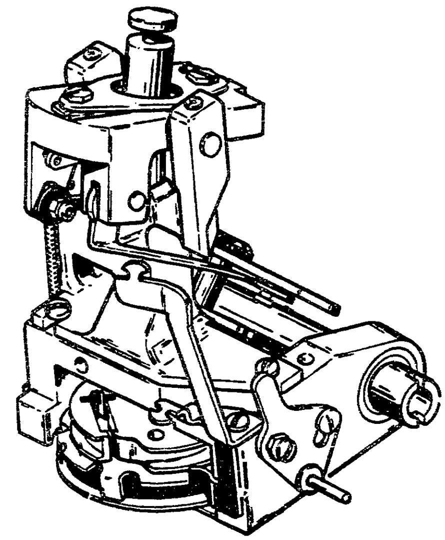


Figure 3-120. Rotate-Cage Spring (Level 1 and Level 2)

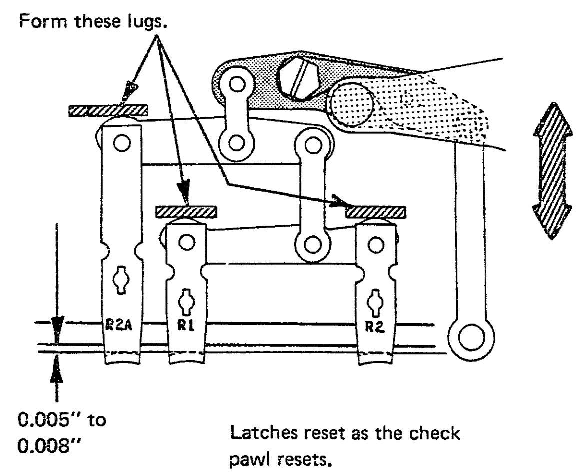
Positive Rotate-Selection Latches (Level 1 and Level 2)

CAUTION
These latches will crack or break if they are excessively formed.

Form the stop lugs above the rotate latches to obtain from 0.005" to 0.008" clearance between the positive bail and the two rotate latches when the positive cams are on their low points.

Check for this clearance by observing the relatching of the latches under the bail. The latches should reset just as the cycle-clutch check pawl resets at rest. A tolerance of 0.003", in movement of the bail, is permitted from the time the first latch resets to the time the last latch resets.

NOTE: The tendency of the stop lugs to return to their original positions can be overcome by overforming the stop lugs slightly and then forming them back to the desired position.



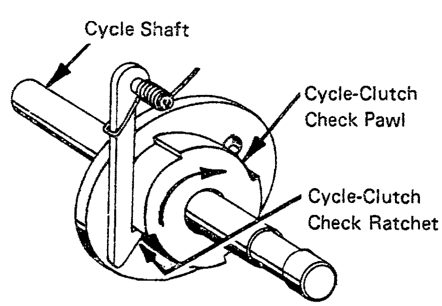


Figure 3-121. Positive Rotate-Selection Latches (Level 1 and Level 2)

-5 Rotate-Selection Latch (Level 1 and Level 2)

NOTE: All positive rotate selections, including latched-home zero, are affected by any change in the vertical rest position of the -5 latch.

With the -5 cam on its high point, adjust the -5 latch stop screw for 0.0055" to 0.0075" clearance to the -5 bail stop.

NOTE: When the cycle clutch is latched at rest, the -5 bail stop must be reset over the -5 latch stop screw.

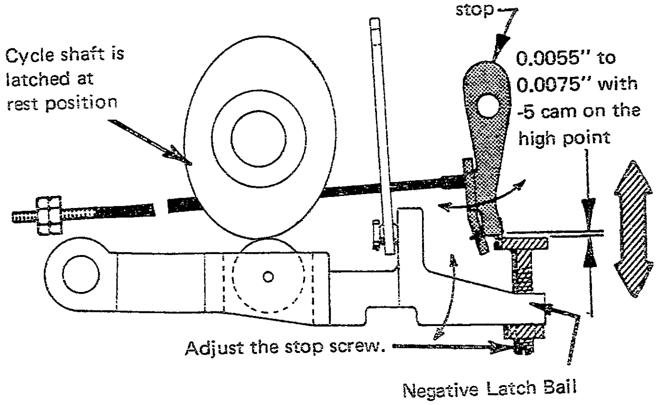


Figure 3-122. -5 Rotate-Selection Latch (Level 1 and Level 2)

ROTATE ALIGNMENT (LEVEL 1 ONLY)

The Level 1 rotate mechanism can be identified by the presence of the compensating rotate arm.

CAUTION
Perform all of the adjustments under "Rotate Alignment Level 1 and Level 2" before making any of the following adjustments.

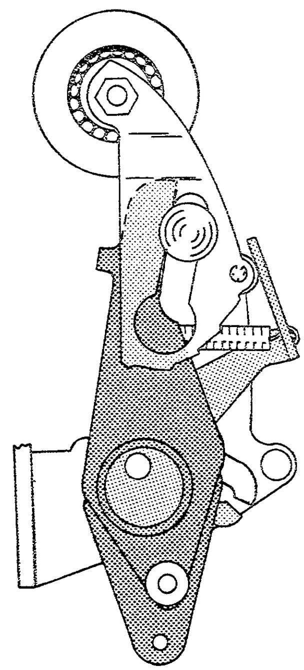


Figure 3-123. Rotate Arm Identification (Level 1)

Rotate Arm Vertical (Level 1)

NOTE: This is a preliminary adjustment. It establishes a vertical condition of the rotate arm for equal leverage movement in both the positive and negative directions.

1. Set the compensator roller 1/16" to 1/8" from the top of its slot.
2. Half-cycle an uppercase latched-home zero-rotate character, with all positive latches removed from under the bail.
3. Adjust the rotate link until the top of the rotate arm is positioned to the No. 1 scribe line on the Hooverometer. Compress the damper spring firmly against the side frame when checking this adjustment. (Lengthen or shorten the rotate link by loosening the two nuts and turning the turnbuckle.

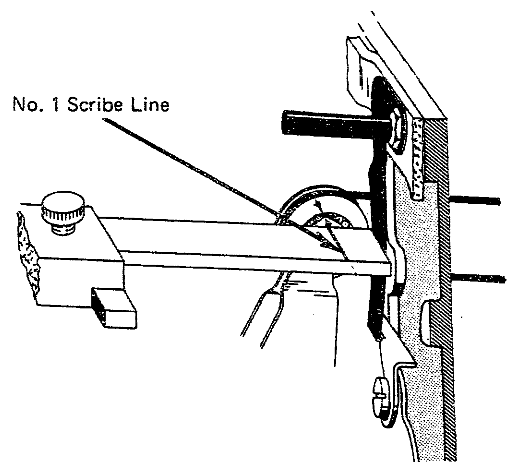


Figure 3-124. Rotate Arm Vertical (Level 1)

Preliminary Homing (Level 1)

NOTE 1: (For printers with a compensating arm) Place the compensating roller 1/16" from the top of its slot.

NOTE 2: The remaining typehead alignment adjustments are based on the typehead homing position and they may affect the homing slightly. Therefore, after the sequence of rotate adjustments has been completed, the preliminary homing may have to be refined.

NOTE 3: Machines that do not use uppercase shift can be adjusted by the shift-arm stop screw. All other machines must be adjusted by the rotate-pulley setscrew.

1. Half-cycle the printer, under power, to an uppercase tilt-three, zero-rotate character (with both tilt latches left under the bail and all positive rotate latches removed). Withdraw the detents by moving the detent actuating lever to the left. Remove the head play in a clockwise direction and allow the detent to slowly reenter the typehead notch. The center of the detent should contact the negative side of the tooth at from 0.010" to 0.020" from the center of the notch.
2. To adjust, move the carrier to the extreme left position and loosen the setscrew in the bottom of the pulley. Manually turn the typehead and rotate the shaft, in relation to the rotate pulley, for correct detenting.

NOTE: It may be necessary, on some machines, to gently tap the bottom end of the rotate shaft to free it from the rotate pulley. Use a screwdriver and a small hammer. However, be sure to maintain rotate-shaft end play of from 0.002" to 0.004".

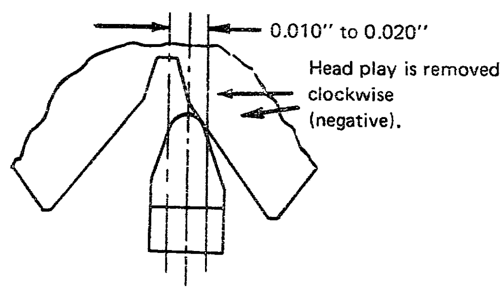


Figure 3-125. Preliminary Homing (Level 1)

Balance Lever (Level 1)

NOTE 1: The "latched-home" rotate position is selected by pulling all the positive rotate latches. No motion, positive or negative, is transmitted to the typehead, resulting in a zero-rotate selection.

NOTE 2: The "I/O home" rotate position is selected by pulling only the -5 rotate latch. The -5 motion cancels the +5 motion, resulting in a zero-rotate selection.

With the printer in uppercase, a half-cycled, "I/O home" selection must detent the same as the "preliminary home" ("latched home") selection. Adjust by loosening the locknut on the balance lever and moving the right-hand member of the balance lever left or right. The nut can be left loose until the correct adjustment is obtained. Do not disturb the adjustment when tightening the nut.

NOTE: The balance lever adjustment ("I/O home") will not appreciably affect preliminary homing ("latched home").

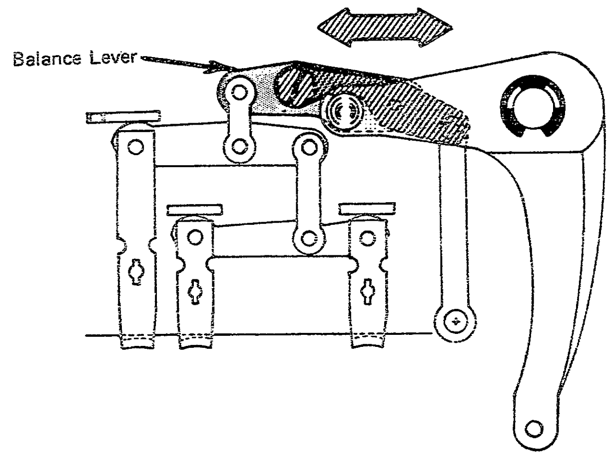


Figure 3-126. Balance Lever (Level 1)

Rotate Arm Motion (Level 1)

Loosen the nut on the bottom of the rotate arm and slide the adjustable plate up or down. A half-cycled uppercase +5 rotate character should detent the same as a half-cycled uppercase -3 character. Check each position (+5 and -3) more than once.

NOTE: If all previous rotate adjustments are correct and the -3 and +5 characters are detenting equally, then all of the selections between +5 and -3 should detent well within the acceptable band width.

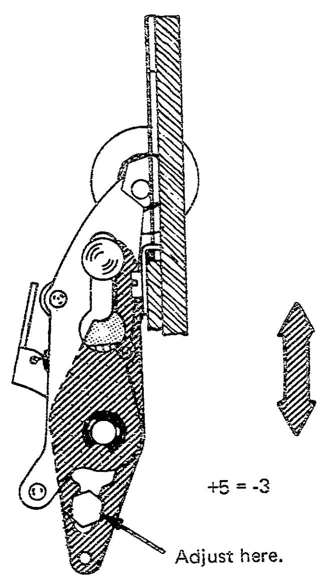


Figure 3-127. Rotate Arm Motion

Preliminary Damper-Spring Adjustment (Level 1)

Slide the damper-spring stop down as low as it will go, behind the damper spring.

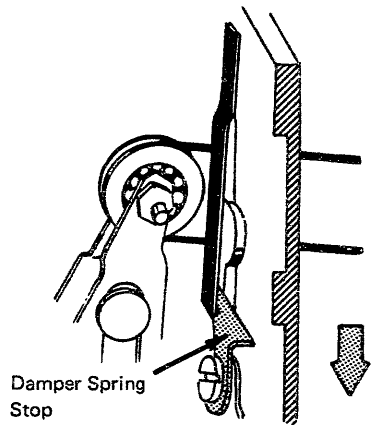


Figure 3-128. Preliminary Damper-Spring Adjustment (Level 1)

Fine Homing (Level 1)

NOTE: The eccentric stud should always be kept in the lower half of its orbit so that it will tend to turn in the tightening direction as it operates against the side frame. Also, if the correct detenting of the -5 character cannot be easily obtained with the eccentric-stud adjustment, the preliminary homing must be readjusted. (See "Preliminary Homing (Level 1)".

1. Raise the compensator to the top of its slot.
2. Adjust the eccentric stud on the rotate arm until a half-cycled uppercase -5 character detents 0.010" to 0.020" from the center of the notch on the negative side of the tooth. Remove the head play in a clockwise direction.

   NOTE: The damper spring must be fully collapsed against the side frame.

3. The eccentric-stud adjustment will affect the compensator roller droppage. Remove the typehead and refine the rotate-link adjustment, under power, until the roller drops 1/16" from the top of its slot with a series of -5 characters. Recheck the eccentric-stud adjustment.

   NOTE: It is possible, at this point, for the -5 character to be detenting correctly but the previously adjusted characters, +5 through -3, to be detenting too far positive or negative. However, the ratio change adjustment (see "Ratio Change Adjustment", following) will position the detenting of the +5 through -3 characters to detent the same as -5 without changing the -4 adjustment. The detenting of +5 through -3 will be affected equally.

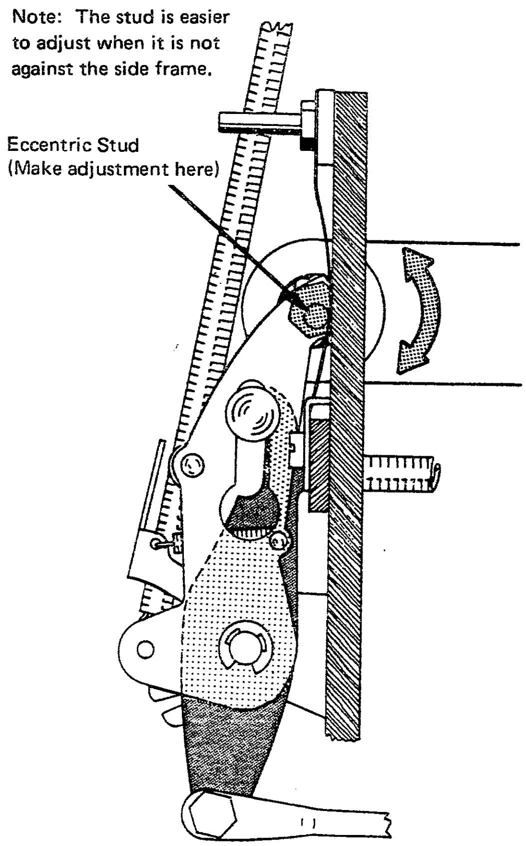


Figure 3-129. Fine Homing (Level 1)

Rotate-Tape Guide (Level 1)

Adjust the rotate-tape guide to 45 degrees outward from vertical, with a clearance of from 0.003" to 0.008" from the tape.

NOTE: Position the rotate-tape guide as high as possible without interfering with the left-hand tilt pulley.

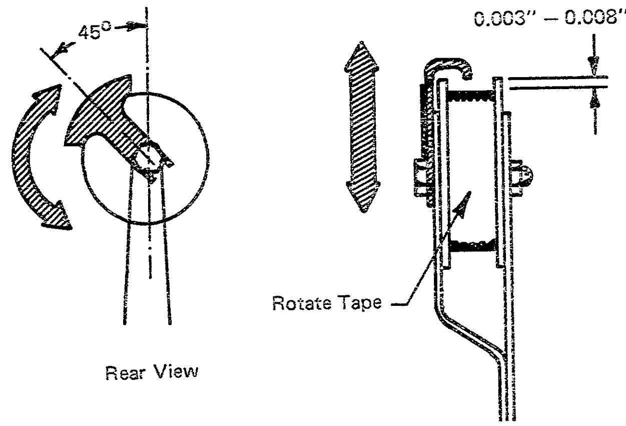


Figure 3-130. Rotate-Tape Guide (Level 1)

Final Damper Spring Stop (Level 1)

With the typehead removed, raise the stop so that when a lowercase -5 character is half-cycled, the damper spring will just collapse against the side frame. Check this by pulling the compensator arm away from the side frame with a spring hook, then allowing it to go back in slowly.

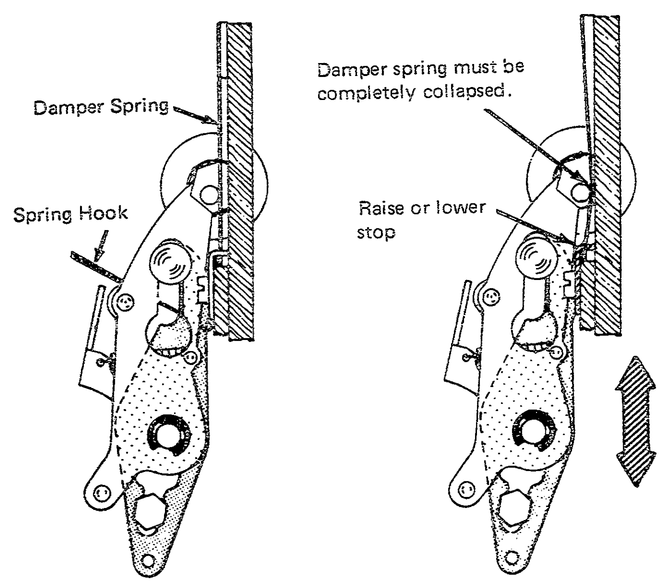


Figure 3-131. Damper-Spring Stop (Level 1)

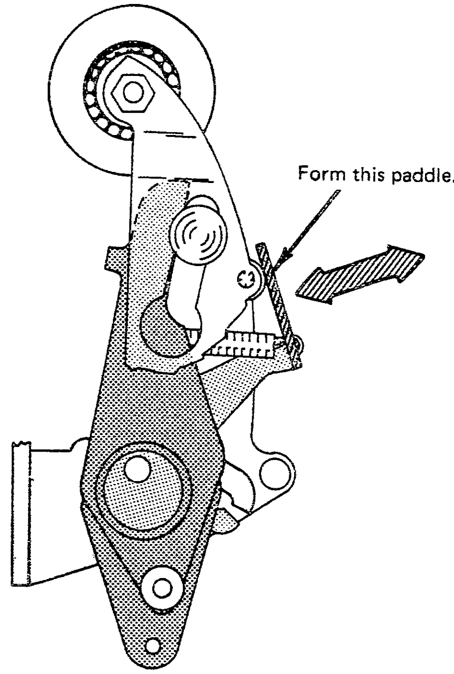
Ratio-Change Adjustment (Level 1)

NOTE: This adjustment affects all of the rotate positions from +5 to -3 equally, without affecting the -5 position.

CAUTION
Hold the paddle near the spring hole with a pair of long-nose pliers and form the top of the handle. Only slight forming is necessary. Excessive forming may crack or break the paddle. When the paddle is being formed, the V-shaped wedging slot may accidentally open up, causing the roller to drop. If this occurs, reseat the roller by raising it to the top and striking a series of -5 characters.

With the machine half-cycled to an uppercase -3 character, form the paddle on the rotate-eccentric arm until the uppercase -3 character detents the same as the uppercase -5 character. Each time the paddle is formed, the machine must be recycled, under power, before the detenting of the -3 character is observed. This allows the eccentric shoulder to reseat itself in the compensating arm.

Check to see that the paddle contacts the barrel on the compensating arm at the -3 position and that it moves away from the barrel during the -4 and -5 positions.



Arm assembly in -3 position

Figure 3-132. Ratio-Change Adjustment (Level 1)

Final Print-Shaft Timing (Level 1)

CAUTION
Excessively advanced or retarded timing can cause parts damage as well as poor horizontal alignment or improper selection. This can happen if the detent enters the wrong notch or remains in the notch too long.

NOTE: If difficulty is encountered in obtaining the correct detent timing, check the following items:

1. Detent skirt clearance–Favor the high side of the tolerance.
2. Typehead homing–Favor the high side of the tolerance.
3. Band width–Make sure that it is not excessive.
4. Head play–Should be from 0.048" to 0.062" measured at the typehead skirt. If excessive head play is suspected, the ball joint should be replaced and the typehead-homing adjustment should be refined.

Advance or retard the print shaft, relative to its gear, so that a +5 and a -5 character enter the correct notch with a clearance of from 0.001" to 0.015".

The detent withdrawal may touch the side of a tooth, but it must not restrict the restoring of the typehead.

Use the following procedure:

1. Loosen the print-shaft gear.
2. Hand-cycle a -5 rotate, tilt-two character until the pawl latches at the half-cycle position.
3. Manually rotate the print shaft; observe the rotate detent as it enters and begins to withdraw. Stop the rotation when the rotate detent has withdrawn halfway from the slope of the tooth skirt.
4. Resume the hand-cycling operation until the typehead begins to rotate back to the rest position. Stop rotation when the typehead tooth just touches the rotate detent. (This provides "light scrubbing action".)
5. Tighten the print-shaft gear.

   NOTE 1: A burred print shaft may cause this procedure to fail. If previous fine-timing adjustments have scored or burred the print shaft, remove the print-shaft gear and rotate it one tooth in either direction, to obtain a good bite on an unburred surface of the print shaft.

   NOTE 2: Be certain to maintain from 0.002" to 0.004" print-shaft end play.

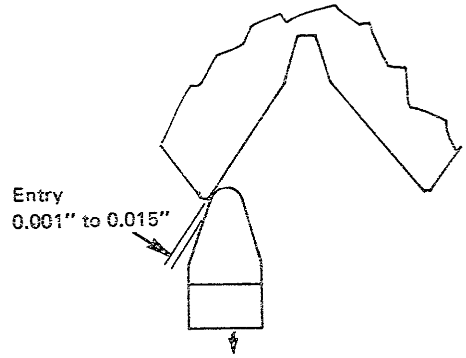


Figure 3-133. Final Print-Shaft Timing (Level 1)

Shift Motion (Level 1)

NOTE: The shift cam must be detented at each position, and the cycle shaft must be latched at the half-cycle position.

Adjust the shift-arm stop screw so that a lowercase -5 character detents *exactly* the same as an uppercase -5 character. As a final check, compare the detent-withdrawal timing of both upper and lowercase.

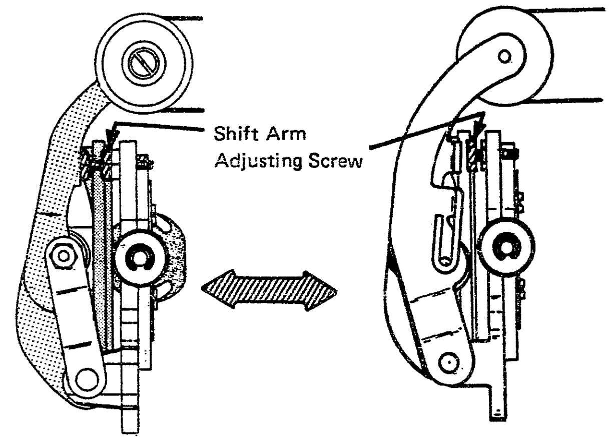


Figure 3-134. Shift Motion (Level 1)

Final Alignment Check (Level 1)

After completing the foregoing adjustments, make a final check to determine if any refinements are necessary. Compare the coarse alignment of 0 rotate compared to +5, -1, -5, and -3. The band width of this group should not exceed 0.030", and none of the group should detent closer than 0.010" to the center of the notch when the head play is removed in the negative direction.

The following table can be used to diagnose the cause of excessive band width between a 0 rotate and +5, -1, -3, -4, -5. These characters are chosen because of their rotate selections. If an excessive band width exists, it will be greatest among these characters. In making the diagnosis, follow the sequence as listed.

Excessive Band Width Between	*Cause*
0 (zero) and -1	Incorrect balance
-3 and +5	Incorrect rotate-arm motion
-3, +5 and 0 (zero)	Incorrect latch clearances
-5 and -3	Incorrect paddle adjustment

Unwanted compensator roller droppage may result from one or more of the following:

- Improper detent timing
- Malselection (popping latches)
- Incorrect rotate-spring tension or damper-spring tension
- Binds in the typehead, upper ball socket, rotate shaft, rotate pulley, or rotate spring
- Binds in the compensator or lever system
- Loose differential-mounting bracket
- Excessive band width or head play

NOTE: After the machine has been in use for some time, wear in the tape system will allow the typehead to drift in the negative direction. It is not necessary to slip the rotate shaft within the rotate pulley to refine the typehead position. The proper position may be gained by refining the eccentric-stud and the ratio-change adjustments. Be sure to reseat the compensator roller after changing the eccentric-stud adjustment. (Maintain the roller position 1/16" from the top of the slot by adjustment of the rotate link.)

ROTATE ALIGNMENT (LEVEL 2 ONLY)

The Level 2 rotate mechanism can be identified by the presence of the solid (instead of compensating) rotate arm.

Perform all the adjustments under "Rotate Alignment (Level 1 and Level 2)" before making any of the following adjustments.

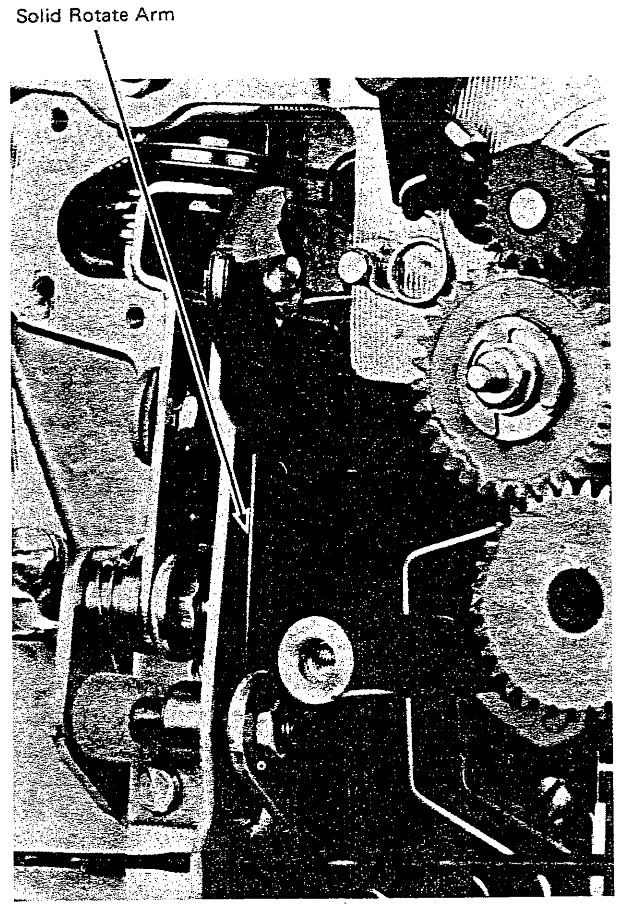


Figure 3-135. Rotate Arm Identification (Level 2)

Rotate Arm Vertical (Level 2)

1. Half-cycle an uppercase zero-rotate, zero-tilt character.
2. If the left end of the rotate link has been loosened for any reason, center it in its adjusting slot.
3. Adjust the rotate link so the pointer on the arm is 15/32" from the outside left-hand surface of the power frame. This can be measured using the No. 1 scribed line on the Hooverometer or 15/32" on a scale.

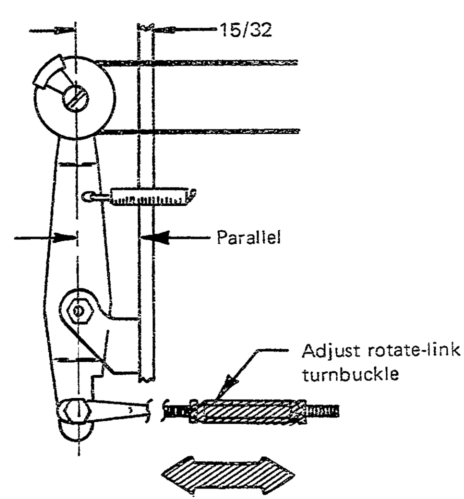


Figure 3-136. Rotate Arm Vertical (Level 2)

Preliminary Homing (Level 2)

NOTE 1: The remaining typehead alignment adjustments are based on the typehead homing position. Therefore, after the sequence of rotate adjustments has been completed, the preliminary homing may have to be refined.

NOTE 2: Machines that do not use uppercase shift can be adjusted by the shift arm stop screw. All other machines must be adjusted by the rotate pulley setscrew.

1. Half-cycle the printer, under power, to an uppercase tilt-three, zero-rotate character (with both tilt latches left under the bail and all positive latches removed). Withdraw the detents by moving the detent actuating lever to the left.

   Remove the head play in a clockwise direction and allow the detent to slowly reenter the typehead notch. If the detent enters the correct notch, adjust the rotate link turnbuckle so the center of the detent contacts the negative side of the tooth at from 0.010" to 0.025" from the center of the notch.
2. If the detent enters the wrong notch, move the carrier to the extreme left position and loosen the setscrew in the bottom of the rotate pulley. Manually turn the typehead and rotate shaft, in relation to the rotate pulley, for correct detenting.

NOTE: It may be necessary, on some machines, to gently tap the bottom end of the rotate shaft, to free it from the rotate pulley. Use a screwdriver and a small hammer. However, be sure to maintain rotate shaft end play of from 0.002" to 0.004".

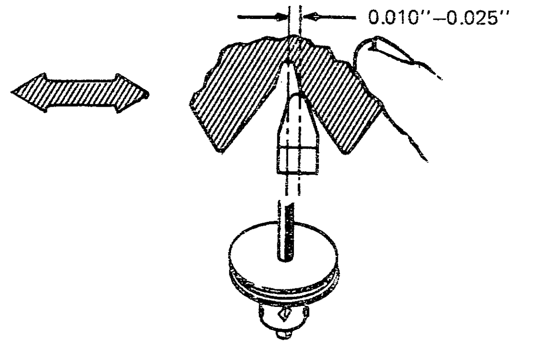


Figure 3-137. Preliminary Homing (Level 2)

Balance Lever (Level 2)

NOTE 1: The "latched home" rotate position is selected by pulling all the positive rotate latches. No motion, positive or negative, is transmitted to the typehead, resulting in a zero-rotate selection.

NOTE 2: The "I/O home" rotate position is selected by pulling only the -5 rotate latch. The -5 motion cancels the +5 motion, resulting in a zero-rotate selection.

With the printer in uppercase, a half-cycled "I/O home" selection must detent the same as the "preliminary home" ("latched home") selection. Adjust by loosening the locknut on the balance lever and moving the right-hand member of the balance lever left or right. The nut can be left loose until the correct adjustment is obtained. Do not disturb the adjustment when tightening the nut.

NOTE: The balance lever adjustment ("I/O home") will not appreciably affect preliminary homing ("latched home").

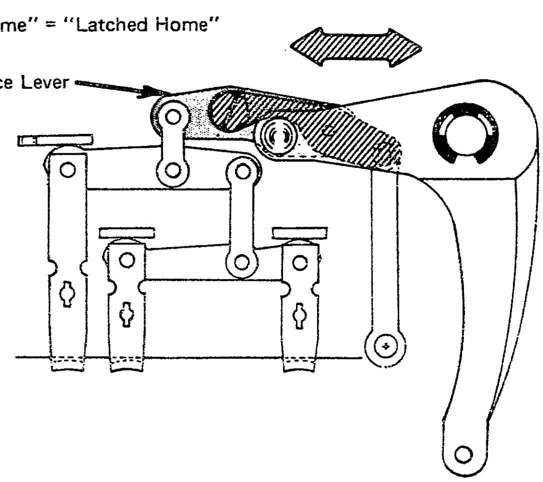


Figure 3-138. Balance Lever (Level 2)

Rotate Arm Motion (Level 2)

Adjust the rotate link up or down until an uppercase +5 character detents the same as an uppercase -5 character.

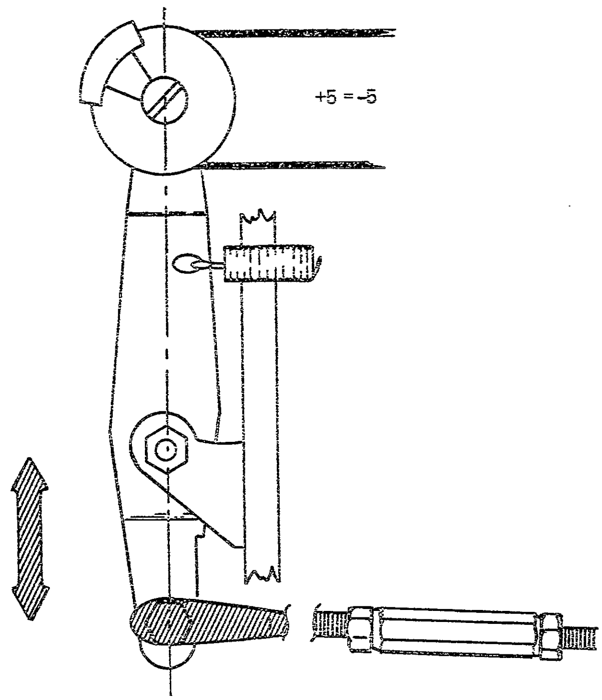


Figure 3-139. Rotate Arm Motion (Level 2)

Fine Homing (Level 2)

Adjust by shortening or lengthening the rotate link so that the detent enters the typehead at from 0.010" to 0.025" in the negative direction, from the center of the detent notch, when the head play is removed in a clockwise direction. Check the +5, -5, -1, and 0 rotate positions and use the position that is the most positive.

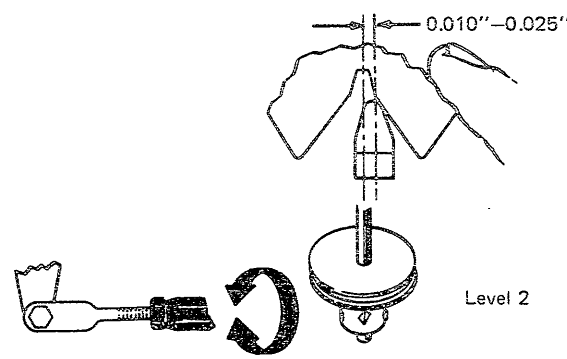


Figure 3-140. Fine Homing (Level 2)

Rotate-Tape Guide (Level 2)

Adjust the rotate-tape guide to 45 degrees outward from vertical, and with a clearance of from 0.003" to 0.008" from the tape.

NOTE: Position the rotate-tape guide as high as possible without interfering with the left-hand tilt pulley.

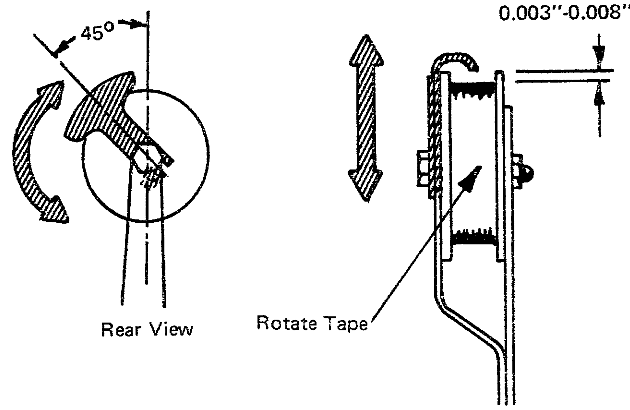


Figure 3-141. Rotate-Tape Guide (Level 2)

Final Print-Shaft Timing (Level 2)

CAUTION
Excessively advanced or retarded timing can cause parts damage as well as poor horizontal alignment or improper selection. This can happen if the detent enters the wrong notch or remains in the notch too long.

NOTE: If difficulty is encountered in obtaining the correct detent timing, check the following items:

1. Detent skirt clearance– Favor the high side of the tolerance.
2. Typehead homing–Favor the high side of the tolerance.
3. Band width–Make sure that it is not excessive.
4. Head play–Should be from 0.048" to 0.062" measured at the typehead skirt. If excessive head play is suspected, the ball joint should be replaced and the typehead homing adjustment should be refined.
5. Print shaft drive gears–Check for excessive backlash.

Advance or retard the print shaft, relative to its gear, so that a +5 and a -5 character enter the correct notch with a clearance of from 0.001" to 0.015". The detent withdrawal may touch the side of a tooth, but must not restrict the restoring of the typehead. See the following procedure.

1. Loosen the print shaft gear.
2. Hand-cycle a -5 rotate, tilt-two character until the pawl latches at the half-cycle position.
3. Manually rotate the print shaft; observe rotate detent as it enters and begins to withdraw. Stop the rotation when the rotate detent has withdrawn halfway from the slope of the tooth skirt.
4. Resume the hand-cycling operation until the typehead begins to rotate back to the rest position. Stop rotation when the typehead tooth just touches the rotate detent. (This provides "light scrubbing action".)

CAUTION
Be certain to maintain from 0.002" to 0.004" print-shaft end play.

5. Tighten the print-shaft gear.

NOTE: A burred print shaft may cause this procedure to fail. If previous fine-timing adjustments have scored or burred the print shaft, remove the print-shaft gear and rotate it one tooth in either direction to obtain a good bite on an unburred surface of the print shaft.

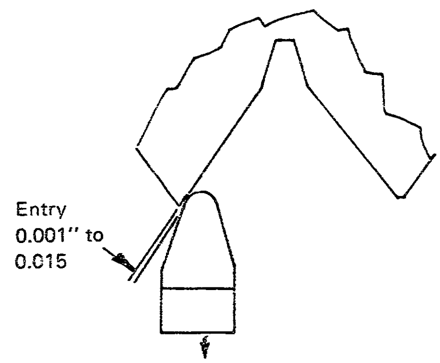


Figure 3-142. Final Print-Shaft Timing (Level 2)

Shift Motion (Level 2)

NOTE: The shift cam must be detented at each position, and the cycle shaft must be latched at the half-cycle position.

Adjust the shift-arm stop screw so that a lowercase -5 character detents *exactly* the same as an uppercase -5 character. As a final check, compare the detent-withdrawal timing of both upper and lowercase.

Final Alignment Check (Level 2)

Check the rotate typehead play, from the point of detent, for the following characters in both upper and lowercase: -5, -1 +5, and zero rotate (all tilt two). Check for a minimum of 0.010" typehead play in a clockwise (minus) direction from the center of the typehead notch and a minimum of 0.015" typehead play in a counterclockwise (plus) direction from the center of the typehead notch.

They should detent within 0.015" of each other in the clockwise (negative) direction.

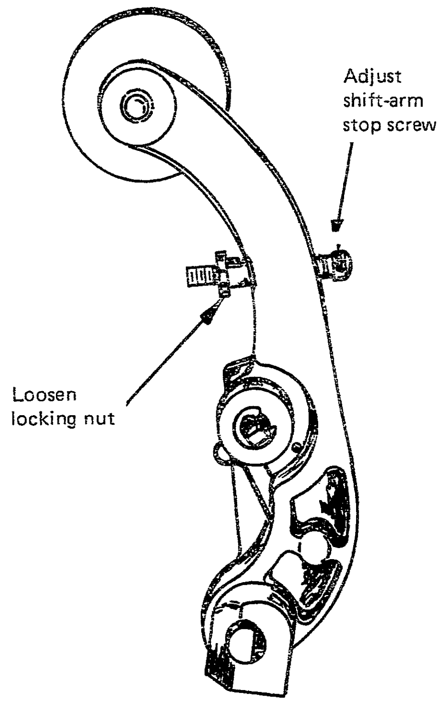


Figure 3-143. Shift Motion (Level 2)

COPY CONTROL AND PLATEN (LEVEL 1)

Copy Control (Level 1)

CAUTION
The copy control lever, while important as a preliminary setting, should not require adjustment unless it becomes loose or unless parts replacement is necessary.

Any changes in this adjustment will affect the front to rear position of the platen; therefore, all platen and print adjustments will have to be checked and readjusted if necessary.

NOTE: The copy-control lever should be all the way forward for the following adjustments, unless stated otherwise.

1. With the copy-control lever detented in the forward position, the high points of the eccentrics should be vertical (Figure 3-144). Adjust the copy-control lever on the shaft to satisfy this condition.

   This adjustment provides the most effective operation of the eccentrics in moving the platen forward and backward.
2. Form the stop ears on the copy-control detent spring to provide positive detenting in the extreme front and rear positions of the lever.

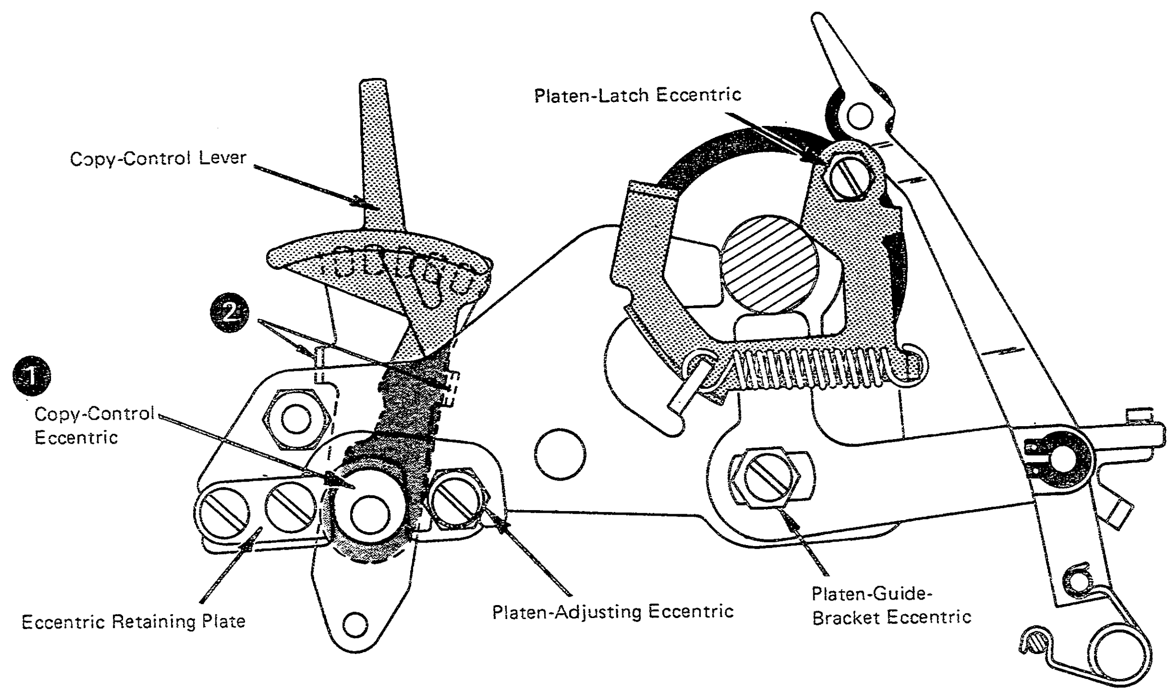


Figure 3-144. Copy Control and Platen (Level 1)

Right-Hand Platen Knob (Level 1)

Position the right-hand platen knob on the platen shaft so the platen-shaft bushing has 0.001" to 0.003" end play and rotates freely without binds.

Platen Height (Level 1)

To adjust the print mechanism, first establish the correct position of the platen and then make the print adjustments relative to the platen position. This involves both a height adjustment and a front-to-rear position. Because of the method used in measuring these positions, they must be considered together and adjusted alternately until both are correct.

Platen Height: With the head of the Hooverometer set at the No. 4 scribe line, the platen should just touch the base of the handle, when the head is resting on the escapement rack (Figure 3-145).

Adjust the platen guide bracket eccentrics to obtain this condition. The high part of the eccentrics should be kept to the rear. The deflector and front feed rolls must be removed when checking the adjustment with the Hooverometer.

When the platen height is adjusted, the platen-latch eccentrics must be checked. Adjust the platen-latch eccentrics with the high part to the rear so the platen is held firmly in position vertically and horizontally. The latches should latch and unlatch freely with the feed rolls released.

NOTE: The Hooverometer should be inserted at a position just to the left of the escapement-cord drum when checking the right side, and directly in line with the 'rotate-two' latch when checking the left side. The handle of the Hooverometer must be as nearly vertical as possible during the checks. The base of the handle does not reach the center line of the platen when the handle is vertical, but the difference in height has been compensated for in the location of the scribe line.

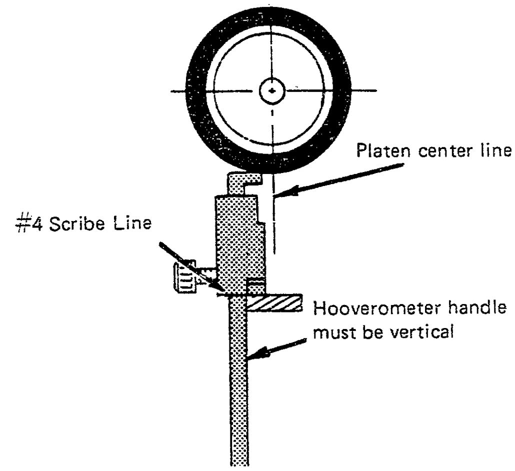


Figure 3-145. Platen Height (Level 1)

Platen, Front to Rear (Level 1)

CAUTION
Any change in the front-to-rear position of the platen necessitates a readjustment of the velocity-control plate and anvil. Also, any change in the platen position may alter the paper-feed adjustments. All paper-feed adjustments should be checked and readjusted if necessary.

Platen, Front to Rear: Half-cycle the machine with the head of the Hooverometer set at the No. 2 scribe line, the tool should just span the distance between the platen and the print shaft. Adjust the platen-adjusting eccentrics to obtain this condition (Figure 3-144).

Check at both ends of the platen. To adjust the platen-adjusting eccentrics, it is necessary to loosen the front screws in the eccentric retaining plates. (Be sure that the Hooverometer does not rest on the print-shaft keyway.)

NOTE: After the correct vertical and horizontal positions of the platen are obtained with the Hooverometer, the vertical position may be refined to provide even printing between the tops and bottoms of the characters. Check at both ends of the writing line.

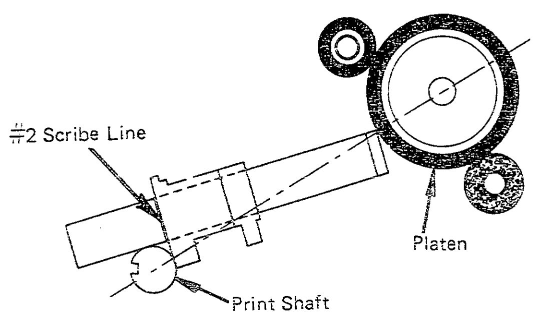


Figure 3-146. Platen, Front to Rear (Level 1)

PRINT MECHANISM (LEVEL 1)

NOTE: Print mechanism adjustments have been grouped into two levels so that the different adjustments can be more easily identified and followed. Level 1 can be identified by the print mechanism *without* the "stick shift" impression control: the mechanism may have either a gear, or gearless, tilt mechanism. See Figure 3-149.

Carrier Shoe (Level 1)

NOTE: The eccentric is accessible with the 3-inch screwdriver, through the opening in the escapement bracket just above the tab-torque bar. The side of the screwdriver blade should be used if possible.

Adjust the upper-carrier-shoe eccentric mounting stud to provide from 0.001" to 0.004" vertical motion of the carrier at the rear. Check at several points along the writing line.

This amount of play ensures free lateral movement of the carrier yet restricts the vertical movement, to help prevent variation in the vertical alignment of the type.

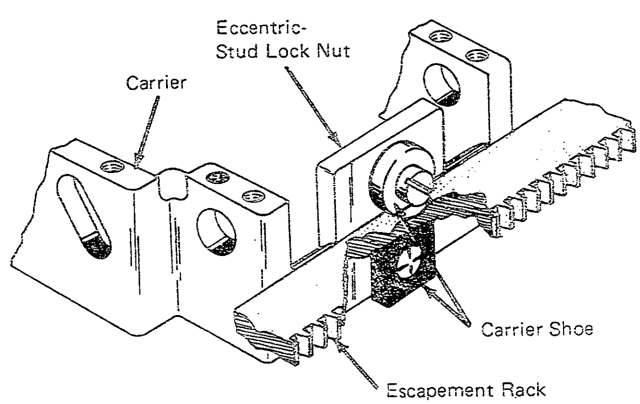


Figure 3-147. Carrier Shoe (Level 1)

Velocity-Control Plate Action (Level 1)

The velocity-control plate must be adjusted to satisfy the following two conditions:

1. With the cam follower held lightly against the low point of the print cam, the center of the home character should clear the platen by from 0.260" to 0.270".
2. With the cam follower held lightly against the high point of the print cam, the home character should clear the platen by from 0.020" to 0.030".

The copy-control lever must be forward.

Position the carrier to the left for ease of adjustment.

The print cam has a fixed amount of rise from its low point to its high point. For this reason, the print-cam follower always receives the same amount of powered travel or motion from the print cam. However, the amount of powered travel that the rocker and typehead receive from the print-cam follower depends directly on the position of the velocity-control-plate pin in the forked slot of the follower. Moving the pin to the front of the slot decreases the powered travel of the typehead, as shown by dimension A. Moving it to the rear increases the powered travel, as shown by dimension B.

Because of the constant operational speed of the print cam and follower, the typehead velocity must increase or decrease in proportion to the increase or decrease in powered travel. An accompanying change in typehead velocity occurs when the powered travel is changed, because the typehead must always travel from its rest position to its active position in the same amount of time, regardless of what this distance may be.

The proper impact velocity of the typehead can be achieved by controlling the amount of powered travel of the typehead while maintaining, at the same time, the correct amount of free flight. Since the position of the platen has been previously fixed, and since the amount of free flight is determined by the point at which the limit of powered travel occurs, relative to the platen, only the rest position (beginning of powered travel) may change when the amount of powered travel is changed. Therefore, in order to maintain a fixed amount of typehead free flight when the amount of powered travel is changed, the velocity-control-plate pin must also be adjusted up or down, relative to the rocker.

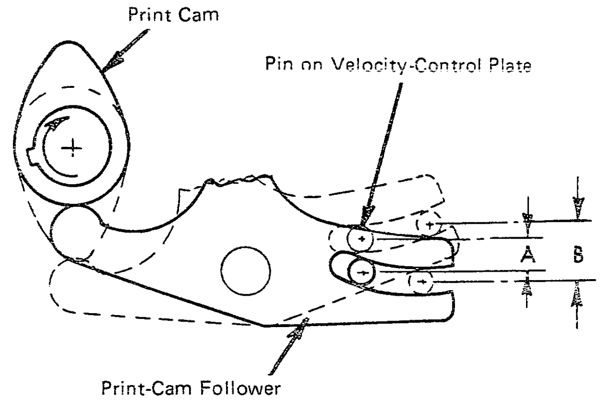


Figure 3-148. Velocity-Control-Plate Action (Level 1)

Velocity-Control-Plate Adjustments (Level 1)

The eccentric shouldered nut (Figure 3-149) on the velocity-control plate provides a means of controlling the vertical position of the velocity-control-plate pin, relative to the rocker, thereby controlling the free flight of the typehead.

The elongated hole in the velocity-control-plate (behind the binding screw) allows the velocity-control-plate pin to be adjusted, front or rear, in the forked slot of the follower, thereby controlling the amount of powered travel that the typehead will receive. Each adjustment affects the other, and so the adjustments must be made alternately until both are correct.

Velocity-Control Free Flight (Level 1)

The adjustments can be made easily if the following procedure is used:

1. Raise the anvil-adjusting eccentrics and the restoring-cam-follower eccentric, to prevent any interference, and remove the ribbon-feed plate for accessibility (Figure 3-149 and 3-151).
2. If the velocity-control plate is loose or is completely out of adjustment, set the high part of the eccentric forward and tighten it in place. Adjust the plate so that about 1/32" of the adjusting slot is visible above the binding screw, and tighten the screw friction-tight. These settings provide a good starting point.
3. Hand-cycle the machine, using a zero-rotate, zero-tilt character, until the print-cam follower is on the high point of the cam. (Do not hold the typehead toward the platen.) With the mechanism in this position, adjust the velocity-control-plate eccentric until a slight drag is felt on three tab cards inserted between the typehead and the platen. A heavy drag should be felt on four cards. No drag should be felt on two cards. You should not be able to insert five cards.

   This will place the limit of powered travel of the typehead from 0.020" to 0.030" away from the platen (providing the typehead with the proper amount of free flight).

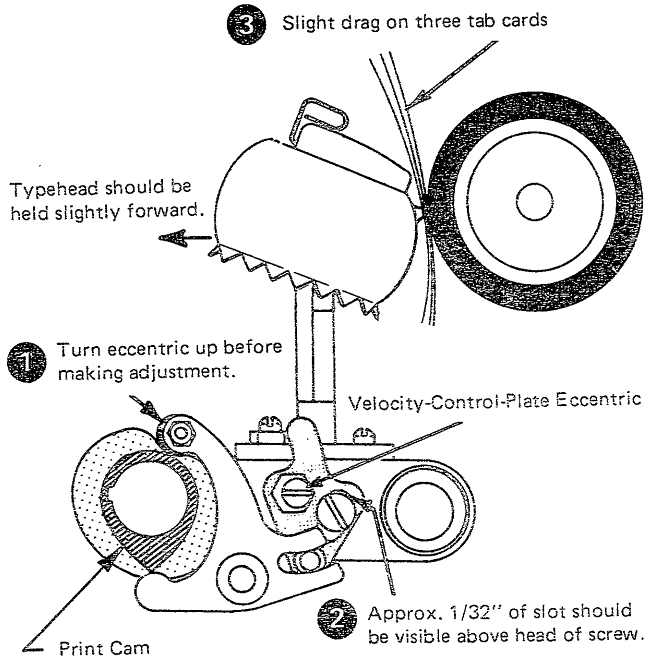


Figure 3-149. Velocity-Control Free Flight (Level 1)

Velocity-Control Total Travel (Level 1)

Hand-cycle the machine until the print-cam follower is at the low point of the cam. This may not be at the rest position. The low point of the cam can be determined by observing the movement of the head toward the front of the machine.

With the typehead at its most forward point, adjust the velocity-control-plate pin forward or backward in the cam-follower slot until there is a clearance of from 0.260" to 0.270" between the center of a zero-rotate, zero-tilt character and the platen.

Since this 0.260" to 0.270" is measured between the typehead and the platen, it is not a measurement of the powered travel of the typehead. The 0.020" to 0.030" free flight is included in this 0.260" to 0.270" and must be subtracted in order to determine the amount of powered travel. The powered travel must never exceed 0.265", as this will cause typehead breakage.

The base of the Hooverometer handle can be used as a measuring device. The handle base is about 0.250" thick; however, all handle bases do not measure the same. Each handle should be measured with a dial indicator or micrometer to determine its exact size. When the size of the handle base has been determined, a thickness of tab cards should be placed around the platen that will total from 0.260" to 0.270" when added to the thickness of the handle base.

Both the free-flight and total-travel adjustments must be rechecked and refined until optimum print quality is obtained. A certian amount of variation in velocity, however, is permissible, to satisfy a customer's application. Be cautious of creating an excessive increase or reduction in velocity, as this will adversely affect the uniformity of impression between characters and the general appearance of the printed copy.

NOTE: Be sure to tighten both screws firmly when the adjustments have been completed. The adjustments should be checked with the ribbon removed.

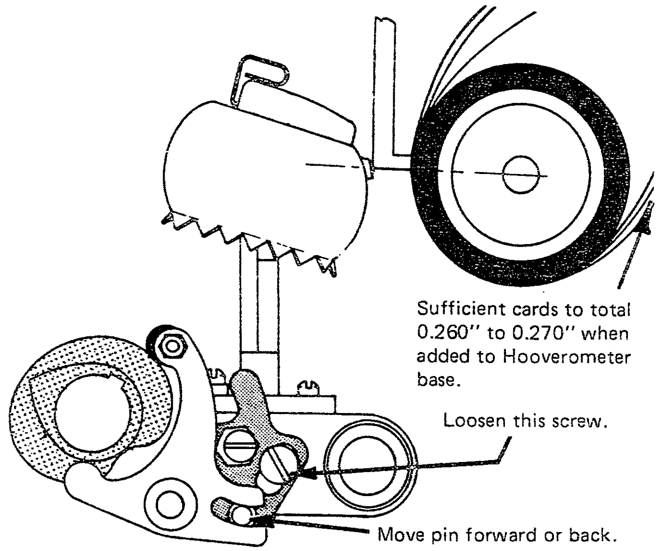


Figure 3-150. Velocity-Control Total Travel (Level 1)

Anvil (Level 1)

CAUTION
Raising or lowering either end of the anvil will slightly affect the adjustment at the other end. Be sure to re-check each adjustment. A clearance of 0.010" to 0.045" must be maintained between the left anvil bracket and the side frame for noise reduction. Adjust the bracket left or right on the anvil to obtain the clearance (11-inch machines only).

Adjust the eccentric at each end of the anvil so the anvil properly restricts the free flight of the typehead. Check this adjustment by printing a period or similar character with the copy-control lever set all the way back. The period should fail to print or print very faintly. With the copy-control lever pulled forward one notch (fourth position), the period should print lightly. The ribbon and one sheet of paper should be used when making the check. The check should be made at each end of the platen only, because flexing of the parts will allow a slightly different condition in the middle of the platen. The high part of each eccentric should be kept outward, towards the side (Figure 3-151).

NOTE: The restoring-cam-follower eccentric should be adjusted all the way up while the anvil is being set. On 15-inch machines, the carrier buffers must also be moved up out of the way of the anvil.

The free flight must be restricted, to ensure that all characters will emboss the paper to the same depth. If no restriction were applied, the smaller characters, such as punctuation marks, would emboss too deeply; the surface area somewhat restricts the amount of embossing for the larger characters. If the free flight of the rocker is stopped at the proper point, even impression between all characters will result.

Carrier Buffers (Level 1, 15-Inch Machines)

A buffer plate attached to the right side of the carrier and an adjusting screw under the left side strike the top of the anvil to prevent the print shaft from flexing downward. Each should have 0.002" to 0.004" clearance with the top of the anvil.

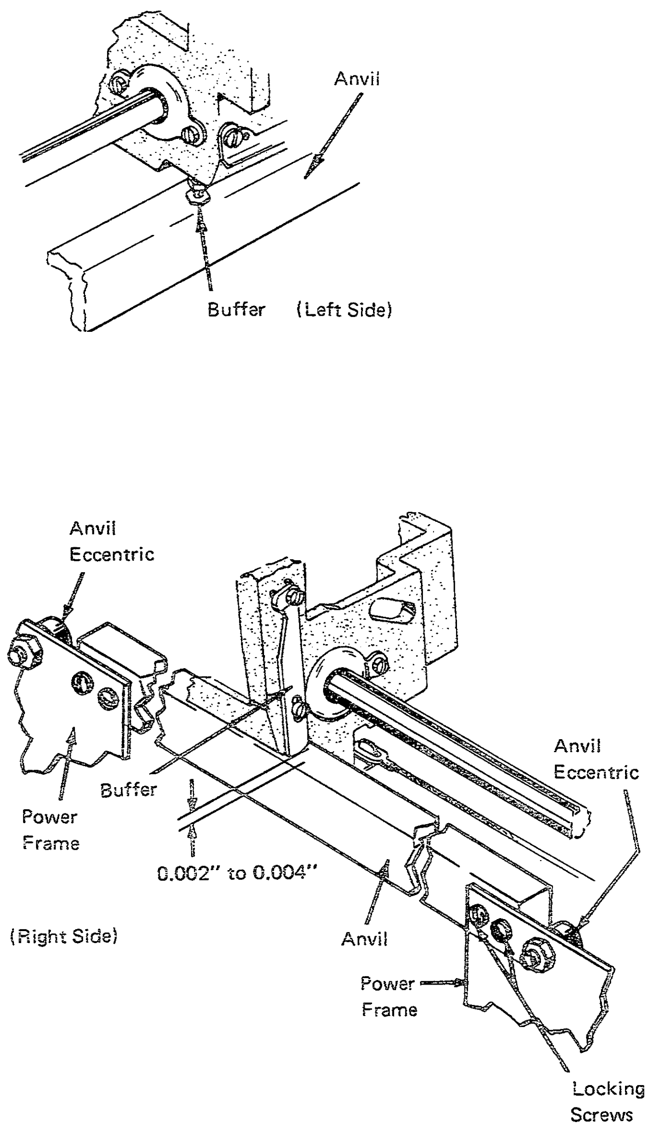
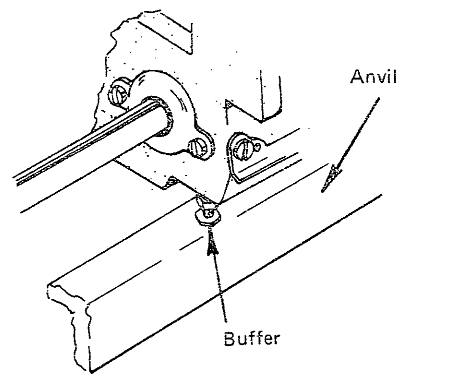


Figure 3-151. Carrier Buffers (Level 1. 15-Inch Machines)

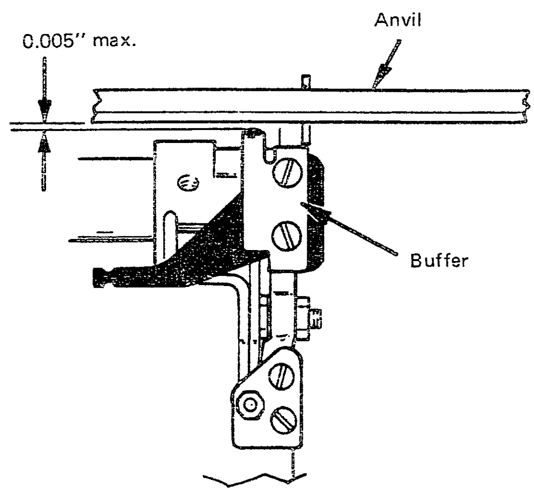
Carrier Buffers (767 Printer, Level 1)

Adjust so the carrier will be supported by the anvil over at least the center 3/4 of the writing line without binding the carrier.



Horizontal Buffer (Tab Cord Anchor Bracket, 767)

Adjust so the anvil-to-buffer clearance is as close as possible without binding the carrier, not to exceed 0.005". Check adjustment over the full length of the writing line.



Carrier-Buffer Eccentric (Right Hand, 767)

Adjust the eccentric to provide 0.005" maximum between the anvil and buffer extension. Check adjustment over the full length of the writing line.

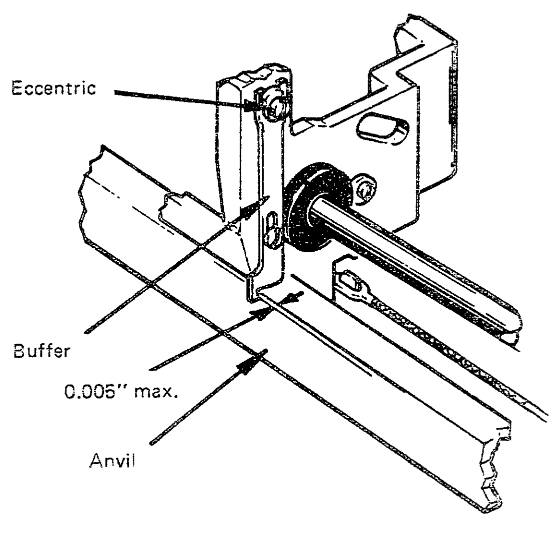


Figure 3-152. Carrier Buffers (767 Printer, Level 1)

Restoring-Cam Follower

1. Print-Cam-Follower Stud: Adjust the pivot stud left or right so that the rubber roller on the follower is centered on the surface of the restoring cam. The stud is held in place in the carrier by a setscrew that is accessible from the bottom of the machine.
2. Restoring-Cam-Follower Eccentric: With the print-cam follower at the high point of the cam and the platen removed, hold the typehead toward the rear until it is restricted by the anvil and striker. The rubber roller should just touch the restoring cam. Adjust the eccentric, keeping the high point forward, to satisfy this condition.

   NOTE: If the roller is too close to the restoring cam, it may bind against the cam during print-shaft rotation. If there is too much clearance, the typehead may not be restored as quickly as it should, and blurred characters may result.

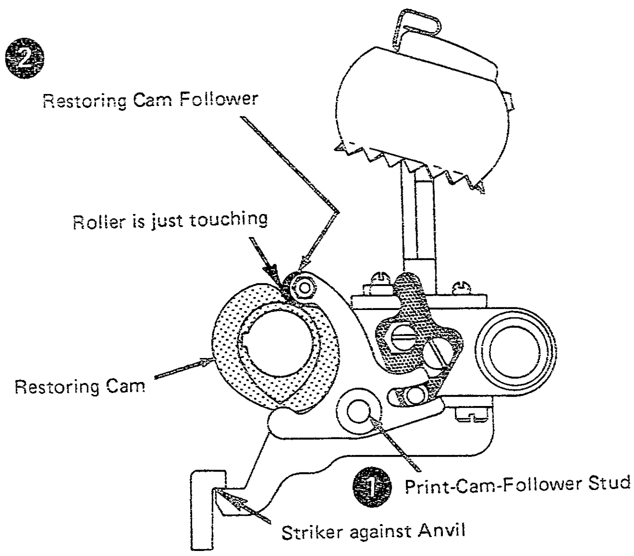


Figure 3-153. Restoring-Cam Follower (Level 1)

COPY CONTROL AND PLATEN (LEVEL 2)

CAUTION
The adjustment of the copy-control lever, while important as a preliminary setting, should not require adjustment unless it becomes loose or unless parts replacement is necessary.

Any changes in this adjustment will affect the front-to-rear position of the platen; therefore, all platen and print adjustments must be checked and readjusted if necessary.

NOTE: The copy-control lever should be all the way forward, for the following adjustments, unless stated otherwise.

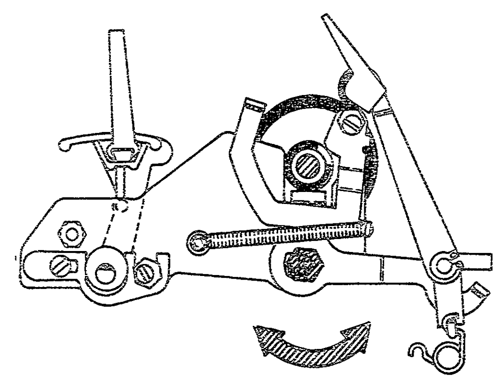


Figure 3-154. Copy Control and Platen (Level 2)

Copy-Control Lever (Level 2)

1. With the copy-control lever detented in the forward position, the high points of the eccentrics should be on top. Adjust the copy-control lever on the shaft to satisfy this condition.

   This adjustment provides the most effective operation of the eccentrics in moving the platen forward and backward.
2. Form the stop ears on the copy-control-detent spring to provide positive detenting in the extreme front and rear positions of the lever.

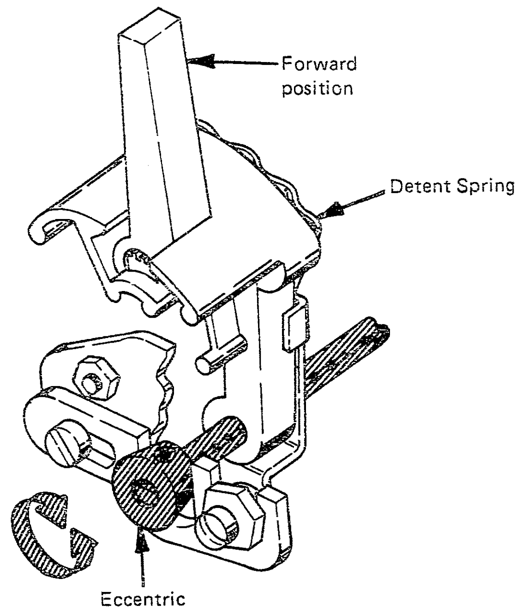


Figure 3-155. Copy-Control Lever (Level 2)

Right-Hand Platen Knob (Level 2)

Position the right-hand platen knob on the platen shaft so the platen-shaft bushing has 0.001" to 0.003" end play and rotates freely without binds.

Platen Height (Level 2)

To adjust the print mechanism, first establish the correct position of the platen, and then make the print adjustments relative to the platen position. This involves both a height adjustment and a front-to-rear position. Because of the method used in measuring these positions, they must be considered together and adjusted alternately until both are correct.

Platen Height: With the head of the Hooverometer set at the No. 4 scribe line, the platen should just touch the base of the handle when the head is resting on the escapement rack.

Adjust the platen-guide-bracket eccentrics to obtain this condition. The high part of the eccentrics should be kept to the rear. The deflector and front feed rolls must be removed when checking the adjustment with the Hooverometer.

NOTE: The Hooverometer should be inserted at a position just to the left of the escapement-cord drum when checking the right side, and directly in line with the 'rotate-two' latch when checking the left side. The handle of the Hooverometer must be as nearly vertical as possible during the checks. The base of the handle does not reach the center line of the platen when the handle is vertical, but the difference in height has been compensated for in the location of the scribe line.

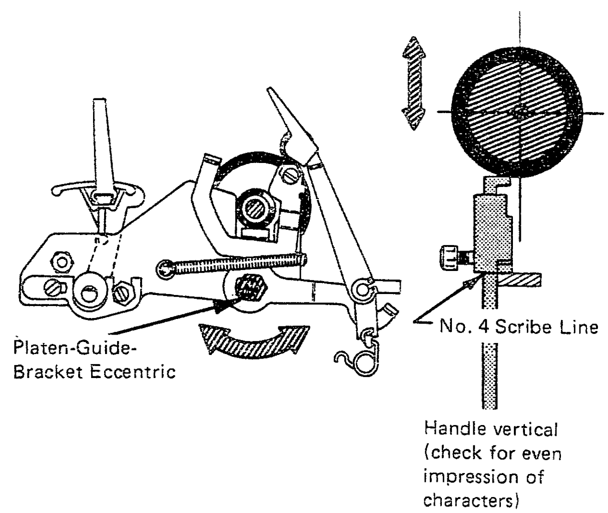


Figure 3-156. Platen Height (Level 2)

Platen, Front to Rear (Level 2)

Platen, Front-to-Rear: Half-cycle the machine. With the head of the Hooverometer set at the No. 2 scribe line, the tool should just span the distance between the platen and the print shaft, as illustrated. Adjust the platen-adjusting eccentrics to obtain this condition.

Check at both ends of the platen. To adjust the platen-adjusting eccentrics, it is also necessary to loosen the front screws in the eccentric retaining plates. (Be sure the Hooverometer does not rest on the print-shaft keyway.)

> *NOTE:* After the correct vertical and horizontal positions of the platen are obtained with the Hooverometer, the vertical position may be refined to provide even printing between the tops and bottoms of the characters. Check at both ends of the writing line.

CAUTION
Any change in the front-to-rear position of the platen necessitates a readjustment of the velocity-control plate and anvil. Also, any change in the platen position may alter the paper-feed adjustments. All paper-feed adjustments should be checked and readjusted if necessary.

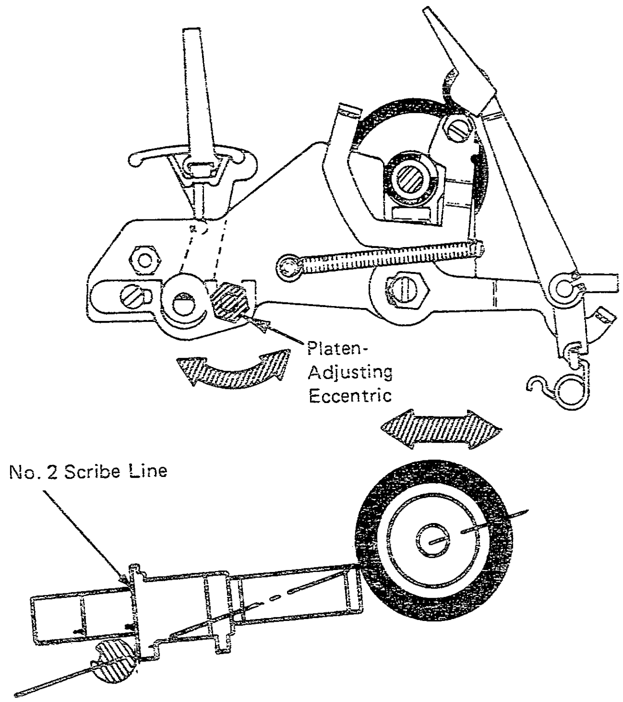


Figure 3-157. Platen, Front to Rear (Level 2)

Platen Latches

Adjust the left- and right-hand platen eccentrics to hold the platen firmly. The high point of the eccentrics should be pointed toward the rear of the printer.

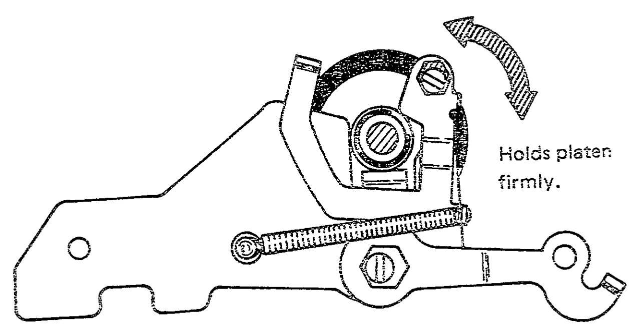


Figure 3-158. Platen Latches (Level 2)

PRINT MECHANISM (LEVEL 2)

NOTE: The print mechanism adjustments have been grouped into two levels so that the different adjustments can be more easily identified and followed.

Level 2 can be identified by the print mechanism *with* the impression control and with a gearless-tilt mechanism only.

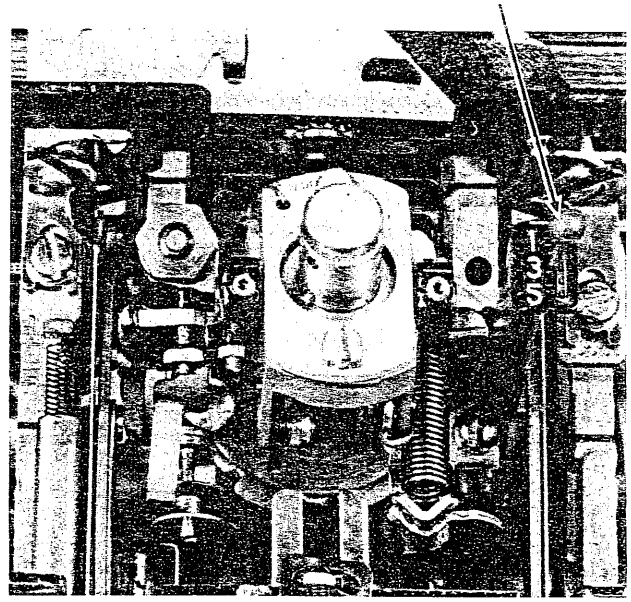


Figure 3-159. Print Mechanism (Level 2)

Carrier Shoe (Level 2)

Adjust the upper-carrier-shoe eccentric mounting stud to provide from 0.001" to 0.005" vertical motion of the carrier at the rear when the spring load on the upper shoe is suppressed.

NOTE: The vertical motion may be felt by firmly moving the carrier up and down at the rear, to overcome the effects of the spring load on the upper shoe.

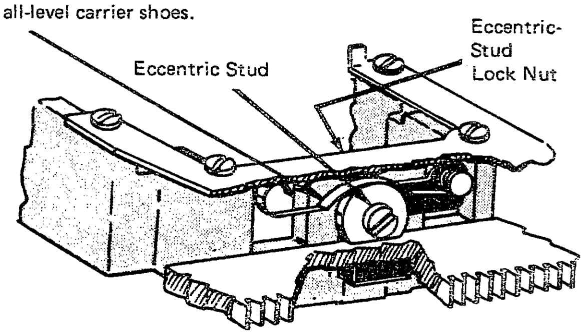


Figure 3-160. Carrier Shoe (Level 2)

Carrier Buffer (Level 2)

Adjust both ends of the support (anvil) vertically to maintain 0.001" to 0.005" clearance with the bottom of the ribbon-feed bracket along the entire length of the writing line.

Binding screws at each end, secure the support to the machine power frame. Elongated holes in the machine power frame enable the support to be adjusted vertically. This adjustment serves the same purpose as the carrier buffers on the early-level machines.

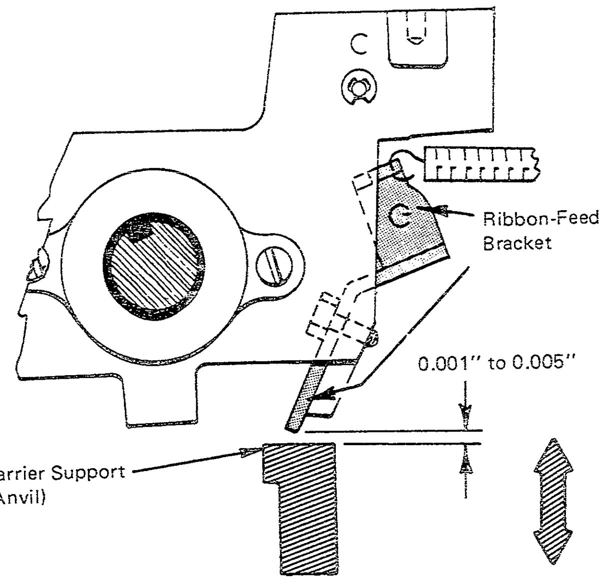


Figure 3-161. Carrier Buffer (Level 2)

Carrier Buffer (Level 3)

Adjust both ends of the carrier support up or down to obtain a clearance of from 0.001" to 0.005" from the top of the support to the high curved portion on the carrier bearing pad. Check this adjustment throughout the full writing line.

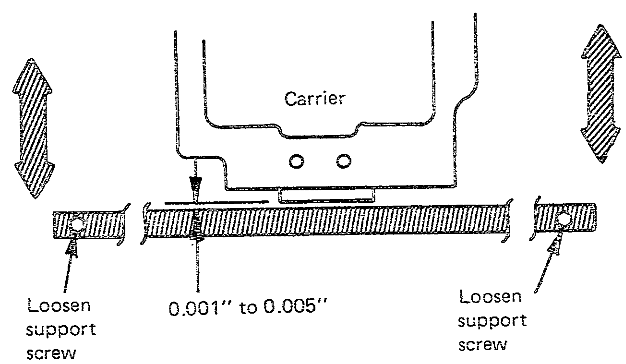


Figure 3-162. Carrier Buffer (Level 3)

Print-Cam-Follower Stop Screw

Adjust the cam-follower stop screw so that the print-cam-follower roller clears the print cam by 0.020" when the machine is at rest. This clearance ensures that the rocker will restore fully on every cycle.

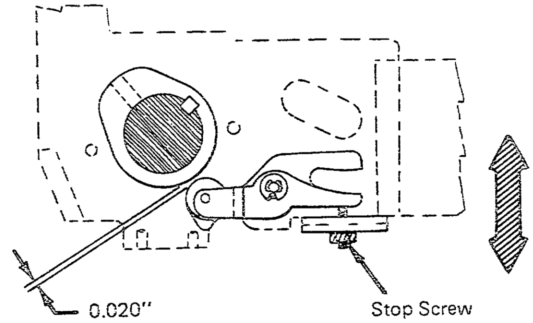


Figure 3-163. Print-Cam-Follower Stop Screw

Print-Cam-Follower Stop (Dual Velocity)

On dual-velocity or "print a space" (no-print) machines, the print-cam-follower clearance allows the roller to shift from one lobe to the other without rubbing on the cam. Use the following procedure to obtain this adjustment:

1. Rest the machine on its back and slowly hand-cycle a high-velocity character until the leading edge of the print-shaft keyway lines up with the center of the roller pin on the cam follower.
2. Loosen the stop-screw locking nut and back out the stop screw approximately two turns. (The roller should be resting against the cam at this point.)

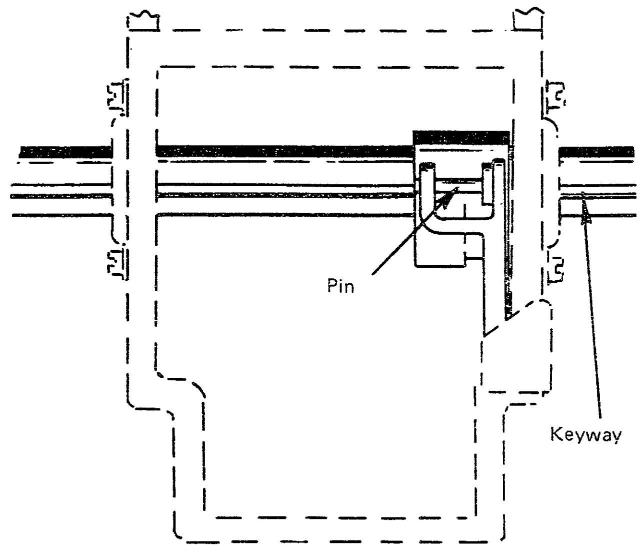


Figure 3-164. Keyway in Line with Roller

3. With the machine resting on its back, place a 0.001" or 0.002" feeler gage between the print cam and the follower roller. This can be accomplished by manually holding the rocker toward the platen while inserting the feeler gage from the front of the carrier (to the right of the carrier pointer) just above the line-lock bracket. With the gage in position, allow the rocker to come back to rest. The feeler gage should become trapped between the roller and the cam. Then, slowly turn the stop screw in until a minimum drag is felt on the feeler gage as it is withdrawn.
4. Tighten the locking nut without moving the screw.

This adjustment may be checked by applying a light film of No. 23 grease on the print cam (in the area indicated in the illustration) and then observing the track that the roller makes in the grease when the machine is hand-cycled. If the stop screw has been adjusted properly, the roller track in the grease should begin at point "A", which is the beginning of the second low dwell on the print cam.

If the roller track begins before point "A", the roller is adjusted too close to the print cam when the machine is at rest. Improper roller-to-cam clearance may cause the roller to drag on the print cam as it shifts during a low-velocity or space selection. Thus, the roller may fail to shift, or shift improperly. If the roller is adjusted too close to the cam at rest, it may receive a ski-jump effect from the print cam as it attempts to follow the print cam from the first low dwell to the second low dwell.

If the roller track begins after point "A", the roller rests too far away from the first low dwell of the print cam and may cause a loss in typehead velocity.

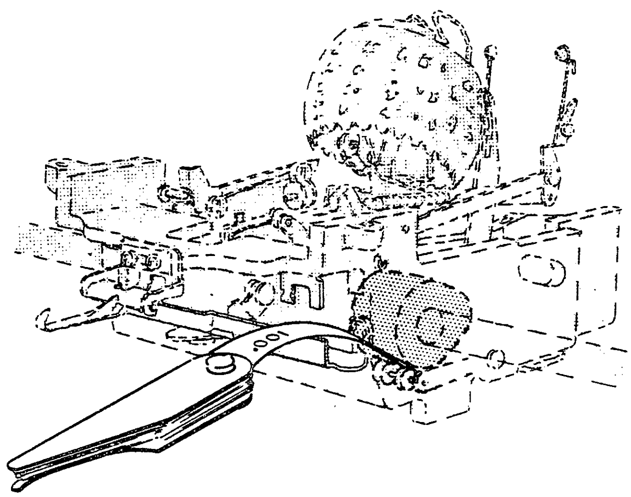


Figure 3-165. Feeler Gage Trapped

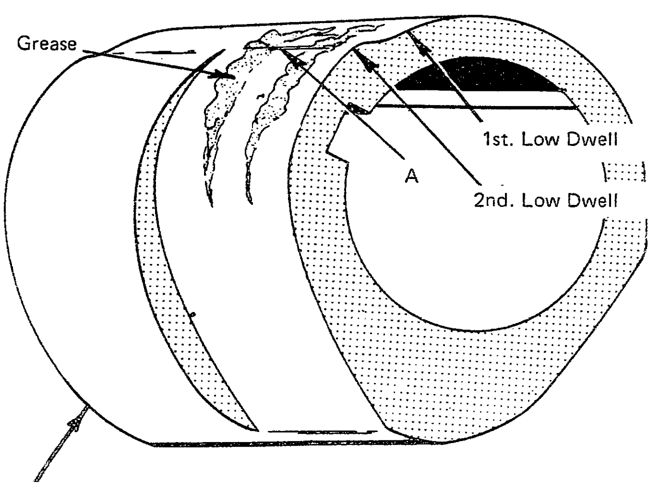


Figure 3-166. Roller Track in Grease

Velocity-Control Cable

Carrier Cable Clamp

Loosen the clamp screw and slide the cable sheath left or right under the clamp until the end of the sheath is flush to 0.010" recessed with the right-hand edge of the clamp.

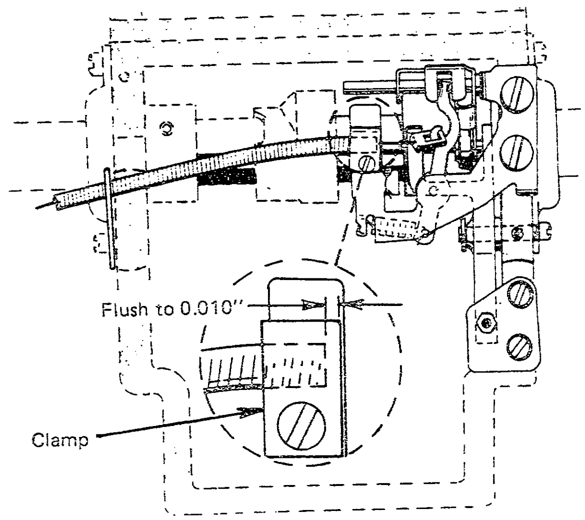


Figure 3-167. Carrier Cable Clamp

Carrier Cable Guide

Position the cable guide horizontally and as high as possible without binding the cable against the carrier.

Form the deflector front or rear to prevent the cable from getting behind the carrier. Check along the entire writing line to make certain the deflector does not rub on the power frame.

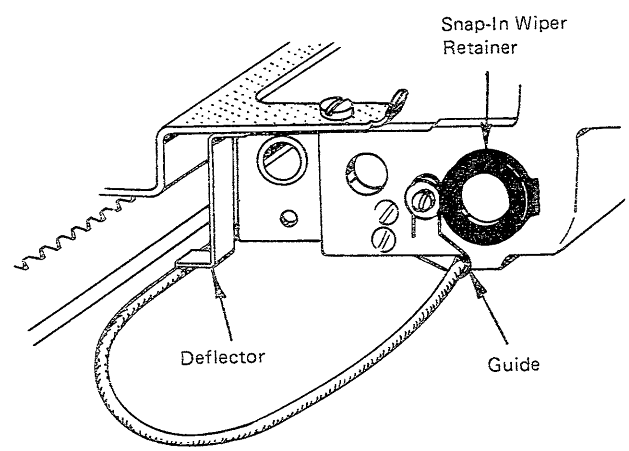


Figure 3-168. Carrier Cable Guide

Center Cable Clamp

Position the cable sheath left or right within the center cable clamp so the bend in the cable will just touch the machine side frame (left) when the carrier is resting two spaces from the extreme left margin.

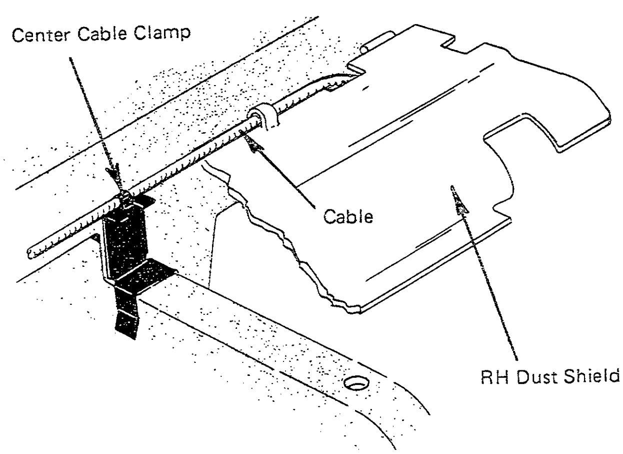


Figure 3-169. Center Cable Clamp

Keyboard Cable Clamp

Loosen the clamp screw and move the cable sheath forward or backward under the clamp to satisfy the following condition:

When a low-velocity character (or space, on no-print machines) is half-cycled, the print-cam-follower roller must shift onto the low-velocity lobe of the print cam by the width of the roller plus 0.030" to 0.040". Moving the cable sheath to the rear will give more movement to the roller by reducing the amount of lost motion felt within the oversized eyelets of the cable.

NOTE: This adjustment may be checked by alternately cycling a low- and high-velocity character after applying a light film of No. 23 grease to both lobes of the print cam. Observe the tracking of the roller in the grease to determine if the roller is shifting properly. The roller must restore fully under the high-velocity lobe when the machine is at rest.

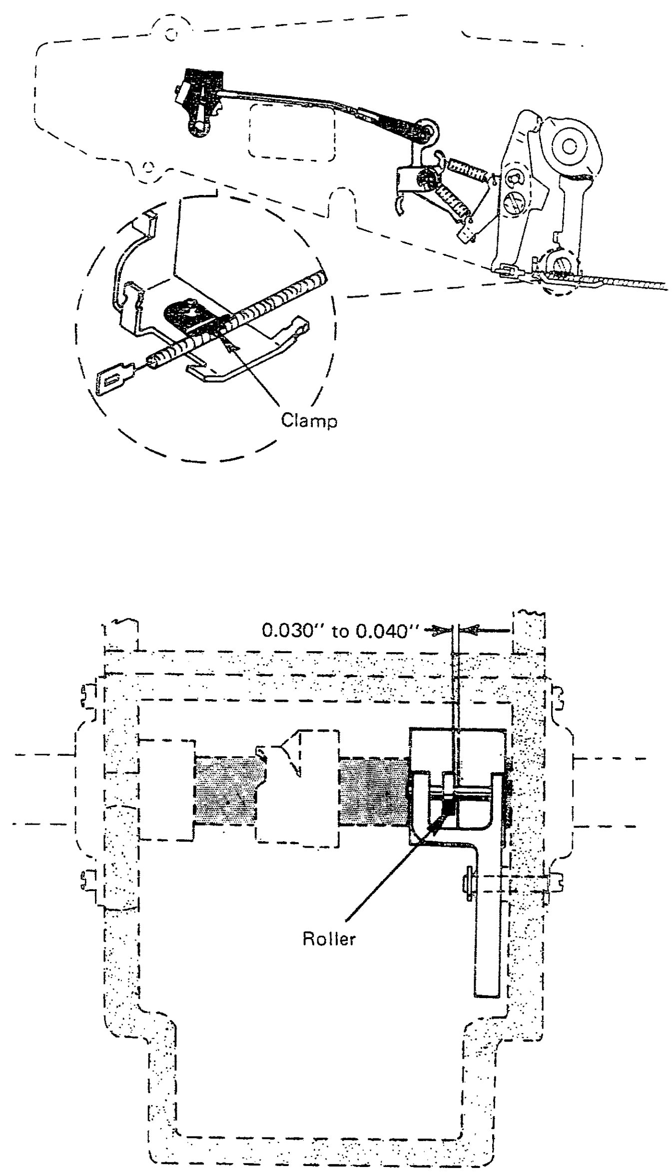


Figure 3-170. Keyboard Cable Clamp

Low-Velocity or No-Print Latch Link

With the machine latched at rest and the low-velocity latch held against the adjusting stop on the cam follower, match the pin clevis on the link with the hole in the latch. When matching the clevis, hold the link toward the rear of the machine so the low-velocity vane will be against the tail of the interposers.

NOTE: The link adjustment ensures that the latch will take a full bite on the adjusting stop and that there will be no lost motion in the system.

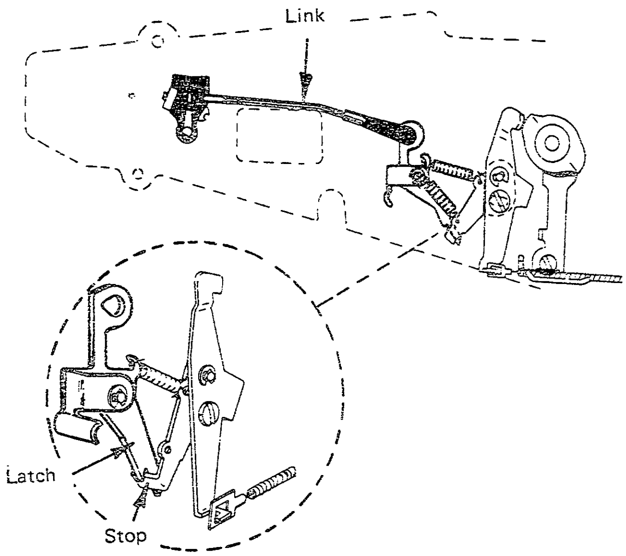


Figure 3-171. Low-Velocity or No-Print Latch Link

Low-Velocity or No-Print Cam

CAUTION
Be sure to disconnect the line cord before attempting to rotate the filter shaft by hand.

Adjust in the following manner:

1. Slowly hand-cycle a low-velocity character (space, on no-print machines) until one of the scribe marks on the cam is in line with the center of the shoe on the cam follower.
2. Without moving the cam, loosen its setscrews and then slightly advance or retard the filter shaft (within the cam) to obtain 0.008" to 0.012" between the latch and the stop. Advancing the filter shaft will increase the clearance; retarding will decrease it.
3. Tighten cam setscrews. The cam must not move in relation to the follower and must be positioned laterally on the filter shaft so it is centered between the cable anchor bracket and the shift-release arm.

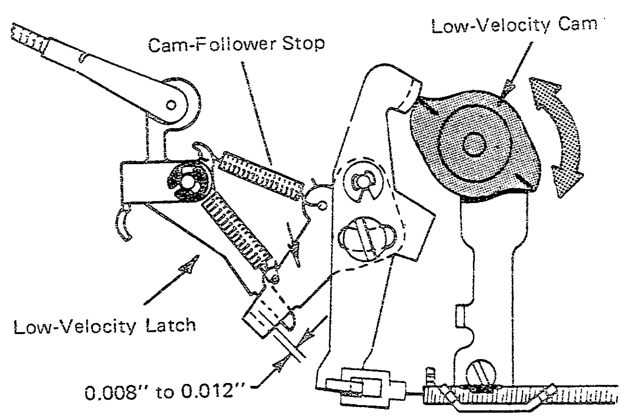


Figure 3-172. Low-Velocity or No-Print Cam

Low-Velocity or No-Print Cam-Follower Stop

With the cycle shaft latched at rest, adjust the stop for 0.008" to 0.012" clearance with the low-velocity latch. Loosen the binding screw "A" to make this adjustment.

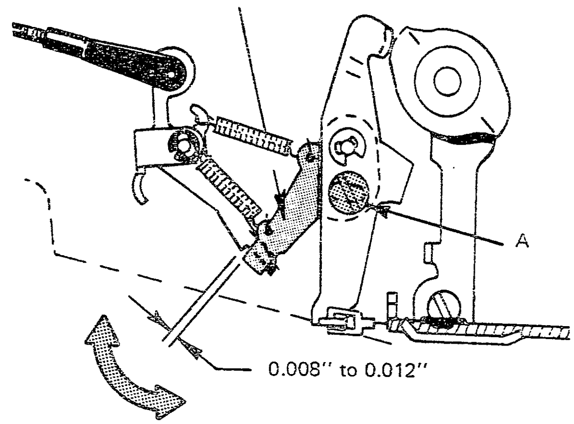


Figure 3-173. Low-Velocity or No-Print Cam-Follower Stop

Total Travel (Without Dual Velocity)

NOTE: Total travel and free flight directly affect each other and must be adjusted alternately until both are correct. Position carrier with pawl mounting stud opposite torque-bar backstop.

With the cycle shaft latched at rest, the impression-control lever set at position 5, and the copy-control lever set at 5 (all the way back), loosen the binding screw and move the detent plate forward or backward until a clearance of 0.250" exists between the platen and the center of the "home" character. This clearance may be measured with the foot of the Hooverometer which is approximately 0.250". When measuring the adjustment, remove the tilt ring play by pressing the typehead lightly toward the front of the machine.

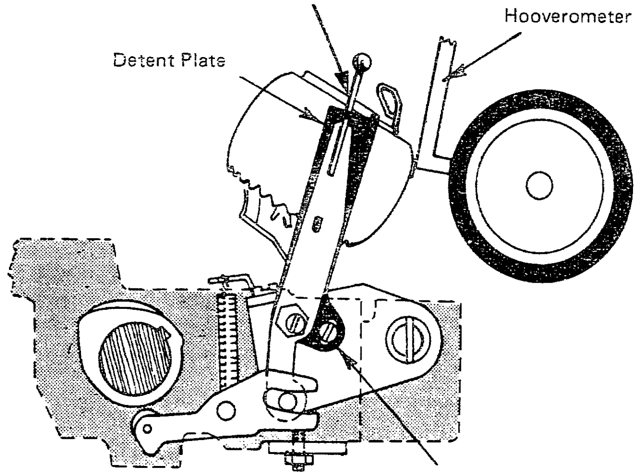


Figure 3-174. Total Travel (without Dual Velocity)

Free Flight (Without Dual Velocity)

Set the impression-control lever at 5 and the copy-control lever at 4, and hand-cycle the machine until the print-cam follower is resting on the high point of the print cam. At this point, there should be 0.035" free flight between the platen and the center of a half-cycled "home" character. Adjust the eccentric on the impression-control lever for this clearance. Keep the high part of the eccentric toward the front of the machine.

> *NOTE:* This adjustment can be measured with the pusher end of the large spring hook, while holding the typehead lightly toward the front of the machine.

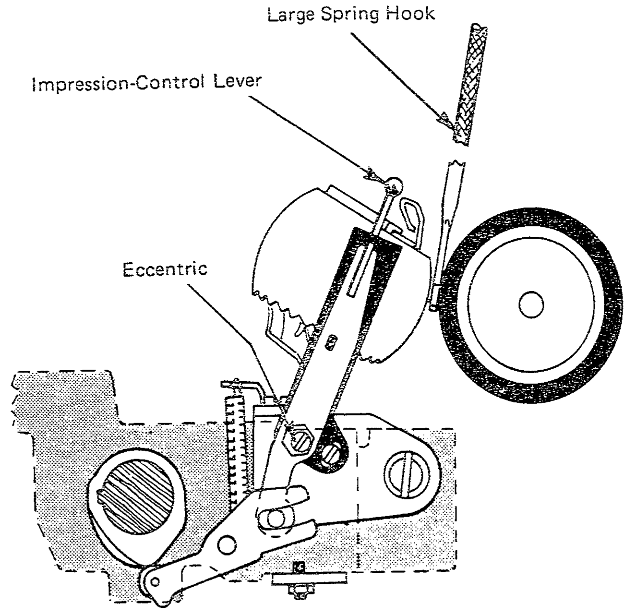


Figure 3-175. Free Flight (without Dual Velocity)

Total Travel (767 Printer)

With the impression control lever in position 5, adjust the velocity control detent plate to give travel of the typehead throughout the full rise of the print cam.

Free Flight (767 Printer)

With the impression-control lever in position 5, adjust the velocity-control-plate eccentric for 0.038" to 0.042" clearance between the home character and the platen when the print-cam follower is resting on the high point of the print cam.

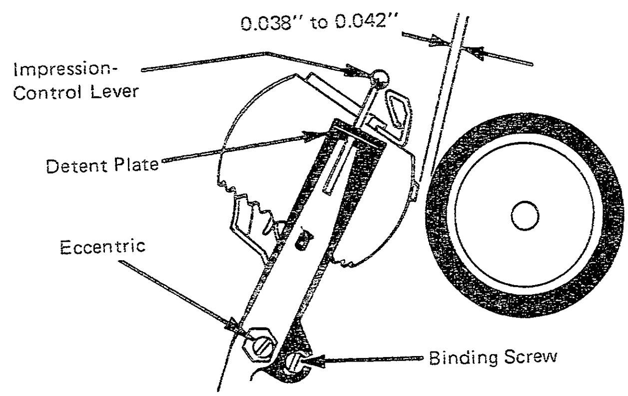


Figure 3-176. Free Flight (767 Printer)

Total Travel (With Dual Velocity or No-Print Space)

NOTE: Total travel and free flight directly affect each other and must be adjusted alternately until both are correct. Position the carrier with the mounting stud opposite the torque-bar stop.

With the cycle shaft latched at rest, the impression-control lever set at 4, and the copy-control lever all the way forward, loosen the binding screw and move the detent plate forward or backward until a clearance of 0.250" exists between the platen and the center of the "home" character. Measure this clearance with the foot of the Hooverometer, which is approximately 0.250". When measuring, remove the tilt-ring play by pressing lightly on the rear of the tilt ring.

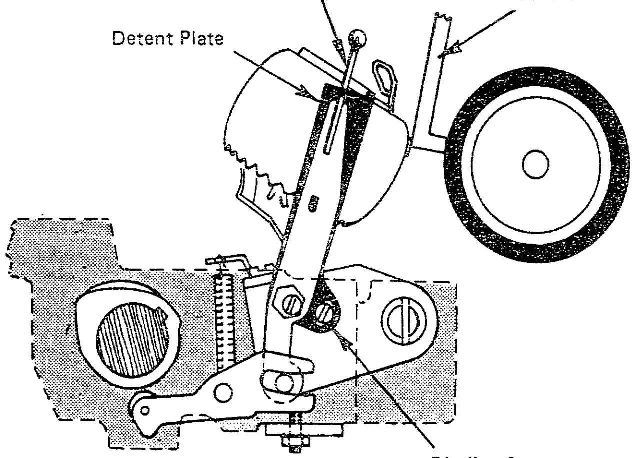


Figure 3-177. Total Travel (with Dual Velocity)

Free Flight (With Dual Velocity or No-Print Space)

Set the impression-control lever at 4 and the copy-control lever all the way forward, and hand-cycle the machine until the print-cam-follower roller is resting on the high point of the cam. At this point, 0.035" of free flight should exist between the platen and the center of the "home" character. Adjust the eccentric on the impression-control lever to obtain this condition. Keep the high part of the eccentric forward.

NOTE: This adjustment can be measured with the pusher end of the large spring hook, while holding the typehead lightly toward the front of the machine.

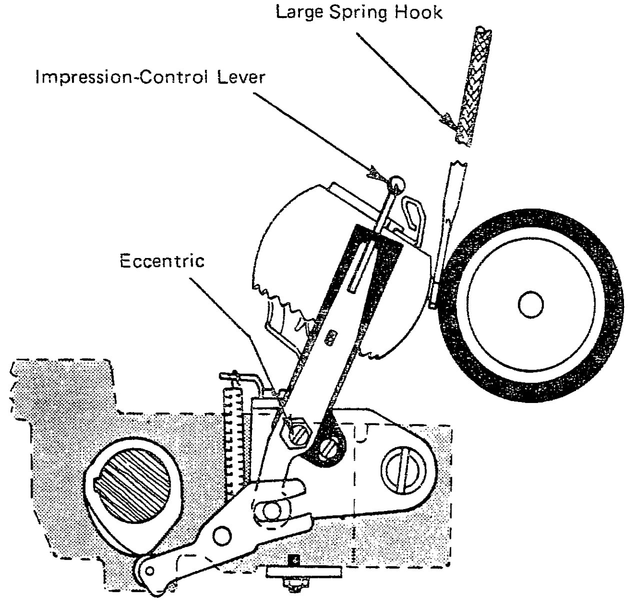


Figure 3-178. Free Flight (with Dual Velocity)

Dual-Velocity (or No-Print) Magnet Assembly (Removed)

Pivot Plate

Adjust the pivot plate for 0.001" to 0.003" between the armature and the yoke with the armature attracted.

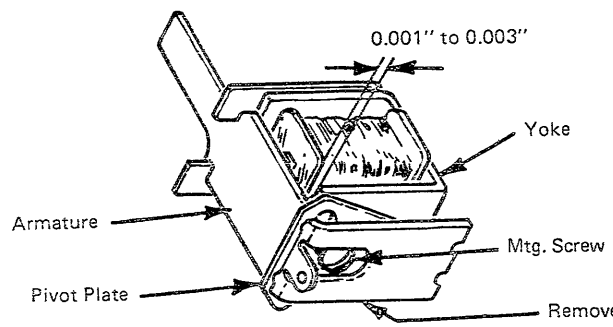


Figure 3-179. Pivot Plate

Residual

The residual should be flush against the yoke.

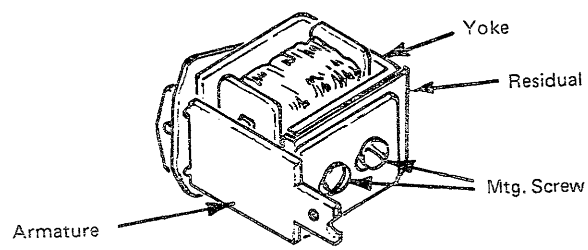


Figure 3-180. Residual

Dual-Velocity (or No-Print) Magnet Assembly (Installed)

With the armature held in a deenergized position, adjust the magnet front-to-rear to obtain 0.010" to 0.015" clearance between the armature and the low-velocity latch.

Position the backstop for 0.030" to 0.035" between the armature and yoke with the magnet deenergized.

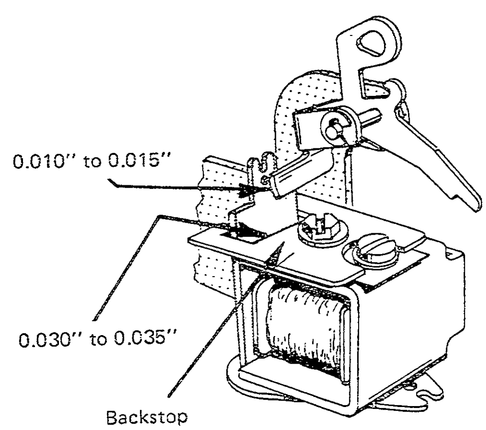


Figure 3-181. Dual-Velocity (or No-Print) Magnet Assembly (Installed)

PRINT ESCAPE MECHANISM

Escapement Rack Identification

The Level 1 escapement rack is pinned to the frame and is not adjustable.

The Level 2 escapement rack is not pinned to the frame, but do not attempt to adjust the escapement rack unless it is absolutely necessary. The Level 2 escapement rack has an identification notch milled in the left end of the rack, beyond the last tooth.

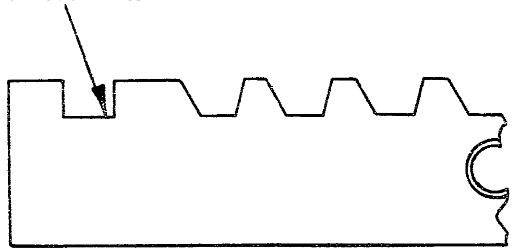


Figure 3-182. Escapement Rack Identification

Escapement Rack Adjustment

Adjust the Level 2 escapement rack so that it is parallel to the print shaft. The correct distance can be found by setting the Hooverometer at the No. 2 scribe line and placing it between the print shaft and the escapement rack. Ensure that the *mid-point* of the base of the Hooverometer handle is resting lightly against the front edge of the escapement rack.

Check this adjustment at both ends and in the middle of the escapement rack.

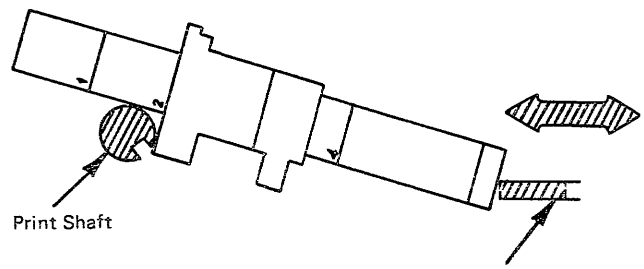


Figure 3-183. Escapement Rack Adjustment

CAUTION
The following relationships are affected by the position of the escapement bracket: tab-lever trigger to tab-torque bar, tab-lever pawl to tab rack, tab lever to escapement and backspace pawls, tab-lever trigger to tab-overthrow stop, escapement and backspace pawls to escapement torque bar, escapement torque bar to pawl pivot stud, and escapement torque bar to tab latch. Each of these relationships must be checked and readjusted, if necessary, after any adjustment of the escapement bracket.

Escapement Bracket (Level 1)

There are three levels of escapement brackets.

The Level 1 escapement bracket (not shown) was installed on very early machines. It is similar to the Level 2, except that it does not have the raised portion and should be adjusted for 0.011" to 0.017" between the escapement bracket and the tab torque bar.

Escapement Bracket (Level 2)

The Level 2 escapement bracket can be identified by the raised portion.

With the carrier to the left, adjust the escapement bracket front-to-rear so 0.0005" to 0.002" exists between the raised area of the escapement bracket and the tab torque bar. The rear surface of the escapement bracket should be kept parallel with the tab torque bar. To aid in 767 printer adjustment, remove or loosen the tab-torque-bar support bracket.

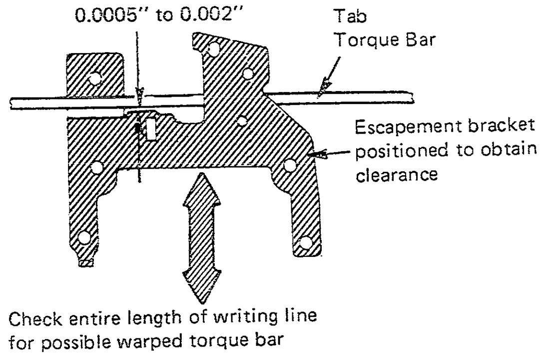


Figure 3-184. Escapement Bracket (Level 2)

Escapement Bracket (Level 3)

The Level 3 escapement bracket can be identified by the absence of the raised portion and by the slightly different shape of the bracket.

Adjust the Level 3 escapement bracket for a clearance of from 0.0005" to 0.002" between the escapement bracket and the tab torque bar. Maintain the bracket parallel to the tab torque bar.

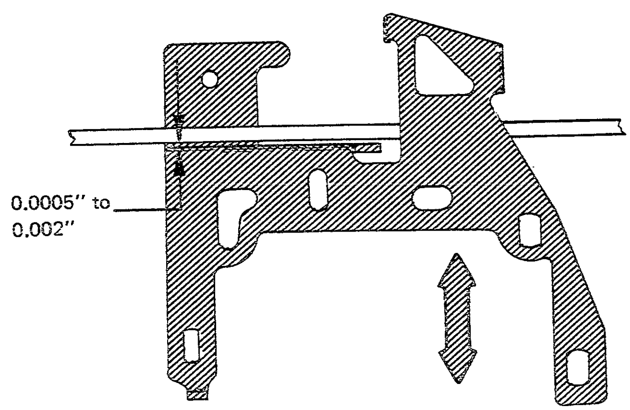


Figure 3-185. Escapement Bracket (Level 3)

Escapement Bracket (Printers without Tab)

Align the left rear surface of the escapement bracket with the back of the escapement torque bar. Check the entire length of the writing line for possible warped torque bar.

NOTE: Be sure to check the pawl mounting stud adjustment (Figure 3-191) after adjusting the escapement bracket.

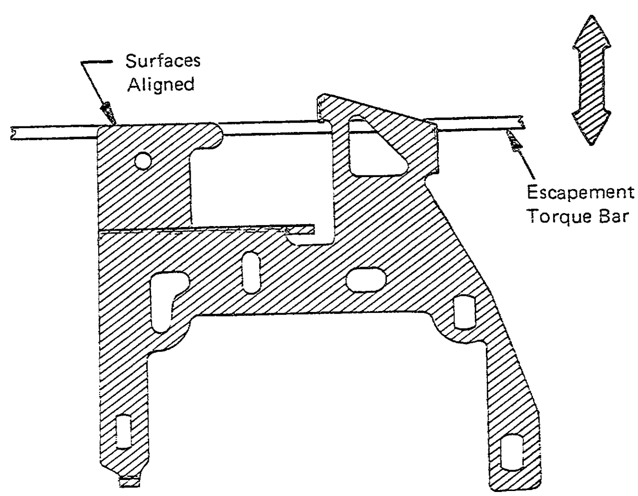


Figure 3-186. Escapement Bracket (Printers without Tab)

Tab-Rack Plate

CAUTION
This part is case-hardened on early machines. Use extreme care when forming.

NOTE: The escapement bracket and tab adjustment must be checked if the tab rack plate is formed.

With the carrier to the right, form the extention on the tab-rack plate so from 0.0005" to 0.002" exists between the escapement bracket and the tab torque bar. This extension supports the tab torque bar on the right side.

Shift the tab-torque-bar retainers for 0.001" to 0.010" end play of the torque bar and no interference between the left end of the torque bar and the paper-feed mechanism.

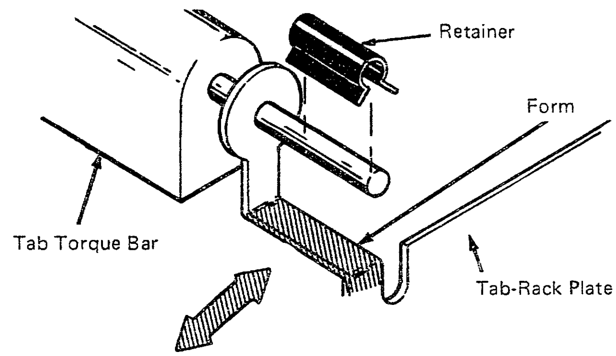


Figure 3-187. Tab-Rack Plate

Escapement Torque Bar (All Machines)

With the escapement trigger centered on the torque-bar lug, position the torque-bar retainers for 0.003" to 0.010" end play.

Escapement-Torque-Bar Stop (Level 1)

Form the torque-bar stop located at the left end of the torque bar so that there is a clearance of from 0.002" to 0.006" between the torque bar and the lug on the escapement pawl.

The escapement cam used with the Level 2 and Level 3 escapement mechanisms provides greater available travel for all escapement parts; therefore, more clearance is permissible and desirable between the torque bar and the escapement-pawl lug.

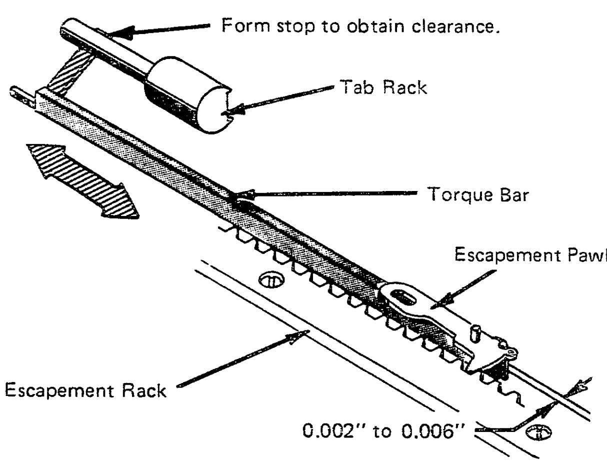


Figure 3-188. Escapement-Torque-Bar Stop (Level 1)

Escapement-Torque-Bar Stop (Level 2)

NOTE: The escapement trigger must not prevent the escapement torque bar from resting against the stop when making the torque-bar-stop adjustment. Also, check the pawl mounting stud and the torque-bar backstop. Neither one of these should be touching the torque bar when the stop adjustment is being made on long-carriage machines.

The torque-bar stop, located at the right end of the torque bar, should be adjusted for a rest-position clearance of from 0.008" to 0.012" between the torque bar and the lug on the escapement pawl.

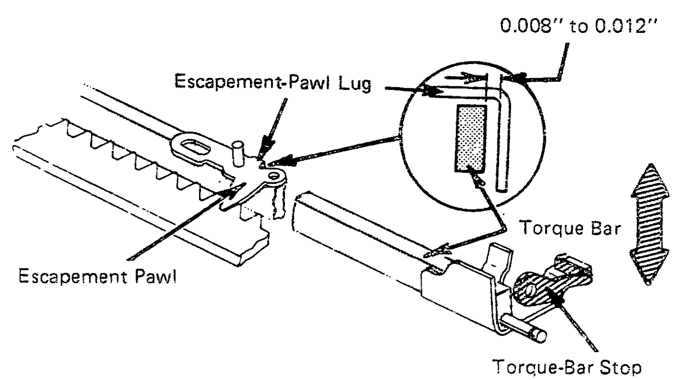


Figure 3-189. Escapement-Torque-Bar Stop (Level 2)

Escapement-Torque-Bar Stop (Level 3)

Loosen the escapement-torque-bar stop screw. Adjust the stop for a rest position clearance of from 0.008" to 0.012" between the torque bar and the lug on the escapement pawl. See Figure 3-189 for clearance.

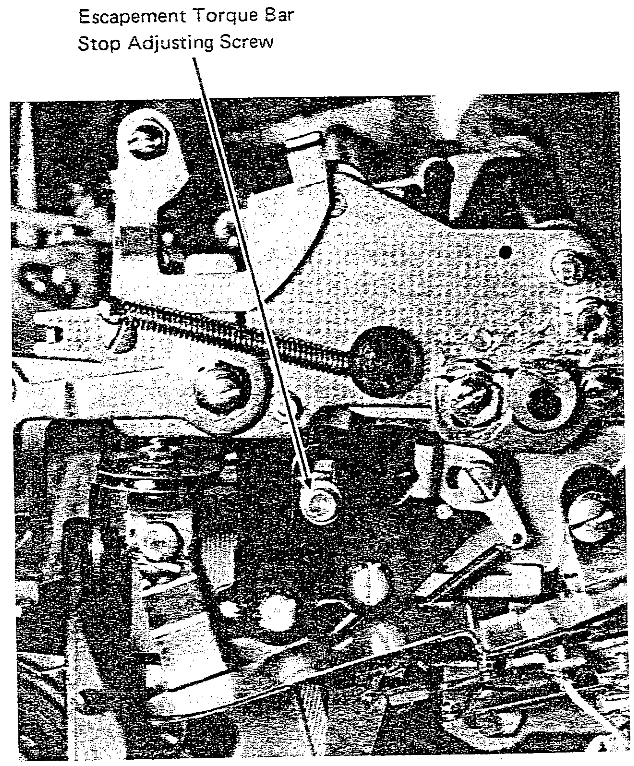


Figure 3-190. Escapement-Torque-Bar Stop (Level 3)

Pawl Mounting Stud

Rotate the pawl mounting stud so that it clears the escapement torque bar by 0.001" at the closest point along the writing line. Keep the high part of the eccentric toward the left so that the force of the torque bar will tend to tighten the stud rather than loosen it.

NOTE: Insufficient clearance will bind the escapement torque bar. Excessive clearance will cause intermittent escapement problems.

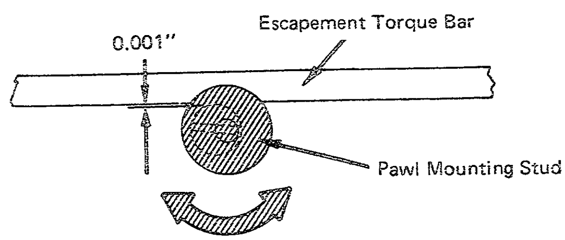


Figure 3-191. Pawl Mounting Stud

Torque-Bar Backstop

Adjust the backstop forward or backward on its mounting stud so there is a 0.001" to 0.005" clearance with the torque bar when the pawl mounting stud on the carrier is opposite the backstop. On current machines (15-inch only) the backstop is mounted under the carrier-return-cord idler-pulley stud. The backstop is not required on 11-inch machines, so only a spacer is used under the stud.

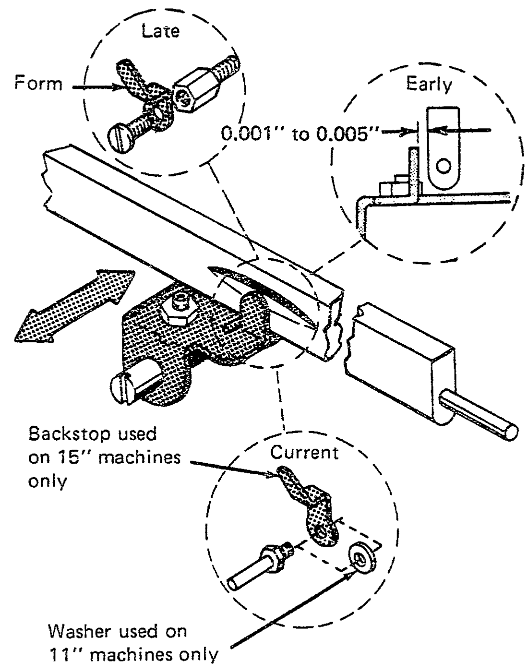


Figure 3-192. Torque-Bar Backstop

Torque-Bar Backstop (767 Printers)

For 767 printers, adjust the escapement-torque-bar backstops front-to-rear for 0.001 inch torque-bar motion between the pawl mounting stud and backstops when the carrier is positioned at each backstop. Position the stops vertically to contact the torque bar no higher than the center of the lower radius of the torque bar.

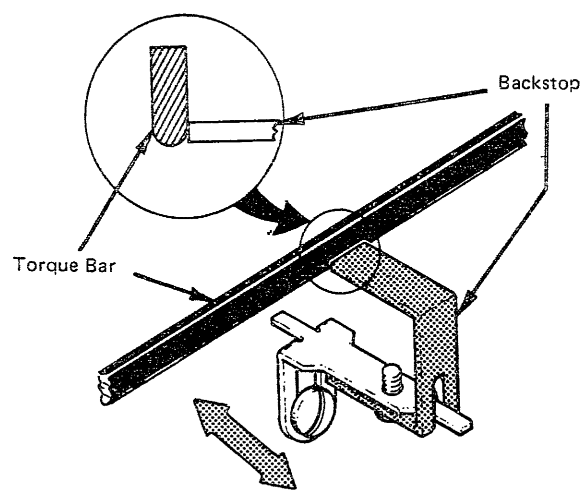


Figure 3-193. Torque-Bar Backstop (767 Printers)

Pivot-Pin Eccentric (Level 1 Only)

The eccentric collar should be adjusted with the high point up so it touches the operational latch bracket. This prevents the pivot pin from bowing during a print-escapement operation. On long-carriage machines, the eccentric should also be adjusted laterally on the pivot pin so the end play of the pivot pin will be 0.002" to 0.005" inch.

NOTE: The eccentric may require a readjustment if the rest position of the pivot pin is changed during carrier-return adjustments.

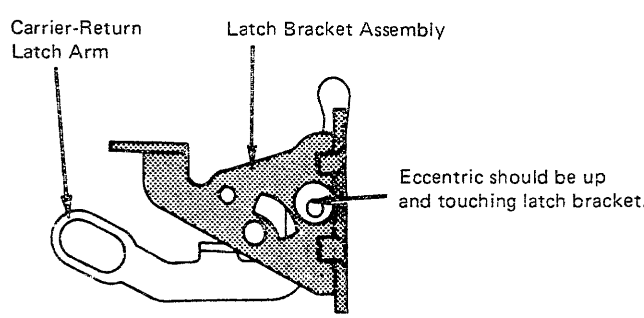


Figure 3-194. Pivot-Pin Eccentric (Level 1 Only)

Escapement Cam

Adjust the cam by rotating it on the filter shaft so that the cam follower roller just reaches the low point of the cam at the rest position (Figure 3-195).

On Level 1 machines, the cam is accessible from the top by inserting the fluted wrench between the carrier-return and backspace keylevers (not present on all printers), just in front of the margin rack. The cam is accessible between the print shaft and the cord on Level 2 machines.

Check the adjustment by holding the cycle-clutch check pawl out of the way so that the cycle shaft can be rotated backward. Rotate the filter-shaft gear backward slightly and observe that the escapement trip link moves forward immediately. This will ensure that the escapement cam is not resting past the low point.

To ensure that the cam follower has fully reached the low point, hand-cycle a print operation. The escapement trip link should not move during the first part of the cycle.

The cam adjustment affects the timing of the print escapement. Advanced timing could cause the trip to occur before the print action, resulting in crowding or blurring of the printed characters. Retarded timing will cause the cam follower to rest part way up the incline of the cam. This could restrict the escapement trigger from resetting over the torque-bar lug as the filter shaft returns to its rest position.

Escapement Trip Link

Adjust the trip link so that there is a clearance of 0.007" to 0.010" between the torque-bar lug and the hook of the escapement trigger in the rest position (Figure 3-195).

CAUTION

In adjusting the escapement trip link, the trigger-lever upstop (Figure 3-197) and the adjustment screw in the spacebar latch lever (Figure 3-228) must not restrict the upward travel of the trigger lever.

The adjustment ensures that the torque bar will always be rotated far enough to trip the pawls from their racks.

If clearance is excessive, the escapement may eventually fail as wear occurs in the system and reduces the amount of travel given to the trigger.

Insufficient clearance may prevent the trigger from resetting over the torque-bar lug at the end of each cycle. It may also cause the escapement to trip too early in the cycle. It should not trip before the print action.

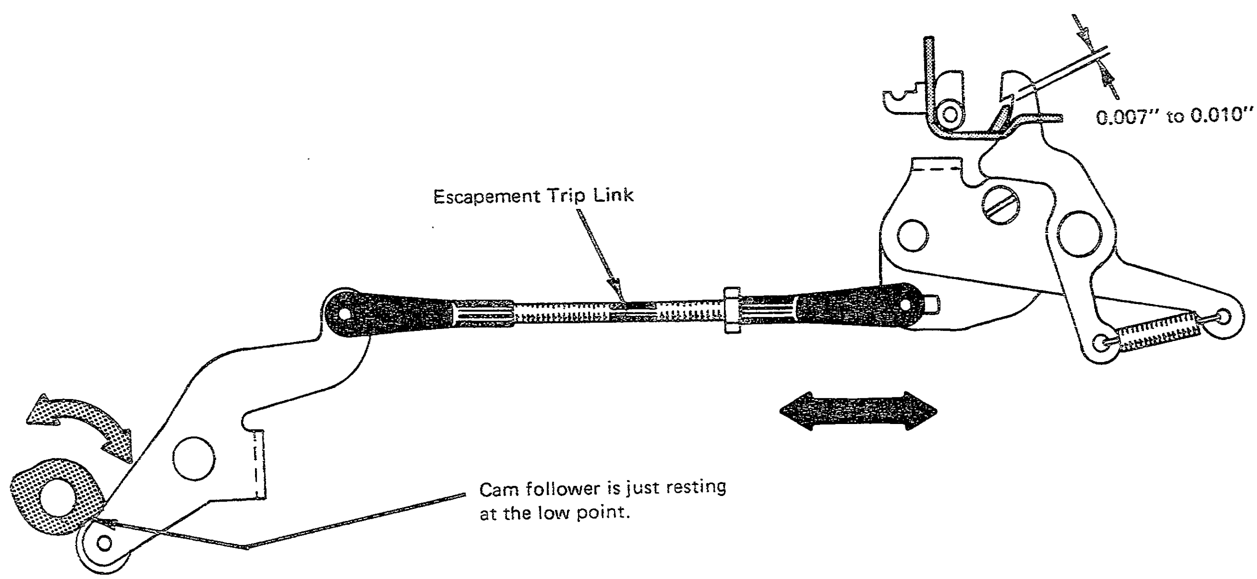


Figure 3-195. Escapement Cam and Trip Link

Escapement-Trigger Guide

Adjust the trigger guide (Level 1 machines) or the trigger knock-off eccentric stud (Level 2) so that the escapement trigger will become disengaged from the torque-bar lug when the escapement pawl clears the rack by from 0.010" to 0.020".

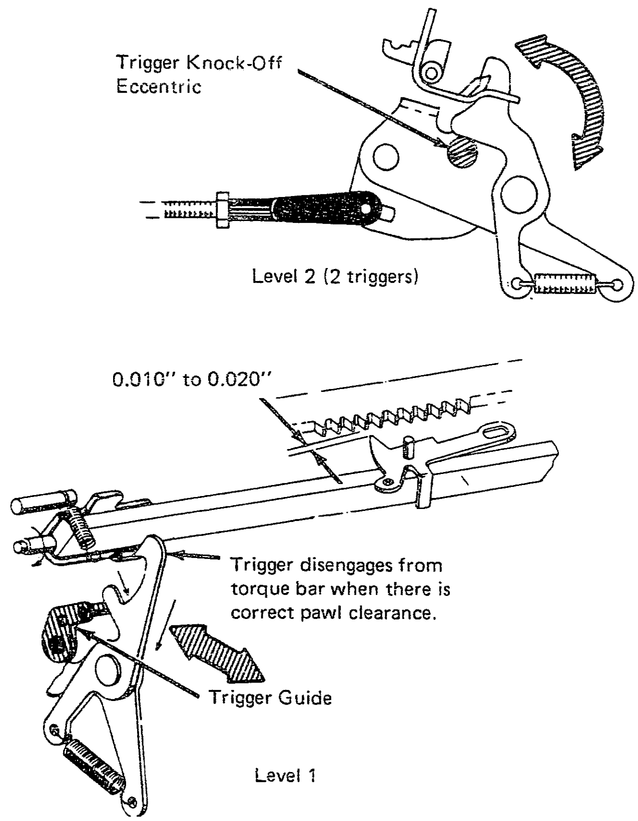


Figure 3-196. Escapement-Trigger Guide

Trigger-Lever Upstop

With the machine at rest and a clearance of from 0.007" to 0.010" between the trigger and the lug on the torque bar, adjust the trigger-lever upstop so that it touches the trigger lever.

The trigger upstop prevents the trigger lever from bouncing as it returns to its rest position.

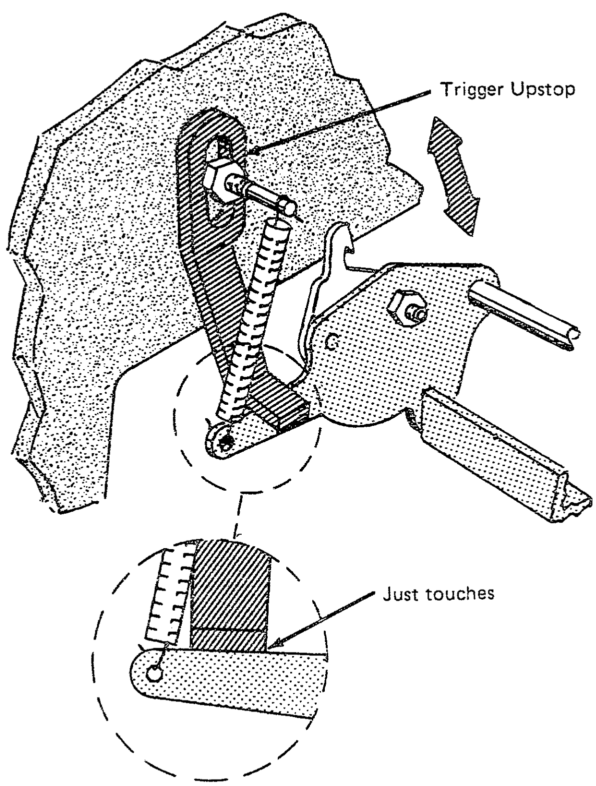


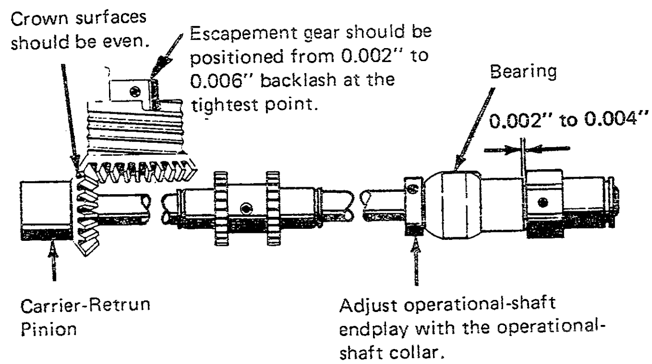
Figure 3-197. Trigger-Lever Upstop

CAUTION
The mainspring tension should be relaxed before the escapement-cord-drum gear is loosened. The cord tension should also be relaxed by removing the cord from the pulley on the cord-tension arm. Be sure there is no end play in the escapement shaft before attempting the gear-mesh adjustment.

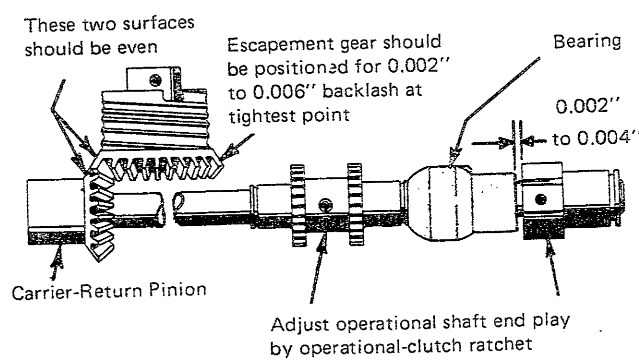
Gear Mesh and Operational Shaft

Adjust the operational shaft laterally with the shift arbor so the crown surfaces of the escapement-cord-drum gear and the carrier-return pinion are even. Maintain 0.002" to 0.004" end play in the operational shaft by adjusting the operational-shaft collar on long-carriage printers or the operational-clutch ratchet on 11-inch printers.

The escapement cord drum gear should be adjusted forward or back to obtain 0.002" to 0.006" backlash at the point of tightest mesh with the carrier return pinion. Be sure there are no binds throughout the travel of the carrier.



LONG-CARRIAGE PRINTER



11-INCH PRINTER

Figure 3-198. Gear Mesh and Operational Shaft

Torque-Limiter Arbor

> CAUTION
> Parts breakage can result if the arbor either binds the pinion or allows a loop of the carrier-return spring to drop between the arbor and the pinion.

Adjust the arbor, laterally, for 0.002" to 0.006" clearance between the left end of the carrier return pinion gear and the right end of the arbor.

Tab-Governor Pinion

With both the tab-governor arbor and the tab pinion-gear collar loose, position the tab pinion-gear collar for from 0.002" to 0.006" pinion-gear backlash, at the point of closest mesh with the escapement-cord-drum gear. Tighten the tab pinion-gear collar.

Insert a 0.005" feeler gage between the pinion gear and the collar; slide the tab-governor arbor to the right and tighten the arbor.

A tab-governor spring clip was added to the left end of the tab-governor spring on printers with the lubrication change. This spring clip can be added to earlier printers if it is necessary. This spring clip will prevent fretting between the tab-governor spring and the metal collar, and also provide quicker action of the tab-governor spring.

This clip should be installed on the left end of the tab-governor spring, with the left end of the spring pointed down and a slight clearance between the right end of the spring and the tab-pinion gear.

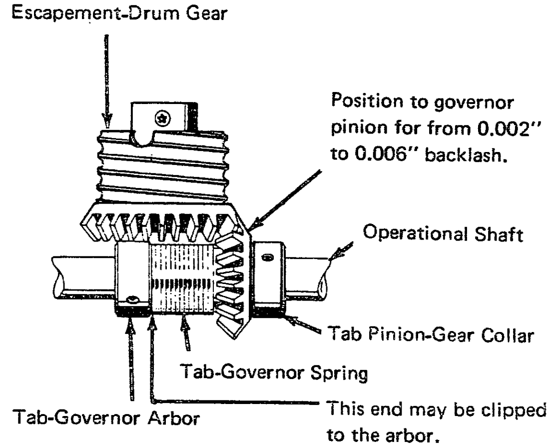


Figure 3-199. Tab-Governor Pinion

Carrier-Return Cord

Refer to Chapter 4, "Removals", for a fast method of installing the carrier-return cord.

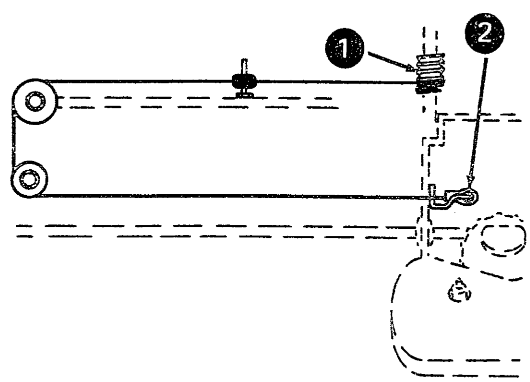


Figure 3-200. Carrier-Return Cord

Escapement Cord

Refer to Chapter 4, "Removals", for a fast method of installing the escapement cord.

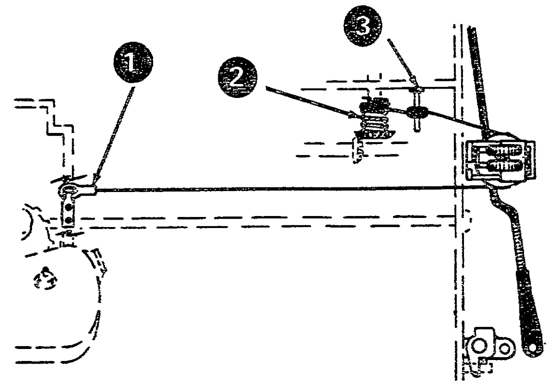


Figure 3-201. Escapement Cord

Cord Tension

CAUTION
Make no attempt to adjust the cord tension with the escapement-cord drum, because the drum is setscrewed to a flat spot on the escapement shaft.

NOTE: A time-saving method of adjusting the transport cord pulley closer to the side frame is to tie a knot in the cord as close to the hook (see point 1, Figure 3-201) as possible.

1. With both cords properly threaded (Figures 3-200 and 3-201), adjust the carrier-return cord drum (see point 1, Figure 3-200) so that the pulley pivot-screw nut clears the pulley bracket by from 0.005" to 0.125" (Figure 3-202). Use the procedure given in the preceding note, if possible.

   This position of the pulley ensures that it will not contact the cover as it compensates for the cord stretch. Adjusting the pulley nearer the power frame puts an unnecessary load on the cords.

   CAUTION
   Maintain end play of 0.002" by holding the escapement shaft forward while the cord drum is moved to the rear, against the rear bearing.

2. The eccentric mounting stud (see point 3, Figure 3-201) for the front idler pulley should be set so that the pin is horizontal and above center on the eccentric. The pin will then be angled slightly toward the left.

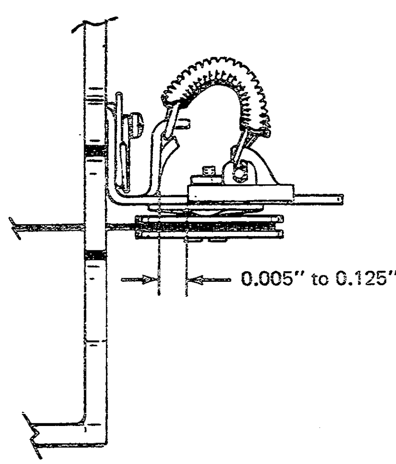


Figure 3-202. Cord Tension

Mainspring Tension

CAUTION
Handle the mainspring carefully, to prevent it from slipping when the tension is being increased or decreased. The outside loop of the mainspring must not be in a position to contact C-5.

NOTE: There are three levels of mainsprings that may be identified in the following manner: Level 1 has no identification marks. Level 2 is a 100-inch mainspring with "100" stamped on the cage; the cage and retainer are both black. Level 3 is a 100-inch mainspring with "100" stamped on the cage; the cage is black and the retainer is light-colored.

For an approximate setting of the mainspring, move the carrier to the extreme right limit of its travel. For a Level 1 or Level 3 mainspring, wind the spring up 4-2/3 to 5-1/3 turns. For a Level 2 mainspring, wind the spring up 6-2/3 to 7-2/3 turns.

The final adjustment for all levels is to adjust the mainspring cage until from 1/2 to 3/4 pound of tension is measured as the carrier escapes through the extreme right-hand margin, in a powered tab operation. Measure this tension with the pusher end of the spring scale against the right side of the carrier.

The capacitor and the cage stop screw (if present) must be removed to make this adjustment.

CAUTION
After adjusting the mainspring tension, be sure that the carrier will return to the extreme left-hand margin without binding.

On 767 printers, the mainspring must exert at least 6 oz (with Mylar* tape in the horizontal program unit) or 8 oz (without Mylar* tape) on the carrier as it escapes through the line lock of the extreme right-hand margin.

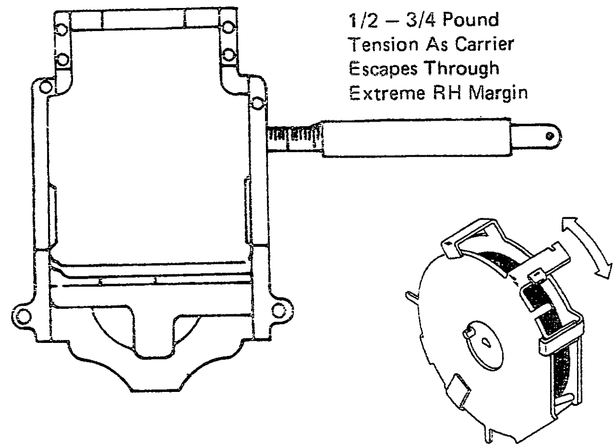


Figure 3-203. Mainspring Tension

*Mylar is a registered trademark of E. I. duPont de Nemours & Co.

OPERATIONAL CONTROL MECHANISM

Keylever-Pawl Overlap

Adjust each keylever-pawl guide stud so that all keylever pawls, except the index keylever pawl and the carrier-return keylever pawl, overlap their respective interposers by from 0.034" to 0.046" with both parts at rest. Adjust the index keylever-pawl guide for from 0.040" to 0.052" overlap, and the carrier-return keylever-pawl guide for from 0.020" to 0.035" overlap. Repeat carrier return should be adjusted for 0.034" to 0.046" overlap. The overlap ensures proper repeat/non repeat action.

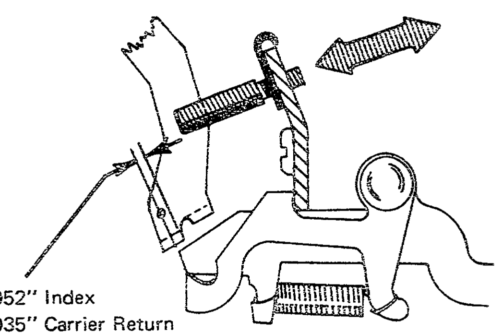


Figure 3-204. Keylever Pawl Overlap

Keylever Pawl to Interposer Clearance

Adjust the height of the interposers by positioning the keylever-pawl guide bracket up or down to obtain a clearance of 0.020" to 0.025" between the index keylever pawl and the index interposer at rest. The keylever-pawl guide bracket should be kept horizontal.

The adjusting slot in the carrier return, backspace, and tab keylevers should be formed to obtain 0.020" to 0.030" clearance between the keylever pawl and the interposer at rest.

Adjust the spacebar-lever eccentric with the high part forward (Level 1 machines), or form the adjusting slot in the right-hand space-bar keylever (Level 2 machines), to obtain a keylever to interposer clearance of 0.010" to 0.015". This does not apply to machines having a no-print space bar

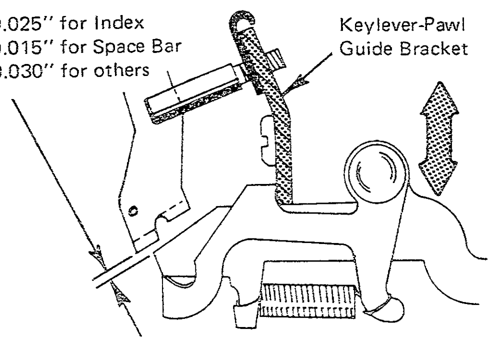


Figure 3-205. Keylever Pawl to Interposer Clearance

Operational Latch Height (Tab)

Adjust the tab-latch stop eccentric for a clearance of from 0.005" to 0.015" when the tab operational latch passes under the cam-follower lever.

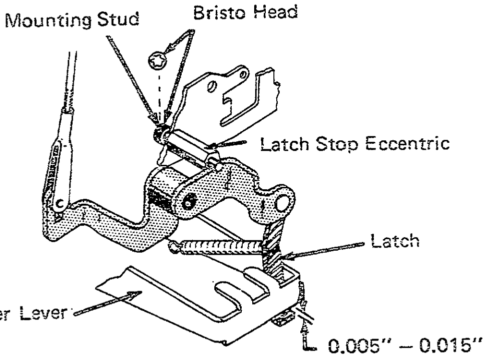


Figure 3-206. Operational Latch Height (Tab)

Operational Latch Height (Bksp, Sp)

The latch screw should be adjusted so that the backspace operational latch will pass under the cam-follower lever with a clearance of from 0.003" to 0.010". The spacebar latch adjusting screw is adjusted so that the spacebar latch passes under the cam-follower lever with a clearance of from 0.005" to 0.015".

NOTE 1: The high side of the specifications is preferred. With the motor running, check the clearances by pulling the latches to the rear with a spring hook.

NOTE 2: For the carrier-return latch height, see adjustment 3 in "Clutch Latch Overthrow" under "Carrier-Return Mechanism (Level 1)", following.

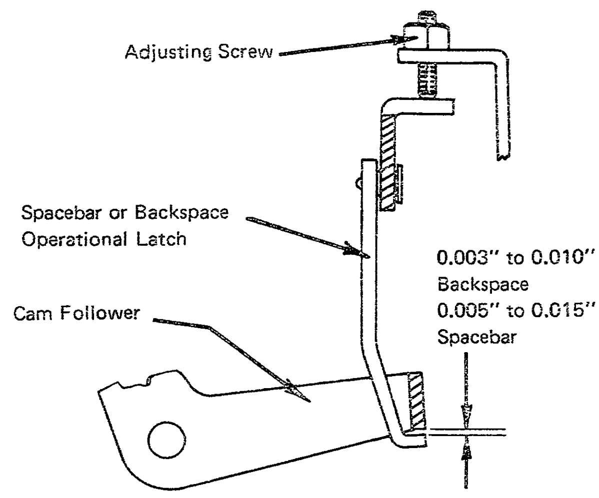


Figure 3-207. Operational Latch Height (Bksp, Sp)

Interposer Adjusting Screws

Adjust the interposer adjusting screws so that a front to rear clearance of from 0.015" to 0.020" exists between the tab and backspace latches and their respective cam followers. The spacebar and carrier-return latches should have a clearance of from 0.025" to 0.035"

NOTE: If the cam followers are operated too far when this adjustment is being checked, the interposer restoring bail will force the interposers forward slightly, and an erroneous adjustment will result.

The keylever pawl to interposer clearance should be re-checked after this adjustment. The interposers must operate freely and without binds.

NOTE: The operational interposer springs should be placed in the center hole at the rear of the interposer.

This adjustment directly affects the timing between the cam release and the positioning of the operational latches under the cam follower. Excessive clearance can allow the cam follower to move down at the rear before the latch has moved fully under the follower.

The adjustment may be checked after operating the cams enough to move the cam followers down slightly at the rear. With the machine on its back, the latches can be pushed against the cam followers to estimate the clearance.

Machines that have the carrier-return latchspring loaded to the rear (under the cam follower) should be adjusted as follows:

1. Hold the carrier-return latch to the front against its interposer (the interposer should be latched at rest).
2. Adjust the interposer adjusting screw for from 0.035" to 0.045" between the latch and cam follower.
3. Release the interposer and proceed with the next adjustment.

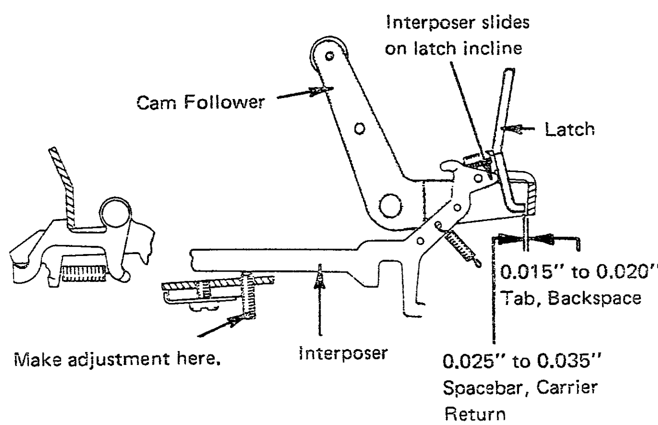


Figure 3-208. Interposer Adjusting Screws

Cam Check Ring

Adjust the cam check-ring eccentric so that there is a clearance of from 0.015" to 0.025" between the tip of the cam pawl and the teeth of the cam ratchet, with the cam latched in the rest position. Keep the high part of the eccentric radially outward. The check-ring mounting screws must be loosened before the adjustment can be made.

This adjustment ensures that the pawl will clear the ratchet and that the check ring will latch positively at the completion of each cam operation.

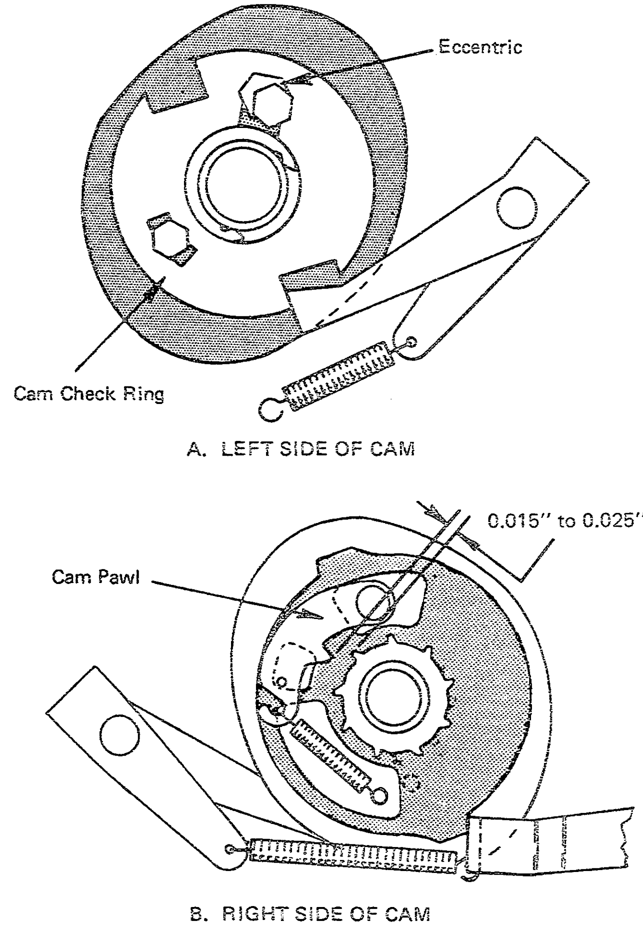


Figure 3-209. Cam Check Ring

Clutch-Release-Arm Stop Pad

Form the stop pads so that, with the clutch-release arm at rest (against its stop pad), the clutch-release arm has a 5/8 to 3/4 bite on the latching surface of the clutch wheel. This should be observed from the rear of the machine.

The interposers must be latched forward and not in contact with the clutch-release arm when this adjustment is made.

NOTE: On long-carriage machines, position the operational clutch ratchet laterally on the operational shaft so that each clutch-release arm will take an equal lateral bite on its clutch wheel. This ensures that neither clutch-release arm can slip sideways off its respective clutch wheel, causing an unwanted cam operation. This condition is critical on the carrier return/index cam, as it will cause an index operation each time the cam is released.

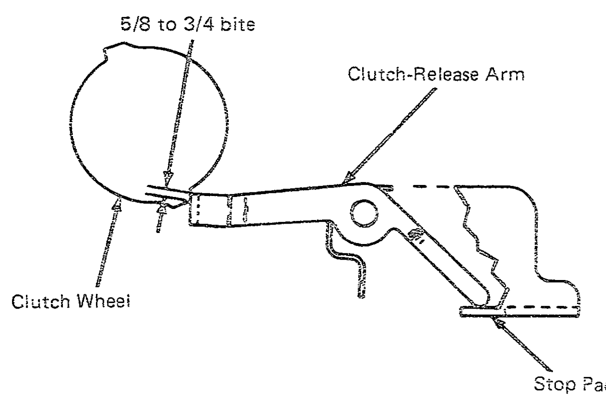


Figure 3-210. Clutch-Release-Arm Stop Pad

Clutch-Release Arm

Form the lug at the bottom of each clutch-release arm so that it clears the interposer lug (interposers and cams must be latched) by from 0.025" to 0.035" on Carrier Return and Index, and from 0.035" to 0.045" on Tab, Backspace, and Spacebar. On 767 printer backspace, adjust clearance for 0.040" to 0.050".

Insufficient clearance will cause the cams to be released too early in the rearward travel of the interposers; consequently, the operational latch involved will not have sufficient bite on the cam-follower lever as it is operated down at the rear. The operational latch may slip from beneath the cam follower and cause an incomplete operation. Excessive clearance could allow the interposer to reach the limit of its travel before the cam is released.

NOTE: The clearance may be judged using the push end of the large spring hook. The end is approximately 0.035" thick.

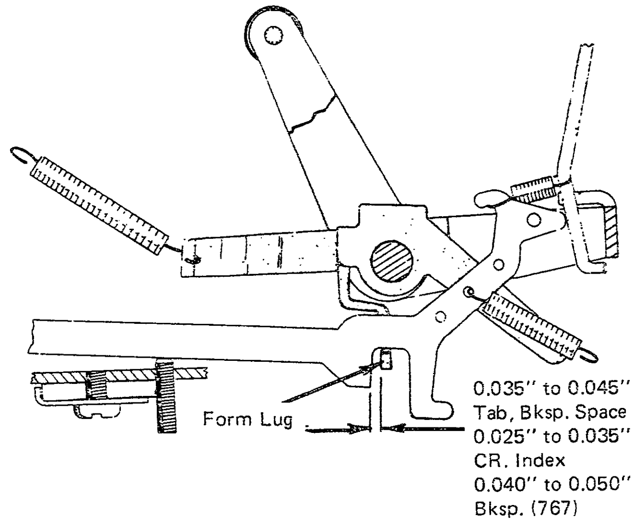


Figure 3-211. Clutch-Release Arm

Interposer Restoring Bail

Level 1: Form the lug at each side of the restoring bail so that the interposers will be restored forward from 0.010" to 0.030" past the latching point when either cam is operated. Check the interposers at each side, and form the lug on the side being checked. Form the lugs forward or backward to obtain the adjustment. Forming the lugs forward increases the throw of the interposers. Too much forming will cause them to break.

This adjustment ensures positive relatching of the interposers without excessive overthrow, and thus prevents an interposer from taking an extra cycle.

Level 2: The restoring bail is adjusted by two small eccentrics located on the right and left sides of the interposer restoring bail.

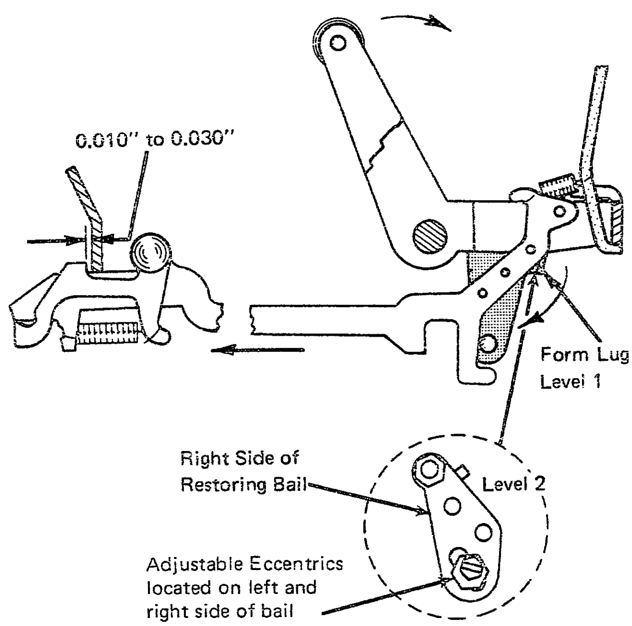


Figure 3-212. Interposer Restoring Bail

OPERATIONAL MAGNET ASSEMBLY (LEVEL 1)

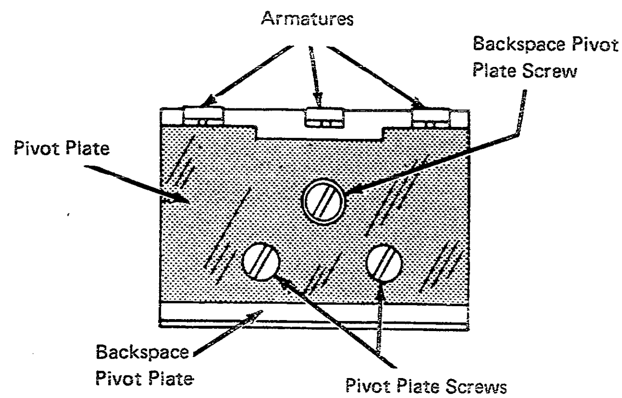


Figure 3-213. Operational Magnet Assembly (Level 1)

Tab, Backspace, and Index Magnets

1. Backspace Pivot Plate: Position this plate vertically so that the armature (manually attracted) clears its yoke by from 0.001" to 0.003" (all three screws must be loose). Position horizontally, so that all armatures center on their yokes.
2. Pivot Plate: Tighten the backspace pivot-plate screw, and position this plate so that the left and right armatures clear their yokes by from 0.001" to 0.003".

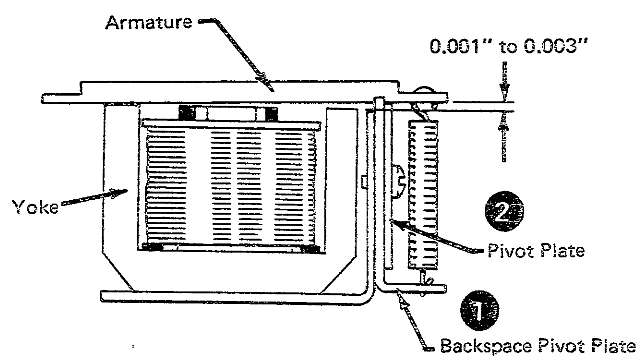


Figure 3-214. Tab, Backspace, and Index Magnets

Carrier-Return and Space Magnets

1. Adjust the plate vertically so that the left and right armatures clear their yokes by from 0.001" to 0.003".
2. Adjust the plate horizontally so that the armatures center in their guide slots.

These first two adjustments provide free operation of the armatures and prevent binding or choke-off.

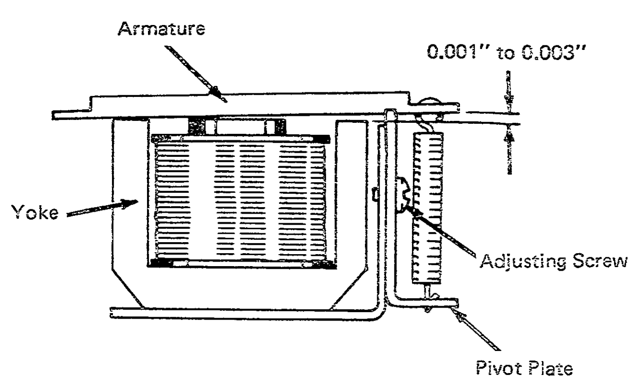


Figure 3-215. Carrier-Return and Space Magnets

Armature Backstop

Position (armatures at rest) so that the armatures clear their yokes by from 0.020" to 0.025". Adjust by setting the backstop for 0.011" clearance to the attracted armature.

This adjustment provides sufficient motion to unlatch the interposers and also ensures that the armatures will be attracted by the magnet coils when they are energized.

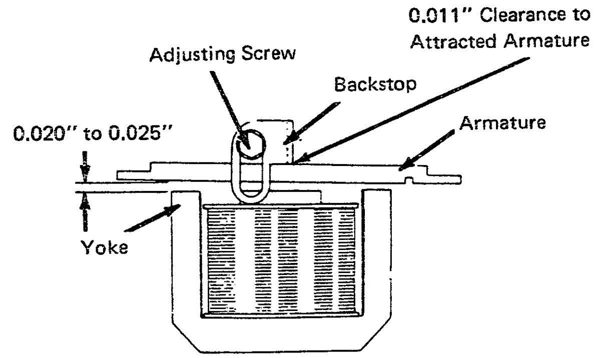


Figure 3-216. Armature Backstop

Magnet Unit Position, Left to Right

Adjust the magnet unit left to right so that the armatures are directly beneath their corresponding interposers (Figure 3-167).

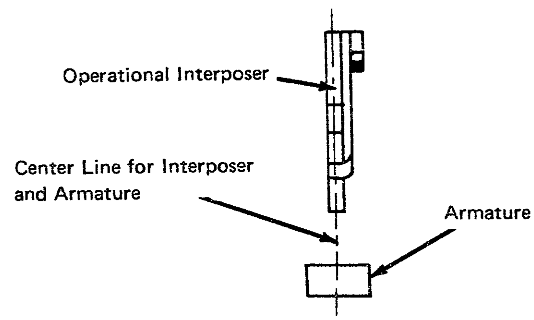


Figure 3-217. Magnet Unit Position, Left to Right

Magnet Unit Position, Front to Rear

Adjust the magnet unit front to rear so that the armature link holes are slightly to the rear of the interposer link holes.

Having the pull link offset ensures unlatching of the interposers, since the link pulls downward and also the the rear.

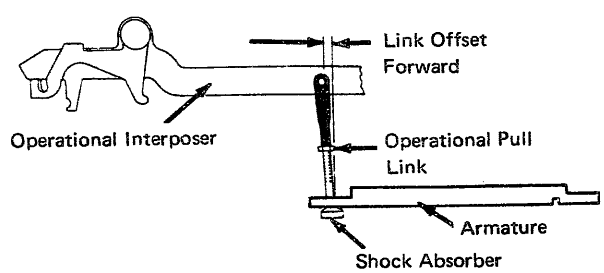


Figure 3-218. Magnet Unit Position, Front to Rear

Pull Link Active

Adjust the operational pull links so that there is a clearance of from 0.002" to 0.010" between the interposer latch bracket and the interposer latch, at the point of relatching.

NOTE: Test this adjustment by manually attracting the armature and turning the operational shaft so that the interposer is being restored toward the front.

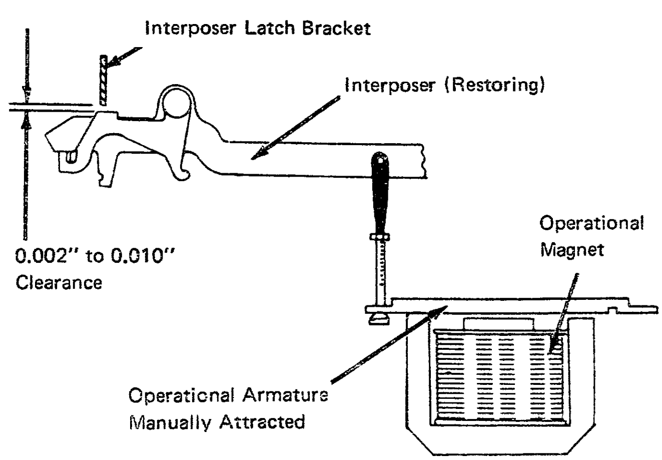


Figure 3-219. Pull Link, Active

Pull Link, At Rest

With all parts at rest, there must be a clearance between the pull link and the armature. The pull link must be approximately one-half turn too long; this will ensure that the armature is moving before picking up the load of the interposer. A trip link adjusted too short can cause an intermittent operation or complete failure to release.

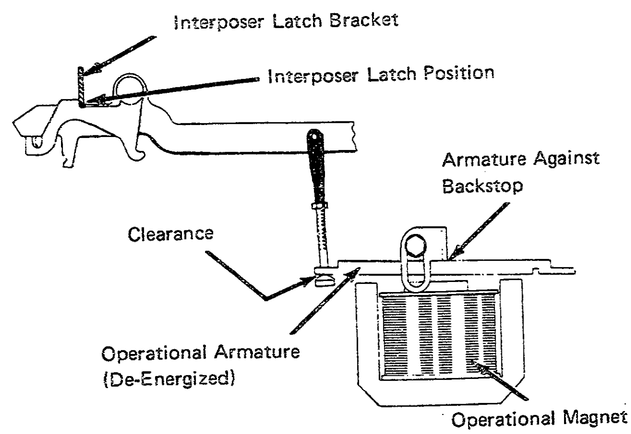


Figure 3-220. Pull Link, At Rest

OPERATIONAL MAGNET ASSEMBLY (LEVEL 2)

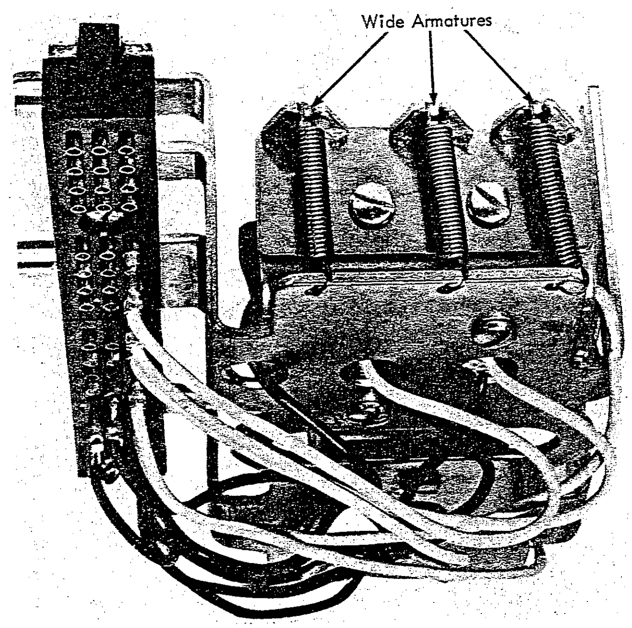


Figure 3-221. Operational Magnet Assembly (Level 2)

Pivot Plate—All Magnets (Level 2)

Position so that the armatures (manually attracted) rest on the nonmagnetic shim. This will provide from 0.001" to 0.003" clearance between the armature and the yoke. Early production units not incorporating this shim should be adjusted for from 0.001" to 0.003" clearance between the armature and the yoke.

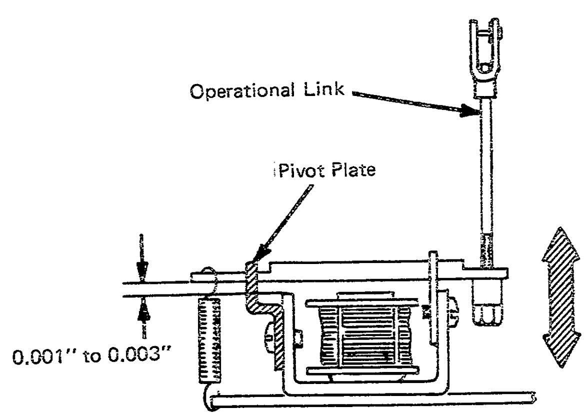


Figure 3-222. Pivot Plate-All Magnets (Level 2)

Armature Backstop (Level 2)

Position vertically, so that the attracted armatures clear their yokes by from 0.001" to 0.003". Demount the front bank of magnets from the mounting bracket, to gain access to the backstop screws. If there are residuals, attract the armature against the residual and raise the backstop against the armature.

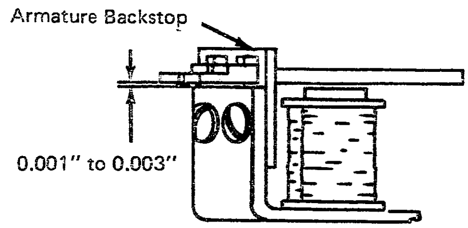


Figure 3-223. Armature Backstop (Level 2)

Magnet Unit Position, Left to Right (Level 2)

Adjust the magnet unit left-to-right so that the armatures are directly beneath their corresponding interposers.

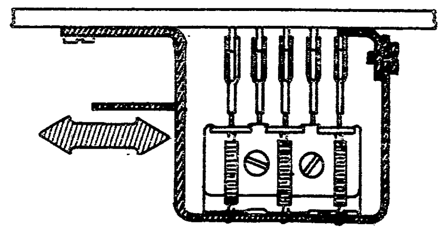


Figure 3-224. Magnet Unit Position, Left to Right (Level 2)

Magnet Unit Position, Front-to-Rear (Level 2)

Adjust the front-to-rear so that the armature link holes are slightly to the rear of the interposer link holes.

Having the pull link offset ensures the unlatching of the interposer, since the link pulls downward and also to the rear.

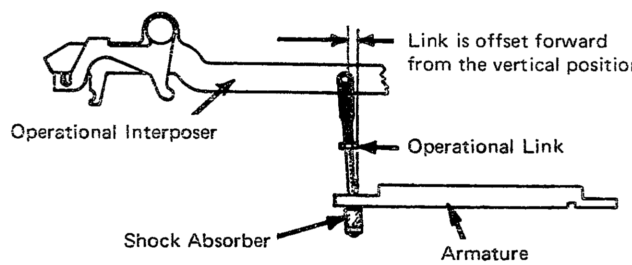


Figure 3-225. Magnet Unit Position, Front to Rear (Level 2)

Pull Link, Active (Level 2)

Adjust the operational pull links for a clearance of from 0.002" to 0.010" between the interposer-latch bracket and the interposer latch, at the point of relatching.

NOTE: Test this adjustment by manually attracting the armature and turning the operational shaft so that the interposer is being restored toward the front.

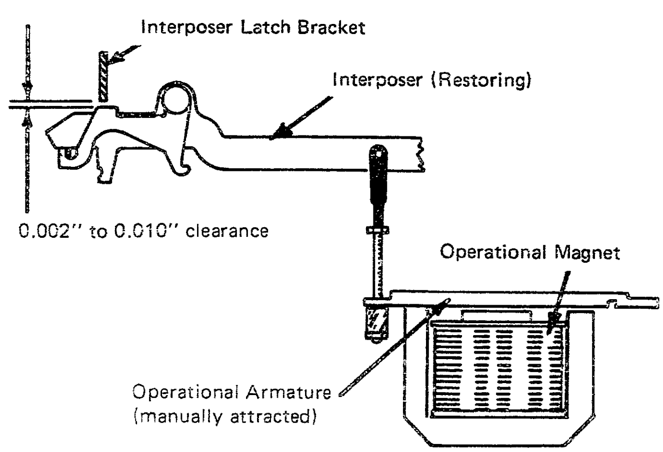


Figure 3-226. Pull Link, Active (Level 2)

Pull Link, At Rest (Level 2)

With all parts at rest, there must be a clearance between the pull link and the armature. The pull link must be approximately one-half turn too long; this will ensure that the armature is moving before picking up the load of the interposer. A pull link adjusted too short can cause intermittent or complete failure to release.

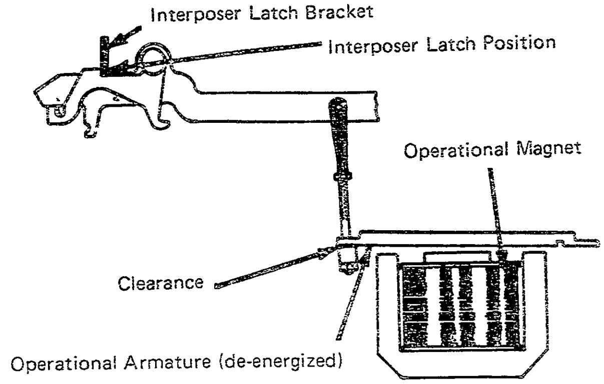


Figure 3-227. Pull Link, At Rest (Level 2)

SPACEBAR MECHANISM

NOTE: All print-escapement and operational-control adjustments must be correct before attempting spacebar adjustments.

Spacebar-Latch-Lever Screw

Adjust the screw in the spacebar-latch lever so the spacebar trigger contacts the escapement torque-bar arm when the backspace-cam follower is at the large scribe mark on the backspace cam.

NOTE: With the machine latched at rest, check for a minimum of 0.001" clearance between the adjusting screw and the spacebar-trigger lever. If this clearance is not present, recheck the escapement trip-link adjustment (Figure 3-195) and check the trigger upstop.

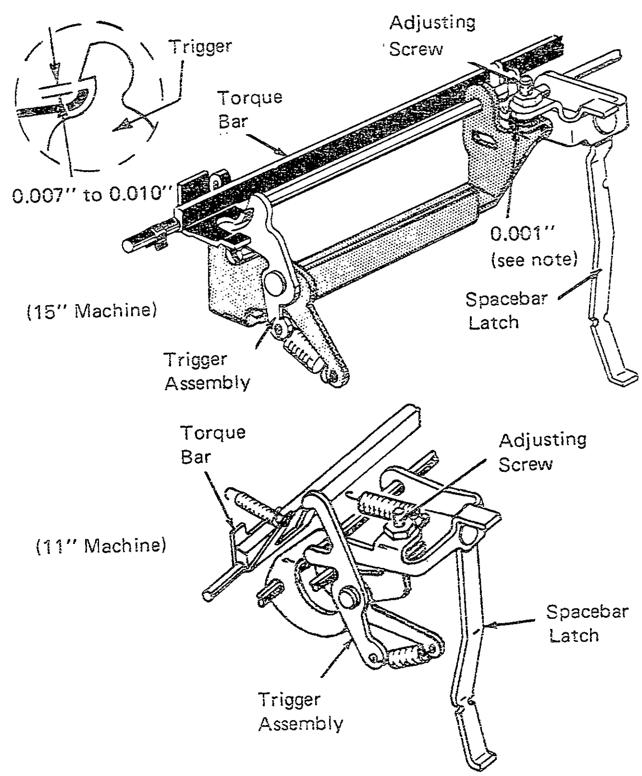


Figure 3-228. Spacebar-Latch-Lever Screw

Trigger Upstop

The trigger upstop (not present on 11-inch printers) should be adjusted so it just touches the trigger lever.

This adjustment ensures that the trigger will properly reset over the lug on the escapement torque bar after each spacebar operation. It also ensures that there will be a maximum transfer of motion from the spacebar operational latch to the trigger-lever assembly.

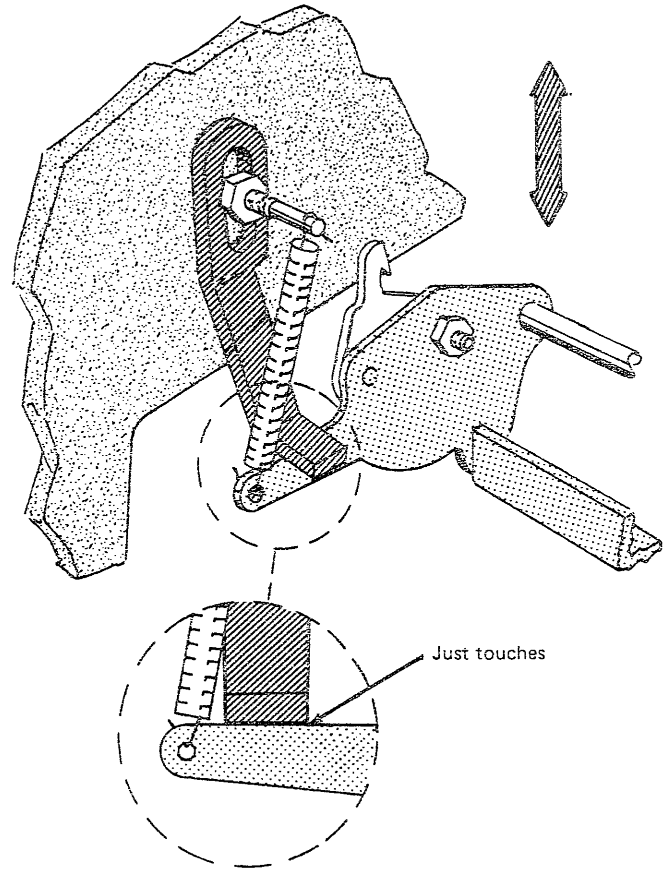


Figure 3-229. Trigger Upstop

Spacebar Guide Stud (Level 1)

Adjust the guide stud to operate freely in the spacebar stem throughout the full travel of the spacebar.

The guide stud is accessible if the two upper screws of the keylever guard are removed and the guard is rotated forward, out of the way. The operational keylever springs must be disconnected in order to rotate the guard.

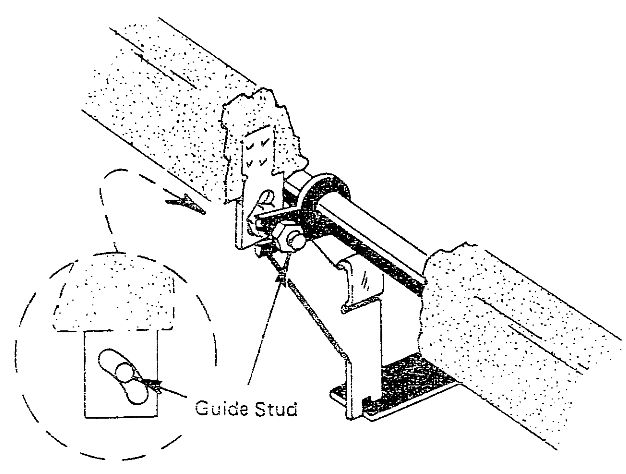


Figure 3-230. Spacebar Guide Stud (Level 1)

Spacebar Guide Stud (Level 2)

Adjust the guide stud forward or backward in its elongated mounting hole so a clearance of 1/16" to 1/32" exists between the bottom of the skirt on the spacebar and the bottom of the skirt on a pressed fourth-row keybutton.

The guide-stud mounting bracket is adjusted so the stabilizing link on the bottom of the spacebar stem does not bind on the guide stud.

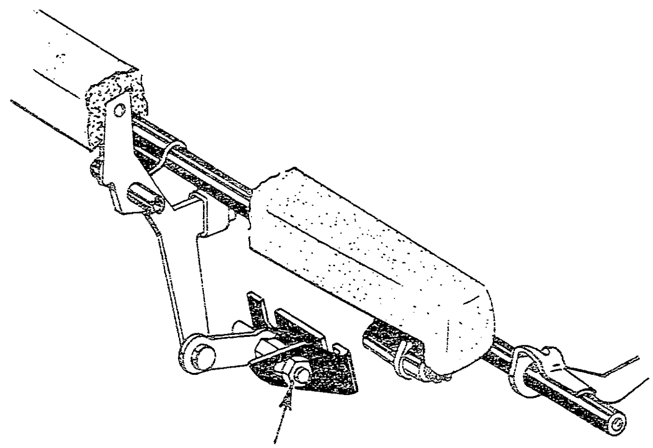


Figure 3-231. Spacebar Guide Stud (Level 2)

Spacebar Return Spring (Level 1)

Adjust the return spring front to rear so the top of the spacebar is level. The spring should be formed up or down so a weight of 2-1/2 ounces will just fail to trip the spacebar interposer.

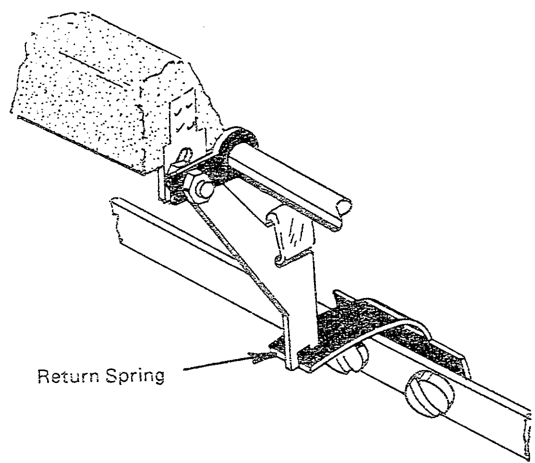


Figure 3-232. Spacebar Return Spring (Level 1)

Spacebar Return Spring (Level 2)

Position the spring in one of the three holes in the carrier-return/backspace repeat bail so a load of 2-3/4 to 3-1/4 ounces will trip the spacebar interposer.

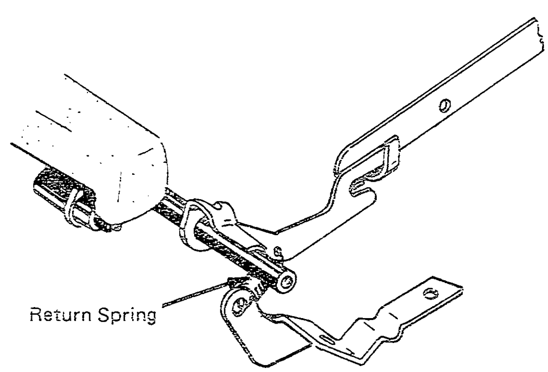


Figure 3-233. Spacebar Return Spring (Level 2)

Spacebar-Repeat Stop, Optional (Level 1)

Adjust the stop to obtain 0.001" to 0.005" clearance between the spacebar-repeat arm and the spacebar shaft at the time a single operation occurs.

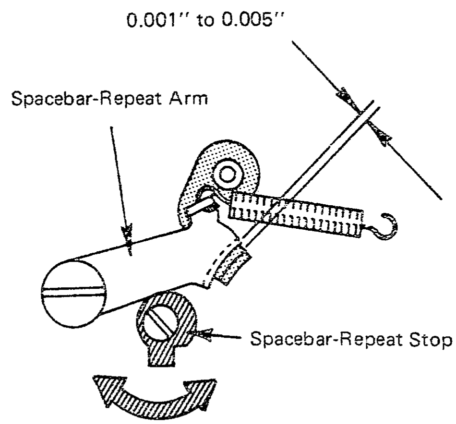


Figure 3-234. Spacebar-Repeat Stop, Optional (Level 1)

Spacebar-Repeat Stop, Optional (Level 2)

Adjust the spring anchor up or down so a clearance of 0.001" to 0.005" exists between the spring and the anchor, when a single operation takes place as the spacebar is pressed slowly.

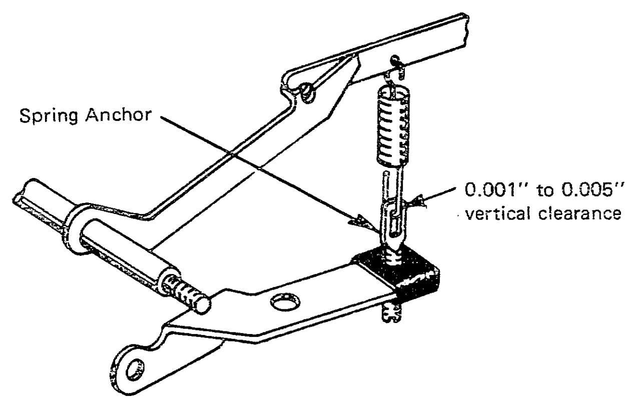


Figure 3-235. Spacebar-Repeat Stop, Optional (Level 2)

Spacebar Final Stop

Adjust or form the stop to obtain 0.005" to 0.010" clearance between the stop and the spacebar center stem with the spacebar pressed to just trip the spacebar interposer. On current-level machines, the final stop has been eliminated and the repeat lug is broken off the keylever pawl.

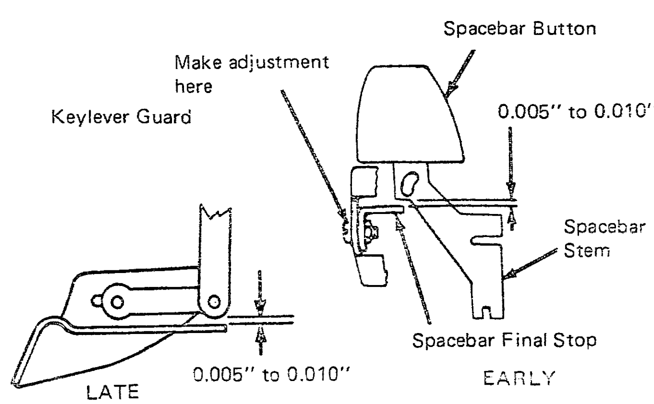


Figure 3-236. Spacebar Final Stop

Spacebar Interlock Mechanism (Level 1)

Lockout Cam

Adjust the escapement cam left or right on the filter shaft so that, when the lockout cam is on the high point of the escapement cam, the lockout cam will have a 0.050" to 0.060" lateral motion toward the left.

Maintain the proper radial position of the escapement cam. Adjust so the escapement-cam follower is resting on, and at the beginning of, the low dwell of the cam when the filter shaft is in its rest position.

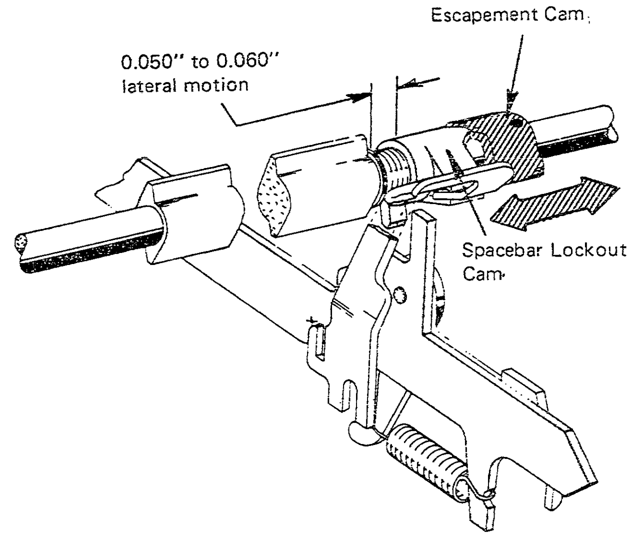


Figure 3-237. Lockout Cam

Lockout-Cam Guide

Adjust the guide up or down so the spacebar interposer will be allowed to move to the rear 0.020" to 0.030" when the interposer is unlatched. The filter shaft must be rotated until the lockout cam moves fully to the right to check this adjustment.

NOTE: The spacebar interposer, when released and interlocked, must clear the clutch-release arm by 0.005" to 0.020".

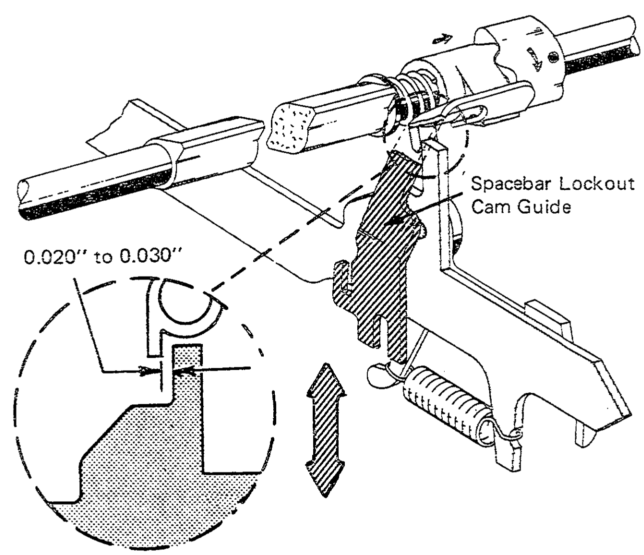


Figure 3-238. Lockout-Cam Guide

Spacebar Interposer Guide

Adjust the interposer guide left or right to obtain 0.015" to 0.025" clearance between the interposer and the lockout cam. The filter shaft should be in its rest position and the spacebar interposer released to the rear when making this adjustment.

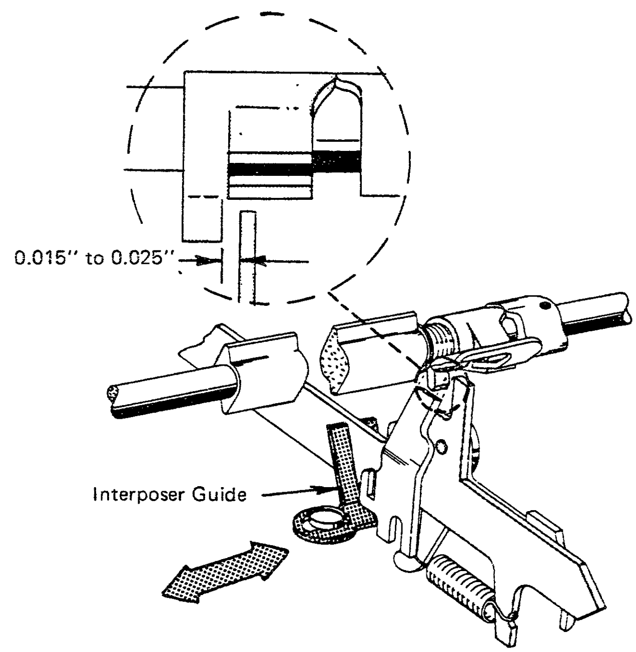


Figure 3-239. Spacebar Interposer Guide

Spacebar Interlock Mechanism (Level 2)

Spacebar Interlock Cam

With the machine latched at rest, adjust the spacebar interlock cam radially on the filter shaft so the tip of the interlock interposer rests on the high point of the cam. Position the interlock cam laterally on the filter shaft so the cam is against the flutes of the filter shaft and the setscrew is toward the right side of the machine.

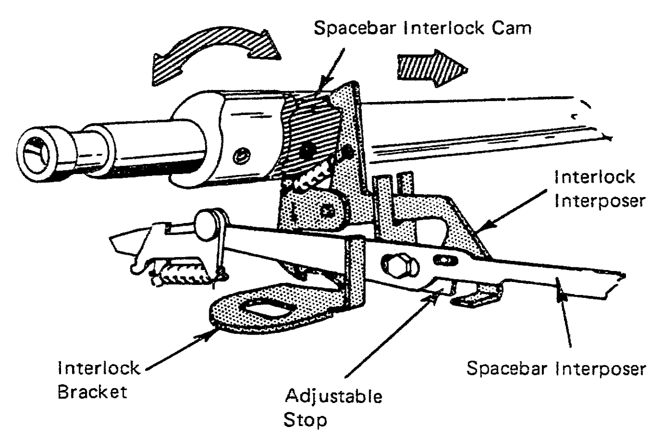


Figure 3-240. Spacebar Interlock Cam

Interlock Bracket

With the machine latched at rest and the spacebar interposer released to the rear, adjust the interlock bracket front or rear to obtain a clearance of 0.040" to 0.050" between the interlock interposer and the adjustable stop on the spacebar interposer.

NOTE: The interposer must be adjusted so it will be guided by the spacebar interlock bracket without binding.

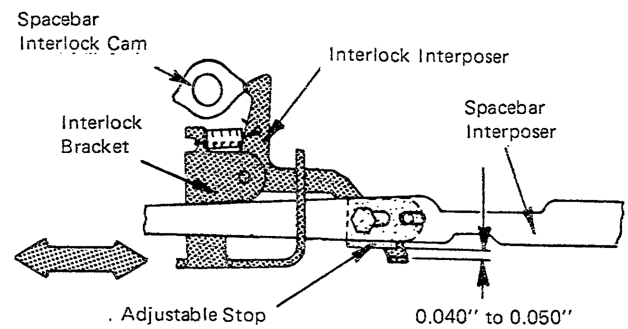


Figure 3-241. Interlock Bracket

Adjustable Stop

Position the adjustable stop on the spacebar interposer forward or backward so 0.020" to 0.025" clearance will exist between the stop and the interlock interposer when the machine is half-cycled and the spacebar interposer is latched at rest.

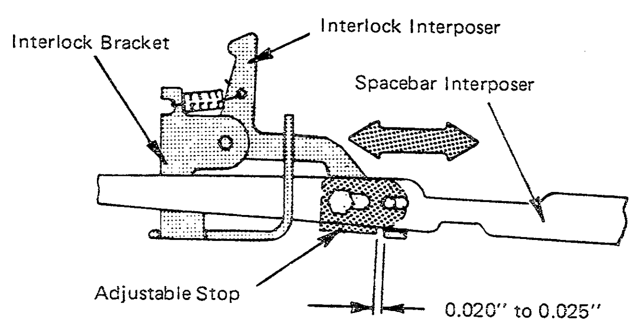


Figure 3-242. Adjustable Stop

Space-to-Print Interlock (767)

Position the space-to-print interlock bellcrank (with the bail at rest) to obtain 1.7" between the spring holes in the bellcrank and the spring anchor.

With all parts at rest, adjust the clevis for 0.005" to 0.012" between the clevis and the bellcrank.

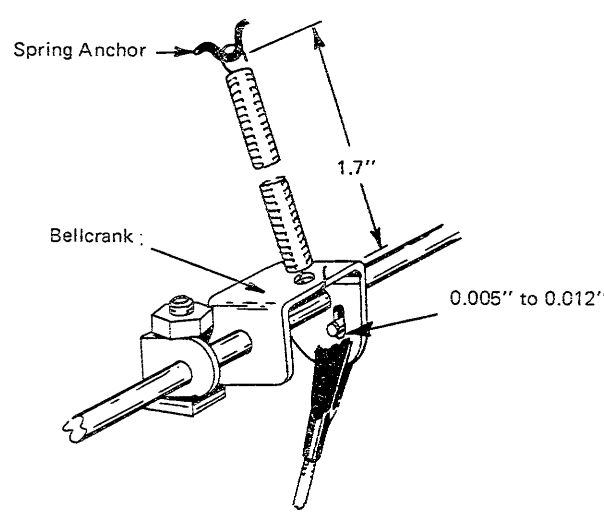


Figure 3-243. Space-to-Print Interlock (767)

No-Print Escapement (835 and 935 Printer)

Adjustment of the spacebar keylever to interposer is the same as that required for the rest of the keyboard. All adjustments are the same as "Print Mechanism (Level 2)" with the exception of the roller track on the print/no-print cam. Position the carrier five spaces from the extreme left margin. With a space half-cycled, the print-cam-follower roller must shift onto the no-print cam by the width of the roller plus 0.050" to 0.060". Check the adjustment at the extreme right margin.

Spacebar Shaft

Adjust the spacebar shaft for 0.002" to 0.004" end play.

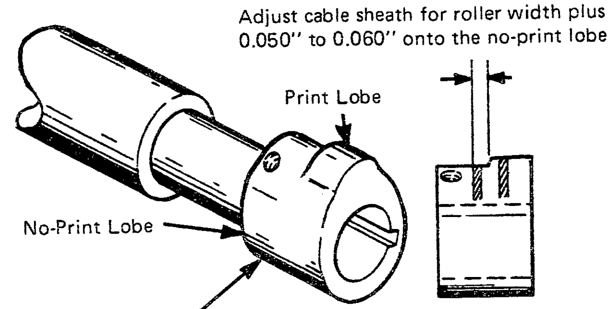


Figure 3-244. No-Print Escapement (835 and 935 Printers)

BACKSPACE MECHANISM

NOTE: The tab-lever stop on Level 1 and Level 2 tab mechanisms, print escapement, and operational control adjustments must be correct before backspace adjustments are attempted.

Backspace Rack

With the backspace rack in the rest position, there should be a clearance of from 0.005" to 0.015" between the working surfaces of the rack tooth and the backspace pawl. Adjust the hexagon-headed screw in the backspace bellcrank to obtain this condition.

The adjustment minimizes lost motion in the mechanism and ensures that the backspace pawl will positively reset into the next rack tooth at the completion of a backspace operation. Excessive clearance can contribute to escapement problems as well as backspace failures by allowing the backspace pawl to hold the carrier against the backspace rack tooth. Partial spacing will result if the carrier alternates stopping on the escapement pawl and the backspace pawl.

Check the adjustment by feeling the motion of the rack as it is manually moved from its rest position into contact with the backspace pawl. The movement should be equal to the adjustment clearance. Check at both extreme positions of the carrier so as to include the difference in mainspring tension. Also check the resetting of the pawl at both positions by operating the backspace bellcrank manually and releasing it slowly.

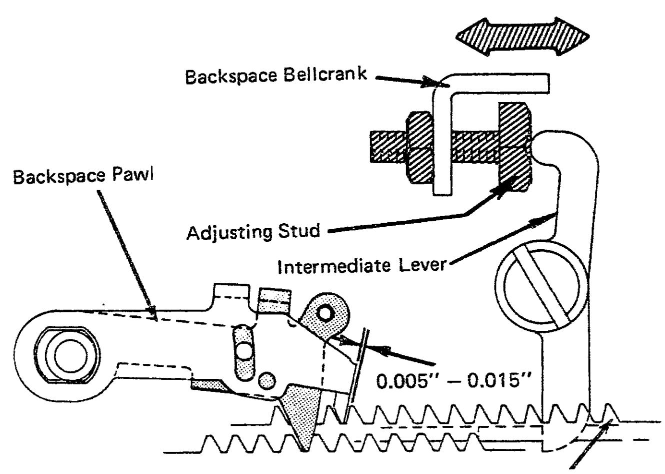


Figure 3-245. Backspace Rack

Intermediate Lever

With the backspace cam hand-cycled to the high point, the escapement pawl should just fail to drop into the preceding rack tooth; this causes the manual backspace operation to fail. Adjust the intermediate-lever pivot screw forward or backward in its elongated mounting hole to obtain this condition.

The rear portion of the intermediate lever is supplied with the same amount of motion from the hexagon-headed screw on the bellcrank, regardless of any change in the front-to-rear position of the intermediate lever. Therefore, the difference in throw to the backspace rack is achieved, when changing the front-to-rear position of the intermediate lever, by increasing or decreasing the leverage or distance between the pivot point of the intermediate lever and the point of contact between the intermediate lever and the backspace rack. Moving the intermediate lever to the rear will increase the backspace-rack motion.

During a powered backspace operation, the carrier develops enough momentum (allowing the escapement rack to properly overthrow and drop into the preceding rack tooth) for a positive operation.

If the immediate lever moves the backspace rack too far, it will cause double backspacing. Check the operation at both ends of the carriage to include the variation in the mainspring tension.

NOTE 1: The rest position of the backspace rack should be checked and readjusted, if necessary, after any change in the front-to-rear position of the intermediate lever.

NOTE 2: On 11-inch machines below serial number 4012015, the contour or rise to the backspace operational cam is slightly different from that found on later-level machines. This cam provided much less momentum to the carrier; therefore the backspace rack required more motion in order to produce a positive backspace operation.

Adjust the early-level backspace mechanism as follows. With the backspace cam manually operated to the high point, the escapement pawl must drop into the preceding rack tooth and overthrow by 0.005" to 0.010". Obtain this condition by adjusting the intermediate lever forward or backward in its elongated mounting hole.

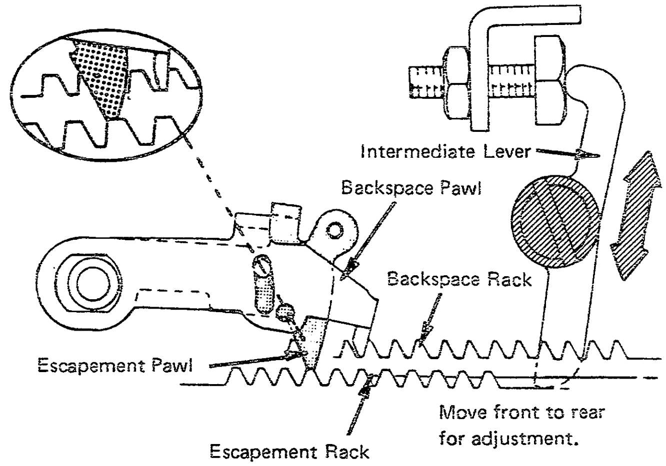


Figure 3-246. Intermediate Lever

CARRIER-RETURN MECHANISM (LEVEL 1)

NOTE: The print-escapement and operational control adjustments must be correct before attempting the carrier-return adjustments.

Pawl Clearance (Level 1)

Adjust the clutch-latch eccentric so that the escapement pawl will clear the rack teeth by 0.005" to 0.020" when the latch is being held down by the keeper. Do not bend the latch while adjusting the eccentric.

This adjustment ensures that the escapement pawl will not drag along the rack during a carrier-return operation and that the pawl will be allowed to reenter the rack quickly at the completion of the return operation.

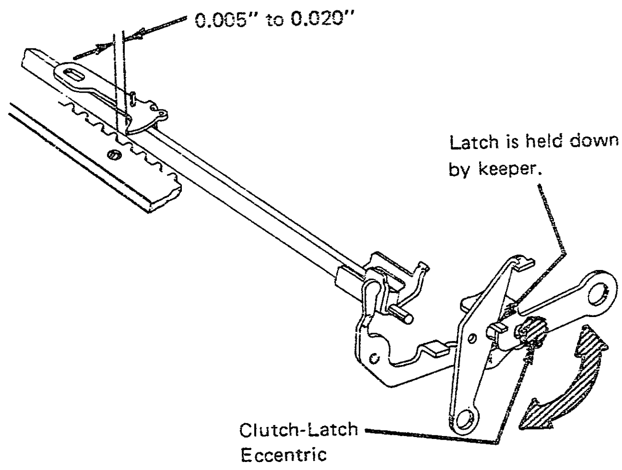


Figure 3-247. Pawl Clearance (Level 1)

Clutch-Latch Overthrow, 11-Inch Machine Only (Level 1)

With the platen and feed rolls installed and the index-selector lever set in the double position, manually operate the carrier-return cam to the high point while observing the motion of the clutch latch. It should overthrow the latching surface of the keeper by 0.030" to 0.040". Adjust the carrier-return latch-arm adjusting screw to obtain this condition.

NOTE: Installing the platen and feed rolls, plus setting the index-selector lever in the double index position, permits the overthrow adjustment to be measured while the system operates under a load.

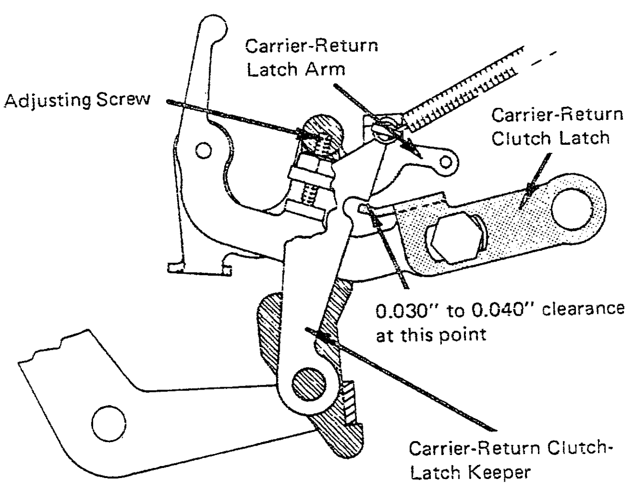


Figure 3-248. Clutch Latch Overthrow, (Level 1) 11-Inch Machine Only

Clutch-Latch Overthrow (Level 1), 15-Inch Machine and 767

Carrier-Return Lever

Position the carrier-return lever laterally on the latch-actuating-arm pin so that the carrier-return latch will hang vertically without binding against its interposer. Tighten the locking screw in the lever onto the flat portion of the pin.

Carrier-Return Latch Overthrows

With the carrier-return cam on the highest point, adjust the latch-arm adjusting screw so that the clutch latch will overthrow the latching surface of the keeper by from 0.030" to 0.040". The platen and feed rolls must be installed and the index-selector lever must be in the double-index position when this adjustment is checked.

Carrier-Return Latch Height

With the carrier-return cam latched in the rest position, adjust the screw so that the carrier-return latch will pass under the cam follower by a clearance of from 0.003" to 0.015".

NOTE 1: Any change in the carrier-return latch height directly affects the front-to-rear position of the latch (with respect to the cam follower), when the machine is at rest. (See "Interposer Adjusting Screws" under "Operational Control Mechanism", preceding.)

NOTE 2: On a limited number of printers equipped with the Level 1 carrier-return mechanism, a carrier-return latch-actuating arm was used that did not have a flat surface machined on the left end of its pivot pin. These Level 1 latch-actuating arms should be replaced before attempting to make the carrier-return adjustments.

The flat surface is required to establish the proper radial position of the carrier-return lever on the pin (with respect to the latch-actuating arm), and ensures that the carrier-return lever cannot slip on the pin.

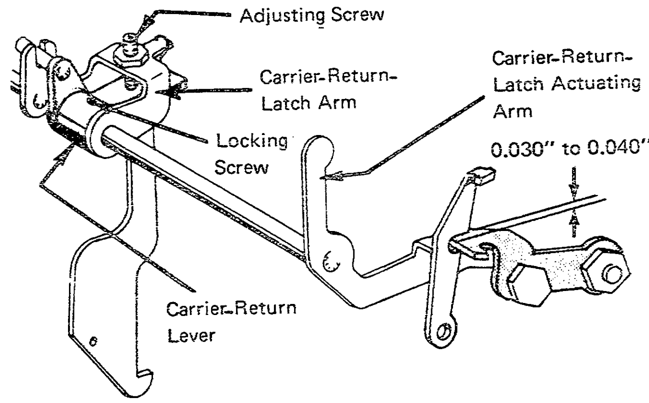


Figure 3-249. Clutch Latch Overthrow, (Level 1) 15-Inch Machine and 767

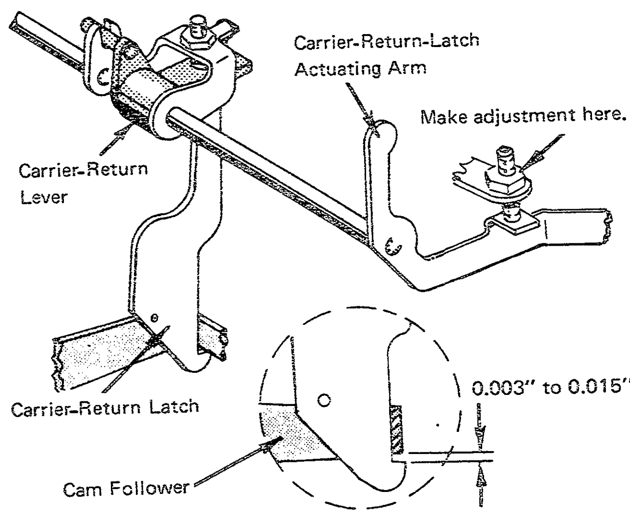


Figure 3-250. Carrier-Return Latch Height (Level 1), 15-Inch Machine and 767

Carrier-Return Latch Height, 11-Inch Machine

With the carrier-return/index cam at rest, adjust the carrier-return latch height by adjusting the screw on the backplate so the latch will pass under the cam follower by 0.001" to 0.010" when it is released to the rear.

The latch-height adjustment ensures maximum throw for the latch and that it will move under the cam follower freely.

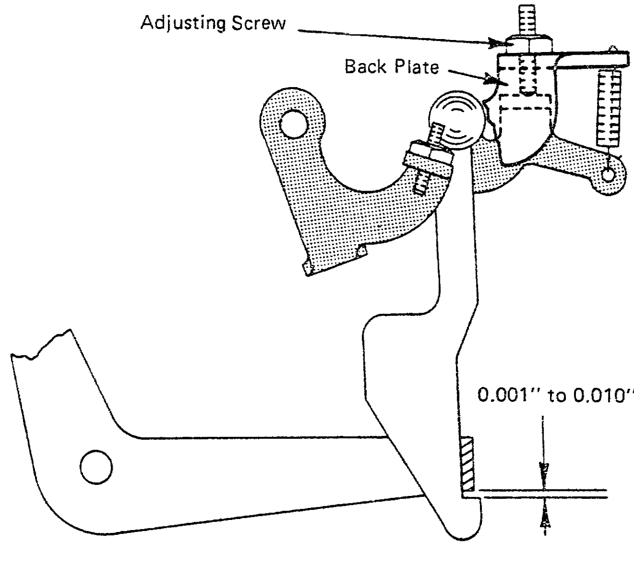


Figure 3-251. Carrier-Return Latch Height, 11-Inch Machine

Carrier-Return-Shoe Overlap

Adjust the carrier-return actuating-arm bracket left or right so that the carrier-return shoe overlaps the last three coils on the right end of the clutch spring.

Covering the last three coils ensures that all the coils of the spring will be used in the clutch operation.

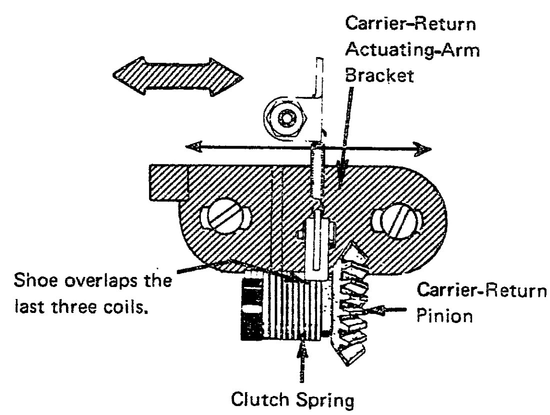


Figure 3-252. Carrier-Return-Shoe Overlap

Carrier-Return Clutch Arm

Adjust the clutch arm on the carrier-return clutch-arm hub so that the formed lug which mounts the actuating-arm stud is horizontal when the machine is at rest.

Carrier-Return Shoe Clearance

The nylon shoe on the clutch-actuating arm should clear the carrier return clutch spring by from 0.010" to 0.020" when the machine is at rest. Adjust the nut on the actuating-arm stud to obtain the proper clearance. In no case should the shoe-to-clutch-spring clearance be less than 0.010" (0.015" on 767).

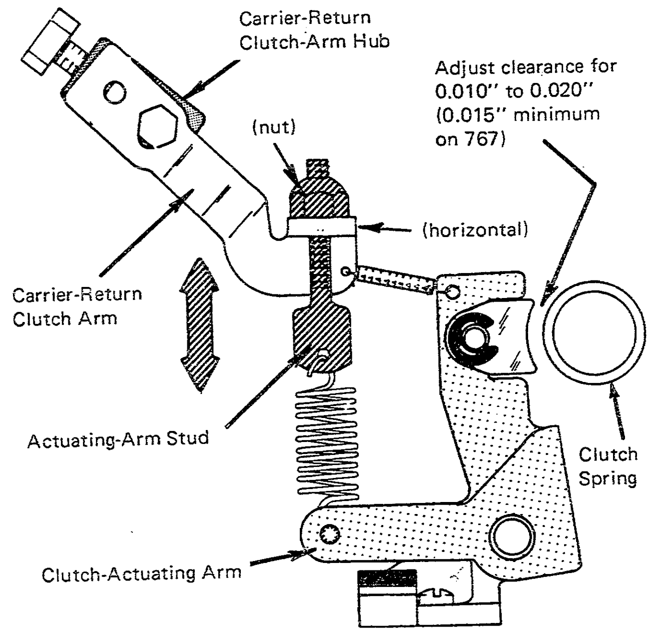


Figure 3-253. Carrier-Return-Shoe Clearance

Margin-Rack Overbank (Level 1)

With the carrier held fully to the left, against the margin stop, there should be a clearance of from 0.003" to 0.008" between the working surfaces of the escapement pawl and the escapement-rack tooth. Adjust the left margin-rack bushing to obtain this condition.

The overbank adjustment ensures that the escapement pawl will enter the correct escapement-rack tooth when the carrier-return clutch is unlatched at the left margin.

Observe the adjustment from the top, with the platen and deflector removed and the left margin stop positioned toward the middle of the rack.

The overbank may also be adjusted by adjusting the margin-rack bushing to clear the nylon washer on the margin rack by from 0.025" to 0.030" with the carrier resting at the left margin. The right margin-rack eccentric should be loose when making this adjustment, so that the left margin stop will be against the stop latch on the carrier. The 0.025" to 0.030" compensates for the 0.022" floating action in the escapement pawl.

For the margin-rack eccentric, refer to the procedure described in "Margin-Rack Overbank Guide (Level 2)" under "Margin-Control Mechanism", following.

NOTE: Any change in overbank on machines equipped with this early-style margin-rack assembly will directly affect the clutch-unlatching adjustment.

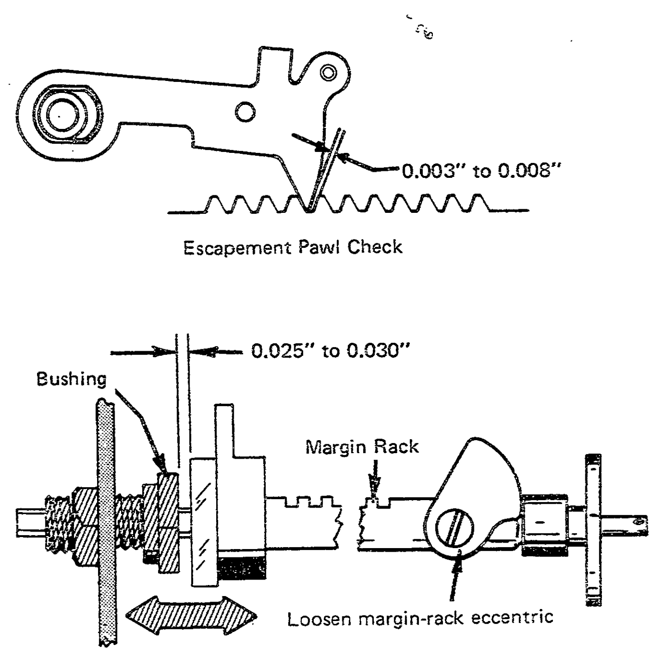


Figure 3-254. Margin-Rack Overbank (Level 1)

Clutch Unlatching

With either style margin rack held to its extreme left position, the carrier-return latch keeper should clear the latch by from 0.001" to 0.015", at the unlatching point. Check by manually holding the latch at the unlatching point while the machine is idling. Lengthen or shorten the carrier-return unlatching link to obtain this clearance.

> *NOTE:* If the clutch fails to latch properly (on machines equipped with the Level 1 margin rack) after the clutch-unlatching adjustment has been completed, check the margin-rack eccentric adjustment under "Margin Control Mechanism", following. The eccentric may be holding the rack too far to the left, restricting the margin-rack motion, and thereby reducing the amount of bite that the latch may take on the keeper.

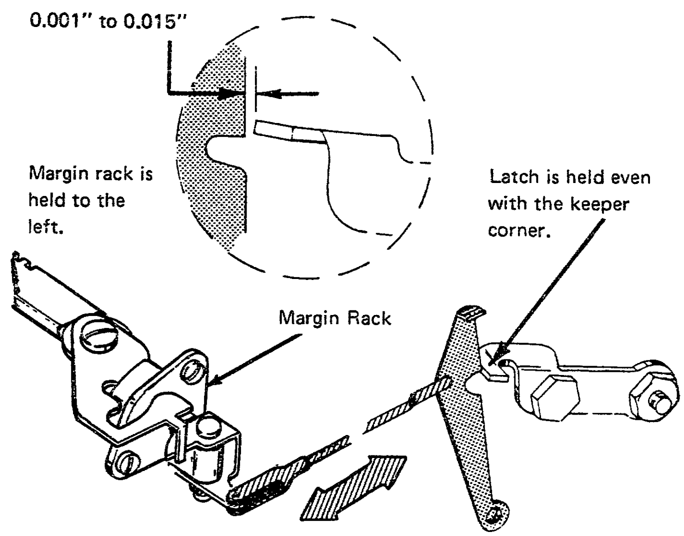


Figure 3-255. Clutch Unlatching

Torque Limiter

The torque limiter should transmit one or two pounds of pull on the carrier, measured at the left-hand end of the margin rack, while unlatching the carrier-return keeper-latch arm. Set the left-hand margin stop one space to the right of the final stop when measuring the transmitted load.

Check this adjustment by holding the pusher end of spring scale against the left end of the margin rack. With the carrier at the left margin, operate the carrier return. Relieve the tension on the scale until the carrier-return keeper-latch arm just unlatches. At this point the scale should read one to two pounds.

Adjust the eccentric stud in the torque-limiter hub. If sufficient adjustment is not available at the eccentric, the torque-limiter spring may be shifted on the torque-limiter hub by positioning the torque-limiter spring clamp.

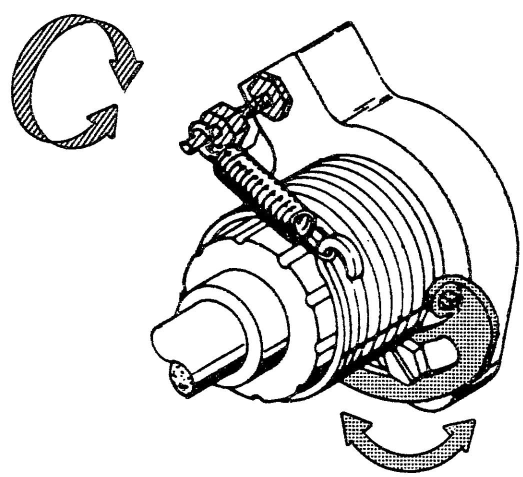


Figure 3-256. Torque Limiter

CARRIER-RETURN MECHANISM (LEVEL 2)

NOTE: The print-escapement and operational-control adjustments must be correct before the carrier-return adjustments are attempted.

Pawl Clearance

Adjust the clutch-latch eccentric so that the escapement pawl will clear the rack teeth by from 0.005" to 0.020", when the latch is being held down by the keeper.

There should be some clearance between the latch actuating arm and the escapement torque bar when the latch is not held down by the keeper.

NOTE: The latch actuating-arm collar if present should be adjusted for from 0.001" to 0.007" end play of the latch actuating arm before making the pawl-clearance adjustment. Do not bend the latch while adjusting the eccentric.

The adjustment ensures that the escapement pawl will not drag along the rack during a carrier-return operation, and that the pawl will be allowed to reenter quickly at the completion of the return operation.

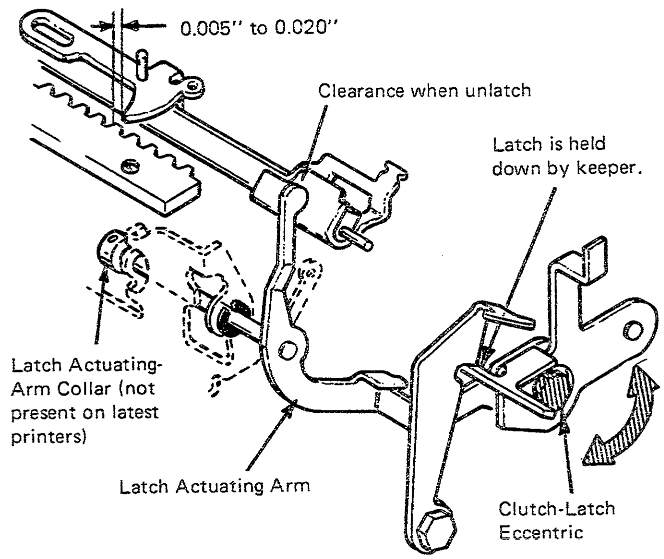


Figure 3-257. Pawl Clearance

Carrier-Return Lever

Use the following procedure to position the carrier-return lever and to obtain the correct clutch-latch overthrow and latch-arm height.

1. Carrier-Return Lever: Position the carrier-return lever laterally on the left operational pivot pin so that the carrier-return latch will hang vertically, without binding against its interposer. Tighten the locking screw in the lever onto the flat portion of the pivot pin.

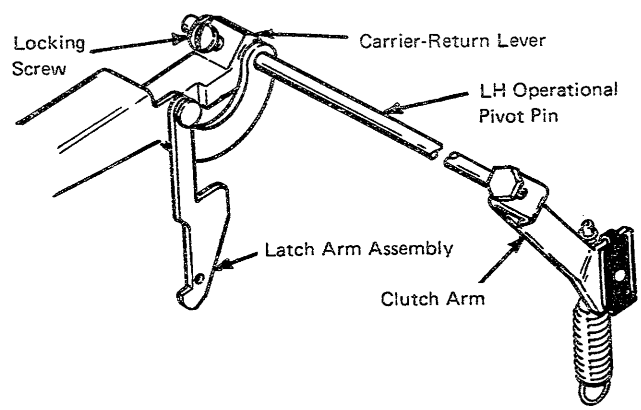


Figure 3-258. Carrier-Return Lever

2. Clutch-Latch Overthrow: With the carrier-return cam on the high point, adjust the keeper-latch-arm adjusting screw so that the clutch latch will overthrow the latching surface of the keeper by from 0.010" to 0.025".

   Be sure that the platen and feed rolls are installed, that the contact assembly is in place, and that the index-selector lever is in the double-index position, when making this adjustment.

   NOTE: Any change in the carrier-return latch height directly affects the front-to-rear position of the latch (with respect to the cam follower), when the machine is at rest. (See "Interposer Adjusting Screws" under "Operational Control Mechanism", preceding.)

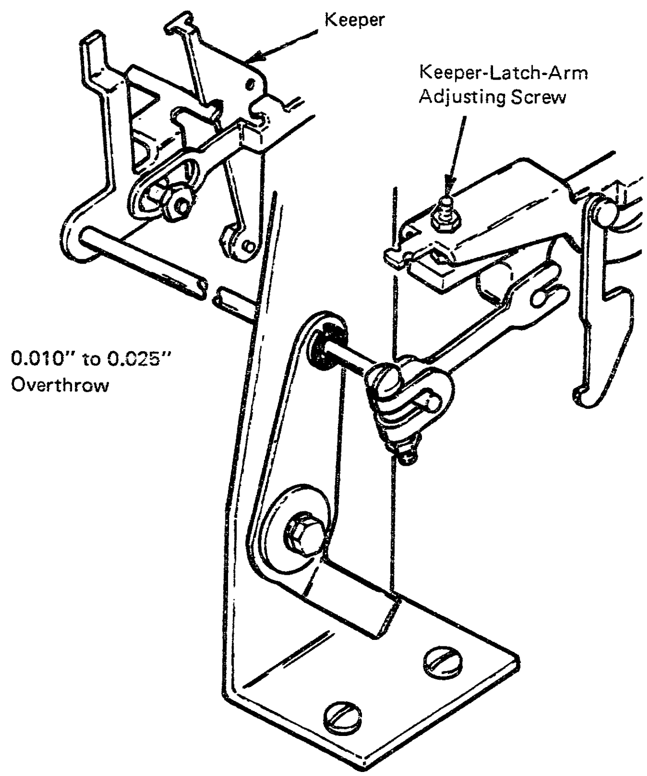


Figure 3-259. Clutch-Latch Overthrow

3. Latch-Arm Height: With the carrier-return cam latched in the rest position, adjust the screw so that the carrier-return latch will pass under the cam follower with a clearance of from 0.003" to 0.015".

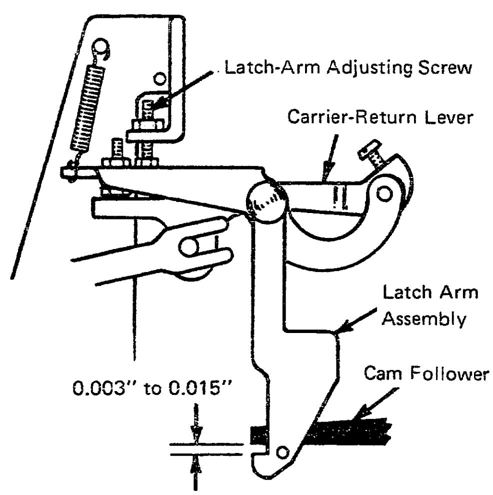


Figure 3-260. Latch-Arm Height (Level 2)

Carrier-Return Latch Height (Level 2), 11-Inch Machines

With the carrier-return cam at rest, adjust the carrier-return latch height by the adjusting screw on the carrier-return adjusting plate so the latch will pass under the cam follower by 0.003" to 0.015".

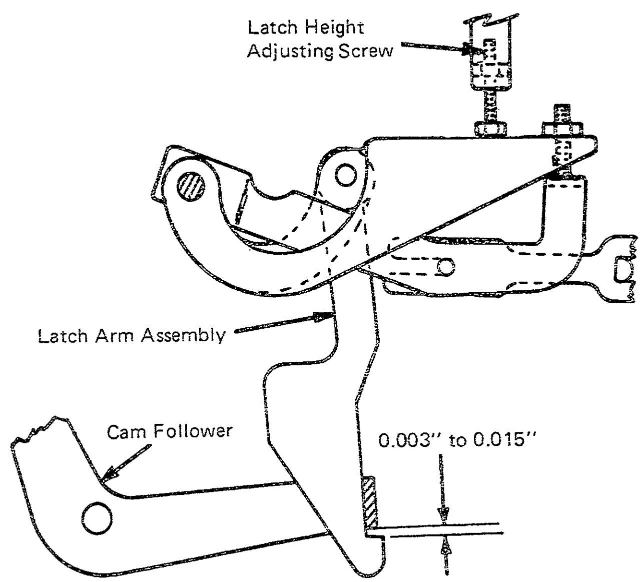


Figure 3-261. Carrier-Return Latch Height (Level 2), 11-Inch Machine

Carrier-Return-Shoe Overlap (Level 2)

Adjust the carrier-return actuating-arm bracket left or right so that the carrier-return shoe overlaps the last three coils on the right end of the clutch spring. Covering the last three coils ensures that all the coils of the spring will be used in the clutch operation.

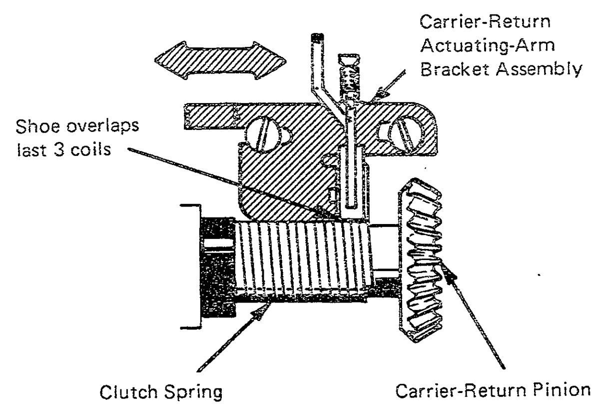


Figure 3-262. Carrier-Return-Shoe Overlap (Level 2)

Carrier-Return-Shoe Clearance (Level 2)

The nylon shoe on the clutch-actuating arm should clear the carrier-return-clutch spring by from 0.010" to 0.020" when the machine is at rest. Adjust the screw on the clutch arm to obtain proper clearance. In no case should the shoe-to-clutch spring clearance be less than 0.010" (0.015" on 767).

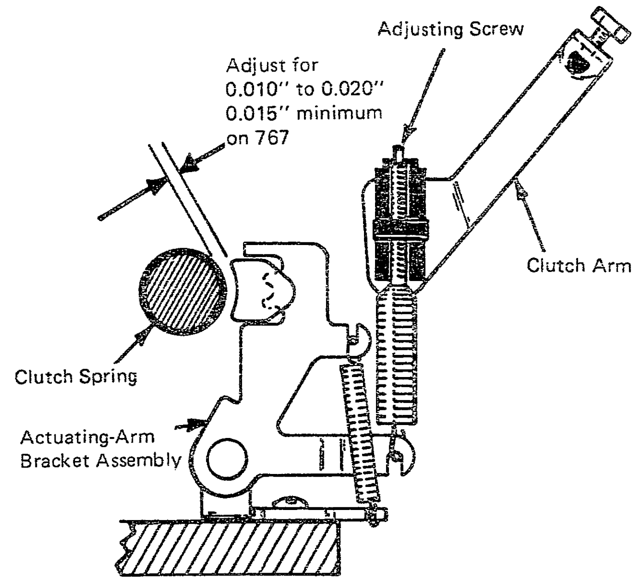


Figure 3-263. Carrier-Return-Shoe Clearance (Level 2)

Margin-Rack Overbank (Level 2)

With the carrier resting at the left margin stop, adjust the margin-rack overbank guide left or right on the margin rack to obtain a clearance of from 0.001" to 0.005" between the stop latch on the carrier and the left margin stop.

The adjustment of the overbank guide on the margin rack determines the rest position of the margin rack. The adjustment ensures that the left margin stop will set accurately when the stop is slid to the right, against the margin-stop latch on the carrier.

In addition, the adjustment of the overbank guide, with the amount of lateral motion that the guide permits the rack (because of the design of the guide) when the carrier moves into the left margin during a carrier-return operation, automatically provides the carrier with the overbank required for proper escapement-pawl reentry, at the completion of a carrier-return operation.

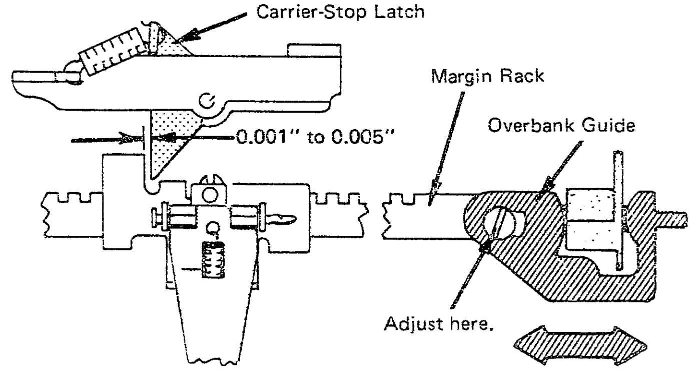


Figure 3-264. Margin-Rack Overbank (Level 2)

Clutch Unlatching (Level 2)

With either style margin rack held to its extreme left position, the carrier-return latch keeper should clear the latch by from 0.001" to 0.010" at the unlatching point. Check by manually holding the latch at the unlatching point while the machine is idling. Lengthen or shorten the carrier-return unlatching link to obtain this clearance.

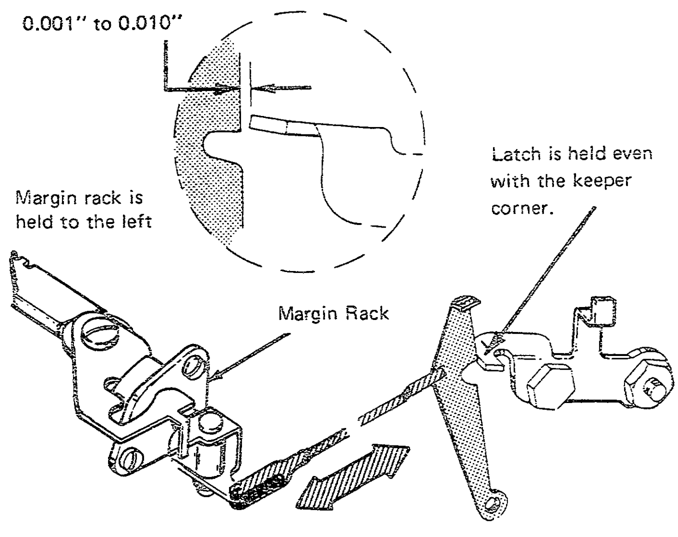


Figure 3-265. Clutch Unlatching (Level 2)

Torque Limiter (Level 2)

The torque limiter should transmit one or two pounds of pull on the carrier, measured at the left-hand end of the margin rack, while unlatching the carrier-return keeper-latch arm. Set the left-hand margin stop one space to the right of the final stop when measuring the transmitted load.

Check this adjustment by holding the pusher end of spring scale against the left end of the margin rack. With the carrier at the left margin, operate the carrier return. Relieve the tension on the scale until the carrier-return keeper-latch arm just unlatches. At this point the scale should read one to two pounds.

Adjust the eccentric stud in the torque-limiter hub. If sufficient adjustment is not available at the eccentric, the torque-limiter spring may be shifted on the torque-limiter hub by positioning the torque-limiter spring clamp.

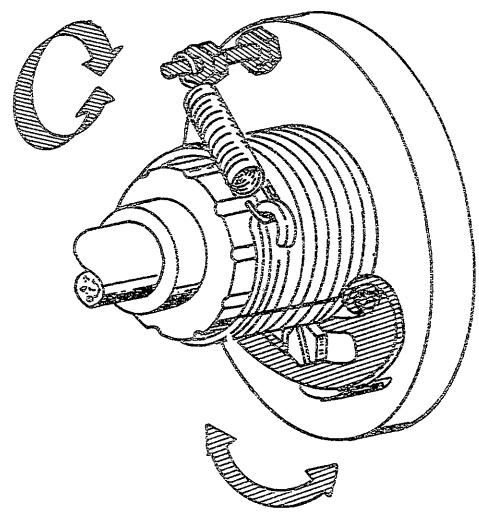


Figure 3-266. Torque Limiter (Level 2)

INDEX MECHANISM (LEVEL 1)

NOTE: All operational control adjustments must be correct before any attempt is made to adjust the index mechanism.

Index Link (Level 1)

NOTE: Adjustment of the index link and link stud must be considered together. Make these adjustments alternately until both are correct.

As a preliminary setting, position the index-link stud in the middle of the slot in the pawl carrier.

With the index-selection lever in the single-space position, adjust the index link so the index pawl bottoms in the ratchet against a tooth after 0.030" rise on the index cam. Half-turn adjustments may be made by disconnecting and turning the link at the top. The cam rise may be simulated by leaving the cam latched in the rest position and placing four strips of IBM card stock between the cam and cam follower.

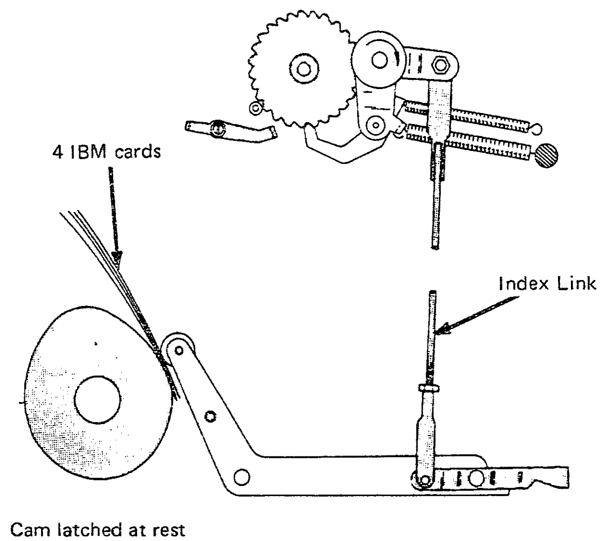


Figure 3-267. Index Link (Level 1)

Index-Link Stud (Level 1)

Adjust the index-link stud forward or backward in the slot of the pawl carrier so one full tooth of motion is given the index pawl after it starts to drive the platen.

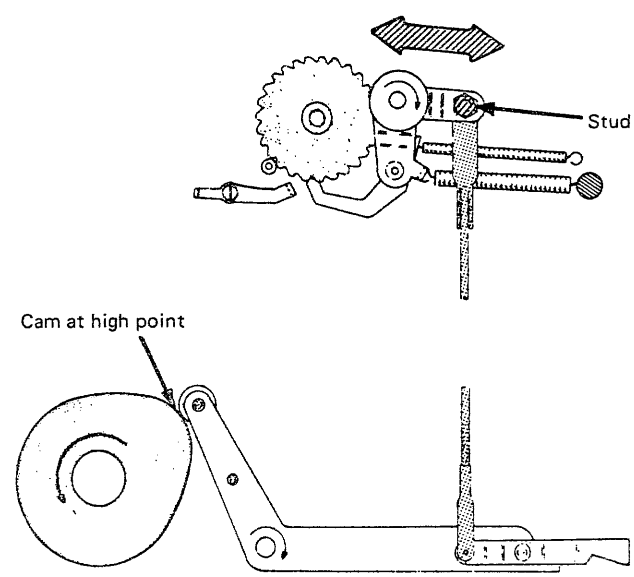


Figure 3-268. Index-Link Stud (Level 1)

Upper Index Pawl Stop (Level 1)

With the index cam latched, adjust the upper index-pawl stop so the index pawl clears the ratchet by 0.015" to 0.030".

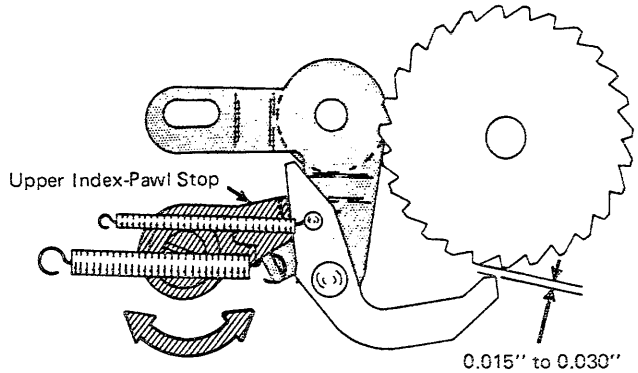


Figure 3-269. Upper Index-Pawl Stop (Level 1)

Multiplying Control Lever (Level 1)

NOTE: Be sure the indexing action is not choked off by the platen-overthrow stop.

1. As a preliminary setting, position the multiplying control-lever stop front to rear so its elongated hole is centered.
2. Adjust the multiplying control-lever vertically to just clear the bottom edge of the multiplying lever when it is moved from the single- to the double-index position. The adjustment should be made with the index cam latched. Keep the high point of the eccentric toward the front of the machine.
3. Adjust the multiplying control-lever stop front to rear so that two full teeth of motion are given the index pawl after it starts to drive the platen.

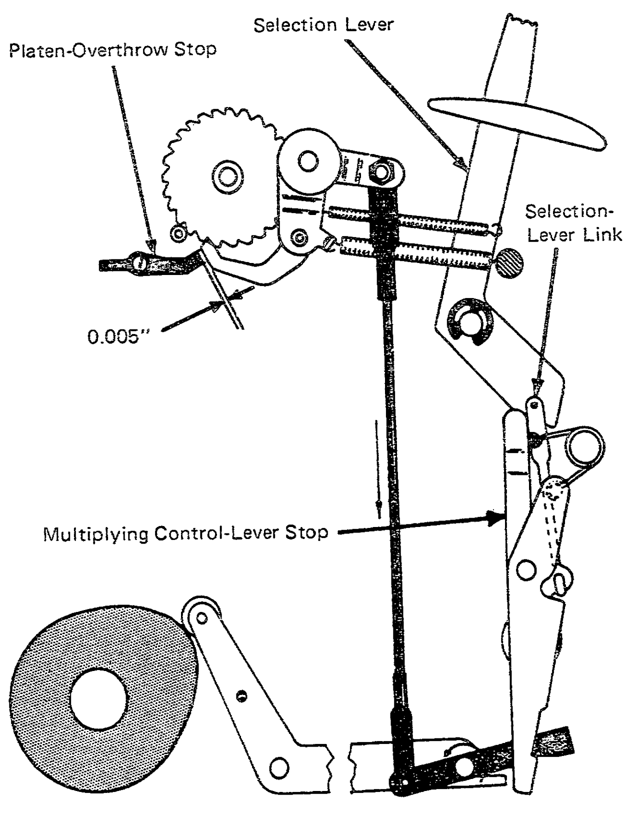


Figure 3-270. Multiplying Control Lever (Level 1)

Platen-Overthrow Stop (Level 1)

Adjust the stop forward or backward so there is 0.005" clearance between the stop and the pawl and when the cam is on its high point.

Index-Selection Lever (Level 1)

Adjust the index-selection lever link so the lever lines up with the double mark on the case when the lever is in the double-space position.

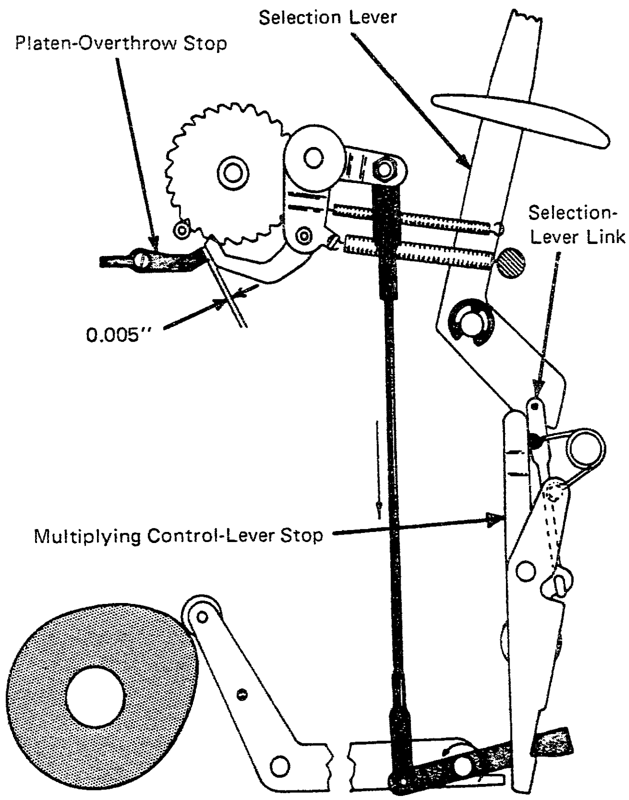


Figure 3-271. Index-Selection Lever (Level 1)

INDEX MECHANISM (LEVEL 2)

NOTE: All operational control adjustments must be correct before any attempt is made to adjust the index mechanism.

Multiplying-Lever Stop (Early Level 2)

The early multiplying-lever stop used on the Level 2 index mechanism should be adjusted both horizontally and vertically. The stop is adjusted vertically so the multiplying lever will operate above and below a horizontal position by an equal amount. The horizontal and vertical adjustments of the stop must be made alternately until both are correct.

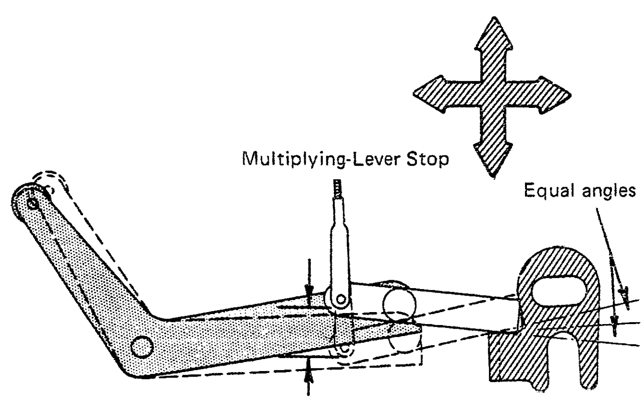


Figure 3-272. Multiplying-Lever Stop (Early Level 2)

Multiplying-Lever Stop (Late Level 2)

Adjust the multiplying-lever stop, front or rear, to produce from 0.370" to 0.390" (27-tooth platen ratchets) or 0.320" to 0.340" (36-tooth platen ratchets) motion to the index link when the carrier-return/index cam is operated to its high point (platen removed).

NOTE: This adjustment may be measured with the Hooverometer and a feeler gage. The handle of the Hooverometer is 0.375" wide.

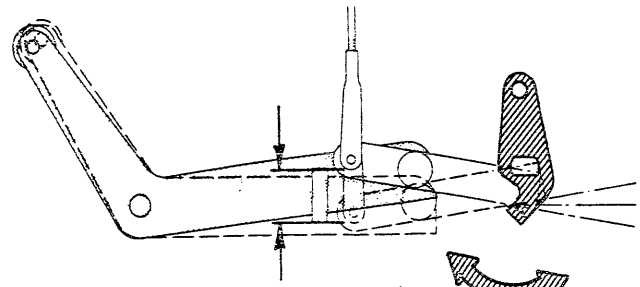


Figure 3-273. Multiplying-Lever Stop (Late Level 2)

Index Link

1. First, loosen the platen-overthrow stop and move it to the front.
2. With the platen installed, hold the detent roller disengaged from the platen ratchet with a spring hook, while an index operation is manually cycled. At the completion of the operation, allow the detent roller to reenter the platen ratchet.

If the index link is properly adjusted, the detent roller will seat between two ratchet teeth without causing any rotational motion to the platen. Adjust the link to obtain this condition.

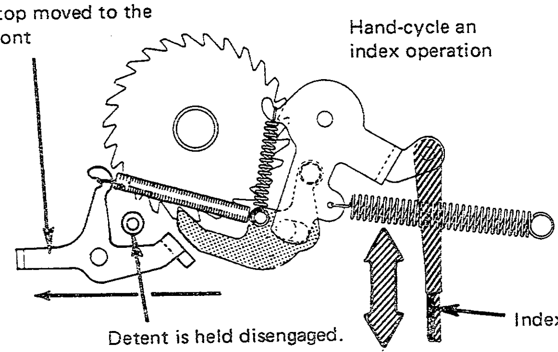


Figure 3-274. Index Link

Platen-Overthrow Stop

With the index cam rotated to its high point, adjust the platen overthrow stop to clear the index pawl by from 0.002" to 0.010".

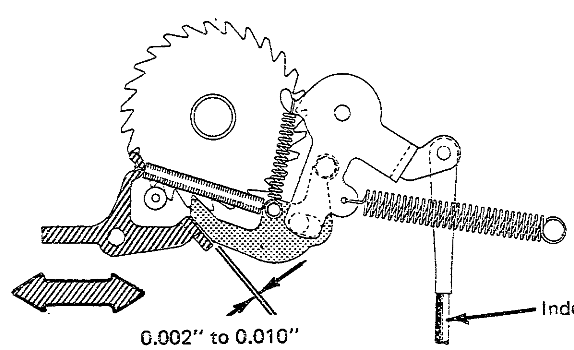


Figure 3-275. Platen-Overthrow Stop

Index-Selection Cam

With the index cam latched at rest and the selection lever in the double-space position, adjust the selection cam, front to rear, so that the index pawl clears the platen ratchet at rest and enters the correct tooth.

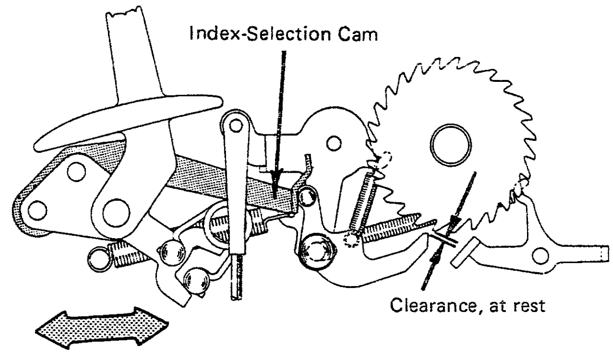


Figure 3-276. Index-Selection Cam

Index-Selection Cam, Vertical

Adjust the selection cam up or down to center the index pawl on the cam surface, with the selection lever in the single-space position.

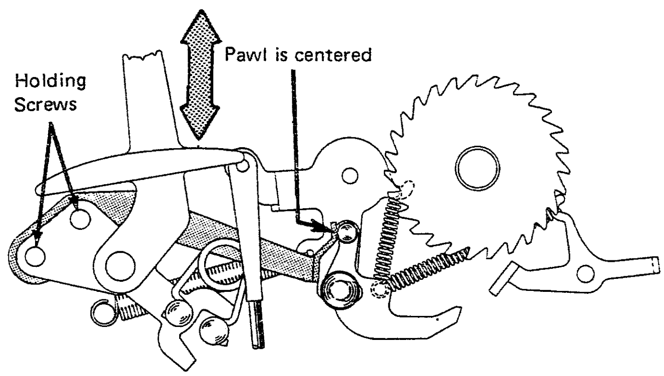


Figure 3-277. Index Selection Cam, Vertical

TAB SET-AND-CLEAR MECHANISM (SPRING-DETENTED TABS)

Tab Rack Rotational

Adjust the bellcrank (Figure 3-279) attached to the left end of the tab rack so that an unset tab stop is centered between the tab-lever pawl and the tab-set lug on the escapement bracket. Latch the tab lever to the rear to check this adjustment.

NOTE: The tab set and clear lever must be fully seated on the top of the two pivot pins on the left side of the power frame.

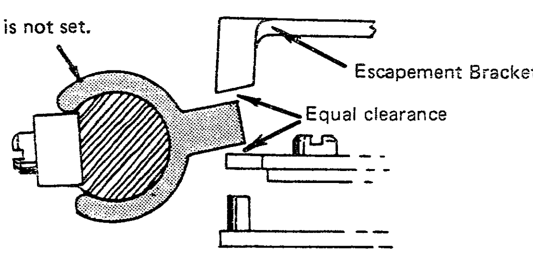


Figure 3-278. Tab Rack Rotational

Tab Set-and-Clear Link

Adjust the link so the slope of the keybutton matches the slope of the ON/OFF switch keybutton with the switch in the OFF position.

NOTE: A link guide found on the 11-inch machine should be adjusted so it will permit free operation without allowing the link to flex during a set or clear operation. The link guide must also be positioned in the slot of the selector-latch-bail shaft to maintain the proper lateral position of the shaft. On 15" and 767 machines, the intermediate lever should be vertical within 0.015".

Set-and-Clear Arm Stops

Form the stop lugs on the set-and-clear lever bracket so that they limit the movement of the arm just as the tab stop fully reaches its set or cleared position. Also, form the extension on the rear stop lug so that the tab set-and-clear arm cannot pivot sideways out of engagement with the tab-rack bellcrank.

NOTE: On the Level 1 tab set-and-clear mechanism, the stop lugs were anchored and adjusted by two screws on the outside of the power frame.

Tab-Rack Brake (Level 1 Only)

Adjust the tab-rack brake so that the tab rack will not flip past the rest position when it is released from either a set or clear position. The tab rack must return fully to the rest position when the keybutton is released slowly.

The brake, just inside the power frame at the left end of the tab rack, should be formed, if necessary, to spring load the tab rack toward the right side of the machine.

NOTE: The index detent lever will rest against the tab rack, with the platen removed. The lever must be clear of the tab rack when the brake adjustment is checked.

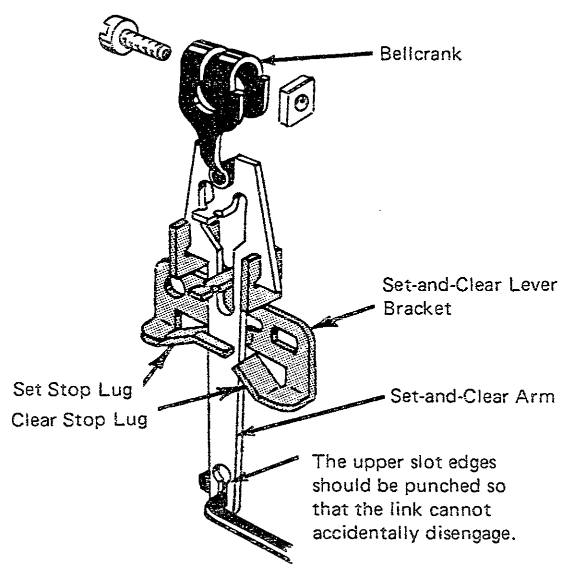


Figure 3-279. Set-and-Clear Arm Stops

Gang Clear Finger (Spring-Detented)

1. Adjust the gang clear finger, front to rear, to obtain a clearance of 0.001" to 0.010" from the clear lug on any set tab stop.
2. Form the end of the gang clear finger to obtain a minimum clearance of 0.001" between the gang clear finger and the tab-rack tube. Check for interference between the top of the gang clear finger and the underside of the tab-set spring.
3. Check for a minimum clearance of 0.001" between lugs on the rear of the escapement and backspace pawls and any set tab, when the tab rack is rotated to the clear position and the pawls are removed from the rack, as in a carrier-return operation. If this clearance is not present, recheck the tab-rack-position and pawl-clearance adjustments.

   NOTE: It will not always be possible to clear a single tab stop when two or more adjacent tab stops are set. The gang clear finger can be moved slightly right or left to ensure positive clearing of a desired stop. The tab stop directly to the left may also be cleared or partially cleared.

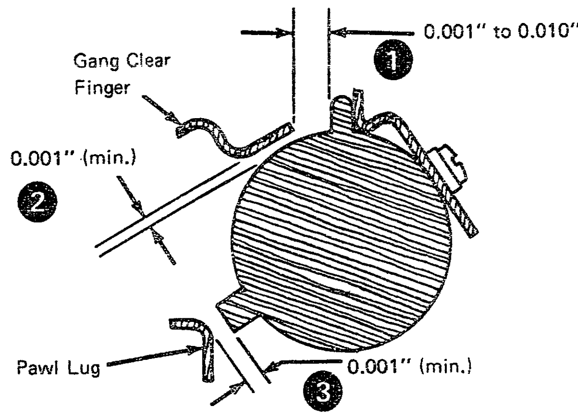


Figure 3-280. Gang Clear Finger (Spring-Detented Tabs)

TAB SET-AND-CLEAR MECHANISM (FRICTION-DETENTED TABS)

NOTE: The friction-detented tab rack can be identified by the absence of the tab stop detent springs. The friction-detented tab stops are set at the plant to require a minimum of 100 grams to set and reset.

Tab Rack Rotational (Friction-Detented Tabs)

Adjust the tab-rack bellcrank attached to the left end of the tab-lever so that an unset tab stop is centered between the tab lever pawl and the tab-set lug on the escapement bracket. Check this adjustment by latching the tab lever to the rear.

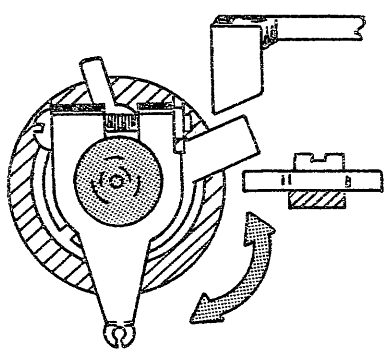


Figure 3-281. Tab Rack Rotational (Friction-Detented Tabs)

Tab Set Lug

Form the tab-set stop lug on the set-and-clear bracket (Figure 3-279) so that the tab-lever pawl, when latched out, will engage a set tab stop approximately in the center of the tab stop.

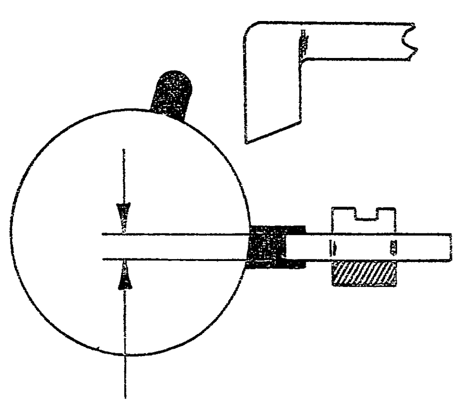


Figure 3-282. Tab Set Lug

Gang Clear Finger (Friction-Detented Tabs)

1. Position the gang clear finger so that it clears the clear lug on any set tab stop by from 0.020" to 0.030".
2. Form the end of the gang clear finger so that the underside of the gang clear finger clears the rack by from 0.005" to 0.010".
3. Adjust the clear stop lug on the set-and-clear bracket (Figure 3-279) so that the stop will limit the tab-rack rotation after a set tab stop is cleared. Do not let the stop limit be determined by the tab stops "bottoming" in the tab-rack slots.
4. Check for a minimum clearance of 0.001" (see No. 3, Figure 3-280) between the lugs on the rear of the escapement and backspace pawls and any set tab, when the tab rack is rotated to clear position and the pawls are removed from the rack, as in a carrier-return operation. If this clearance is not present, recheck the tab-rack-position and pawl-clearance adjustments.

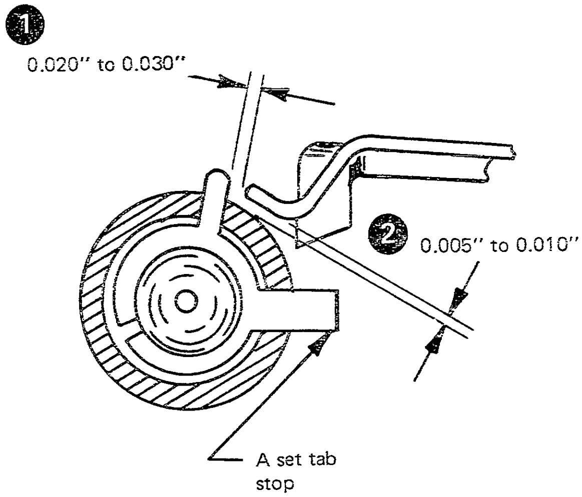


Figure 3-283. Gang Clear Finger (Friction-Detented Tabs)

TAB MECHANISMS (LEVEL 2 AND LEVEL 3)

The late-level (Level 2) tab and the latest-level (Level 3) tab adjustments are combined here. The early-level (Level 1) tab adjustments are described in a separate adjustment series following the Level 2 and Level 3 tab adjustments.

Tab Mechanism Identification (Level 2)

The Level 2 tab mechanism can be identified by the raised portion of the escapement bracket and the presence of a gang clear finger.

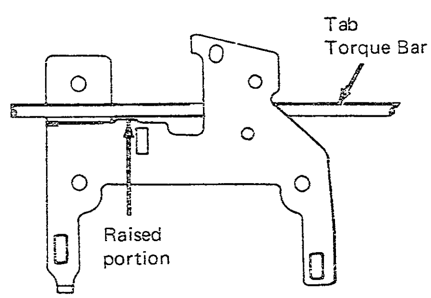


Figure 3-284. Tab Mechanism Identification (Level 2)

Tab Mechanism Identification (Level 3)

The Level 3 tab mechanism can be identified by the absence of a raised portion next to the tab torque bar, the presence of a gang clear finger, and the adjustable escapement-pawl lever.

> *NOTE:* The escapement bracket, torque-bar stop, and pawl mounting stud must be correct before the tab adjustments are made.

If the escapement bracket needs readjusting, all escapement adjustments must be checked before proceeding with the tab adjustments.

> *NOTE:* The overthrow stop and retaining plate can be removed and left off for the following adjustments.

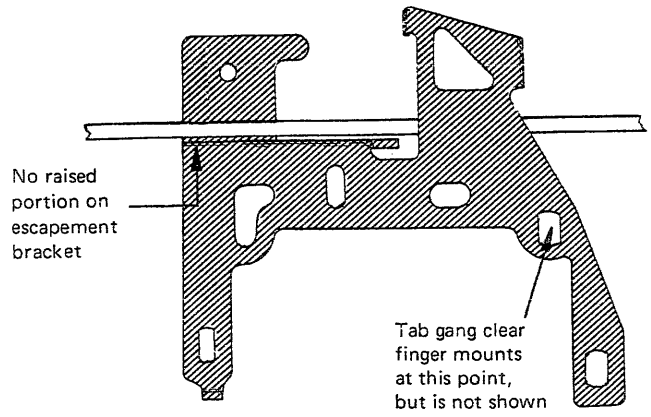


Figure 3-285. Tab Mechanism Identification (Level 2)

Tab-Lever Stop (Level 2)

Level 2 Only: Form the stop on the escapement bracket to obtain 0.001" to 0.003" clearance between the vertical lug on the tab lever and the backspace pawl, when the tab lever is at rest and the backspace pawl is fully seated in its rack. On printers without backspace, adjust for from 0.001" to 0.007" between the vertical lug on the tab lever and the escapement pawl.

This small clearance ensures that the backspace pawl will be allowed to "bottom" in its rack and that a minimum amount of tab-lever motion will be required to remove both the backspace and escapement pawls from their racks during a tab operation.

Level 3: Do not adjust.

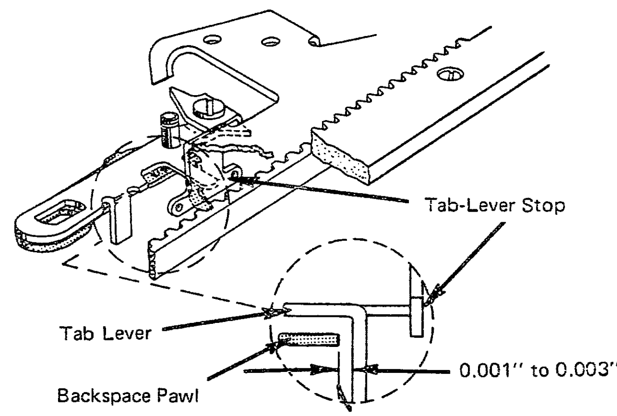


Figure 3-286. Tab-Lever Stop (Level 2)

Tab-Lever Pawl (Level 2)

> *NOTE:* The pusher end of the large spring hook is approximately 0.035" thick and can be used as a gage for this adjustment.

With the tab lever *at rest,* adjust the pawl forward or backward on the tab lever so that the tip of the pawl clears a set tab stop by from 0.035" to 0.050".

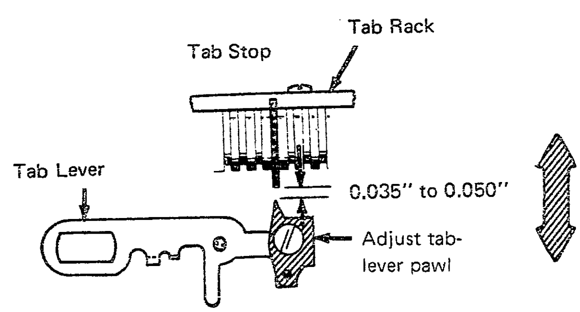


Figure 3-287. Tab-Lever Pawl (Level 2)

Tab-Lever Pawl (Level 3)

With the tab lever *latched out,* adjust the tab-lever pawl for a 0.020" to 0.050" bite on a set tab stop.

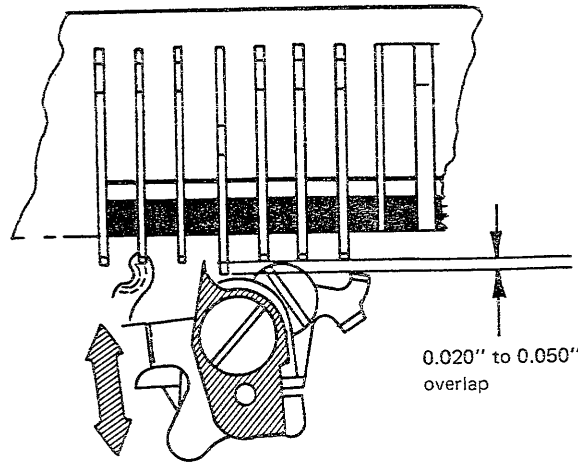


Figure 3-288. Tab-Lever Pawl (Level 3)

Tab-Lever Pawl (Friction Detented Tabs)

With the tab lever at rest, adjust the tab-lever pawl so that the pawl tip clears a set tab stop by from 0.050" to 0.065" This clearance will provide the correct overlap (bite) of from 0.020" to 0.035" on a set tab stop, by the tab pawl in the active position. Excessive overlap could result in tab stops resetting during a tab operation.

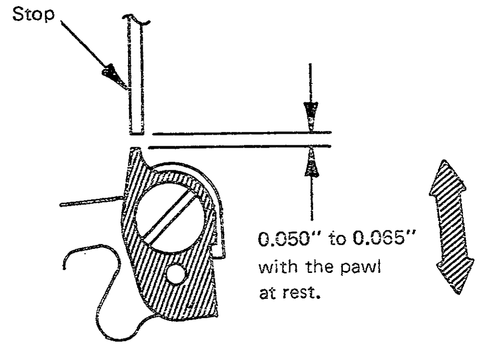


Figure 3-289. Tab-Lever Pawl (Friction-Detented Tabs)

Tab Rack (Level 2 and Level 3)

Level 2: With the tab cam on its high point and the tab lever latched out, adjust the tab rack left or right for a clearance of from 0.005" to 0.020" between a set tab stop and the side of the tab-lever pawl. Hold the carrier firmly so that it can not move, when checking this adjustment.

Level 3: Use the same method of adjustment for Level 3, but adjust for a clearance of from 0.005" to 0.015" clearance.

NOTE: The head of the tab-rack bushing should clear the tab-rack plate by approximately 3/32" when the adjustment is complete.

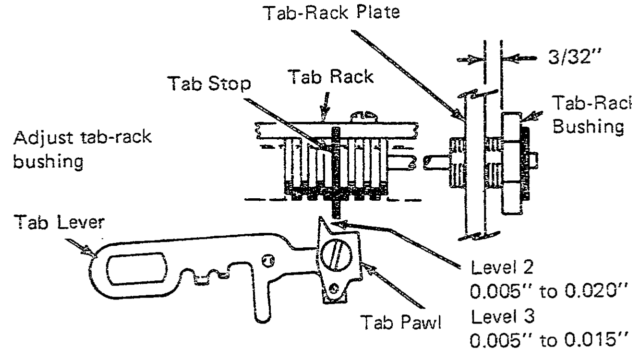


Figure 3-290. Tab Rack (Level 2 and Level 3)

Tab-Pawl Clearance (Level 2)

Form the upright lug of the tab latch forward or backward so that the tip of the escapement pawl clears the escapement-rack teeth by from 0.005" to 0.010" when the tab lever is latched out.

NOTE: The upright lug of the tab latch may be formed with a 3" screwdriver, by using it as a lever, through the hole in the escapement bracket. If excessive forming is required, recheck and refine the adjustment of the tab-lever pawl.

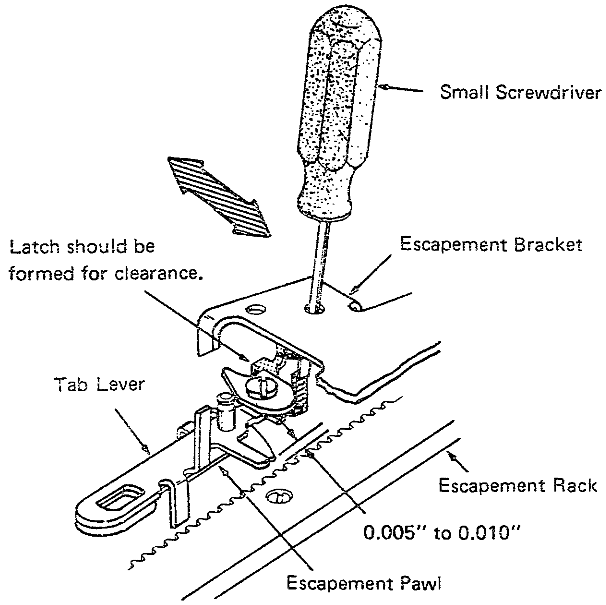


Figure 3-291. Tab-Pawl Clearance (Level 2)

Tab-Pawl Clearance (Level 3)

Do not form the tab-lever latch. With the tab lever latched out, adjust the escapement-pawl lever so that the tip of the escapement pawl clears the escapement-rack teeth by from 0.003" to 0.012".

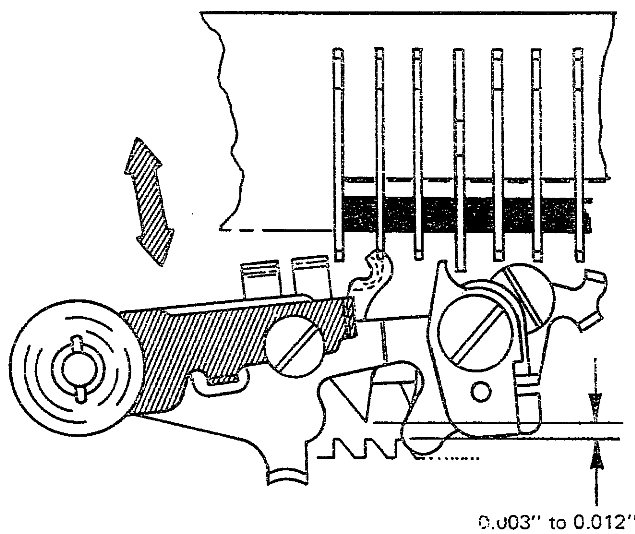


Figure 3-292. Tab-Pawl Clearance (Level 3)

Carrier Return/Tab Interlock (Level 2)

With the carrier-return clutch latch in a carrier-return operation, the upright lug of the tab latch should clear the end of the tab-lever pawl by from 0.005" to 0.025". The rear lug of the tab latch should be formed forward or backward to obtain this condition. This adjustment allows the carrier return to unlatch the tab lever.

NOTE: After this adjustment is made, the carrier-return mechanism should be unlatched and a tab lever latched out. The rear lug on the tab latch should be checked again to ensure that it is not touching the escapement torque bar.

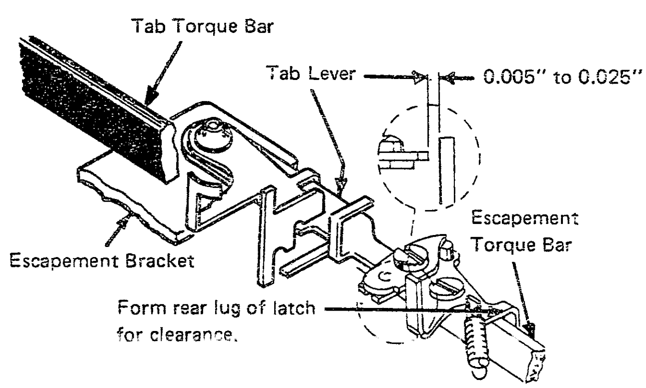


Figure 3-293. Carrier Return/Tab Interlock (Level 2)

Carrier Return/Tab Interlock (Level 3)

Hand-cycle a space-escapement operation until the escapement knock-off trigger is ready to release the escapement torque bar. At this point, check for a clearance of from 0.005" to 0.020" between the upright lug of the tab latch and the right end of the tab lever. Form the rear lug of the tab latch that is behind the escapement torque bar, for this clearance.

> *NOTE:* This adjustment will ensure that any time the escapement torque bar is operated (escapement and carrier return), the tab mechanism will be unlatched.

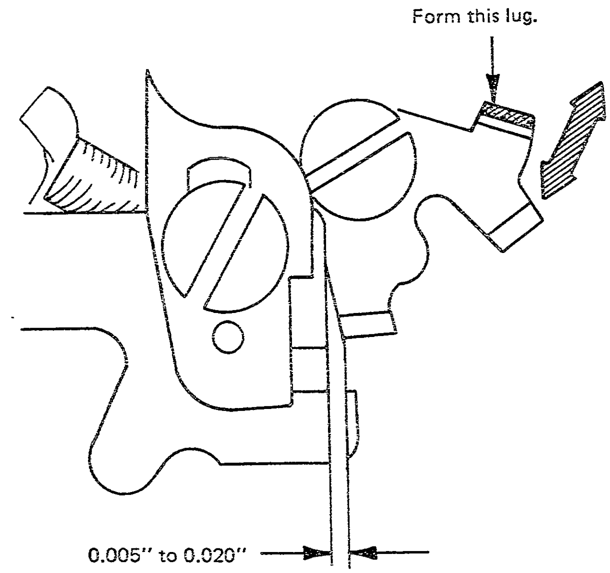


Figure 3-294. Carrier Return/Tab Interlock (Level 3)

Tab-Trigger Extension

Level 2 Only: Carefully form the front (curved) lug of the tab trigger to obtain a clearance of from 0.002" to 0.006" between the tab trigger and the tab torque bar, with the tab lever latched out.

Level 3: Level 3 tab mechanisms do not have the tab-trigger extension.

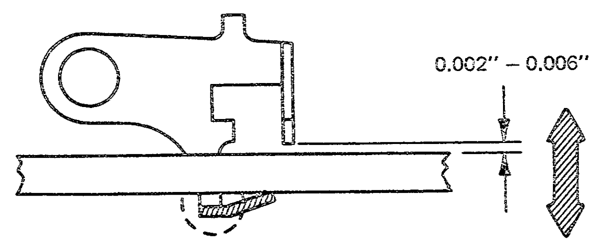


Figure 3-295. Tab-Trigger Extension

Tab-Lever Overthrow (Level 2 and Level 3)

With the carrier in the center of the machine and the tab cam on its high point, adjust the torque-bar actuating link (tab adjusting screw on 11-inch machines) for 0.005" to 0.015" overthrow between the tab latch and the tab lever.

> *NOTE:* Tap the carrier lightly to free the tab torque bar when making this adjustment. The overthrow stop must not interfere with this adjustment.

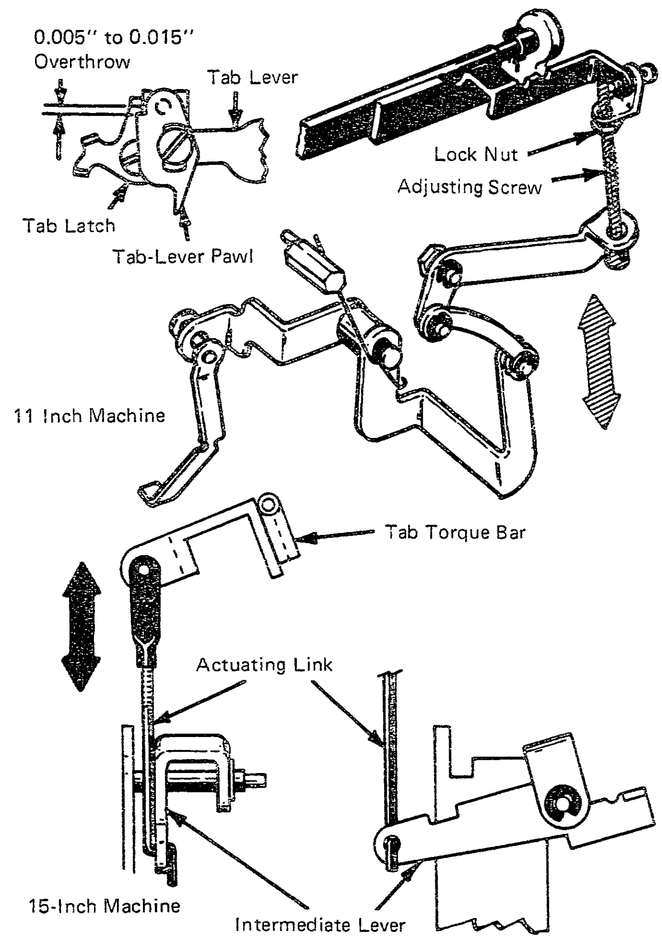


Figure 3-296. Tab-Lever Overthrow (Level 2 and Level 3)

Tab-Torque-Bar Overthrow Stop

Level 2 and 3: With the tab cam on its high point, form the upright lug on the left end of the torque bar for a clearance of from 0.001" to 0.010" between this lug and the overthrow stud.

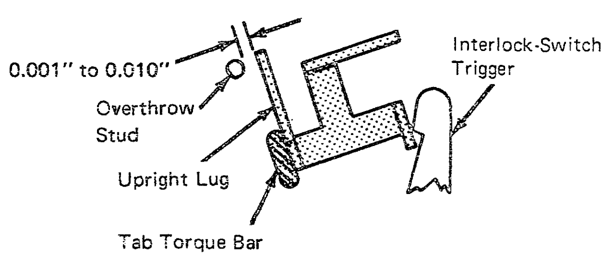


Figure 3-297. Tab-Torque-Bar Overthrow Stop

Tab-Lever Overthrow Stop and Retaining Plate (Level 2)

Level 2: Replace the tab-torque-bar overthrow stop and retaining plate. Adjust the plate left or right so that the overthrow lug on the plate falls directly in line with the upper lug on the tab trigger. Adjust the plate, front to rear, so that the tab torque bar maintains a clearance of from 0.001" to 0.002" from the raised portion on the escapement bracket. Form the overthrow-stop lug on the plate for a clearance of from 0.005" to 0.010" from the tab-lever trigger, when the tab cam is on its high point.

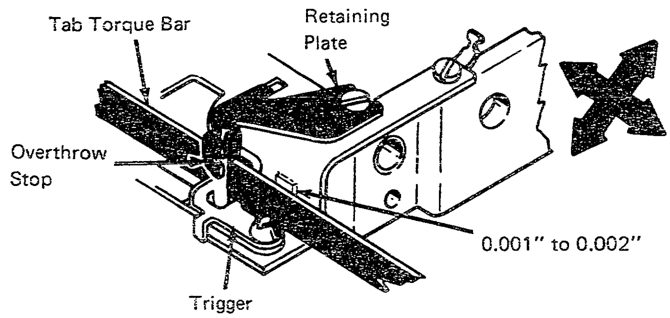


Figure 3-298. Tab-Lever Overthrow Stop and Retaining Plate (Level 2)

Tab Retaining Plate (Level 3 Only)

Replace the tab-torque-bar retainer and position it so that there is a clearance of from 0.002" to 0.005" between the torque bar and the retainer.

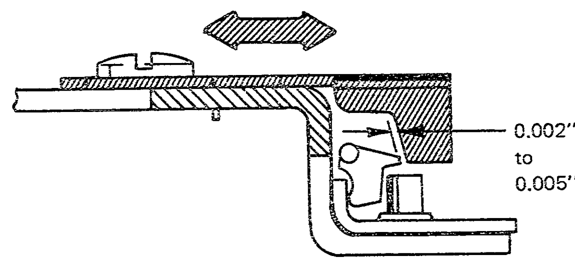


Figure 3-299. Tab Retaining Plate (Level 3 Only)

TAB MECHANISM (767 PRIMARY PRINTER)

Tab-Lever Stop (767)

The escapement-bracket lug that acts as a forward stop for the tab lever should be adjusted so there is 0.001" to 0.003" clearance between the tab-lever lug and the backspace pawl.

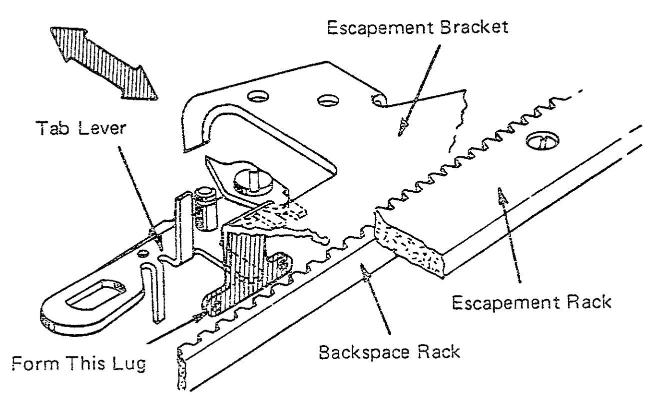


Figure 3-300. Tab-Lever Stop (767)

Tab-Lever Pawl (767)

Adjust the tab-lever pawl forward or backward on the tab lever so the tip of the pawl clears the set tab stop by 0.035" to 0.050" with the tab lever at rest.

> *NOTE:* The push end of the large spring hook is 0.035" thick.

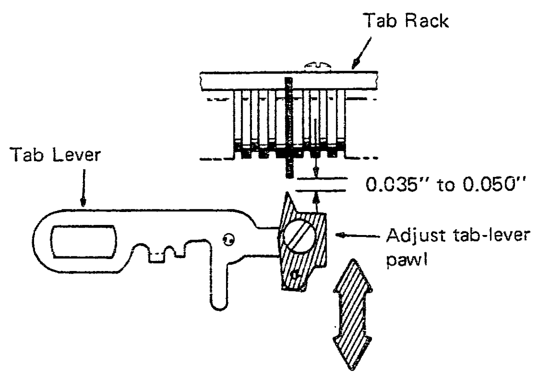


Figure 3-301. Tab-Lever Pawl (767)

Tab Rack (767)

Adjust the tab-rack bushing so there is 0.010" to 0.015" clearance between the tip of the tab-lever pawl and the tab stop as the tips are in line with each other.

> *NOTE:* The head of the tab-rack bushing should clear the tab-rack plate by about 3/32" when the adjustment has been completed.

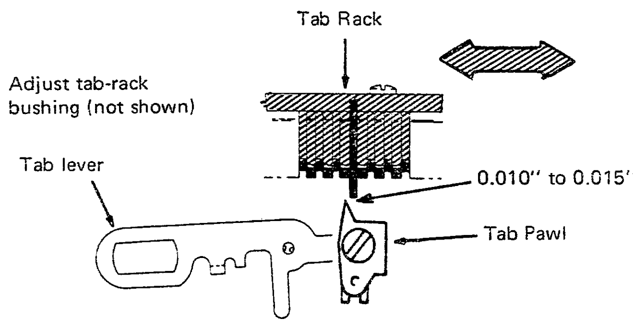


Figure 3-302. Tab Rack (767)

Pawl Clearance

Form the upright lug of the tab latch forward or backward so the tip of the escapement pawl clears the escapement-rack teeth by 0.005" to 0.015" when the tab lever is latched to the rear.

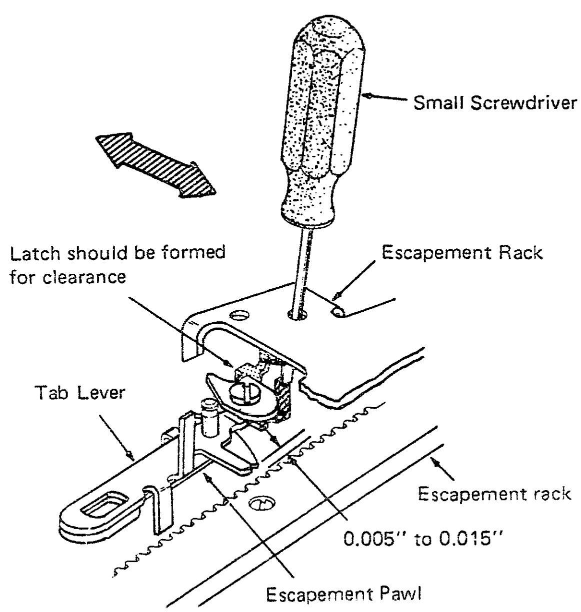


Figure 3-303. Pawl Clearance (767)

Tab Torque Actuating Arm (767)

Adjust so that, with the torque bar vertical, the top of the actuating arm is horizontal.

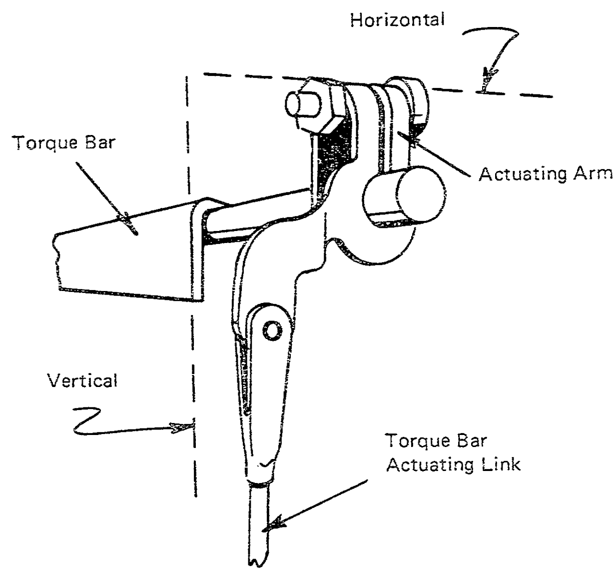


Figure 3-304. Tab Torque Actuating Arm (767)

Tab Operating Links (767)

1. Adjust the torque-bar actuating link so the front side of the torque bar is vertical (with the intermediate lever against its stop).
2. Adjust the intermediate link so the tab lever will overthrow the tab-lever latch by 0.005" to 0.015".

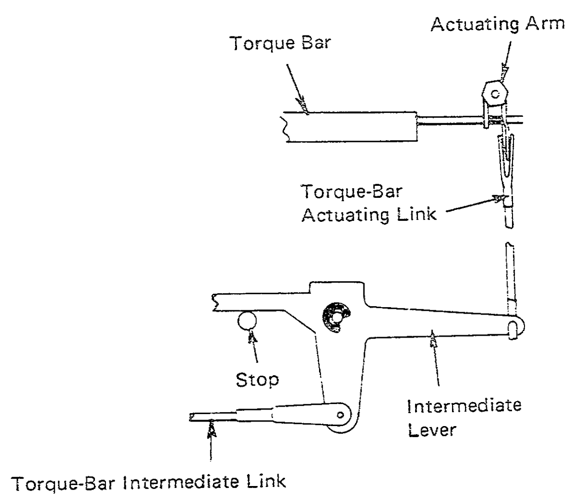


Figure 3-305. Tab Operating Links (767)

Torque-Bar Backup Bracket and Collar (767)

Adjust the torque-bar backup bracket front to rear for 0.001" to 0.003" clearance between the ear on the bracket and the tab torque bar. Check with the carrier at the extreme right and left margin, with the torque bar at rest.

Adjust the tab-torque-bar collar for a clearance of 0.002" to 0.004" between the torque bar and the collar with the torque bar held against the ear on the backup bracket.

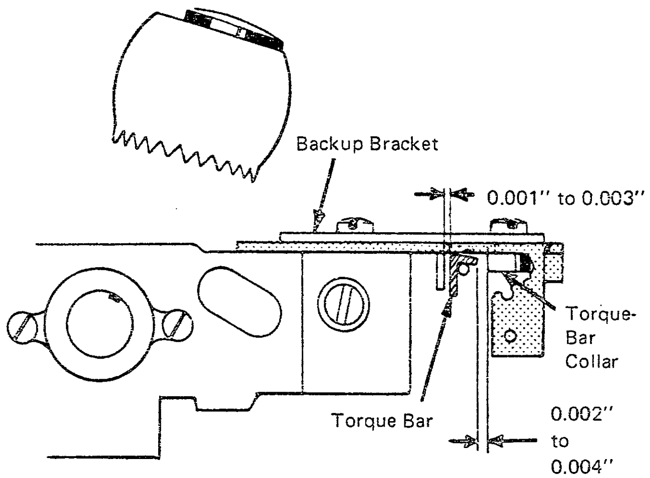


Figure 3-306. Torque-Bar Backup Bracket and Collar (767)

Carrier-Return/Tab Interlock (767)

With the carrier-return clutch latched, the upright lug of the tab latch should clear the end of the tab-lever pawl by 0.005" to 0.025". The rear lug of the tab latch should be formed forward or backward to obtain this condition.

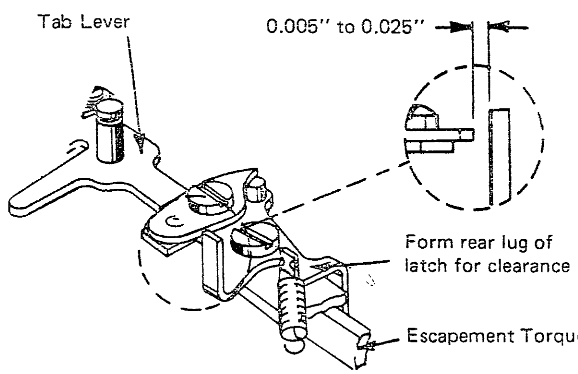


Figure 3-307. Carrier Return/Tab Interlock (767)

TAB MECHANISM (LEVEL 1)

NOTE 1: The Level 1 tab mechanism can be identified by the Level 1 escapement bracket (not shown) on very early-level machines before the tab gang-clear finger was used. It is similar to the Level 2 escapement bracket except that it does not have the raised portion.

NOTE 2: The escapement bracket, torque-bar stop, and pawl mounting stud must be correct before the tab adjustments are made. If the escapement bracket is re-adjusted, all escapement adjustments must be checked before proceeding with the tab adjustments.

NOTE 3: The overthrow stop and retaining plate can be removed and left off for the following adjustments.

Tab Lever Stop (Level 1)

Form the stop on the escapement bracket to obtain a clearance of from 0.001" to 0.003" between the vertical lug on the tab lever and the backspace pawl, when the tab lever is at rest and the backspace pawl is fully seated in its rack.

This small clearance ensures that the backspace pawl will be allowed to "bottom" in its rack and that a minimum amount of tab-lever motion will be required to remove both the backspace and escapement pawls from their racks during a tab operation.

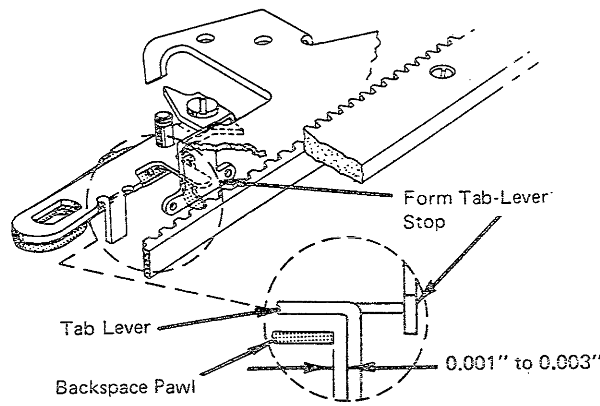


Figure 3-308. Tab-Lever Stop (Level 1)

Tab Lever Pawl (Level 1)

Adjust the pawl forward or backward on the tab lever so that the tip of the pawl clears a set tab stop by from 0.035" to 0.045" with the tab lever at rest.

The adjustment of the tab-lever pawl affects the amount of overlap between the tab stop and the pawl tip in the active position. It also directly affects the pawl clearance during tabulation. Unless the tab-lever pawl is properly adjusted, correct pawl clearance cannot be obtained.

Measure the adjustment of the tab-lever pawl by using the pusher end of the large spring hook. The pusher end is approximately 0.035" thick.

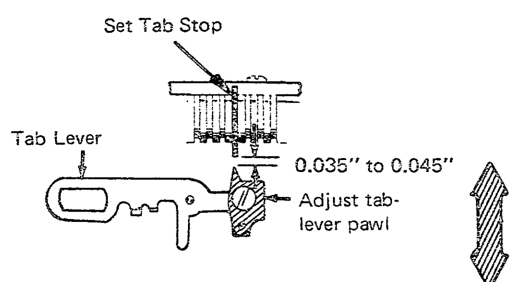


Figure 3-309. Tab-Lever Pawl (Level 1)

Tab Rack (Level 1)

With the tab cam on its high point and the tab lever latched out, adjust the tab rack left or right for a clearance of from 0.005" to 0.020" between a set tab stop and the side of the tab-lever pawl. Hold the carrier firmly so that it can not move when checking this adjustment.

NOTE: The head of the tab-rack bushing should clear the tab-rack plate by approximately 3/32" when the adjustment is complete.

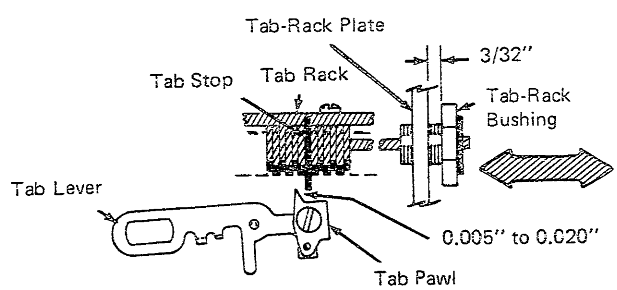


Figure 3-310. Tab Rack (Level 1)

Pawl Clearance (Level 1)

The upright lug of the tab latch should be formed forward or backward so that the tip of the escapement pawl clears the escapement-rack teeth by from 0.005" to 0.010" when the tab lever is latched to the rear.

This adjustment ensures that the escapement pawl will reenter the rack quickly to minimize the chances of entering the wrong rack tooth. If clearance is excessive, the tab keylever and associated parts also might not have enough throw to positively latch the tab lever each time.

The upright lug of the tab latch may be formed by using a 3" screwdriver as a lever through the hole in the escapement bracket. If excessive forming is required, recheck and refine the adjustment of the tab-lever pawl.

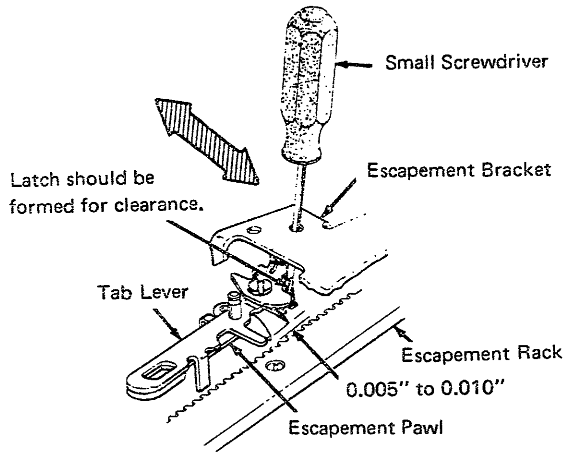


Figure 3-311. Pawl Clearance (Level 1)

Tab-Lever Overthrow, 11-Inch Machine (Level 1)

Position the adjusting plate front to rear so the actuating link and clevis clears the power frame.

NOTE: Clearance must be observed throughout the full motion of the tab bellcrank.

Position the adjusting plate with the tab interposer released and the backspace cam on its high point, rotating the torque bar (relative to the adjusting plate) so the tab lever overthrows the tab latch by 0.005" to 0.015".

The tab-lever overthrow stop or the tab-torque-bar overthrow stud must not limit this adjustment.

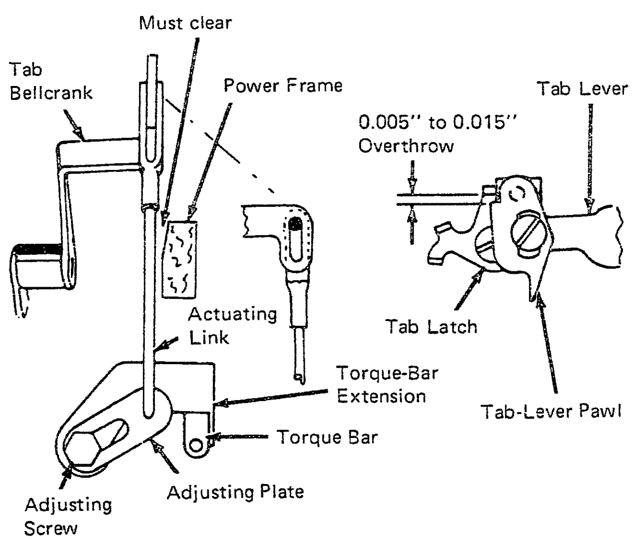


Figure 3-312. Tab-Lever Overthrow, 11-Inch Machine (Level 1)

Actuating Link, 15-Inch Machine (Level 1)

With the Tab/Sp/Bksp cam latched and the intermediate lever resting against its upstop, adjust the actuating-link clevis so the tab torque bar hangs vertically.

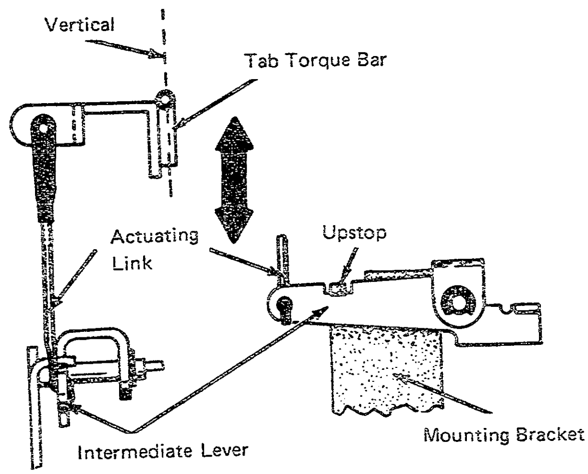


Figure 3-313. Actuating Link, 15-Inch Machine (Level 1)

Intermediate-Lever Tab, 15-Inch Machine (Level 1)

With the tab interposer released and the Tab/Sp/Bksp cam on its high point, form the intermediate-lever tab so that the tab-lever pawl overthrows the 'tab' latch by from 0.005" to 0.010".

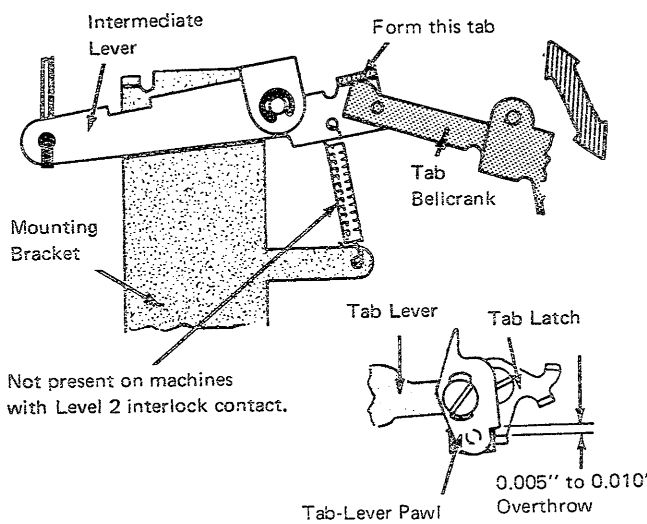


Figure 3-314. Intermediate-Lever Tab, 15-Inch Machine (Level 1)

Lockout Lever (Level 1)

Position the lockout lever to clear the torque bar by from 0.005" to 0.010", with the torque bar at rest.

> *NOTE:* The position of the lockout lever must not choke off the motion of the tab lever during unlatching. On Level 2 and Level 3 machines, the tab-lever trigger replaces the lockout lever and is not adjustable.

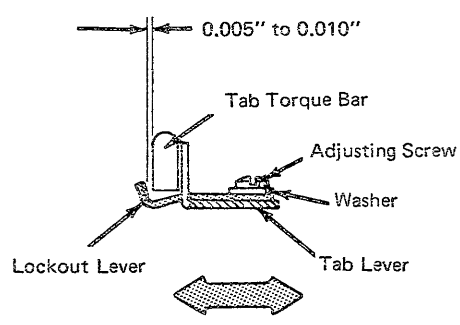


Figure 3-315. Lockout Lever (Level 1)

Tab-Torque-Bar Support (Level 1)

With the tab torque bar at rest, position the torque-bar support (relative to the escapement plate) to clear the torque bar by from 0.001" to 0.006".

The purpose of the torque-bar support is the same as the retaining plate on Level 2 and Level 3 tab mechanisms.

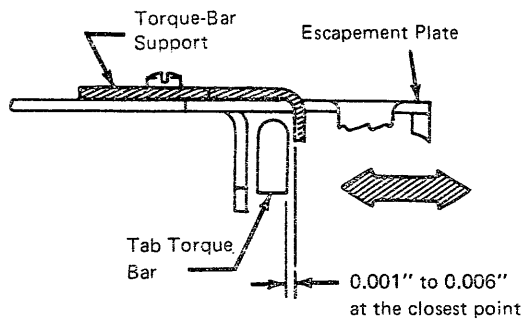


Figure 3-316. Tab-Torque-Bar Support (Level 1)

Tab-Lever Overthrow Stop (Level 1)

Adjust forward or backward so that there is a clearance of from 0.005" to 0.015" between the lug of the tab lever and the overthrow stop, when the tab lever is latched to the rear.

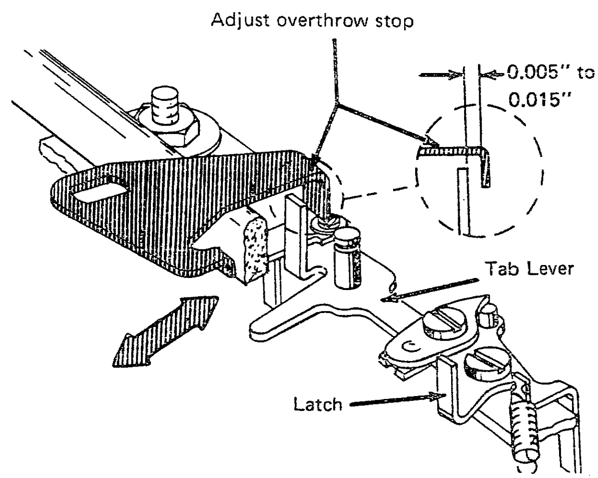


Figure 3-317. Tab-Lever Overthrow Stop (Level 1)

Carrier Return/Tab Interlock (Level 1)

With the carrier return clutch latched, the upright lug of the 'tab' latch should clear the end of the tab lever pawl by from 0.005" to 0.025". The rear lug of the 'tab' latch should be formed forward or back, to obtain this condition. The lug may be formed by using the pusher end of the large spring hook as a T-bender.

The adjustment ensures that the carrier return and tab cannot both be latched simultaneously. If both were allowed to latch, the tab lever pawl would lock against a set tab stop during the carrier return operation.

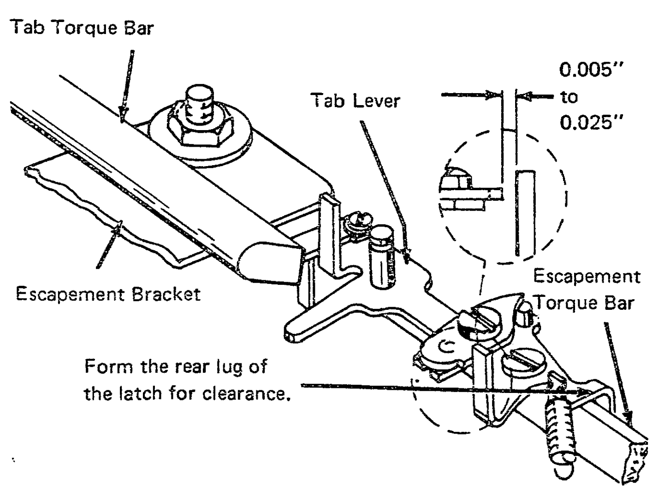


Figure 3-318. Carrier Return/Tab Interlock (Level 1)

MARGIN CONTROL MECHANISM

Margin-Rack Overbank Guide (Level 2)

With the carrier resting at the left margin, adjust the overbank guide left or right on the margin rack to obtain a clearance of from 0.001" to 0.005" between the margin stop and the margin-stop latch on the carrier, when the margin rack is in its rest position. To check this clearance, remove the floating action of the margin-stop latch by pulling the stop latch to the right with a spring hook.

The adjustment ensures that the left margin stop will set accurately when the stop is slid to the right, against the margin-stop latch on the carrier.

> *NOTE:* Machines having a Level 1 margin rack use an eccentric plate mounted on the right end of the margin rack to control the rest position of the rack. Use the same procedure indicated above to obtain the 0.001" to 0.005" clearance between the margin stop and the stop latch on the carrier.

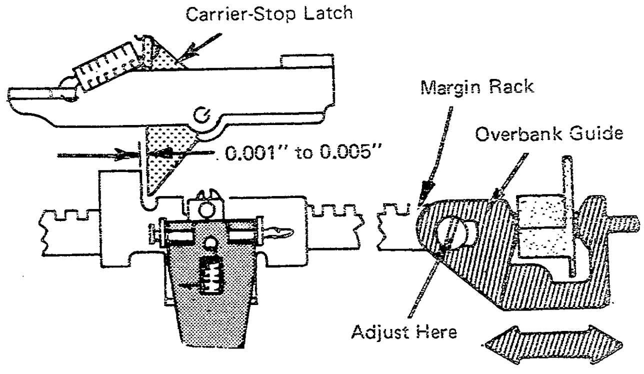


Figure 3-319. Margin-Rack Overbank Guide (Level 2)

Margin Release, 11-Inch Machine (Level 1)

With the margin-release keylever at rest, loosen the fluted screw in the margin-release lever and rotate the margin rack (within the release lever) to a level position. Then tighten the fluted screw.

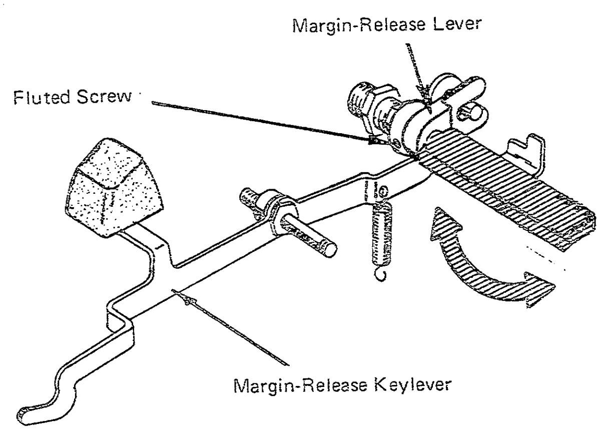


Figure 3-320. Margin Release, 11-Inch Machine (Level 1)

Margin Release, 11-Inch Machine (Level 2)

Form the margin-set-lever stop, which is fastened to the left end of the margin rack, so the margin rack is level when the margin release keylever is at rest.

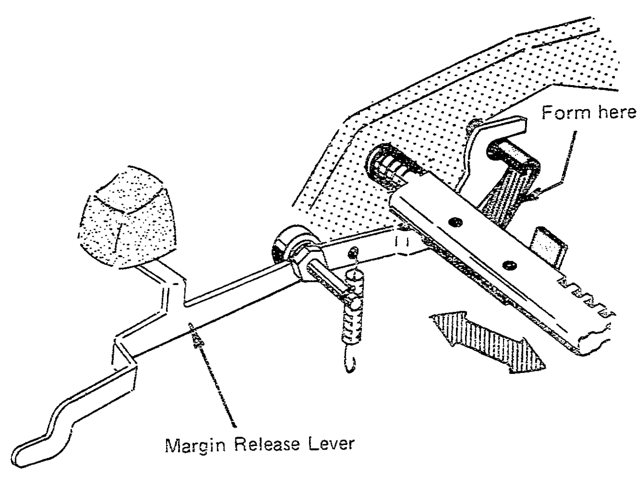


Figure 3-321. Margin Release, 11-Inch Machine (Level 2)

Margin Release, 15-Inch and 767 Machines (Level 1)

With the margin-release keylever at rest, loosen the left margin-release lever and adjust it radially about its shaft so the top surface of the margin-release lever is parallel with the slope of the side frame. The lever should also be positioned laterally on its shaft so it operates freely without restricting the margin-rack motion when the rack is pushed to the left into its overbank position.

With the margin-release keylever at rest, loosen the fluted screw in the margin-release lever and rotate the margin rack (within the release lever) to a level position. Then tighten the screw.

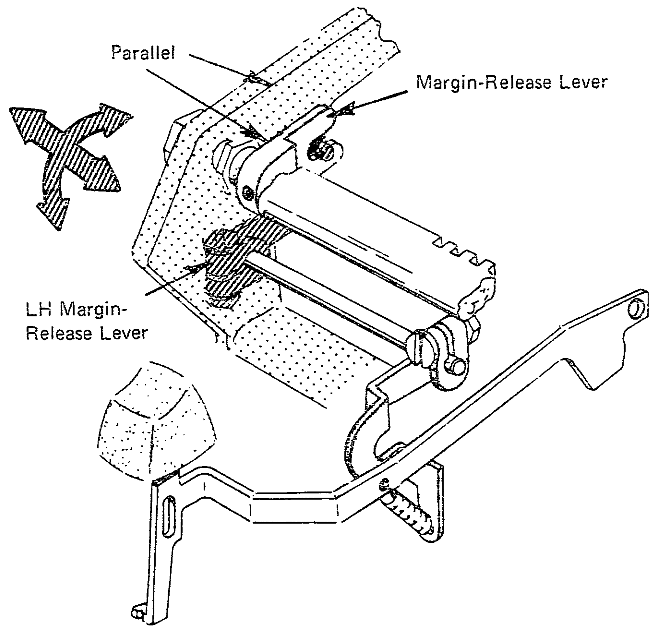


Figure 3-322. Margin Release, 15-Inch and 767 Machines (Level 1)

Margin Release, 15-Inch and 767 Machines (Level 2)

Position the left margin-release lever laterally so that 1/32" of the rolled pin on the margin-set-lever stop protrudes beyond the left face of the left-hand margin-release lever.

Position radially so the margin rack will be horizontal when the margin-release keylever is in its rest position. (This adjustment can be obtained by adjusting either the left or right margin-release lever.)

Margin-Stop Final Stop (Level 1)

Form the lug on the final stop (which is welded to the bottom side of the margin rack) to obtain a clearance of 0.001" to 0.010" between the final stop and the margin stop with the margin-stop pin fully seated in the extreme left tooth of the margin rack.

Margin-Stop Final Stop (Level 2)

Position the margin-set-lever stop left or right on the margin rack so it will clear the margin stop by 0.001" to 0.010" when the margin-stop pin is fully seated in the extreme left tooth of the margin rack.

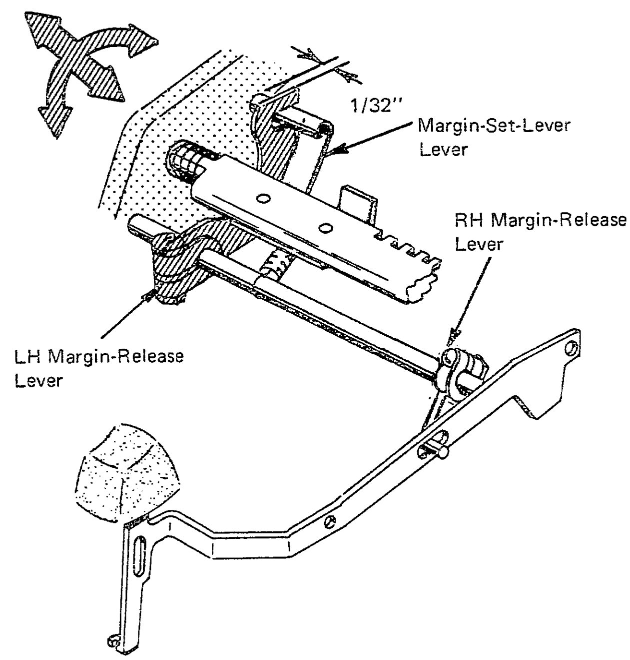


Figure 3-323. Margin Release, 15-Inch and 767 Machines (Level 2)

Bell-Ringer-Bail Adjusting Plate (Level 2)

Position the adjusting plate so the bell ringer bail is parallel to the margin rack.

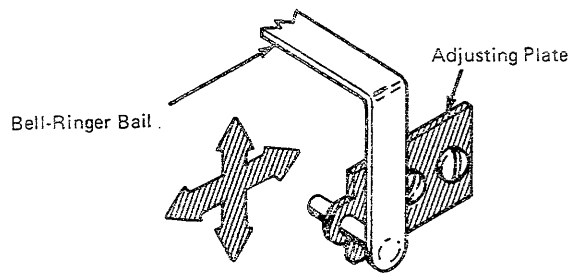


Figure 3-324. Bell-Ringer-Bail Adjusting Plate (Level 2)

Bell-Ringer-Bail Lever (Level 1)

NOTE: When adjusting the bell-ringer-bail lever (all levels), maintain 0.002" to 0.004" end play in the bell-ringer bail.

With the carrier positioned away from the right margin stop, adjust the bail lever on the left end of the bell-ringer bail to have 0.005" to 0.020" clearance with the bell-clapper-bellcrank lever when the bail is at rest against the bail stop located at the right end of the bail.

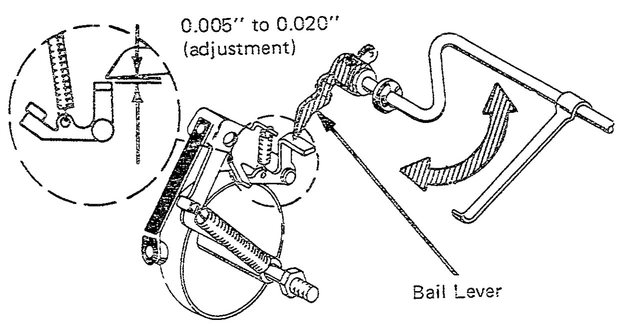


Figure 3-325. Bell-Ringer-Bail Lever (Level 1)

Bell-Ringer-Bail Lever (Level 2)

With the carrier positioned away from the right margin stop, adjust the bail lever on the left end of the bell-ringer bail so that, when the bottom portion of the lever is allowed to contact the underside of the bell-clapper-bellcrank lever, a clearance of 0.005" to 0.020" will exist between the bell-ringer bail and the bell-ringer bellcrank.

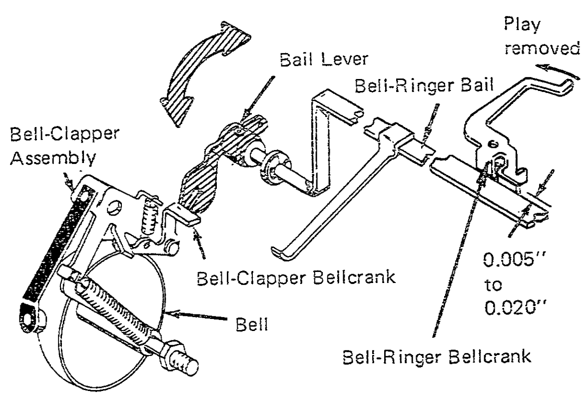


Figure 3-326. Bell-Ringer-Bail Lever (Level 2)

Bell-Ringer-Bail Lever (Level 3)

Adjust the rest position of the bell-ringer bail to clear the bell-ringer bellcrank by 0.005" to 0.020" by forming the lug on the right bell-ringer-bail bracket. The play should be removed from the bell-ringer bellcrank as indicated in the illustration for the Level 2 lever.

With the carrier positioned away from the right margin stop, adjust the bell-bail lever located on the left end of the bell-ringer bail to have 0.015" to 0.025" clearance between the bell ringer bail lever and the bell clapper spring when the bail is at rest.

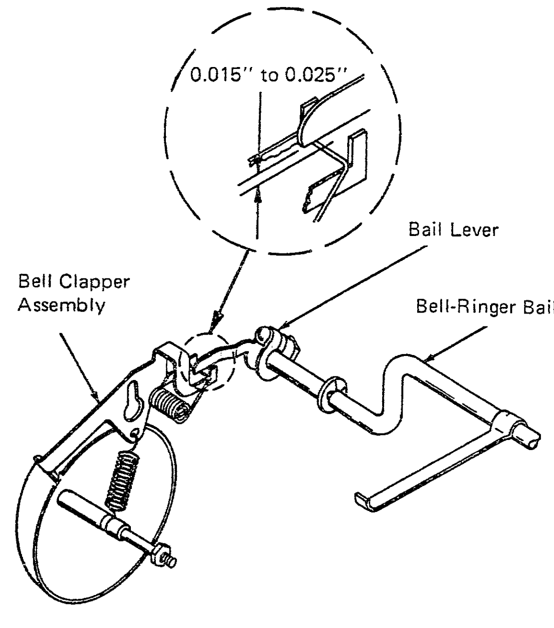


Figure 3-327. Bell-Ringer-Bail Lever (Level 3)

Machines without Bell

The bail stop located on the right end of the bail should be adjusted so the bell-ringer bail is not moved until the bell-ringer bellcrank begins to rise on the final ramp of the line-lock bracket.

Line-Lock Bracket

Adjust the line-lock bracket up or down so the bell-ringer bellcrank will ride 0.047" to 0.062" from the top as the carrier moves into the line-lock position.

The adjustment ensures the bell-ringer bellcrank will remain in contact with the camming surface of the line-lock bracket throughout the line-lock operation. It also ensures that the bell-ringer bellcrank will ride back over the line-lock bracket if the carrier is returned from a position to the right of the right margin.

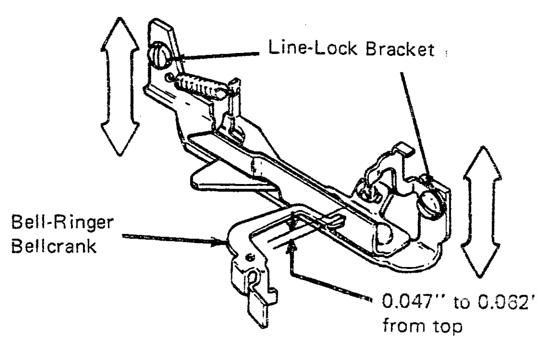


Figure 3-328. Line-Lock Bracket

Bell-Clapper-Bellcrank Lever

The bell should ring one space before the bell-ringer bellcrank moves onto the front surface of the line-lock bracket.

The adjustment is obtained by forming the lug on the bell-clapper bellcrank that acts as a stop for the bell-clapper-bellcrank lever. The forming adjustment changes the amount of bite between the bail lever and the bell-clapper-bellcrank lever.

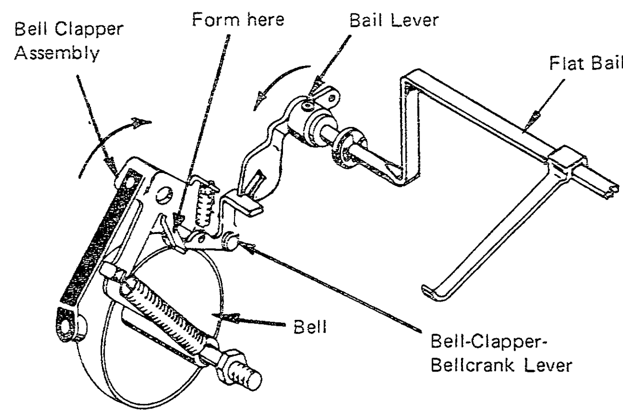


Figure 3-329. Bell-Clapper-Bellcrank Lever

Line-Lock-Bracket Adjustable Plate (Level 1)

Position, with the carrier in the next-to-last space, to a point where the inclined surface just begins to deflect the bell-ringer bellcrank.

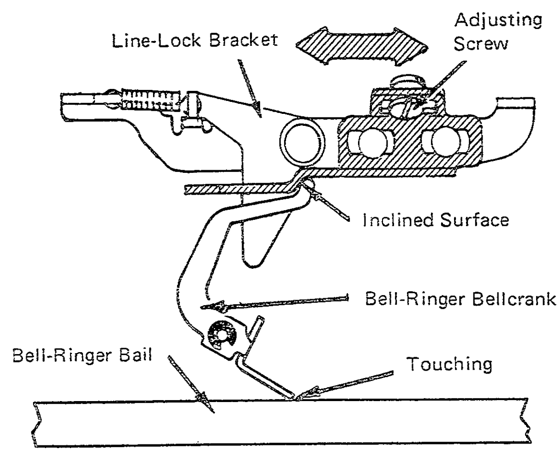


Figure 3-330. Line-Lock-Bracket Adjustable Plate (Level 1)

Line-Lock Bracket-Adjustable Plate (Level 2)

Position, with the carrier in the next-to-last column, to obtain 0.001" minimum clearance between the inclined surface and the bell-ringer bellcrank.

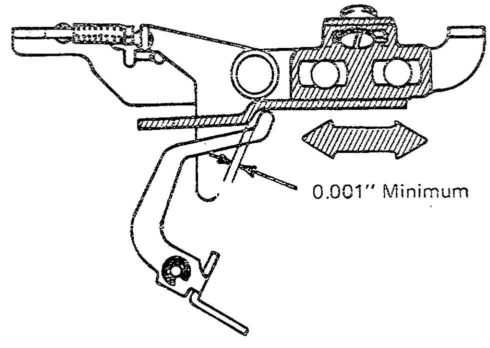


Figure 3-331. Line-Lock Bracket-Adjustable Plate (Level 2)

Line Lock (Level 1)

Form the line-lock actuating arm on the bell-ringer bail so the line-lock interposer is fully pressed when the carrier pointer is in line with the mark on the right margin stop.

NOTE: The line lock should not be felt in the space preceding the desired locking point. The line-lock actuating arm should not be choked off so as to bind the carrier as the spacebar is operated through the line lock.

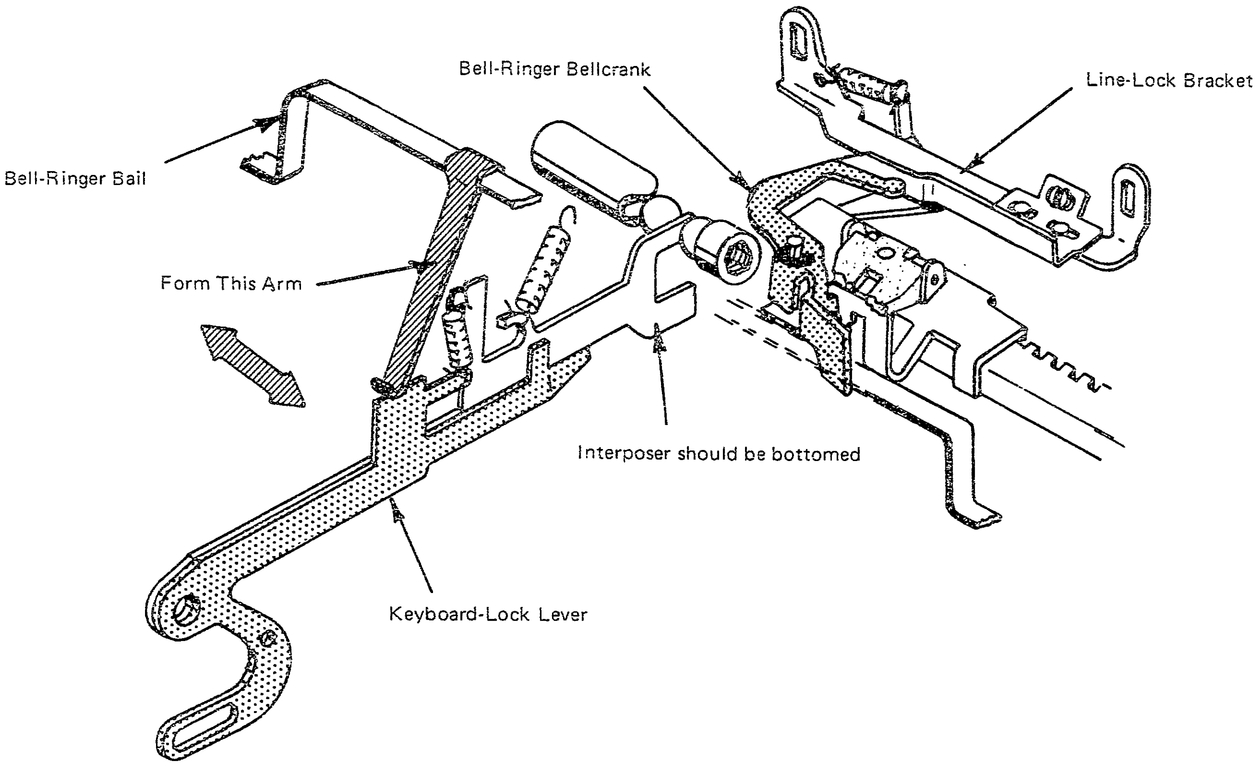


Figure 3-332. Line Lock (Level 1)

Line Lock (Level 2)

Adjust the keyboard line-lock actuating eccentric to lock the keyboard approximately 2/3 space to the left of the right-hand margin.

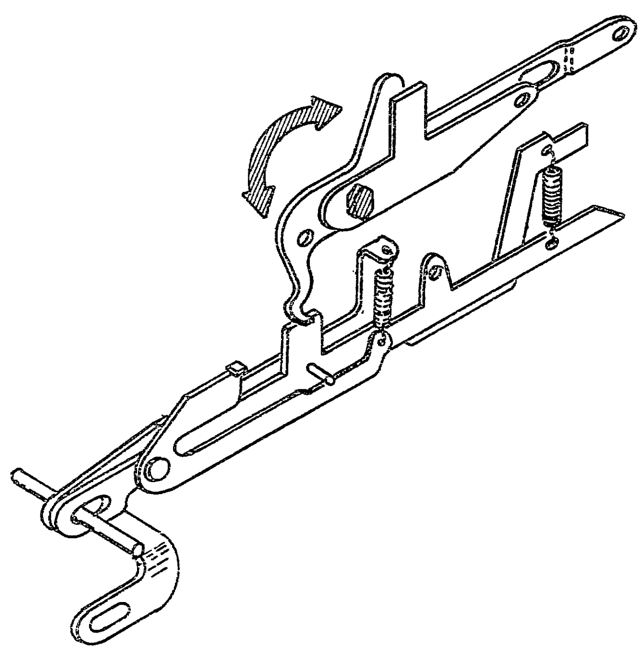


Figure 3-333. Line Lock (Level 2)

PAPER-FEED MECHANISM

NOTE 1: For pin-feed-platen machines, use only the adjustments for "Paper Release", "Deflector", and "Line-Gage Card Holder", following.

NOTE 2: Before any paper-feed adjustments are attempted, the position of the platen *must* be correct.

Paper-Feed Braces (Level 1 Only)

With the feed-roll tension springs disconnected, the adjustable braces fastened to the paper-feed mounting arms should be adjusted all the way forward, without deflecting either the feed-roll actuating shaft or the carriage tie rod.

Paper-Feed Mechanism (Level 1)

With the feed-roll tension springs disconnected, the vertical supports for the carriage tie rod and the feed-roll actuating shaft should be adjusted to just touch the bottom of each shaft. The feed-roll actuating-shaft support should be loose when the tie-rod support is adjusted.

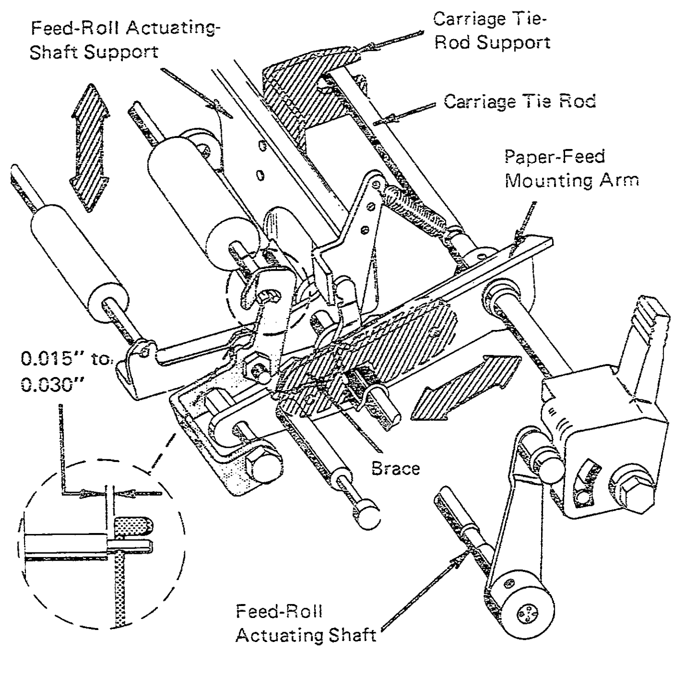


Figure 3-334. Paper-Feed Mechanism (Level 1)

Paper-Feed Mechanism (Level 2)

With the feed-roll tension springs disconnected, position the center support bracket so that the forward lug just touches the underside of the feed-roll shaft while the rear lug just touches the top of the carriage tie rod. The center support bracket should not bow the copy-control shaft.

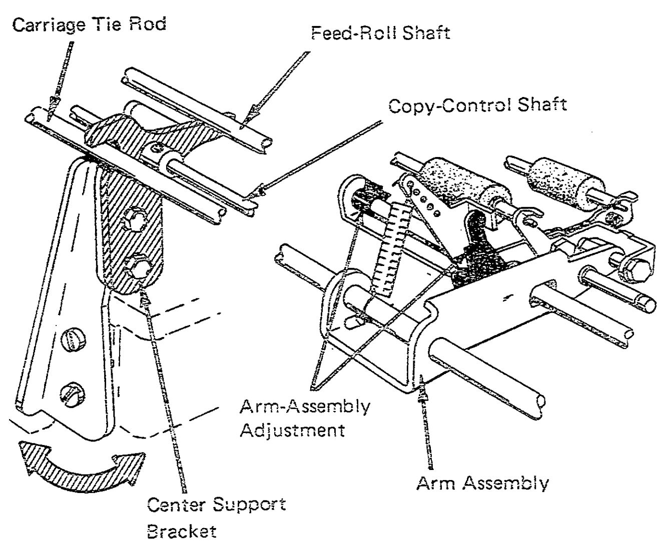


Figure 3-335. Paper-Feed Mechanism (Level 2)

Feed-Roll Tension

Remove the platen and deflector. Place the feed-roll tension springs in the hole of the feed-roll arms that will provide the following tension on each arm measured at the front feed-roll pivot points.

a. 11-inch machine: 2-3/4 to 3-1/4 pounds
b. 15-inch machine: 2 to 2-1/2 pounds

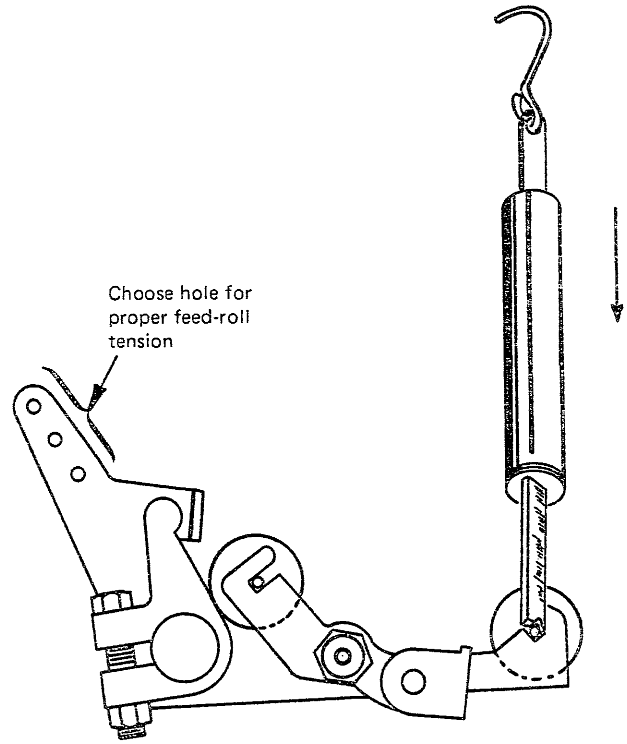


Figure 3-336. Feed-Roll Tension

Feed-Roll Side Play (Level 1)

The right paper-feed mounting arm on the 11-inch machine and the left and right paper-feed mounting arms on the 15-inch machine should be adjusted to provide the rear feed-roll shafts with an end play of 0.015" to 0.030" when the feed rolls are against the platen.

Feed-Roll Side Play (Level 2)

The right front feed-roll-arm assembly on the 11-inch machine and the left and right front feed-roll-arm assemblies on the 15-inch machine should be adjusted to give end play to the feed-roll shafts that will not permit them to contact the sides of the openings in the deflector but will permit them to roll freely.

Feed-Roll Arm (Level 1)

Adjust the eccentrics with the high points to the rear so that three tab cards inserted between the platen and the rear feed rolls will cause a clearance of from 0.008" to 0.012" between the front feed rolls and the platen. The clearance should be equal on both ends of the feed roll.

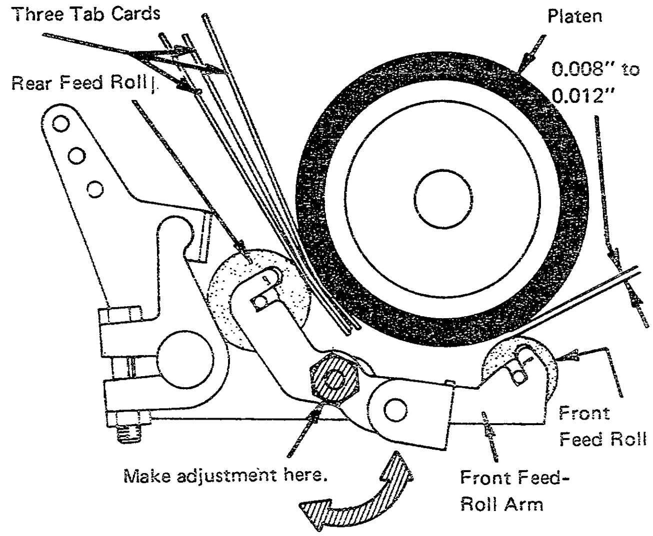


Figure 3-337. Feed-Roll Arm (Level 1)

Feed-Roll Arm (Level 2)

Adjust the front feed-roll adjusting arms as follows: When three tab cards are placed between the front feed rolls and the platen, the rear feed rolls should clear the platen. When two tab cards are placed between the front feed rolls and the platen, the rear feed rolls should touch the platen.

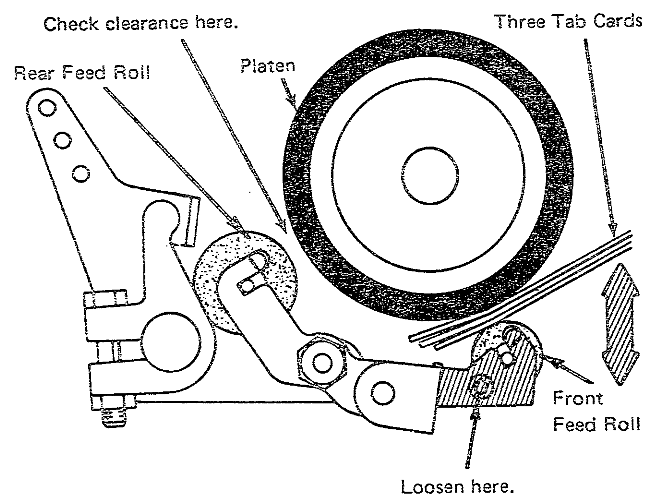


Figure 3-338. Feed-Roll Arm (Level 2)

Paper Release

Adjust the feed-roll-release levers to obtain a release clearance of at least 0.055" between the rear feed roll and the platen. The clearance should be the same at each end.

Excessive clearance can cause interference between the front feed roll and the carrier, whereas insufficient clearance will not permit straightening of thick paper packs.

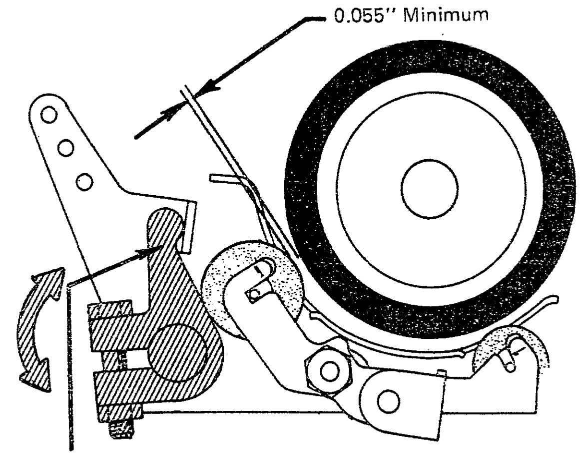


Figure 3-339. Paper Release

Deflector

Position the deflector by forming the deflector supporting tabs on the front and rear feed-roll arms so that there is a clearance of from 0.010" to 0.020" between the front and rear of the deflector and the platen. Three tab cards inserted between the platen and the deflector (at the front and rear) should provide a slight drag. No drag should be felt when one tab card is inserted.

Paper Bail

1. Bail Shaft–Position the shaft in the right bail arm so that each arm can be pulled forward the same distance from the platen before the entire bail begins to move. This ensures that both bail rollers will have equal pressure against the platen.

   NOTE: Neither bail arm should be deflected left or right after the bail shaft is tightened.

2. Bail Stop–Form the lugs that stop the rearward movement of the paper-bail arms to obtain a clearance of from 0.005" to 0.010" between the lugs and the bail arms, when the copy-control lever is at its extreme rear position. This prevents interference between the bail arms and the line-gage card holder when the platen is removed.
3. Adjust the retaining clips on the right and left lever mounting studs to give 0.002" to 0.006" end play to each bail lever.

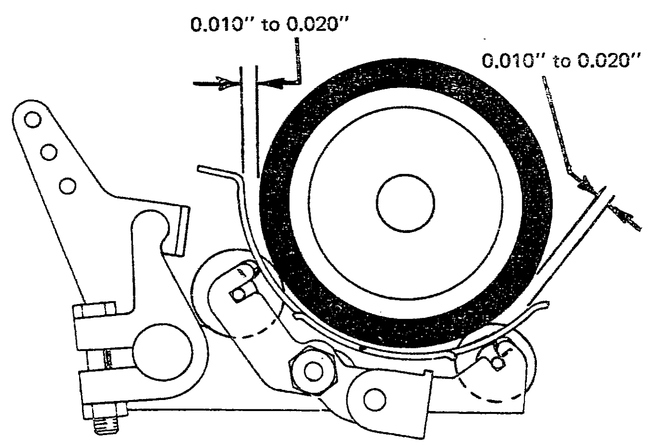


Figure 3-340. Deflector

Line-Gage Card Holder

1. Adjust the line-gage card holder forward or backward for a clearance of from 0.005" to 0.010" with the platen.

   NOTE: On pin feed platens: Adjust for from 0.005" to 0.015" between the ribbon lift and the card holder; 0.035" between the platen and the card holder.

2. The vertical adjustment should be such that the graduated edge is parallel to, and from 0.002" to 0.005" below, the feet of the typed characters, when viewed from the operator's position.
3. Adjust the card holder left or right so that the point of a letter "V" will align with the mark in the middle of the line-gage card holder.

   NOTE: On pin-feed-platen machines, the graduations on the left card holder should be lined up with the bottom of a series of V's.

FABRIC RIBBON MECHANISM (LEVEL 1)

Centering Springs

With the ribbon-reverse interposer centered, form the lugs of the ribbon-feed plate for a clearance of from 0.003" to 0.005" in the centering-spring loops.

This adjustment ensures that the springs are not extended when at rest and that they will properly restore the mechanism after a reverse operation.

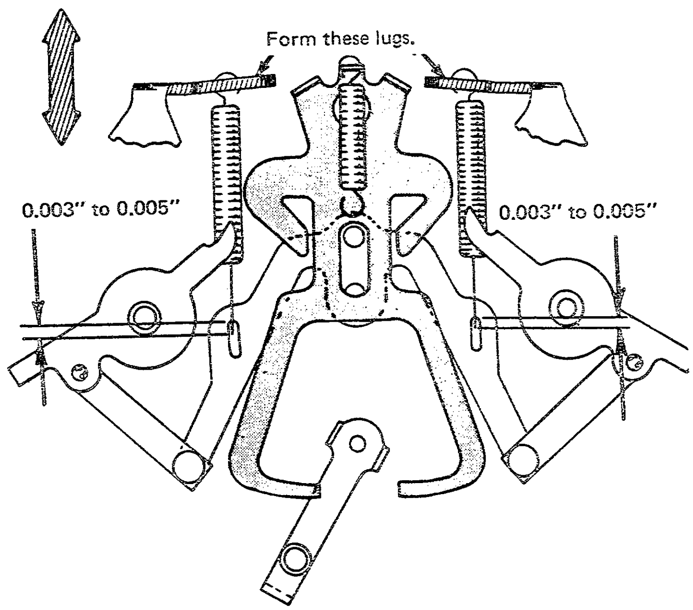


Figure 3-341. Centering Springs

Ratchet Brake Spring

Form the left and right ratchet-brake springs so that each will hold its ratchet in position after the ratchet has been manually rotated far enough to fully actuate the reverse mechanism.

The ratchets should be checked alternately, with the cartridge removed. This is simply a method of testing for the correct braking action of the springs, and it has little to do with the reversing action.

Ribbon-Feed Plate

With the ribbon mechanism set for a reversing operation and the ribbon cam at its high point, adjust the ribbon-feed plate forward or backward so that the ribbon-feed pawl holds the reverse interposer within from 0.001" to 0.015" of its total travel.

This not only ensures sufficient throw for a reversing operation, but also gives optimum ribbon-feed results by determining the rest and active positions for the pawl.

NOTE: After completing the adjustment, manually cycle a character to check that a two-tooth feed is obtained, in addition to from 0.005" to 0.020" overthrow.

The feed pawl must not contact the interposer lever as the pawl is manually reversed from side to side.

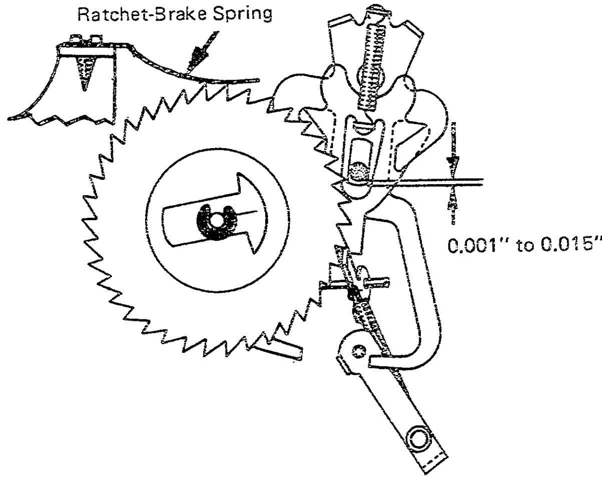


Figure 3-342. Ribbon-Feed Plate

Cartridge Guides

Form the ribbon-feed-plate lug that guides the cartridge into position so that the ribbon spools are centered in the holes of the cartridge and there is from 0.001" to 0.010" lateral movement of the cartridge.

Ribbon-Lift Guide Plate

Adjust the plate as low as possible without causing a change in the ribbon-lift guide height as the ribbon-lift lever is moved from the low-lift the the high-lift position. The ribbon-lift cam should be at the low point when the check is made.

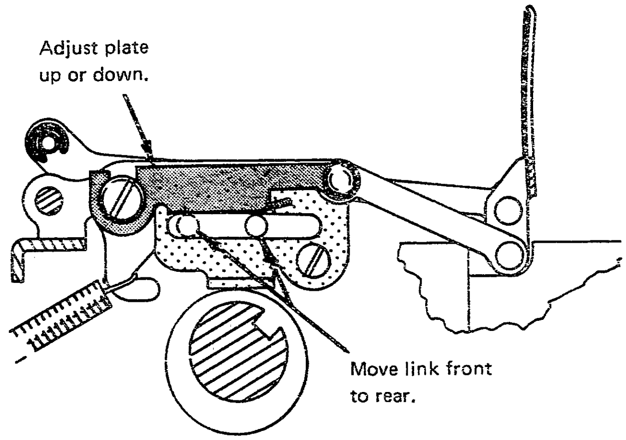


Figure 3-343. Ribbon-Lift Guide Plate

Ribbon-Lift Cam Timing

Line up the dot or small hole in the right side of the ribbon-lift cam with the keyway in the print sleeve. The setscrew in the cam tightens on a flat on the print shaft.

Ribbon-Lift Control Link

Adjust the link forward or backward, by means of the clevis, so that the underscore will strike the ribbon 1/16" from the bottom edge. The ribbon-lift lever must be in the high-lift position when the check is made.

NOTE: Do not adjust the link so short that it chokes off in the front end of the cam-follower slot as the ribbon-lift lever is moved into the high-lift position.

Ribbon-Lift Lock

Adjust the ribbon-lift lock so that it will positively hold the ribbon-lift guide in the load position. The lock is located under the right front corner of the carrier.

Stencil Lockout

With the lift lever in stencil position and the cam follower on the high point of the ribbon-feed cam, form the ribbon-feed latch for a 0.010" clearance with the lug on the cam follower.

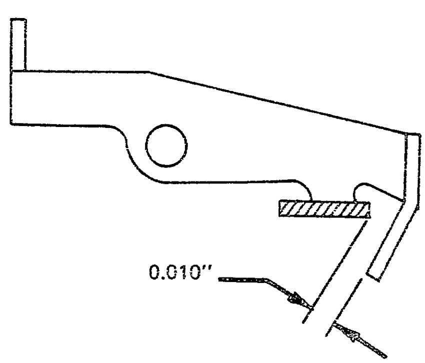


Figure 3-344. Stencil Lockout

FABRIC RIBBON MECHANISM (LEVEL 2)

Cartridge Guide Lugs

Form the cartridge guide lugs so that the cartridge spools will be centered over the ratchets. Side play of the cartridge must be limited to within 0.001" to 0.010".

Cartridge Retaining Springs

The cartridge retaining springs should be firmly against the feed plate and then adjusted, front to rear, so that the cartridge retaining fingers are centered in the holes of the cartridge guide lugs. The ratchet brake portion of the spring should exert a small drag on the feed ratchet. Form only as necessary.

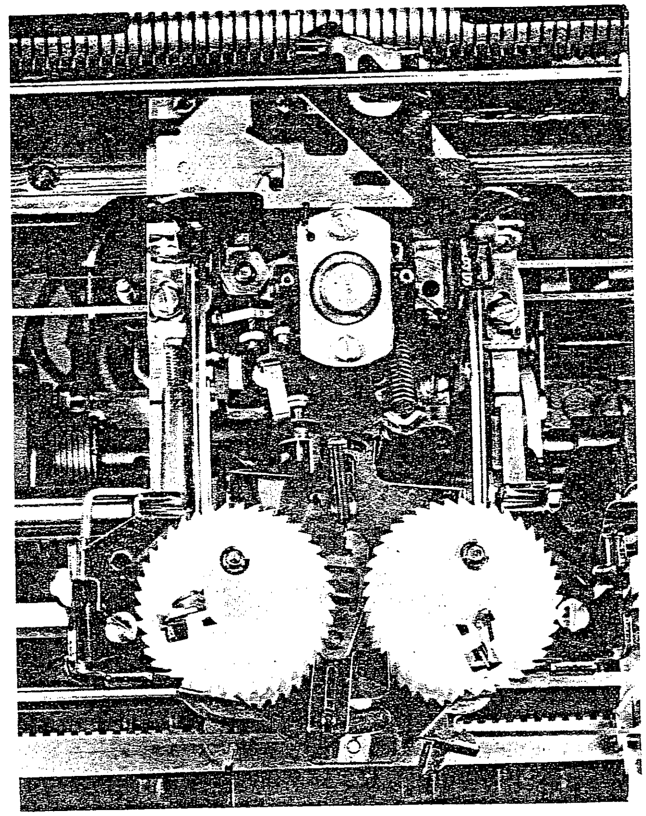


Figure 3-345. Fabric Ribbon Mechanism (Level 2)

Ribbon-Lift Lever

The following three conditions must be met, except for machines with red ribbon shift.

1. Form the lift-lever finger tab left or right so the ribbon-feed pawl will center between the two feed ratchets when the lift lever is placed in the stencil position.
2. Form the rear lug so a clearance of 0.010" to 0.040" exists between the lug and the feed-plate positioning lug when the left ratchet is feeding.
3. Form the front lug so a clearance of 0.010" to 0.040" exists between the lug and the feed-plate positioning lug when the right ratchet is feeding.

   NOTE: Avoid forming the ribbon-feed-plate positioning lug, since breakage would require replacement of the entire feed-plate assembly.

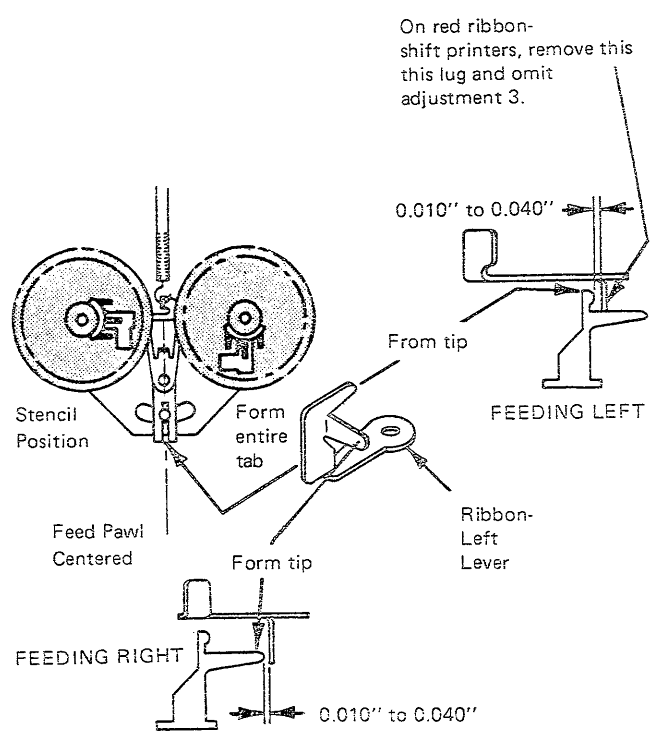


Figure 3-346. Ribbon-Lift Lever

Ratchet-Detent-Lug Overthrow

Form the lug, left or right, so that the ribbon-feed-ratchet tooth overthrows past the edge of the detented lug by from 0.025" to 0.050" when the ribbon-feed cam is hand-cycled to the high point of the ribbon-feed cam.

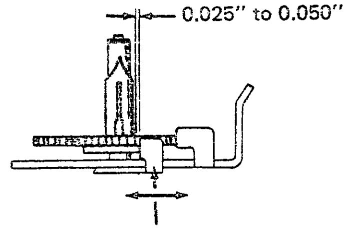


Figure 3-347. Ratchet-Detent-Lug Overthrow

Ratchet-Detent Lug, Front to Rear

CAUTION
The feed-pawl-spring lug should clear the teeth of the opposite ratchet by at least 0.015" when the feed pawl is being withdrawn to the rest position at the end of an operation. Failure to clear the teeth of the opposite ratchet under power may result in a lockup and consequent failure of the ribbon-feed operation.

Form the detent lugs, front to rear, so that the ribbon-feed pawl engages a ratchet tooth by approximately one-half the depth of a ratchet tooth.

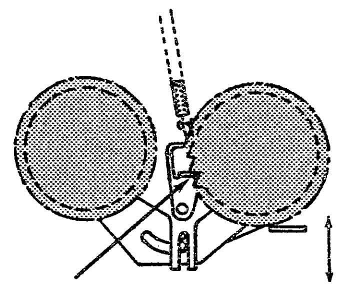


Figure 3-348. Ratchet-Detent Lug, Front to Rear

RIBBON SHIFT MECHANISM

Hinge Plates (Both Magnets)

With the armatures energized, position the hinge plates so that the armatures clear the magnet yokes by from 0.001" to 0.003".

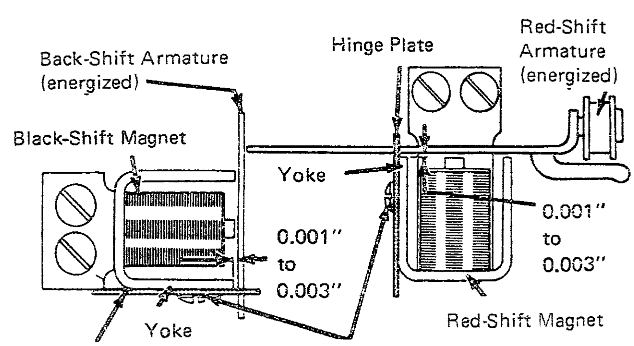


Figure 3-349. Hinge Plates (Both Magnets)

Armature Stops (Both Magnets)

Position the armature residuals to fit firmly and squarely with the surface of the yokes. The design of the residual provides the necessary armature-to-magnet clearance.

> *NOTE:* On Level 1 machines with armature stops, position the stops to obtain a clearance of from 0.001" to 0.003" between the armatures and yokes, with the armatures energized.

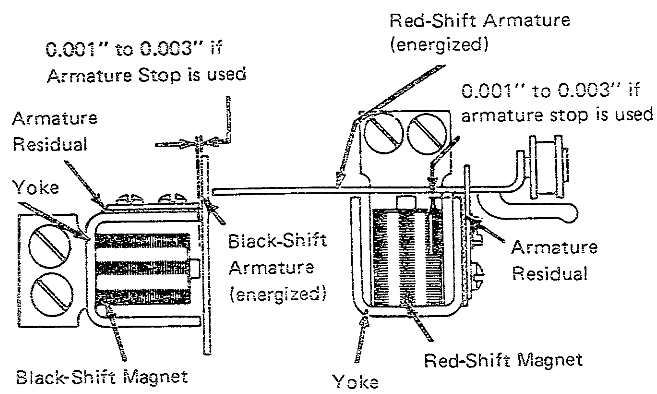


Figure 3-350. Armature Stops (Both Magnets)

Black-Shift Magnet

With the black-shift magnet armature energized and the red-shift magnet armature deenergized, position the black-shift magnet horizontally for a clearance of from 0.002" to 0.006" between the black- and red-shift armatures.

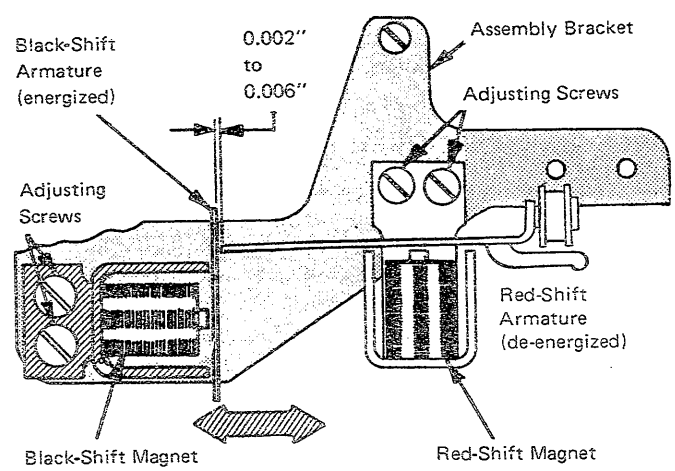


Figure 3-351. Black-Shift Magnet

Black-Shift-Armature Overthrow

With the red-shift armature energized and the black-shift armature deenergized, position the black-shift magnet vertically so that the armature overthrows the red-shift armature by from 0.002" to 0.006".

> *NOTE:* The black-shift magnet position can be achieved in one operation by inserting a 0.030" gage between the black-shift armature and the upper yoke. Manually attract the red-shift armature and position the black-shift magnet horizontally, snug against the gage, while positioning vertically for the 0.002" to 0.006" latching clearance. Tighten the black-shift-magnet mounting screws and check the unlatching clearance (Figure 3-351).

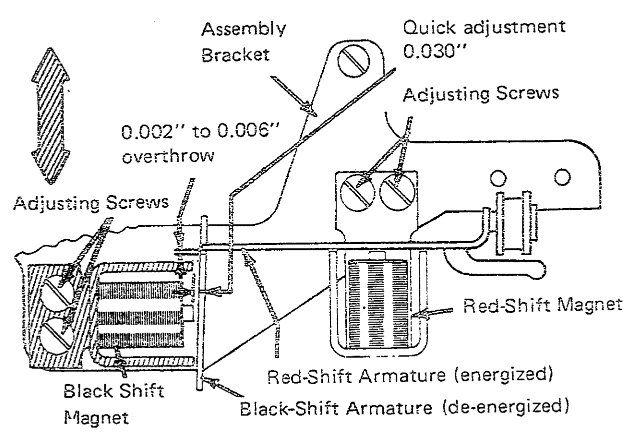


Figure 3-352. Black-Shift-Armature Overthrow

Magnet Adjustments (One Magnet)

With the red-shift-magnet armature energized, position the hinge plate and armature stop (Level 1) so that the armature clears the yoke (both inner and outer poles) by from 0.001" to 0.003".

NOTE: On Level 2 magnets, the armature residuals provide the necessary armature-to-yoke clearance.

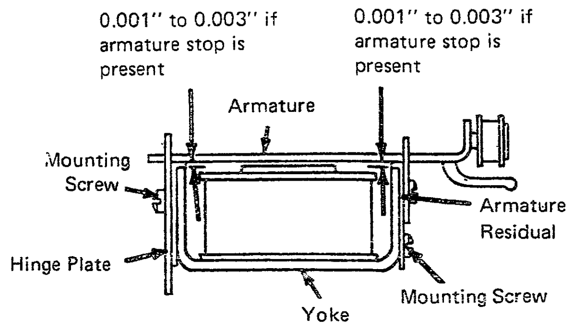


Figure 3-353. Magnet Adjustments (One Magnet)

Pivot Arm

With the manual ribbon-lift lever in the black position, form the pivot-arm extension (up or down) so that the latch does not drag when it is moved from the latched to the unlatched position.

NOTE: Position the pivot-arm bracket so that the highest and lowest characters print equidistant from the top and bottom of the red portion of the black and red ribbon.

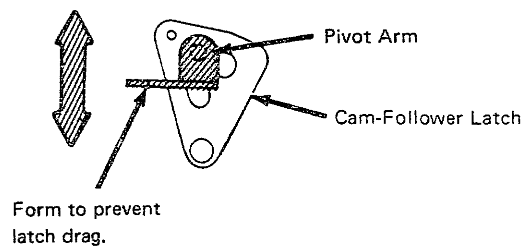
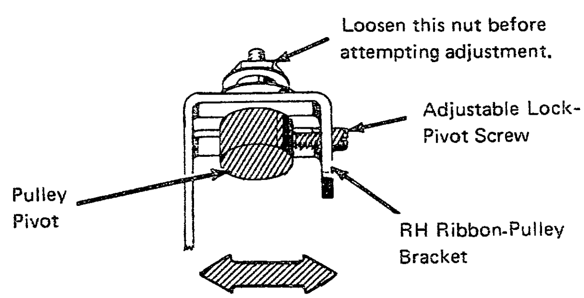


Figure 3-354. Pivot Arm

Right-Hand Pulley and Latch

With the red-shift armature energized, position the right-hand pulley pivot to obtain a clearance of from 0.001" to 0.006" between the stud and follower-latch slot.



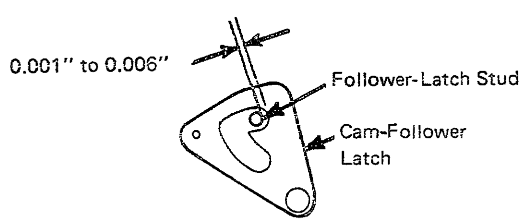


Figure 3-355. Right-Hand Pulley and Latch

Red-Shift-Armature Backstop and Latch

With the armature deenergized, position the red-shift-armature backstop to obtain a clearance of from 0.001" to 0.006" between the stud and the follower-latch slot.

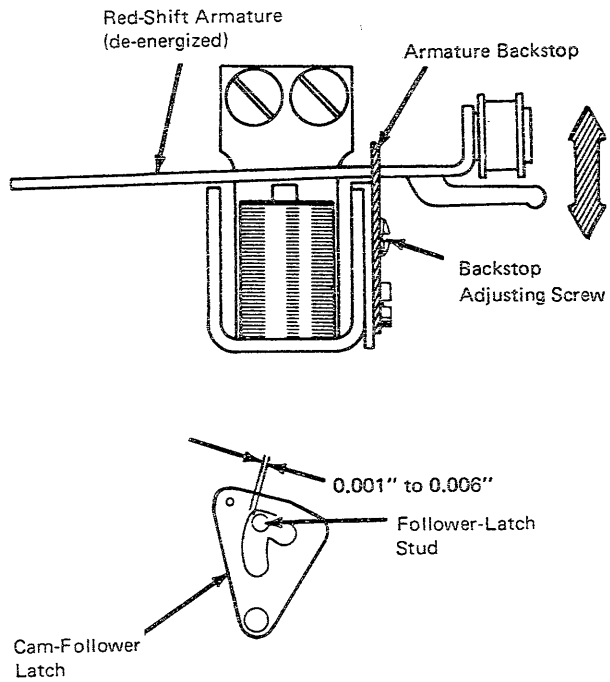


Figure 3-356. Red-Shift-Armature Backstop and Latch

COVERS AND MOUNTS

Top-Cover Hinge

Adjust the hinge so the contour of the top cover matches the contour of the center cover.

Adjust the top cover left or right by loosening the hinge screws in the top cover. Adjust the top cover to the front or rear by loosening the hinge screws inside the center cover.

Top-Cover Latches

Position so the top cover is latched securely in the closed position.

Hinge Springs

Position so the top cover will be detented and held in the open position.

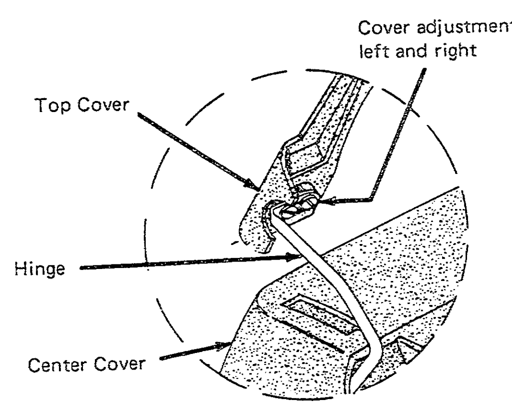


Figure 3-357. Top-Cover Hinge

Center-Cover Mounts

Adjust so that, with the machine suspended in the covers, all of the openings for keybuttons have equal clearance on each side and, also, the platen clears the covers in the extreme front or rear position. The clearance between the paper guide and the deflector will be 0.020" to 0.040". The top of the spacebar will be 1-3/8" above the bottom of the center-cover section.

NOTE: The shock-mount brackets are adjustable front to rear as well as up and down. The cover brackets are adjustable left and right on the shock mounts.

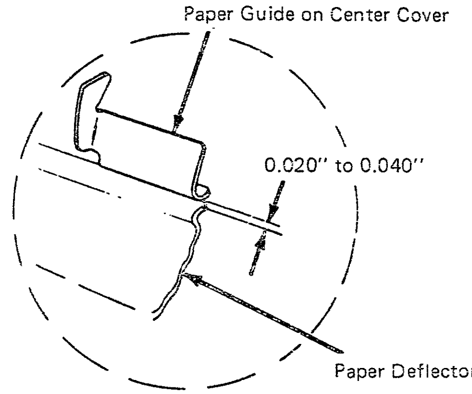


Figure 3-358. Center-Cover Mounts

Tilt-Up Covers

With the printer resting in the bottom cover, position the printer relative to its mounting brackets so that:

1. The keybuttons have equal front and rear clearance with the center cover.
2. The platen clears the covers in the extreme front and rear positions.
3. The paper guide clears the deflector by 0.020" to 0.040".
4. The top of the spacebar is approximately 1-1/2" above the top edge of the bottom cover.

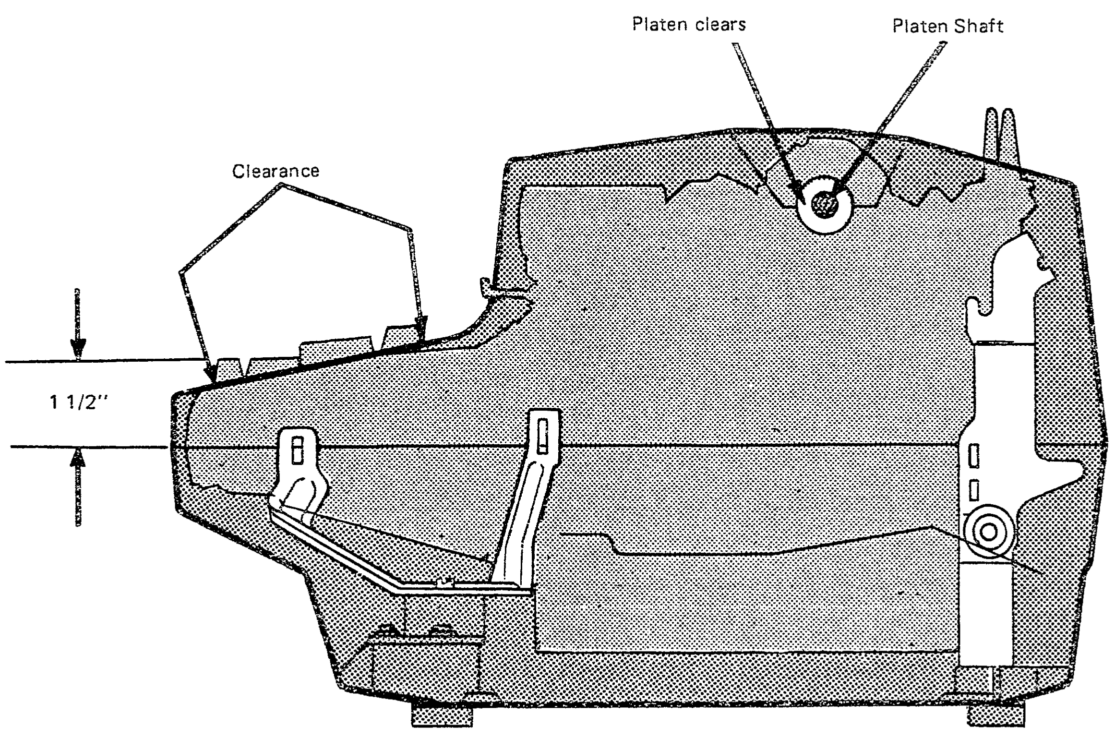


Figure 3-359. Tilt-Up Covers

HORIZONTAL PROGRAM UNIT (767 PRINTER)

Tape Hold-Down

With the tape lid down, adjust the tape hold-down parallel with the tape table and for 0.010" clearance with the tape table. This adjustment is critical and must be made with the feeler gage. Before tightening the two locking screws, check that the feed wheels are centered in the slots of the tape hold-down. Check the tape roller to tape table for approximately 0.010" clearance. Replace the tape lid or reform if necessary.

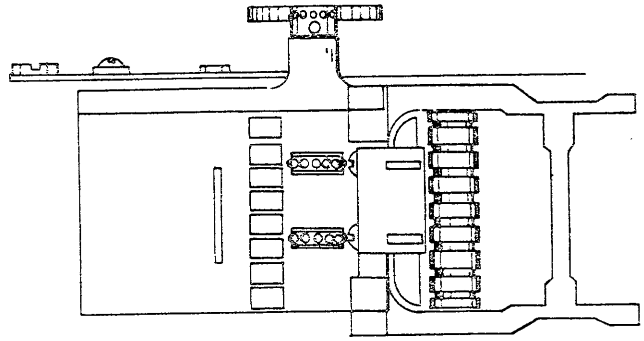


Figure 3-360. Horizontal Program Unit (767 Printer)

Sensing Support

Position so the sensing arms have clearance with the sides of the slots in the tape table and are centered in the holes punched in the program tape.

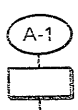
Also, the sensing support must be against the step of the tape table.

Program Tape

Adjust the program-tape registration with a program tape in the unit. With the carriage at rest and a slight pressure applied to hold the tape to the left (front of the typewriter) a sensing hole should be directly over the star wheels. Shift the program-unit plate to the right or left to obtain exact registration. Tighten the registration screws. Remove the program tape.

Adjust each of the sensing-arm stop screws so the arm does not bounce when sensing consecutive punches in the program-tape channel. For the 767 printer (6400 primary printer), this can be accomplished best by programming the carrier to sweep back and forth, as follows:

1. Insert a horizontal tape punched 1 and 2 in column 0, all channels in the next 50 columns.
2. Left margin at zero, carrier at zero.
3. Wire program step thus:



Horizontal
Position 15

4. Move pulse switch to DIGIT.
5. Program start and press the Pulse switch.
6. Disconnect and tape the horizontal-sense common wire.
7. Move the Pulse switch to OFF.
8. While the carrier is sweeping, back out each stop screw until the arm bounces, turn the screw in until the bounce just disappears, turn the screw in another 1/4 turn, and tighten the lock nut.
9. When all stop screws are adjusted, turn off the machine and replace the horizontal-sense common.

Make and Break Program

Adjust the make and break of program sense contacts with go/no/go gage (PN 9900166).

A force of 20 to 25 grams should just break the program contact. This force is applied at a right angle to the tape table. Use an ohmmeter to check the break. (Only two wires are used in each contact. The tension wire has been omitted.)

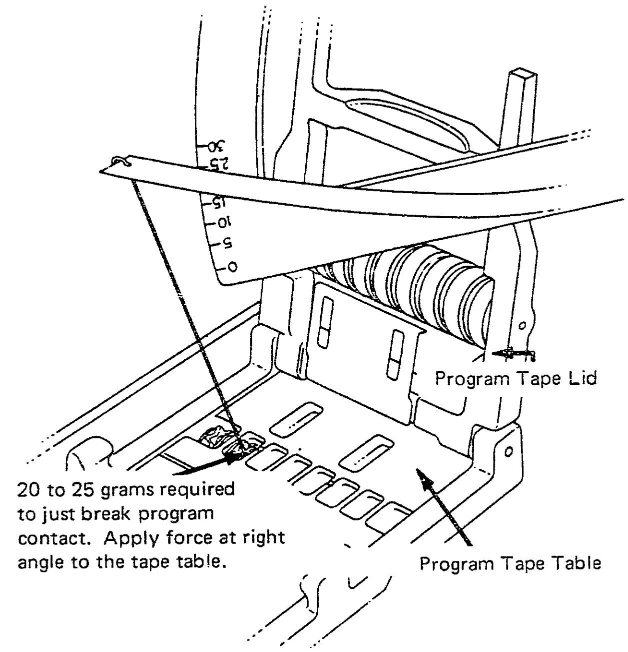


Figure 3-361. Make and Break Program

Tape Guide Bracket

Position the bracket by its eccentric to obtain 0.006" between the tape drive sprocket and the guide wheel (lock screw loose).

Idler Pulleys

Position the brackets so the tape runs parallel to each pulley.

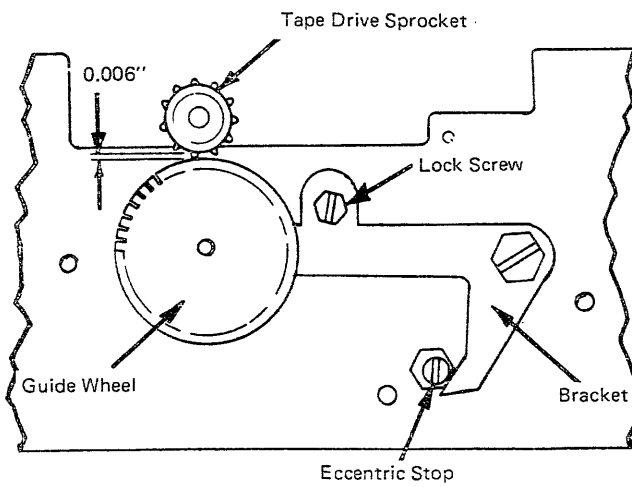


Figure 3-362. Tape Guide Bracket

CYCLE-CLUTCH AND CYCLE-SHAFT REMOVAL

NOTE: On machines with the Level 1 clutch pulley and hub (one-piece), replace with the two-piece pulley and hub assembly when removing the cycle shaft for any reason. See "Cycle-Clutch Pulley Removal (Level 2)", following in this chapter.

1. Remove the covers and typehead.
2. Position the carrier to the extreme right.
3. Remove the degree-wheel pointer (No. 1, Figure 4-1).
4. Remove the degree wheel (No. 2, Figure 4-1).

CAUTION
The degree-wheel screw has left-hand threads.

5. Remove the gear guard (No. 3, Figure 4-1).
6. Remove dust covers (not shown).

CAUTION
There is a possibility of misplacing the shims (if present) under the selection contact assembly when it is removed. Use care to ensure that the shims are replaced in the same place from which they were removed.

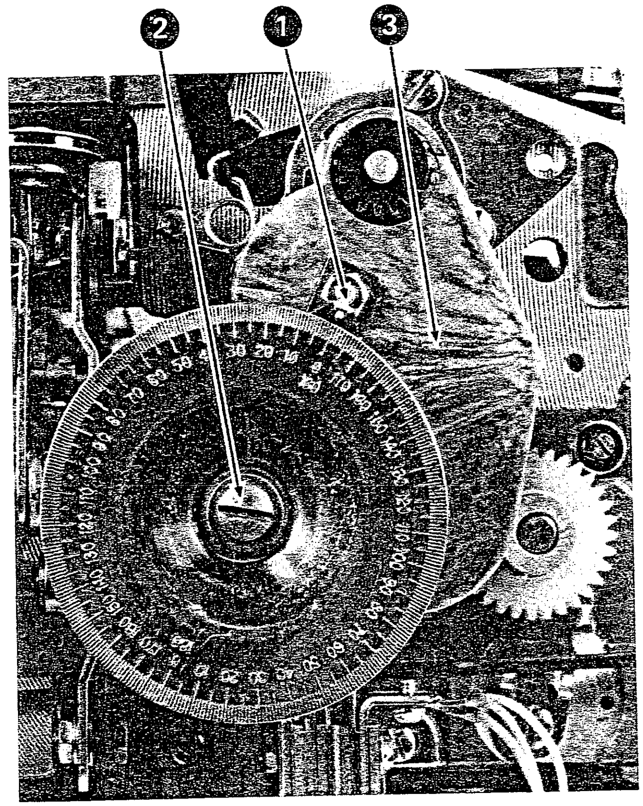


Figure 4-1. Cycle-Clutch and Cycle-Shaft Removal (Steps 1-6)

7. Remove the two screws (No. 1, Figure 4-2) that hold the contact plate to the frame. Remove the contact assembly and hold it to the front with a rubber band.

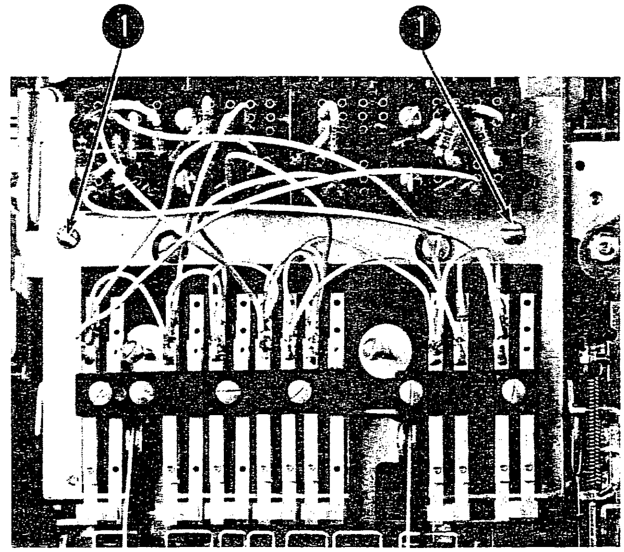


Figure 4-2. Cycle-Clutch and Cycle-Shaft Removal (Step 7)

8. Remove the two pivot screws (No. 1, Figure 4-3).

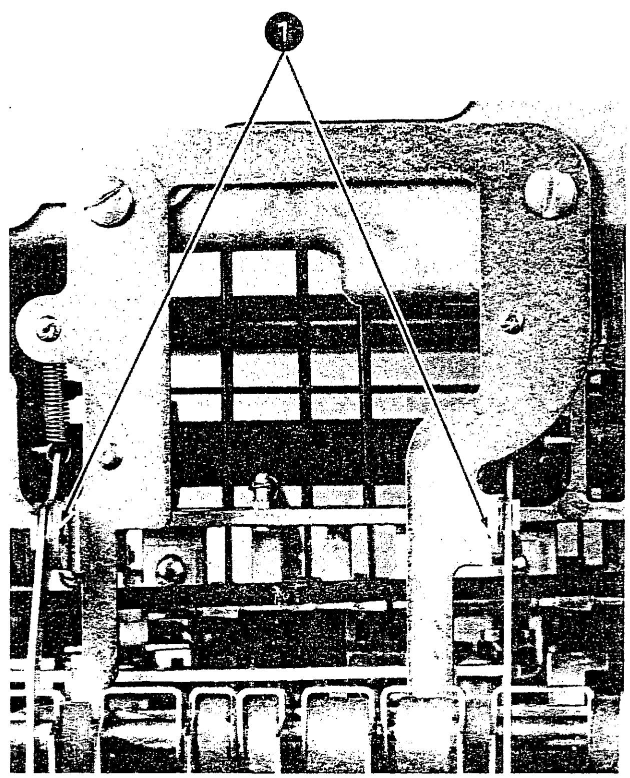


Figure 4-3. Cycle-Clutch and Cycle-Shaft Removal (Step 8)

9. Remove the C1-C2 contact shield, remove the front screw from the C1-C2 contact assembly (No. 1, Figure 4-4), and swing the assembly down out of the way of the bearing plate.
10. Remove the cycle-clutch check pawl and spring (No. 1, Figure 4-5).
11. Remove the intermediate gears (No. 2, Figure 4-4).
12. Remove the three bearing-plate screws (No. 3, Figure 4-4).

NOTE 1: The cycle-clutch check pawl is mounted on the top screw.

NOTE 2: The latch-bail overthrow stop is held in place by a nut on the lower left screw. Remove the nut.

13. Pry the bearing plate (No. 4, Figure 4-4) away from the frame (front end first) with a screwdriver.

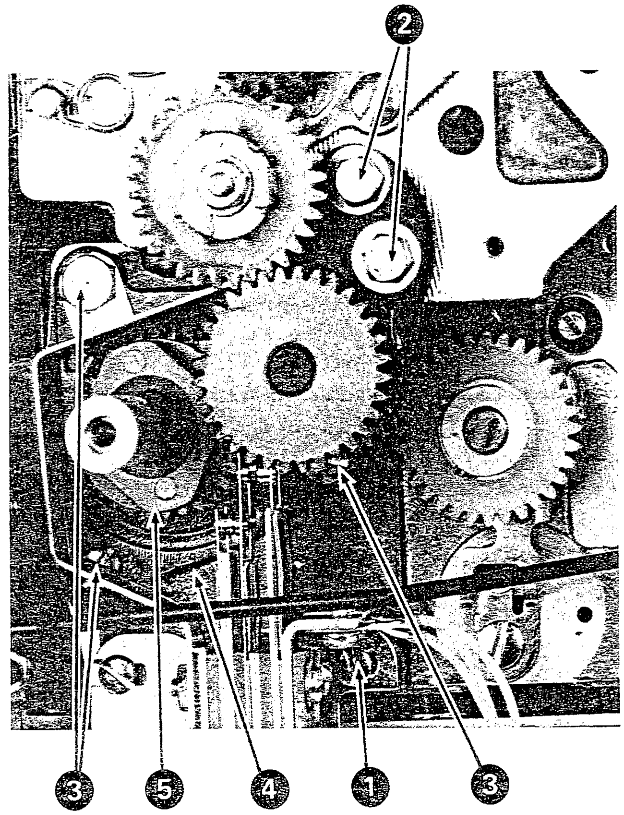


Figure 4-4. Cycle-Clutch and Cycle-Shaft Removal (Steps 9-13)

14. After partially removing the bearing plate, force the positive bail down with a screwdriver (No. 2, Figure 4-5), making sure that all the latches are under the bail. Insert a fluted wrench through the lower left bearing-plate mounting hole (No. 3, Figure 4-4) and over the top of the bail to hold the bail down. Do not remove the positive-bail restoring spring.
15. Remove the cycle shaft, pushing the -5 and rotate 2 links out of the way with a spring-hook pusher end. The pusher-restoring-bail arms will easily bend to the left to allow removal.
16. When installing a new cycle shaft, remove the C1-C2 cams (No. 5, Figure 4-4), the cycle-shaft gear (behind the C1-C2 cams), and the shims from the old shaft, and put them on the new one. Be sure to put the flexible nylon shim on first.

NOTE: The number of shims may vary with the new shaft to maintain from 0.001" to 0.006" end play. This end play should be checked by installing the cycle shaft with the cycle-clutch spring, sleeve, and collar removed. The bearing plate must be installed and tight. Once the correct end play is obtained, reinstall the complete cycle-shaft assembly.

17. The following adjustments should be checked after the cycle-shaft has been replaced:
    a. Idler gears
    b. Cycle-shaft end play
    c. Cycle-clutch latch height
    d. Cycle-clutch spring
    e. Cycle-clutch-latch bite
    f. Damper spring (not on machines with solid rotate arm)
    g. Filter-shaft timing
    h. Print-shaft timing
    i. C1-C2 contact timing

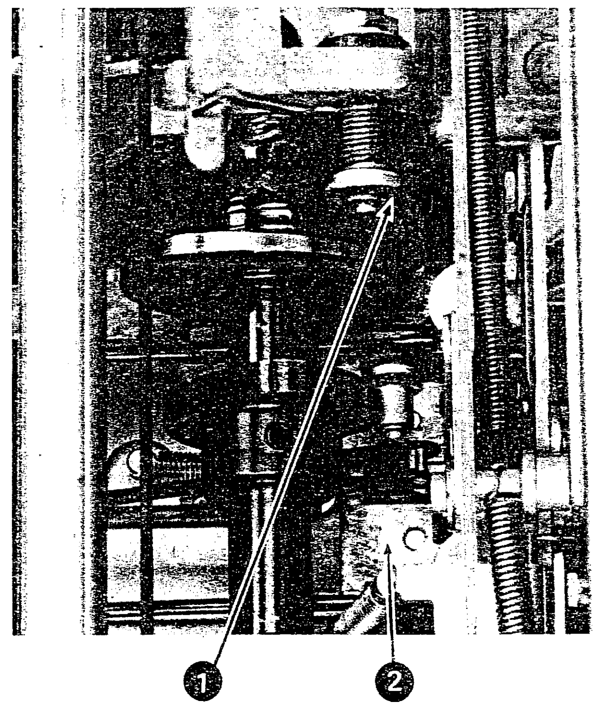


Figure 4-5. Cycle-Clutch and Cycle-Shaft Removal (Steps 14-16)

BELT REPLACEMENT

1. Perform the cycle-clutch and cycle-shaft removal.
2. Cut the old belt if necessary, and remove it from the machine.
3. Wipe all grease from the outside of the cycle-clutch pulley.
4. Before installing the new belt, wrap it around the cycle-clutch pulley to ensure that the cogs on the belt match the pulley. Replace both the belt and pulley if they do not match.
5. With the belt around the cycle-clutch pulley, slip the other end of the belt loop over the motor pulley, loosening the motor mounts if necessary.

Check the following adjustments after the belt has been replaced:

a. Idler gears
b. Filter-shaft timing
c. Print-shaft timing
d. Damper spring (not on printers with the solid rotate arm mechanism)
e. C1-C2 contact timing

ALTERNATE BELT REPLACEMENT

1. Perform steps 1-6 and 9-14 of the cycle-clutch and cycle-shaft removal. Omit steps 7 and 8.
2. Slip the new belt through the bearing-plate hole, around the shaft, and over across the cycle shaft to the cycle-clutch latch (Figure 4-6). Work it between the latch and the cycle-clutch sleeve with the aid of a burnishing blade (Figure 4-7).
3. Loosen the motor mount and slip the belt over the motor pulley.

The following adjustments should be checked after the belt has been replaced:

a. Idler gears
b. Cycle-clutch-latch bracket height
c. Damper spring (used with compensator arms only)
d. Filter-shaft timing
e. Print-shaft timing
f. C1-C2 contact timing

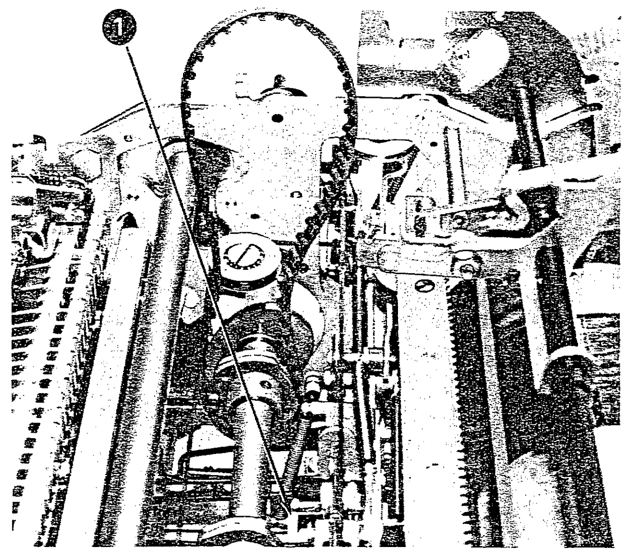


Figure 4-6. Alternate Belt Replacement

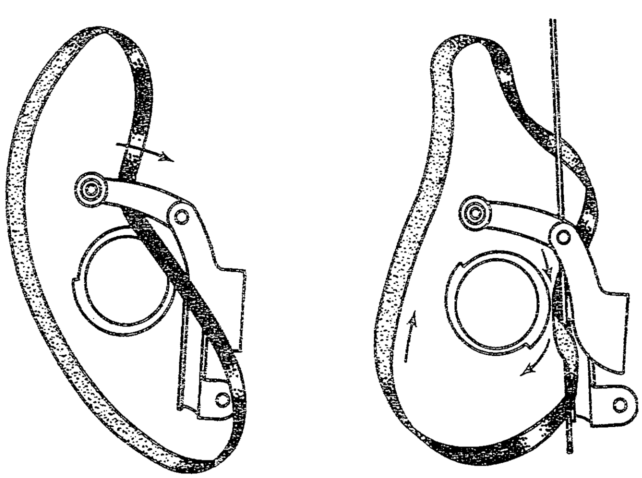


Figure 4-7. Belt Replacement (between Latch and Sleeve)

CORD REPLACEMENT

NOTE: Replace both cords if either one must be replaced. *All cords* must be prestretched before they are cut to the following lengths:

Tab cord for the 11" machine—cut to 18"
15" machine—cut to 22-1/2"

CR cord for the 11" machine—cut to 22-1/2"
15" machine—cut to 28"

1. Disconnect the carrier-return-clutch unlatching link (No. 1, Figure 4-9).
2. Manually latch the carrier-return-clutch and hand-cycle the machine until the mainspring is wound (4-2/3 to 5-1/3 turns for the 100-inch mainspring). Count the revolutions of the drum shaft.
3. With the carrier to the extreme right, feed the carrier-return cord around the pulleys and connect it to the cord drum (No. 1, Figure 4-8).
4. Connect the carrier-return cord (No. 2, Figure 4-8) to the carrier, using the pusher end of a spring hook. Set the eyelet on the pusher fork with the cord in the fork, pulled taut along the spring-hook handle (Figure 4-10).
5. Hand-cycle the carrier fully to the left while holding the slack cord. This winds the cord evenly on the carrier-return-cord drum.
6. Connect the escapement cord to the drum with about one turn of the cord on the drum (No. 2, Figure 4-9).
7. Connect the end of the cord to the carrier and then place it on the pulleys (No. 3, Figure 4-9).
8. Connect the clutch-unlatching link.
9. Adjust the mainspring, with the carrier at the extreme right.
10. Adjust the cord tension.

NOTE: A timesaving method of increasing cord tension is to tie a knot in the end of the cord as close to the hook as possible.

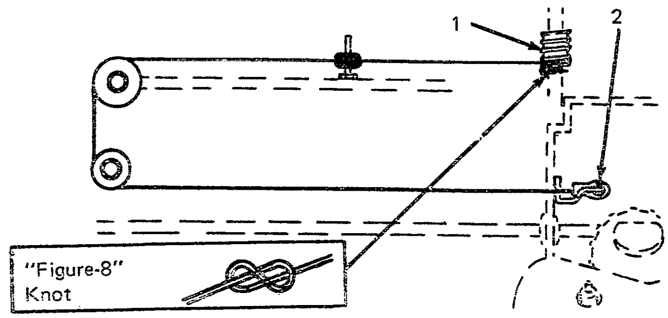


Figure 4-8. Carrier-Return-Cord Replacement

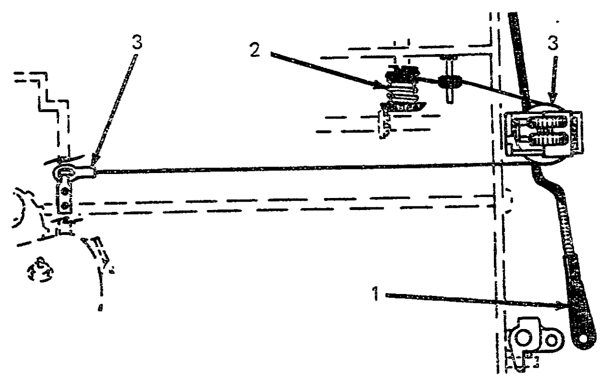


Figure 4-9. Escapement-Cord Replacement

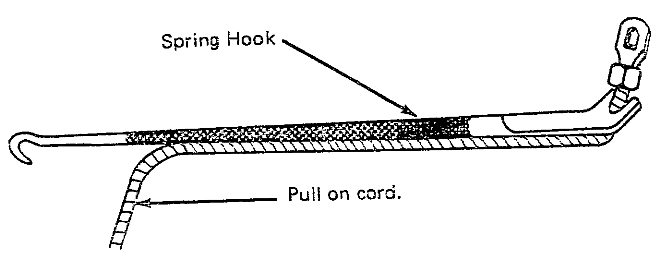


Figure 4-10. Attaching The Carrier-Return Cord

CYCLE-CLUTCH-PULLEY REMOVAL

1. Remove the cycle clutch and cycle shaft.
2. Remove the belt from the pulley (No. 1, Figure 4-11).

   NOTE: To simplify removal of the old plastic-style cycle-clutch pulley and hub, cut it so that it will slip by the rotate bellcrank. The new metal cycle-clutch pulley and hub, supplied with the bill of materials, can easily be installed.
3. Remove the two setscrews from the same hole in the pulley. One is used on top of the other as a lock screw (No. 2, Figure 4-11).
4. Remove the cycle-clutch hub from the pulley.

The following adjustments should be checked after the cycle-clutch pulley has been replaced:

a. Latch height
b. Cycle-shaft end play
c. Idler gears
d. Cycle-clutch spring
e. Cycle-clutch-latch bite
f. Damper spring
g. Filter-shaft timing
h. Print-shaft timing
i. C1-C2 contact timing

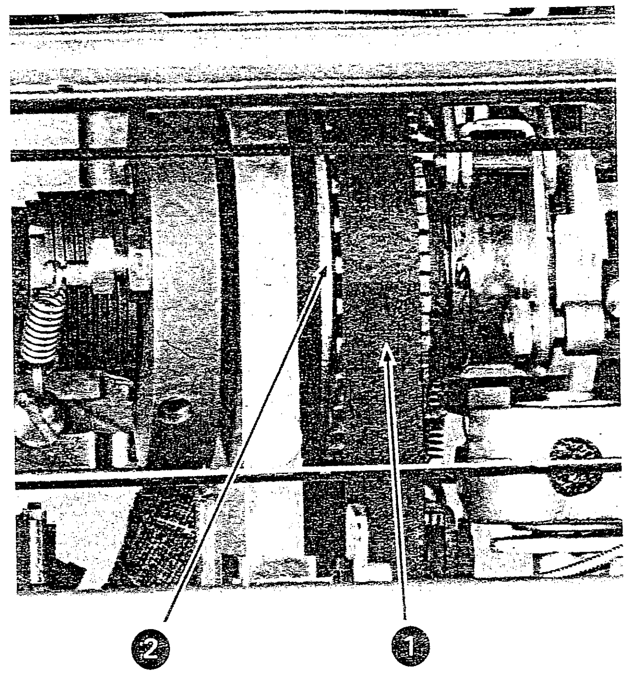


Figure 4-11. Cycle-Clutch-Pulley Removal

ROTATE-SPRING REPLACEMENT

1. Remove the right and left dust covers.
2. Remove the ribbon plate.
3. Center the carrier over the cycle shaft.
4. Remove the two screws (No. 1, Figure 4-12) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band. Do not lose the shims, if present.

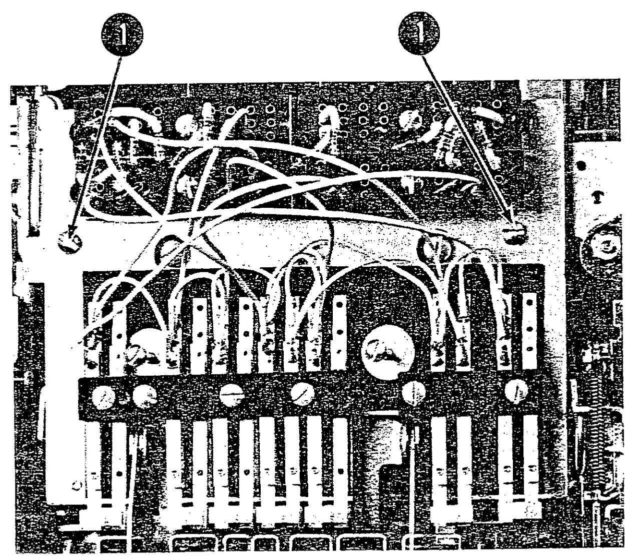


Figure 4-12. Rotate-Spring Replacement (Steps 1-4)

5. Release the rotate-cage-spring tension gradually. With the pusher end of a spring hook or a small screwdriver, hold the cage spring counterclockwise so that the retainer clip can be disengaged from the lugs on the cage. Allow the tension to slowly rotate the cage until the retainer engages the next lug on the cage. Continue to release the tension, working with only one lug at a time, until all tension is released.
6. Remove the screw (No. 2, Figure 4-13) to the right of the yoke on the carrier, and remove the rotate-cage-spring-tension clip. Earlier machines have a screw entering from the bottom of the carrier, with a nut on top holding the clip.

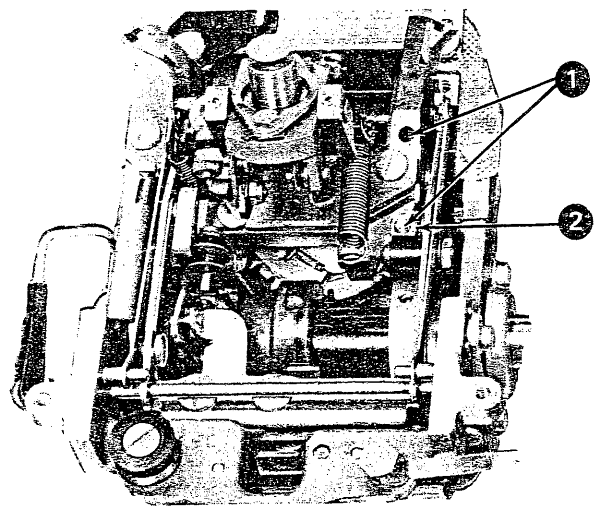


Figure 4-13. Rotate-Spring Replacement (Steps 5 and 6)

7. To loosen the striker, follow steps a through c.
   a. On machines with striker and bearing, back out the two screws (No. 1, Figure 4-14) on the right 1/4" and remove the screw on the left (No. 2, Figure 4-14).
   b. On machines with bearing only, remove the lower right and left screws and back out the right screw 1/4" (Figure 4-14).

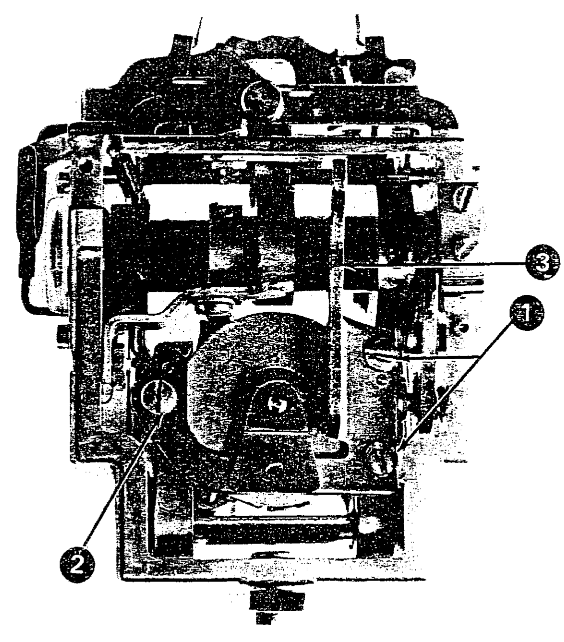


Figure 4-14. Rotate-Spring Replacement (Step 7)

c. On machines without striker or bearing, remove the right-hand screw (No. 1, Figure 4-15) and back out the upper left screw 1/4" (No. 2, Figure 4-15). It is not necessary to loosen the lower left screw.

8. Remove the striker (if present) and rotate-spring retaining plate (No. 3, Figure 4-15). The rotate spring can now be removed.

NOTE: In later-level machines, a spring clip prevents the spring from being trapped in the pulley notch. If it was not installed, the clip should be added on reassembly.

The following adjustments should be checked after the rotate-spring is replaced:

a. Rotate-spring tension
b. Typehead homing
c. Damper spring (on Level 1 rotate mechanisms only)
d. The rotate-spring retaining plate (No. 3, Figure 4-15) must not bind the rotate-pulley hub (No. 4, Figure 4-15)

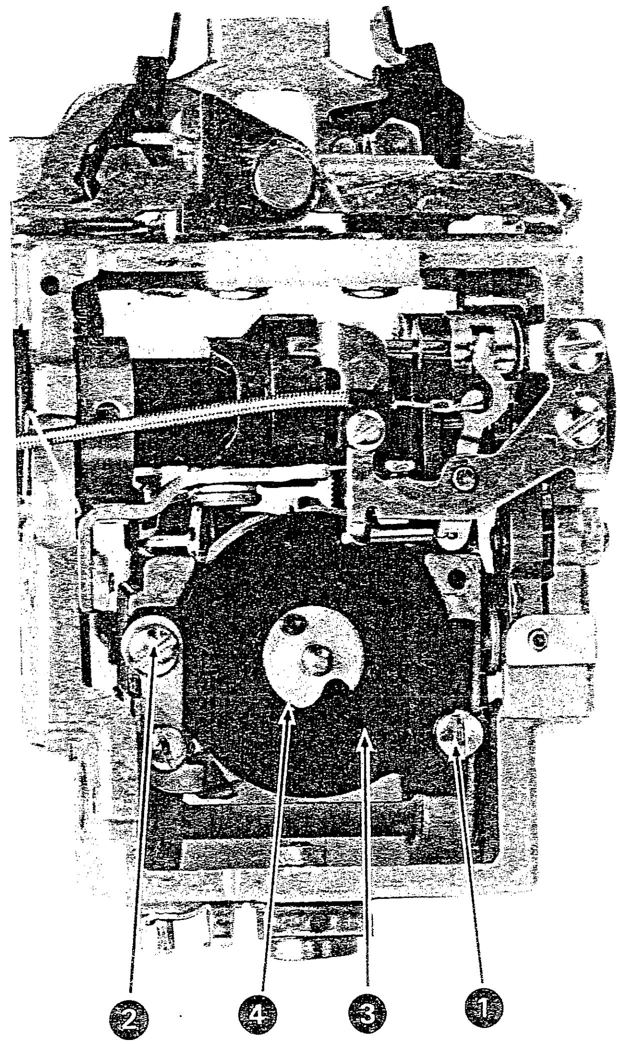


Figure 4-15. Rotate-Spring Replacement (Step 8)

LOWER-BALL-SOCKET AND TILT-RING REMOVAL

1. Remove the right and left dust covers and ribbon cartridge. Center the carrier over the cycle shaft.
2. Shift into uppercase.
3. Remove the two screws (No. 1, Figure 4-12) that hold the contact plate to the frame. Remove the contact plate, holding it to the front with a rubber band. This plate is not present on all printers.
4. Half-cycle a 0-rotate, 2-tilt character. Note which position the tilt detent is in, for replacement, and be sure the machine is still in uppercase.
5. Measure the clearance between the left side of the tilt ring and the yoke. (The tilt ring should be replaced to this same clearance.)
6. Loosen the two setscrews (No. 1, Figure 4-16).
7. Remove the two pivot pins (No. 2, Figure 4-16).
8. Remove the tilt ring (No. 3, Figure 4-16) and remove the ball joint.

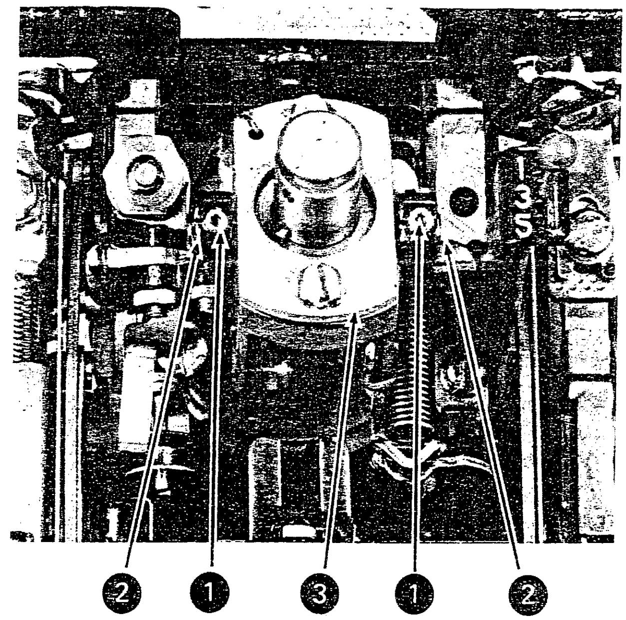


Figure 4-16. Lower-Ball-Socket and Tilt-Ring Removal (Steps 1-8)

9. Loosen the rotate-pulley setscrew (No. 1, Figure 4-17).
10. Use the butt end of a small spring hook as a follower to push out the lower ball socket (No. 2, Figure 4-17).

NOTE: This prevents the wedge from being lost. When replacing the socket, be sure the pin is pointing toward the front left and right rear corners.

The following adjustments should be checked after the lower ball socket and tilt ring is replaced:

a. Tilt detenting
b. Typehead homing
c. Tilt ring
d. Upper ball socket

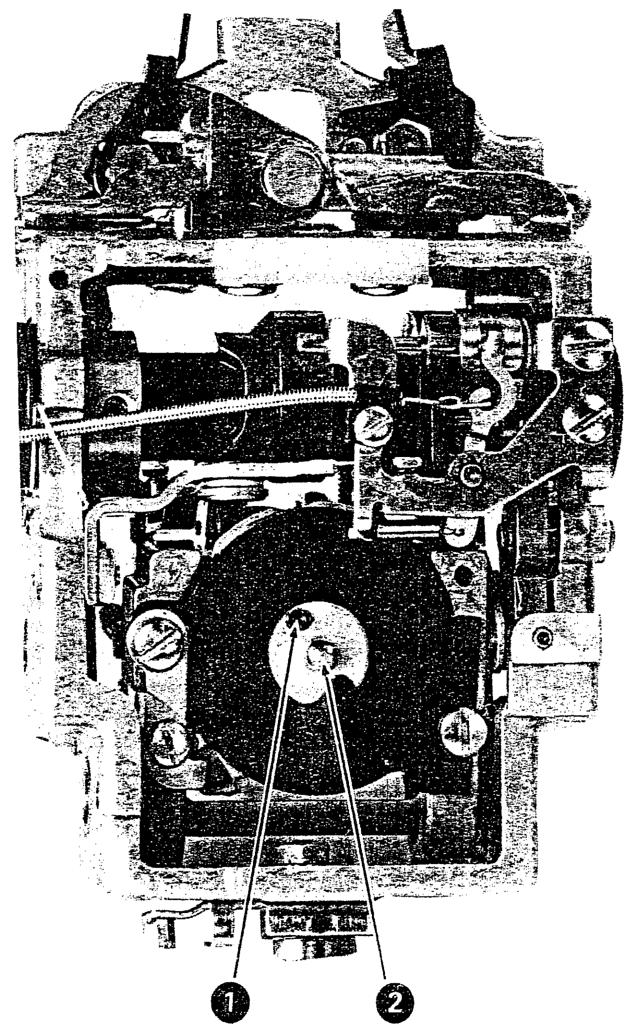


Figure 4-17. Lower-Ball-Socket and Tilt-Ring Removal (Steps 9 and 10)

ROTATE-TAPE REPLACEMENT

1. Remove the left and right dust covers.
2. Position the carrier 3" from the left frame.
3. Remove the broken pieces of tape from the machine.
4. Disconnect the tilt-pulley tension spring if you are working on a gear-tilt machine. Reconnect the spring after step 9.
5. On gear-tilt machines, rock the tilt ring toward the front so that the tilt pulley no longer shows at the front of the carrier.
6. Trip the cycle-clutch latch and half-cycle a tilt-0, rotate-0 character until the typehead is fully detented.
7. Leaving the typehead on the printer and holding it securely, withdraw the detent from the typehead. Rotate the typehead three full turns counterclockwise, allowing the detent to reengage the typehead each time you remove your hand to take a new grip on the head. Continue into the fourth turn until the T-slot in the rotate pulley is accessible at the front of the carrier (No. 1, Figure 4-18). Now fully seat the detent.
8. Thread the eyelet end of the new tape through the front of the carrier and through the LH sideframe. Insert the T-end in the slot (No. 1, Figure 4-18), turn the top edge of the tape to the front as it leaves the left end of the rocker shaft, and thread the tape around the pulleys. Attach the eyelet end to the RH side of the carrier. (Withdraw the detent, force a tilt-3, and allow the detent to reenter.)
9. Now grip the typehead, release the detents, and allow the rotate spring to slowly wind the typehead in a clockwise direction. This winds the new rotate tape around the rotate pulley. Be sure that the tape stays on all three pulleys.

On Level 1 mechanisms (gear tilt), reconnect the tilt pulley spring.

After the rotate tape has been replaced, check rotate-spring tension, skirt clearance, and alignment.

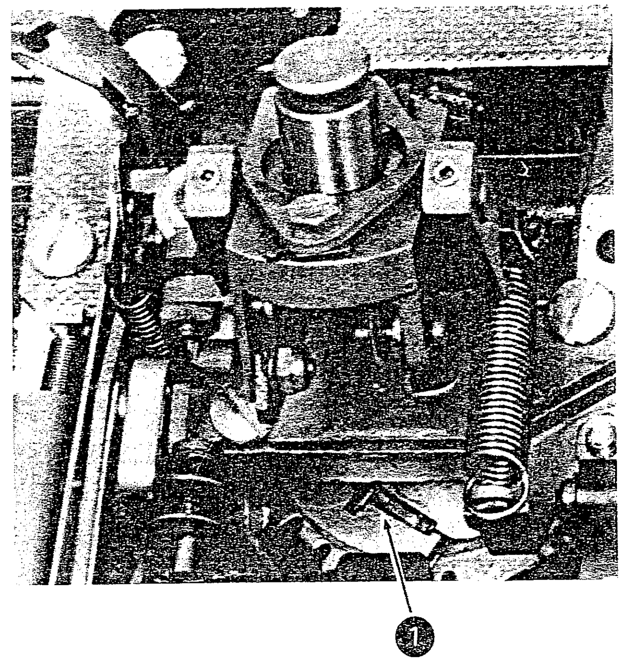


Figure 4-18. Rotate-Tape Replacement

BACKSPACE-ESCAPEMENT PAWL REMOVAL

NOTE: See also "Escapement-Bracket Removal", Figure 4-57.

1. Center the carrier between two feed-roll arms to gain access to the pawl mounting-stud nut. Remove the nut (No. 1, Figure 4-19).
2. Push the pawl mounting stud down so that it will just clear the escapement bracket.
3. Remove the tab-lever spring (No. 2, Figure 4-19), and the tab-trigger spring.
4. Lift out the tab trigger, tab lever, and spacer.
5. Remove the escapement-pawl spring and the backspace-pawl spring.
6. Move the carrier to the right.
7. The backspace pawl, escapement pawl, and thick spacer will remain in place on the mounting stud, resting on the escapement torque bar. Just pick them up.

NOTE: To replace the pawls, reverse the above procedure. Check the escapement, tab, and backspace adjustments.

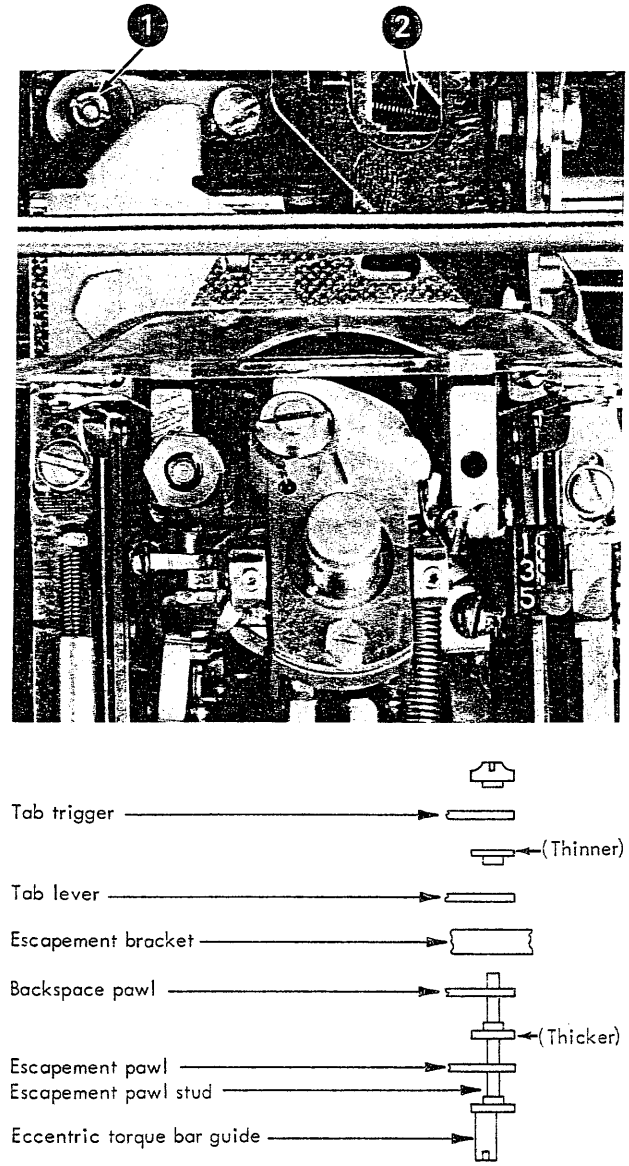


Figure 4-19. Backspace-Escapement Pawl Removal

TILT-TAPE REPLACEMENT

NOTE: The illustration and procedure given below are for gearless-tilt carrier mechanisms. The gear type may vary slightly.

1. Position the carrier 3" from the left frame.
2. Half-cycle a 0-rotate, 0-tilt character (to lock rotate-spring tension).
3. Remove the broken pieces of tape from the machine.
4. Place the eyelet on the stud on the tilt-pulley bellcrank (No. 1, Figure 4-19).
5. Thread the tape around the left tilt-arm pulley and right tilt-arm pulley, and take up the slack in the tape.
6. Withdraw the rotate detent, turn the head counterclockwise to relieve the rotate-tape tension, tilt the head to the front, and restore the detent.
7. Remove the tape-retaining pin from the carrier and insert the tilt tape, keeping it on top of the rotate tape.
8. Restore the typehead to the rest position.
9. Check the tilt-detent adjustment (right tilt pulley).

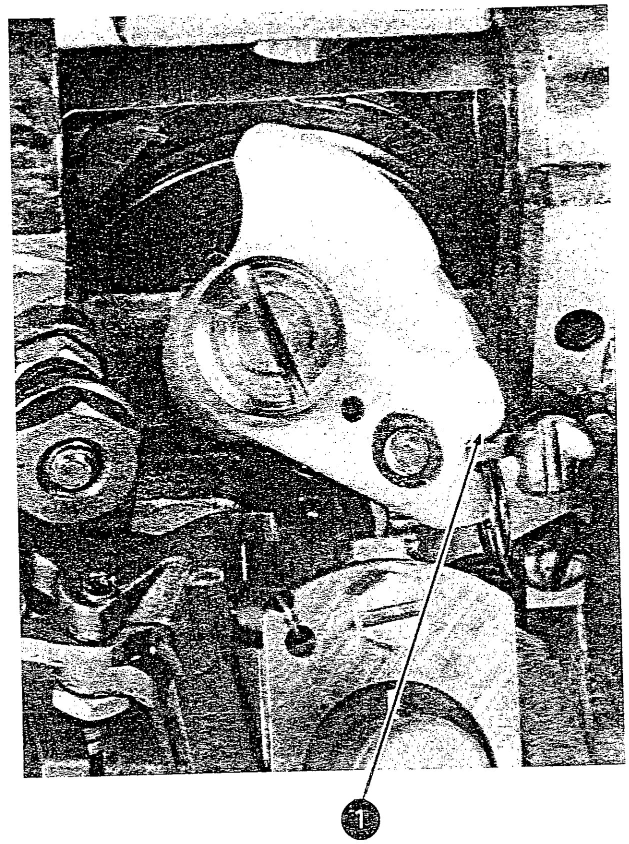


Figure 4-20. Tilt-Tape Replacement

ROTATE-SELECTION-DIFFERENTIAL REMOVAL

1. Position the carrier to the extreme right.
2. Remove the left dust cover, platen, feed rolls, and paper deflector.
3. Remove the two screws (No. 1, Figure 4-21) that hold the plate to the frame. Remove the contact assembly, holding it to the front with a rubber band. Do not lose the shims, if present.

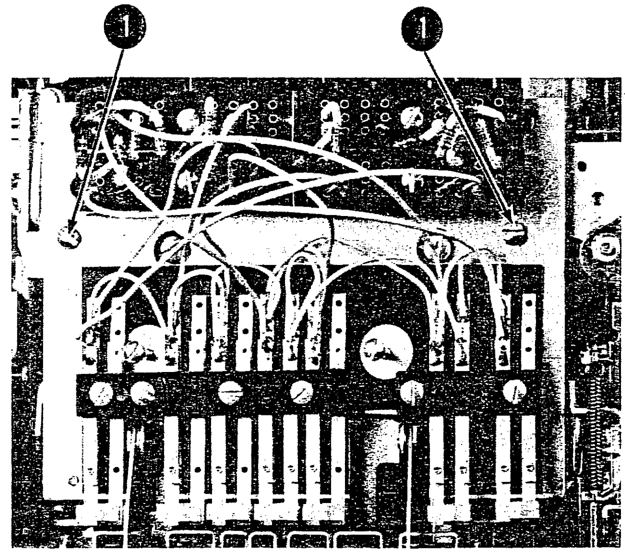


Figure 4-21. Rotate-Selection-Differential Removal (Steps 1-3)

4. Disconnect the clevises and remove them from the links (No. 2, Figure 4-22).
5. Remove the springs from the rotate interposers (No. 1, Figure 3-22).

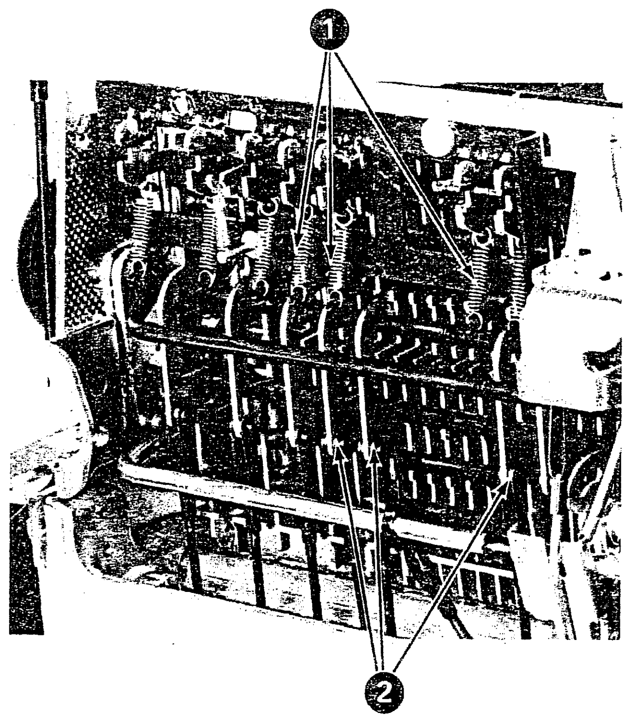


Figure 4-22. Rotate-Selection-Differential Removal (Steps 4 and 5)

6. Disconnect the rotate link at both ends and remove it (No. 1, Figure 4-23).
7. Remove the latch-bail spring (No. 2, Figure 4-23).

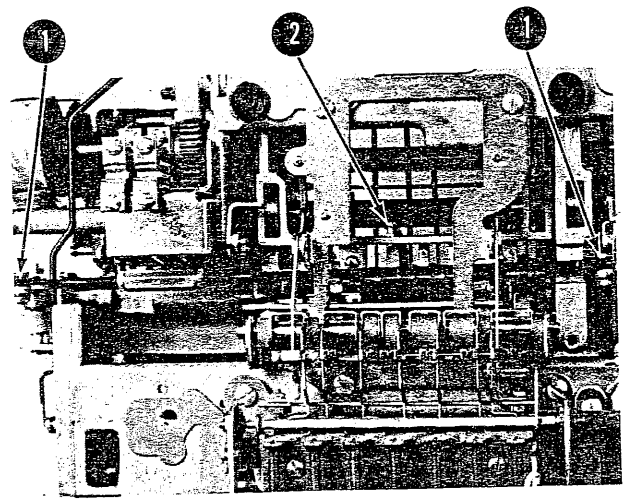


Figure 4-23. Rotate-Selection-Differential Removal (Steps 6 and 7)

8. Remove the motor.
9. Remove the rotate-latch springs (No. 1, Figure 4-24).
10. Remove the check-latch spring (No. 2, Figure 4-24).
11. Remove the guide-bracket mounting stud and screw (No. 3, Figure 4-24).

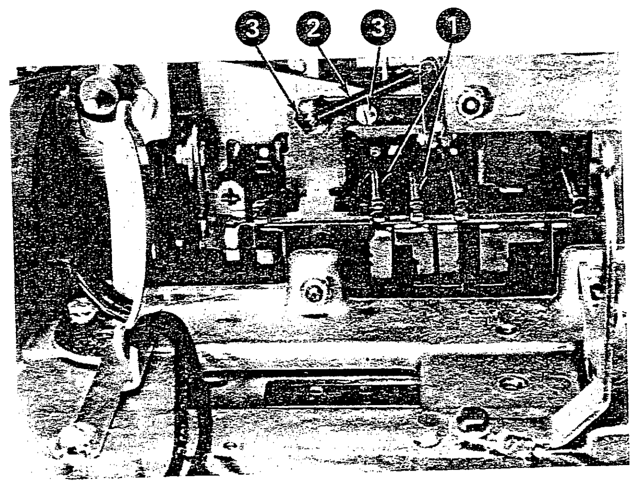


Figure 4-24. Rotate-Selection-Differential Removal (Steps 9-11)

12. Remove the balance-arm mounting stud (No. 1, Figure 4-25).
13. Disconnect the -5 bail drive link from the right end of the balance arm (No. 2, Figure 4-25).
14. Disconnect the tilt-differential spring (No. 3, Figure 4-25).
15. Rotate the cycle shaft until the cam followers are on the low points of the cams.
16. Remove the rotate-differential assembly.

The following adjustments should be checked after the rotate-selection-differential assembly has been replaced:

a. Typehead homing
b. Rotate-latch clearance
c. Rotate-differential guides

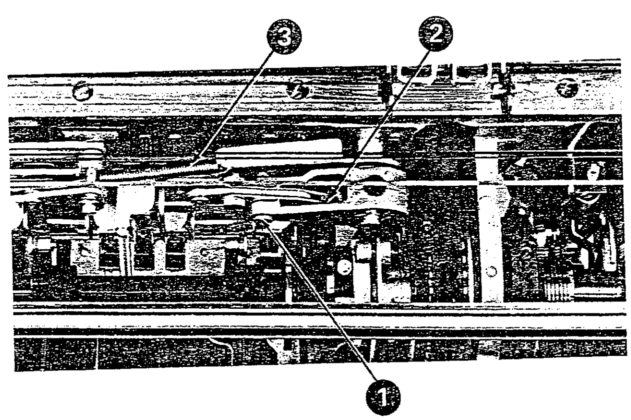


Figure 4-25. Rotate-Selection-Differential Removal (Steps 12-14)

TILT-SELECTION-DIFFERENTIAL REMOVAL

1. Position the carrier to the extreme right.
2. Remove the left dust cover, platen, feed rolls, and paper deflector.
3. Remove the springs from the tilt interposers (No. 1, 4-26).
4. Disconnect the clevises and remove them from the links (No. 2, Figure 4-26).
5. Remove the motor.

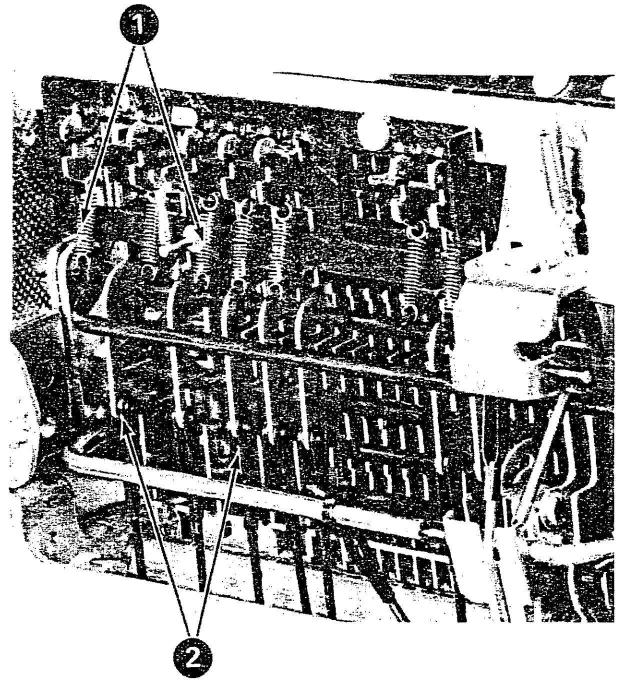


Figure 4-26. Tilt-Selection-Differential Removal (Steps 3 and 4)

6. Remove the tilt-latch springs (No. 1, Figure 4-27).
7. Remove the tilt links (No. 2, Figure 4-27).

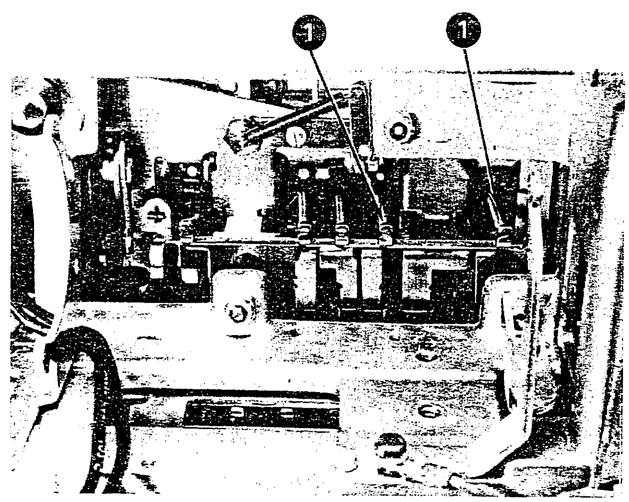


Figure 4-27. Tilt-Selection-Differential Removal (Steps 6 and 7)

8. Remove the positive-bail spring (No. 1, Figure 4-28).
9. Remove the tilt-differential spring (No. 2, Figure 4-28).
10. Remove the rotate-arm spring (No. 3, Figure 4-28).
11. Remove the two C-clips and remove the tilt-differential assembly (No. 4, Figure 4-28).
12. The following adjustments should be checked after the tilt-differential assembly is replaced:
    a. Tilt detenting
    b. Latch clearance

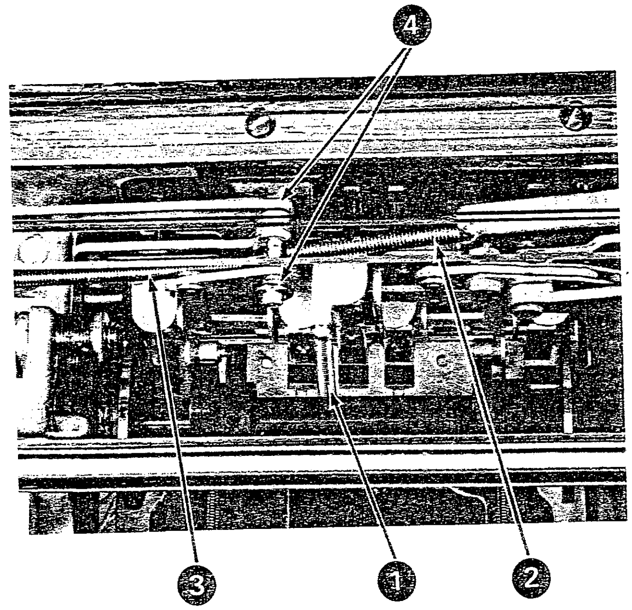


Figure 4-28. Tilt-Selection-Differential Removal (Steps 8-11)

DIFFERENTIAL-PLATE REMOVAL

1. Position the carrier to the extreme right.
2. Remove the left dust cover, platen, feed rolls, and paper deflector.
3. Remove all springs from the interposers (No. 1, Figure Figure 4-29).
4. Disconnect the clevises and remove them from the links (No. 2, Figure 4-29).
5. Remove the two screws that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band. Do not lose the shims, if present.

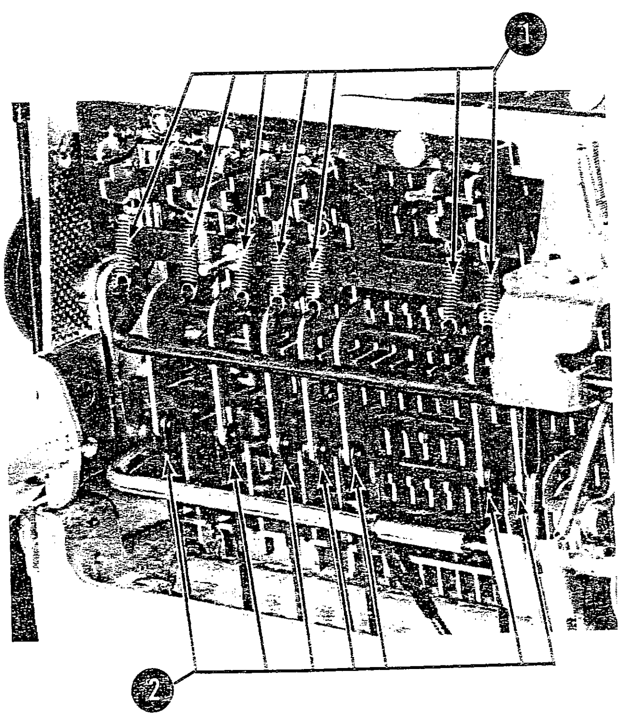


Figure 4-29. Differential-Plate Removal (Steps 3 and 4)

6. Unhook the check-latch-link spring (No. 1, Figure 4-30).
7. Remove the rotate-arm link (No. 2, Figure 4-30).
8. Scribe the position of the pusher-arm plate to the power frame and remove the four mounting screws (No. 3, Figure 4-30).
9. Remove the positive-bail spring (No. 4, 4-30).
10. Carefully remove the pusher-arm-plate assembly.

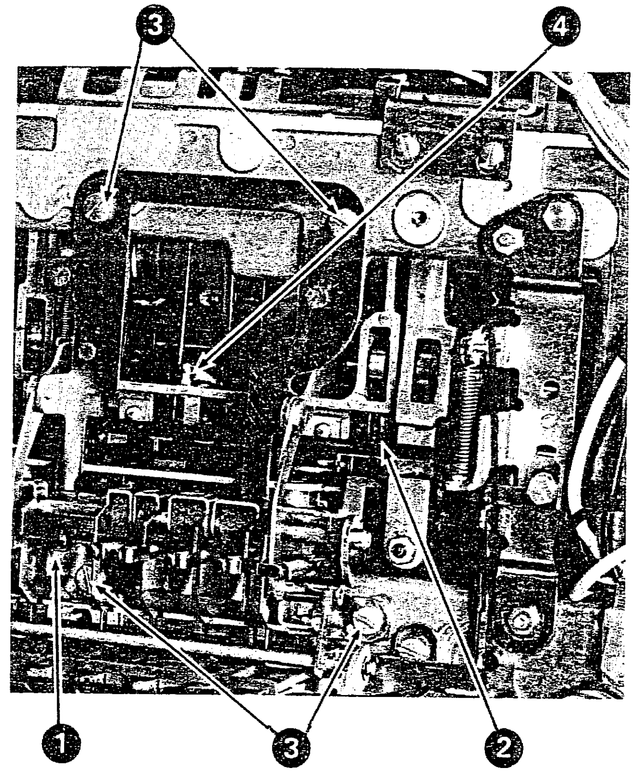


Figure 4-30. Differential-Plate Removal (Steps 6-10)

11. Remove the motor.
12. Remove all latch springs (No. 1, Figure 4-31).
13. Remove all latch links (No. 2, Figure 4-31).
14. Remove the left motor mount (No. 3, Figure 4-31).
15. Remove the four differential mounting nuts (No. 4, Figure 4-31). Do not lose the wedge in the lower left mounting stud.
16. Complete the cycle-shaft removal.

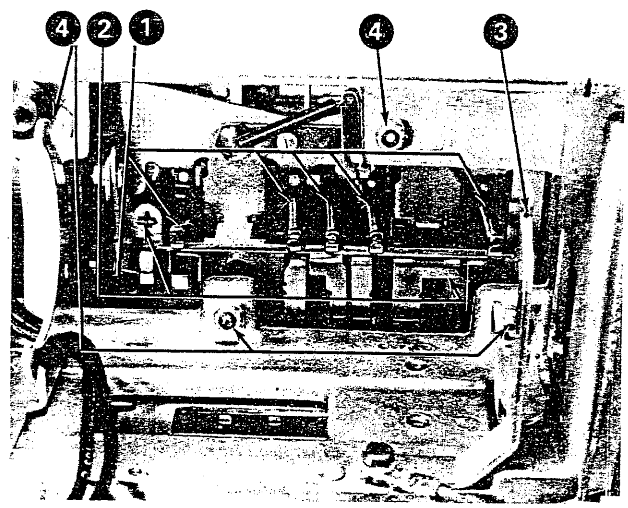


Figure 4-31. Differential-Plate Removal (Steps 12-15)

17. Remove the cycle-clutch-latch bracket (No. 1, Figure 4-32).
18. Remove the C-clip from the negative-latch link (No. 2, Figure 4-32).
19. Remove the C-clip from the tilt-link stud (No. 3, Figure 4-32).
20. Remove the rotate-arm spring (No. 4, Figure 4-32).
21. Detach the check-latch clevis (No. 5, Figure 4-32).
22. Remove the differential-bracket assembly.
23. The following adjustments should be checked after the differential-plate is replaced:
    a. Rotate-differential guides
    b. Tilt-differential guides
    c. Rotate-latch clearance
    d. Tilt-latch clearance
    e. Tilt detenting
    f. Typehead homing
    g. Cycle-clutch-latch bracket

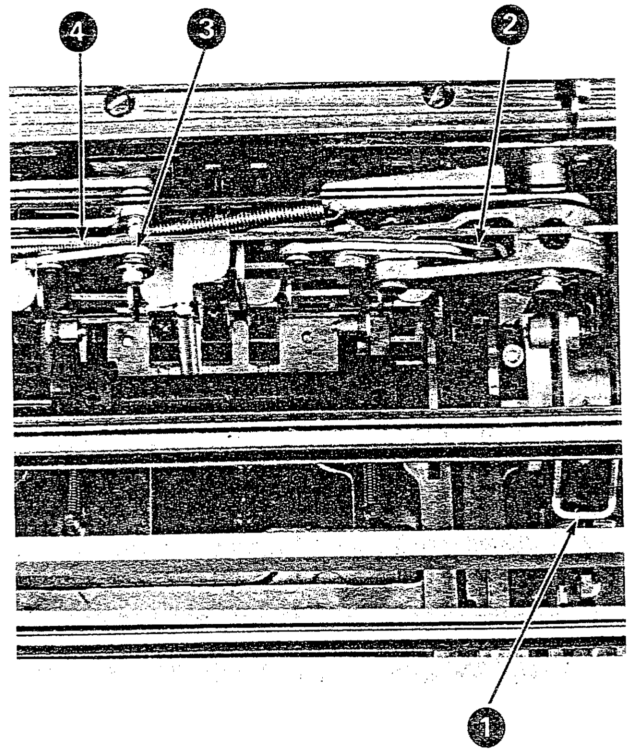


Figure 4-32. Differential-Plate Removal (Steps 17-21)

SELECTOR-BAIL REMOVAL

1. Remove the two screws (No. 1, Figure 4-33) that hold the contact plate to the frame. Remove the contact plate, holding it to the front with a rubber band.

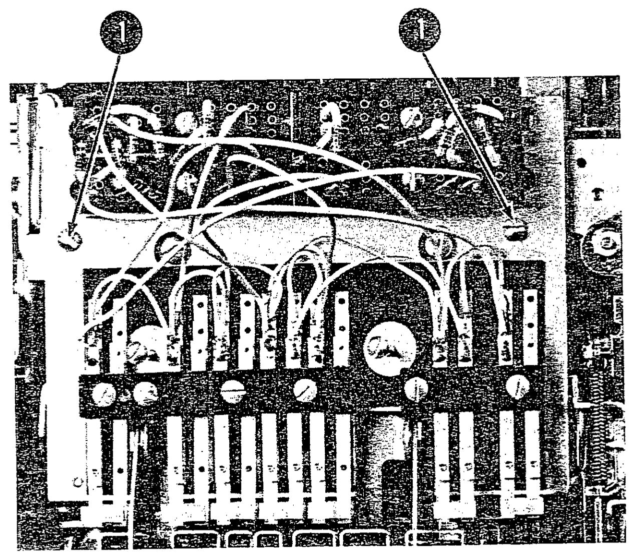


Figure 4-33. Selector-Bail Removal (Step 1)

2. Scribe the power frame, remove the four mounting screws (No. 1, Figure 4-34), and carefully remove the pusher-arm assembly.
3. Remove the positive-bail spring (No. 2, Figure 4-34), and pull the bail down.

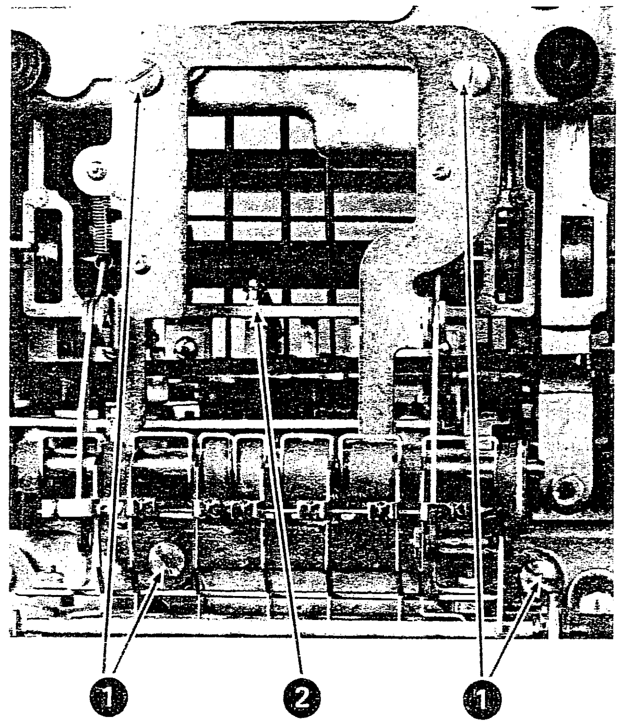


Figure 4-34. Selector-Bail Removal (Steps 2 and 3)

4. Remove all the C-clips from the positive bail shaft (No. 1, Figure 4-35).
5. Swing the retainer (not shown) on the outside of the power frame out of the way and pull the bail shaft out.
6. Work the bail assembly out through the bottom of the machine.
7. The following adjustments should be checked after the selector bail is replaced:
   a. Latch clearance
   b. Latch-bail overthrow stop

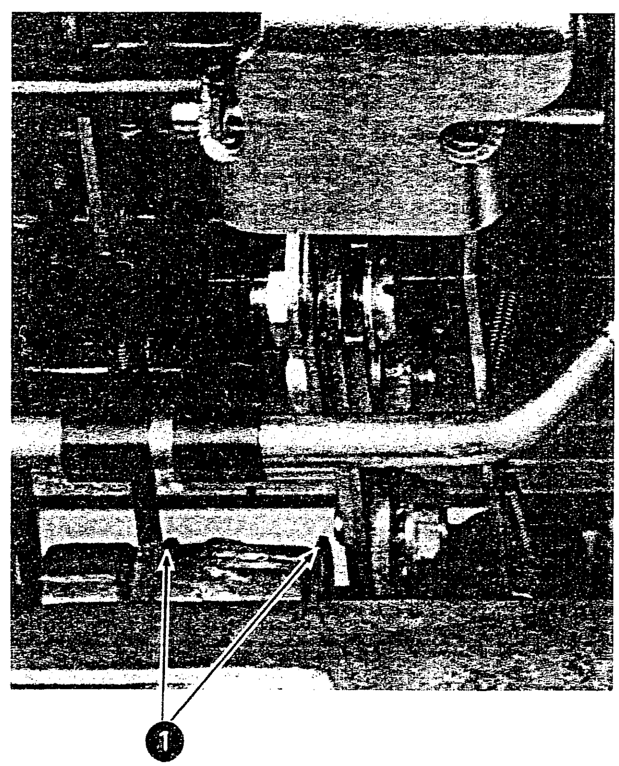


Figure 4-35. Selector-Bail Removal (Steps 4-7)

PRINT-MAGNET-ASSEMBLY REMOVAL

1. Disconnect the cycle-clutch trip link (No. 1, Figure 4-36) by unhooking the clevis or by removing the elastic stop-nut.
2. Remove the support leg in the lower left corner (No. 2, Figure 4-36).
3. Remove the four mounting screws (No. 3, Figure 4-36).
4. Carefully remove the magnet assembly.

   NOTE: The magnet unit is shimmed away from the power frame to allow the knock-off extension to be within range of the knock-off eccentric and to maintain the magnet unit parallel to the pushers. These shims (spacers) vary in thickness and must be put back in the same location from which they were removed whenever the magnet unit is replaced.

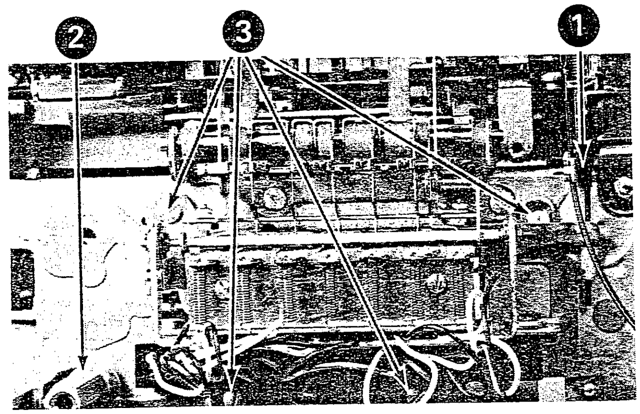


Figure 4-36. Print-Magnet-Assembly Removal (Steps 1-4)

LATCH-PUSHER REMOVAL

1. Remove the two screws (No. 1, Figure 4-37) that hold the contact plate to the frame. Remove the contact plate, holding it to the front with a rubber band. Do not lose the shims, if present.

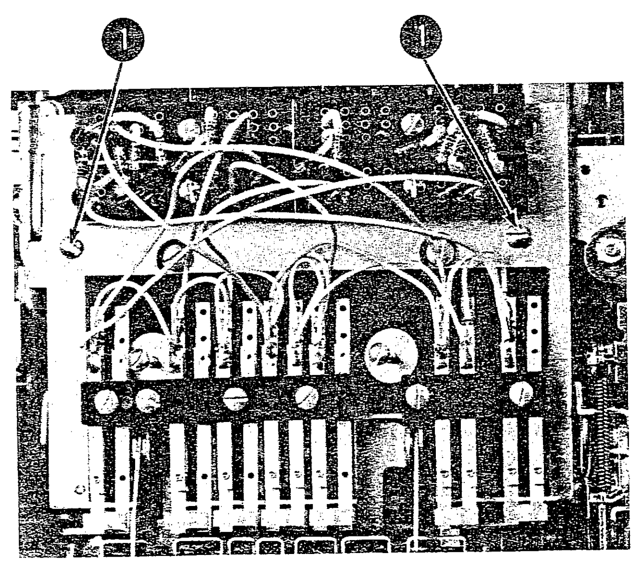


Figure 4-37. Latch-Pusher Removal (Step 1)

2. Disconnect the pusher springs (No. 1, Figure 4-38).
3. Remove the C-clip on the end of the shaft (No. 2, Figure 4-38), and remove the shaft until the desired pusher is free.
4. The following adjustments should be checked after a latch pusher has been replaced:
   a. Latch-to-pusher clearance
   b. Latch-pusher-to-armature clearance

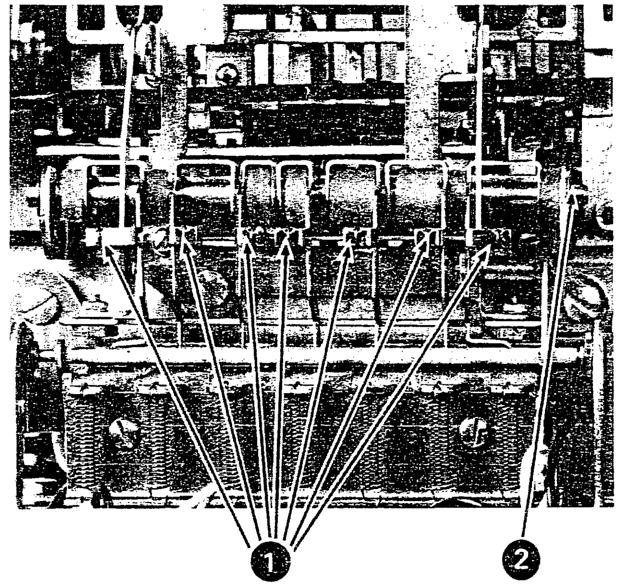


Figure 4-38. Latch-Pusher Removal (Steps 2-4)

SHIFT-MAGNET-ASSEMBLY REMOVAL

1. Remove the spring from the hold armature (No. 1, Figure 4-39).
2. Loosen the front mounting stud (screw on Level 2) (No. 2, Figure 4-39).
3. Loosen the rear mounting screw (No. 3, Figure 4-39).
4. Slide the assembly forward and remove it.
5. The shift-magnet-assembly adjustments should be checked after the shift-magnet assembly is removed.

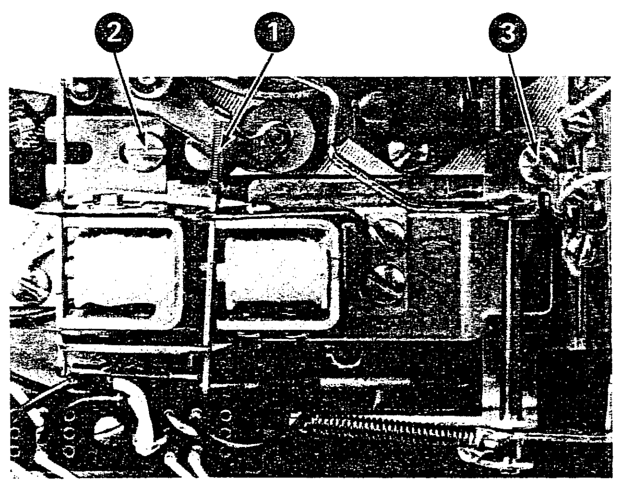


Figure 4-39. Shift-Magnet-Assembly Removal (Steps 1-3)

BACKSPACE-RACK REMOVAL

1. Remove the motor.
2. Remove the backspace-rack spring (No. 1, Figure 4-40).
3. Remove the three backspace-rack mounting studs (No. 2, Figure 4-40), one of which is not shown, and remove the rack.
4. The following adjustments should be checked after the backspace rack has been replaced:
   a. Tab-lever stop
   b. Backspace rack
   c. Intermediate lever

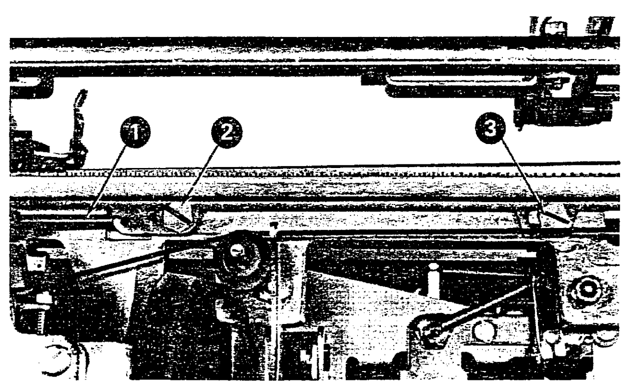


Figure 4-40. Backspace-Rack Removal

SHIFT-ARM REMOVAL

1. Position the carrier to the left and remove the right dust cover.
2. Remove the shift-contact assembly (No. 1, Figure 4-41). (Not necessary with stamped shift arm.)
3. Remove the shift-arm brace (No. 2, Figure 4-41). (Not necessary with stamped shift arm.)
4. Loosen the setscrews that hold the shift-arm pivot (No. 3, Figure 4-41).
5. Rotate the head counterclockwise, remove the tape from the shift-arm pulley, and pull it on the tilt pulley.
6. Remove the shift-arm pivot and arm.
7. The following adjustments should be checked after the shift-arm is replaced:
   a. Typehead homing
   b. Shift-contact adjustments, if removed.

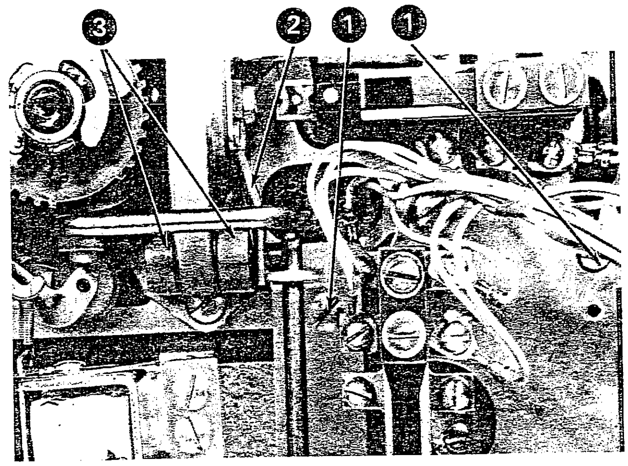


Figure 4-41. Shift-Arm Removal (Steps 2-4)

OPERATIONAL-CAM-CHECK-PAWL AND ESCAPEMENT-CAM-FOLLOWER REMOVAL

1. Position the carrier to the left and remove the right dust cover.
2. Disconnect the escapement link (No. 1, Figure 4-42).
3. Remove all C-clips from the check-pawl shaft (No. 2, Figure 4-42).
4. Slide the shaft to the left until the desired part is free. Remove springs only as necessary.

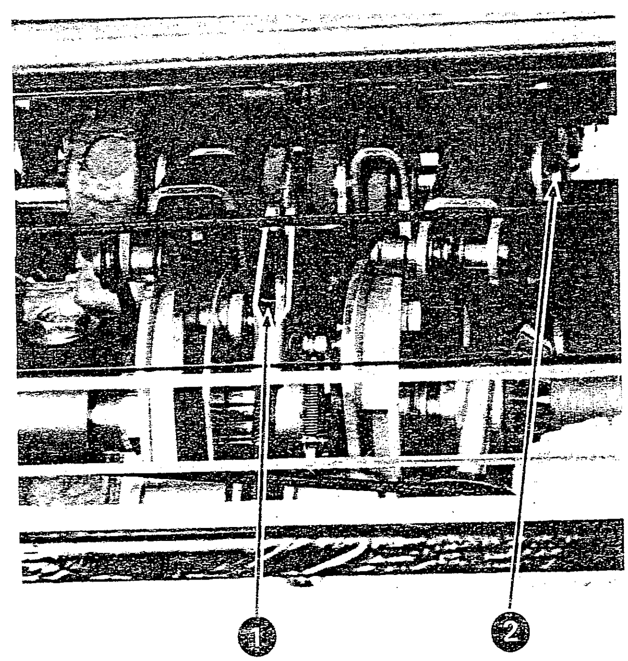


Figure 4-42. Operational-Cam-Check-Pawl and Escapement-Cam-Follower Removal

OPERATIONAL-CAM-FOLLOWER OR CLUTCH-RELEASE-ARM REMOVAL

1. Complete the operational-shaft removal
2. Remove the C-clips from the cam-follower pivot shaft (No. 1, Figure 4-43).
3. Remove the auxiliary cam-follower spring (No. 2, Figure 4-43).

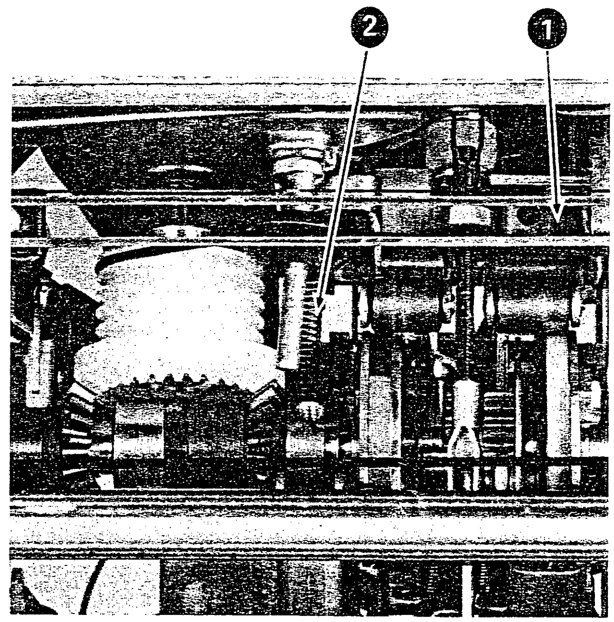


Figure 4-43. Operational-Cam-Follower Removal

4. Work the shaft to the right until the desired part is free.
5. To remove a clutch-release arm:
   a. Move the cam follower aside.
   b. Spring the interposers adjacent to the release arm slightly, and roll the release arm out from under (No. 1, Figure 4-44).

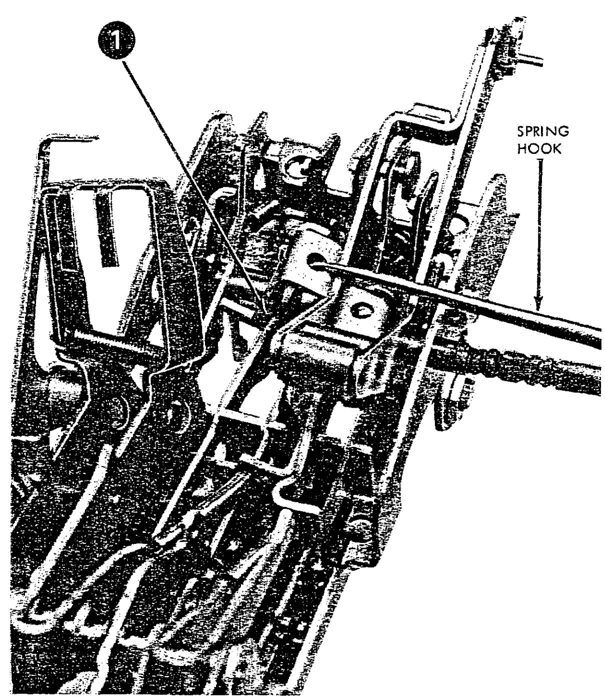


Figure 4-44. Clutch-Release-Arm Removal

OPERATIONAL-MAGNET-ASSEMBLY REMOVAL

1. Remove the shift-magnet assembly.
2. Remove the actuator-arm spring (No. 1, Figure 4-45).
3. Remove the two mounting screws (No. 2, Figure 4-45).
4. Remove the actuator-arm pivot screw (No. 3, Figure 4-45). It may be necessary to remove both pivot screws on some machines.
5. Remove the armature-link clevises (No. 4, Figure 4-45).

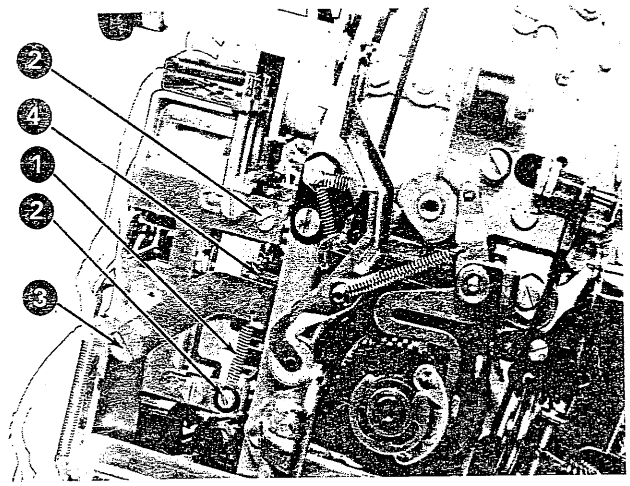


Figure 4-45. Operational-Magnet-Assembly Removal (Steps 1-5)

6. Remove the mounting screw (No. 1, Figure 4-46).
7. Remove the nut (No. 2, Figure 4-46), and carefully remove the magnet assembly.

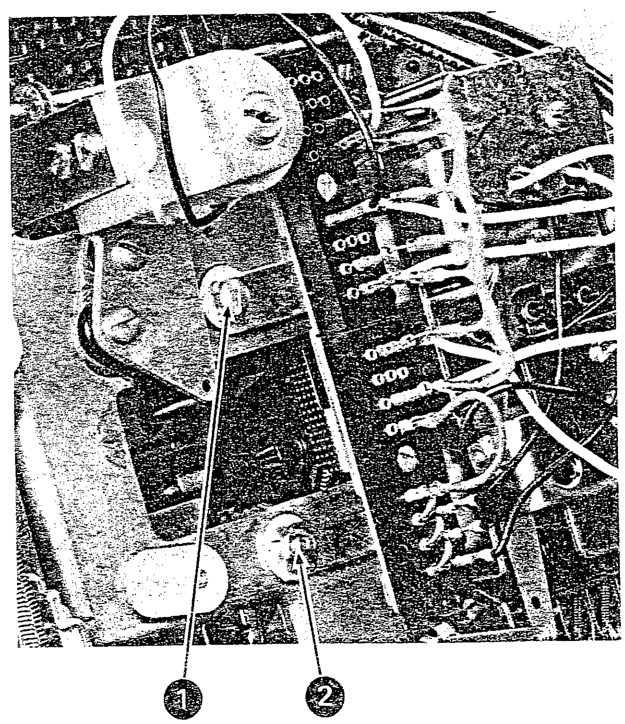


Figure 4-46. Operational-Magnet-Assembly Removal (Steps 6 and 7)

OPERATIONAL-LATCH-BRACKET REMOVAL

1. Remove the feedback-contact assembly bracket by loosening the two screws (No. 1, Figure 4-47).

DANGER
Care must be used in unwinding and removing the mainspring so that the spring does not fly out and cause personal injury.

2. Remove the mainspring and hub (No. 2, Figure 4-47).
3. Disconnect the backspace-latch spring (not shown).
4. Remove the back plate (No. 3, Figure 4-47).

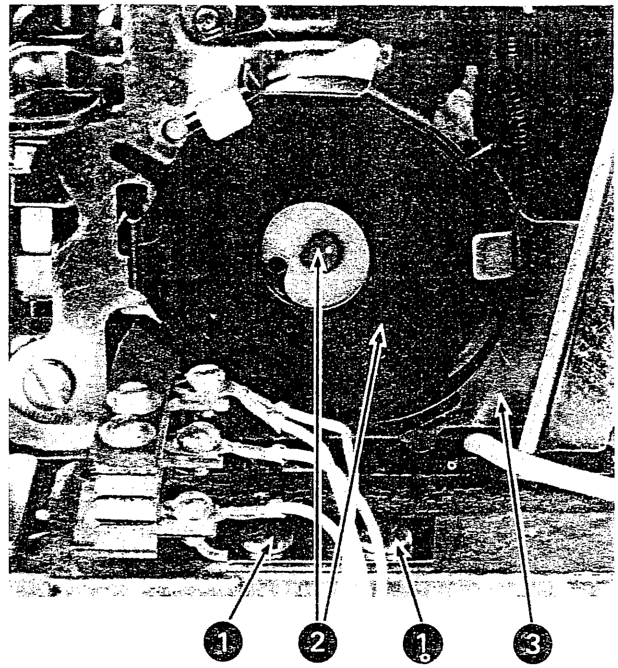


Figure 4-47. Operational-Latch-Bracket Removal (Steps 1-4)

5. Disconnect the backspace-rack spring (No. 1, Figure 4-48).
6. Disconnect the cam-follower spring (No. 2, Figure 4-48).
7. Disconnect the space and tab-latch springs (No. 3, Figure 4-48).
8. Disconnect the tab-bellcrank-link clevis (not shown)
9. Disconnect the detent spring (No. 4, Figure 4-48).
10. Disconnect the carrier-return-latch spring (No. 5, Figure 4-48).
11. Remove the index-selection link (No. 6, Figure 4-48).
12. Remove the carrier-return eccentric by removing the eccentric nut (No. 7, Figure 4-48).
13. Remove the escapement link (No. 8, Figure 4-48).
14. Disconnect the carrier-return actuating spring and carrier-return actuating-arm spring (No. 9, Figure 4-48).
15. Remove the escapement-torque-bar restoring spring (No. 10, Figure 4-48).
16. Remove the two mounting screws (the left one is not visible) and one nut (No. 11, Figure 4-48).
17. Work the operational-latch bracket out of the machine.
18. The following adjustments should be checked after the operational-latch bracket has been replaced:
    a. C5 and C6 timing
    b. Mainspring tension
    c. Escapement-trigger guide
    d. Escapement link
    e. All operational-latch clearances
    f. Carrier return
    g. Backspace

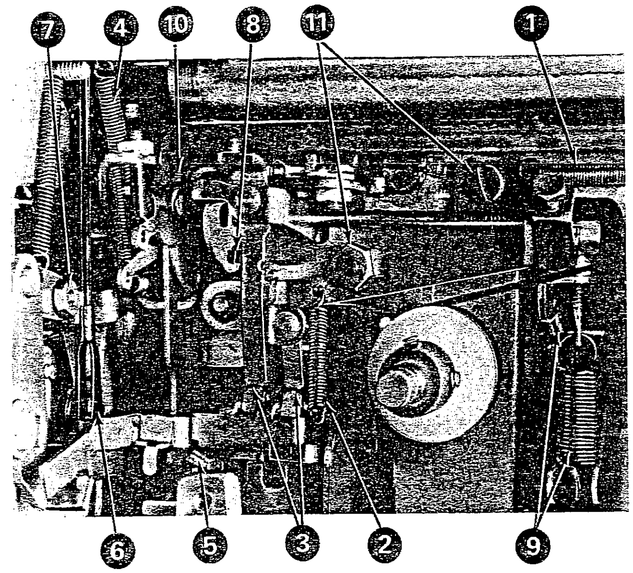


Figure 4-48. Operational-Latch-Bracket Removal (Steps 5-18)

SHIFT-CAM REMOVAL

1. Turn the typehead counterclockwise and remove the relaxed rotate tape from the shift-arm pulley. Place the tape around the tilt pulley.

   NOTE: On machines with a punched shift arm, demount the arm and allow the pulley to pass through the right side frame until the arm comes to rest against the side frame.

2. Remove the lowercase-armature spring (No. 1, Figure 4-49).
3. Remove the shift-magnet assembly (No. 2, Figure 4-49).
4. Remove the shift-interlock, shift-release, and cam-detent springs.
5. Remove the C-7 contact assembly (No. 3, Figure 4-49).
6. Remove the shift-release support bracket (No. 4, Figure 4-49).
7. Remove the detent assembly (No. 5, Figure 4-49).
8. Remove the shift-release arm and the shift-interlock assembly (No. 6, Figure 4-49).
9. Remove the retaining ring from the shaft and remove the shift-clutch ratchet (No. 7, Figure 4-49).

   NOTE: On early-level machines, observe the shift-clutch-spring position so that it can be replaced in the correct hole in the shift-clutch ratchet. On later machines, observe the spring position so that it can be replaced in the correct hole in the shift cam.

10. Remove the shift-clutch spring (behind the ratchet).

    CAUTION
    On Level 2 shift mechanisms, the turned-down end of the shift-clutch spring must be lifted out of its hole in the shift-cam hub before the spring is removed, or spring damage will result.

11. Remove the shift arbor from the operational shaft (No. 8, Figure 4-49).

    NOTE: Do not rotate the shaft backward.

12. Remove the shift cam (No. 9, Figure 4-49).
13. The following adjustments should be checked after the shift cam has been replaced:
    a. All shift-mechanism adjustments
    b. Shift-magnet assembly
    c. Upper and lowercase typehead homing

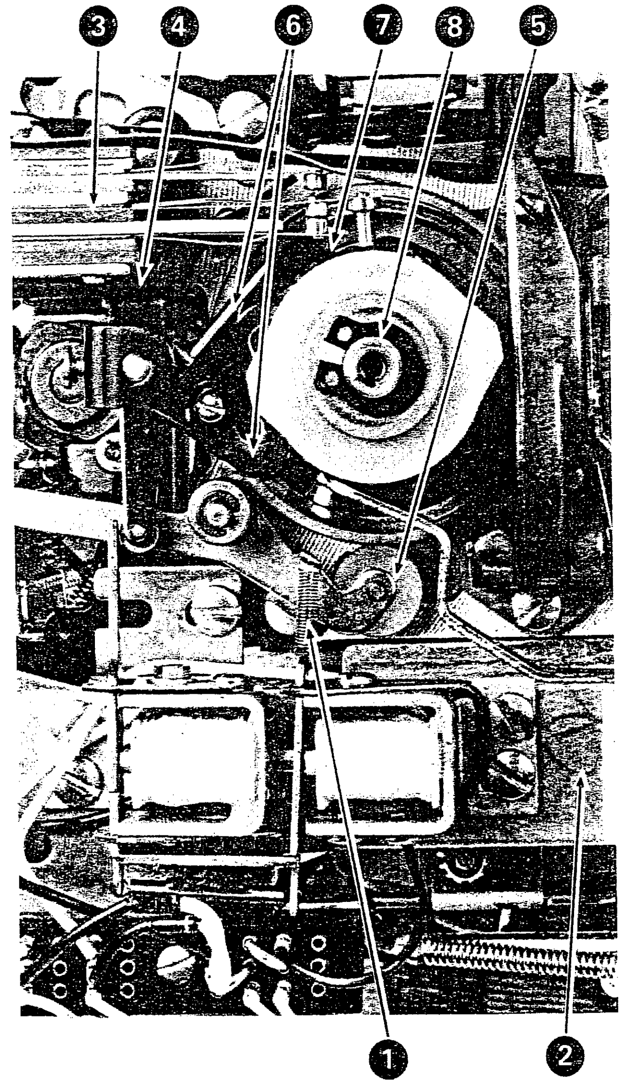


Figure 4-49. Shift-Cam Removal

OPERATIONAL-SHAFT REMOVAL

1. Remove the shift-clutch ratchet and the clutch spring. Do not disturb the clutch arbor.
2. Loosen the setscrews in: the torque-limiter hub, the tab-governor hub, the tab-governor collar, the operational-cam ratchet, and the right shaft collar. (See No. 1, Figure 4-40).
3. Remove the clip from the carrier-return-pinion spring (No. 2, Figure 4-50).
4. Push the torque-limiter hub to the left as far as possible; then spread the coils on the carrier-return-pinion spring and, with the pusher end of a spring hook, push the left pinion-retainer clip off the shaft. (If this clip is not present, continue on to the next step. This clip is not needed and therefore should be removed if one is found.)
5. Move the pinion gear to the left and remove the retainer clip at the right side of the pinion (No. 3, Figure 4-50).
6. All parts on the operational shaft are now loose, and the shaft may be pulled out, through the bearing, toward the right. Lift the freed parts out the top or allow them to drop as the shaft is withdrawn.

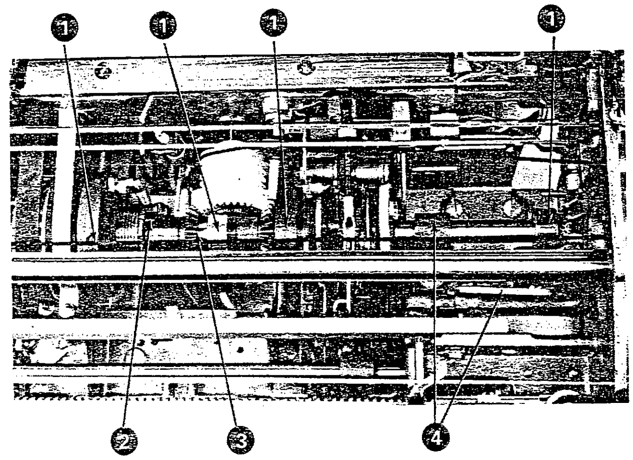


Figure 4-50. Operational-Shaft Removal

OPERATIONAL-SHAFT REPLACEMENT

1. Since the shift-clutch arbor has not been loosened from the shaft, the shaft need only be reinserted until the shift-clutch arbor bears against the shaft bearing (with 0.002" to 0.004" end play) to ensure the same position of the carrier-return pinion gear as before disassembly. On improved-lubrication-shift machines, readjust the shift-clutch-ratchet end play.
2. To reset the operational cams in their proper positions, equalize the clearance between the cams and the check pawls. With ratchets having only one setscrew, tighten the setscrew to the flat side on the operational shaft.

   NOTE: Reset the tab and carrier-return interlock-switch-follower arms below the operational cams.
3. Set the tab-governor hub and collar, observing the proper mesh end-play adjustments.
4. After reinstallation of the retainer clip on the right side of the carrier-return pinion gear, move the torque-limiter hub to the right, against a 0.003" feeler-gage blade inserted between the torque-limiter hub and the carrier-return pinion. Tighten the torque-limiter hub; then remove the gage.
5. Install the clip that fastens the carrier-return-pinion spring to the torque-limiter arbor.
6. Maintain the operational-shaft support to hold the shaft firmly without binding (No. 4, Figure 4-50).

OPERATIONAL-INTERPOSER-BRACKET REMOVAL

1. Complete the operational-magnet removal.
2. Complete the operational-shaft removal.
3. Complete the operational-latch bracket removal.
4. Remove the six (two shown) mounting screws (No. 1, Figure 4-51).
5. Remove the C5 auxiliary cam follower.
6. Remove the keylever-pawl guides from the operational-interposer bracket (not shown).
7. Work the bracket assembly out through the rear of machine.
8. The following adjustments should be checked after the operational-interposer-bracket assembly has been replaced:
   a. Bevel-gear mesh
   b. Operational-latch pivot-pin eccentric
   c. Escapement-trigger guide
   d. Mainspring tension
   e. Keylever-pawl to interposer clearance
   f. Operational-latch height
   g. Backspace rack
   h. Pawl clearance
   i. Clutch-latch overthrow
   j. Carrier-return actuating arm
   k. Multiplying-control lever

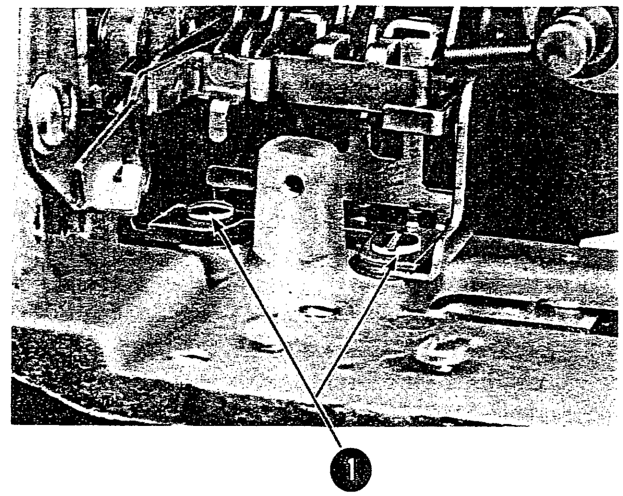


Figure 4-51. Operational-Interposer-Bracket Removal

CARRIER-SHOE REMOVAL

1. Scribe the position of the escapement bracket.
2. Remove the two card-holder screws (No. 1, Figure 4-52).
3. Remove the two escapement-bracket screws (No. 2, Figure 4-52).

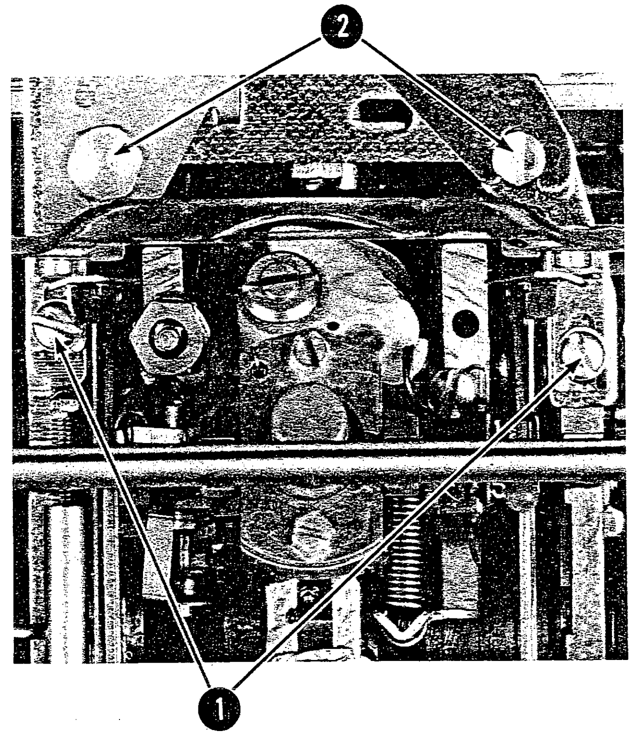


Figure 4-52. Carrier-Shoe Removal (Steps 1-3)

4. Work the carrier out from under the escapement bracket, to the right.
5. Remove the nut from the carrier-shoe stud and remove the shoe (No. 1, Figure 4-53).
6. The following adjustments should be checked after the carrier shoe has been replaced.
   a. Carrier shoe
   b. Escapement bracket
   c. Tab

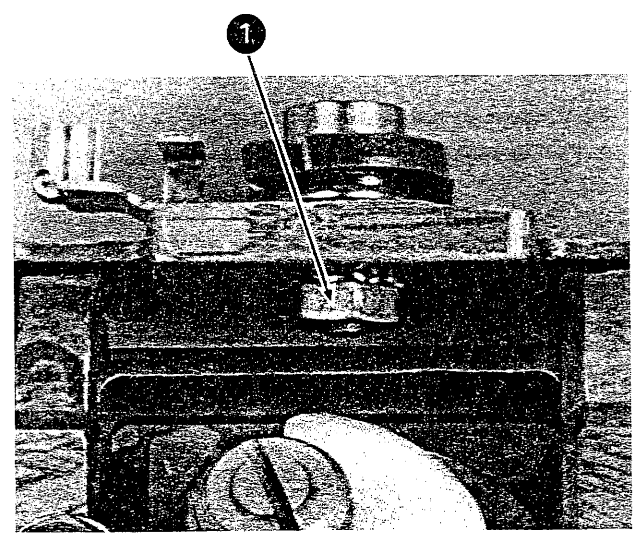


Figure 4-53. Carrier-Shoe Removal (Steps 4 and 5)

CARRIER AND ROCKER REMOVAL

1. Remove the ribbon-feed-mechanism mounting screws (No. 1, Figure 4-54).

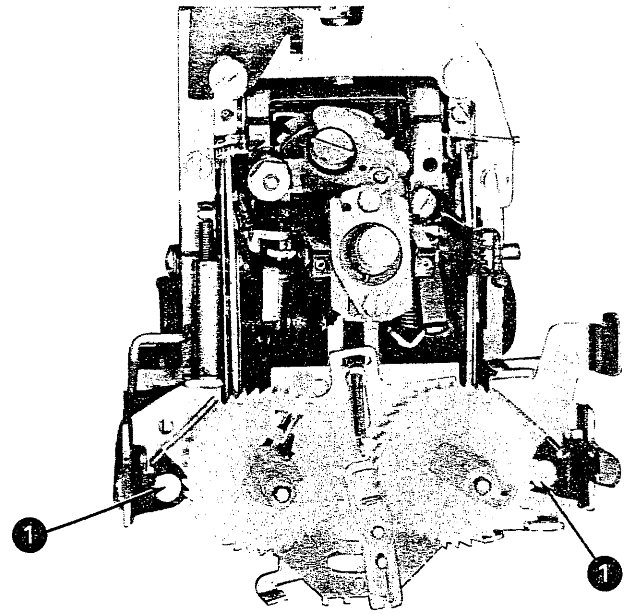


Figure 4-54. Carrier and Rocker Removal (Step 1)

2. Remove the card holder (No. 1, Figure 4-55).
3. Disconnect the ribbon-lift spring (No. 2, Figure 4-55).
4. Release the rotate-spring tension. Refer to "Rotate Spring Replacement" step number 5 for the correct procedure.
5. Remove the tilt-pulley spring (gear-tilt only).
6. Remove the tape anchor screw (No. 3, Figure 4-55).
7. Remove the tapes (No.4, Figure 4-55).
8. Remove the tape wiper, if present.
9. Remove the escapement-bracket mounting screws (No. 5, Figure 4-55).
10. Remove the print-shaft gear (not shown).
11. Disconnect the cords.
12. Remove the print shaft (No. 6, Figure 4-55).
13. Remove the carrier and rocker assembly.

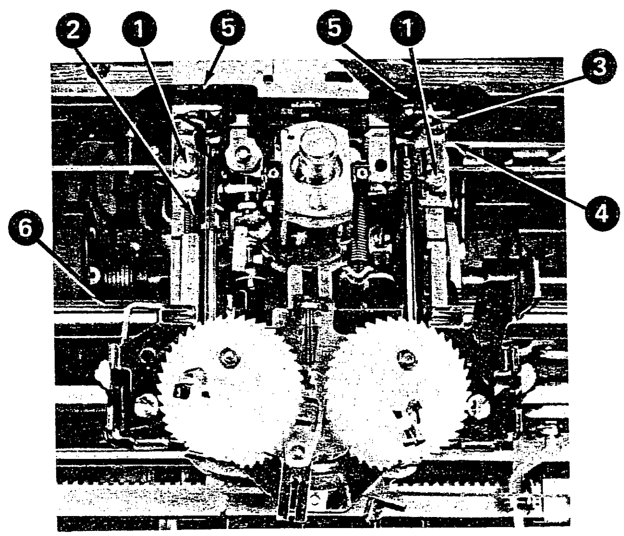


Figure 4-55. Carrier and Rocker Removal (Steps 2-13)

NOTE: If rocker removal is necessary, complete the following steps.

14. Remove the anvil striker (No. 1, Figure 3-56, if it is present.
15. Remove the rotate spring, cage, and pulley (No. 2, Figure 4-56).
16. Remove the tape guide (No. 3, Figure 4-56).
17. Remove the C-clip on the rocker shaft (No. 4, Figure 4-56).
18. Loosen the rocker-shaft setscrew and remove the rocker shaft (No. 5, Figure 4-56).
19. Check the carrier and rocker escapement, and the alignment adjustments after reassembly.

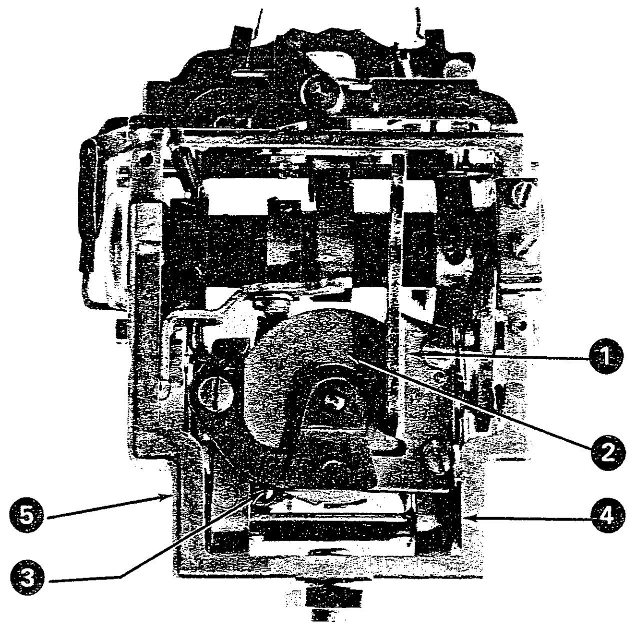


Figure 4-56. Carrier and Rocker Removal (Steps 15-19)

ESCAPEMENT-BRACKET REMOVAL

1. Position the carrier approximately one-third of the distance from the left end of the machine.
2. Remove the platen, deflector, and feedrolls. Remove the ribbon-lift spring. Remove the tab retaining plate (No. 1, Figure 4-57).
3. Measure the clearance between the tab torque bar and the escapement bracket with a feeler gage (No. 2, Figure 4-55). If the escapement bracket has a raised portion next to the tab torque bar, measure the clearance at this point.
4. Scribe the position of the escapement bracket.
5. Remove the remaining rear escapement-bracket screw; the one holding the tab gang-clear finger (No. 3, Figure 4-57).
6. Remove the two front escapement-bracket screws that hold the card holder (No. 4, Figure 4-57).
7. Remove the tab-link clevis from the right end of the torque bar (No. 5, Figure 4-57).
8. Remove the tab-torque-bar retainer clip from the right end of the tab torque bar (No. 6, Figure 4-57).
9. Remove the tab spring from the left end of the tab torque bar.
10. Manually half-cycle the printer to a tilt 3 and a rotate +5 character position.

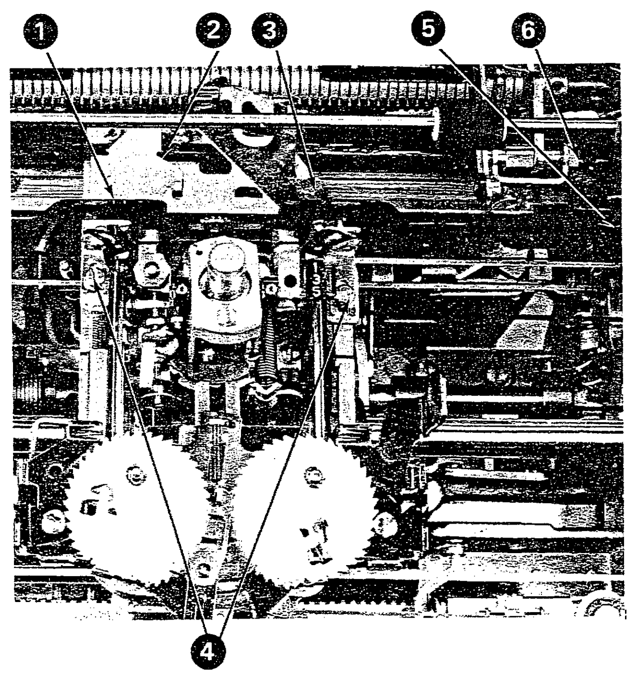


Figure 4-57. Escapement-Bracket Removal

11. Lift the escapement bracket. Hand crank the carrier from under the bracket (to the right) to approximately one-third of the distance from the right end of the machine. Push the tab torque bar to the right so the left end will be free. Pull the left end forward and out of the machine.

NOTE: A slight amount of manipulation may be required to disengage the escapement bracket and tab torque bar from the carrier.

12. The following adjustments should be checked after the escapement bracket has been replaced:
    a. Escapement bracket
    b. Tab gang-clear finger
    c. Tab retaining plate
    d. Card holder

INTERPOSER REMOVAL

1. Align the carrier over the line-lock interposer (No. 1, Figure 4-58).
2. Disconnect the operational keylever springs, carrier-return spring, and backspace spring (No. 2, Figure 4-58).
3. Remove the keylever upstop (No. 4, Figure 4-58).
4. Remove the spacebar equalizing rod (No. 5, Figure 4-58).
5. Remove the bell-bail lever (No. 6, Figure 4-58).
6. Remove the bell-ringer bail (No. 7, Figure 4-58).
7. Remove the margin rack (No. 8, Figure 4-58).
8. Slip sound deadening over operational keybuttons (No. 9, Figure 4-58). Raise the keylevers (Figure 4-59), being careful to raise them evenly on machines that have keylever-pawl leaf springs.

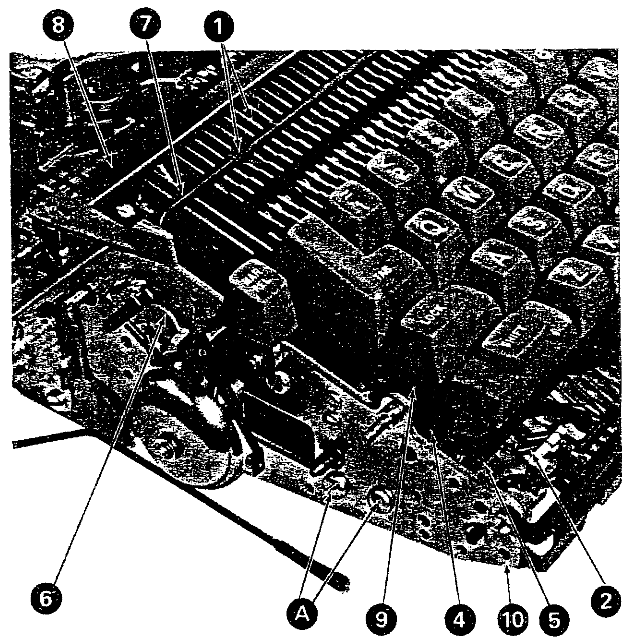


Figure 4-58. Interposer Removal (Steps 1-8 and 11)

9. Push the fulcrum rod to the interposer being removed with a fulcrum rod tool (No. 1, Figure 4-59).
10. Remove the spring from the interposer being removed (No. 2, Figure 4-58).
11. To remove the line-lock interposer, it is necessary to remove the screws marked "A" on Figure 4-58 and pull the interposer-guide-comb support forward (not shown).
12. The following adjustments should be checked after the interposer is replaced:
    a. Keylever guide
    b. Bell-ringer-bail lever

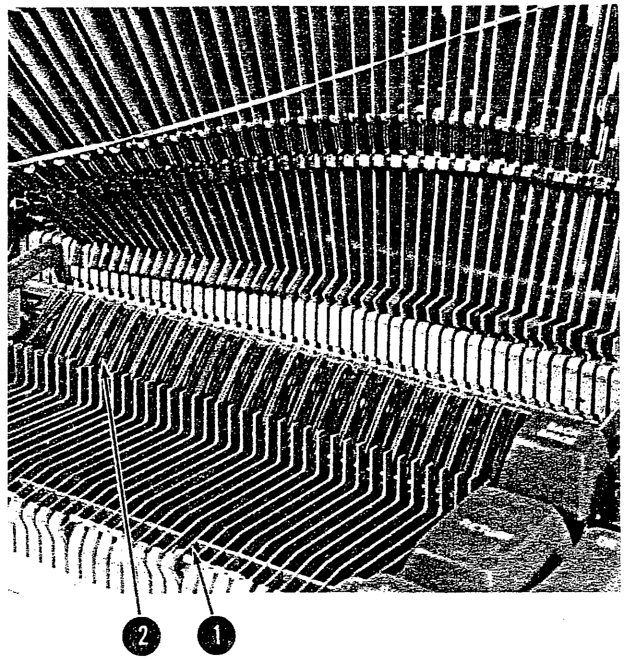


Figure 4-59. Interposer Removal (Steps 9 and 10)

KEYLEVER REMOVAL

1. Position carrier to expose rear of keylever to be removed.
2. Remove margin rack (No. 8, 4-60).
3. Remove bell-bail lever (No. 6, 4-60) (On some printers, the margin-release lever must be removed. See Step 7.)
4. Remove bell ringer bail (No. 7, 4-60).
5. Remove keybutton from keylever that is to be replaced.
6. Remove other keybuttons that extend over the keylever that is to be replaced.
7. Remove keylever-pivot-rod C-clip. Using a follower rod, push the keylever pivot rod out until the keylever is free.
8. On keyboards with two banks of keylever-pawl leaf springs spanning the character keylevers: disengage the spring leaf from the keylever to be removed, remove the keylever upstop, and pivot the support across the front of the keyboard forward and down on its lower screws (No. 10, Figure 4-60).

   On keyboards with individual keylever-pawl coil springs: raise the pivot end of the keylever to be removed and work it to the rear until it clears the keylever upstop at the front.
9. Work the keylever out toward the front of the machine.
10. Replace in the reverse order of removal.

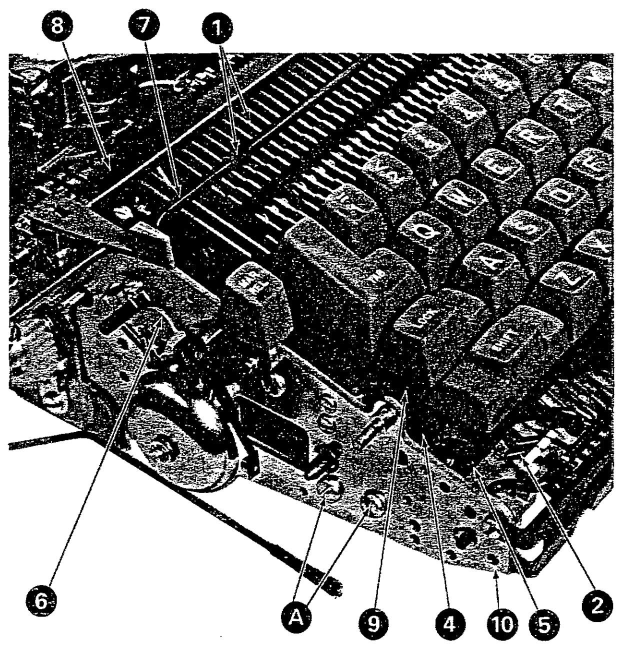


Figure 4-60. Keylever Removal

CAUTION
To avoid damaging the keylever pawl when replacing a keybutton, move the pawl off the interposer and support the keylever.

RED-RIBBON-SHIFT-TAPE REPLACEMENT

1. Hook the end of the tape with the small clip in the small hole in the follower under the ribbon-feed plate.
2. Thread the tape around the pulleys as shown in Figure 4-61.
3. Hook the other end of the tape with the large clip on the stud on the right front of the carrier as shown.
4. Check for twisted tape and binds and recheck the right-hand pulley and latch adjustment (Figure 3-355).

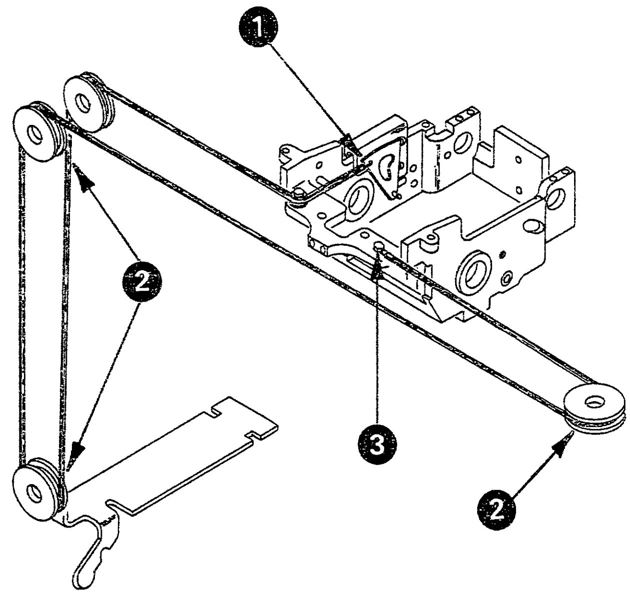


Figure 4-61. Red-Ribbon-Shift Tape Replacement

PRINT-SLEEVE REMOVAL

1. Position the carrier to the center of the machine.
2. Remove the ribbon-feed-mechanism mounting screws and remove the ribbon-feed mechanism.
3. Remove the print-shaft gear and the C-clip on the left end (if present).
4. Remove the print shaft.
5. Remove the print-shaft wiper retainers from both sides of the carrier.
6. Loosen the setscrews in all three cams on the print sleeve.
7. Position the ribbon-lift cam (leftmost cam on the sleeve) so the key slot aligns with the key on the print sleeve.
8. Slide the print sleeve to the left far enough to remove the detent (center) cam and the print (right-most) cam.
9. Remove the key from the print sleeve.
10. Remove the ribbon-lift cam and slide the sleeve from the carrier.

NOTE: When reinstalling the print sleeve, the ribbon-lift cam must be installed with the dot or small hole in the side of the cam to the right. Check print-shaft timing, ribbon-lift-cam timing, and print-shaft end play.

RIBBON-FEED PLATE REMOVAL

1. Remove the ribbon.
2. Make sure the ribbon-lift guides are down.
3. Remove the two screws and cartridge-retainer springs from the ribbon-feed plate.
4. Push the ribbon-feed pawl towards the rear of the machine.
5. Turn and tilt the ribbon-feed plate towards the typehead, while lifting up.

CONTACTS USED ON KEYBOARD I/O PRINTERS

This chapter describes the locations, adjustments, and timings of the contacts used on keyboard I/O printers.

NOTE: The specification for a 0.040" air gap between the O/S and N/O point on the contacts is a preliminary adjustment. The air gap will be varied to obtain the correct N/O duration; however, *a transfer time (N/C break to N/O make) of 3 degrees to 9 degrees must be present* on all printers except the Models 765 and 767 used with the 6400 system. Intermittent problems, as well as contact burning, can be the result of no transfer time (bridging). Contact bridging must be checked with an oscilloscope.

The Off-Line Selectric ® Analyzer (OLSA) does not have a bridging-detection circuit incorporated. As a result, the OLSA should not be used as a final check for this type of error.

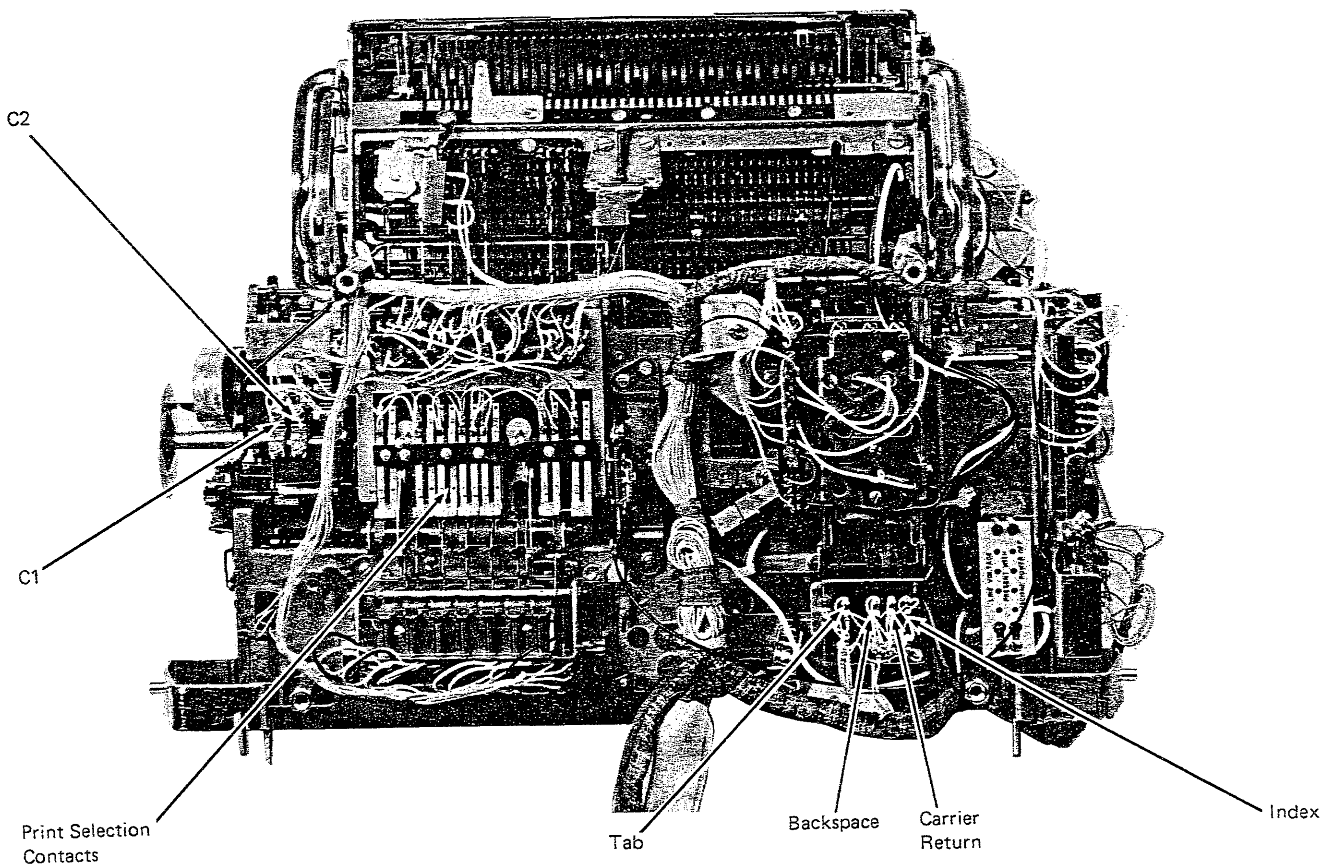


Figure 5-1. Bottom View Showing Contact Locations

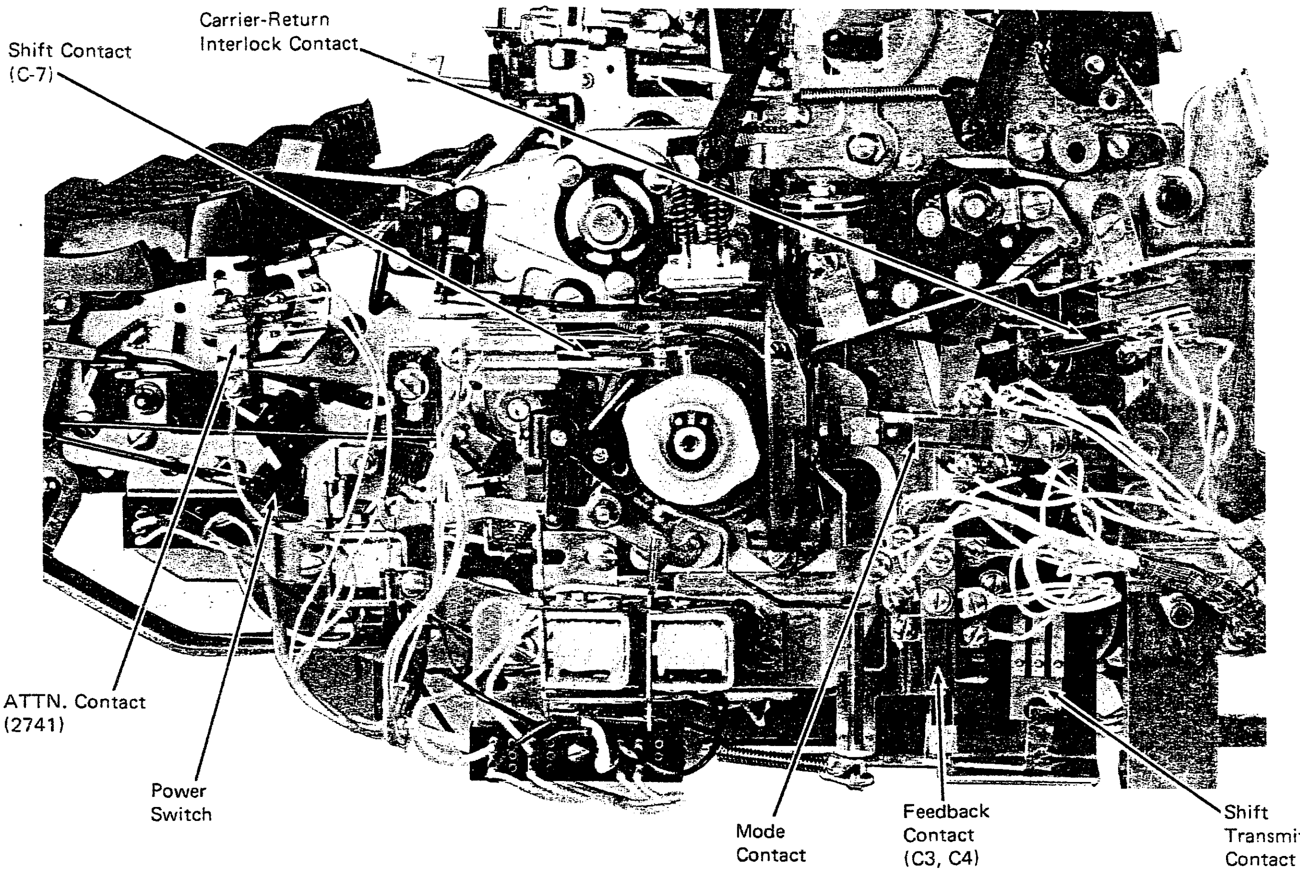


Figure 5-2. Right View Showing Contact Locations

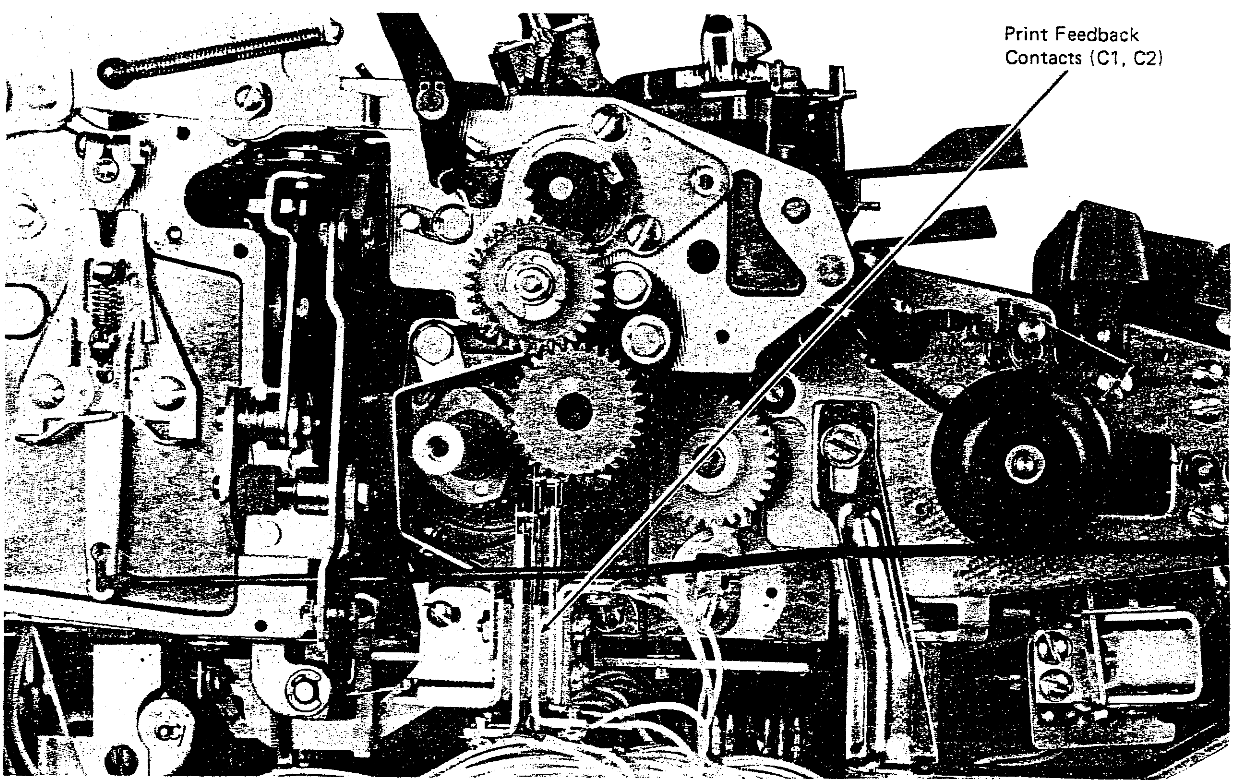
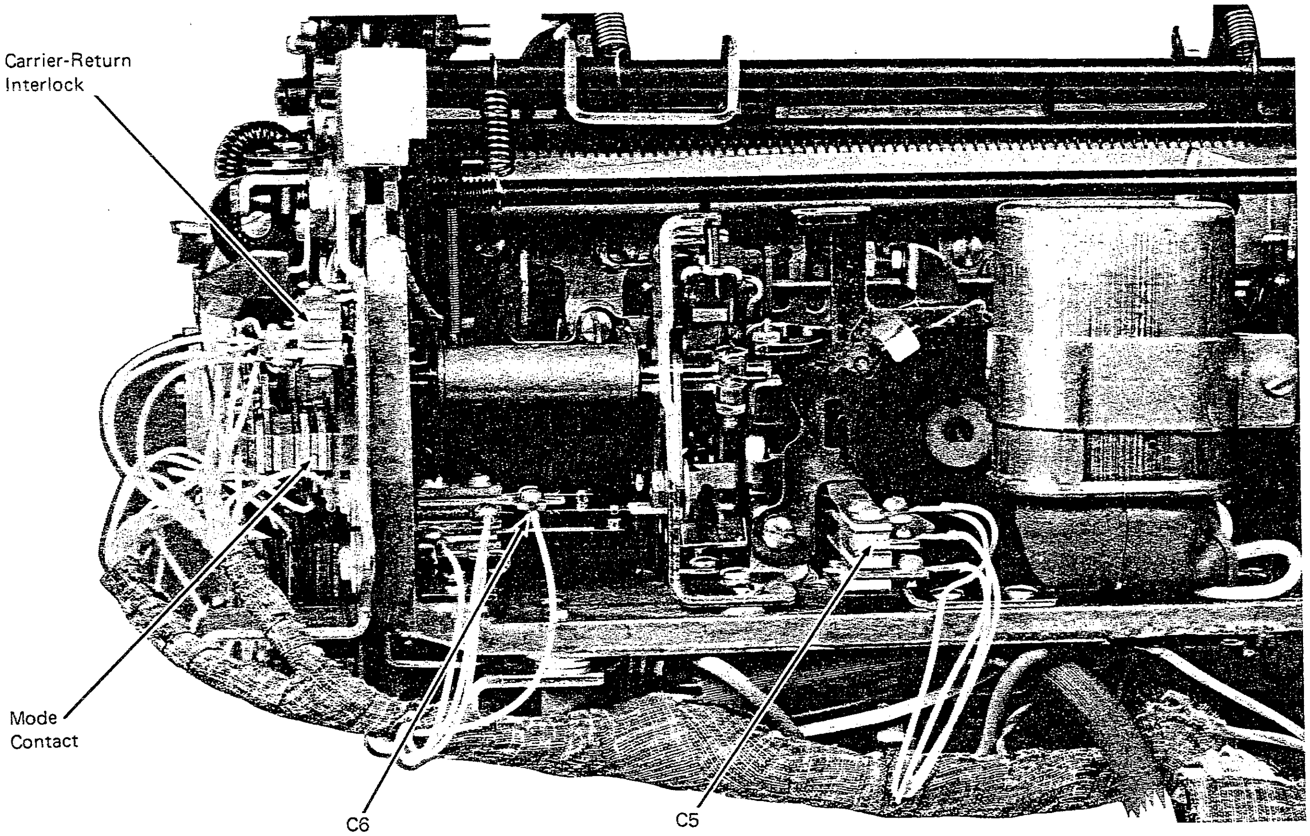


Figure 5-3. Left View Showing Contact Locations



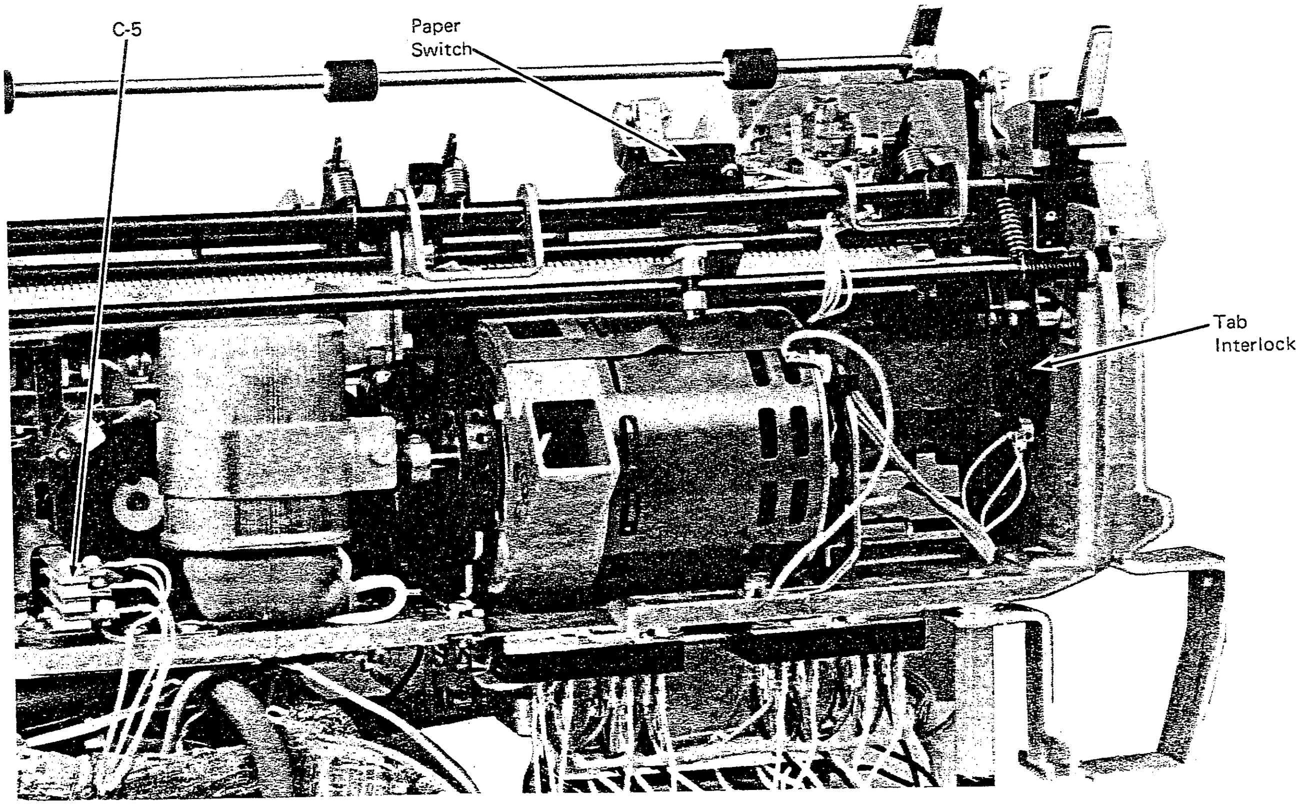
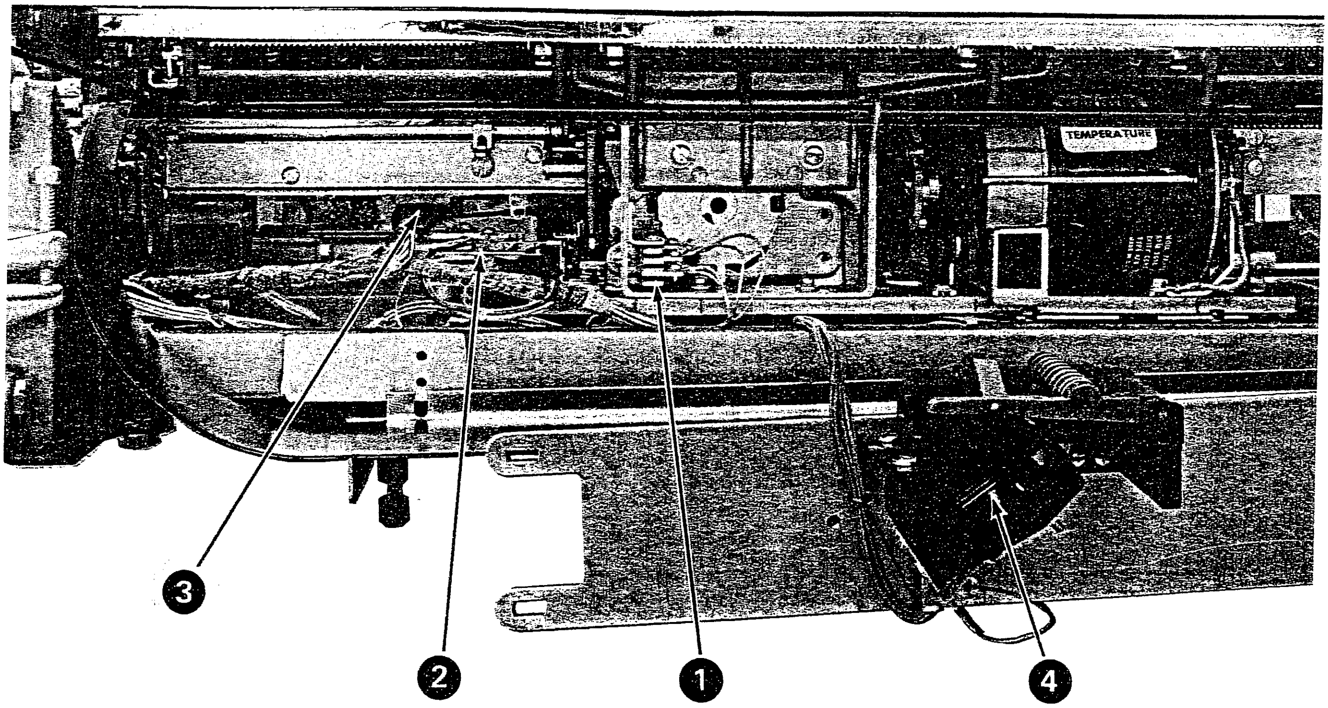


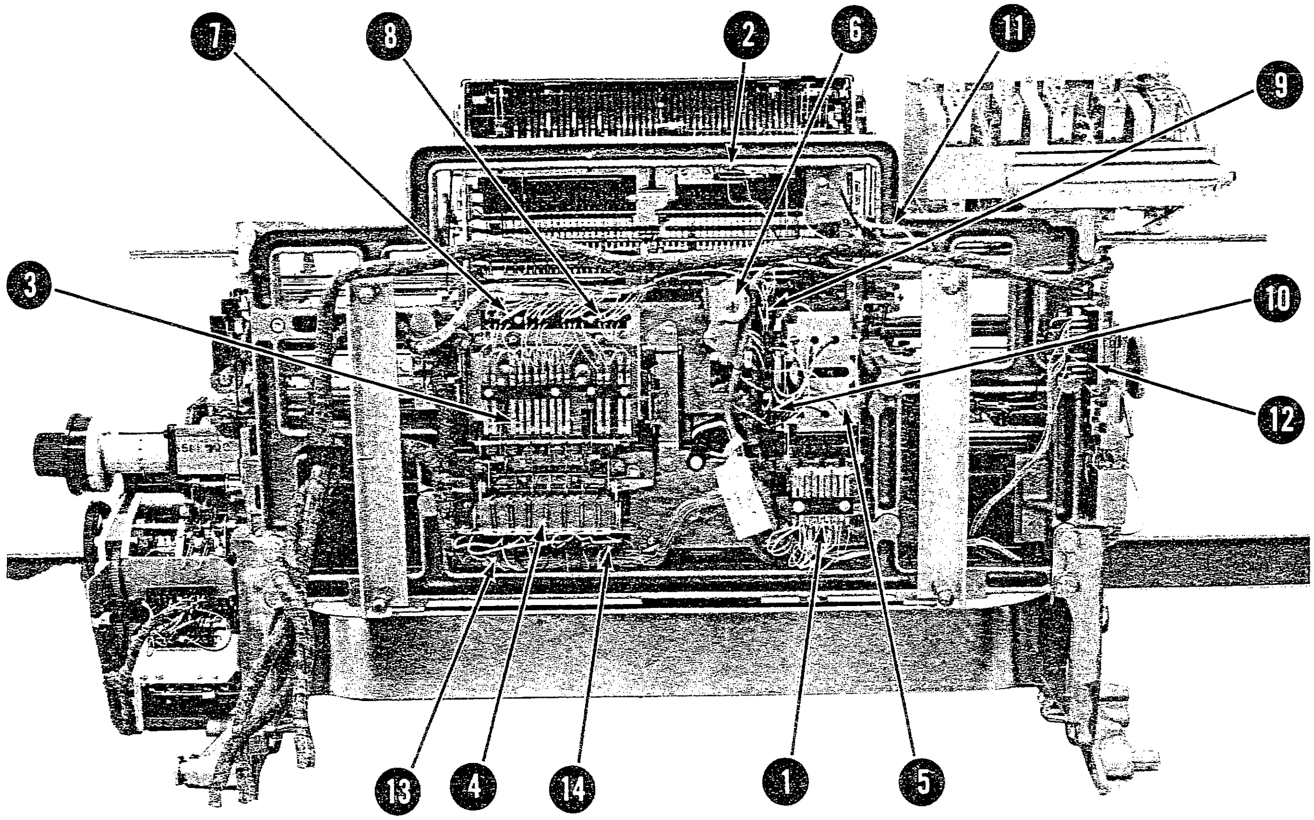
Figure 5-4. Rear View Showing Contact Locations



Legend:

1. C5
2. C6
3. Tab Interlock
4. Horizontal Program

Figure 5-5. Operation-Feedback Contacts (767)



Legend:

1. Operational Transmit
2. Keyboard Mode
3. Print-Selection Transmit
4. Print-Selection Magnet
5. Operational Magnet
6. Keyboard-Lock Magnet
7. Edge-Connector A
8. Edge-Connector B
9. Edge Connector C
10. Edge-Connector D
11. End-of-Line Contact
12. Edge-Connector E
13. Edge Connector G
14. Edge-Connector H

Figure 5-6. Transmit Contacts (767)

PRINT-SELECTION-CONTACT ASSEMBLY

Contact Stacks

Align the contact stacks so the strap edges are parallel. Loosen the mounting screws and shift the contact blocks for adjustment.

NOTE: The contact assembly should be removed for complete adjustment.

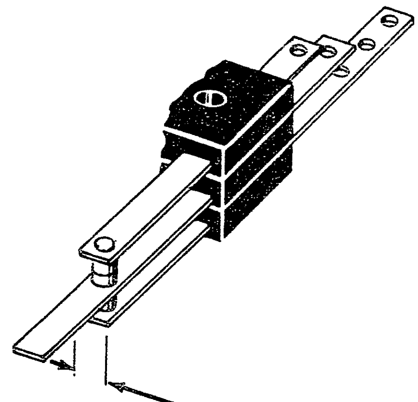


Figure 5-7. Contact Stacks

Actuator Guides

Mount the actuator guides squarely against the rear edge of the contact-mounting plate with the actuators centered between the contact-operating straps. The actuator-guide and contact-mounting screws must both be loosened for this interrelated adjustment.

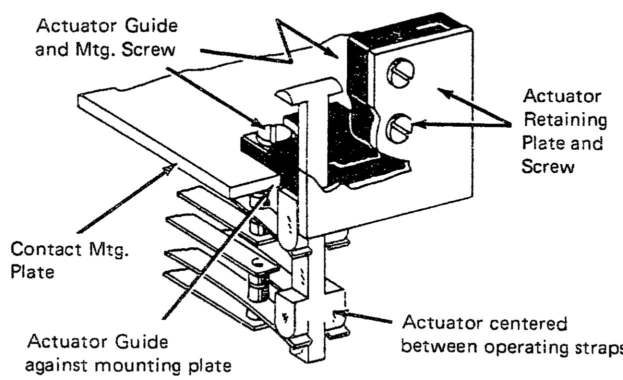


Figure 5-8. Actuator Guides

Contact Straps

With the actuators at rest, form the contact straps as required to satisfy the following conditions:

1. The O/P should just touch the actuator camming surface.
2. The O/P should produce a slight rise of the N/C straps.
3. The N/O to O/P clearance should be 0.020" to 0.030". The low end of the tolerance is preferable.

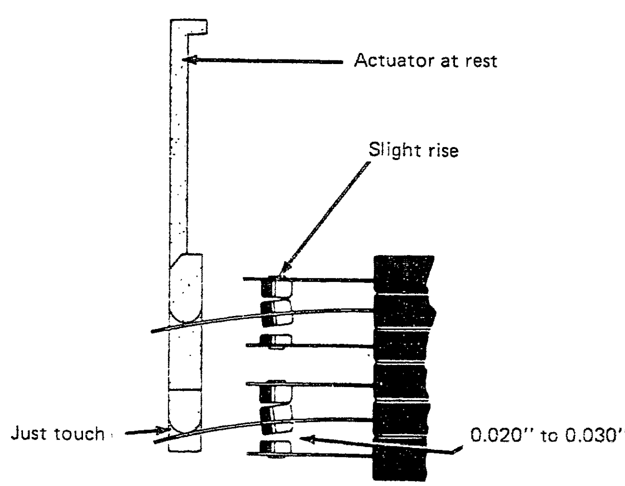


Figure 5-9. Contact Straps

Contact-Assembly Mounting Plate

Position the contact-assembly mounting plate for the following conditions:

1. To the rear so that the actuator retaining plates contact the differential plate.
2. Left to right so the step in the actuator guide plate clears the LH side of the R5 bail.

   NOTE: The contact assembly is shimmed (when necessary) to provide a clearance of 0.040" to 0.065" between the selector-latch extensions and the contact actuators.

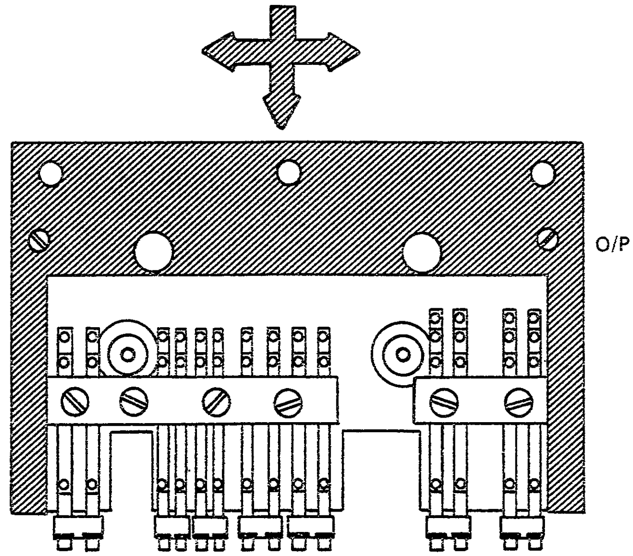


Figure 5-10. Contact-Assembly Mounting Plate

PRINT-FEEDBACK-CONTACT ASSEMBLY, C1 AND C2

C1 and C2 (All Machines Except 767)

NOTE: On present production machines, C2 is nearest the power frame with C1 on the outside. Some early machines have C1 and C2 reversed. The C1 cam has a shorter duration than the C2.

1. Form the N/C support so the O/P lifts the N/C contact 0.002" to 0.005" from the N/C support.
2. Preliminary adjustment of N/O support straps is for 0.030" to 0.040" airgap between O/P and N/O contact.
3. Position the mounting bracket so the O/P straps clear the low point on the cams by at least 0.002".
4. Form the N/O support for the correct duration. Refer to C1 and C2 timing charts.

NOTE: The setscrew holes in the cams must not line up with the O/P straps of the contacts.

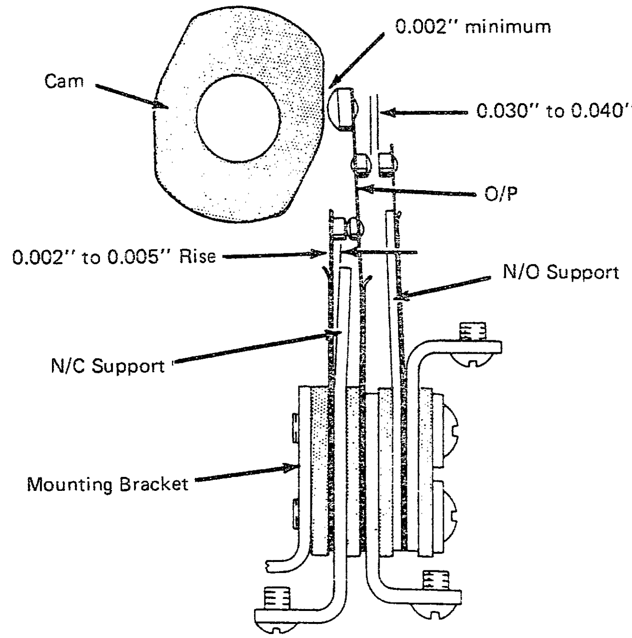


Figure 5-11. C1 and C2 (All Machines Except 767)

MACHINE	C-1 N/O		C-2 N/O	
	MAKE	BREAK	MAKE	BREAK
1415 M-1	90° ± 3	135° ± 3	35° ± 3	125° ± 3
1415 M-2	90° ± 3	135° ± 3	35° ± 3	125° ± 3
1003 Sabre	80° ± 3	145° ± 3	25° ± 5	120° ± 3
1003 Pan Am	80° ± 3	145° ± 3	25° ± 5	120° ± 3
1003 Delta	80° ± 3	145° ± 3	25° ± 5	120° ± 3
1014	$75° \pm^{10}_{3}$	120° ± 10	20° ± 3	$92° \pm^{8}_{6}$
7030 Stretch	85° ± 3	130° ± 3	20° ± 3	120° ± 3
7040/44	90° ± 3	135° ± 3	35° ± 3	125° ± 3
1620 M II	85° ± 3	130° ± 3		
2152	85° ± 3	130° ± 3		
767 6400	70° ± 3	135° ± 3	20° ± 3	110° ± 3
835 2740/41	85° ± 3	130° ± 3		

MACHINE	C2 N/C		
	BREAK	MAKE	DURATION
835 2740/41 1980, 1620 M II 870, 2152	20° ± 3	120° ± 3	100°
	C1 N/C		
870	30° ± 5	85° ± 5	55°

Figure 5-12. C1 and C2 Timing Chart

Contact	N/O Duration	Color
C-1	45°	Blue
C-1	65°	Black
C-2	90°	White
C-2	110°	Orange

Figure 5-13. C1 and C2 Cam Chart

C1 and C2 (767)

1. Adjust the N/C tension strap so the N/C contact strap will rise off the support strap 0.004" to 0.006" with 40 to 60 grams pressure. The O/P should be held away from the N/C point when checking this tension.
2. Adjust the O/P tension strap so the N/C contact is held 0.004" to 0.006" off the support strap by the operating strap.
3. Adjust the N/O support strap for 0.035" to 0.045" air-gap between the O/P contact and the N/O contact. It is desirable for the N/C contact to break just as the N/O makes. Up to 3° of bridging (both contacts made at the same time) is permissible.
4. Position the contact mounting bracket so the O/P straps clear the cam (at the low point) 0.002" minimum.

   NOTE: Print-feedback contacts are mounted on different tabs to permit equalizing the O/P to cam clearance.

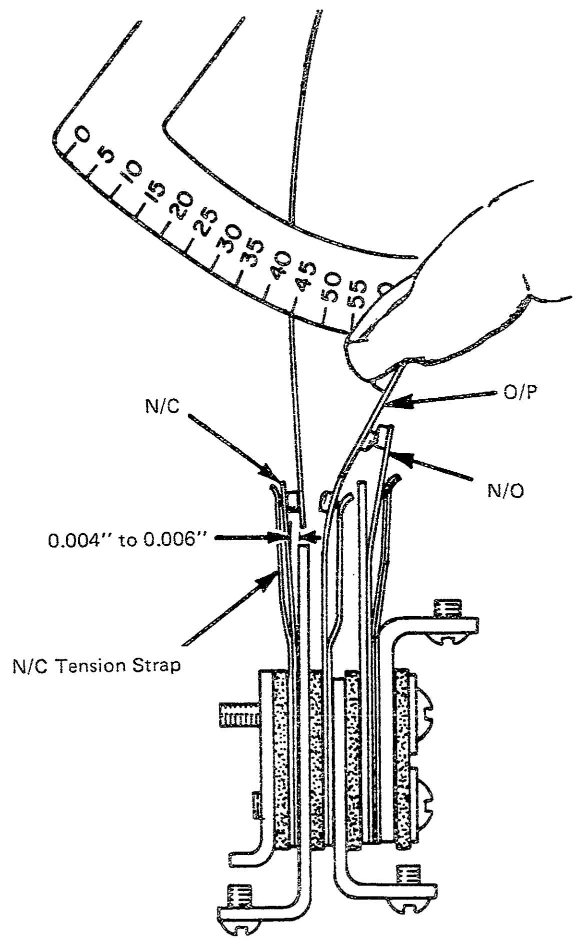


Figure 5-14. C1 and C2 (767)

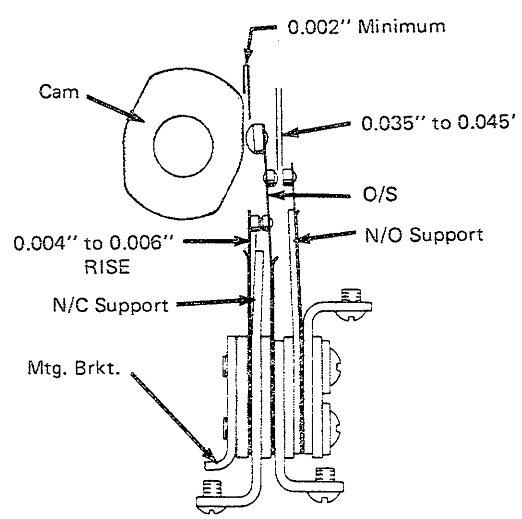


Figure 5-15. C1 and C2 Airgap (767)

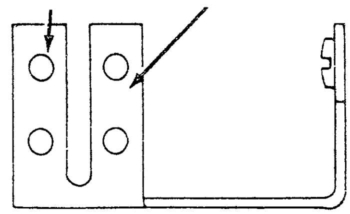


Figure 5-16. Print-Feedback Bracket

KEYLEVER CONTACTS

Stop Screw

NOTE: The contact assembly should be removed from the contact and stop-screw mounting bracket for the stop-screw adjustment.

Position the mounting bracket (left to right) so the stop screws are directly under the keylever.

Adjust the keylever stop screws so the keylevers do not go further down than the tab keylever.

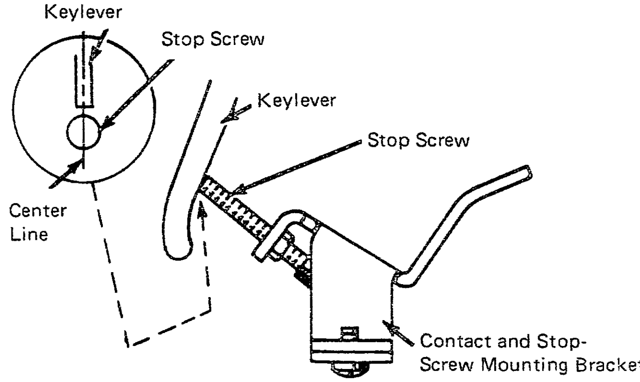


Figure 5-17. Stop Screw

Contact Position

Position the contact-actuating springs relative to the O/P's for vertical alignment.

Form the N/C contact so that the O/P (at rest) lifts the N/C contact adequately. Check for sufficient O/P to N/O contact airgap. The N/C contact must break before the N/O contact makes.

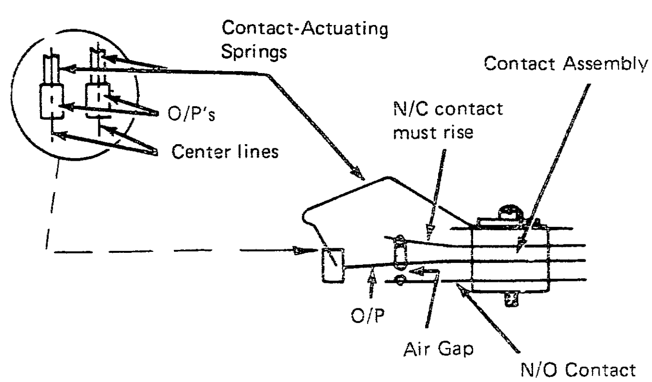


Figure 5-18. Contact Position

Contact-Assembly Position

Position the contact assembly (left or right) on the mounting bracket so the keylevers are centered on their contact-actuating springs.

With the keylevers held against their stop screws, position the mounting bracket (front to rear) for adequate rise of the N/O contacts.

NOTE: Check the following conditions:

1. The N/C contact must open.
2. Overthrow after the N/O contact makes must not be enough to damage the contact straps.

Index-Keylever Contacts

Position the contact bracket so the O/P just touches the index keylever.

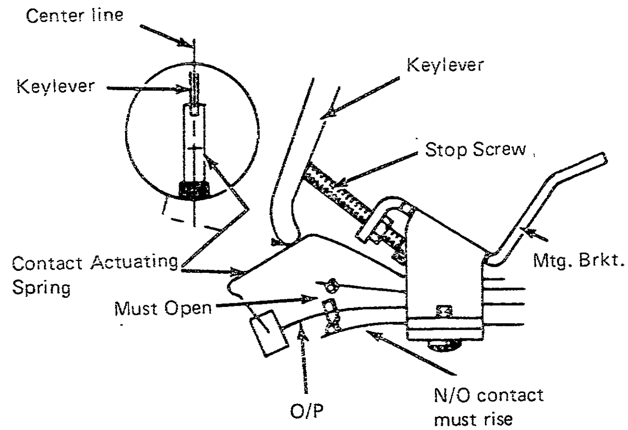


Figure 5-19. Contact-Assembly Position

REPEAT CONTACTS (835, 2741 WITH TYPAMATIC FEATURE)

Form the N/O support straps of the repeat-underscore and the repeat-space/backspace contacts for 0.040" contact airgap.

Position the repeat-underscore-contact mounting bracket for a clearance of 0.005" – 0.010" between the contact O/P and the repeat-underscore keylever when the downward travel of the keylever is just sufficient to trip the interposer.

Form the backspace arm of the repeat bail so that the backspace keylever downward motion trips the interposer just before the keylever touches the repeat bail.

Form the repeat arm of the spacebar shaft so that the spacebar downward travel trips the interposer just before the pin in the end of the repeat arm touches the space-repeat keylever.

Position the repeat-space/backspace-contact mounting bracket for barely perceptible to 0.005" clearance between the contact O/P and the contact bail.

KEYBOARD MODE CONTACTS

Mode Contact

Form the N/C support so the O/P lifts the N/C contact by 0.002" to 0.005".

Form the N/C support so the N/O contact clears the O/P by 0.040".

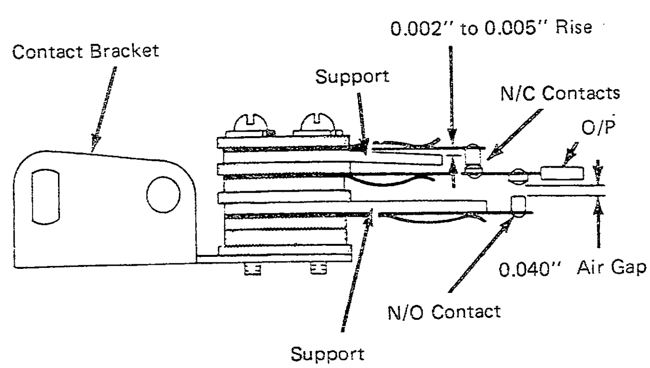


Figure 5-20. Mode Contact

Mode-Contact Actuating Lever

Position the contact bracket for a clearance of 0.002" to 0.010" between the operating strap and actuating lever.

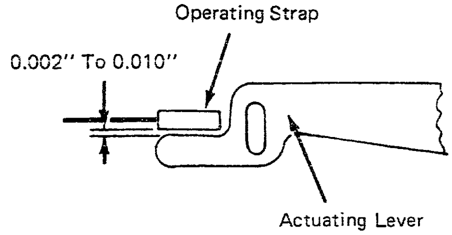


Figure 5-21. Mode-Contact Actuating Lever

SHIFT CONTACT ASSEMBLY

Contact Mounting Plate

Position the contact mounting plate vertically so the cam-follower roller is centered on the shift-cam surface.

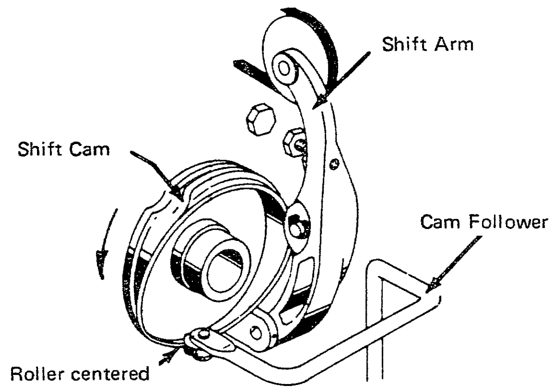


Figure 5-22. Contact Mounting Plate

Contact Positioning

Position the feedback and transmitting assemblies under their mounting screws for the following conditions:

1. Operating points centered on actuating tabs.
2. All contact points (on straps) in stack aligned.

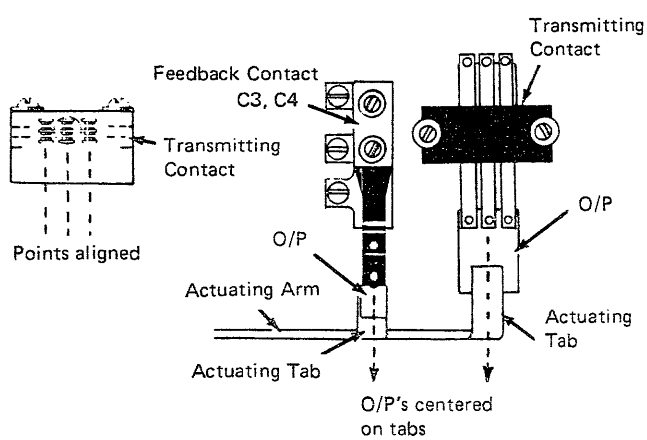


Figure 5-23. Contact Positioning

Contact Actuating Arm

Position the contact-actuating arm (with the cam-follower roller held against the detented shift cam) so the O/P ball is centered between the actuating-arm tabs.

> *NOTE:* If a starting reference is required, form the O/P so the center of the O/P ball is 9/16" from the contact-mounting plate.

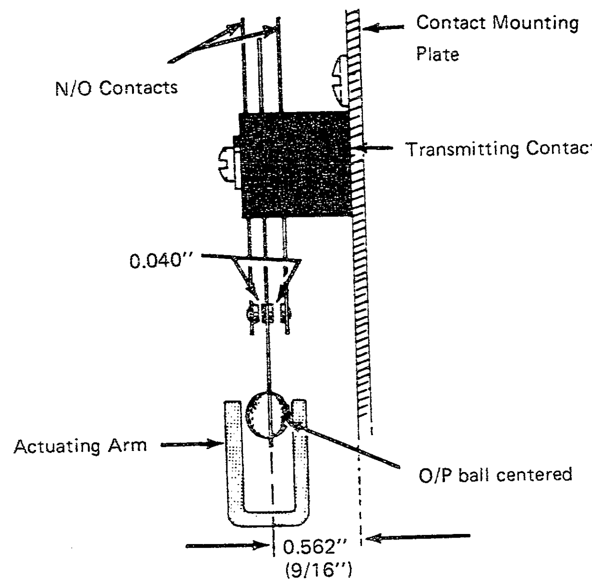


Figure 5-24. Contact Actuating Arm

Transmitting-Contact Airgap

Form the N/O contacts to clear the O/P's by 0.040".

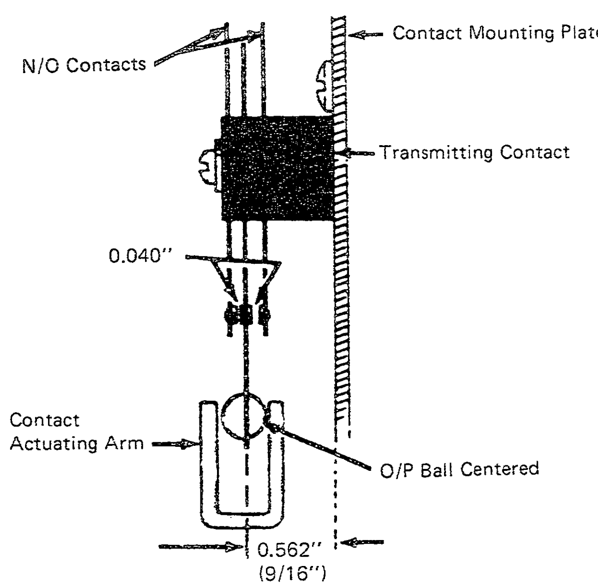


Figure 5-25. Transmitting-Contact Airgap

C3 and C4 Feedback or Mode Contact Rise and Airgap

Form the N/C contact supports so the O/P's lift the N/C contact straps 0.002" to 0.005".

For the N/O contact supports so the N/O contacts clear the O/P's by 0.040".

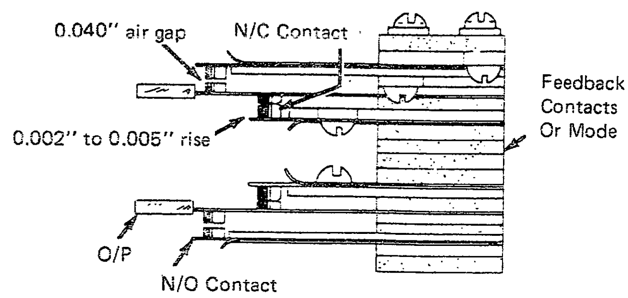


Figure 5-26. C3 and C4 Feedback or Mode Contact Rise and Airgap

C3, C4 Contact-Actuator Tabs

Form the actuator tabs so both N/O contacts receive equal motion as the shift cam rotates through 360°.

NOTE: If necessary, the actuator tabs may be formed to achieve timing requirements in Figure 5-29.

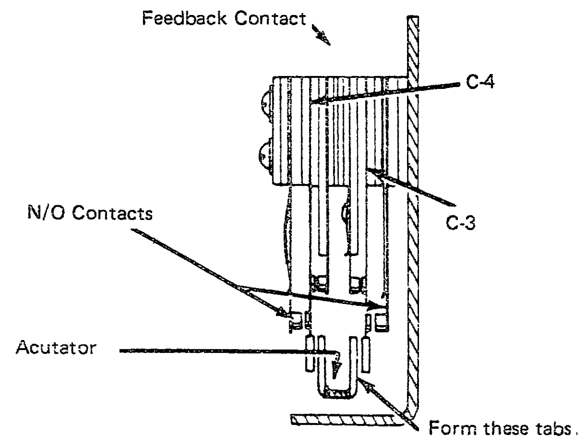


Figure 5-27. C3 and C4 Contact-Actuator Tabs

Mode-Contact Actuating Arm

With the shift ratchet released, hand-cycle from lower to uppercase and adjust as follows:

1. On early machines, position the actuating arm so the UC-1 contact closes at 80° of the shift-cam rotation. On late machines with the punched shift arm, form the actuating arm.
2. Form the actuating tab so that the UC-2 contact closes at 130° of shift-cam rotation.

   NOTE: The shift-ratchet teeth are spaced 10° apart and may be used as a timing indicator.

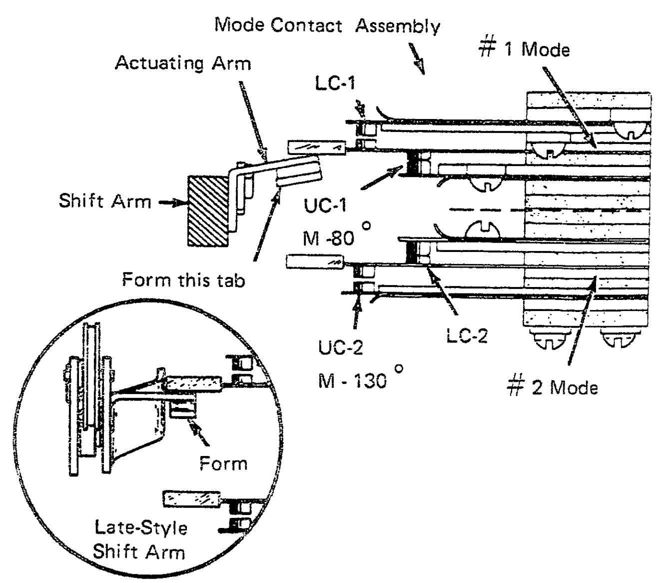


Figure 5-28. Mode-Contact Actuating Arm

Shift	N/O Make	Break	Duration
C3 & C4	35° ± 5°	145° ± 5°	
C-7 (835 & 2152)	100° ± 5°	120° ± 5°	20°
Mode #1 Mode #2	80° ± 10° 130° ± 10°	100° ± 10° 50° ± 10°	
*Mode #1 *Mode #2	100° ± 10° 130° ± 10°	120° ± 10° 87° ± 10°	

NOTE: Each shift operation is 180°.

* These timings are for printers with beat-the-shift change, identified by a blue shift ratchet for 11" machines or a green shift ratchet for 15" machines.

Figure 5-29. Shift-Contact Timing Chart

C-7 Shift-Contact Assembly (835 and 2152)

1. Adjust the C-7 mounting bracket so the cam-follower stud will be 0.002" to 0.010" from the cam with the shift ratchet latched home. Be sure the follower stud is centered vertically on the cam surface.
2. Adjust the C-7 cam for the contact timing shown in Figure 5-29.

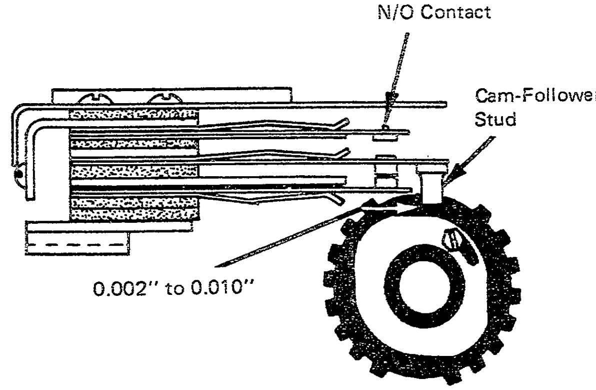


Figure 5-30. C-7 Shift-Contact Assembly (835 and 2152)

OPERATIONAL CONTACT AND LATCH ASSEMBLY, UNIT REMOVED (LEVEL 1)

Contact-Strap Position and Airgap

With the contacts latched, position the straps under the two mounting screws for the following conditions:

1. Latches centered on O/P stops.
2. Vertical alignment of mating contacts.
3. All contacts of each stack must lie in the same horizontal plane (individual forming may be required).

Rotate the contact mounting bracket under its four screws for 0.015" to 0.020" contact airgap.

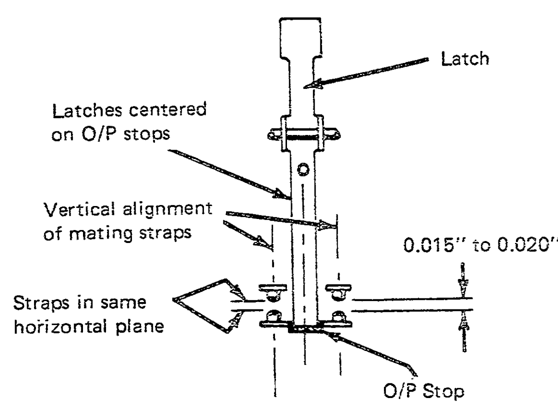


Figure 5-31. Contact-Strap Position and Airgap

Normally Open Contact Rise

With the contacts unlatched, form the N/O straps for 0.005" minimum rise.

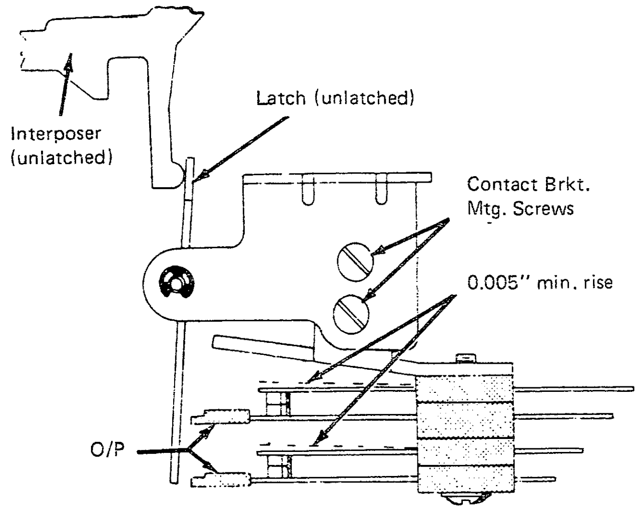


Figure 5-32. Normally Open Contact Rise

Latch Stop (Late Level 1 Machines)

Position so the end of the O/P stops are flush with the forward latch surface.

NOTE: As required, form individual latches in the area shown.

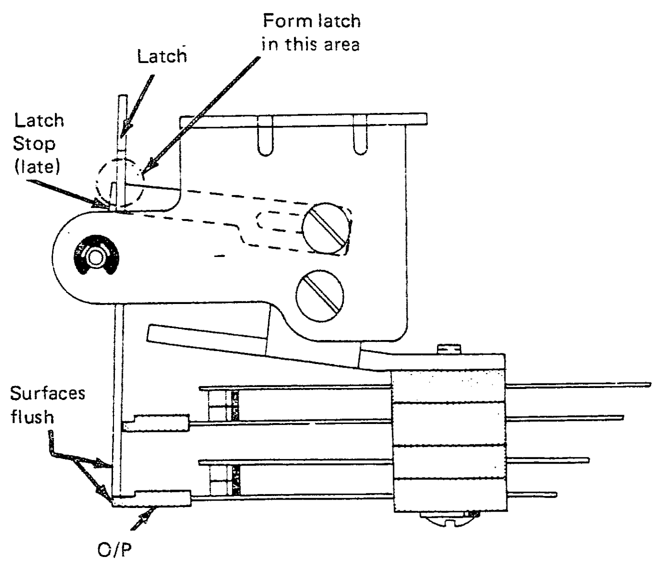


Figure 5-33. Latch Stop (Late Level 1 Machines)

OPERATIONAL CONTACT AND LATCH ASSEMBLY, UNIT INSTALLED (LEVEL 1)

Assembly (With Latch Stop) Position

With the operational interposer released, position the unit (front to rear) so the latches clear the O/P stops by 0.005" to 0.015".

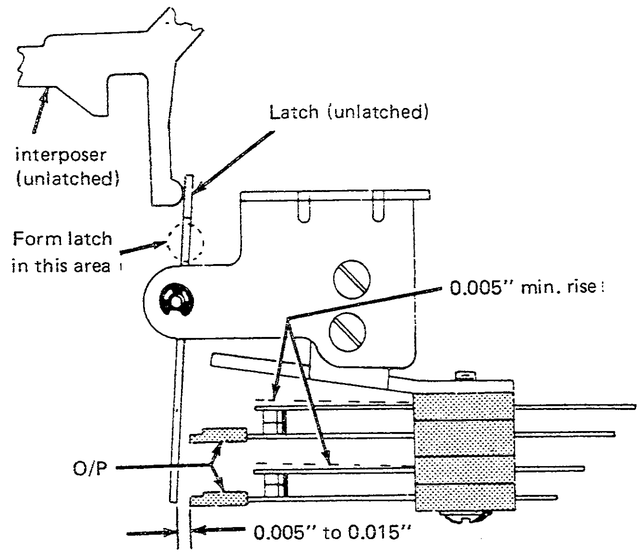


Figure 5-34. Assembly (with Latch Stop) Position

Assembly (Without Latch Stop) Position

With the contacts latched, position the assembly (front to rear) for the following interrelated conditions:

1. The latch just touches the interposer extension.
2. The forward latch surface is flush with the end of the O/P stop.

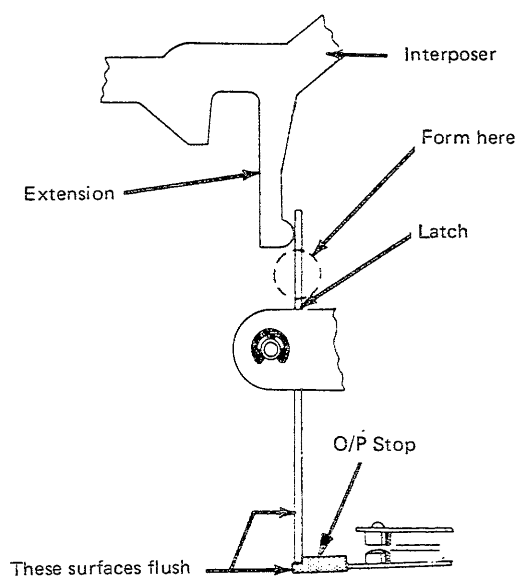


Figure 5-35. Assembly (without Latch Stop) Position

Bail Eccentric

Adjust (all operational functions restored) so the latches clear the O/P stops by 0.001" to 0.008".

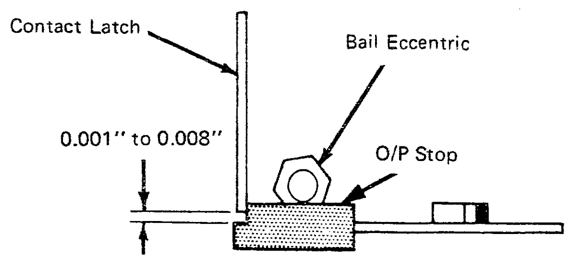


Figure 5-36. Bail Eccentric

Parallel Actuating Bails

Form the actuating-arm slot as required to provide equal latch to O/P stop clearance where a bail actuates more than one contact.

> *NOTE:* With the operational cams on their high points, the actuating bails must clear the O/P stops by a minimum of 0.005" (Figure 5-38). This condition should have been satisfied by previous adjustments and is required to provide adequate contact rise.

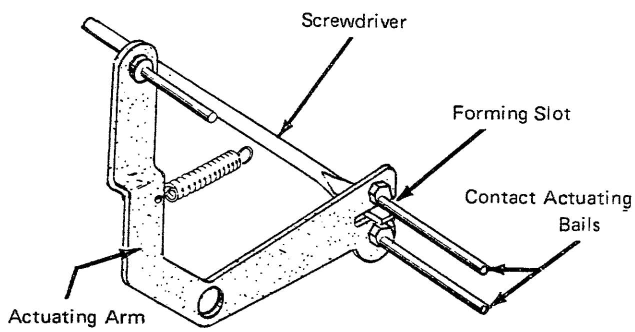


Figure 5-37. Parallel Actuating Bails

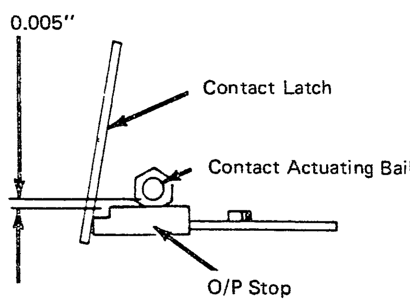


Figure 5-38. Check of Actuating Bail Clearance

OPERATIONAL CONTACT AND LATCH ASSEMBLY (LEVEL 2)

Operational Link

Adjust the links (with the cams latched at rest) so the contact actuators will have 0.015" to 0.025" travel before bottoming. This can be checked by pulling on the actuating arm and observing 0.015" to 0.025" motion of the actuator.

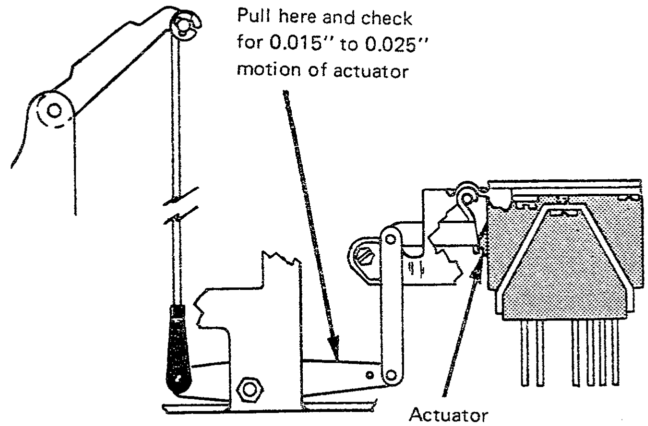


Figure 5-39. Operational Link

Adjusting Plates

The actuator-latch adjusting plates should be adjusted so the actuator latches clear the rise on the actuator by 0.005" to 0.015" with the operational cams latched at rest.

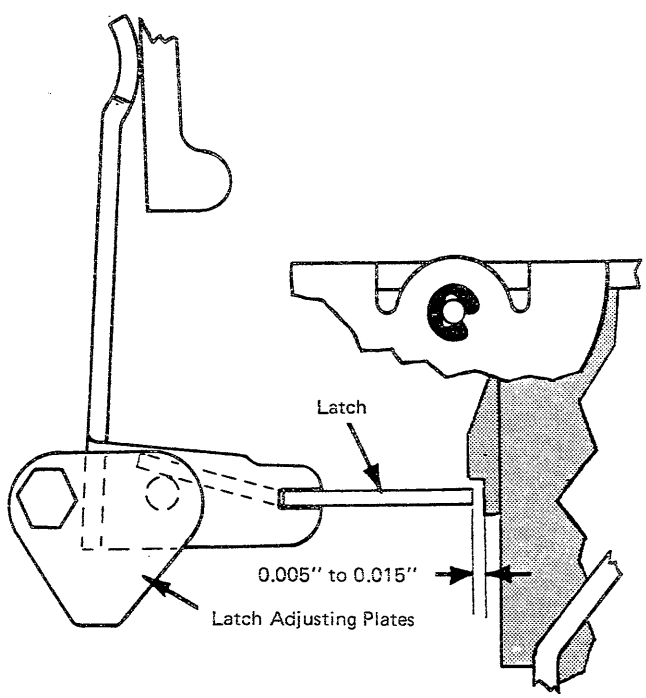


Figure 5-40. Adjusting Plates

Contact Latches

Form the tails of the interposer followers so the latches will clear the step on the actuator by at least 0.001" with the interposers latched.

NOTE: The bottom of the latches should not be below the bottom of the actuator.

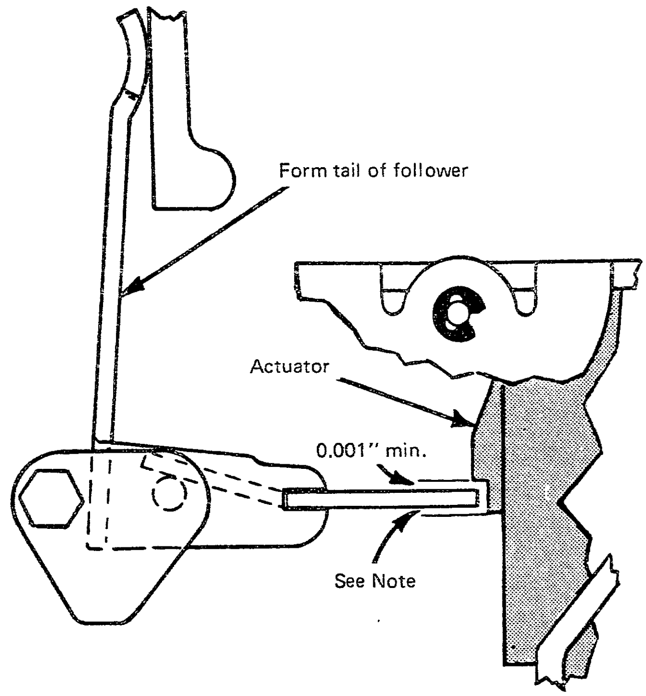


Figure 5-41. Contact Latches

OPERATIONAL FEEDBACK CONTACTS (C-5, C-6)

C-5 and C-6 Operating Straps

Position the O/P's centrally under the actuator tabs.

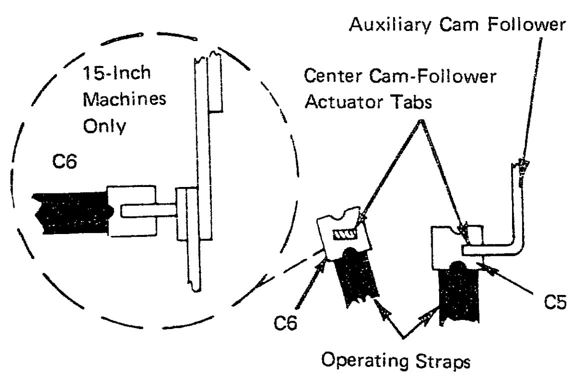


Figure 5-42. C-5 and C-6 Operating Straps

C-5 and C-6 Support Straps

Form the N/C supports so the O/P's lift the N/C contacts 0.002" to 0.005".

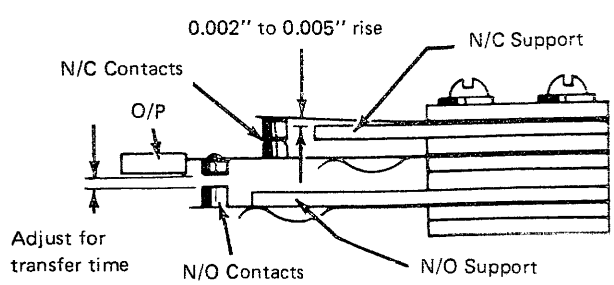


Figure 5-43. C-5 and C-6 Support Straps

C-5 and C-6 Contact Timing

Form or adjust the contact mounting bracket (up or down) for timing. Form the N/O support strap for transfer time (N/C break to N/O make) of 10° to 20° for C-5 and 20° to 40° for C-6.

NOTE: Trip the tab interposer; turn the operational shaft until the cam just starts to turn. This is 0°.

Machine	C-5 N/O Make	C-5 N/O Break	C-6 N/O Make	C-6 N/O Break
1415 M-1	55 ± 5	130 ± 5	170 ± 5	305 ± 5
1415 M-2	55 ± 5	130 ± 5	170 ± 5	305 ± 5
1003 Sabre	55 ± 5	130 ± 5	170 ± 5	305 ± 5
1003 Pan Am	55 ± 5	130 ± 5	170 ± 5	305 ± 5
1003 Delta	55 ± 5	130 ± 5	170 ± 5	305 ± 5
1014	55 ± 5	130 ± 5	170 ± 5	305 ± 5
7030 Stretch	55 ± 5	130 ± 5	170 ± 5	305 ± 5
7040/44	55 ± 5	130 ± 5	170 ± 5	305 ± 5
1620 MII	55 ± 5	130 ± 5	170 ± 5	305 ± 5
2152	55 ± 5	130 ± 5	170 ± 5	305 ± 5
6400-767	55 ± 5	130 ± 5	170 ± 5	305 ± 5
835-2740/41	60 ± 5	125 ± 5	170 ± 5	305 ± 5
870	35 ± 5			

Figure 5-44. C-5 and C-6 Timing Chart

C 5/6 Contact and Timing (2740 Model 2 and 1980)

Adjust the C-5/6 contact assembly in the following sequence; the first two steps should be taken with the assembly out of the machine, and the last two steps with it installed.

The N/C contact support strap is not formed, and it serves as the reference point from which all other adjustments are made.

1. Form the rest stop (upstop) on the contact bracket so that, with the contact-operating bellcrank held against the stop, the N/C contact strap rises 0.002" to 0.005" off the end of its support strap.
2. With the contact-operating bellcrank held against the upstop, form the N/O contact support strap for and airgap of 0.080" to 0.085" between the transfer point and the N/O point.
3. With the contact assembly installed, form the contact bracket, forward or backward, to obtain the correct timing for the space function. Overform the bracket slightly, then come back to specified timings.
4. Adjust the carrier-return operating-arm eccentric to obtain a clearance of 0.015" to 0.025" between the contact-operating bellcrank and the carrier-return cam follower. This should result in the correct timing for the carrier-return operation.

Do not form any part of the contact-operating bellcrank.

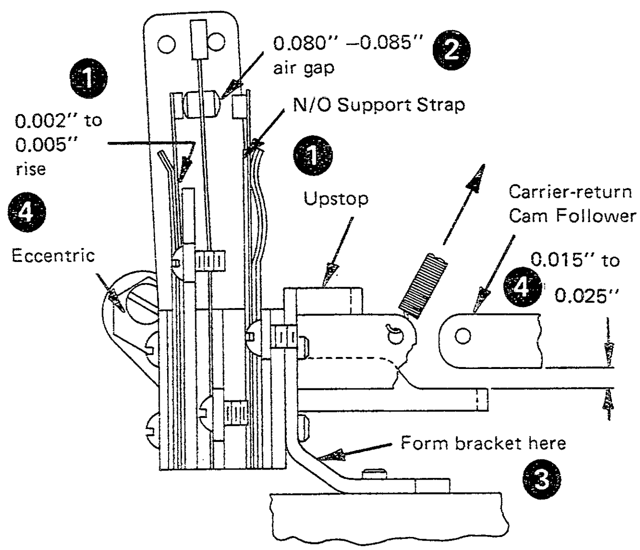


Figure 5-46. C 5/6 Contact Timing

C 5/6	N/O Make	
	(degrees of cam rotation)	
(Space)	70 ± 10	(Duration is determined by: (1) when the contact transfers, and (2) how much N/O air gap it has.)
(CR)	165 ± 20	

Note: C 5/6 N/C must not remake on a carrier return operation before the carrier return interlock contact transfers.

Figure 5-45. C 5/6 Contact Assembly

C-5 and C-6 Contacts (6400-767)

Adjust the N/C tension strap so the N/C contact strap will rise off the support strap 0.004" to 0.006" with 40 to 60 grams pressure. The tip of the gram gage must be on the center of the N/C contact.

NOTE: Hold O/P strap away from N/C when checking tension.

Also, adjust the tension strap on the operating strap so the N/C contact is held 0.004" to 0.006" off the support strap by the operating strap. The N/C contact rise should be measured at the end of the support strap nearest the N/C contact.

Form the N/O supports to adjust for transfer time between the O/P and N/O contacts. This is a preliminary adjustment. See the last paragraph of this section for the final adjustment.

Adjust the N/O support strap for 0.035" to 0.045" airgap between the O/P and N/O contact. It is desirable for the N/C contact to break just as the N/O makes. Up to 3° of bridging (both contacts made at the same time) is permissible.

Form or adjust the contact mounting bracket (up or down) for the make and break times. Refer to the timing chart (Figure 5-44) for contact timing and duration.

NOTE 1: 0.035" to 0.045" airgap may have to be altered to obtain timing.

NOTE 2: Trip the tab interposer; turn the operational shaft until the cam just starts to turn. This is 0°.

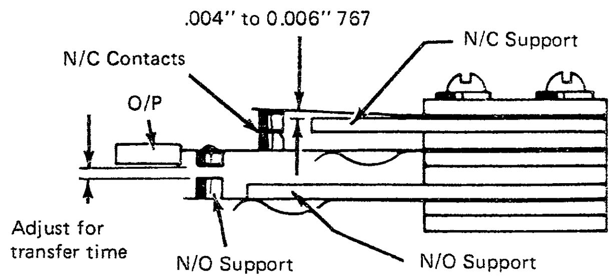


Figure 5-47. C-5 and C-6 Contacts (6400-767)

CARRIER RETURN INTERLOCK CONTACT

Carrier-Return Interlock, Inactive

NOTE: The N/O contacts must remain closed during the return of the carrier to the left margin. Excessive rise on the contact straps will cause the contacts to bounce.

1. Form the N/C support so that the O/P lifts the N/C contact from 0.002" to 0.005".
2. Form the N/O support so that the O/P clears the N/O contact from 0.035" to 0.045".

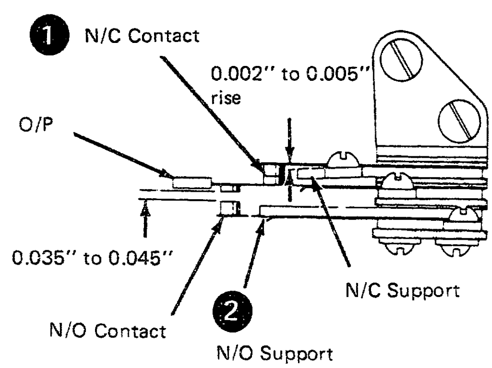


Figure 5-48. Carrier-Return Interlock, Inactive

Carrier-Return Interlock, Active

With the carrier-return clutch latched, position the mounting bracket so that the N/O contact rises from 0.010" to 0.020" from the N/O support. Contact transfer should occur at 230 degrees (± 60 degrees) of the cam cycle.

NOTE: 835 printer interlock contact timing–make at 200° (± 20°). 1980 Models 9 and 12 and 835 Model II–make at 200 (+ 0, - 20°).

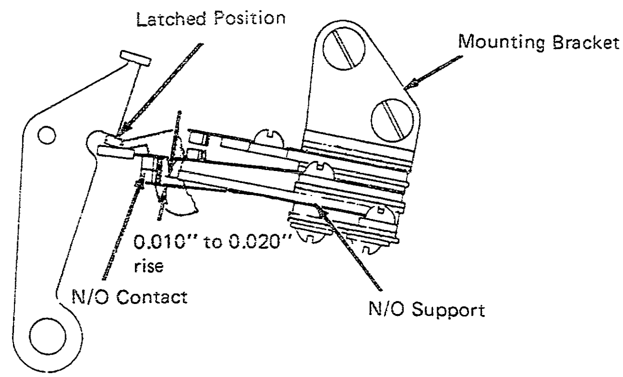


Figure 5-49. Carrier-Return Interlock, Active

TAB INTERLOCK CONTACTS (ALL LEVELS)

Tab-Interlock Contact Position (Level 1)

1. Form (see circled area in figure) the actuating wire (left or right) so that it contacts the actuating arm near the right-angle bend.
2. With the tab interposer released and the Tab/Sp/Bksp cam on its high point, position the mounting bracket (front to rear) so that the actuating arm overlaps (0.040" minimum) the actuating wire. This ensures that the actuating wire does not rise above the actuating arm.

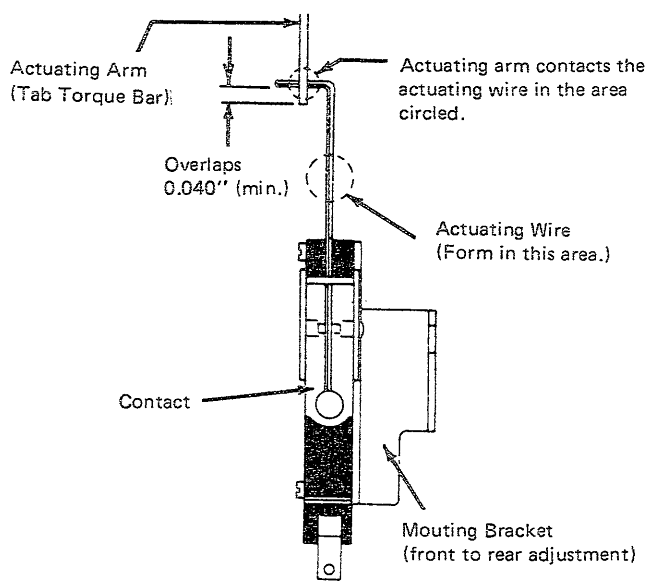


Figure 5-50. Tab-Interlock Contact Position (Level 1)

Tab-Interlock Contact Transfer (Level 1)

As the tab torque bar restores, position the mounting bracket (up or down) so that the contact-actuating wire travels from 0.031" to 0.062" after the contact transfers. This is done to ensure that machine vibration does not cause the contact to transfer.

NOTE: During initiation of a tab operation, the switch must transfer (up position) before the Tab/Sp/Bksp cam reaches its high point. Torque-bar bounce must not re-transfer the contact while the tab lever is latched out.

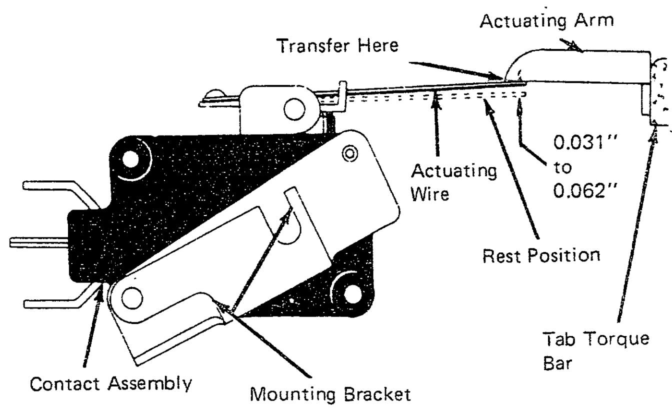


Figure 5-51. Tab-Interlock Contact Transfer (Level 1)

Tab-Interlock Switch (Level 2)

1. With the torque bar in the rest position, form the horizontal lug on the left end of the tab torque bar so that there is from 0.005" to 0.015" between the tab-switch trigger and its latching surface.
2. Adjust the tab-interlock switch bracket by its mounting screws, for three conditions:
   a. Up and down, so that the torque bar is vertical in the rest position. Be sure that torque-bar linkage does not interfere when making this adjustment.
   b. Front to rear, so that there is from 0.001" to 0.004" clearance between the tab-switch trigger and the rear edge of the tab-torque-bar extension.
   c. Adjust the switch by its mounting screws for from 0.002" to 0.008" clearance between the switch plunger and trigger.

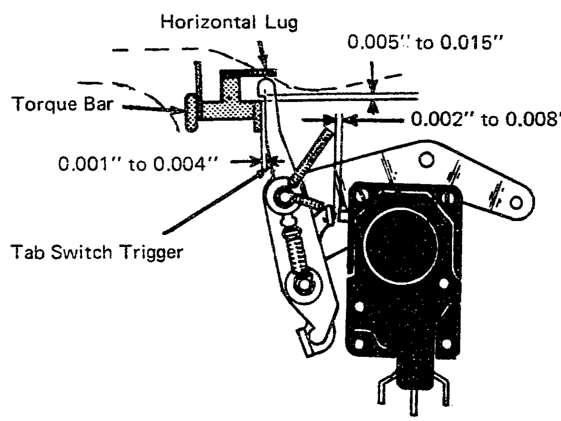


Figure 5-52. Tab-Interlock Switch (Level 2)

Tab-Interlock Latch Stop (767)

Form the latch stop to allow the latch lever to engage the switch lever by 0.020" to 0.030". (The latch lever must unlatch reliably when the intermediate lever returns to rest.)

NOTE: The switch lever must overthrow the latch lever by 0.010" when the tab cam is at the high point.

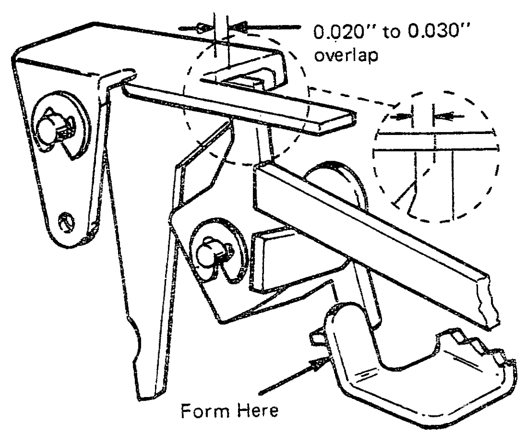


Figure 5-53. Tab-Interlock Latch Stop (767)

Switch Mounting Bracket (767)

Position the switch mounting bracket to provide a minimum of 0.025" clearance between the latch lever and the intermediate lever with the tab torque bar latched out. (The switch lever should have 0.002" minimum clearance with the intermediate lever at this time.)

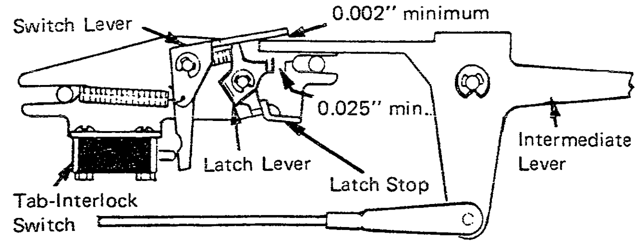


Figure 5-54. Switch Mounting Bracket (767)

Switch Position (767)

With the intermediate lever at rest, position the interlock switch so that, with a 0.020" feeler gage on the tip of the intermediate lever, the switch transfers when the switch lever is operated by hand, but will not transfer when a 0.025" gage is used.

NOTE: During a tab operation, the switch must transfer before the tab cam reaches the high point and remain transferred until the carrier reaches the next tab stop. A minimum of 0.010" clearance must be maintained between the switch lever and the switch plunger during the latched portion of the tab cycle.

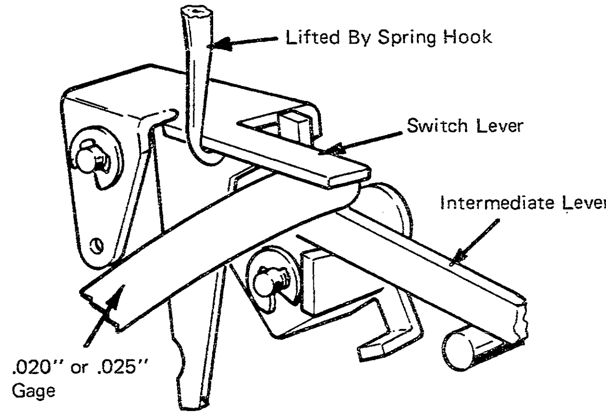


Figure 5-55. Switch Position (767)

LAST-COLUMN CONTACT

Last-Column Contact, At Rest (Level 1)

1. Form the N/C support so the O/P (at rest) produces a slight rise of the N/C contact.
2. Form the N/O support so the N/O contact clears the O/P by 0.020" to 0.030".
3. Position (carrier in next-to-last space) the contact actuator on the bell-ringer bail so it just touches the O/P. When positioning the actuator, all backlash must be held out of the actuator-to-line-lock bracket linkage.

   NOTE: To place the carrier in the next-to-last space, space to the right until the RH margin setting locks the keyboard, and backspace two spaces.

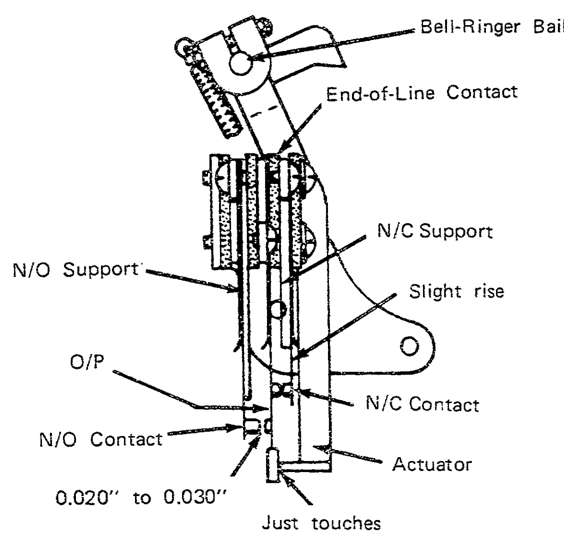


Figure 5-56. Last-Column Contact (Level 1)

Last-Column Contact, Active (Level 1)

As the carrier moves from the next-to-last space, check for the following conditions.

1. The contact transfer must be complete (and without bounce) within one space.
2. N/C contact must break.
3. O/P must lift the N/O contact sufficiently to ensure reliable make.

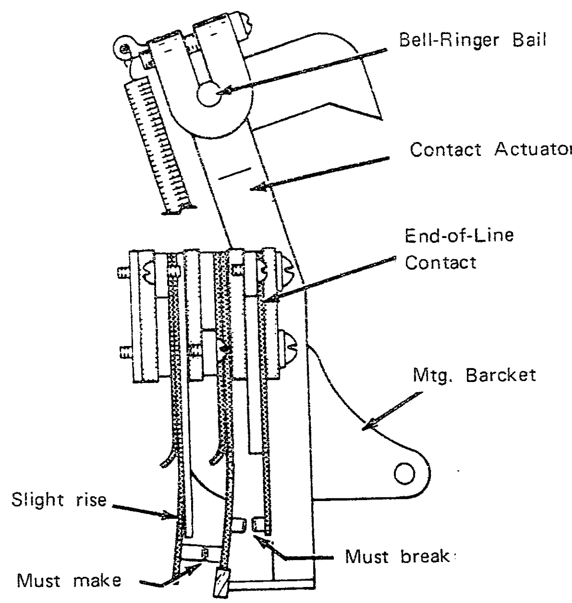


Figure 5-57. Last-Column Contact, Active (Level 1)

Last-Column Contact (Level 2)

Transfer the switch and check for a 0.010" minimum overthrow when escaping from the last column; the switch should retransfer with a backspace operation.

Adjust the actuator arm to give a 0.060" to 0.094" left-to-right clearance between the actuator arm and the formed angle on the switch wire.

Adjust the contact backup spring so the actuator arm will contact the backup spring 0.250" to 0.312" before it contacts the switch wire.

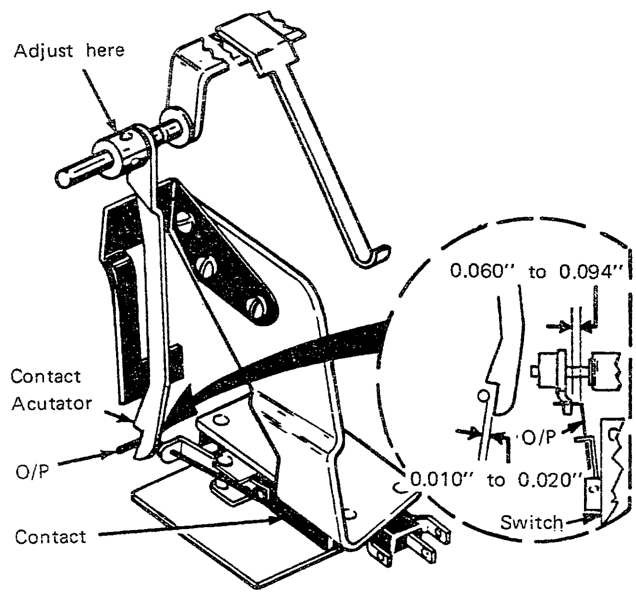


Figure 5-58. Last-Column Contact (Level 2)

Last-Column Contact (Level 3)

With the carrier in the last column, adjust the actuator screw to obtain the following conditions:

1. Transfer the switch and have a minimum overthrow of 0.010" when the carrier is escaping from the last column, and it will retransfer with a backspace operation.
2. Provide a minimum clearance of 0.005" between the actuator screw and the switch plunger, with the carrier in last column.

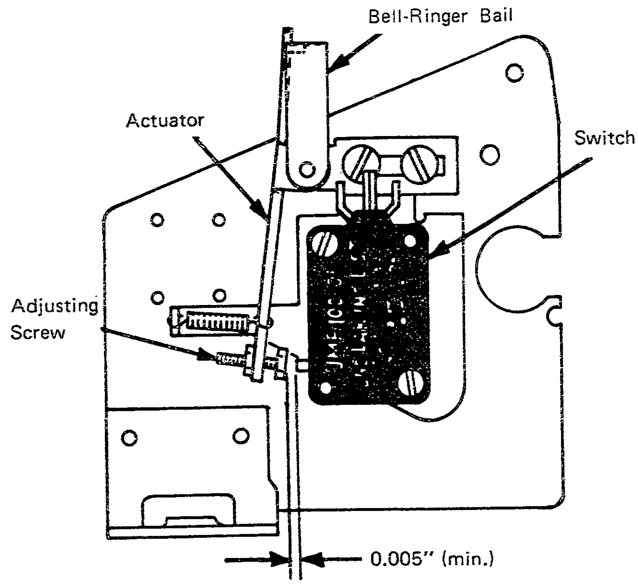


Figure 5-59. Last-Column Contact (Level 3)

Last-Column Contact (Level 4)

With the carrier positioned in the next to last column of print, adjust the switch so that the roller will clear the actuator-arm step by 0.010" minimum clearance. The actuator arm should have a 0.010" minimum overthrow. Check at the left center and right-hand positions of the bail.

The switch should transfer when the carrier escapes into the last column.

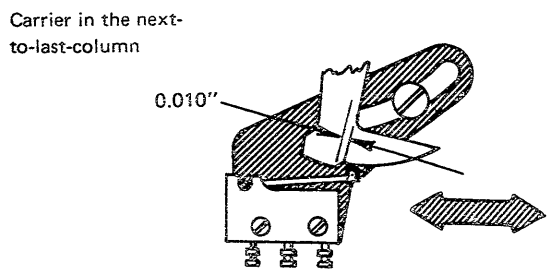


Figure 5-60. Last-Column Contact (Level 4)

End-of-Line Switch (767 Printer)

Position the switch so it transfers just as the line lock actuating arm touches the line lock interposer.

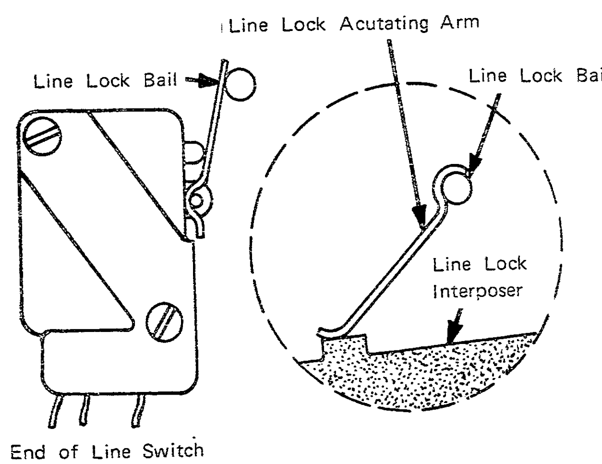


Figure 5-61. End-of-Line Switch (767 Printer)

RIBBON-MODE CONTACTS

NOTE: Excessive wipe on the N/O contact may cause failure of the red shift-magnet armature to latch. When the N/O point makes, the pulse to the magnet is removed. This is just before the armature latches. Therefore, we are depending on red armature momentum to latch the mechanism on red ribbon.

Ribbon Contact Assembly

1. Form the O/P so it lifts the N/C contact by 0.005" to 0.008".
2. Form the N/O contact so it clears the O/P by 0.020" to 0.030".
3. Position the contact mounting bracket on the magnet mounting bracket so the red shift-magnet armature (at rest) clears the O/P pad by 0.002" to 0.005".

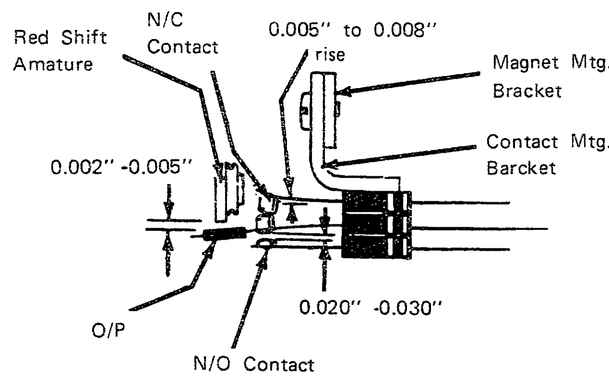
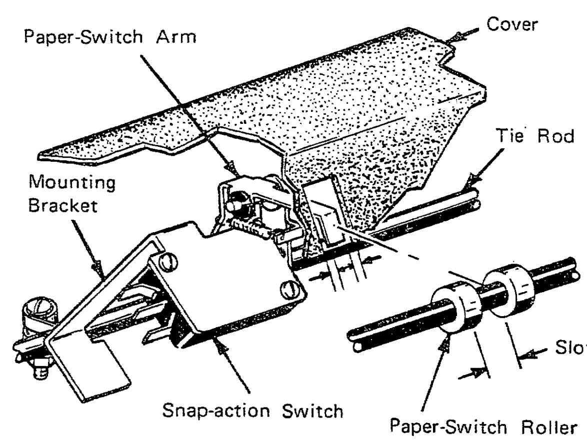


Figure 5-62. Ribbon Contact Assembly

PAPER SWITCH (835 AND 935 PRINTERS)

1. The paper-switch arm should be centered in the cover slot.

   NOTE: The top portion of the paper-switch arm should be approximately horizontal.
2. The snap-action switch must transfer after the arm enters the slot of the paper-switch roller and return to normal before the arm leaves the slot.



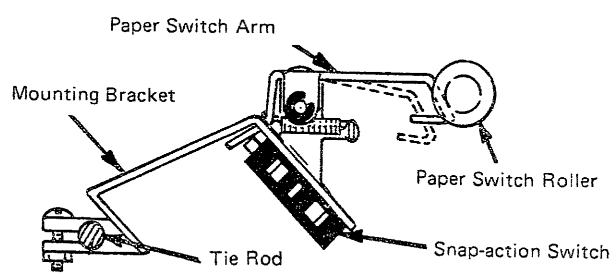


Figure 5-63. Paper Switch (835 and 935 Printers)

The following is a list of the keyboard printer models and the IBM system on which they are used.

Keyboard Printer Models	Size	Using System
1518	15"	1500
865	11"	870
865	15"	870
1620 II	11"	1620 II
767	22"	6400
Stretch AEC	11"	
Stretch ECS	11"	
1014 (Inquiry Station)	11"	1410
1710R (1620 II)	11"	1710R
835	15"	2740
935	15"	2741
1415	11"	1410
SABRE AA	11"	Airlines Reservations System
SABRE PAN-O-MAC	11"	Airlines Reservations System
SABRE DELTA	11"	Airlines Reservations System
1977-1 AA	11"	Airlines Reservations System
1977-1 DELTA	11"	Airlines Reservations System
1977-1 CONTINENTAL	11"	Airlines Reservations System
2152	15"	360/20
1980-9 (HFC) (AETNA)	15"	1971/30 or 35
1980-12 (DMV) (AETNA)	15"	1971/30 or 35
2970	15"	2970

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