IBM®

OPD CUSTOMER ENGINEERING
Selectric I/O Reference Manual
Section 1

Reprinted July, 1966

F/N 241-5308-0

CONTENTS

LUBRICATION SECTION 1

GENERAL PROCEDURE

Power clean the printer with the covers removed. Clean the feed rolls, platen, and deflector. Unless otherwise stated, all parts of the printer should be inspected and lubricated once every four months.

Note: Lubrication must be applied judiciously to eliminate excessive quantities and prevent migration or spin-off into electrical contacts.

LUBRICATION

Figures 1 through 8 show the points that require lubrication. The number references require IBM #10. The letter references require IBM #23. Points that do not require lubrication every four months are identified with the required frequency in the reference list. A rule of thumb should be "All bearing areas having a sliding motion use IBM #23 and all bearing areas having rotational motion use IBM #10 unless otherwise specified."

Machines with power on 24 hours daily require more frequent lubrication than machines used for single-shift operation. The following areas are primarily affected by idling time, since only the operational shaft is driven:

1. Motor and motor pulley
2. Cycle-clutch spring and arbor
3. Driven-pulley hub and bearing
4. Operational cam bearings
5. Right-hand operational shaft and shift cam bearing
6. Shift-clutch spring and arbor

Since these machines are hot 24 hours daily, some lubricant evaporation can be expected in areas not driven during idling; however, they are not nearly so affected as items 1 through 6. Where power is on 24 hours daily, we recommend lubricating these items every six weeks.

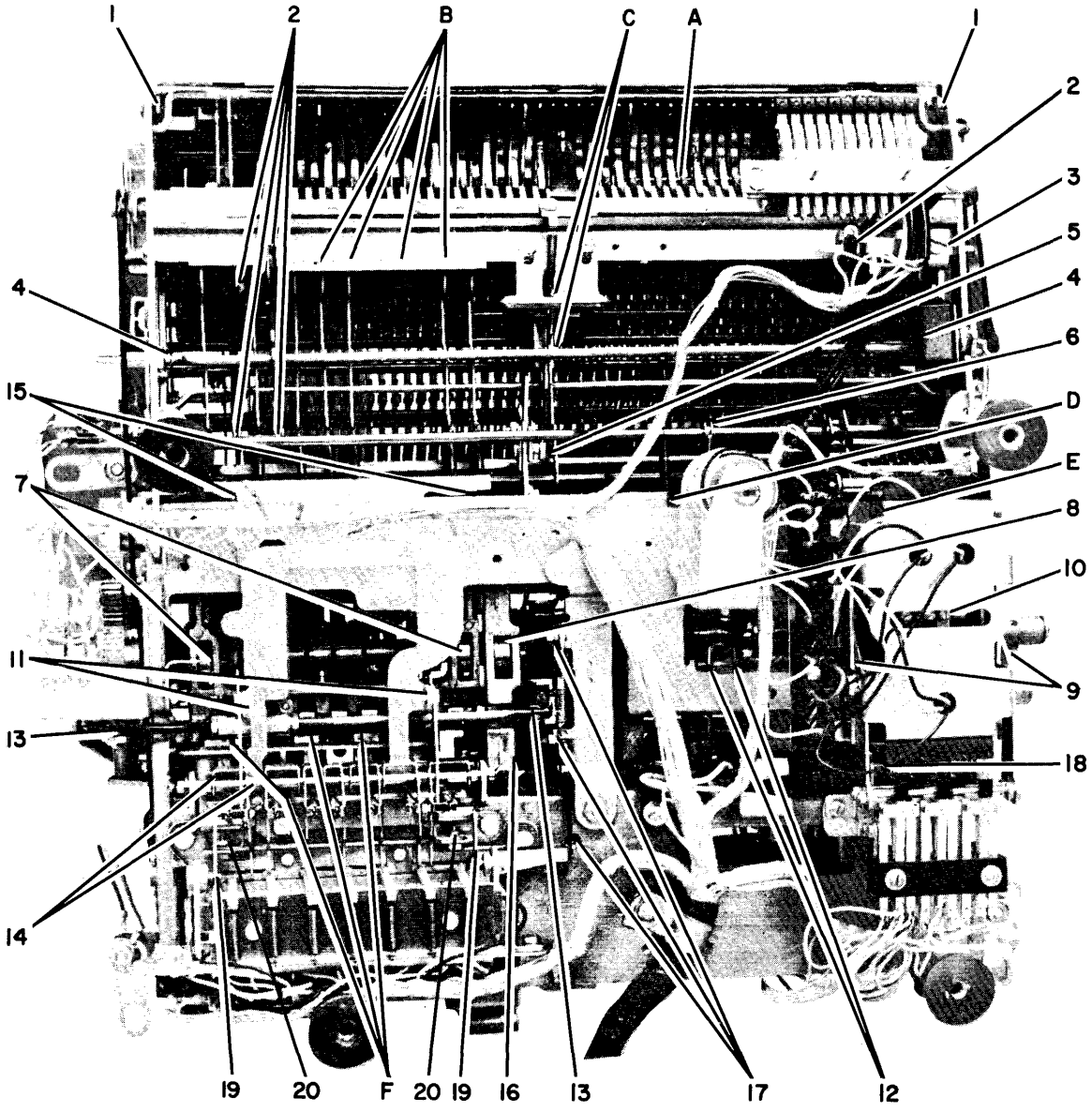


Figure 1. Bottom View Of The Printer

IBM #10

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

IBM #23

- 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

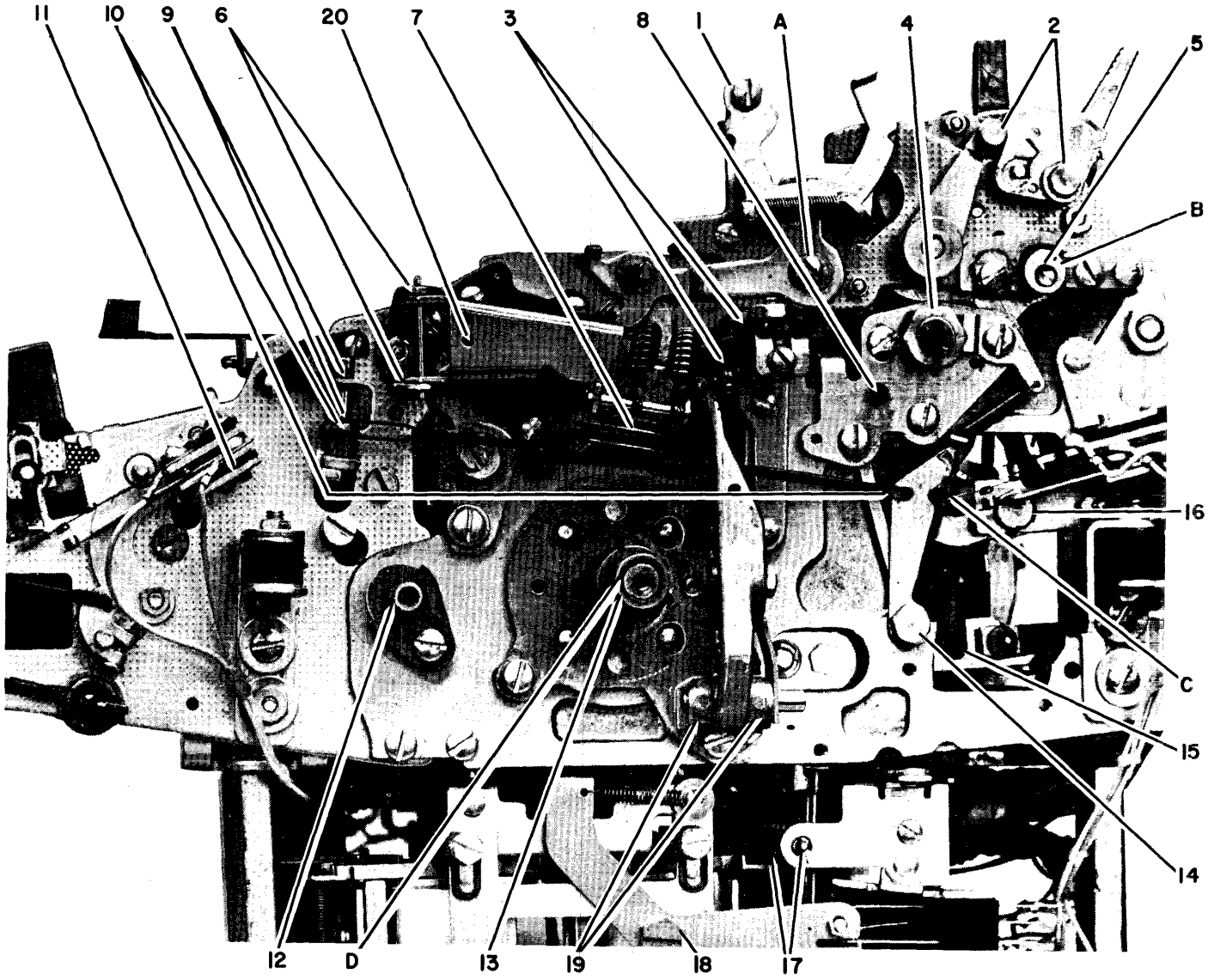


Figure 2. Right Side Of The Printer

IBM #10

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. Operational-contact link-rod pivots
18. Contact-bail pivots
19. Shift arm pivot
20. Print shaft bearing

IBM #23

A. Guide-bracket sliding surface
B. Copy-control eccentric surface
C. Carrier-return latch keeper
D. Shift clutch spring and arbor

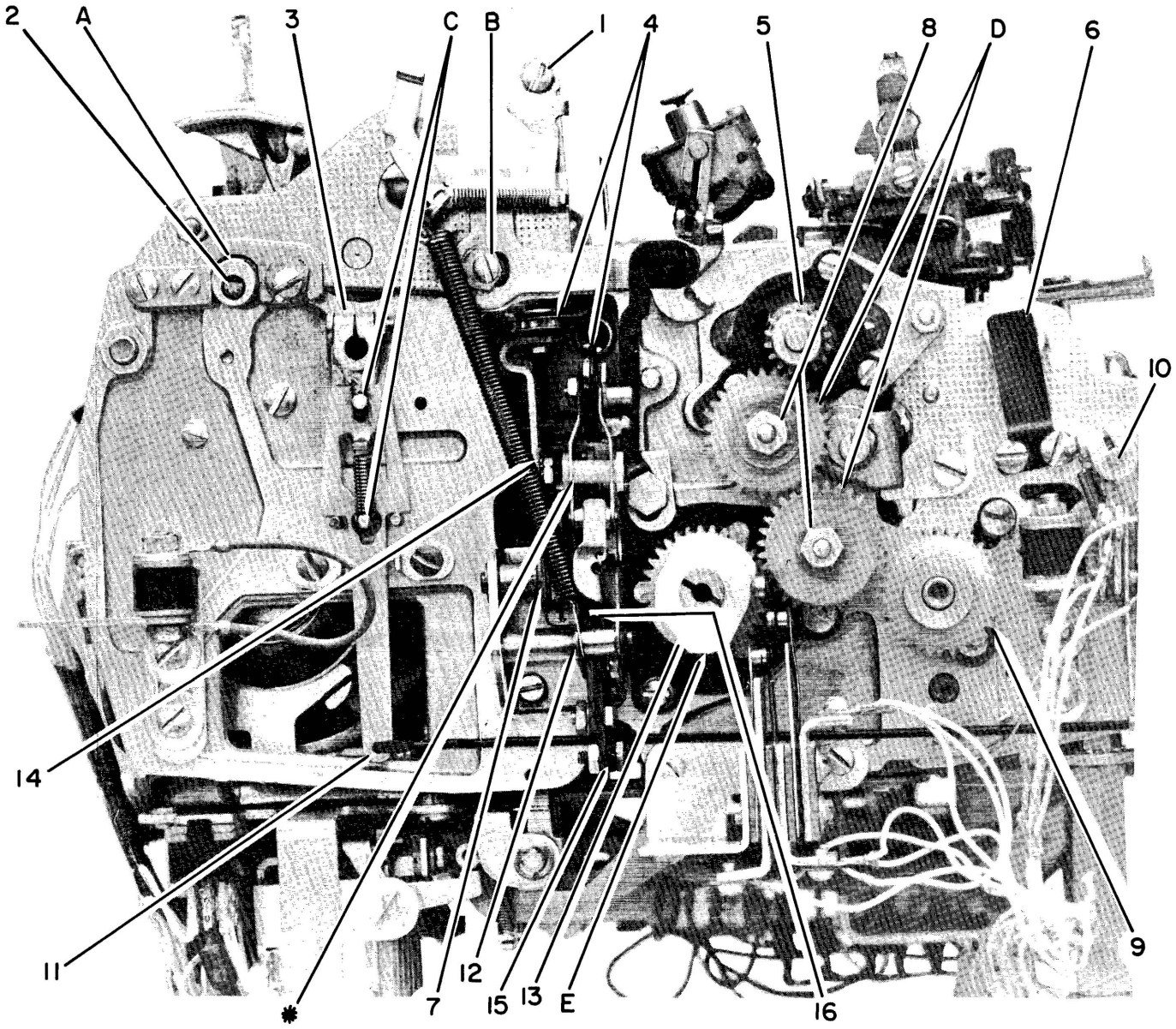


Figure 3. Left Side Of The Printer

IBM #10

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. Wear-compensator pivots
13. Cycle-shaft bearing
14. Tilt link pivot
15. Rotate link
16. Rotate arm paddle eccentric

IBM #23

A. Copy-control eccentric surface
B. Guide-bracket sliding surface
C. Tab set/clear bellcrank
D. Idler gear teeth
E. C1 and C2 cam surfaces

* Keep free of any lubricants

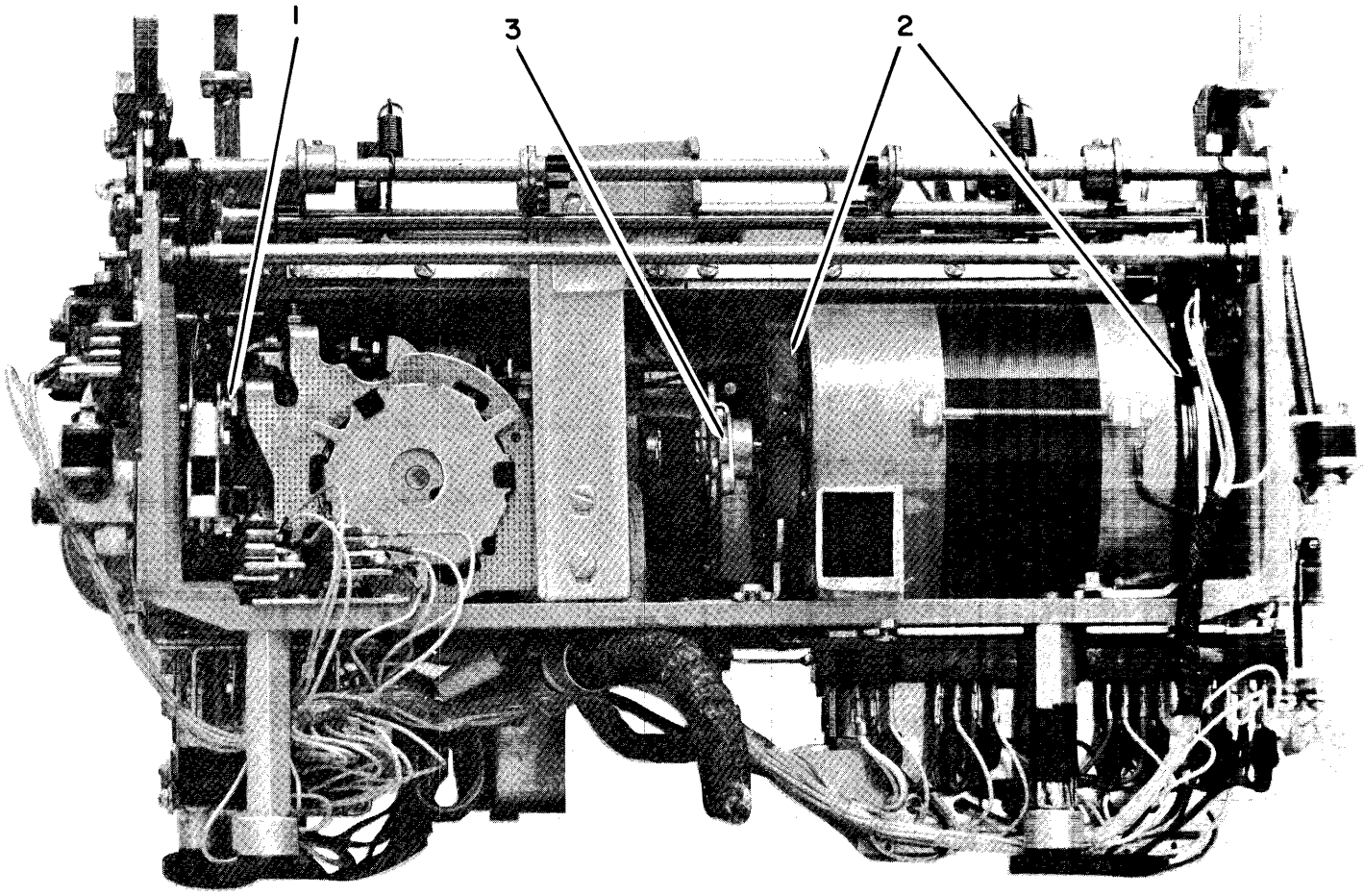


Figure 4. Back Of The Printer

IBM #10
1. Index-control lever (old style)
2. Motor bearings
   All pivots and bearings in operational unit.
3. Motor pulley and clutch assembly.

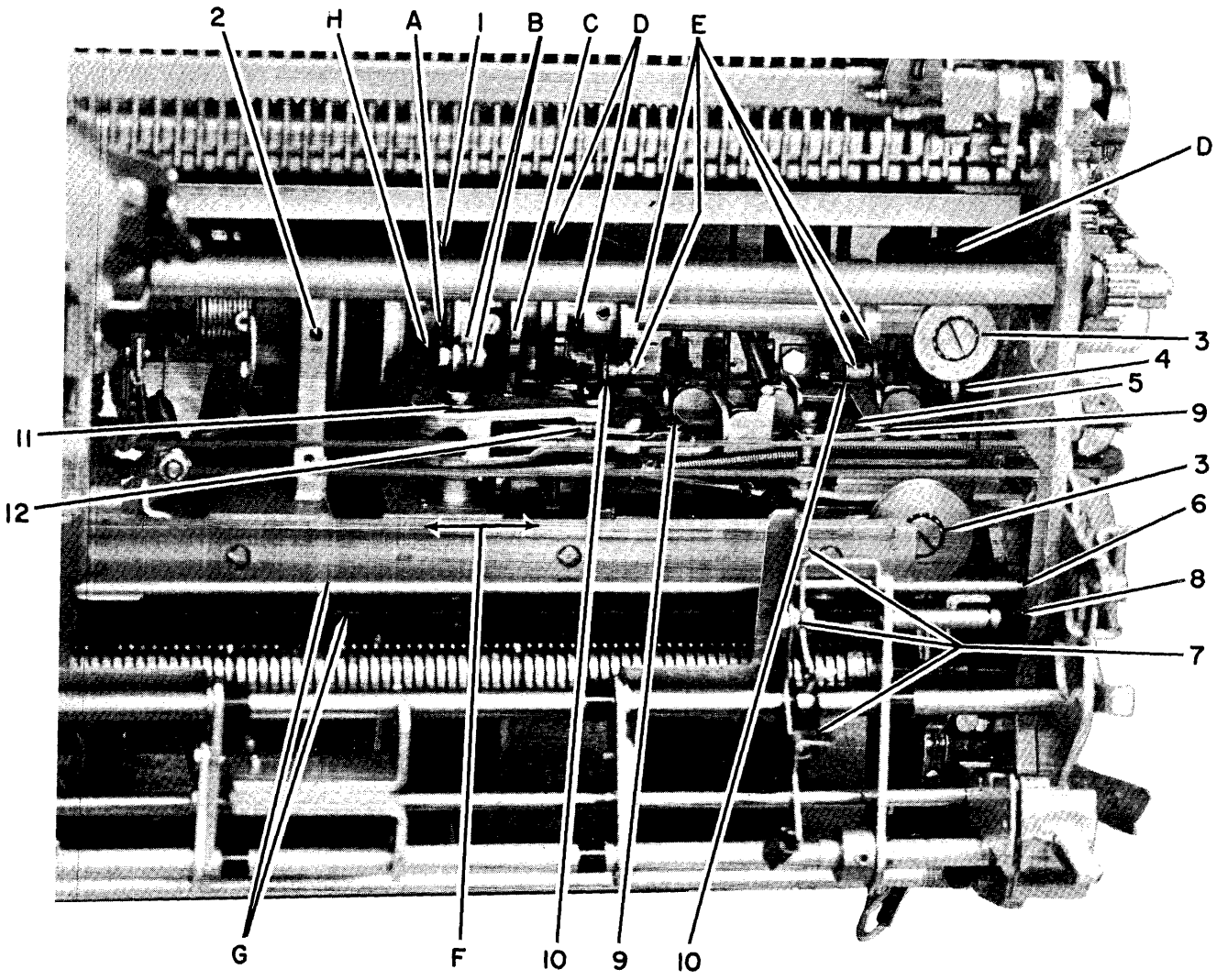


Figure 5. Differential Mechanism

IBM #10

1. Cycle-clutch latch pivot
2. Center bearing
3. Carrier-return pulleys
4. Cycle-clutch check-latch pivot
5. Check-selector latch pivot
6. Tab-torque-bar pivot
7. Feed-roll bearings
8. Escapement-torque-bar pivot
9. All selector latch and differential mechanism pivots
10. Latch pusher roller and pivot studs
11. Rotate bellcrank
12. Balance arm

IBM #23

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

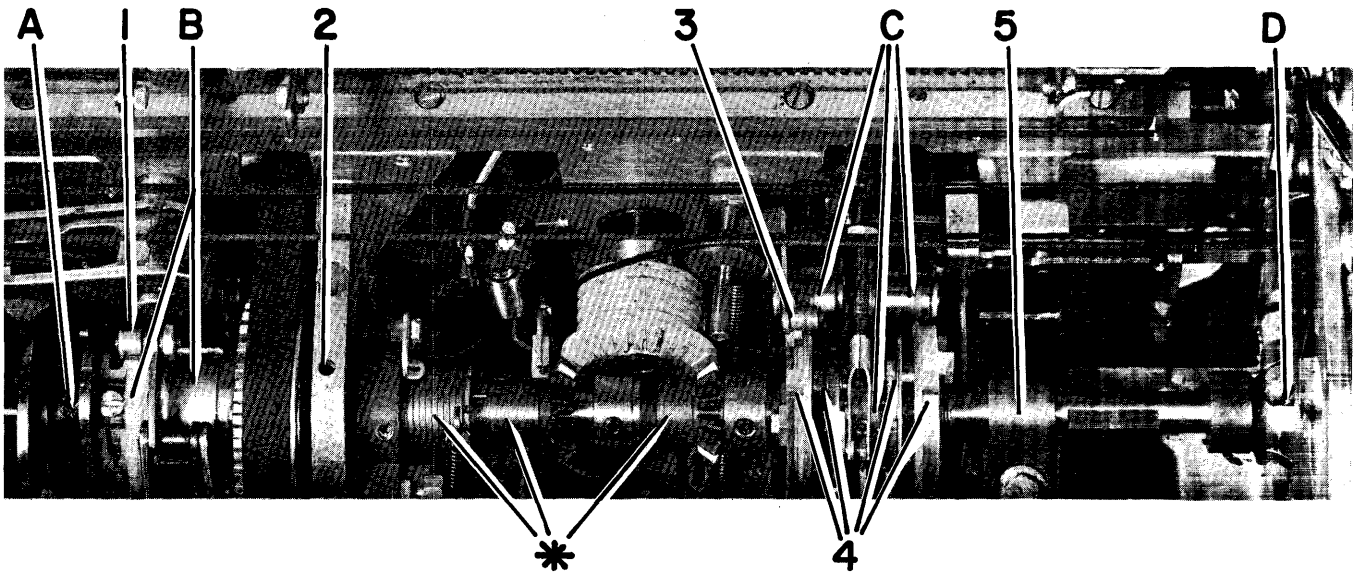


Figure 6. Improved Lubrication Machines

IBM #10

1. Latch restore roller pivot.
2. Center Bearing.
3. C-5 cam follower roller.
4. Operational cam wicks and pawl pivots.
5. Operational shaft stabilizer (sintered iron).

IBM #23

A. Cycle clutch (inside) (with grease gun).
B. Cycle clutch sleeve and restoring cam surfaces.
C. Operational cam surfaces, rollers, and drive ratchets.
D. R.H. bearing and shift clutch (inside) (with grease gun).

* Do not lubricate - oil impregnated or self lubricating

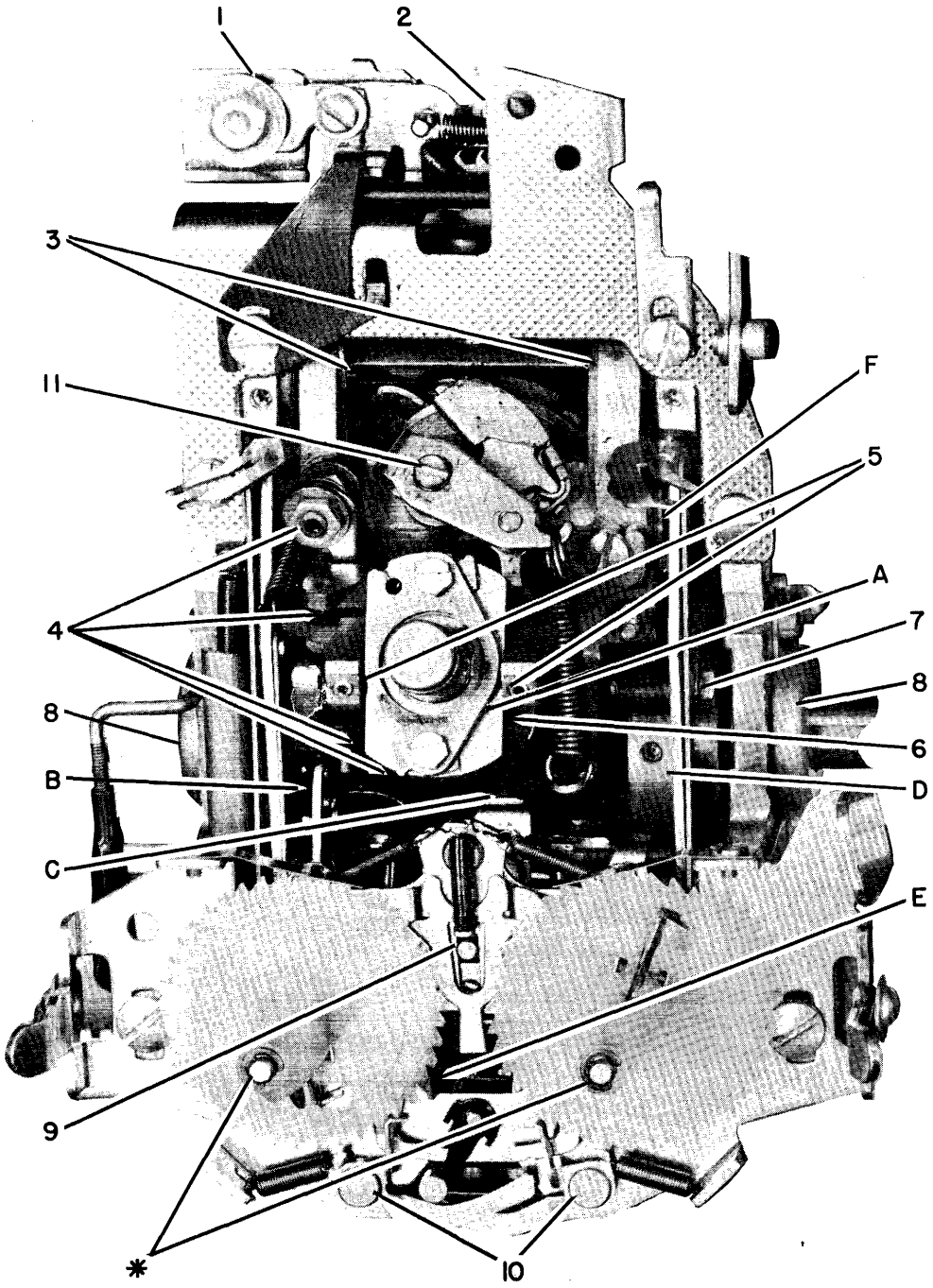


Figure 7. Carrier Mechanism

* Keep cartridge and spindles free of all lubricants

IBM #10
1. Tab-lever pivot
2. Tab-lever latch pivot
3. Rocker pivots
4. Detent pivots
5. Tilt-ring pivots
6. Lower ball socket
7. Print-cam roller bearing
8. Print-shaft wipers
9. Interposer-lever sliding surface
10. Detent-lever bearings
11. Tilt bellcrank pivot

IBM #23
A. Tilt ring and ball joint
B. Ribbon-lift cam surface
C. Ribbon-feed and detent cam surface
D. Print-cam surface
E. Ribbon-feed pawl
F. Velocity control plate pin

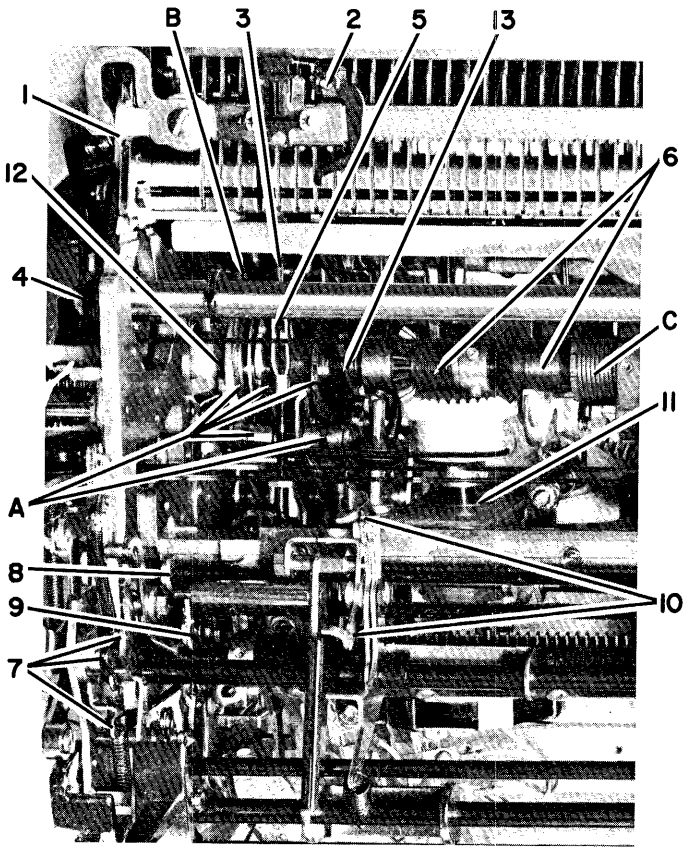


Figure 8. Operational Mechanism

IBM #10

1. Right-hand margin-rack bushing
2. End-of-line contact-actuating pivots
3. Escapement-cam-follower roller
4. Print-shaft bearing
5. Escapement clevis
6. Spring-clutch arbor. Oil carriage return spring clutch only when reassembly is necessary
7. Index pawls
8. Tab-torque-bar pivot
9. Power-tab bellcrank-link ends and pivots
10. Feed-roll bearings
11. Escapement-shaft bearing
12. Operational cam and RH bearing
13. Operational cam pivot

IBM #23

A. Operational-cam surfaces, rollers, and drive ratchets
B. Actuating arm and check-pawl contact surface
C. Torque-limiter spring clutch

PRINTER CONTACT LOCATIONS

Figures 9 to 13 show the locations of the printer contacts.

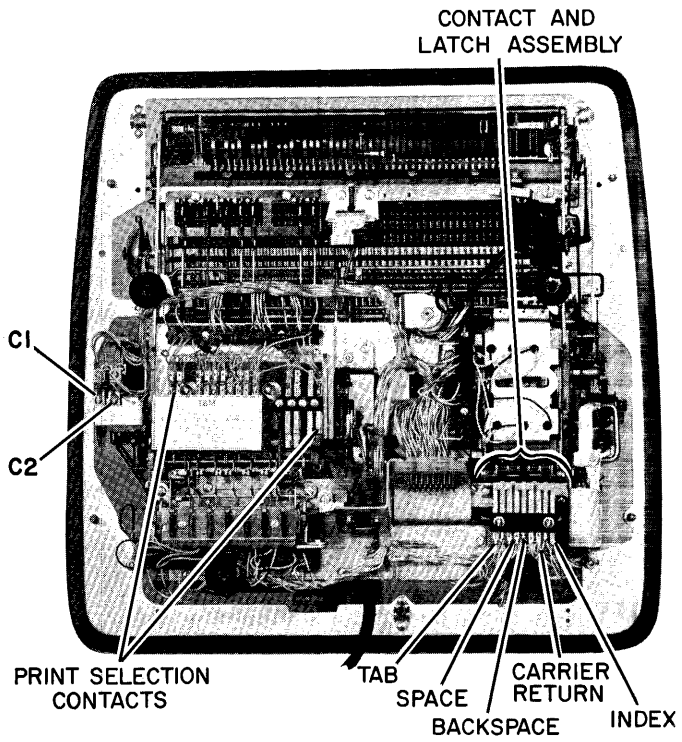


Figure 9. Bottom View Showing Contact Location

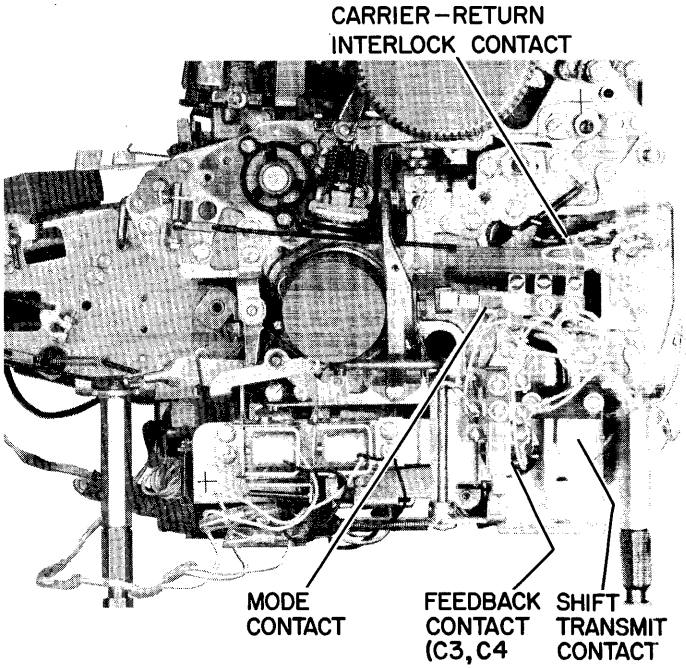


Figure 10. Right View Showing Contact Location

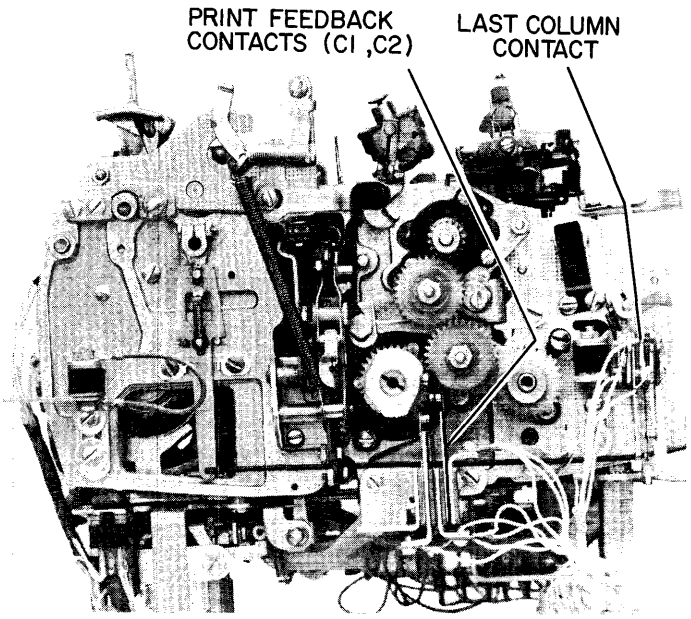


Figure 11. Left View Showing Contact Location

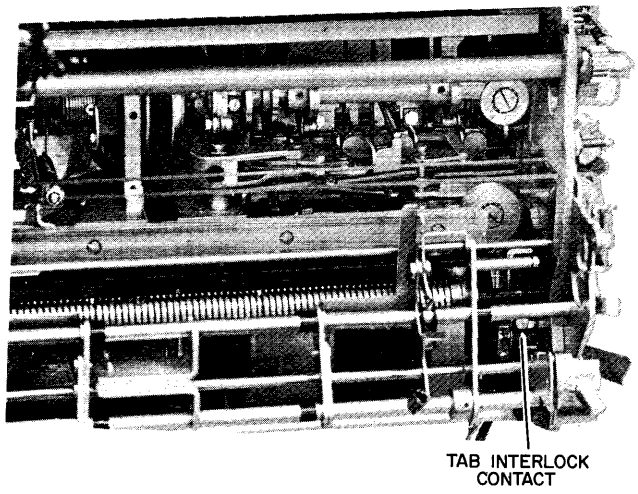


Figure 13. Upper Left Rear Corner Showing Contact Location

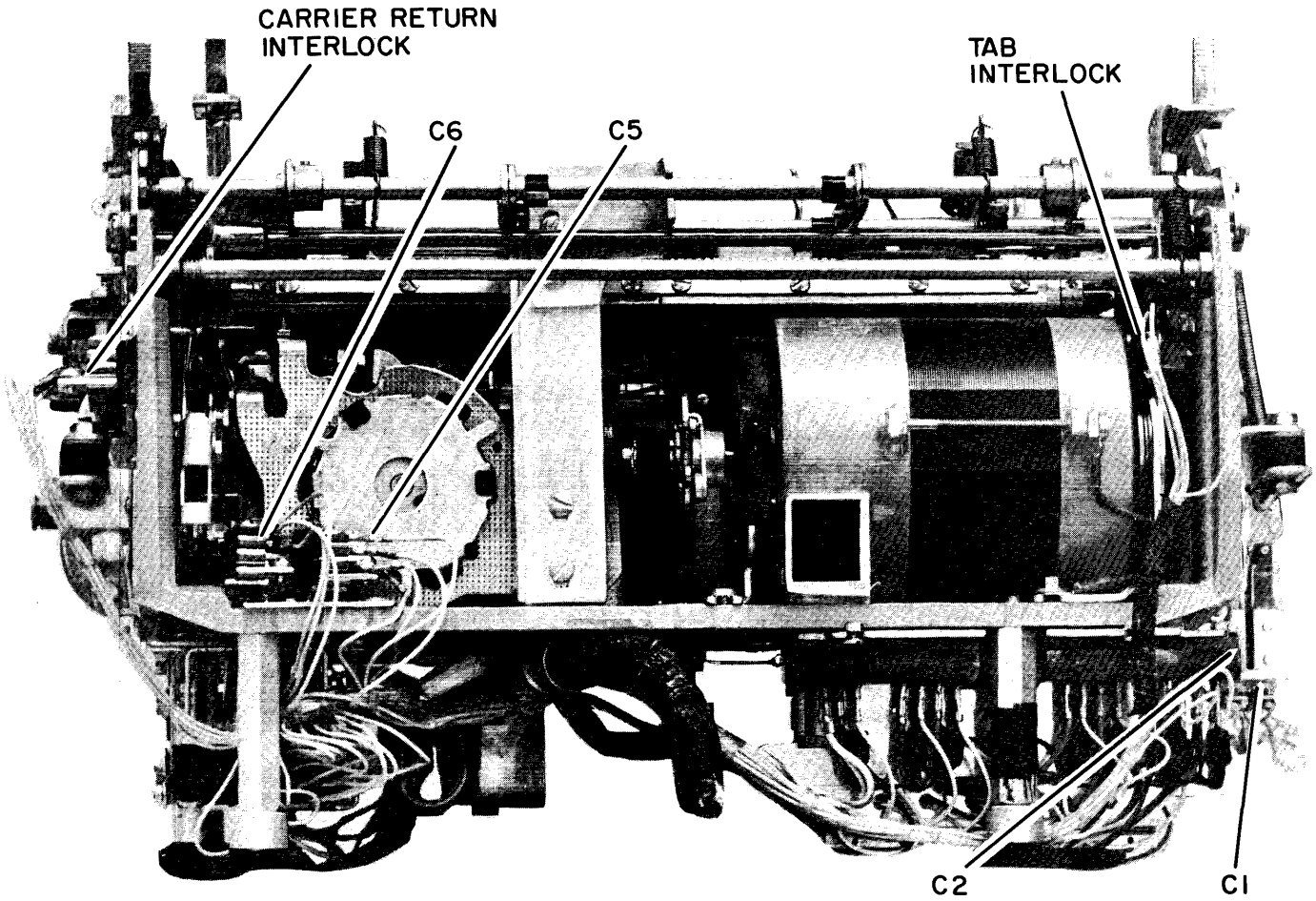


Figure 12. Rear View Showing Contact Location

Inspection Period	Inspection Area
1	Impression and Alignment Tilt Mechanism Rotate Mechanism Detenting Keyboard Area
2	Selection Magnet Units Operational Magnet Units Pusher Unit Cycle Clutch Unlatching Cycle Clutch
3	Contacts Contact Cleaning Ribbon Feed Mechanism Escapement Motor Drive and Carrier Return Indexing and Paper Feed Shift (Enter Mechanism)

FIRST INSPECTION PERIOD

IMPRESSION AND ALIGNMENT

1. The rotate and tilt tapes must be free from kinks and nicks.
2. Check for binds or excessive play in the tilt and rotate detents with respect to their guides. Check the tilt ring in relation to its pivots, and the upper ball socket with respect to the tilt-ring spacer.
3. Check for smooth compensator action.
   Static check:
   a. Half-cycle a -5 selection with the typehead removed.
   b. Pull the rotate arm out until it is completely removed from the compensator leaf spring.
   c. Release the rotate arm. This should cause the leaf spring to collapse against the power frame.

DYNAMIC CHECK

1. a. Move the roller to the top of the compensator.
   b. Repetitively type minus-five selections. The roller should return to the compensated position. If wear has caused the compensator roller to drop almost to the bottom of the slot, half-cycle a -5 character. Tilt the machine up on its back. Raise the nylon wedge manually, and tighten the rotate link until there is 1/16" travel left in the nylon wedge. Tighten the nuts on the rotate link. NOTE: The compensator nylon wedge must be clean and free of oil. If it does not drop easily, or appears to be oily or dirty, flush the wedge with cleaning fluid and wipe dry.
2. The general condition of all selection and output-motion adjustments can be checked by making a complete strike-up of the keyboard. Type back over it several times, watching for signs of misalignment with the previously typed characters. If alignment is not satisfactory, the need for closer inspection can be met by observing the dynamic detenting action of the typehead.

TILT MECHANISM

1. Check the tilt motion: Use T0 and T3.
2. Check the tilt detenting: Use a T3 character and half-cycle the machine. Place a slight pressure on the rear of the tilt ring. Remove the detent, and allow it to return slowly. The ring should move no more than .005".

ROTATE MECHANISM

1. Half-cycle a 0-rotate, 3-tilt character and observe the detenting. Follow the same procedure for a +5 rotate, 3-tilt character, a -3 rotate, 3-tilt character, and a -5 rotate, 3-tilt character.

   The variance in bandwidth of these characters should not exceed .030".

NOTE: Check as follows: Half-cycle the character and remove detent from the head. Take the play out of the head in a clockwise direction. Allow the detent to return slowly, and observe the point the detent strikes or enters the skirt. Bandwidth equals the difference between the best and worst character.

DETENTING

1. Print-shaft timing: The detent must enter and leave the head without hitting the skirt. Check by manually half-cycling. Use a -5, home, and a +5 character.
2. The skirt clearance should be .025" - .035" in a 2-tilt position. When both detents are engaged fully in their respective notches, there should be .001" minimum motion of the detent-cam follower with respect to the detent lever.

KEYBOARD AREA

1. All key levers operate freely. No binds.
2. All key levers have enough travel to fully latch an interposer and restore positively.
3. With any interposer latched down, the cycle-clutch-release pawl should clear its keeper by .002" - .008" (unlatching adjustment).
4. The cycle-clutch-latch-pawl bite on the keeper must be one-half the thickness of the keeper. Adjust the bail upstop.
5. The cycle-clutch-latch pawl overthrows the keeper by .020" - .025" (under manual operation) when restoring.
6. Operational key levers should allow for positive single operation.

Latch Selection. The latch links should allow the latches to overhang the bail flush to .010" overlap.

Manually half-cycle the following selections one at a time, and observe the latches:
0-rotate, 1-tilt character
-5 rotate, 1-tilt character
+ 1 rotate, 0-tilt character
+ 2 rotate, 0-tilt character
+ 3 rotate, 0-tilt character

These characters allow each latch to be checked individually. Observe that the selected latches clear the bail fully, and do not snap off. Observe that the nonselected, or operated, latch seats fully on the bail, does not jump off, and makes the correct selection.

SECOND INSPECTION PERIOD

SELECTION MAGNET UNITS

1. Check the pick times of all magnets by observing (on an oscilloscope) the voltage rise across a 10-ohm, 1/2-watt resistor (part 321271) in series with the individual magnet coils, when a 48-volt pulse is applied to the coil. All pick times must be ten milliseconds or less, with the exception of U.C. shift magnet, red ribbon shift magnet and the keyboard-lock solenoid. The U.C. magnet and red ribbon shift magnet armatures must seal within 12 milliseconds maximum and the keyboard lock solenoid must pick in a maximum of 55 milliseconds. See Figure 14 for wave form of magnet pick time.

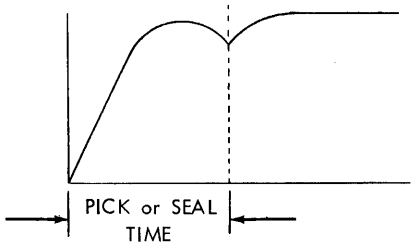


Figure 14. Waveform of Magnet Pick Time

Pick-time readings are the best indicator of magnet performance. High pick times foretell adjustment discrepancies, wear, or sluggishness. They are often evidenced by noticeable machine slowness when repeat operations are performed. Note the following items when high pick times are encountered:

a. With the armature manually attracted, an armature-to-yoke clearance of .001" - .006" is necessary to prevent an armature from rocking on the yoke. Carefully check the pivot points for wear (pivot plate adjustment).
b. Except in the case of the operational magnets, the armature stops are to be adjusted for a .004" - .008" armature-to-yoke clearance. This clearance must be maintained to prevent permanent residual effects in the armature.
c. In no case should an armature rock on the core.

OPERATIONAL MAGNET UNITS

1. When an armature is operated, the armature pull-link adjustment should allow for positive interposer tripping with .002" - .010" overthrow clearance between the interposer and the pawl guide plate at the point of unlatching.

PUSHER UNIT

1. Both latch-pusher cam-follower rollers must contact the cams on the selector cam shaft throughout a cycle.
2. Check the individual pusher-to-latch extension clearances. Clean all operational circuit-breaker contacts, and check for pitting.

CYCLE CLUTCH UNLATCHING

1. Positive unlatching of the cycle clutch must occur when each armature is operated by hand, with the latch overthrow .002" - .007" (old style trip mechanism). On the spring-loaded (new style) trip mechanism, overthrow (with an armature operated) should measure .005" - .020" between the trip lever and the latch lever. Check to insure thar the K.O. eccentrics do not choke off the armature travel (K.O. eccentrics should clear trip bail extensions by .003" to .008" with armatures manually attracted).
2. Check for .005" - .010" vertical clearance between the selection-armature latching surface and the pushers, and for .001" - .010" horizontal between the tip of the pushers and the armatures.
3. The trip bail pivot eccentrics must allow equal motion to be transmitted from the T2 and R5 armatures to the trip link. The eccentrics must be in the upper sphere of their adjustment to prevent binding.

CYCLE CLUTCH

1. Latch height: Measure with #3 scribe line on Hoover-ometer.
2. Cycle shaft collar: The cycle clutch should begin to slip approximately 15° before the check pawl detents. Hand cycle the machine, using a -5 rotate, 0-tilt character.
3. Nylon stop: Adjust for four degrees rotation or overthrow when the cycle shaft is latched home.
4. Shaft end play: .001" - .003".
5. All gears: Minimum play, no binds, screws tight.
6. Print-shaft timing: The keyway should be toward the dowel pin on the carrier.
7. Filter-shaft timing: With an interposer latched down, there should be .005" - .010" between the interposer and the filter shaft.

THIRD INSPECTION PERIOD

CONTACTS

1. The operational transmitting contact latches should be flush with the end of the contact-strap stop (interposers latched), and should have .005" - .015" clearance between the contact-strap stop and the latch (interposers unlatched).
2. There should be .002" - .010" clearance between the print-feedback O/P's and the low point of the feedback cams.
3. The tab interlock microswitch should move at least .031" after the switch has transferred when the tab torque bar is moving toward its rest position. The switch must remain transferred during tabulation and must transfer before the backspace cam reaches its high point.
4. The carrier-return-interlock (normally-open) strap should rise a minimum of .010" off its support terminal with the carrier-return-clutch latch latched.
5. Check the timing and air-gap adjustments on all contacts. All transmitting and checking contacts should have:
   a. .020" air gap except the shift which is .040".
   b. All circuit-breaker contacts and interlocks should have a .040" air gap.

CONTACT CLEANING

Caution: Under no condition should contact files, burnishing blades or similar tools be used to clean gold contacts in this machine.

To clean the gold contacts, use IBM Contact Cleaner and clean bond paper.

RIBBON FEED MECHANISM

1. A -5 rotate, 1-tilt character should strike the ribbon 1/16" from the bottom in the high lift position.
2. Check for enough tension of the ribbon-feed mechanism-ratchet-brake springs to hold the ribbon ratchets in a rotated position, to overcome positively the action of the centering spring.
3. The ribbon-feed pawl should hold the reversing interposer within .005" - .010" of its total travel with the ribbon-feed cam on its high point and the ribbon mechanism set for a reversing operation. Positive two-tooth feed plus .010" overthrow should result.

ESCAPEMENT

1. The carrier should escape smoothly and positively throughout the full length of the writing line and through the right-hand margin under spacebar operation and tabulation.
2. Check for frayed or loose transport cords.
3. Tension should be maintained on the right-hand transport pulley to maintain its mounting parallel to the power frame. Its outside flanges should be 1-7/32" from the right-hand outside surface of the power frame.
4. The line-gage holder must clear the platen at all points, and not impede carrier motion.
5. A minimum of .015" clearance should exist between the carrier-return shoe and the spring-clutch. Note, however, that excessive clearance can result in erratic carrier-return motion.
6. Check for 1/2-3/4 pounds of mainspring tension measured at the carrier as it escapes through the linelock load at the extreme right-hand margin.
7. Check for .002" - .004" backlash of the tab governor and carrier-return pinion gears with the escapement gear.
8. Letter escapement should occur as soon after print as possible.
9. The trigger guide should disengage the trigger from the escapement-torque-bar arm when the escapement pawl has cleared the rack by .010" - .015". Both the letter-escapement and the spacebar operation should allow .005" - .010" excess motion after the trigger has disengaged the trigger from the torque-bar arm.
10. When operated, the tab lever should overthrow the tab-lever latch by .005" - .010" without being choked off by the tab torque-bar lockout lug or backup eccentric, and without overthrowing into the tab rack. Observe the operation at both ends and the middle of the torque bar. Dynamically check for tab failures using five irregularly set tab stops for at least five columns.
11. Check to make sure that the carrier-return operation unlatches the tab when both operations occur simultaneously.
12. With the backspace operated manually, the escapement pawl should just fail to get a new tooth on the escapement rack.
13. There should be a clearance of .005" - .015" between the front of the backspace pawl and a tooth of the backspace rack (with the carrier at rest).
14. Overthrow clearance of .010" - .020" is required between the interposer pawls and the operational-latch bracket when the operational cams are on their high point.

MOTOR DRIVE AND CARRIER RETURN

1. Check for adequate tension of the motor-pulley belt, or for a frayed or noisy belt.
2. The selector and operational cam shafts, and the print and filter shafts, must have .002" end play.
3. There must be freedom from binds in the idler gear train with minimum backlash.
4. With the carrier-return cam on its high point, the carrier-return arm should overthrow its keeper by .020" - .030".
5. The carrier-return brake shoe should cause the carrier-return spring clutch to drive the carrier no later than when the escapement pawl clears the last one-third of the escapement rack tooth. The clutch shoe should overlap the last three coils of the spring clutch.
6. The carrier-return unlatching link must positively unlatch the carrier-return latch at the left-hand margin with .005" - .010" overtravel when the margin-rack overbank is set.
7. The escapement pawl must not drag the escapement rack during carrier-return operations.
8. Measure one-half to one pound tension of the shock unloader at the left-hand margin while unlatching the carrier-return keeper-latch arm.

INDEXING AND PAPER FEED

1. Check for .015" - .030" clearance between the platen ratchet and the index pawl, at rest.
2. Index operation should result in one full-tooth motion of the index pawl with respect to the platen ratchet (in single-linespace position) and two full-teeth motion with no evidence of hesitation or drag (in the double-linespace position).

SHIFT

Check the cam and spring for rust. Check for the positive release of the ratchet when the key lever is two thirds down. Turn power on, and hold the shift ratchet (grey section). Release the ratchet by pressing the key. Allow the ratchet to rotate slowly while holding down on the key. The shift cam should stop at a fully detented position for each 180° operation. The white nylon roller should seat fully in cam notch.

IBM®

OPD CUSTOMER ENGINEERING
Selectric I/O Reference Manual
Section 2

Reprinted July, 1966

F/N 241-5309-0

CONTENTS

ADJUSTMENTS SECTION 2

ADJUSTMENT THEORY

MOTOR AND DRIVE

1. Drive Belt - Adjust the motor mounting brackets forward or back to obtain a minimum amount of belt noise.

   Both ends of the motor must be adjusted the same in order to maintain the rotor shaft perpendicular to the drive belt.

   The belt must never be so loose that jumping cogs on the motor pulley is a possibility. Check by operating the shift mechanism while holding the carrier with the carrier return in operation. This loads the motor to a point where failure will be most probable.

2. Motor Pulley - Adjust the motor pulley left or right so that the drive belt rides fully on the teeth of both pulleys without rubbing the flange of either. Position the retaining clip for .005" to .015" end play.

3. Motor Clutch Pawl Stops (Fig. 1) - Form for a clearance of .010" to .020" between the clutch pawl tip and pulley ratchet when the pulley is manually rotated.

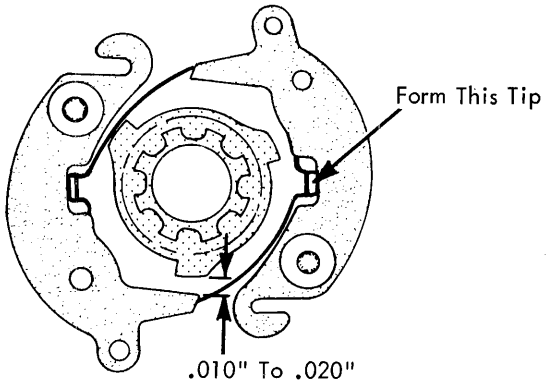


FIGURE 1. Motor Clutch Pawls

4. Idler Gears - Adjust the idler gear studs so that minimum backlash is present between mating gears. The mechanism must be free of binds throughout 360° rotation of the gears.

   Minimum backlash is necessary to prevent erratic operation of the drive train and to insure minimum overthrow of the driven shafts.

   The lower idler gear must be adjusted first because the upper idler gear is adjusted to the final position of the lower gear.

   CAUTION: After any removal and replacement of the left hand cycle shaft bearing, the mesh of the lower idler gear must be checked. The lower idler gear stud is mounted to the bearing plate; therefore any slight rotation of the plate will affect the gear mesh.

KEYBOARD SECTION

1. Filter Shaft - With the cycle shaft in the rest position, the working surface of the filter shaft should clear a depressed interposer by .005" to .010" (Fig. 2).

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

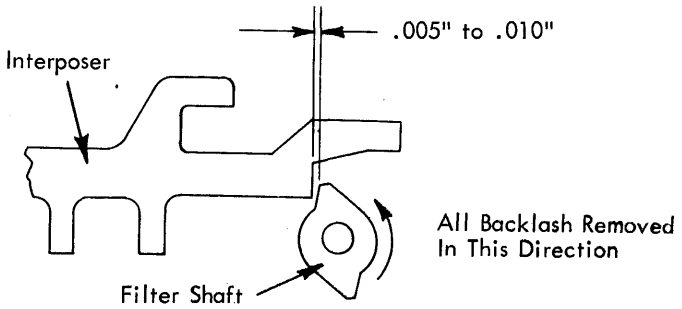


FIGURE 2. Filter Shaft Adjustment

All backlash of the gear train should be taken out forward when checking the filter shaft adjustment. This simulates a powered operation in which the momentum rotates the top of the filter shaft to its extreme forward position.

Insufficient clearance between the filter shaft and the interposers could allow the filter shaft to stop just under the rear of the interposers. The keyboard would then be inoperative, because the interposers could not be depressed.

Excessive clearance would delay the operation of the interposers. The selector latches would not be pulled forward until after having been pulled down slightly by the latch bail. This would result in excessive wear and a noisy operation as the latches were snapped forward from under the bail.

CAUTION: Excessive clearance will also cause malselection.

NOTE: Be sure to maintain .002" to .004" end play of the filter shaft within the left hand filter shaft bearing. The mounting of the left hand filter shaft bearing allows .011" lateral play of the bearing. Do not confuse this lateral play of the bearing with the filter shaft end play.

2. Rear Interposer Guide Comb - Adjust the interposer guide comb up or down so there is .020" to .030" clearance between the bottom edge of the interposers and a vane of the filter shaft (Fig. 3).

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

   CAUTION: Check the clearance at several points along the filter shaft.

   NOTE: The purpose of this adjustment is to prevent "bridging". "Bridging" is a form of malselection caused by two or more interposers being depressed 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 check-

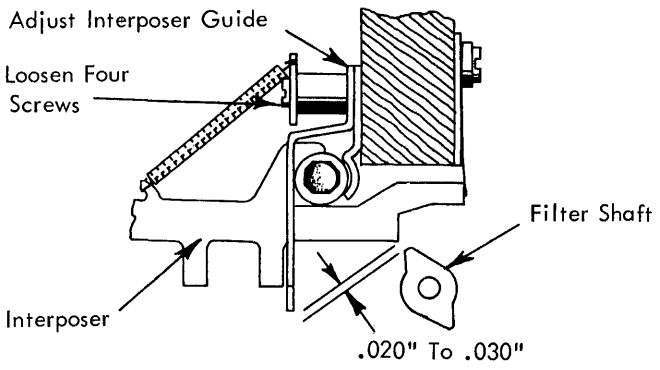


FIGURE 3. Rear Interposer Guide Comb

ing 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 .005". This check should be performed at several places along the filter shaft.

WARNING: 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.

3. Bail Parallel

a. Loosen cycle bail up stop and move it up out of the way of the cycle bail.

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

c. Adjust the bail anchor plate up or down so that the cycle bail will rest as evenly as possible on all the interposers.

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.

4. Interposer Latch Springs (Preliminary) With the H interposer latched down, adjust the left hand end of the right hand section of latch springs so that there will be approximately .015" remaining travel of the interposer before it bottoms (Fig. 4). Check this clearance by pulling the interposer down with a spring hook.

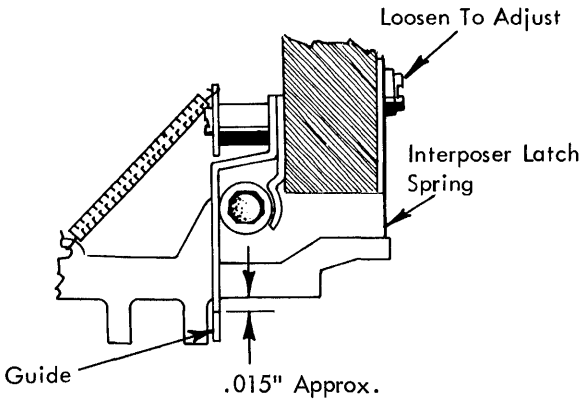


FIGURE 4. Interposer Latch Spring Adjustment

5. Cycle Clutch Latch Bite - Adjust the cycle clutch keeper bracket forward or back so that the cycle clutch latch overlaps the step on the cycle clutch sleeve by .030" to .035" (the thickness of the metal plate). (Fig. 5)

The overlap can readily be observed from the bottom of the machine.

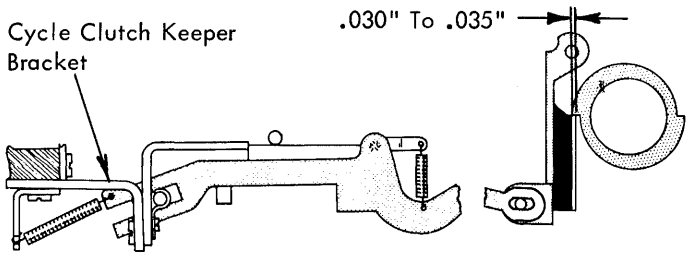


FIGURE 5. Cycle Clutch Latch Bite Adjustment

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.

6. Cycle Clutch Latch Restoring

a. **Late Style** - Position the restoring roller so that the latch pawl overthrows the keeper by .020" to .025" with the restoring cam on its high point. Check on both restoring cam lobes and adjust on the lobe providing the least motion (Fig. 6).

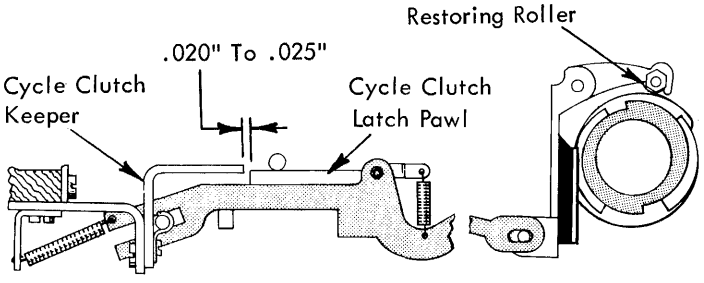


FIGURE 6. Cycle Clutch Latch Restoring, **Late Style**

b. Early Style - Adjust the restoring lever so that the latch pawl overthrows the keeper by .030" to .045" (Fig. 7).

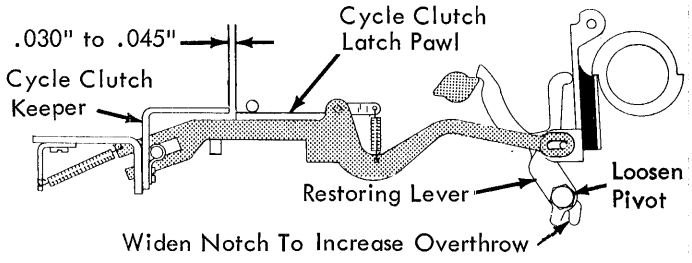


FIGURE 7. Cycle Clutch Latch Restoring Adjustment

7. Cycle Clutch Release Point - Adjust the cycle clutch keeper vertically for .002" to .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 (Fig. 8).

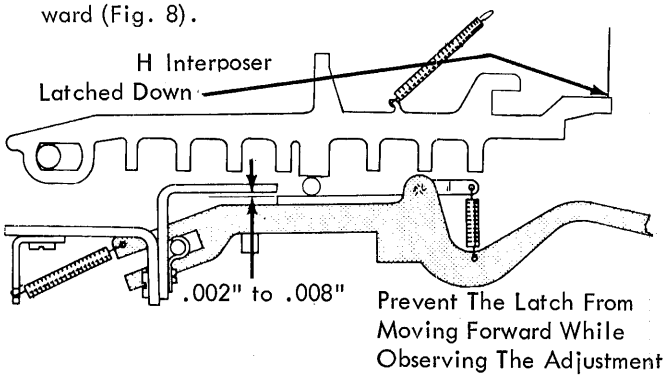


FIGURE 8. Cycle Clutch Release Point Adjustment

Too much clearance indicates that the clutch is being released too early in the travel of the interposer. Erroneous selection can occur because a flicking action on the keylevers can cause 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.

Insufficient clearance does not insure that the clutch will be released when an interposer is latched down. If an interposer is latched down without releasing the clutch, the keyboard will be locked because the interposer will remain in the compensator. The keyboard can be unlocked only by depressing the latched interposer a second time sufficiently to unlatch the clutch.

8. Interposer Latch Spring Adjustment, Final - Position the left and right interposer latch spring sections vertically so that the .002" to .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 deviation in parallelness between the rear interposer guide comb and the cycle bail.

The interposer latch springs are adjusted as low as possible to minimize "flicking". "Flicking" is caused by the interposer failing to remain in the path of the filter shaft vane when the shaft is operated. By adjusting the latch springs as low as possible, a lower cycle clutch release point can be achieved. This helps to minimize "flicking" because the interposer must now travel further into the path of the filter shaft vane in order to release the cycle clutch and remains in the path of the filter shaft for a longer period of time during a "flicking" condition.

9. Cycle Clutch Latch Pawl Bite - Adjust the cycle clutch bail upper stop to provide .030" to .035" bite between the latch pawl and its keeper (1/2 the thickness of the keeper) (Fig. 9).

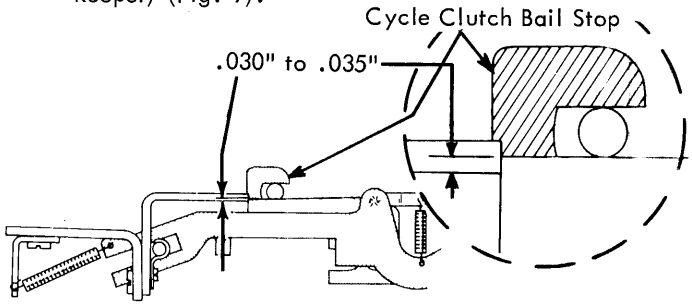


FIGURE 9. Cycle Clutch Latch Pawl Bite Adjustment

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. In order to adjust the cycle clutch bail stop it is only necessary to loosen both nuts and the front screw. Do not loosen the rear screw.

Insufficient bite increases the possibility of a repeat cycle because positive latching is not insured. Excessive bite will affect the touch of the keyboard because the latch pawl must be moved farther in order to trip the clutch.

10. Front Keylever Guide Comb - Position the guide comb vertically to allow the keylevers to travel .010" to .020" after the keylever pawl resets (Fig. 10).

NOTE: An individual keylever may be adjusted by opening or closing the horseshoe slot on the keylever.

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

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

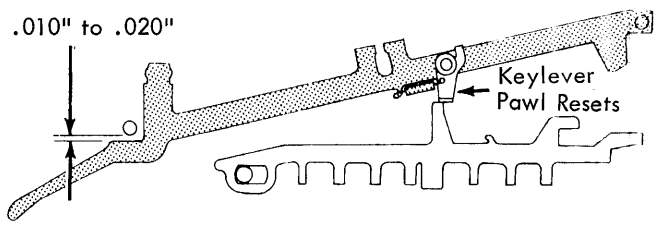


FIGURE 10. Front Keylever Guide Comb

11. Selector Compensator - Adjust as follows:

a. Late Style (Fig. 11)
   1. Loosen locking set screws in the LH and RH nylon blocks.
   2. Latch the extreme RH interposer down.
   3. 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.
   4. 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).

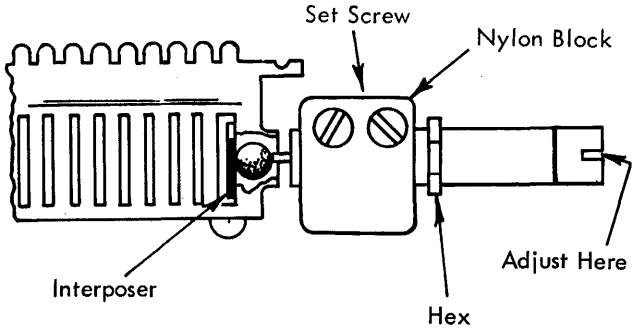


FIGURE 11. Compensator Adjustment, Late Style

   5. Repeat the same procedure on the LH side.
   6. Tighten the locking screws in the nylon blocks.

b. Early Style (Fig. 12) - With the extreme RH interposer latched down and held against the right side of its guide slot, adjust 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.

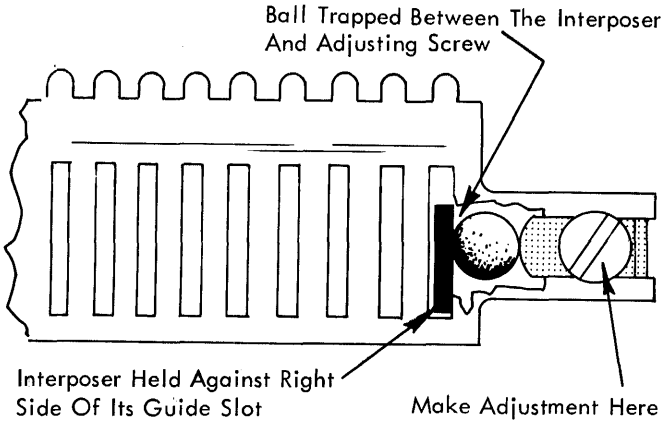


FIGURE 12. Compensator Adjustment, Early Style

12. Latch Bail Shaft - Adjust the plate that supports the right end of the bail shaft so that the bail shaft is parallel to the cycle shaft.

This adjustment is extremely important because the rollers on the latch bail MUST contact their respective selector cams at the same point and with the same pressure in order to insure that both cams operate the bail together.

The bail shaft is set at the factory and should not require a readjustment unless the plate becomes loosened or parts replacement is necessary. This is a difficult adjustment to make and should not be loosened unless absolutely necessary.

The adjustment can be made if necessary by loosening and tightening the bail shaft plate mounting screws with a hammer and screwdriver. The screws should be left friction-tight until the correct position of the plate is obtained in order to facilitate the adjustment.

The bail shaft plate must be adjusted both vertically and horizontally in order to make the rollers of the latch bail ride their respective cams equally. Changing either the vertical or horizontal position will affect the other; therefore both adjustments must be considered together and adjusted alternately until both are correct. If a readjustment is necessary, the following procedure may be used.

a. The correct vertical position is obtained by raising or lowering the bail shaft mounting plate until both bail rollers have equal pressure against their respective cams. Check by testing the drag on strips of paper inserted between the rollers and the cams.

b. The front to rear position of the bail shaft plate can be set relative to the cycle shaft. Set the Hooverometer to span the distance between the cycle shaft and the left end of the bail shaft as illustrated in Fig. 13. Move the Hooverometer to the right and adjust the bail shaft plate forward or back to the same clearance as at the left side. With the bail shaft parallel to the cycle shaft, the bail rollers should be contacting their respective cams at the same point.

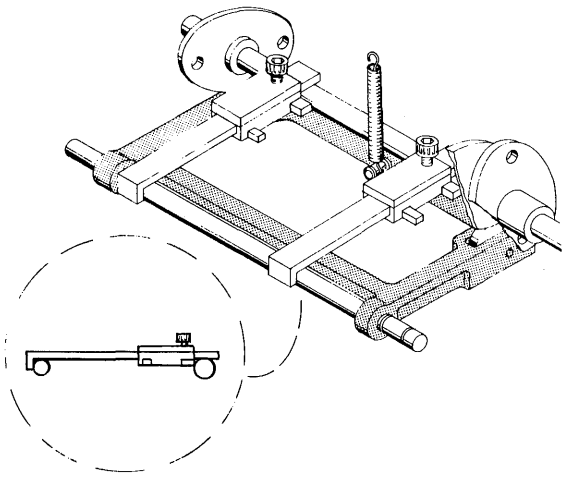


FIGURE 13. Latch Bail Shaft Plate Adjustment

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

CAUTION: On early level machines the cycle bail stop and the character interrupter must be readjusted after any change in the position of the bail shaft plate, because both of these parts are mounted on the plate.

13. Differential Guides

a. The rotate differential guide should be adjusted left or right so that the vertical links of the system hang in a true vertical position (Fig. 14).

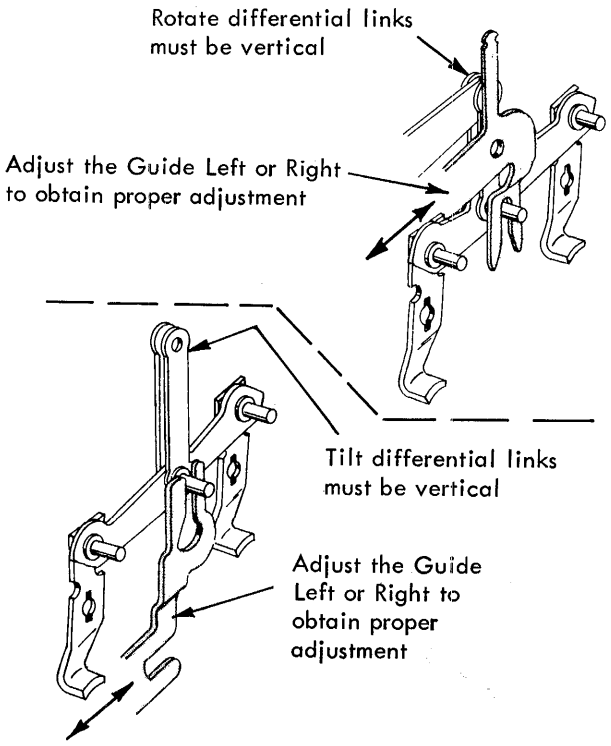


FIGURE 14. Selector Latch Guides

The guide for the rotate differential 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 is attached to the bottom of the differential mounting bracket and is easily accessible from beneath the machine.

b. The latch bail guide should be adjusted left or right so that all positive rotate and tilt selector latches hang vertically in the latch bail. The guide is attached to the lower left corner of the differential mounting bracket (Fig. 15).

14. Latch Bail Stop - The latch bail stop, located just beneath the bail, prevents the bail from getting beneath the selector latches during shipment. Adjust the stop to clear the latch bail by .005" to .015" when the bail is at the high point of the cycle shaft cams (Fig. 16).

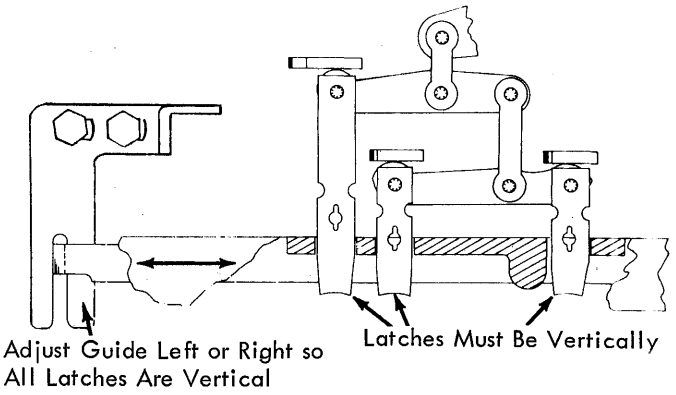


FIGURE 15. Latch Bail Guide

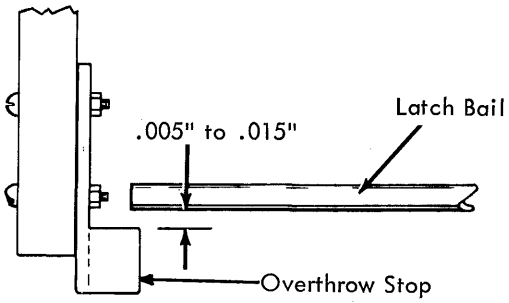


FIGURE 16. Latch Bail Overthrow Stop

NOTE: Excessive clearance will allow the bail to overthrow at the high point of the cams. During the overthrow it is possible for the latches to get on top of and bind off the bail. This condition is more prevalent with the check latch.

15. Latch Interposer Stop - Form the stop lugs to obtain .001" to .005" clearance between each latch interposer and its respective selector bail (Fig. 17 or 18).

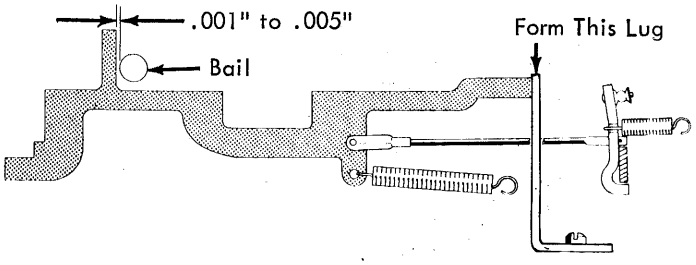


FIGURE 17. Latch Interposer Stop (Early Style)

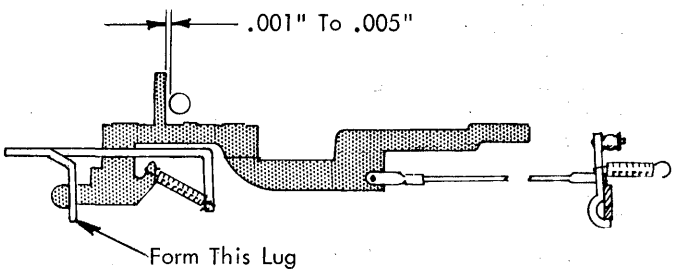


FIGURE 18. Latch Interposer Stop (Late Style)

NOTE: On the late style, be sure that the left to right position of the front interposer mounting bracket is such that the latch links will exert a straight pull on the selector latches.

The latch interposer stop lugs establish a position for the latch interposers so that the correct adjustment of the selector latch links can be obtained. Selection timing will be directly affected by an erroneous stop lug adjustment.

16. Selector Latch Links

a. With the machine at rest adjust the negative 5 latch link so that the negative 5 latch will overlap the stop screw head by .050" to .060" (Fig. 19).

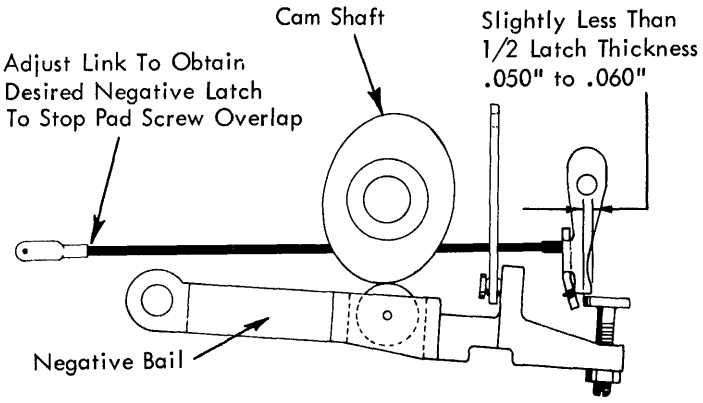


FIGURE 19. Negative Latch Link

b. With the machine at rest adjust the tilt and positive latch links so that their latches will overlap the latch bail with .005" to .015" overhang (Fig. 20).

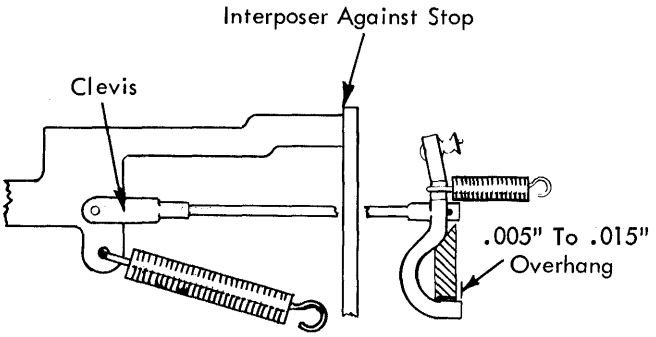


FIGURE 20. Tilt and Positive Latch Links

Adjusting a link too short can result in erroneous selection because the latch will not have a secure bite on the latch bail plate (or negative-five stop screw). The force of operation could cause the latch to slip off part of the way through a cycle and cause a noisy operation as well as erroneous selection.

17. Check Latch

a. Upstop (Fig. 21) - With the selector cams at the low point, form the upstop so that the latch clears the bail by .020" to .025".

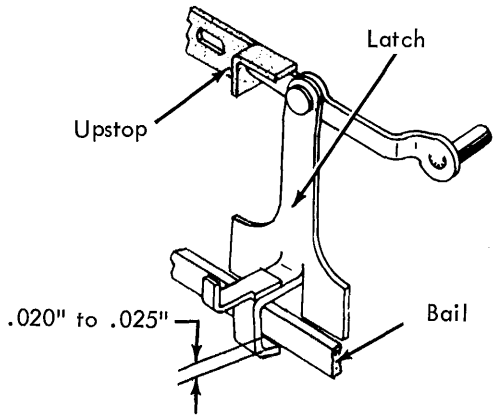


FIGURE 21. Check Latch Upstop

Insufficient clearance may cause the check latch to fail to reset under the bail plate. It may allow the check latch to get on top of the bail and bind off the bail.

b. Spring Return Arm (Fig. 22) - Position to hold the pivot arm against the upstop.

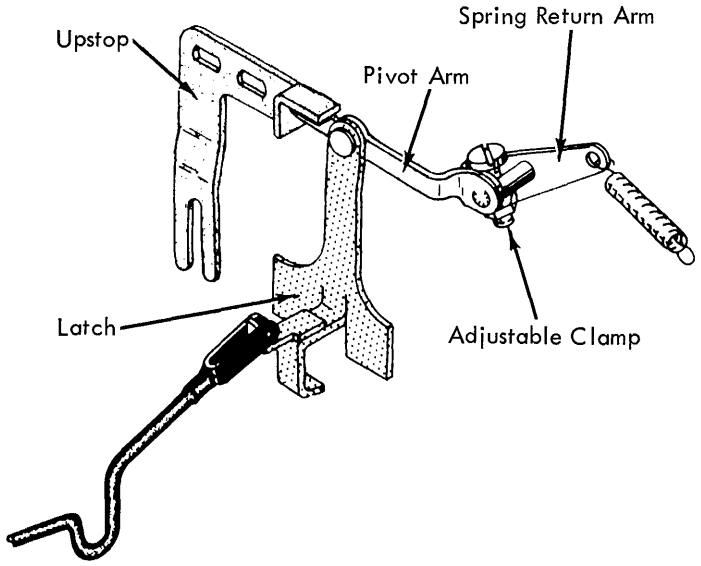


FIGURE 22. Check Latch Spring Return Arm

c. Check Latch Link - With the machine at rest adjust the check latch link so that the check latch clears the bail by .001" to .010" (Fig. 23).

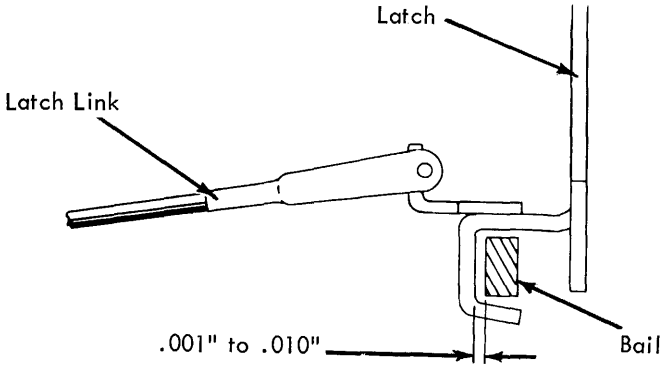


FIGURE 23. Check Latch Link

LATCH PUSHER ASSEMBLY

NOTE:

a. Do not remove pusher plate unless replacement of the plate is required.
b. The selector latch link adjustments (Figure #'s 19, 20, and 23) must be correct before making any pusher to latch extension adjustments.
c. When removal of the Latch Pusher Assembly is required, scribe (for reinstallation reference) the pusher plate to power frame relationship. If the original relationship can be maintained, the adjustments will not have been destroyed by removal. In case of loss of relationship, position the pusher plate as nearly as possible for the prescribed latch to pusher clearances (Fig. 25A) and proceed with the following adjustments.

1. Pusher Bail Eccentrics (Fig. 24) - Adjust so that the top edge of the follower arms are flush with the pusher bail.

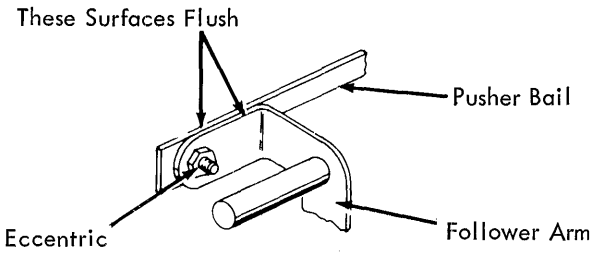


FIGURE 24. Pusher Bail

2. Latch Pushers T2, T1, R2, R1, & R5 (Fig. 25A) - Form to clear their respective latch extensions by .025" to .035".

3. Latch Pusher, R2A (Fig. 25A) - Form to clear latch extension by .040" to .050".

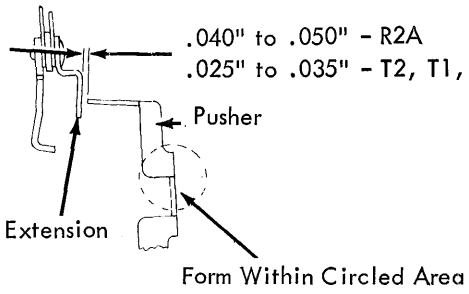


FIGURE 25A. Latch Pushers

Malselection or parity errors may be caused by the latch pushers contacting their latch extensions when an unselected pusher is against its armature. There should be a minimum of .002" clearance (Fig. 25B) between the pusher and the latch extension when the pusher is against its armature. To check this adjustment, turn machine power off, trip the cycle clutch, and hand cycle a few degrees through a cycle. The pusher cam follower should be on the low dwell of the pusher cam.

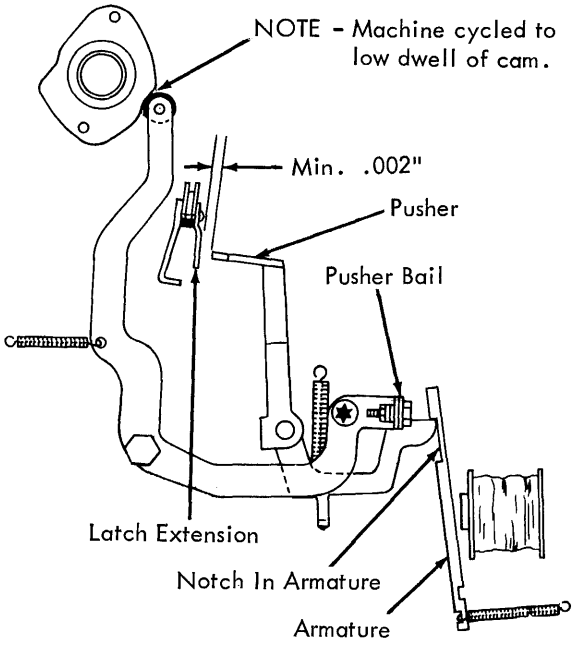


FIGURE 25B. Pusher Clearance

4. Check Latch Pusher (Fig. 26) - Form so that the check latch clears the selection bail by .020" to .030". This clearance must be observed with the selection bail lowered slightly.

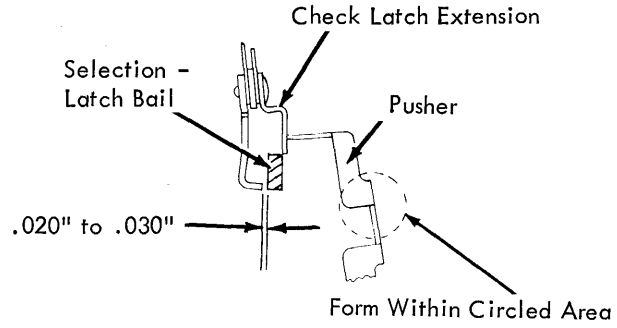


FIGURE 26. Check Latch Pusher

Adjustments 2, 3 and 4 along with the Print Magnet armature to Pusher adjustments insure that the pushers will not contact the latch extensions when the latches are active (pulled down by the bail).

PRINT SELECTION MAGNET ASSEMBLY. (EARLY STYLE)

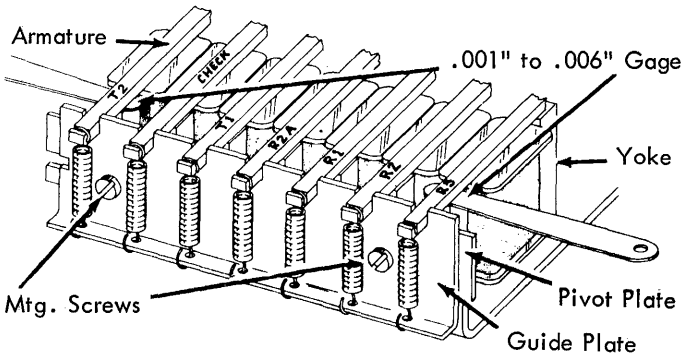
NOTE:

For complete adjustment, the magnet unit should be removed. To prevent interference from the trip bail, turn the high points of the pivot eccentrics to the top.

1. Pivot Plate (Fig. 27) - Adjust for a clearance of .001" to .006" between the yoke and armatures with the armatures manually attracted. Measure clearances at the outside armatures (T2 & R5).

2. Guide Plate (Fig. 27) - Position as follows:

a. Vertically - to provide equal spring tension on all armature springs.
b. Horizontally - so that all armatures are centered in the guide slots.



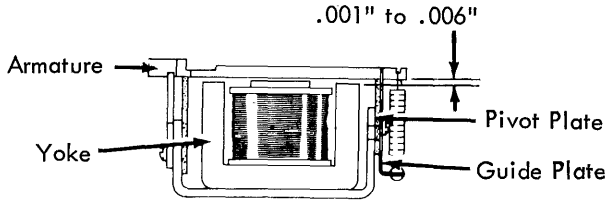


FIGURE 27. Pivot Plate

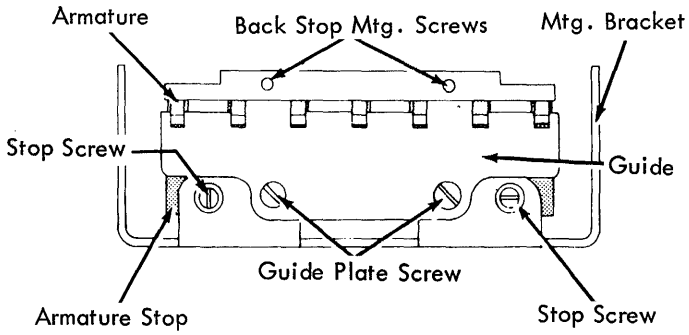


FIGURE 28. Armature Stop

3. Armature Stop - With the armature manually attracted, adjust for a clearance of .004" to .008" between the armatures and yokes (Fig. 29 - see Fig. 28 for assembly end view). Measure clearances at the outside armatures (T2 & R5).

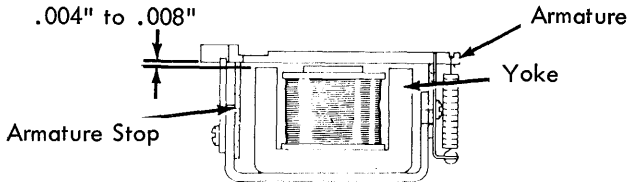


FIGURE 29. Armature Stop

4. Armature Guide - Position horizontally so that the armatures are centered in the guide slots (Ref. Fig. 28).

5. Back Stop (Fig. 30) - Position vertically (with armatures at rest) for a clearance of .041" to .044" between the armature stop and armatures. Measure clearance at the outside armatures (T2 & R5).

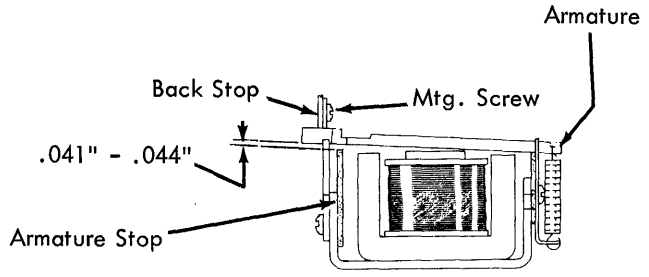


FIGURE 30. Armature Backstop

6. Pivot Eccentrics (Fig. 31) - Adjust so that the cycle clutch trip bail is parallel to the armatures. The following procedure may be used.

a. Disconnect the trip link (Fig. 35).
b. Apply slight pressure to the knock off extension (Fig. 34) or trip link extension to hold the bail in contact with the armatures.
c. Apply slight pressure to the T2 and R5 armatures (Ref. Fig. 27). Both armatures should be touching the trip bail. If not, adjust the pivot eccentrics to satisfy this condition.

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

d. After completing step c, while holding the trip bail against the armatures, check the center armatures to be sure they are touching the trip bail or clear it by a maximum of .002". Excessive clearance can cause extra cycles.

NOTE: Item 6 is a preliminary adjustment. For final adjustment, see note under Item 3 of cycle clutch trip mechanism.

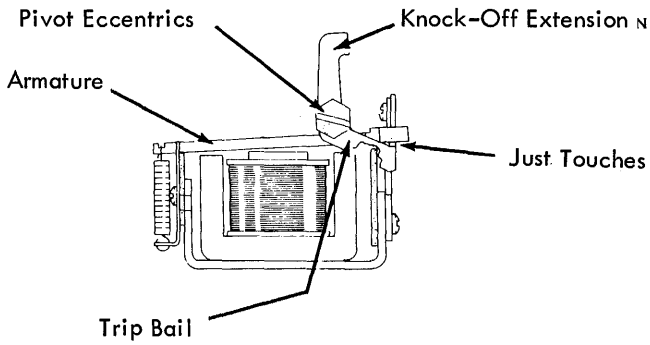


FIGURE 31. Pivot Eccentrics

7. Magnet Unit (Fig. 32) - Position under its two mounting screws for .005" to .010" clearance between the pusher tails and armature latching surfaces (armatures at rest).

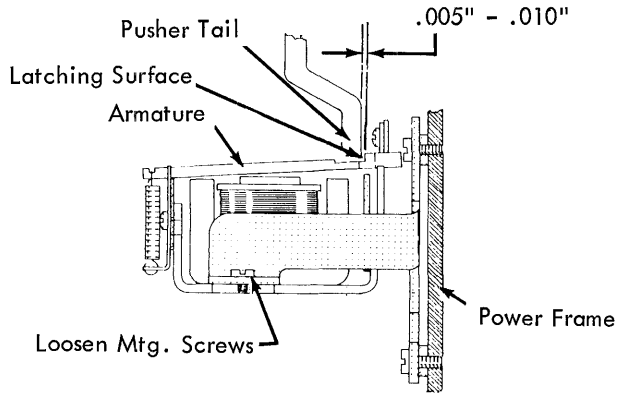


FIGURE 32. Magnet Unit Position

This adjustment insures that the pusher does not contact its latch extension when the pusher is against its armature during a print cycle. If allowed to touch mal-selection will result.

8. Mounting Bracket (Fig. 33) - Position under its four mounting screws for .001" to .010" clearance between the pusher tails and armatures.

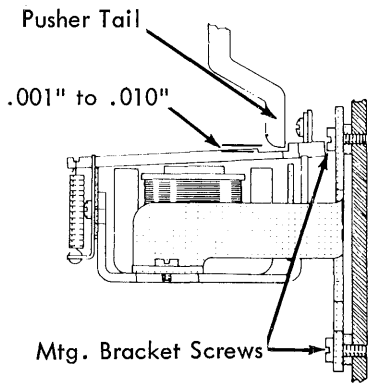


FIGURE 33. Mounting Bracket Position

NOTE:

Adjustments 7 & 8 are interacting - both requirements must be satisfied.

Excessive clearance may cause mal-selection since the armature may not hold the pusher tail when the magnet is not energized.

No clearance (the pusher holding the armature away from rest) can cause mal-selection since the pusher may not be released when the armature is attracted by its magnet. Also extra cycles may result since the armature at rest would be holding the cycle clutch trip bail partially rotated.

9. Knock Off Eccentrics (Fig. 34) - Adjust (T2 and R5 armatures manually attracted) to clear the trip bail extensions by .003" to .008".

Excessive clearance will cause extra cycles due to the armatures not being knocked off. It is necessary to knock off the armatures since residual magnetism is present.

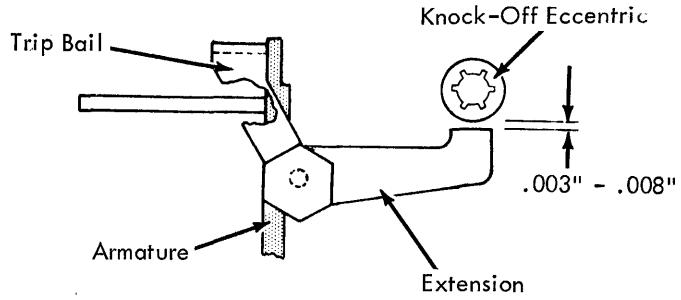


FIGURE 34. Knock Off Eccentrics

No clearance will cause failure to cycle because the trip bail will not be able to rotate to trip the cycle clutch.

PRINT SELECTION MAGNET ASSEMBLY (Late Style)

NOTE: The late style magnet assembly may be identified by the absence of pivot eccentrics, and the single knock-off extension (Fig. 34.1).

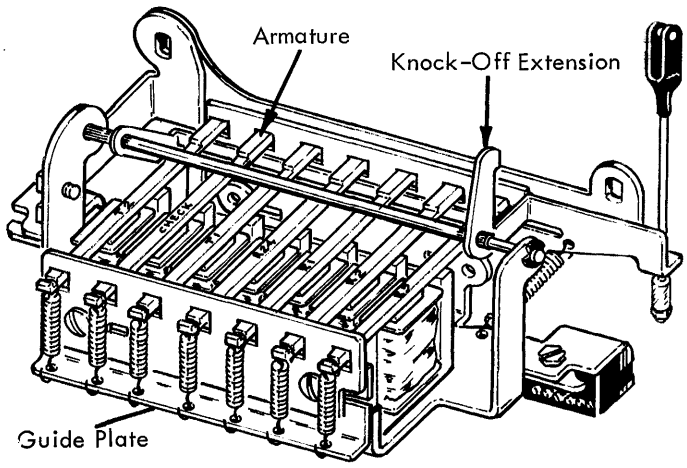


FIGURE 34.1 Magnet Assembly

1. Guide Plate (Fig. 34.1) - The position of the guide plate is predetermined by holes which fit over stamped projections on the pivot plate.

2. Pivot Plate (Late Style) Fig. 34.2 - Adjust for a clearance of .002" to .005" between the yoke and armatures with the armatures manually attracted. Measure clearance of the outside armatures (T2 & R5).

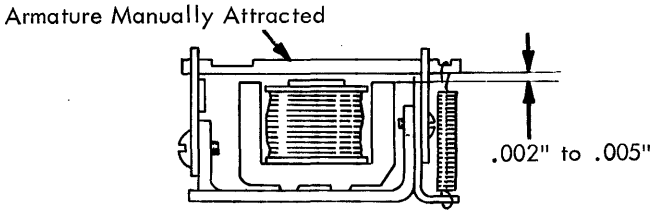


FIGURE 34.2 Pivot Plate

3. Armature Stop (Late Style - With the armature manually attracted, adjust armature stop for a clearance of .003" to .007" between the armature and yoke (Fig. 34.3).

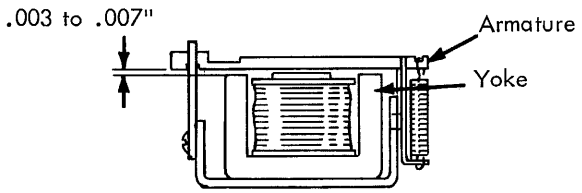


FIGURE 34.3 Armature Stop

4. Knock-Off Eccentric (Late Style) - The redesigned trip bail contains only one extension. It is adjusted to .003" to .008" as shown on Fig. 34.

5. Trip Bail (Late Style) - Adjust so that the cycle clutch trip bail is parallel to the armatures. The following procedure may be used:

   a. Disconnect the trip link.

   b. Loosen screw (Fig. 34.4).

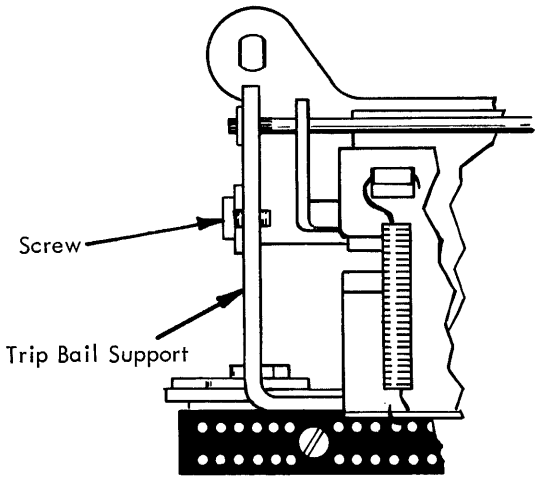


FIGURE 34.4 Trip Bail

   c. Apply slight pressure to the knock-off extension (Fig. 34.1).

   d. Apply slight pressure to the T-2 and R-5 armatures (Fig. 34.1). Both armatures should be touching the trip bail. If not, form the left trip bail support to obtain this condition.

   e. Tighten screw in Fig. 34.4.

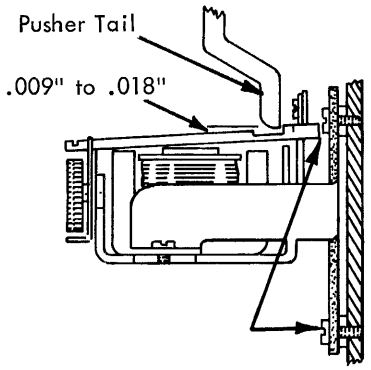


FIGURE 34.5 Mounting Bracket

6. Magnet Unit (Fig. 32) - Position under its two mounting screws for .005" to .010" clearance between the pusher tails and the armature latching surfaces (armatures at rest).

7. Mounting Bracket (Fig. 34.5) - Position under its four mounting screws .009" to .018" clearance between the pusher tails and armatures.

8. Trip Link (Late Style) - The clevis is now attached to the link and the adjustment is made with a self-locking nut. The adjustment is the same as in Fig. 37.

CYCLE CLUTCH TRIP MECHANISM, LATE

1. Latch Stop (Unit Removed) (Fig. 35) - Position so that the latch lever overlaps the trip lever lug by .040" to .045".

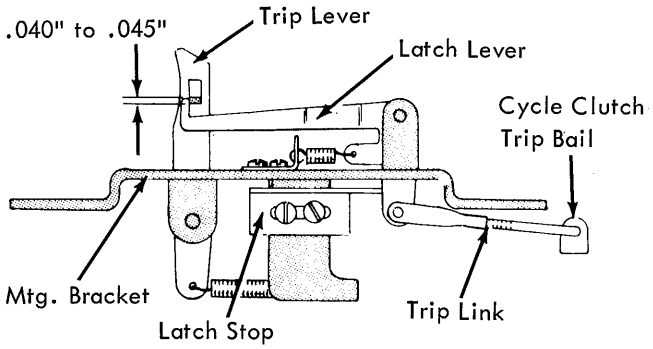


FIGURE 35. Latch Lever

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.

2. Mounting Bracket (Unit Installed) (Fig. 35) - Position front to rear so that the trip lever clears the cycle clutch latch by .003" to .010" (Fig. 36).

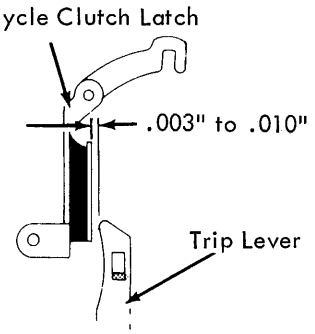


FIGURE 36. Mounting Bracket Position

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.

3. Trip Link Clevis (Fig. 35) - With either the T2 or R5 armature manually attracted, adjust the clevis so that the latch lever overthrows the trip lever lug by .005" to .020" (Fig. 37).

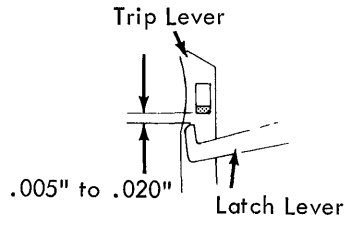


FIGURE 37. Trip Link Adjustment

NOTE:
If necessary, refine the pivot eccentric adjustment to obtain equal latch lever overthrow from the T2 and R5 armatures (Ref. Fig. 31).

CYCLE CLUTCH TRIP MECHANISM, EARLY

1. Trip Link (Fig. 38) - Hold a print magnet armature attracted and adjust the cycle clutch trip link clevis to move the cycle clutch latch .002" to .007" away from the clutch sleeve.

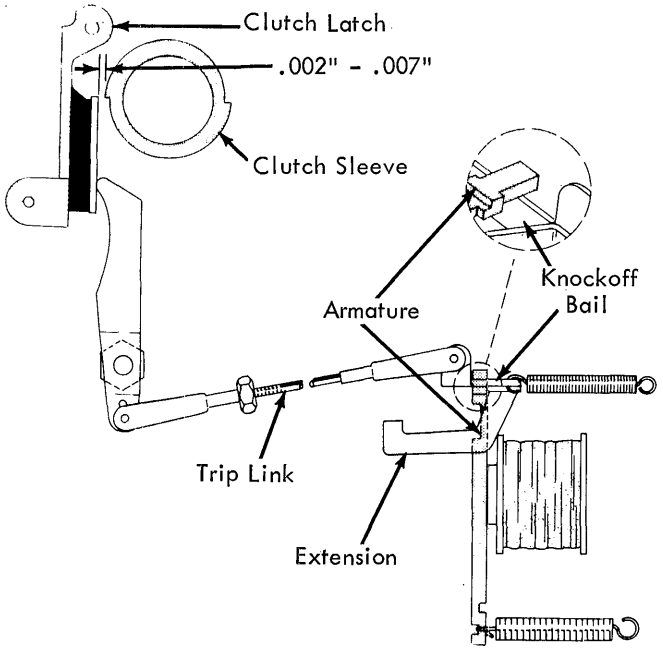


FIGURE 38. Early-Style Cycle-Clutch Trip-Link Adjustment

INHIBITOR

1. Adjust the inhibitor trip lever (Fig. 39) so that the bottom edge of the inhibitor pawl is flush with the bottom edge of the cycle clutch latch (Fig. 39) with all parts at rest.

This adjustment provides an adequate "bite" between the cycle clutch latch and inhibitor pawl to prevent extra cycles.

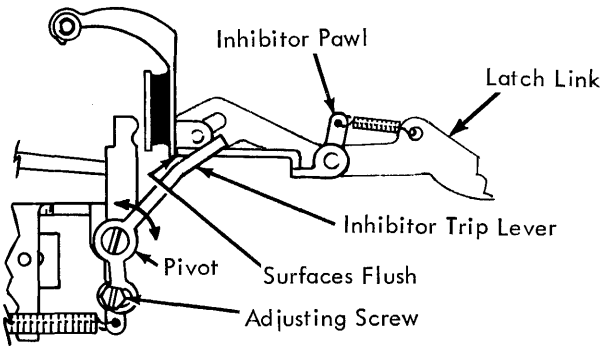


FIGURE 39. Inhibitor

PRINT SELECTION CONTACT ASSEMBLY

1. Contact Stacks (Fig. 40) - Align so that the strap edges are parallel. Loosen mounting screws and shift contact blocks for adjustment.

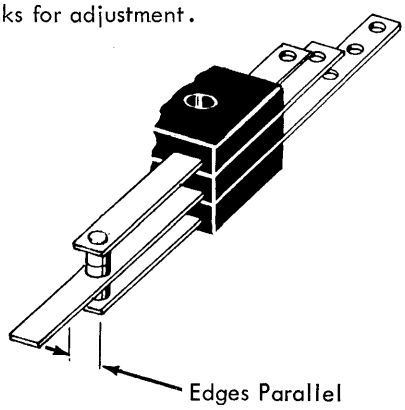


FIGURE 40. Contact Stacks

NOTE:
The contact assembly should be removed for complete adjustment.

2. Actuator Guides (Fig. 41) - Mount 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 inter-related adjustment.

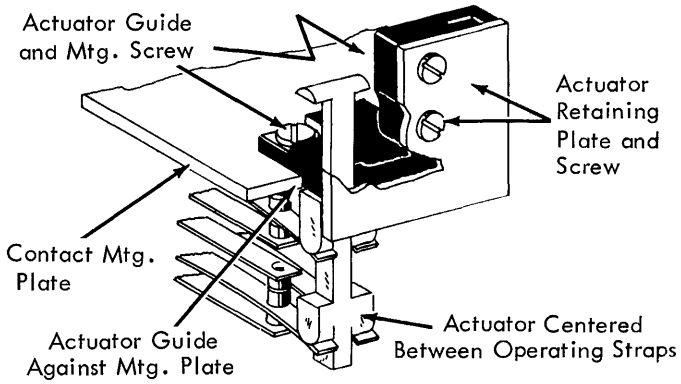


FIGURE 41. Actuator Guides

3. Contact Straps (Fig. 42) - Form (actuators at rest) as required to satisfy the following conditions.

a. The O/P should just touch the actuator camming surface.
b. The O/P should produce a slight rise of the N/C straps.
c. The N/O to O/P clearance should be .020" to .030". The low end of the tolerance is preferable.

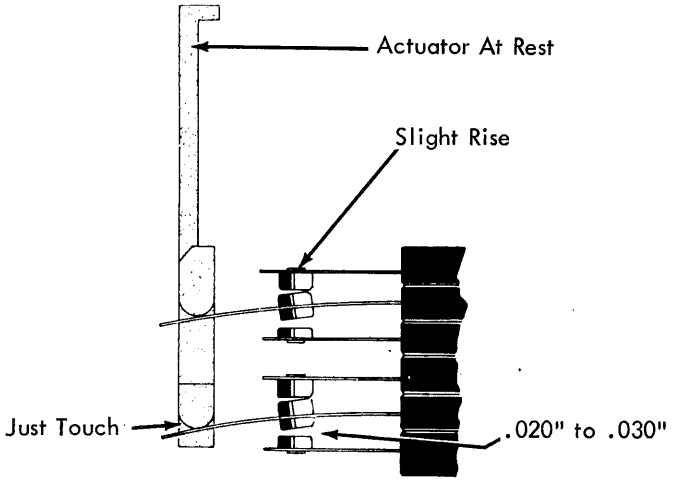


FIGURE 42. Contact Straps

4. Contact Assembly Mounting Plate - Position for the following conditions.

a. To the rear so that the actuator retaining plates contact the differential plate.

b. Left to right so that the step in the actuator guide plate clears the L.H. side of the R-5 bail.

PRINT FEEDBACK CONTACT ASSEMBLY, C1 and C2

On present production machines, C2 is nearest the power frame with C1 on the outside. Some low serial number Printers have this arrangement reversed. The longer (C2) and shorter (C1) duration can easily be distinguished by inspection since the cam land is widest on the longest duration (C2) cam.

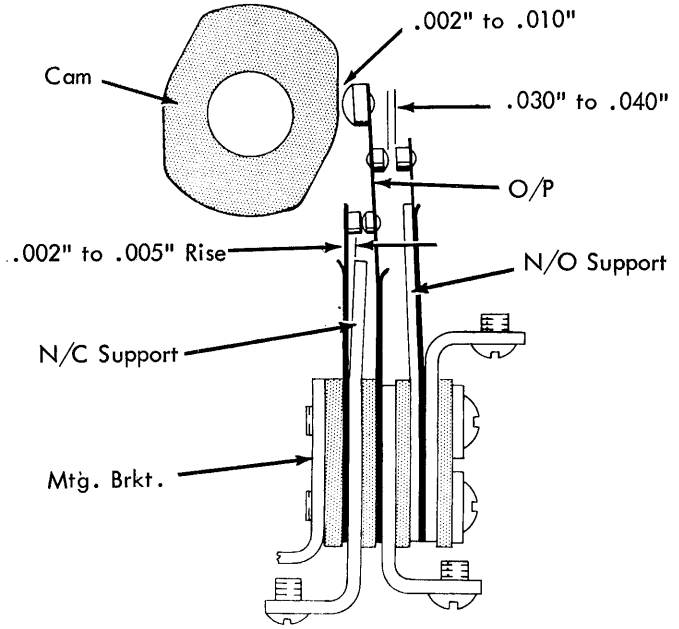


FIGURE 43. Print Feedback Contacts

1. Form the N/C supports so that the O/P's lift the N/C contacts .002" to .005" from the N/C supports (Fig.43).

2. Preliminary adjustment of N/O support straps is for .030" to .040" air gap between O/P and N/O contact. Adjust for correct timing after Adjustment 3.

3. Position the contact mounting bracket so that the O/P's clear the cam (at the low point) .002" to .010" (Fig. 43).

NOTE:
Print feedback contacts #1 and #2 are mounted on different tabs to permit equalization of the O/P to cam clearance (Fig. 44).

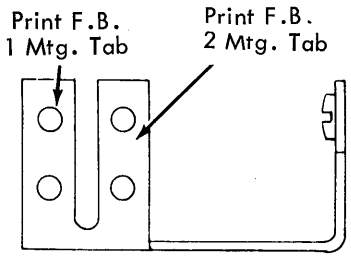


FIGURE 44. Print Feedback Bracket

TIMING CHART

	C-1 N/O		C-2 N/C	
MACHINE	MAKE	BREAK	BREAK	MAKE
731 ET //	85° ±3	130° ±3	20° ±3	120° ±3
735 ET 15	85° ±3	130° ±3	20° ±3	120° ±3
775 MT/ST	85° ±3	130° ±3	20° ±3	120° ±3

FIGURE 45. Timing Chart

CAM CHART

Contact	N/O Duration	Color
C-1	45°	Blue
C-1	65°	Black
C-2	90°	White
C-2	110°	Orange

FIGURE 46. Cam Chart

KEYLEVER CONTACTS

NOTE:
The contact assembly should be removed from the contact and stop screw mounting bracket for adjustments 1 & 2.

1. Stop Screw (Fig. 47)

   a. Position the mounting bracket (left or right) so that the stop screws are directly under the keylever.
   b. Adjust the keylever stop screws so that the keylevers do not go further down than the tab keylever.

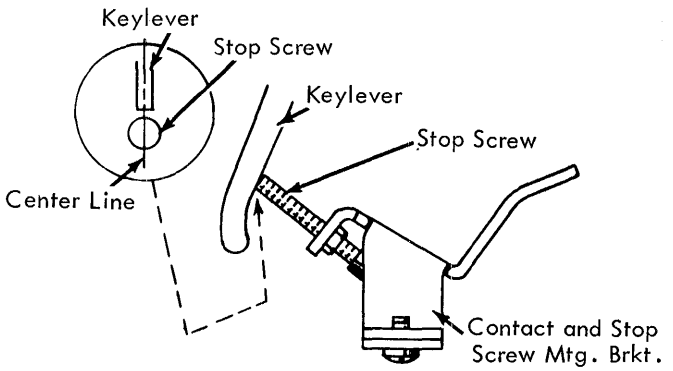


FIGURE 47. Stop Screw

2. Contact Position (Fig. 48)

   a. Position the contacting actuating springs relative to the O/P's for vertical alignment.
   b. Form the N/C contact so that the O/P (at rest) lifts the N/C contact adequately. In this condition, check for sufficient O/P to N/O contact air gap. The N/C contact must break before the N/O contact makes.

NOTE:
Contact assembly must be installed for adjustments.

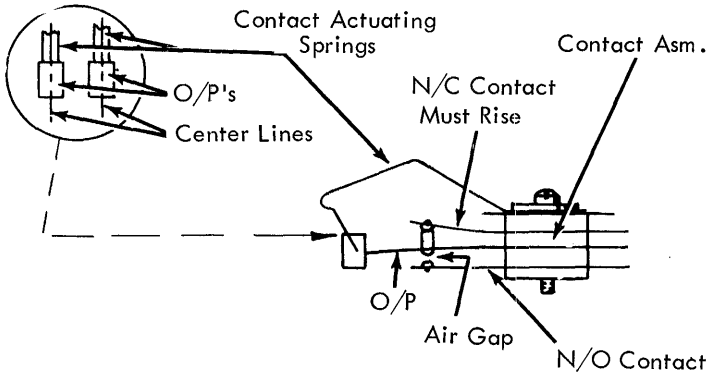


FIGURE 48. Contact Position & Air Gap

3. Contact Assembly Position, unit installed (Fig. 49)

   a. Position the contact assembly (left or right) on the mounting bracket so that the keylevers are centered on their contact actuating springs.
   b. With the keylevers held against their stop screws, position the mounting bracket (front to rear) for adequate rise of the N/O contacts.

   Check the following conditions:
   1. The N/C contact must open.
   2. Overthrow after the N/O contact makes must not be great enough to damage the contact straps.

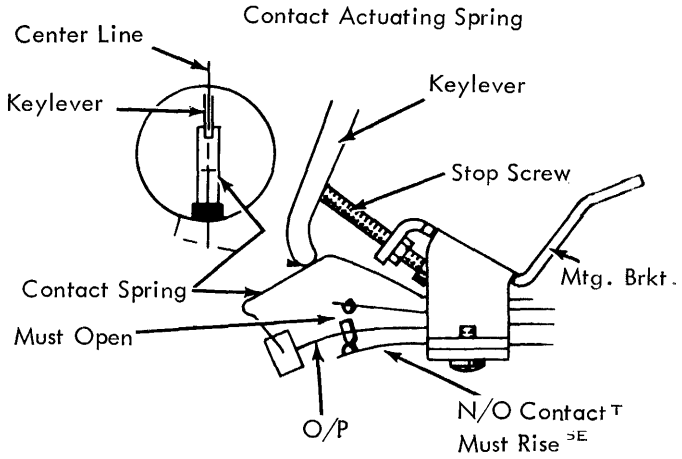


FIGURE 49. Keylever Contact Adjustment

4. Index Keylever Contacts - Position the contact bracket so that the O/P just touches the index keylever.

KEYBOARD LOCK MECHANISM

1. Switch Link - With the On/Off Switch in the off position adjust the switch link so that the On/Off keybutton matches the slope of the keyboard (Fig. 50).

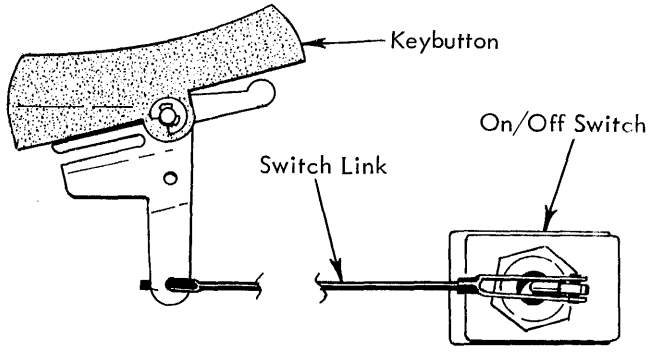


FIGURE 50. On/Off Switch

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

2. Lockout Bail Link - Position the clevis approximately half way on the threads of the link (Fig. 51).

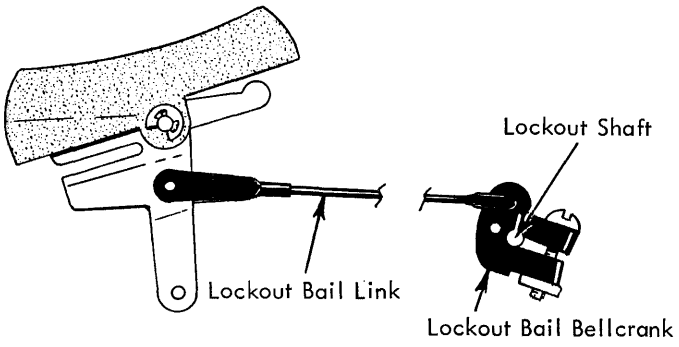


FIGURE 51. Lockout Link

3. Lockout Bail Bellcrank - With the On/Off switch in the off position rotate the lockout bail relative to the lockout bail bellcrank (Ref. Fig. 51) so that the cycle clutch pawl stop overlaps the cycle clutch pawl by 1/3 to 1/2 (Fig. 52).

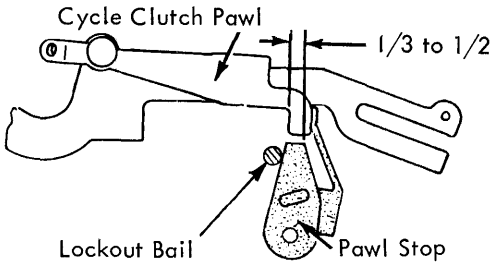


FIGURE 52. Cycle Clutch Pawl Stop

Excessive overlap between the pawl stop and cycle clutch pawl can cause keyboard lockup to occur since the pawl stop must move to the rear and the cycle clutch pawl to the front to unlock the keyboard.

4. Keyboard Lock Bellcrank Link - Adjust the link so that the bellcrank is fully bottomed in the selector compensator without choking off the action of the lockout bail (Fig. 53).

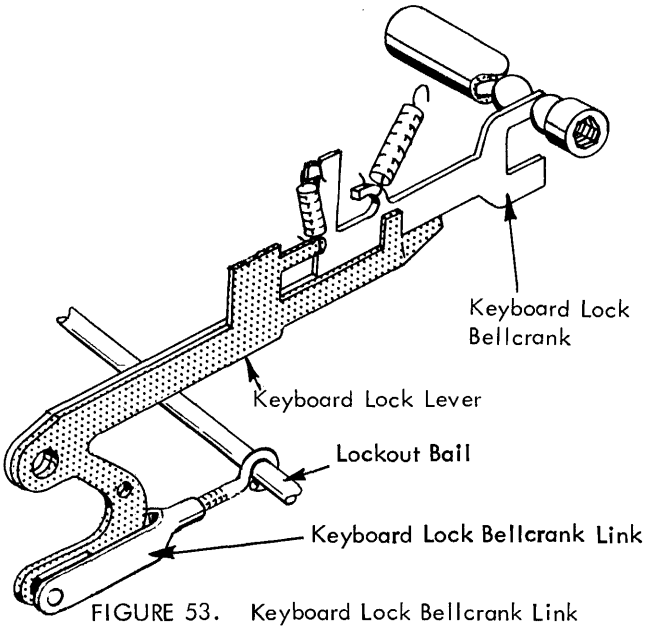


FIGURE 53. Keyboard Lock Bellcrank Link

5. Operational Lockout Shaft Link - With the switch in the on position adjust the operational lockout shaft link so that the flat portion of the lockout shaft is toward the top of the machine and parallel to the bottom power frame (Fig. 54).

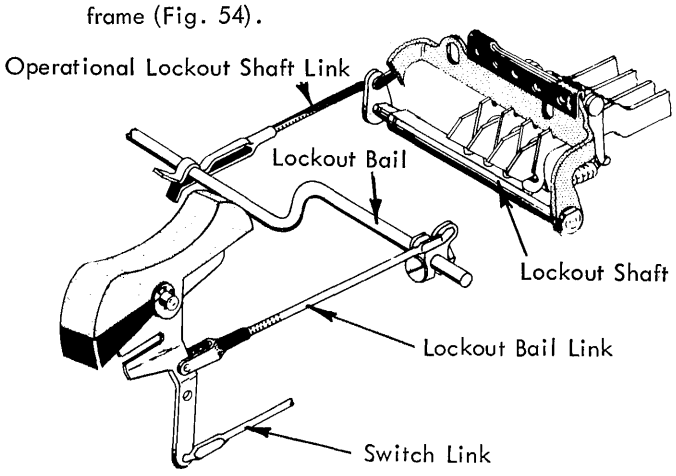


FIGURE 54. Operational Lockout Shaft Link

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

A mal-adjusted link may cause the lockout shaft to rotate further than normal. When this happens the operational interposers may be locked or slow releasing since the interposers will rub on the lockout shaft when released.

KEYBOARD LOCK MECHANISM (SOLENOID OPERATED)

1. Solenoid (Fig. 55) - Adjust as follows:

   a. Screw plunger spring on plunger to cover all threads.
   b. With the plunger engaged, screw adjustable core "in" until the plunger shoulder begins to lift off the plunger guide, then back off 1/2 turn (Fig. 55).

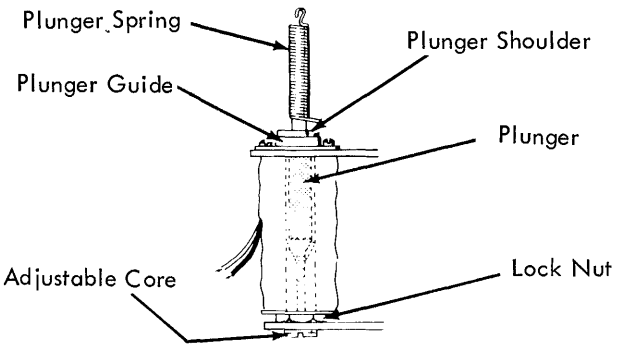


FIGURE 55. Solenoid

   c. Position the solenoid directly beneath the lockout lever (Fig. 56).

      This adjustment insures the plunger will bottom against the plunger guide and not against the adjustable core.

2. Eccentric Stop (Fig. 56) - Adjust (lockout lever resting against the eccentric stop) so that the plunger shoulder clears the plunger guide by .078" to .110".

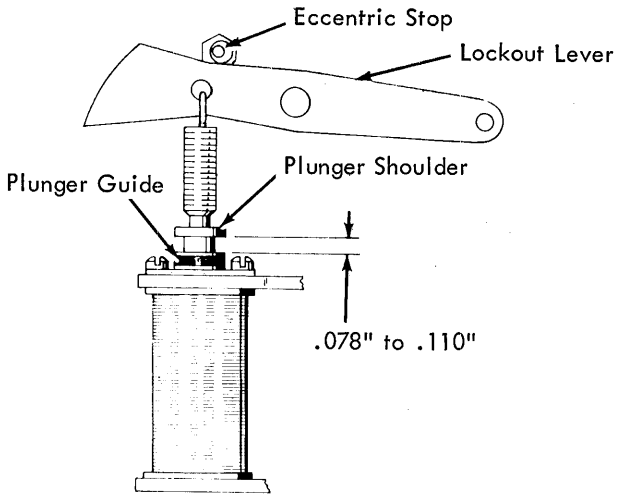


FIGURE 56. Eccentric Stop

NOTE:
The adjustment of the plunger spring to the plunger may require refinement so that adjustment #2 falls within the range of the eccentric.

This adjustment insures adequate motion to lock or unlock the keyboard depending upon the lockout lever which may be installed as shown in Figure 56 or inverted.

3. Keyboard Lock Link Clevis - With the keyboard unlocked, adjust the keyboard lock link clevis so that the operational keylevers clear the lockout adjusting comb by .005" to .015" (Fig. 57). This insures that the lockout mechanism will not interfere with the operational keylevers and also will not require excessive motion to lock the functions.

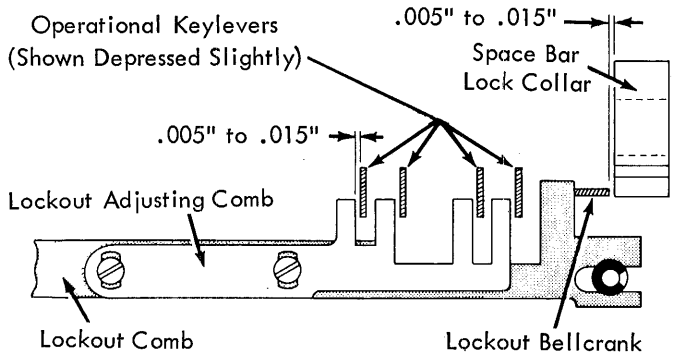


FIGURE 57. Adjusting Comb, Keyboard Unlocked

NOTE:
Adjustments 3, 4, and 5 are for the early style lockout adjusting comb. Only adjustment 3 applies for the late style lockout comb (Fig. 58.1).

4. Position the spacebar lock collar:

a. Left or right to clear the lockout bellcrank by .005" to .015" with the keyboard unlocked (Fig. 57).

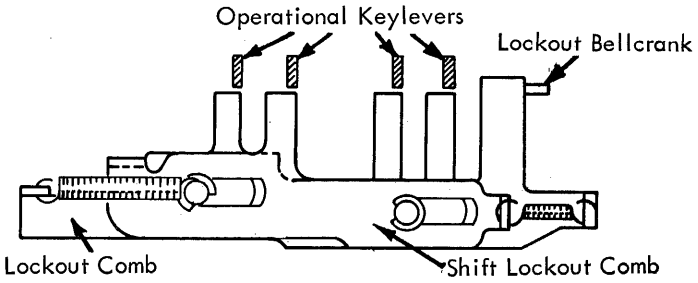


FIGURE 58.1 Adjusting Comb - Late Style

b. Radially, so that the leading edge on the step of the collar clears the lockout bellcrank by .005" to .015" with the keyboard locked (Fig. 58).

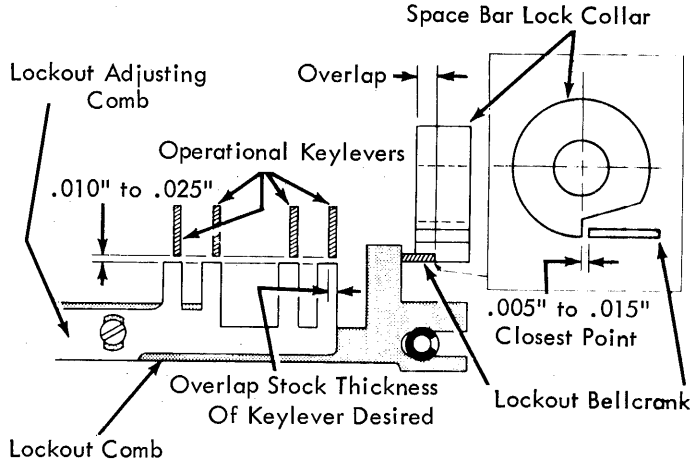


FIGURE 58. Adjusting Comb, Keyboard Locked

5. Lockout Adjusting Comb - Position (up or down) the lockout adjusting comb to clear the bottom of the operational keylevers by .010" to .025" with the keyboard locked (Fig. 58).

This adjustment insures that the lockout adjusting comb will not bind off on the operational keylevers when the keyboard lock is operated.

6. Shift Lock Link - Adjust the clevis to reliably unlatch the shift lock (Fig. 59).

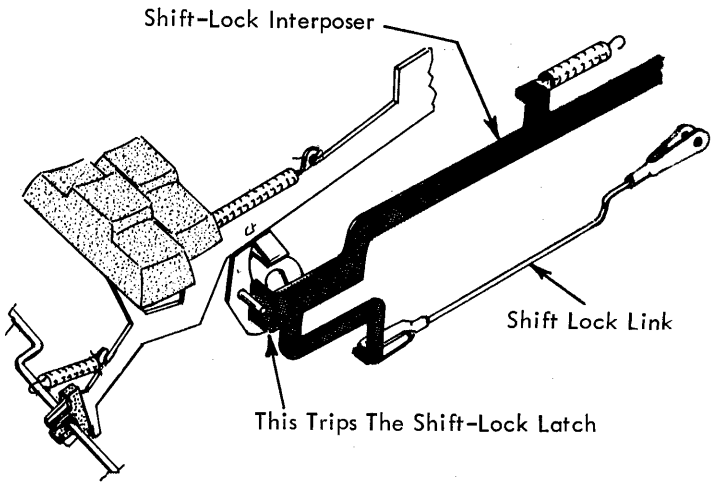


FIGURE 59. Shift-Lock Link

NOTE:

Check to insure that the shift lock can be latched with the keyboard lock de-activated.

7. Keyboard Interposer Lock Assembly

a. Adjust the keyboard interposer lock assembly by loosening the four mounting screws and moving the assembly up or down for .003" to .015" clearance between the bottom of the interposer and the keyboard interposer lock assembly when the keyboard interlock assembly is activated (Fig. 60).

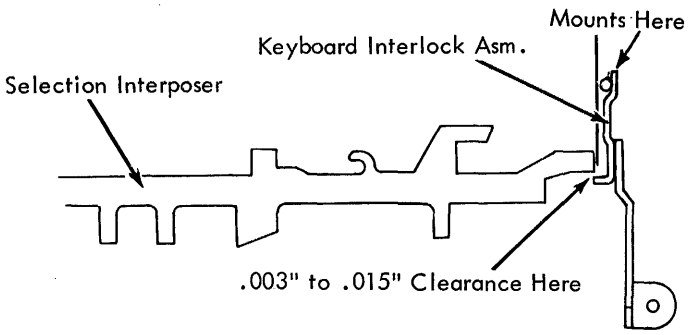


FIGURE 60. Keyboard Interposer Lock Assembly

This adjustment insures that the interposer lock does not bind off on the selection interposers when the keyboard lock solenoid is operated. It also prevents the selection interposer from moving down far enough to trip the cycle clutch.

b. Adjust the keyboard interposer lock link so there is .010" to .020" clearance between the interposer and the interposer lock assembly with everything in the unlocked position (Fig. 61).

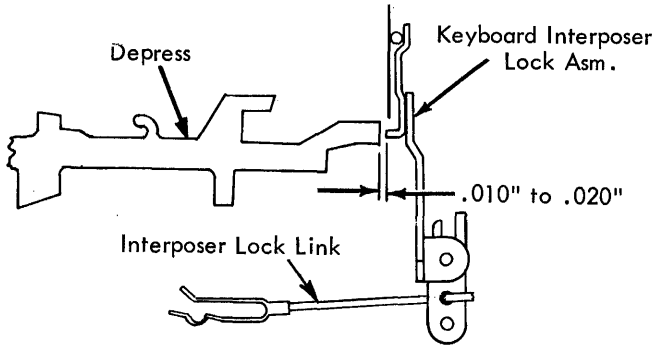


FIGURE 61. Keyboard Interposer Lock Link

This insures that the interposers will not bind on the interposer lock when operating the printer from the keyboard.

8. Cycle Clutch Pawl Stop - Adjust the pawl stop mounting bracket so that the cycle clutch pawl stop clears the cycle clutch pawl by .010" to .020" with keyboard locked. Best results are obtained on the high side of the adjustment (Fig. 62).

9. Pawl Stop Link - Adjust the pawl stop link so that there is 1/3 to 1/2 overlap of the cycle clutch pawl stop to the cycle clutch pawl with the keyboard lock mechanism in the lock position (Fig. 62).

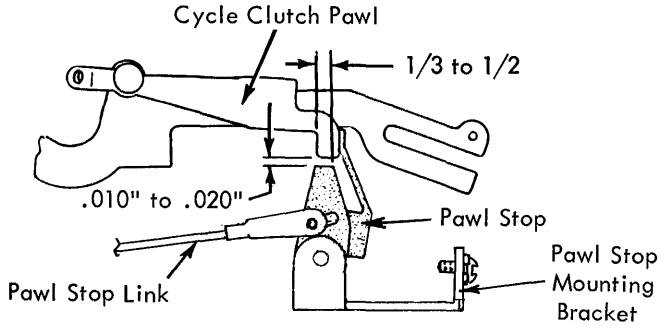


FIGURE 62. Cycle Clutch Pawl Stop

10. Keyboard Mode Contacts - Form the N/C support so that the O/P lifts the N/C contact by .002" to .005" (Fig. 63).

11. Form the N/O support so that the N/O contact clears the O/P by .040" (Fig. 63).

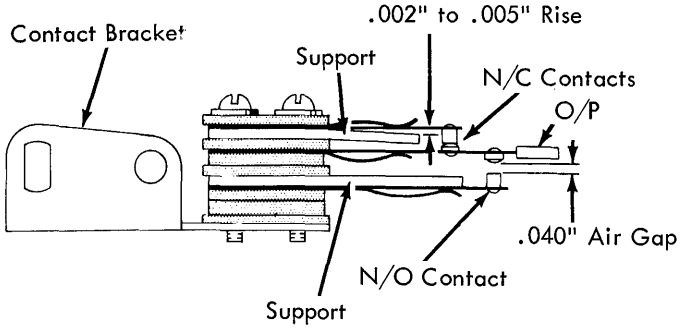


FIGURE 63. Mode Contact

12. Position the contact bracket for a clearance of .003" to .007" between the operating strap and actuating lever (Fig. 64).

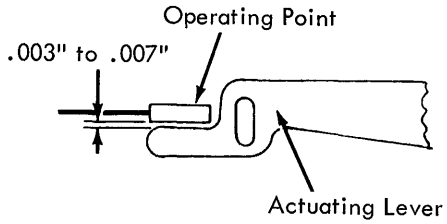


FIGURE 64. Mode Contact Actuating Lever

SHIFT MECHANISM

1. Shift Cam Back-Up Roller - Adjust the back-up roller eccentric left or right so that .001" to .004" of the cam bearing extends beyond the cam (Fig. 65). The eccentric should be kept in the bottom half of its orbit.

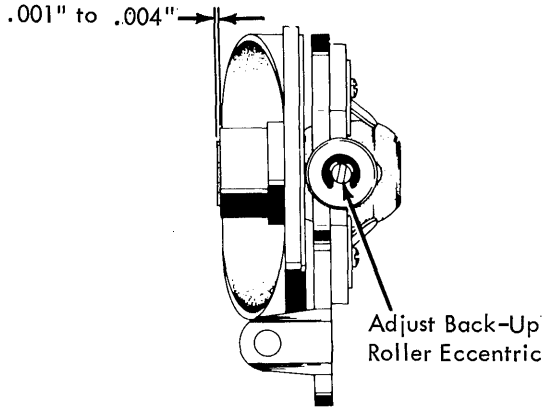


FIGURE 65. Shift Cam Back-Up Roller Adjustment

If the bearing did not extend beyond the cam, the shift clutch arbor could rub against the cam and create a noise as well as a drag on the cam when the cam was stationary.

Two problems could be created by having too much of the bearing extending beyond the cam. A gap would exist between the cam and the shift clutch arbor. This could allow a coil of the shift clutch spring to wedge into the gap and lock the machine. If the back-up roller were excessively far to the left, the cam would be forced to the left at the rear causing it to cock and bind at the pivot.

The set screw for the back-up roller eccentric is accessible through a hole in the cam with the cam in the lower case position. The shift clutch mechanism including the arbor should be removed in order to best observe the adjustment. Be sure that .002" to .004" end play exists in the operational shaft when the arbor is replaced.

CAUTION: Any change in the position of the back-up roller directly affects the typehead homing and the shift arm motion adjustments. Be sure to recheck these adjustments.

2. Shift Clutch Spring Retaining Plate - Adjust the retaining plate attached to the shift cam (Fig. 66) to satisfy the following condition. With the machine turned OFF and the shift cam detented, the shift clutch ratchet should

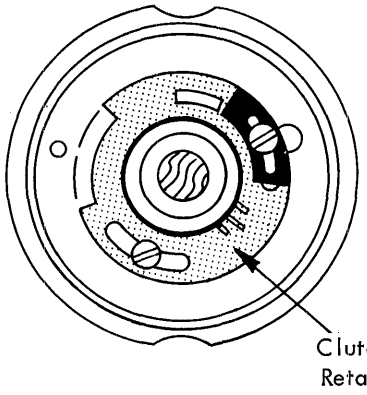


FIGURE 66. Shift Clutch Spring Retaining Plate

rotate .028" - .059" when the shift release arm releases the ratchet. The rotation can be observed relative to the shift interlock (Fig. 67). Half the distance from the center of one ratchet tooth to the next is 3/64" or .047".

The adjustment of the retaining plate determines how much the clutch spring will be expanded when the shift mechanism is at rest. Expanding the spring too much may cause failure of the cam to reach the detented position, because the spring would be expanded too soon. Insufficient expansion would allow the clutch spring to drag when at rest creating a load on the motor and on the shift release mechanism.

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.

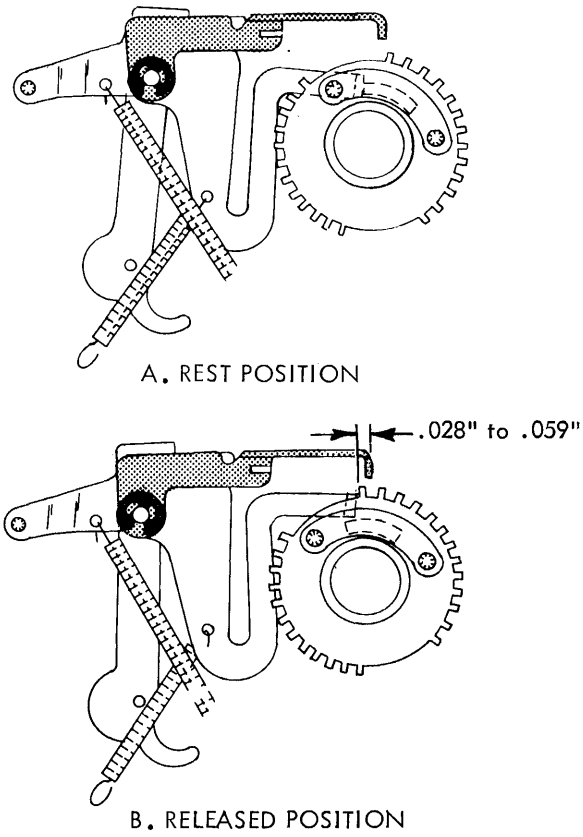


FIGURE 67. Shift Clutch Spring Retaining Plate Adjustment

2.1 Shift Clutch Ratchet Adjustment (Late) (Fig. 67.1) - Adjust the shift clutch ratchet to satisfy the following condition. With the machine turned off and the shift cam detented, the shift clutch ratchet will rotate .028" to .050"when the shift release arm releases the ratchet. The rotation can be observed relative to the shift release arm and the shift cam stop. Be sure to loosen the set screw in the ratchet before adjusting. Note: Remove play from the shift ratchet in a clockwise direction before checking this adjustment.

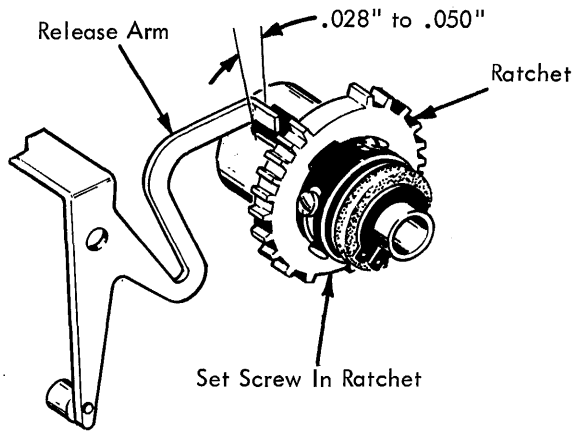


FIGURE 67.1 Shift Clutch Ratchet Adjustment

The adjustment of the shift clutch ratchet determines how much the clutch spring will be expanded when the shift mechanism is at rest. Expanding the spring too much may cause failure of the cam to reach the detented position, because the spring would be expanded too soon. Insufficient expansion would allow the clutch spring to drag when at-rest creating a load on the motor and on the shift release mechanism.

3. Shift Cam Stop - Adjust the stop so that the shift clutch ratchet has .010" to .030" rotary motion between the shift cam stop and the shift release arm with the mechanism at rest (Fig. 68).

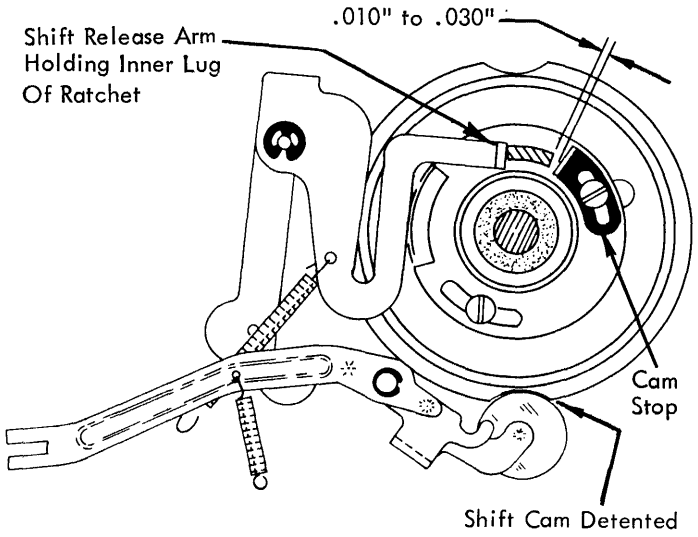


FIGURE 68. Shift Cam Stop Adjustment

The adjustment insures that the shift cam will not be allowed to travel past the detented position.

NOTE: The stop should not bind against the spring clutch when the adjustment is made.

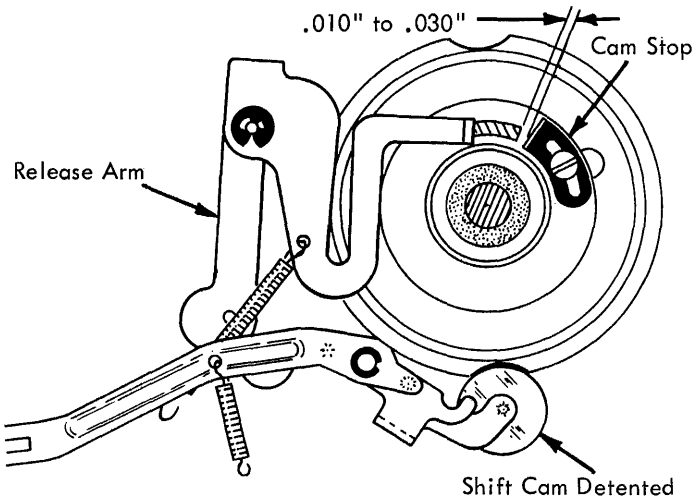


FIGURE 68.1 Shift Cam Stop Adjustment (Late)

CAUTION: Be sure the cam is detented at the time the stop adjustment is checked.

4. Shift Cam Brake (Fig. 69) - The shift cam brake shall be so adjusted, that the shift cam will stop in the center of the detent position ± .015", when the detent roller is held away from the cam during the shift from upper case to lower case.

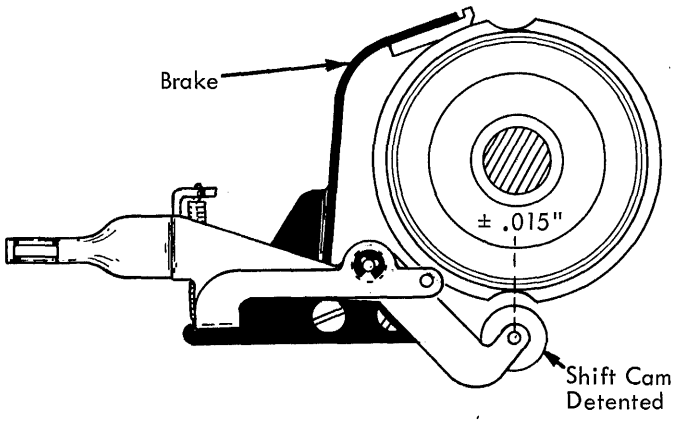


FIGURE 69. Shift Cam Brake Adjustment

Excessive braking action could prevent the cam from reaching the detented position in the lower case. Insufficient braking action would result in a noisy shift operation and expose the mechanism to possible parts breakage.

5. Shift Release - Adjust the shift release link (Fig. 70). With the shift keylever bottomed, the shift release arm shall clear the shift clutch ratchet stop by .010" to .030". A balance between the two releasing points insures the proper adjustment.

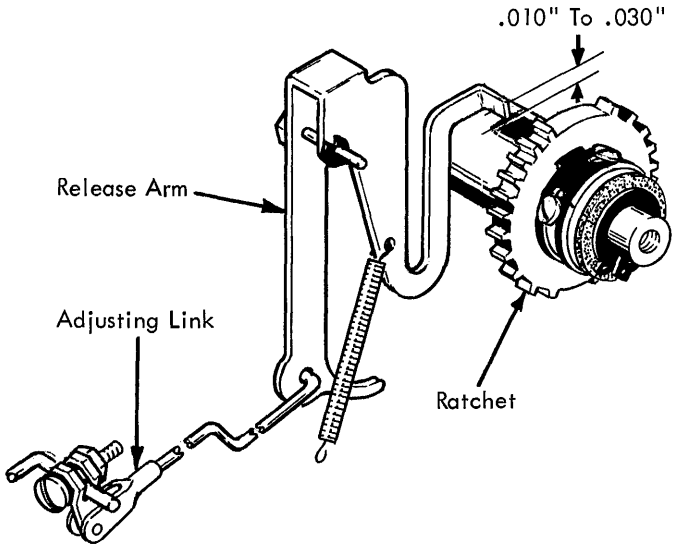


Figure 70. Shift Release Mechanism

NOTE: The shift bellcrank (Fig. 70) attached to the right end of the bail should be set prior to making the link adjustment. For proper leverage the bellcrank should operate with same over-center travel in both directions.

6. Shift Lock - Adjust the shift lock bracket up or down so that 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 depressing either shift keybutton.

7. Shift Interlock

   a. 15 Inch Machine - 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 (Fig. 71a).

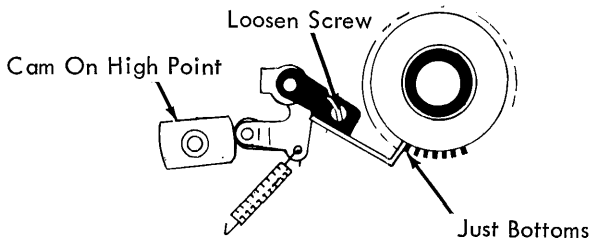


FIGURE 71A. Shift Interlock

   b. 11 Inch Machine - With the shift interlock on the high point of the cam, form the interlock so that the tip just bottoms between two teeth on the ratchet (Fig. 71b).

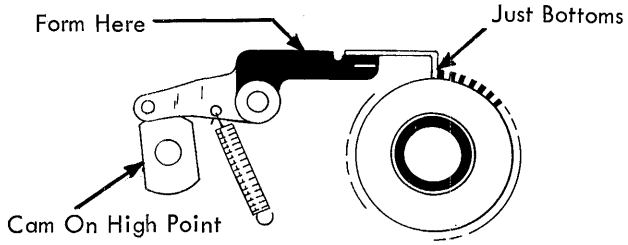


FIGURE 71B. Shift Interlock

8. Shift Interlock Cam - 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 .030" to .060" exist between the tip of the interlock and the top of a tooth on the shift clutch ratchet (Fig. 72).

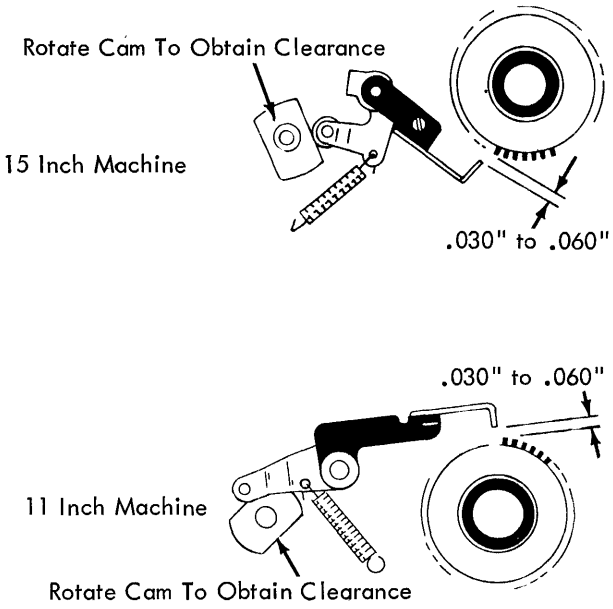
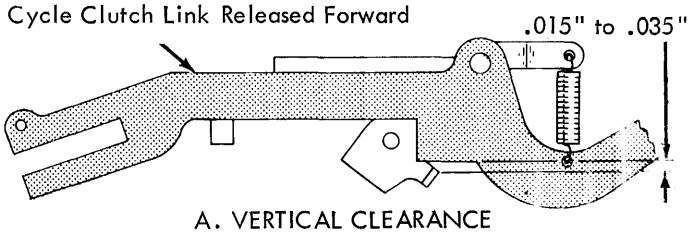


FIGURE 72. Shift Interlock Cam

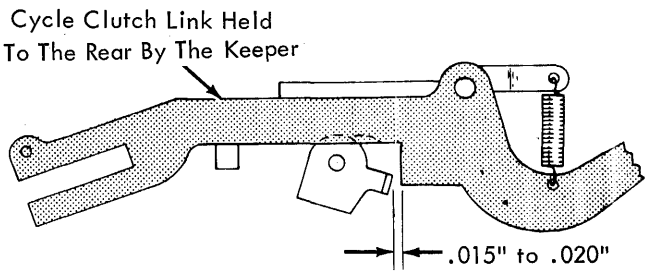
9. Character Interrupter - The character interrupter bail plate is adjusted in its elongated slot to satisfy 2 conditions.

   a. With the shift cam detented in lower case and the cycle clutch latch link released forward, the character interrupter pawl should clear the bottom of the link by .015" to .035" (Fig. 73A).

   b. With the shift cam undetented and the cycle clutch latched to the rear, the character interrupter pawl should clear the front of the cycle clutch latch link by .015" to .020". For the 767 printer adjust for .005" to .010" (Fig. 73B).



A. VERTICAL CLEARANCE



B. HORIZONTAL CLEARANCE

FIGURE 73. Character Interrupter Adjustments

SHIFT MAGNET ASSEMBLY

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

1. Hinge Plates (Fig. 74) - Position the hinge plates with the armatures manually attracted to obtain .001" to .003" clearance between the armatures and hinge plates.

   This clearance insures free operation of the armature. With no clearance and oil on the two surfaces the armature would have a sluggish operation. Excessive clearance may cause slow operation due to the relationship between the magnetic field and armature.

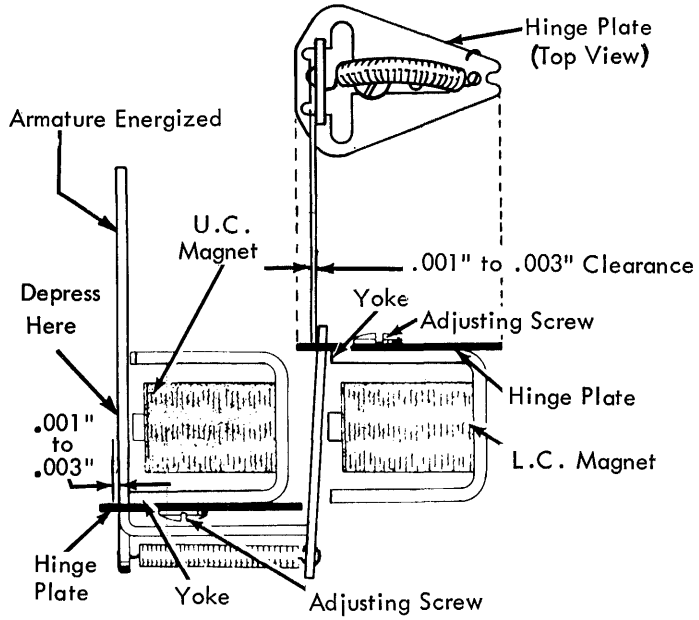


FIGURE 74. Hinge Plates

2. Armature Stops (Fig. 75) - Position (magnets energized) so that the armatures clear their yokes by .003" to .007".

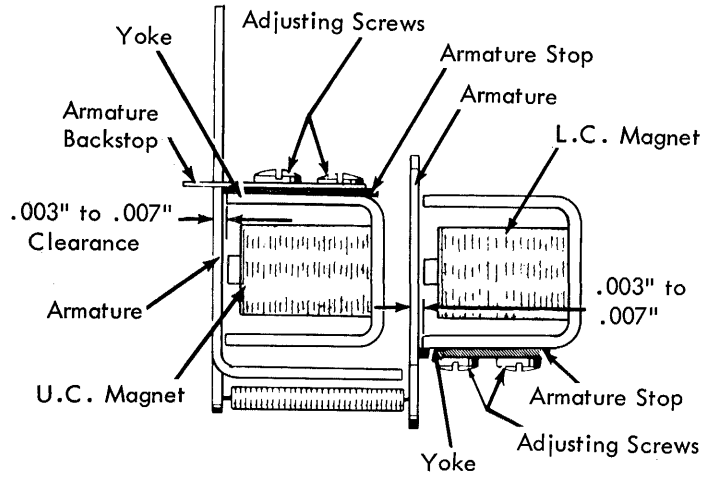


FIGURE 75. Armature Stops

The adjustment insures that the armature will not touch magnet core. If an armature does touch a core it may be held by residual magnetism.

3. Armature Backstop, 11 Inch Machine (Early) (Fig. 76) - Adjust the armature backstop (UC magnet - armature at rest) so that the armature clears the core by .028".

   Insufficient clearance may reduce the armature motion enough to cause shift failure. Excessive clearance may cause shift failure since the magnetic field may not be able to pull in the armature.

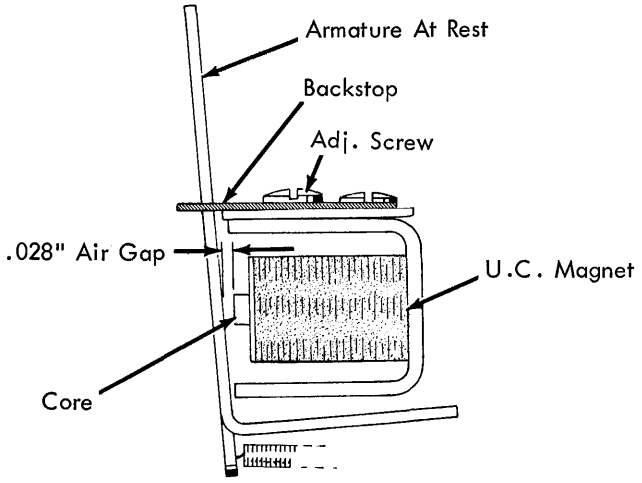


FIGURE 76. Armature Backstop, 11 Inch Machine

4. UC Magnet Assembly - Position so that its mounting screws are centered in the elongated holes with the hinge plates (Fig. 74) parallel with the assembly mounting plate.

5. LC Magnet Assembly - Position as follows:

   a. Front to Rear - LC armature (energized) clears the UC armature (at rest) by .010" (Fig. 77).

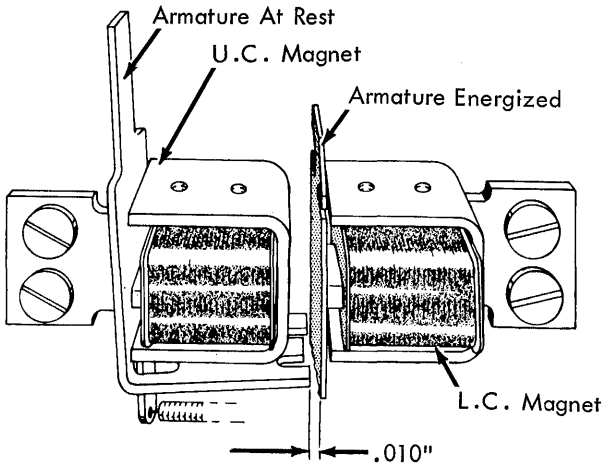


FIGURE 77. LC Magnet Assembly (Front to Rear)

This clearance insures positive unlatching of the upper case armature.

b. Up or Down - UC armature (energized) clears the LC armature (at rest) by .003" to .006" (Fig. 78).

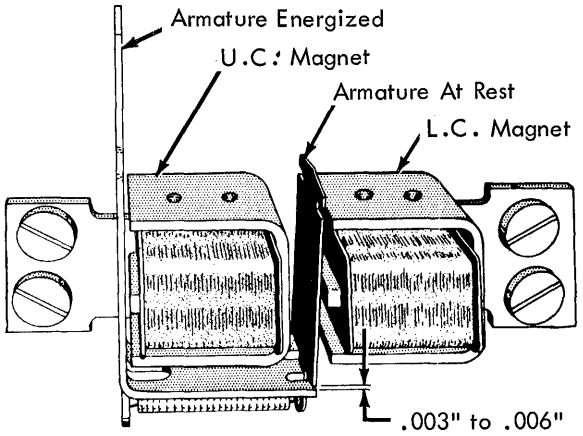


FIGURE 78. LC Magnet Assembly (Up or Down)

When the upper case armature is picked the lower case armature must be able to snap forward and latch the upper case armature. If the clearance is excessive the upper case armature may move far enough to allow a shift to take place. When this happens the printer will be in lower case while the magnet assembly is latched in upper case.

6. Magnet Assembly Mounting Bracket (Early)

a. 11 Inch Machine (Fig. 79) - Position the magnet assembly mounting plate (front to rear) so that the UC armature (at rest) clears the release arm pin by .002" to .008".

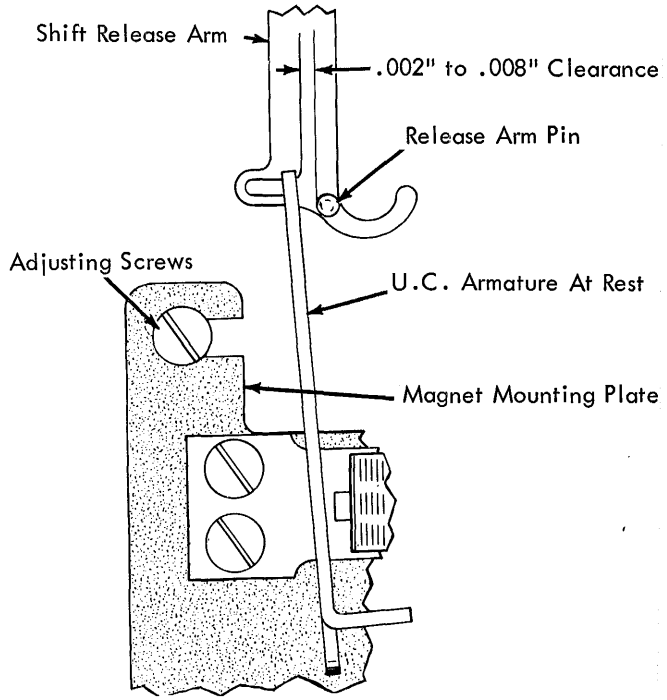


FIGURE 79. Magnet Assembly Mounting Bracket

b. 15 Inch Machine And All Late Style Shift (Fig. 80) - Position the magnet assembly mounting plate (UC armature energized) so that the release arm clears the shift ratchet lug by .005" to .015".

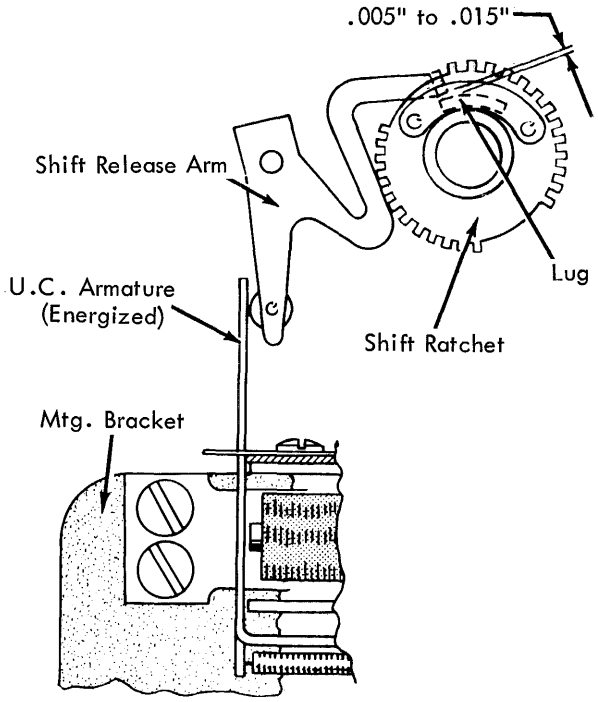


FIGURE 80. Magnet Assembly Mounting Bracket

7. UC Armature Backstop, 15 Inch Machine (Early) Fig. 81) - Position (armature at rest) so that the UC armature clears the release arm roller by .002" to .008".

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.

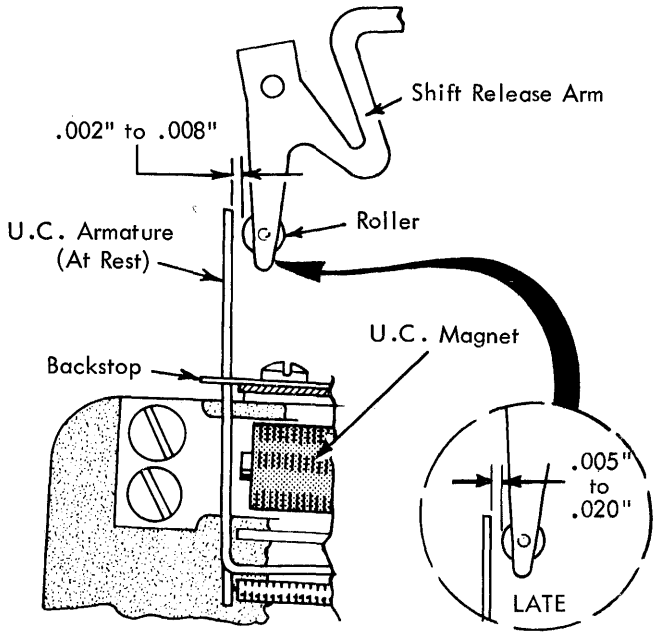


FIGURE 81. U.C. Armature Backstop

7.1 UC Armature Backstop (Late) (Fig. 81) - Position armature backstop (armature at rest) so that the UC armature clears the release arm roller by .005" to .020".

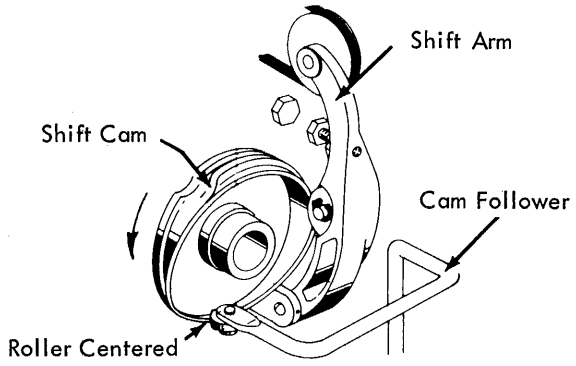


FIGURE 82. Contact Mounting Plate

SHIFT CONTACT ASSEMBLY

1. Contact Mounting Plate (Fig. 82) - Position vertically so that the cam follower roller is centered on the shift cam surface.

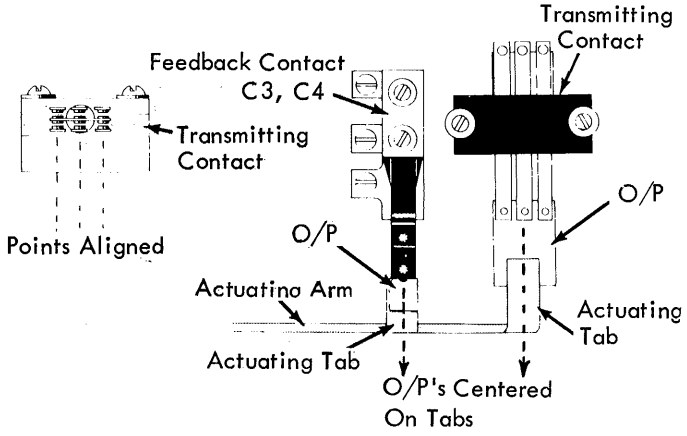


FIGURE 83. Contact Positioning

2. Contact Positioning (Fig. 83) - Position the feedback and transmitting assemblies under their mounting screws for the following conditions:

   a. Operating points centered on actuating tabs.
   b. All contact points (or straps) in stack aligned.

3. Contact Actuating Arm (Fig. 84) - Position (with the cam follower roller held against the detented shift cam) so that the O/P ball is centered between the actuating arm tabs.

NOTE: If a starting reference is required, form the O/P so that the center of the O/P ball is 9/16" from the contact mounting plate.

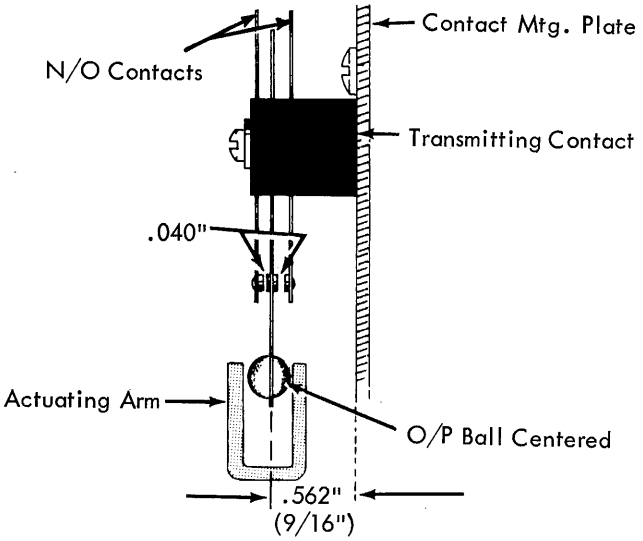


FIGURE 84. Contact Actuating Arm

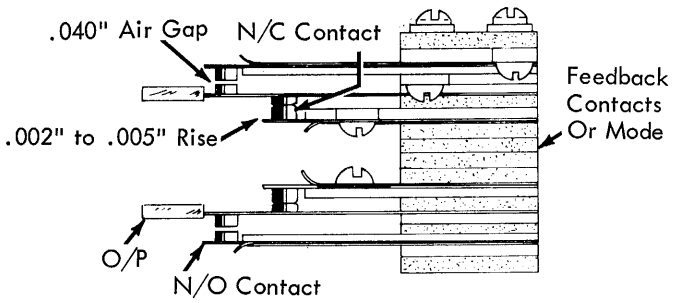


FIGURE 85. Contact Rise and Air Gap

4. Transmitting Contacts Air Gap (Fig. 84) - Form the N/O contacts to clear the O/P's by .040".

5. Feedback or Mode Contact Rise and Air Gap (Fig. 85) -

   a. Form the N/C contact supports so that the O/P's lift the N/C contact straps .002" to .005".
   b. Form the N/O contact supports so that the N/O contacts clear the O/P's by .040".

6. Actuator Tabs (Fig. 86) - Form 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 - see the timing charts for specifications.

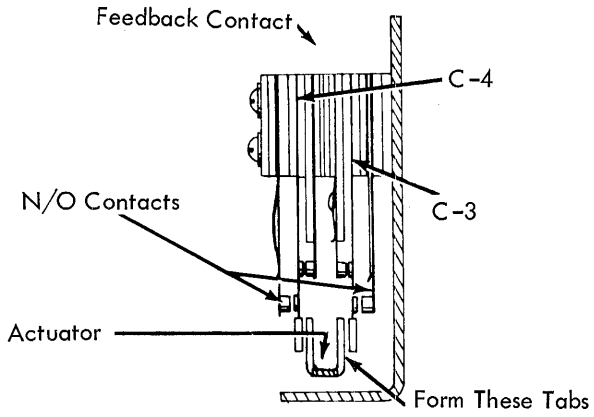


FIGURE 86. Actuator Tabs

TIMING CHART

Shift	N/O Make	Break
C3 & C4	35° ± 5°	145° ± 5°

Note: Each Shift operation is 180°

7. Mode Contact Actuating Arm - With the shift ratchet released, hand cycle from lower to upper case and adjust as follows (Fig. 87).

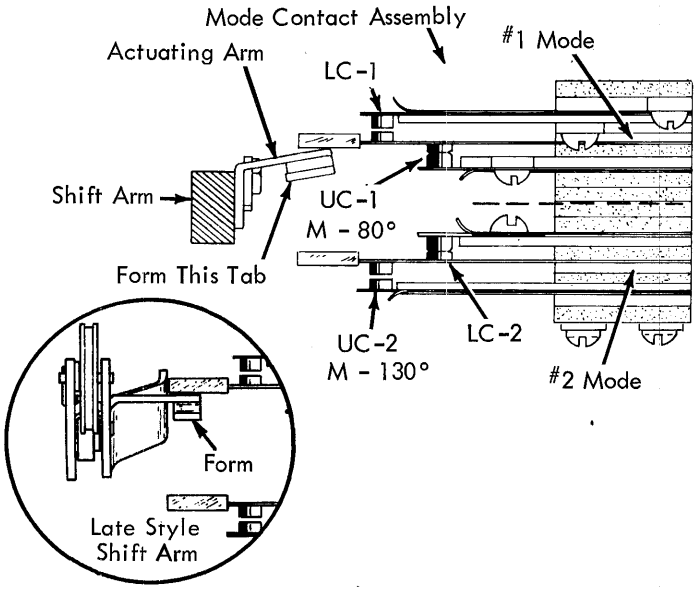


FIGURE 87. Mode Contact Actuating Arm

TIMING CHART

Shift	N/O-Make	Break
Mode #1	80° ± 10°	100° ± 10°
Mode #2	130° ± 10°	50° ± 10°

Note: Each Shift operation is 180°

a. Position the actuating arm so that the UC-1 contact closes at 80° of shift cam rotation.

Note: Form actuating arm on machines with "Late Style" shift arm.

b. Form the actuating tab so that the UC-2 contact closes at 130° of shift cam rotation. For Model 775 (MT/ST) Mode #3, use Mode #2 specifications.

NOTE: The shift ratchet teeth are spaced 10° apart and may be used as a timing indicator.

CYCLE CLUTCH

1. Cycle Shaft - Shim the cycle shaft to obtain .001" to .003" end play of the shaft. The shims are placed between the left hand bearing and the check ratchet. The shims are available in various thicknesses and are coded by shape as described in the Parts Catalog.

CAUTION: The slight end play of the shaft insures that it will rotate freely. Excessive play could allow a coil of the cycle clutch spring to wedge between the two hub members of the clutch causing a machine lock-up. (End play can most easily be measured with the spring clutch removed.)

NOTE: With the end play removed to the right, maintain .002" clearance between the cycle shaft gear and the left hand bearing.

2. Cycle Clutch Latch Bracket - Adjust the bracket vertically so that the steps of the cycle clutch sleeve are horizontal when the sleeve is stopped by the latch (Fig. 88).

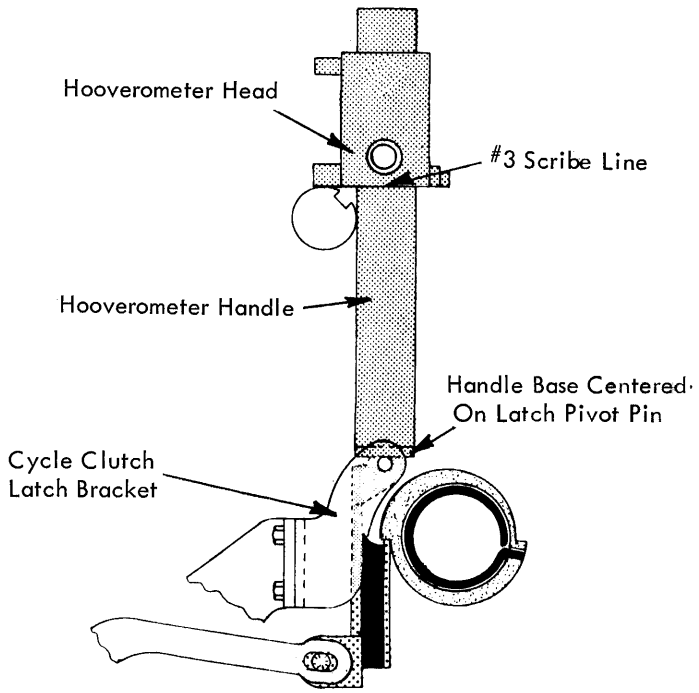


FIGURE 88. Cycle Clutch Latch Bracket Adjustment

To insure that the latch is parallel to the sleeve, it should be adjusted in the following manner:

a. Loosen the two latch mounting screws and pull the latch to the top of its adjustment.
b. Snug the screws "lightly".
c. 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 (#3 scribe line).
d. Tighten the cycle clutch latch mounting screws.

Keeping the sleeve surface in contact with the latch surface will insure that the latch will remain parallel to the sleeve while you are adjusting its height.

If the bracket were adjusted too low, the steps would be at an angle to the line of motion of the cycle clutch latch. The latch would have difficulty in moving forward to release the clutch sleeve, and a slow, hesitant operation would result.

With the bracket too high, the force of stopping the cycle shaft through the cycle clutch sleeve would tend to cam the latch forward. A repeat cycle operation could result.

When properly adjusted the top of the latch pivot pin is 1.546" below the top of the print shaft. This distance can be measured with the use of the Hooverometer. With the head of the Hooverometer set at the #3 scribe line, the head should rest on top of the print shaft with the handle touching the latch pivot pin (Fig. 88). Be sure the Hooverometer handle is vertical. It will be vertical if the base of the handle is centered over the latch pivot pin.

NOTE: Changing the height of the cycle clutch latch necessitates a readjustment of the cycle clutch collar, cycle clutch stop, and the cycle clutch latch restoring mechanism.

CAUTION: The latch bracket must not become cocked so that only a corner of the latch plate is stopping the sleeve. Excessive wear could result. The cycle clutch sleeve could also be tilted by the latch causing it to bear against the cycle clutch pulley hub creating a noisy operation.

3. Cycle Clutch Spring and Collar Adjustments

a. Lateral position of the spring - Loosen the collar and position the spring left or right on its hubs so that the right hand end of the spring will clear the face of the cycle clutch pulley by .004" to .012" (Fig. 89).

NOTE: This adjustment insures that a maximum number of coils of the spring clutch will grip the driving hub during a cycle operation. Any slippage between the driving hub and the spring clutch could decrease the typehead velocity during a print operation resulting in intermittent light impression. A lack of clearance between the right end of the spring clutch and the face of the cycle clutch

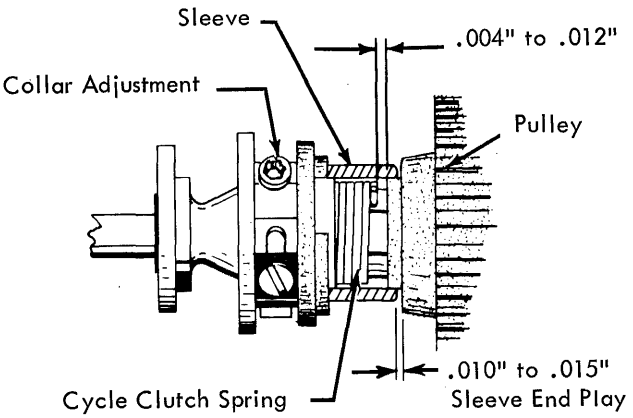


FIGURE 89. Lateral Position of the Cycle Clutch Spring and Collar

pulley would create a bind causing the spring clutch to place a heavy torque on the cycle clutch sleeve. This excessive torque on the sleeve results in a sluggish keyboard because the cycle clutch latch link spring has difficulty in pulling the latch off the sleeve.

b. Lateral position of the collar - position the collar left or right so that the sleeve will have .010" to .015" end play.

NOTE: This adjustment insures that there will be no binds between the right end of the sleeve and the cycle clutch pulley. A bind will cause a sluggish keyboard just as in the previous adjustment.

c. Radial position of the collar - (The position of the collar directly controls the radial position of the left hand end of the cycle clutch spring with respect to the cycle shaft. It determines how much the spring clutch will be expanded when the cycle clutch sleeve is latched and the cycle shaft is in its rest position.) Adjust the collar so that when a zero tilt, negative-five rotate character is hand cycled the cycle clutch spring will begin to slip (expand) when the cycle shaft is 1/16" to 3/32" from its rest position measured on the surface of check ratchet (Fig. 90).

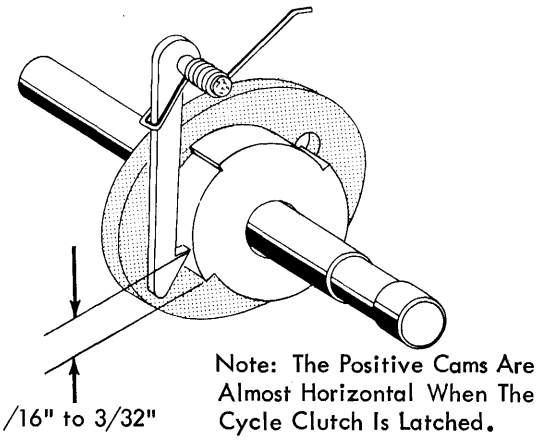


FIGURE 90. Radial Position of Cycle Clutch Collar

This adjustment is difficult to observe at the check ratchet. A 1/16" to 3/32" rotation of the cycle shaft will cause the print shaft gear to turn approximately one tooth. The adjustment can easily be read by one of the following methods.

(a) Print Shaft Gear Method

1. Hand cycle a zero tilt, negative-five 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 depressing a keybutton.
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 1/2 to one tooth. If the print shaft gear rotated further than one tooth the collar must be moved top toward the rear. Less than 1/2 to one tooth, move it top toward the front.

A zero tilt, negative-five rotate character is used because it offers the greatest resistance to the cycle shaft during the restoring portion of a cycle, causing the cycle clutch spring to slip at the earliest possible time.

NOTE: If the collar should become completely loose, a good starting point may be obtained by positioning the collar so that its adjusting screw head is approximately in line with the high point of the negative-five cam.

CAUTION: The cycle clutch stop attached to the collar may prevent the shaft from reaching the latched position. Any change in the cycle clutch collar adjustment will necessitate a readjustment of the stop; therefore it is usually best to loosen the stop before attempting to adjust the collar.

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

3.1 Cycle Clutch Spring and Collar Adjustment (Late Style Clutch (Fig. 90.1) -

a. The cycle clutch spring and collar shall be positioned laterally to the left so that the longest spring ear is against the minus 5 cam. The parts are so designed that the clearance between the cycle clutch sleeve and the pulley will be .006" to .020".

b. Radial position of the collar - (The position of the collar directly controls the radial position of the left hand end of the cycle clutch spring with respect to the cycle shaft. It determines how much the spring clutch will be expanded when the cycle clutch sleeve is latched and the cycle shaft is in its rest position.) Adjust the collar so that when a zero tilt, negative-five rotate character is hand cycled the cycle clutch spring will begin to slip (expand) when the cycle shaft is 1/16" to 3/32" from its rest position measured on the surface of check ratchet (Fig. 90.1).

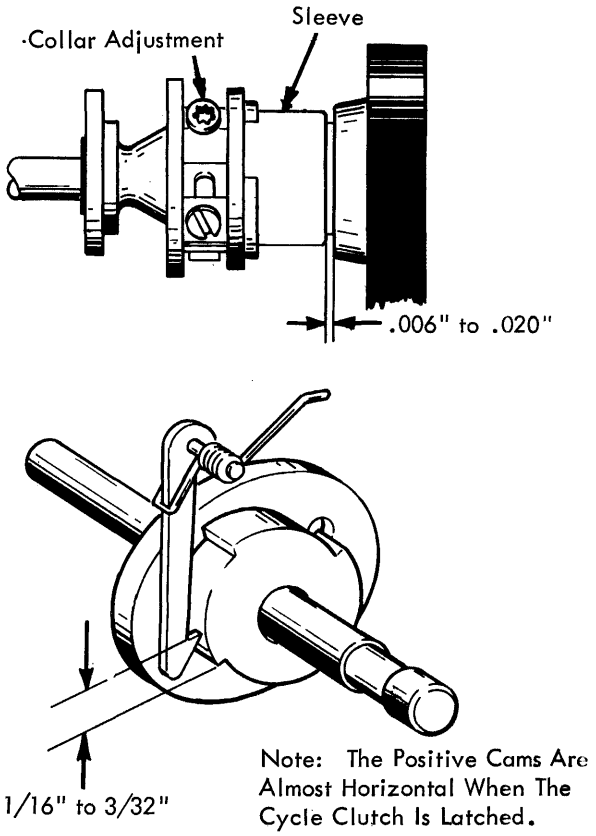


FIGURE 90.1. Radial Position of Cycle Clutch Collar

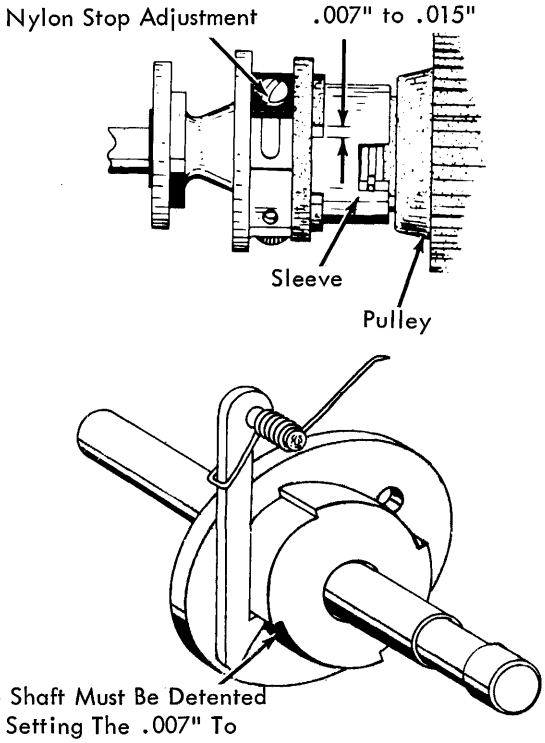


FIGURE 91. Cycle Clutch Overthrow Stop, Late Style

4. Cycle Clutch Overthrow Stop - 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 .007" to .015" (Fig. 91 or Fig. 92).

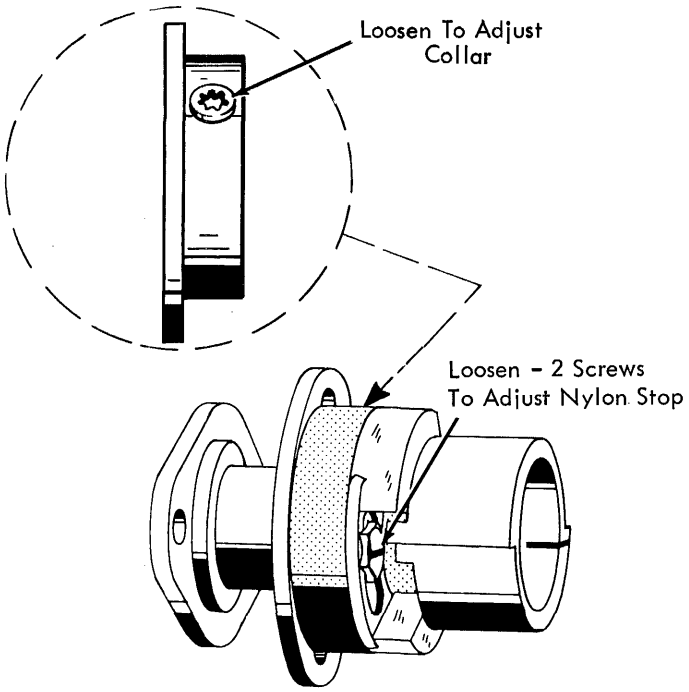


FIGURE 92. Cycle Clutch Overthrow Stop, Early Style

NOTE: It is best to set this adjustment on the low side of the tolerance. Too much cycle shaft overthrow combined with excessive backlash in the gear train could allow the filter shaft to overthrow into the path of the character interposers. This condition could result in intermittent keyboard lock-up or intermittent touch problems.

CAUTION: After adjusting the cycle clutch overthrow stop check the cycle clutch sleeve end play as the overthrow stop may bind against the sleeve.

CARRIER AND ROCKER

1. Tilt Tube End Play - (machines prior to gearless tilt). The tilt pulley should be adjusted up or down on the tilt tube so that .002" to .004" end play exist in the tilt tube (Fig. 93).

The tilt pulley is attached to the tilt tube by a set screw and key against a flat surface on the tilt tube. The set screw 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

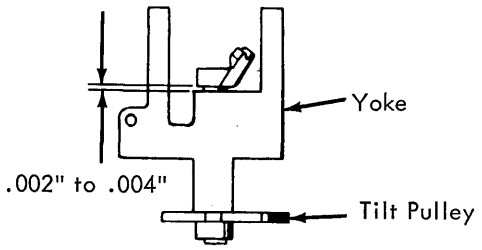


FIGURE 93. Tilt Tube End Play Adjustment

spring stud can then be removed through the hole in the carrier. The hole in the carrier and rocker will make the tilt pulley set screw accessible with a fluted wrench.

NOTE: 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. Be sure to re-install the shim if disassembly is necessary.

2. Rotate Shaft End Play - Adjust the rotate pulley up or down on the rotate shaft so that .002" to .004" end play exists in the rotate shaft relative to the tilt tube or yoke (Fig. 94 A & B).

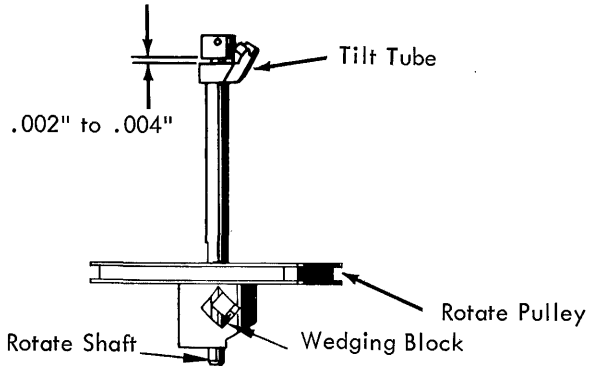


FIGURE 94A. Gear Type Tilt

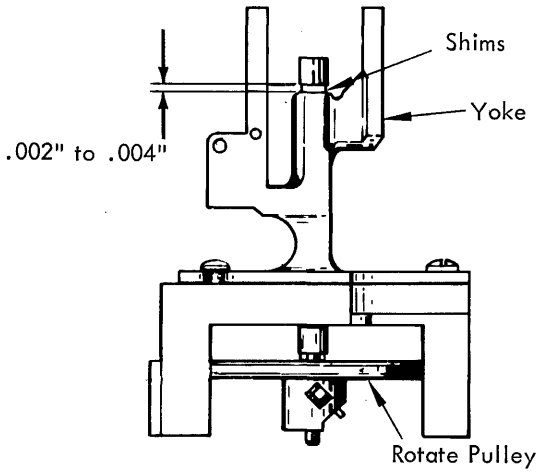


FIGURE 94B. Gearless Tilt

The rotate pulley is secured to the rotate shaft by a wedging block and a set screw. The pulley set screw is accessible from below with the carrier centered over the cycle shaft and the shift in the upper case. After loosening the set screw the grip of the block on the shaft must be broken by rotating the type head counterclockwise manually while blocking rotation of the pulley. This can be done by inserting the 3" screwdriver at the rear between the notch in the pulley and the tape guide block.

Be careful not to damage the tape or pulley with the screwdriver. DO NOT rotate the type head clockwise against the tension of the tape in an effort to break the pulley loose. Tape breakage or other parts damage may result.

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

3. Tilt Ring - The upper ball socket should be centered over the lower ball socket within .002". It is adjusted by moving the tilt ring left or right after loosening the tilt ring pivot pin set screws. All side play of the tilt ring should be removed by the pivot pins while still allowing the tilt ring to pivot freely.

   If the tilt ring is not properly centered, the rotate position of the head can vary slightly as the head is tilted to the different tilt positions. This could constitute a portion of the band width in the rotate system.

   The tilt ring is centered at the factory and every effort should be made to maintain its centered position. If tilt ring removal or replacement is necessary, a feeler gauge should be inserted between the tilt ring and the yoke to determine the clearance before the tilt ring is removed. The tilt ring should be replaced to the same clearance.

   The tilt ring can easily be removed if the machine is half cycled to a two tilt position. On machines prior to the gearless tilt mechanism, care should be taken to insure that the tilt sector gears are properly meshed whenever the tilt ring is installed. The rear tooth of the tube sector gear should enter the second notch of the tilt ring sector gear (Fig. 95).

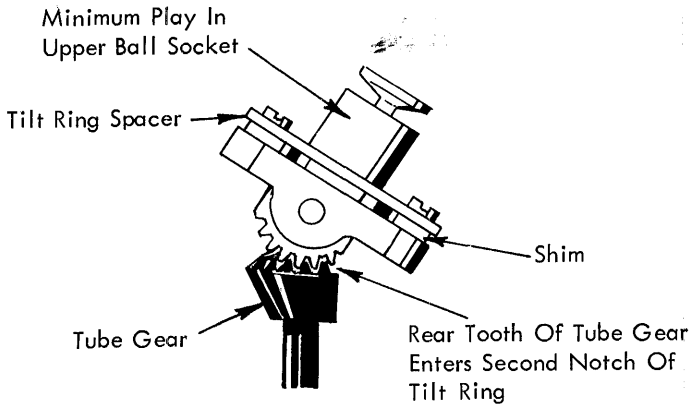


FIGURE 95. Upper Ball Socket Adjustment

CAUTION: Side play in the tilt ring can cause poor horizontal and vertical alignment. It can also affect impression.

4. Upper Ball Socket - The upper ball socket must rotate completely free of binds with little or no up and down play. The adjustment is made by raising or lowering the tilt ring spacer by installing thicker or thinner shims at the front and rear (Fig. 95).

   In order to check the upper ball socket for binds it is necessary to remove the ball joint so that the upper ball socket can be rotated by hand. This can be done either by removing the tilt ring and upper ball socket together and checking them off the machine or by removing the upper ball socket and replacing it without the ball joint. If the tilt ring is removed, its position relative to the yoke must be checked by a thickness gauge before removal.

   NOTE: If the upper ball socket, tilt ring, or tilt ring spacer are ever replaced by new parts, the shimming adjustment must be checked.

   CAUTION: Vertical play in the upper ball socket will affect vertical alignment and impression because the typehead will not maintain a definite position.

   Also, care must be taken to insure that the entire rotate system is free from binds. A bind in the upper ball socket can result in poor horizontal alignment if the rotate detent fails to fully seat in the detent notch before print occurs. An excessive bind can cause unwanted roller droppage in the wear compensator during a negative selection. Binds in the system (carrier area) can be checked by manually operating the shift arm in and out.

5. Tilt Detent - Adjust the guide and pivot screws so that the tilt detent will operate freely with no side play (Fig. 96).

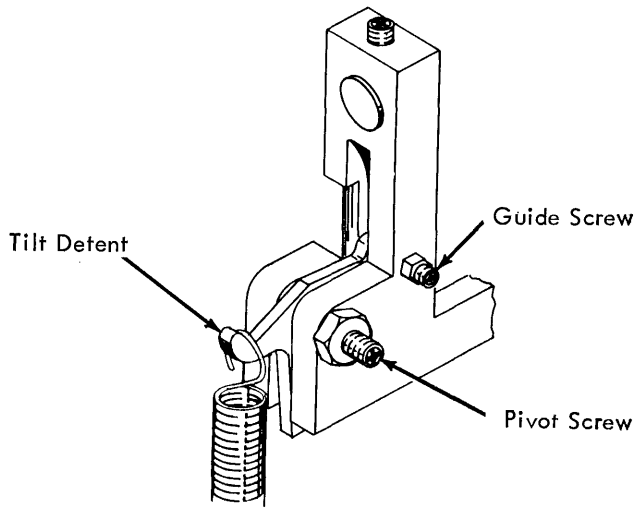
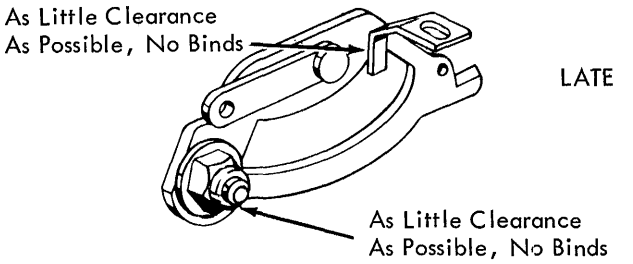


FIGURE 96. Tilt Detent Adjustment

Excessive side play in the tilt detent will cause poor vertical alignment. A bind in the tilt detent will affect both the 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.

6. Rotate Detent - Adjust the front and rear guides so that the rotate detent will operate freely with no side play (Fig. 97).

Excessive play in the detent will result in poor horizontal alignment because the detent cannot positively position the type head.



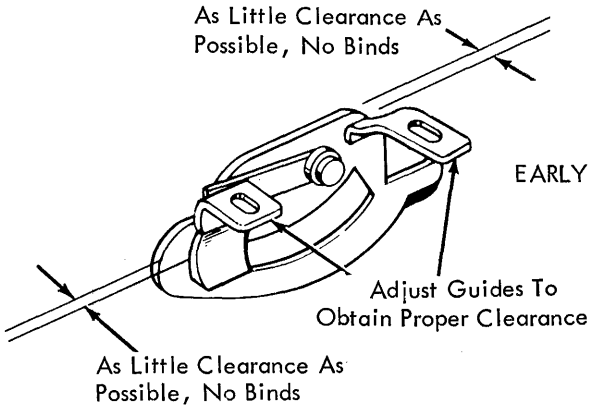


FIGURE 97. Rotate Detent Guides

7. Rocker Shaft - Adjust the rocker shaft left or right to obtain .002" to .004" side play in the rocker (Fig. 98).

The side play exists between a C-clip around the shaft at the right of the rocker and a thrust washer against the carrier casting at the left of the rocker. The rocker shaft is held in place by a set screw at the left end of the shaft.

Excessive play in the rocker could affect horizontal alignment by allowing the rocker to shift its position left to right.

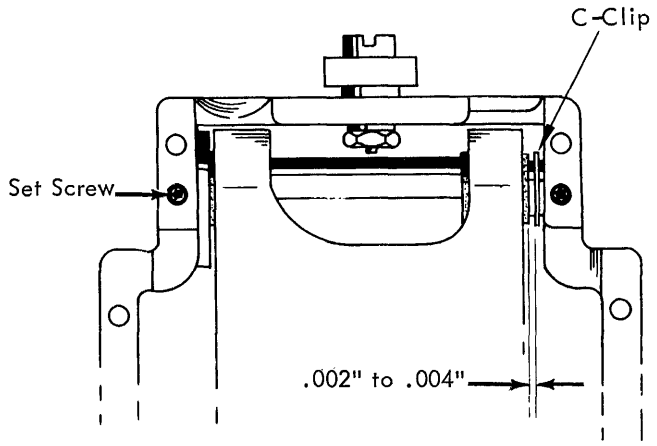


FIGURE 98. Rocker Shaft Adjustment

8. Print Sleeve End Play - Adjust the print sleeve end play to be .002" to .004". The end play is controlled by the print cam on the right hand end of the sleeve. The adjustment should not be gained with the ribbon lift cam because its set screw tightens down into a dimple in the print sleeve fixing the position of the cam (Fig. 99).

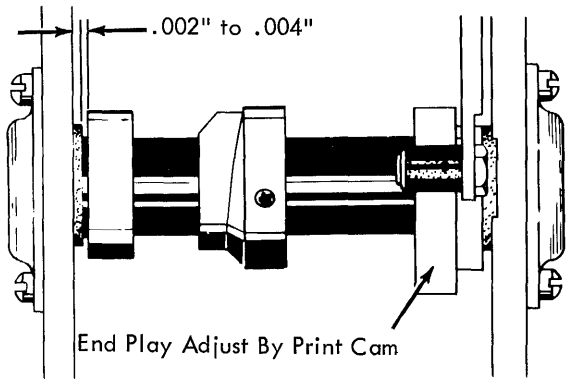


FIGURE 99. Print Sleeve End Play

9. Detent Cam Follower Bracket - Position the detent cam follower bracket which is mounted to the left side of the carrier by two screws to satisfy the following conditions:

a. Front to rear for a clearance of .015" between the print sleeve and the end of the pin on the cam follower (Fig. 100a).

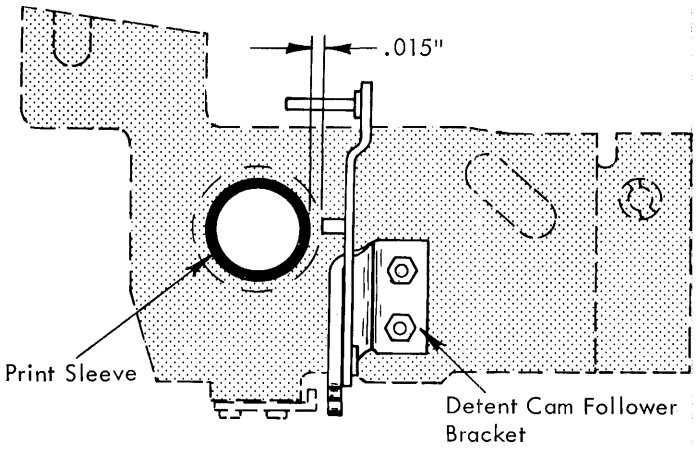


FIGURE 100A. Detent Cam Follower Bracket

b. Vertically so that the bottom surface of the pin on the cam follower lines up with the scribe line #1 on the Hooverometer when the Hooverometer is placed against the print sleeve as shown in Figure 100b.

This bracket is set at the factory with a dial indicator and should not require readjustment unless it becomes loose.

NOTE: The position of the bracket directly affects the timing relationship between the detent cam and the print cam. An improperly adjusted bracket may cause the detents to begin to withdraw before the typehead prints, or the typehead to print

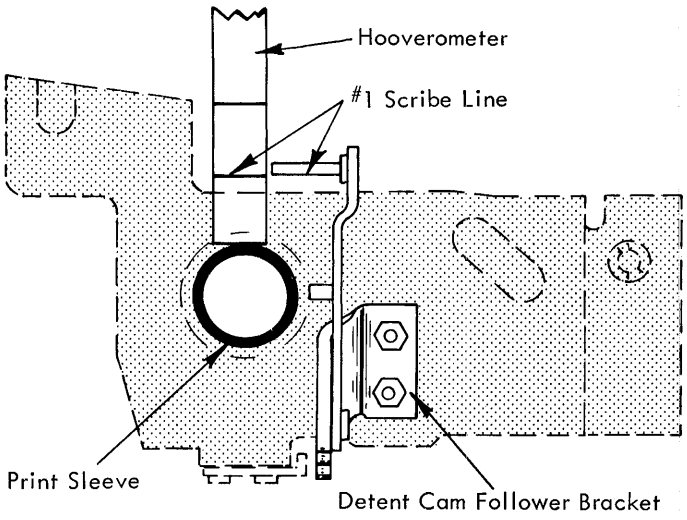


FIGURE 100B. Detent Cam Follower Bracket

before the detents have fully seated. If this occurs it will generally show up as poor vertical alignment because the tilt detent always seats and withdraws ahead of the rotate detent.

10. Detent Mechanism (Machines prior to gearless tilt) The detent mechanism must be adjusted to satisfy the following conditions:

a. Position the ribbon feed and detent cam left or right on the print sleeve so that the inside rib of the cam will be in line with the left hand edge of the ribbon feed cam follower (Fig. 101 A & B).

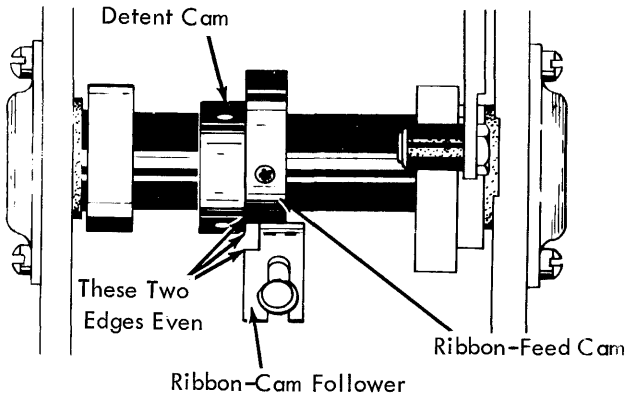


FIGURE 101B. Ribbon Feed Cam (Early)

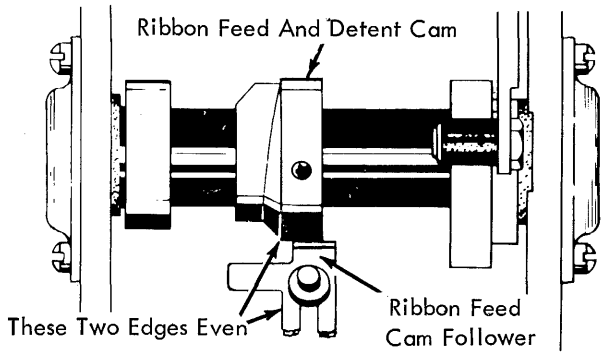


FIGURE 101A. Ribbon Feed Cam (Late)

b. Adjust the detent actuating lever support front or rear (under its locking screw) so that the rotate detent will clear the teeth on the type head skirt by .025" to .035" when the cycle shaft is at rest (Fig. 102). This clearance should be observed when the type head is manually tilted to a two tilt position since the two tilt position provides the rotate detent with the least amount of motion.

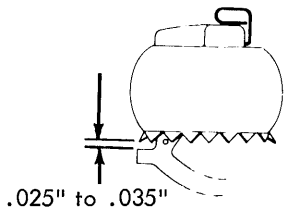


FIGURE 102. Skirt Clearance

Moving the actuating lever support to the rear will increase skirt clearance.

c. With the detent cam follower on the low dwell of the detent cam (detents fully seated) rotate the actuating lever support until .001" clearance is felt between the detent actuating lever and the detent cam follower roller. Rotating the support clockwise will increase the clearance.

NOTE: The adjustments of the detent mechanism directly affect each other and must be adjusted alternately to obtain the correct clearances.

The .001" lost motion adjusted into the system between the detent actuating lever and the detent cam follower insures that the tilt detent will fully seat in the detent notch of the tilt ring. Too much clearance would allow the detents to enter their notches too early and withdraw too late. This could cause an intermittent erroneous character to print, parts breakage, or roller droppage in wear compensator.

The .025" to .035" skirt clearance allows the rotate detent to enter and withdraw from the type head notch area at the proper time with respect to the rotating typehead. If this clearance is too small the rotate detent will enter the notch area too early and withdraw too late. This will also cause an intermittent erroneous character to print, parts breakage, or unwanted roller droppage. Too much skirt clearance will only cause premature wear on the detent mechanism due to the leverage gain.

Since the detent cam and print cam are both keyed to the print shaft, the relationship between the detent timing and the point at which the type head prints is non-adjustable. The designs of the two cams is such that the detents will be fully seated in their notches when the type head contacts the platen during a print operation. The only thing that can affect this timing relationship is the position of the detent cam follower mounting bracket. The position of this bracket is fixtured at the factory and should not be changed.

11. Detent Mechanism (Gearless Tilt)

The detent mechanism must be adjusted to satisfy the following conditions:

a. With the cycle shaft at rest and the typehead manually held in a two tilt position, adjust the ribbon feed and detent cam left or right on the print sleeve (Fig. 103) so that the rotate detent will clear the detent teeth on the typehead skirt by .025" to .035" (Fig. 104).

Moving the cam to the left will increase the clearance.

b. With the detent cam follower on the low dwell of the cam (detents fully seated), loosen the locknut on the detent actuating lever support and adjust the Bristo screw up or down until there is a clearance of .001" felt between the detent actuating lever and the detent cam follower roller (Fig. 105).

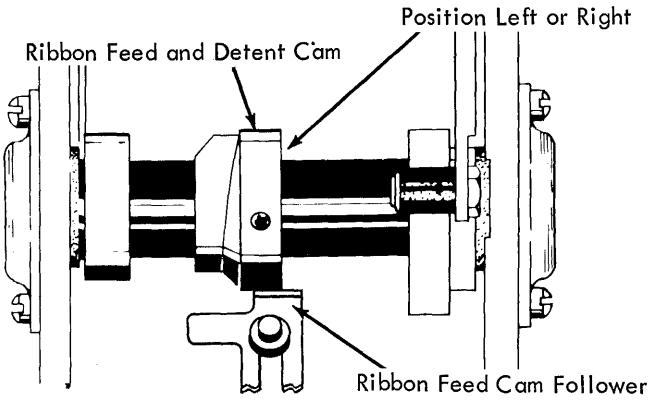


FIGURE 103. Detent Cam Adjustment

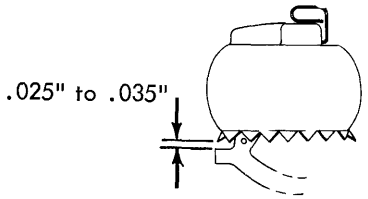


FIGURE 104. Skirt Clearance

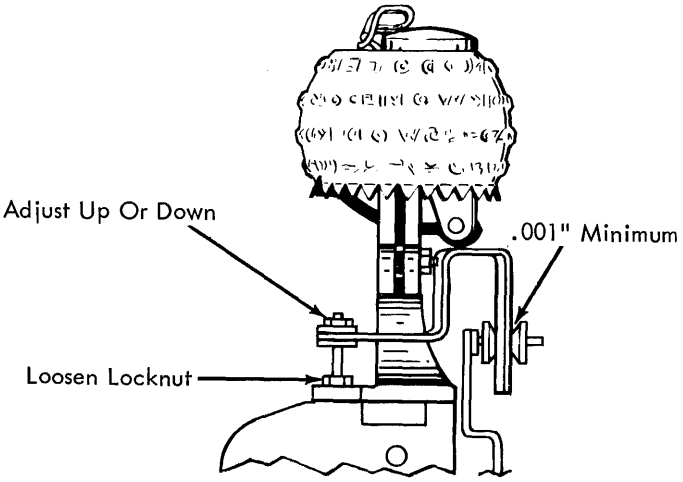


FIGURE 105. Detent Lever Support

Adjusting the Bristo screw up will increase the clearance.

NOTE: Read the "note" under Adjustment #10 as it pertains to the gearless tilt mechanism also.

ALIGNMENT.

1. Preliminary Print Shaft Timing - With the cycle shaft latched in its rest position, loosen the print shaft gear and rotate the print shaft so that the keyway is approximately in line with the end of the ribbon lift cam follower pivot screw (Fig. 106). The keyway will be about 45° to the rear from the top of the shaft.

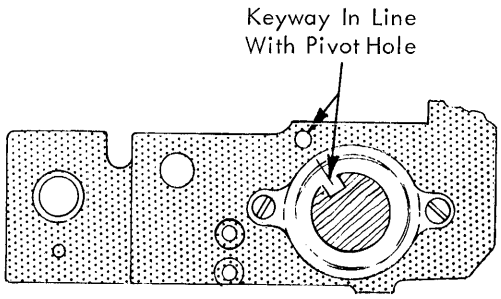


FIGURE 106. Preliminary Timing

The preliminary setting of the print shaft establishes a coarse timing of the two detent entry and withdrawal so that the detents will not be engaged in their notches when the type head and tilt ring are in motion. A more accurate timing adjustment will be made later.

2. Tilt Selector Latches - Form the two stop lugs (Fig. 107) above the tilt selector latches so that the latches will reset simultaneously (under the latch bail) just as the cycle clutch check pawl drops into the notch on the check ratchet at the rest position (Fig. 108).

The adjustment can easily be checked by hand cycling a zero-tilt character twice in succession. As the cycle shaft begins to pass its rest position, place your finger lightly against the cycle clutch check pawl while observing the selector latches. If the adjustment is correct you should feel the check pawl drop into the rest position notch on the check ratchet simultaneously as the two selector latches reset under the latch bail.

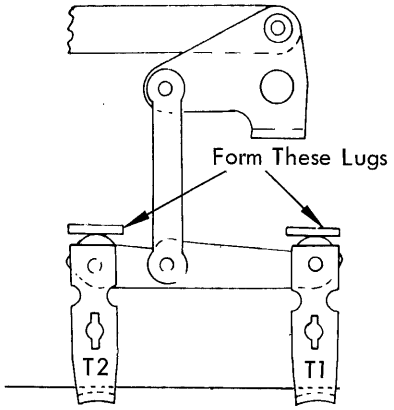


FIGURE 107. Selector Latch Stop Lugs

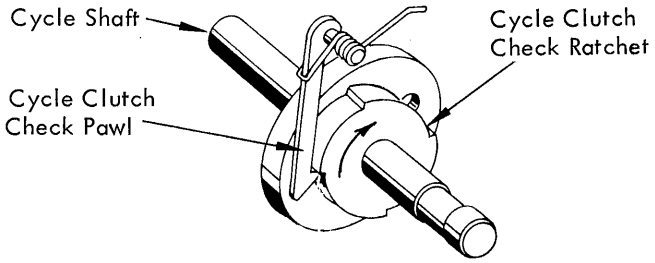


FIGURE 108. Latches Reset As Check Pawl Drops In

Form the stop lugs by tapping them up or down with a hammer and screwdriver. The stop lugs should be overformed slightly then brought back to the correct position, otherwise the "memory" of the metal will cause them to restore toward their original position.

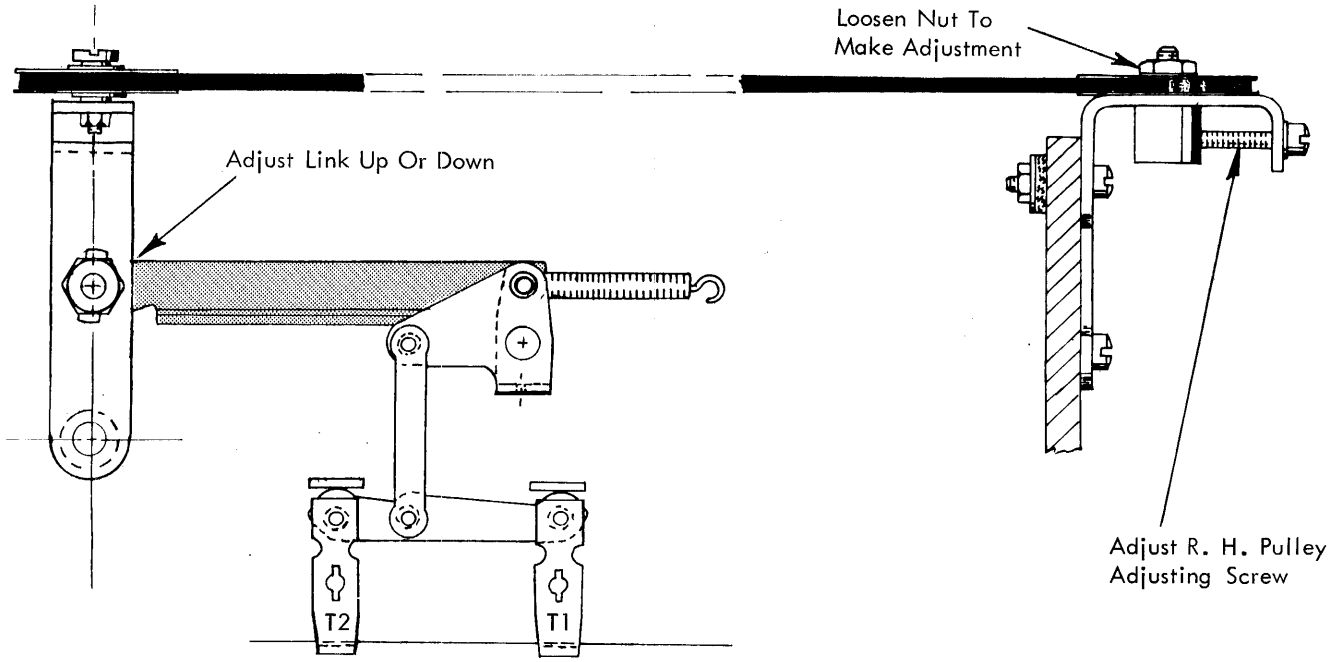


FIGURE 109. Tilt Mechanism

NOTE: It is very important for each selector latch to receive the same amount of motion from the latch bail, when operated, in order to produce the proper amount of motion to the tilt arm link for a desired selection. If one of the stop lugs is adjusted too low, its respective latch will reset early under the latch bail producing an excessive amount of latch clearance for that latch. This means that this latch when operated will not receive as much motion from the latch bail as the other latch will when it is operated. This condition which is undesirable causes the band width of the system to increase.

3. Tilt Arm Motion - Adjust the tilt link up or down on the tilt arm (Fig. 109) to control the tilt ring motion so that the tilt ring will coarse align the same for a 3-tilt character as it does for a zero-tilt character.

In order to check this adjustment, it is necessary to roughly home the tilt ring first. To rough home, half-cycle a zero-tilt character and adjust the right hand tilt pulley (Fig. 109) so that the tilt detent will enter slightly on the rear side of the V-shaped detent notch in the tilt ring when the tilt ring play is removed in the restoring direction (Fig. 110). As the tilt detent is allowed to seat itself, the rear of the tilt ring should rise slightly. This is a preliminary adjustment and will require refinement after the proper tilt arm motion is obtained.

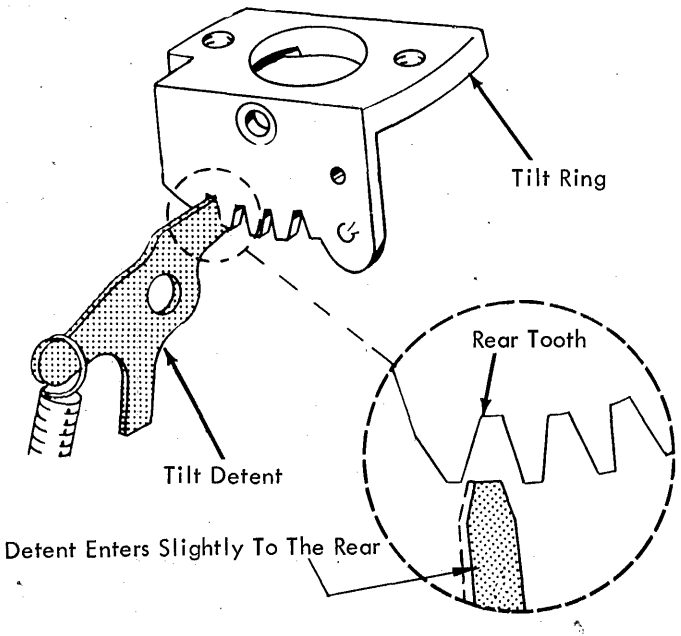


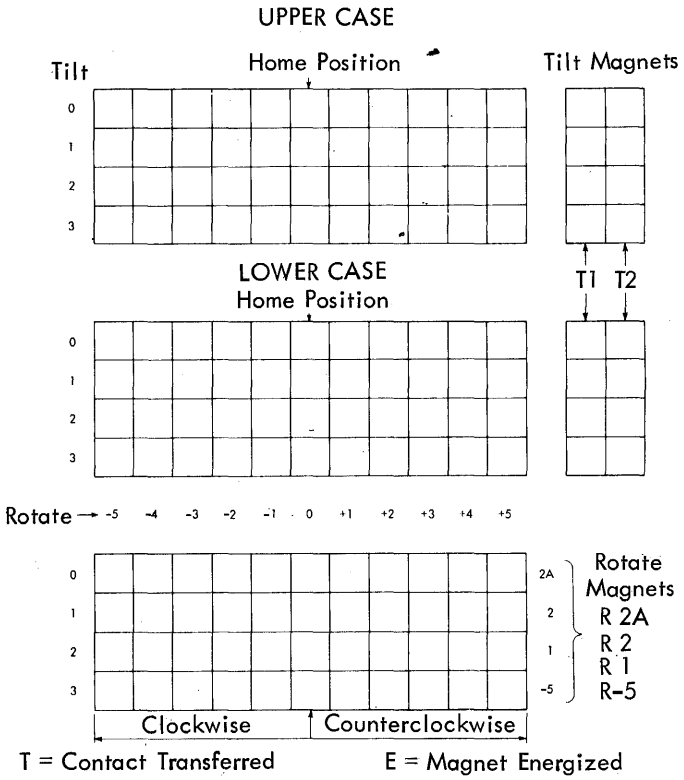
FIGURE 110. Rough Homing

Once the print shaft has been preliminarily timed and the tilt ring rough homed, all of the following adjustments that require half-cycling should be done under power so as to include all the stresses on the system.

When the tilt arm motion is adjusted properly, a half-cycled 3-tilt character will coarse align the same as a half-cycled 0-tilt character. That is, both selections will provide the same rising action to the rear of the tilt ring as the detent is allowed to seat in the detent notch. If the 0-tilt and 3-tilt coarse align the same, the 1-tilt and 2-tilt selections will also coarse align the same because of the leverage designed into the system.

NOTE: The right hand tilt pulley lock nut may be left loose while making the tilt arm motion adjustment, because a slight readjustment of the pulley may be necessary during the tilt arm motion adjustment.

On late level machines the tilt arm link has a horizontal elongated mounting hole where it fastens about the shouldered screw on the tilt arm and the tilt arm is lightly spring loaded away from the side frame by a hairpin spring. The tilt pulley spring is far stronger than the hairpin spring thus holding the tilt arm against the right hand end of the elongated mounting hole in the link. Although this modification has no definite effect on a tilt operation, its function is to remove any slack that may appear in the tilt tape. An example is when an operator changes the typehead she may accidentally tilt the head causing the tape to slacken.



NOTE: If possible CE should note what characters are I/O home and which are latch home

FIGURE 111.

4. Tilt Ring Homing - With a zero-tilt character half-cycled and the tilt ring play removed in the negative direction (Fig. 112a) (restoring direction), adjust the right hand tilt pulley so that the rear of the tilt ring will rise about .005" when the detent is manually allowed to seat in the detent notch (Fig. 112b).

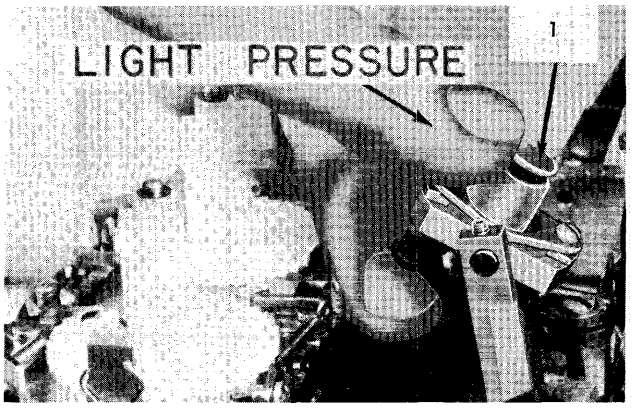
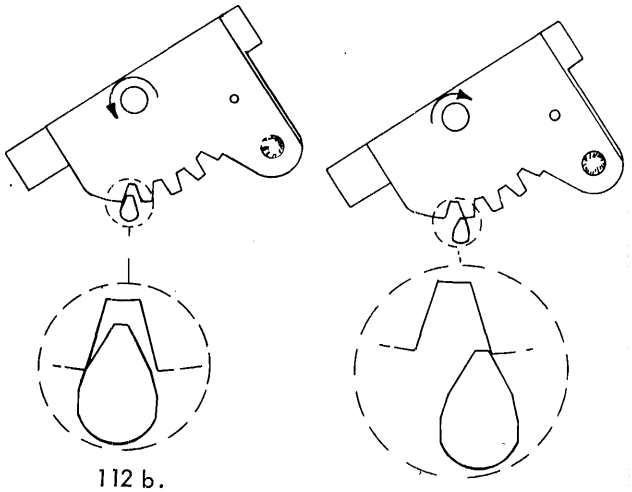


FIGURE 112a. Tilt Detent Entry

Check the other tilt positions and then refine the homing adjustment on the tilt selection that provides the least amount of rise to the rear of the tilt ring.

As a further check, remove the tilt ring play in the positive direction and observe the detent entry on the forward side of the detent notch (Fig. 112c). The detent should enter far down the forward slope of the detent notch but not so far that it contacts the tip of the tooth. By homing the tilt ring off center, favoring the positive side of the detent notch, a maximum amount of wear potential is achieved.



112 b.
Play Removed In
The Negative Direction

112 c.
Play Removed In
The Positive Direction

FIGURES 112b. and 112c. Tilt Detent Entry

5. Rotate Spring Tension - Adjust the rotate spring in the rocker so that it will have 1-7/8 to 2 pounds tension when the machine is half-cycled using a lower case negative 5 character. The least amount of tension is present in the spring when it is in this position. The type head must be removed when making this adjustment.

The rotate spring tension is adjusted by turning the spring cage from the front (Fig. 113a). 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 counter-clockwise. Care must be taken to decrease the tension slowly so that the cage does not spin freely. Spring damage could otherwise result.

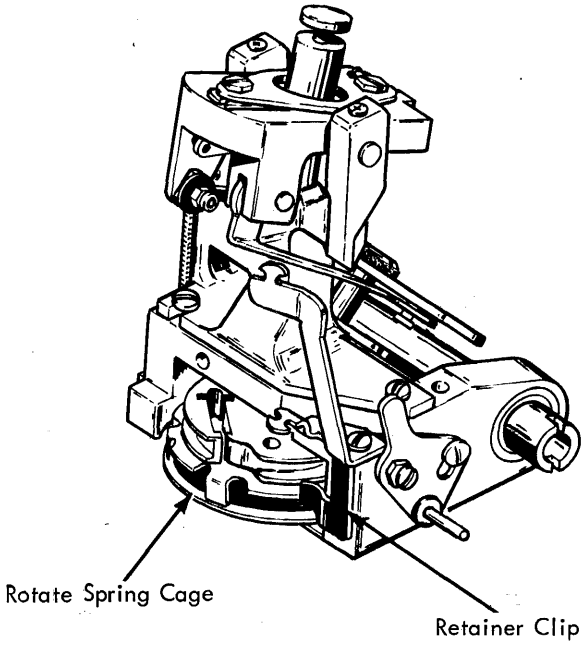


FIGURE 113a. Rocker Assembly

Tension of the spring is critical in that it must be properly balanced with the springs of the wear compensator. Excessive tension will overload the levers system and increase wear. Insufficient tension will not provide the torque necessary for rapid lower case negative rotate operations. It will also affect the wear compensator operation if the tension is not sufficient to overcome the compensator damper spring in the negative-5 position.

The rotate spring tension should be measured with a spring scale as indicated by Fig. 113b. Using a lower case -5 character, read the spring scale while slowly allowing the shift arm to move in towards its stop screw. The spring scale should read 1-7/8 to 2 pounds just as the

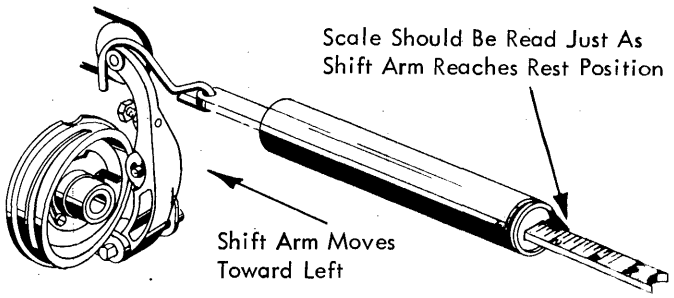


FIGURE 113b. Spring Scale Measurement For Rotate Spring Adjustment

arm reaches its stop screw. To overcome static friction, read the spring scale while the arm is moving.

If a spring scale is not available, the tension may be obtained in the following manner (Fig. 114). With the machine half-cycled at a negative five lower case (machines which are locked in upper case use upper case -5 character) position and the type head removed, insert a large spring hook around the lower compensator arm. Pull so that the rotate arm eccentric just clears the damper spring and release it. The tension of the rotate spring should be enough to completely collapse the damper spring against the power frame with the damper spring stop adjusted at the bottom of the spring.

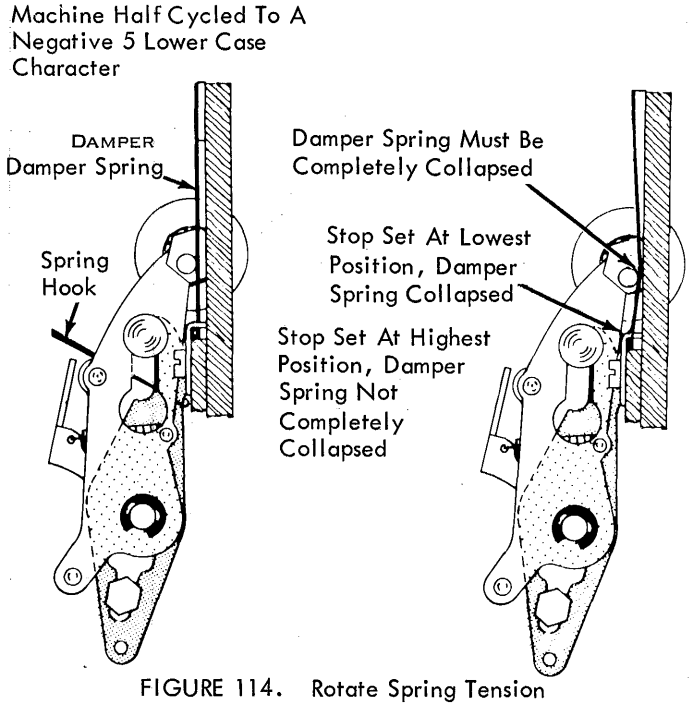


FIGURE 114. Rotate Spring Tension

With the damper spring stop all the way up, the damper spring should not be completely collapsed. Check and adjust the rotate spring to satisfy both conditions.

NOTE:

Lower damper spring stop to bottom before proceeding with sequence. CAUTION - The damper spring method is only useable when it is impossible to obtain a spring scale.

NOTE: The accuracy given to the next seven coarse alignment adjustments determines the "band width" (detenting variation) of the rotate system. Each one of these seven adjustments contributes to the band width in a different manner. Generally, it takes experience in making each adjustment to learn how much accuracy is needed to end up with an accumulated band width which is acceptable. The band width of the rotate system should never exceed .020" nor should any extra time be spent in trying to obtain one any less than .010".

6. Rotate Selector Latches

a. Form the stop lugs above the positive rotate selector latches (Fig. 115) so that the latches will reset simultaneously (under the latch bail) just as the cycle clutch check pawl drops into the notch on the check ratchet at the rest position.

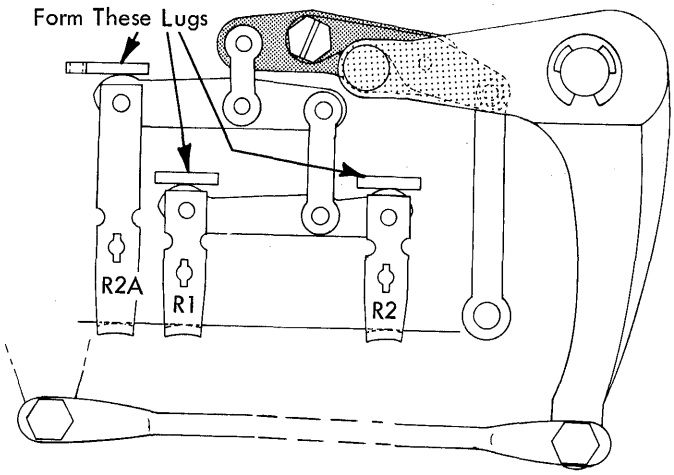


FIGURE 115. Rotate Selector Latches

NOTE: The adjustment theory under "tilt selector latches" also pertains to the rotate selector latches.

b. Adjust the negative-5 latch stop screw so that the negative-5 latch (Fig. 116) will reset simultaneously as the check pawl drops into the notch on the check ratchet at the rest position.

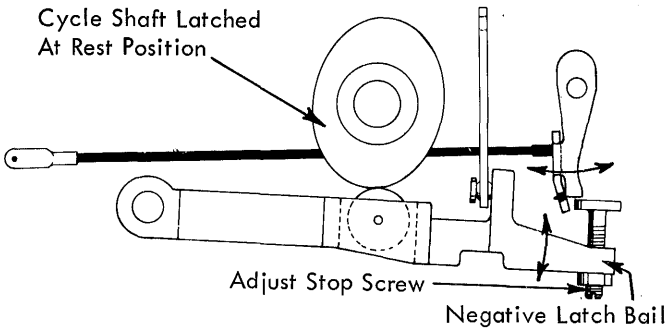


FIGURE 116. Negative 5 Latch Stop Screw

The negative-5 latch controls the position of the negative latch bail during zero and all positive rotate selections. Changing the latch adjustment causes the coarse alignment of the zero and all positive rotate selections to change equally with respect to the negative selections. No change is felt in the coarse alignment of the negative rotate selections when the negative-5 latch adjustment is altered because the latch is out of the system during all negative selections (Fig. 117).

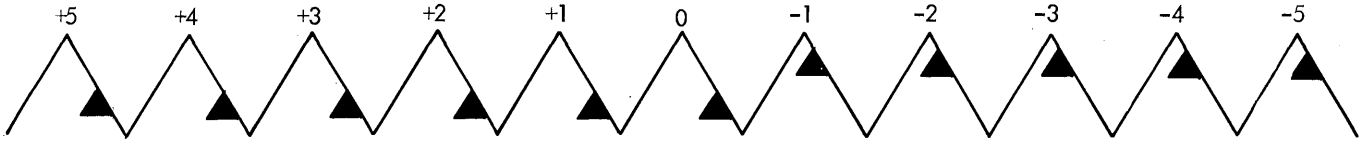


FIGURE 117. Excessive Negative 5 Latch Clearance

Considering the balance lever to be properly adjusted, the effects of the negative-5 latch adjustment on the system can be explained by the following: From the rest position the amount of movement in the negative direction given to the rotate bellcrank is fixed because the negative latch bail moves from the high point of the negative cam to its low point. From the rest position the amount of movement in the positive direction given to the rotate bellcrank can be increased or decreased by changing the negative-5 latch adjustment. In other words, when the machine is at rest the negative-5 latch bail is resting on the high point of the negative-5 cam. Whenever a no-rotate or positive selection occurs, the negative-5 latch bail is allowed to follow its cam towards the low point until it is restricted by the negative-5 latch. This small increment of negative motion to the negative-5 latch bail during a no-rotate or positive selection causes the positive motion to be reduced by an equal increment. Therefore, the adjustment of the negative latch can change the balance of motion between positive and negative selections. Even though it is possible, it is not permissible to use the negative latch adjustment for balancing purposes. The negative latch should always be adjusted for the proper reset clearance. This allows the system to operate with optimum leverage loads in both positive and negative selections. Balancing between positive and negative should always be accomplished by adjusting the balance lever.

NOTE: Figure 117 illustrates how the coarse alignment detenting would change at the typehead if only the negative-5 latch adjustment were maladjusted on a machine. It is possible for this same detenting pattern to show up on a machine that has the correct negative-5 latch adjustment but other adjustments maladjusted. For this reason it is best to adjust the negative latch as specified in the adjustment rather than by adjusting it while observing the effects that the adjustment change will produce at the typehead.

References will be made to 2 different methods of obtaining a no rotate character. These methods can be defined as:

Latched Home - zero rotate with no plus or minus rotation.

I/O Home - zero rotate with both plus 5 and minus 5 rotation.

7. Rotate Arm Vertical - With the typehead removed and the machine half-cycled to an upper case zero rotate character (latched home) adjust the rotate link so that the point at the top of the rotate arm is 15/32" from the machine sideframe. The compensator roller should be 1/16" from the top of the slot when this adjustment is made.

The adjustment sets up a vertical condition for three points in the rotate arm, the center of the pulley, the rotate arm pivot point, and the rotate link connection. With the rotate arm vertical at a half-cycled zero rotate position, the leverage within the rotate arm will be the same for positive and negative movements of the arm.

The adjustment can be measured using the #1 scribe line on the Hooverometer handle as illustrated in Fig. 118. The scribe line measurement makes allowance for the thickness of the compensator damper spring.

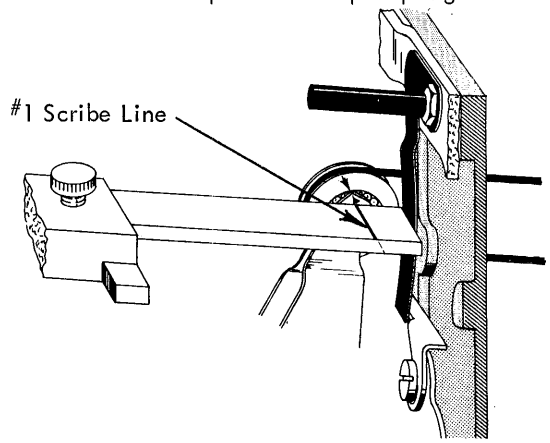


FIGURE 118. Rotate Link Adjustment Measurement

NOTE: The eccentric stud at the top of the rotate arm should be turned all the way to the left at this point to prevent interference with subsequent adjustments.

8. Preliminary Typehead Homing - Half cycle the machine under power using an upper case zero rotate (latched home) character. Check detenting, if in correct notch of typehead preliminary adjustment of .010" to .020" does not apply. Go on to next adjustment.

If detent is in wrong typehead notch, then loosen screw in bottom of rotate pulley and slip typehead so the detent will enter .010" to .020" from the center of the detent notch on the negative side of the notch when head play is lightly removed in the negative direction (Fig. 119).

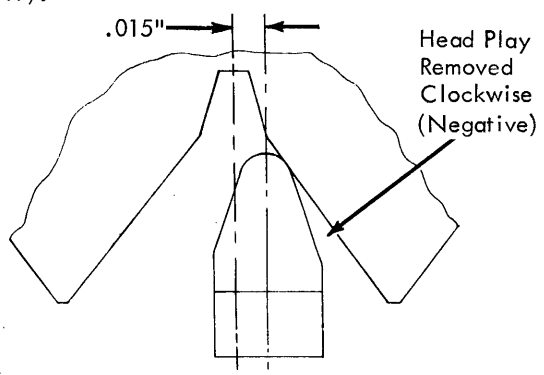


FIGURE 119. Type Head Homing

The main purpose of this preliminary homing adjustment is to aid the Customer Engineer in making the rest of the coarse alignment adjustments. It places the typehead in approximately the correct position so that its rotation, for a given selection, may be easily measured and used as a tool in making the next four adjustments. After completing this sequence of adjustments the preliminary homing adjustment may have to be refined.

NOTE: Be sure to maintain .002" to .004" end play in the rotate shaft when making this adjustment. Also, make sure that the compensator roller is 1/16" from the top of the slot.

Machines locked in upper case can sometimes be adjusted by the stud in the shift arm.

9. Balance Lever - With the machine in upper case loosen the lock nut on the balance lever and move the right hand member of the balance lever (Fig. 120) left or right until a half-cycled +5/-5 (I/O Home) combination detents (coarse aligns) the same as a half-cycled zero rotate character. The combination can easily be obtained by holding the negative-5 latch interposer forward with the fore finger while striking a +5 character with the thumb.

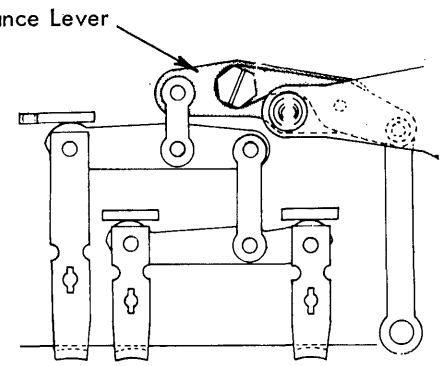


FIGURE 120. Balance Lever Adjustment

Begin the adjustment by half-cycling a zero rotate character in the normal manner. Check the detent entry to see exactly how much off-center the detent enters with the head play removed clockwise. Next half-cycle using the cancellation method described above and check the detent entry. If it is different from the normal zero rotate character, it indicates that the typehead has moved because of an unbalanced condition between the positive and negative motions.

With the machine in the half-cycled position using the cancellation method, adjust the right hand member of the balance lever left or right until the detenting is exactly as it is when a zero rotate character is half-cycled normally. Changing the balance lever adjustment will not appreciably affect the detenting of the half-cycled zero rotate character.

NOTE: The nut on the balance lever screw can be left loose until the correct adjustment is obtained. Be sure not to move the adjustment when tightening the nut.

In Fig. 121 the effects of the wear compensator are disregarded and all adjustments are correct except the balance lever. The right hand member of the balance lever is maladjusted too far to the left creating too much negative motion and not enough positive motion. Looking at the positive side of Fig. 121 you can see that the maladjusted balance lever causes a progressive loss of motion to the rotate bellcrank from the zero to a positive five rotate position. The greatest loss of motion is felt at the positive five position because the left end of the balance lever receives the most motion for this selection. When the negative side of the balance lever is operated, the maladjusted balance lever causes the rotate bellcrank to receive an excessive amount of motion as illustrated by the detenting of the negative five rotate position. This excessive motion is felt equally in all of the negative selections because the negative end of the balance lever receives the same motion from the cam for all negative selections. The progressive loss of motion felt from the negative five to the negative one rotate position is caused by the positive side of the balance lever. It produces a deficiency of motion in the negative selections just as it did during the positive selections.

Notice the detenting of a negative one selection in Figure 121. This selection combines the error of a positive four and a negative five causing the negative one to be the worst detenting selection with respect to the zero rotate selection. Although the cancellation method (+5/-5) combines even a greater error than the negative one selection, either one may be used to effectively make the balance lever adjustment. Checking the detenting of the other positions is not necessary.

If the balance lever were out of adjustment in the opposite direction so that there was too much positive and not enough negative motion, the error pattern would remain the same except that the detents would move towards the opposite side of the detent notches.

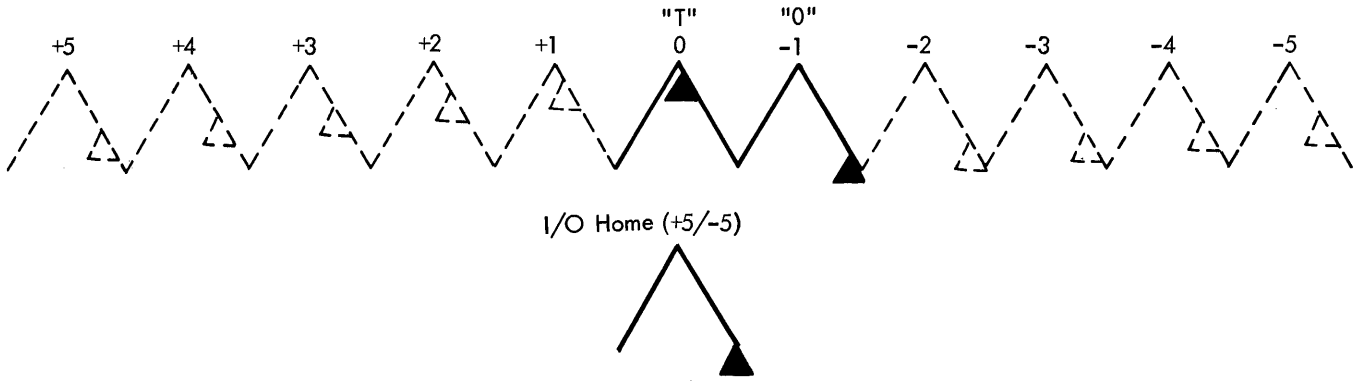


FIGURE 121. Excessive Negative Balance

10. Rotate Arm Motion - The adjustable plate on the bottom of the rotate arm (Fig. 122) should be adjusted up or down so that a half-cycled upper case +5 rotate character detents the same as a half-cycled upper case -3 rotate character. When observing the detenting remove the head play lightly in the negative direction.

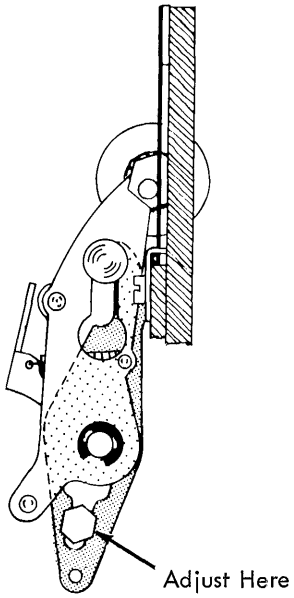


FIGURE 122. Rotate Arm Movement

The rotate arm motion is measured only as far as the negative three position in the negative direction. The negative four and five positions are not used because these two positions are affected by the ratio change operation of the wear compensator.

By comparing the detenting of the -3 and +5 characters, it can be determined whether or not the rotate arm is multiplying the motion, received from the rotate link, enough to rotate the typehead to the selected position. Once the -3 and +5 characters are detenting the same, then all of the selections between positive five and negative three will detent well within the acceptable band width provided that all of the previous adjustments have been made correctly. If a slight difference in detenting must exist between the -3 and +5 characters it is permissible and sometimes desirable provided that the -3 character detents more negative than the +5 character. In other words, it is better to have too much rotate arm motion than too little. The reason for this is to place a small amount of wear potential into the system for the areas of the differential mechanism where wear cannot be compensated for (positive latches and latch bail). Thus, as wear occurs in these areas causing the rotate arm motion to decrease, the detenting variation between the +5 and -3 characters will also reduce.

Figure 123 illustrates the effects on detenting caused by insufficient rotate arm motion. Notice that the largest detenting variation occurs between the +5 and -3. This is because the +5 and -3 characters operate in opposite directions and the error that appears when these two positions are compared is the combined error of both positive and negative motion.

If the rotate arm motion was excessive the detenting pattern would remain the same except that each detent would be on the opposite side of its detent notch.

NOTE: The adjustment may be left loose during each check until the correct position is obtained.

11. Eccentric Stud Adjustment (Typehead Homing) - Use the following procedure to adjust the eccentric stud:

a. Damper spring stop - as a preliminary adjustment, slide the damper spring stop down as low as it will go behind the damper spring (Fig. 124).

b. Raise the compensator roller all the way to the top of the V-shaped wedging slot.

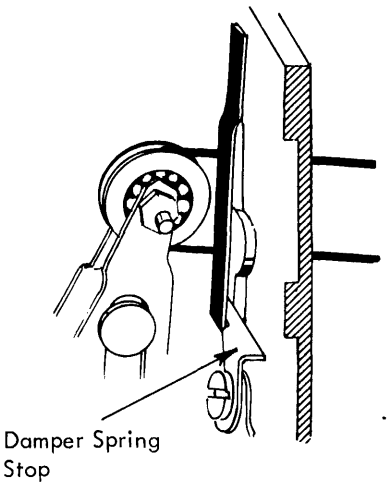


FIGURE 124. Damper, Spring Stop - Preliminary Adjustment

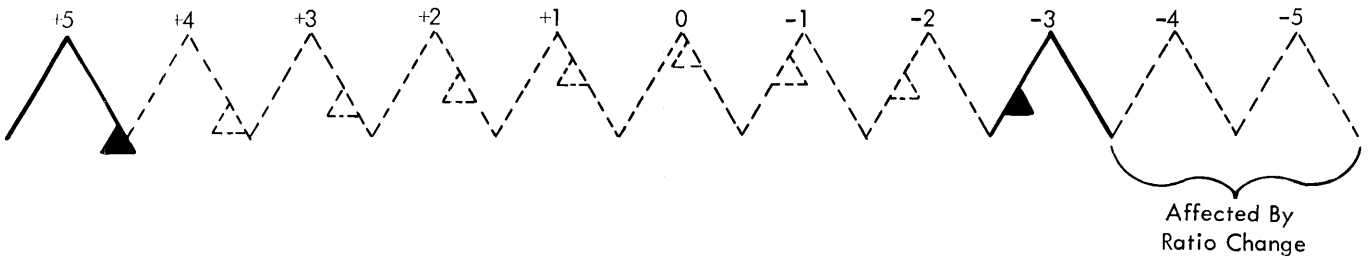


FIGURE 123. Insufficient Rotate Arm Motion

c. Half-cycle an upper case -5 character and adjust the eccentric stud (Fig. 125) in against the machine sideframe until the -5 character detents .010" to .020" in the negative direction from the center of the detent notch when the head play is lightly removed in the negative direction (Fig. 126). Make sure that the damper spring is fully collapsed against the machine sideframe.

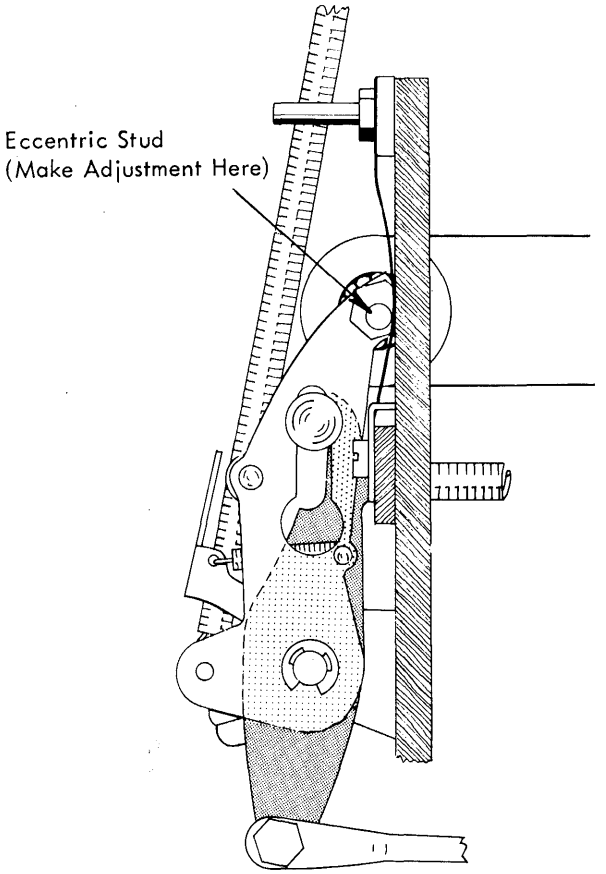


FIGURE 125. Eccentric Stud

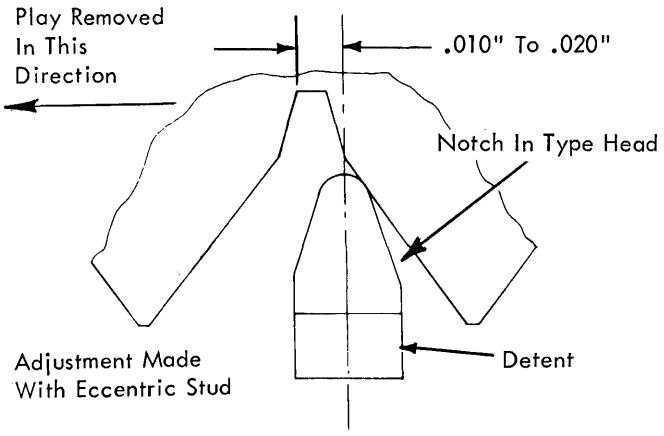


FIGURE 126. Eccentric Stud

After the eccentric stud has been properly adjusted the compensator roller must be reseated by raising it to the top of the V-shaped slot and striking a series of -5 characters. The compensator roller should seat 1/16" down from the top of the slot. If it drops too little or too much the rotate link should be adjusted and the roller reseated until the 1/16" is obtained. Having the roller seat 1/16" from the top of the slot sets up a vertical condition between the compensating arm and the rotate arm so that the leverage within the arm assembly will be the same for both positive and negative movements of the arm.

In some cases it may be found that after the eccentric stud is adjusted the roller will not drop but remain trapped at the top of the V-shaped slot. If this occurs, lengthen the rotate link and then recheck the eccentric stud adjustment.

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 sideframe. Also, if the correct detenting of the -5 character cannot be easily obtained with the eccentric stud adjustment the preliminary homing adjustment (Adj. #8) must be readjusted.

d. Damper spring stop - with the typehead removed, raise the stop so that when a lower case -5 character is half-cycled the damper spring will just collapse against the sideframe. Check by pulling the compensator arm away from the sideframe with a spring hook and then allow it to go back in slowly (Fig. 127).

Machine Half Cycled To Negative 5 Lower Case Character

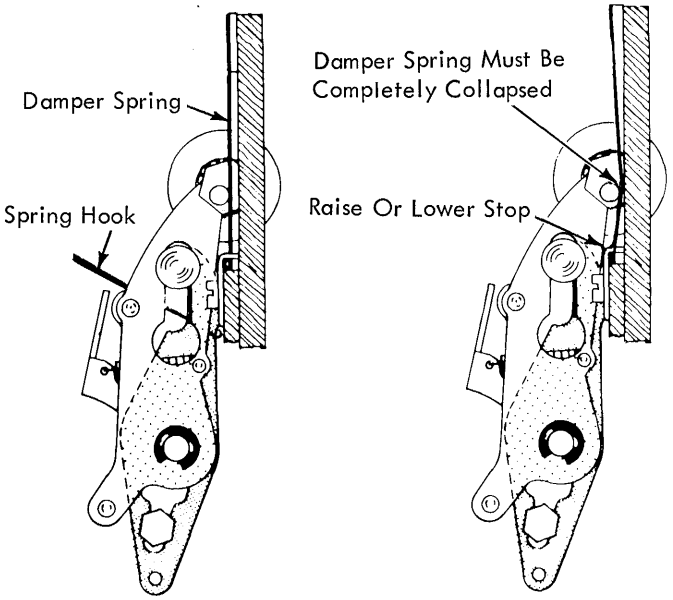


FIGURE 127. Damper Spring Stop

The main purpose of the eccentric stud adjustment is to stop the negative motion of the rotate arm as it approaches the negative five position so that all of the pressure on the compensator roller will be relaxed when the compensating arm has reached its full negative position. Assuming that no ratio change was felt in the system at the time of making the eccentric stud adjustment, stopping the rotate arm early to relax the pressure on the roller will cause the negative motion of the rotate arm between

the negative four and negative five rotate positions to be reduced, or the detenting of the negative five to be positive with respect to all the other rotate positions.

Since the ratio change adjustment will not affect the negative five position, the typehead is then rehomed to the negative five position making it detent properly but causing all of the other positions (-4 through +5) to detent too far negative. The lost motion of the rotate arm is still felt between the negative four and negative five rotate positions. The rotate arm motion in this area can be controlled by the ratio change adjustment which will be discussed under the next adjustment. This rehoming of the typehead to the negative five position (which is usually a slight refinement of the original homing adjustment) is accomplished by the eccentric stud adjustment rather than by slipping the rotate shaft within the rotate pulley. It has been found that the homing adjustment can readily be refined to the negative five position with the eccentric stud while at the same time obtaining a relaxed condition for the compensator roller (accomplished by controlling the length of the rotate link and reseating the compensator roller).

12. Ratio Change Adjustment - With the machine half-cycled under power to an upper case -3 character, form the paddle on the rotate eccentric arm until the upper case -3 character detents the same as the upper case -5 character. Each time the paddle (Fig. 128) is formed the machine must be recycled under power before observing the detenting of the -3 character. This allows the eccentric shoulder to reseat itself in the compensating arm.

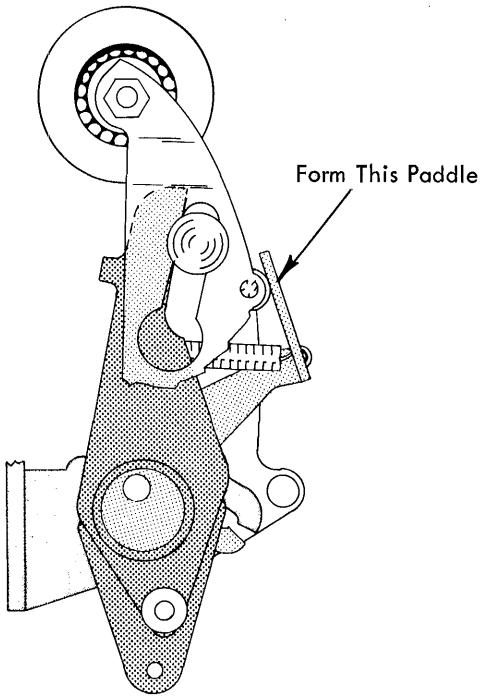


FIGURE 128. Arm Assembly In -3 Position

CAUTION: When forming the paddle 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. This adjustment should require only slight forming of the paddle.

Forming the paddle has no effect on the negative five position. This can be easily seen by looking at Figure 129 which shows the arm assembly in a negative five position. In this position there is a large clearance between the paddle and the barrel on the rotate arm therefore any change in the paddle position just increases or decreases this clearance without affecting the negative five position of the rotate arm.

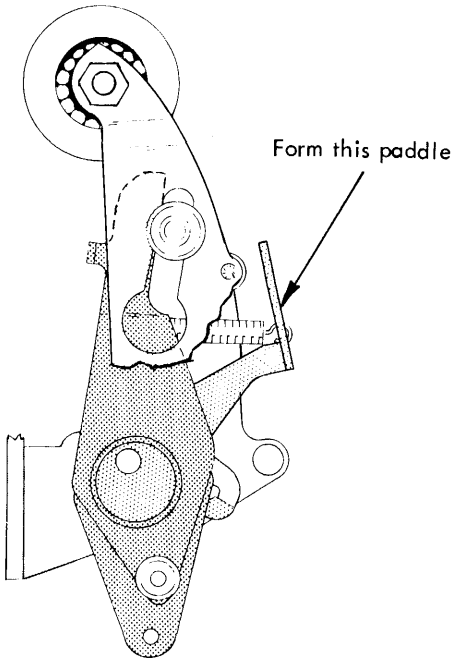


FIGURE 129. Arm Assembly in -5 Position

The paddle adjustment does affect all of the rotate positions from a negative three to a positive five position equally because it controls how long the compensating arm will rotate about the eccentric shoulder on the rotate eccentric arm as it travels from the negative five position towards the negative three position. In other words the more clearance there is between the rotate arm and the paddle, the farther the compensating arm can travel under a ratio change condition as it moves towards the negative three position.

Figure 130 illustrates how the detenting pattern of the typehead is affected by the ratio change adjustment.

Notice in Figure 130A that all the rotate positions from the -3 to the +5 detent equally but much less negative than the -5. This indicates that there is too much ratio change (too much motion) in the system between the -5 and the -3. The paddle should be formed in until the -3 detents the same as the -5.

Figure 130B illustrates the detenting pattern of a system that lacks a sufficient amount of ratio change. All the rotate positions from -3 to +5 detent alike but too far negative with respect to the -5. The system lacks motion between the -5 and the -3 therefore the paddle should be formed out to increase the amount of ratio change. Note that the negative four position is detenting the same as the -3 in Figure 130B. This is because the ratio

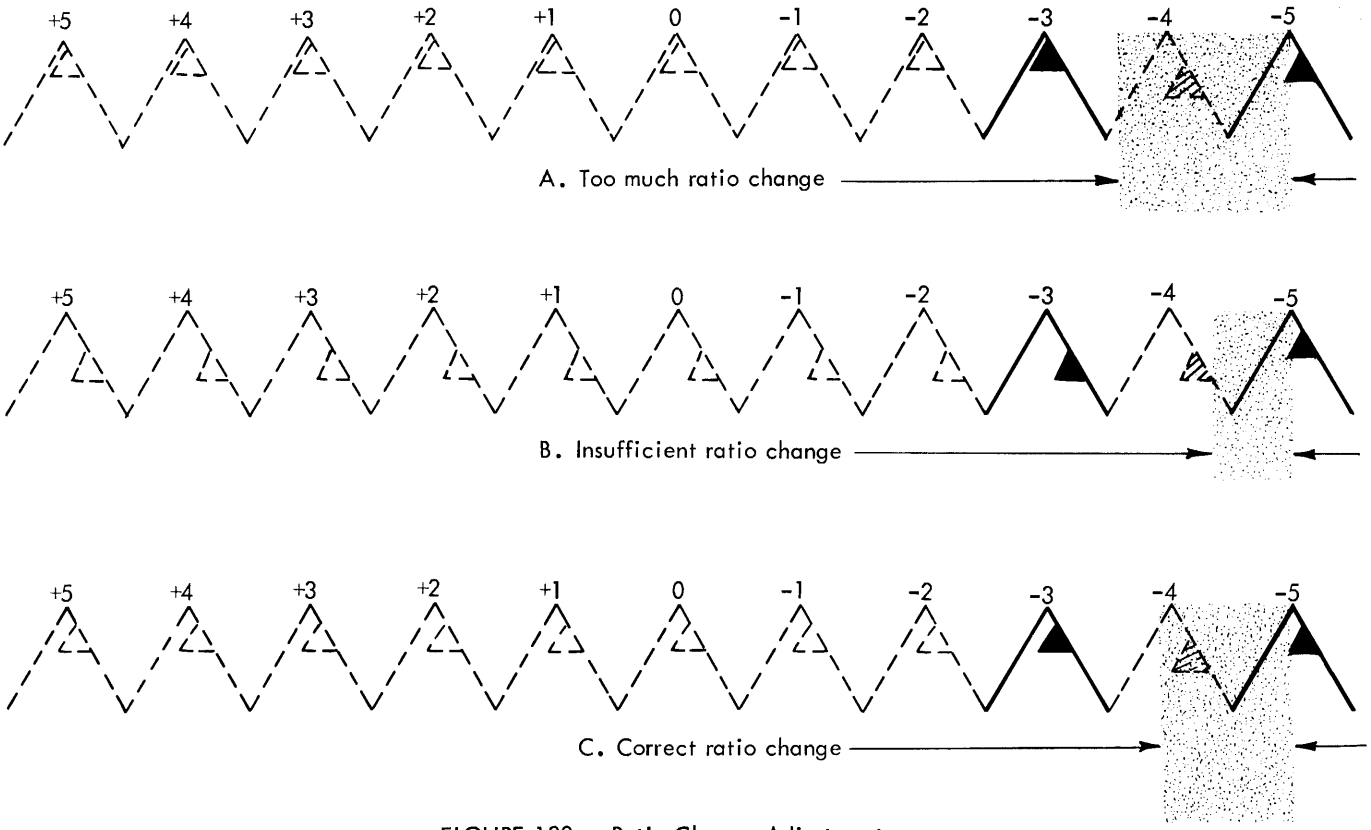


FIGURE 130. Ratio Change Adjustment

change is not occurring at the negative four position, thus the arm assembly is operating as one solid arm at this position.

In Figure 130C the correct amount of ratio change is in the system. All positions from the -3 to the +5 detent the same as the -5. Note that when the -3 detents the same as the -5, the detenting of the -4 is slightly different. This is caused by the ratio change. No attempt should be made to control the detenting of the -4 position because its position may vary on each machine depending on the amount of ratio change required (of each machine) to make the -3 detent the same as the -5.

13. Print Shaft Timing - Advance or retard the print shaft relative to its gear to obtain the proper timing of the rotate detent. Hand-cycle an upper case -5 character and observe the rotate detent as it operates in the typehead notch. The detent must enter the correct detent notch and withdraw without restricting the restoring of the typehead. There should be .002" to .004" backlash felt in the typehead when the detent is near the bottom of the detent notch (Fig. 131).

After adjusting the timing of the rotate detent to an upper case -5 character, check the detent entry and withdrawal of an upper case +5 character. If the detent restricts the typehead from restoring on withdrawal when the +5 is slowly hand-cycled, advance the print shaft slightly until the +5 has a withdrawal backlash of .002" to .004". When the withdrawal adjustment has been completed check the detent entry on both the +5 and -5. The detent must enter the correct notch.

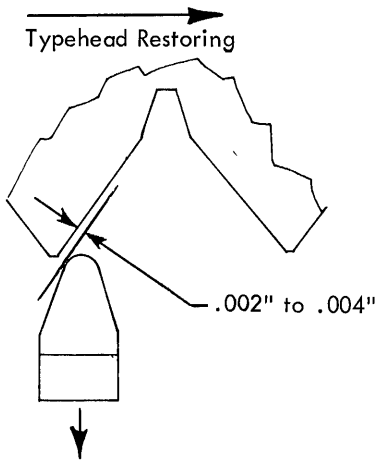


FIGURE 131. Withdrawal Clearance For The -5 Character

CAUTION: After hand-cycling the machine the compensator roller must be raised to the top of the wedging slot and reseated under power by striking a series of -5 characters.

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

a. Detent skirt clearance - favor the high side of the tolerance.
b. Typehead homing - favor the high side of the tolerance.
c. Band width - make sure that it is not excessive.

d. Head play - it should be .045" measured at the typehead skirt. If excessive head play is suspected the ball joint should be replaced and the typehead homing adjustment refined.

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

NOTE: Be sure to maintain .002" to .004" end play in the print shaft.

14. Shift Motion - The shift arm adjusting screw (Fig. 132) should be adjusted in or out to obtain 180° rotation of the typehead during a shift operation.

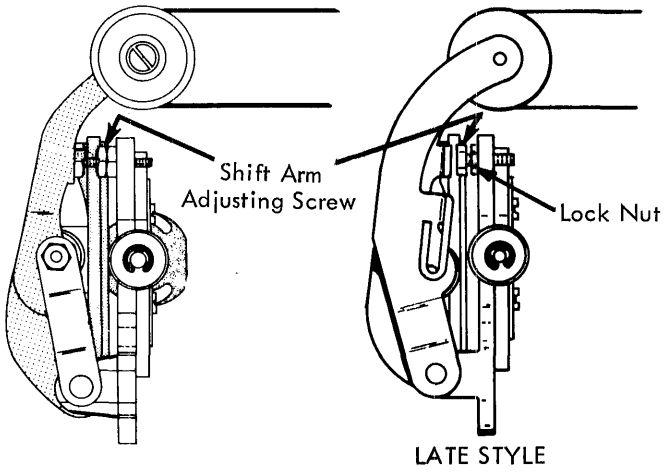


FIGURE 132. Shift Motion Adjustment

The adjustment can be checked by observing the detenting in the lower case compared to the upper case using a -5 character. The detent MUST enter the lower case notch EXACTLY the same as it does the upper case notch. Check by half-cycling the machine and manually withdrawing the detent. Remove the head play clockwise and allow the detent to re-enter slowly. A final check can be made by comparing the detent withdrawal timing of the upper and lower case. They must be exactly alike.

Maladjustment can cause misalignment in the lower case while the upper case remains good.

CAUTION: Be sure that the shift cam is detented at each position during the check and that the cycle shaft is properly latched at the half-cycle position.

15. Final Check - After completing the foregoing adjustments, a final check should be made to see if any refinements are necessary. Compare the coarse alignment of 0 rotate compared to +5, -1, -3, -4, -5. The band width of this group should not exceed .030" and none of the group should detent closer than .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. 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.

a. Improper detent timing

b. Malselection (popping latches)

c. Incorrect rotate spring tension or damper spring tension.

d. Binds in the typehead, upper ball socket, rotate shaft, rotate pulley, or rotate spring.

e. Binds in the compensator or lever system.

f. Loose differential mounting bracket.

g. Excessive band width or head play.

If the band width appears to be all right but the alignment is not satisfactory, check the following items:

a. Detent timing

b. Play or binds in the tilt or rotate detents. Side play in the rotate detent can be checked by holding down the interposer for the letter "N" so that it repeats for a full line. Move the carrier back manually and repeat the operation without indexing. The second line should cover the first line exactly. If any of the characters are shadowed, side play in the rotate detent could be the cause.

c. Loose fitting upper ball socket.

d. Excessive play in the carrier or rocker.

e. Binds in the rocker parts.

f. If the -5 characters vary horizontally, improper damper spring tension could be the cause.

g. Improper tilt adjustments can cause poor horizontal alignment by delaying the detent seating.

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 adjustment. 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.)

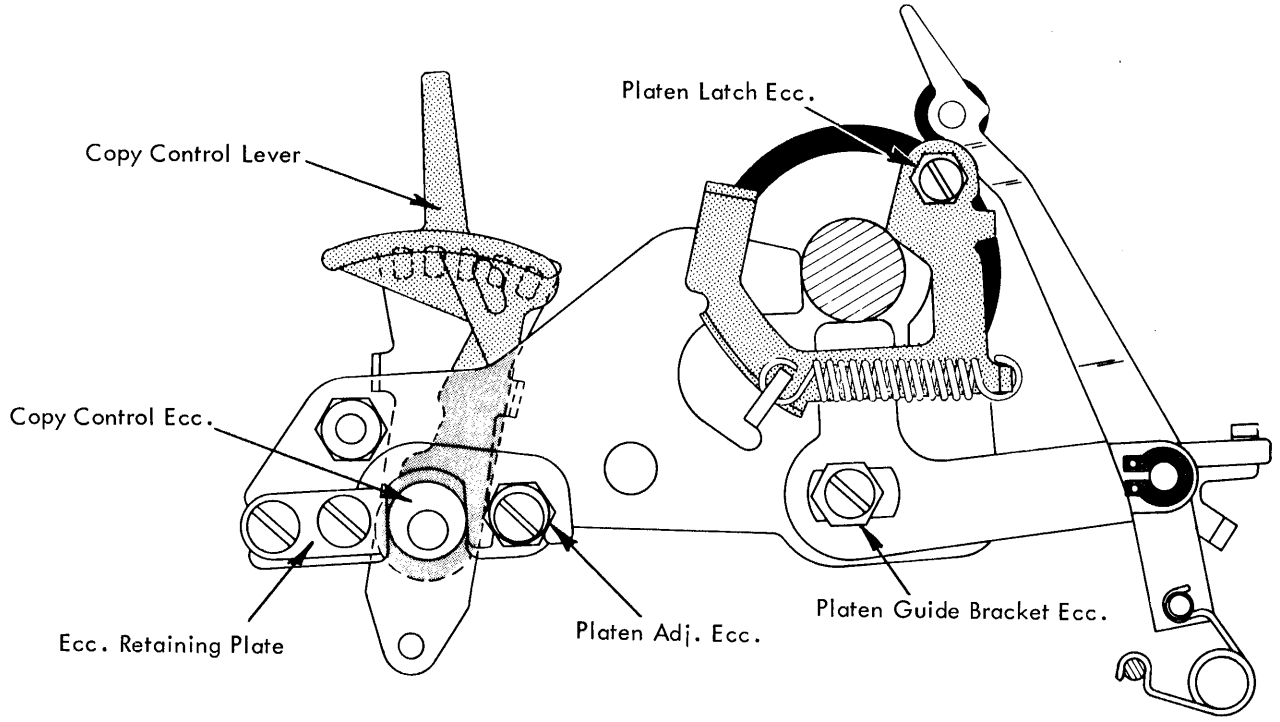


FIGURE 133. Copy Control Mechanism

PRINT MECHANISM - EARLY STYLE

1. Copy Control Lever - With the copy control lever detented in the forward position, the high points of the eccentrics should be vertical (Fig. 133). 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 back.

   NOTE: The stop ears on the copy control detent spring should be formed to provide positive detenting in the extreme front and rear positions of the lever.

   CAUTION: The adjustment of the copy control lever, while important as a preliminary setting, should not require adjustment unless it becomes loose or parts replacement is necessary. Any change in the adjustment will affect the front to rear position of the platen requiring that other adjustments be altered to compensate.

   The copy control lever should be all the way forward unless stated otherwise for the following adjustments.

2. Eccentric Retaining Plates - For maximum efficiency of the copy control eccentrics, adjust the plate on each side of the machine so that no front to rear play exists between the eccentrics and the retaining plates (Fig. 133). Be sure that no binds exist.

3. Platen Latches - Adjust the platen latch eccentrics (Fig. 133) with the high part down so that the platen is held firmly in position vertically and horizontally. The latches should latch and unlatch freely with the feed rolls released.

4. Platen Position - To properly adjust the print mechanism, the correct position of the platen must be established first and then the print adjustments made 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, it is necessary to consider them together and adjust them alternately until both are correct.

   a. Platen Height - With the head of the Hooverometer set at the #4 scribe line, the platen should just touch the base of the handle when the head is resting on the escapement rack (Fig. 134).

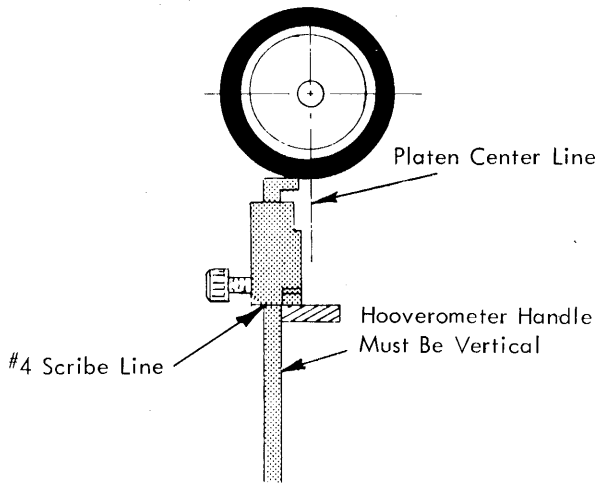


FIGURE 134. Platen Height Adjustment

   Adjust the platen guide bracket eccentrics to obtain this condition (Fig. 133). The high part of the eccentrics should be kept to the rear. It is necessary to remove the deflector and front feed rolls 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.

b. Platen Front to Rear - With the head of the Hooverometer set at the #2 scribe line, the tool should just span the distance between the platen and the print shaft as illustrated in Fig. 135. Adjust the platen adjusting eccentrics to obtain this condition (Fig. 133).

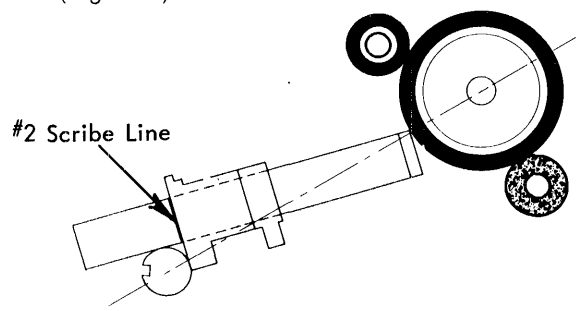


FIGURE 135. Front to Rear Platen Adjustment

Check at both ends of the platen. In order to adjust the platen adjusting eccentrics it is also 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.

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.

5. Carrier Shoe Adjustment

a. Carrier Shoe (Early) - Adjust the upper carrier shoe eccentric mounting stud to provide .001" to .004" vertical motion of the carrier at the rear (Fig. 136). Check at several points along the writing line.

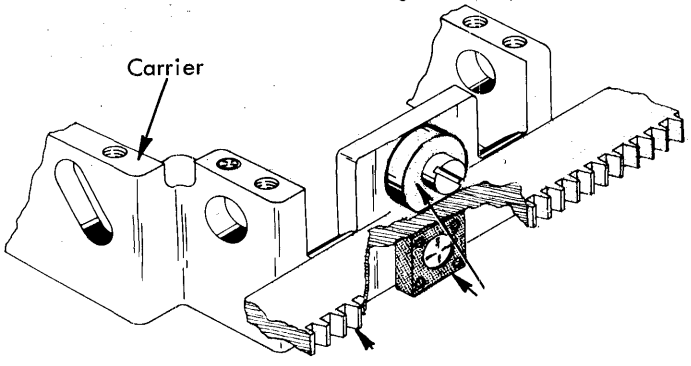


FIGURE 136. Carrier Shoe - Early

This amount of play insures free lateral movement of the carrier yet restricts the vertical movement to help prevent variation in the vertical alignment of the type.

NOTE: The eccentric is accessible with the 3" 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.

b. Carrier Shoe (Late) - Adjust the upper carrier shoe eccentric mounting stud to provide .002" to .006" vertical motion of the carrier at the rear (Fig. 137) when the spring load on the upper shoe is suppressed.

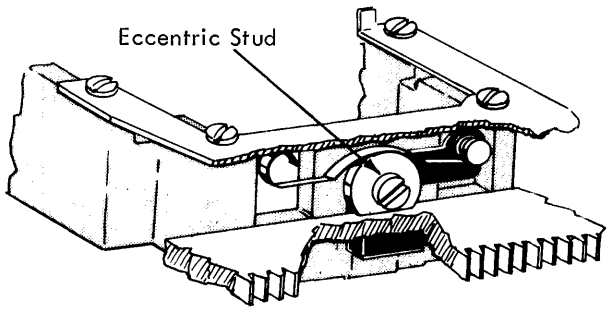


FIGURE 137. Carrier Shoe - Late

NOTE: The vertical motion may be felt by firmly moving the carrier up and down at the rear, so as to overcome the effects of the spring load on the upper shoe.

6. Velocity Control Plate - The velocity control plate must be adjusted to satisfy the following two conditions.

a. 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 .260" to .270".

b. With the cam follower held lightly against the high point of the print cam, the home character should clear the platen by .020" to .030".

The copy control lever should be forward for both adjustments. These adjustments should be made with the carrier positioned in the center of the writing line. On long carriage machines the adjustments should be made with the carrier at the extreme left hand position.

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, is directly dependent upon the position of the velocity control plate pin the the forked slot of the follower (Fig. 138). Moving the pin to the front of the slot decreases the powered travel of the typehead as shown by dimension A (Fig. 138). Moving it to

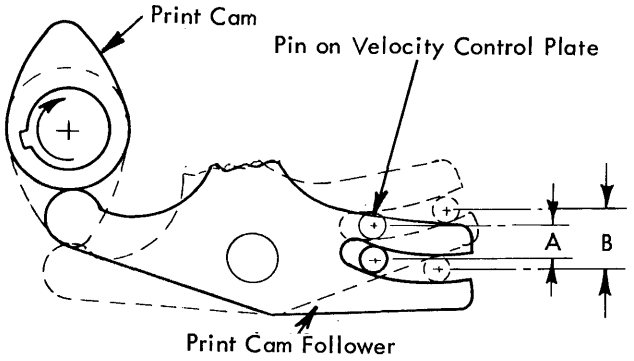


FIGURE 138. Velocity Control Plate Adjustment

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 proportional 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 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 free flight to the typehead when the amount of powered travel is changed, the velocity control plate pin must also be adjusted up or down relative to the rocker.

The eccentric shouldered nut (Fig. 139) 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 must be adjusted alternately until both are correct.

The adjustments can be made easily if the following procedure is used.

a. Raise the anvil adjusting eccentrics and the restoring cam follower eccentric to prevent any interference, and remove the ribbon feed plate for accessibility.

b. If the velocity control plate is loose or 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.

c. 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 (Fig. 139). 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 .020" to .030" away from the platen (providing the typehead with the proper amount of free flight).

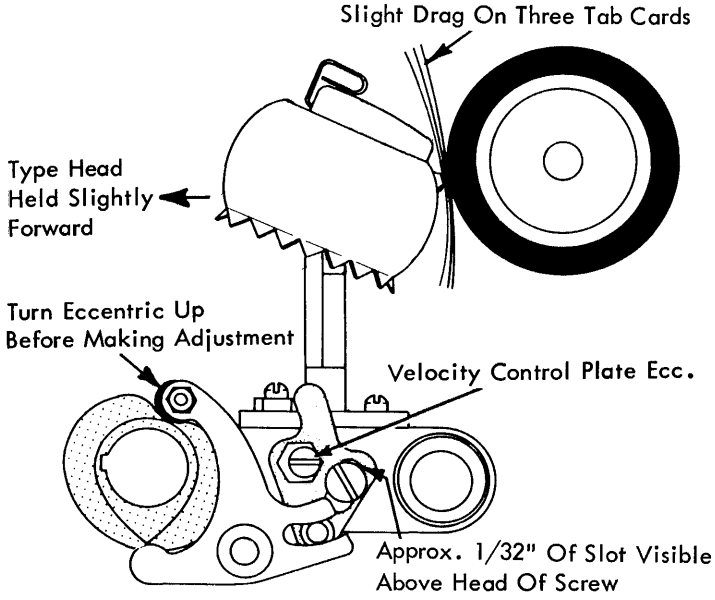


FIGURE 139. Velocity Control Plate Eccentric Adjustment

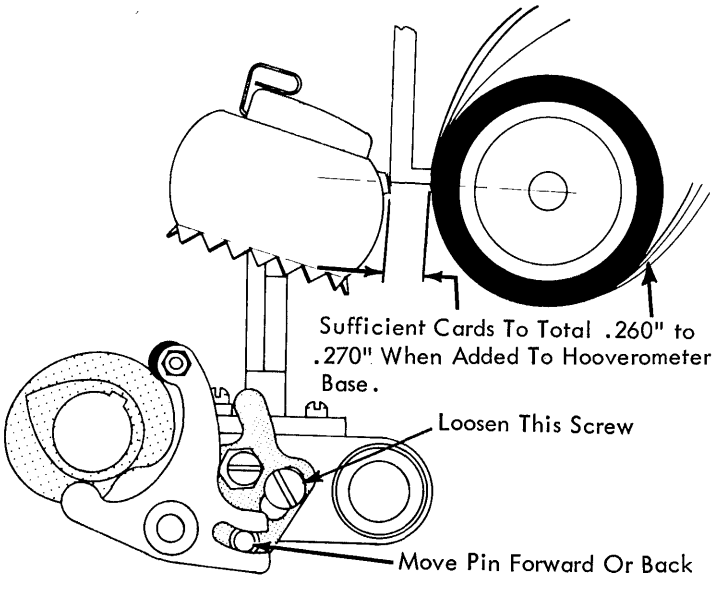


FIGURE 140. Velocity Control Plate Adjustment

d. 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 back in the cam follower slot until a clearance of .260" to .270" exists between the center of a zero rotate, zero tilt character and the platen (Fig. 140).

Since this .260" to .270" is measured between the typehead and the platen it is not a measurement of the powered travel of the typehead. The .020" to .030" free flight is included in this .260" to .270" and must be subtracted in order to determine the amount of powered travel. The powered travel must never exceed .265" as this will cause typehead breakage.

The base of the Hooverometer handle can be used as a measuring device as illustrated in Fig. 140. The handle base is about .250" thick; however they do not all 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 is determined, a thickness of tab cards should be placed around the platen that will total .260" to .270" when added to the thickness of the handle base.

e. Both adjustments must be rechecked and refined until these conditions are obtained. Be sure to tighten both screws firmly when the adjustments are completed.

NOTE: The adjustments should be checked with the ribbon removed.

These adjustments are designed to produce optimum print quality for most applications; however, a certain amount of variation in velocity is permissible in order 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.

7. Anvil - The eccentric at each end of the anvil is adjusted so that the anvil properly restricts the free flight of the typehead. The adjustment can be checked by typing a period 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 to the rear.

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 (Fig. 141).

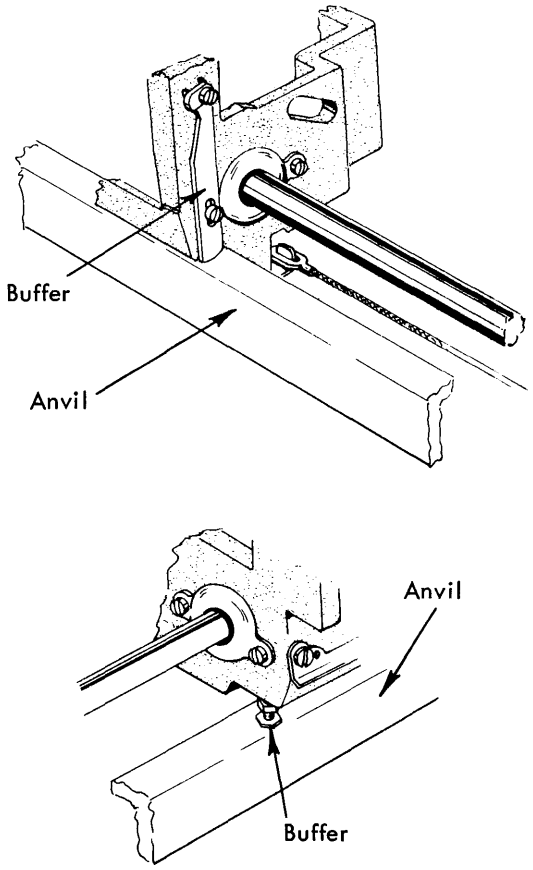


FIGURE 141. Carrier Buffers (15 Inch Machines)

The free flight must be restricted to insure that the characters will all emboss the paper to the same depth. If no restriction were applied, the smaller characters such as punctuation marks would be allowed to emboss too deeply. The surface area somewhat restricts the amount of embossing for the larger characters; thus if the free flight of the rocker is stopped at the right point, even impression between all characters will result.

CAUTION: Raising or lowering either end of the anvil will slightly affect the adjustment at the other end. Be sure to recheck each adjustment. A clearance of .010" to .045" must be maintained between the left anvil bracket and the sideframe for noise reduction purposes. Adjust the bracket left or right on the anvil to obtain the clearance (11 inch only).

8. Carrier Buffers (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 .002" to .004" clearance with the top of the anvil (Fig. 141).

9. Print Cam Follower

a. 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 set screw that is accessible from the bottom of the machine.

b. 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 (Fig. 142). Adjust the eccentric, keeping the high point forward, to satisfy the condition.

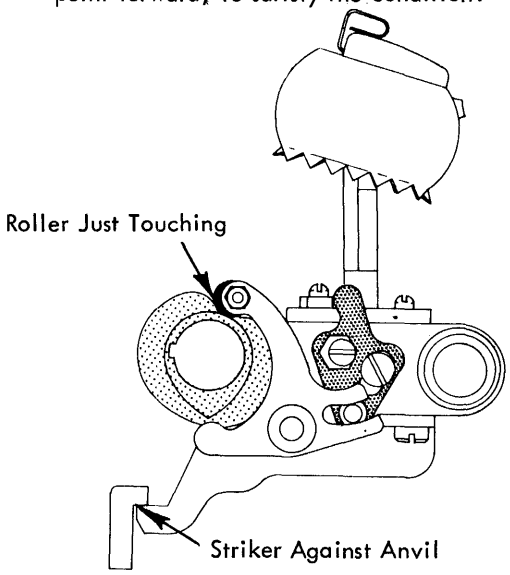


FIGURE 142. Restoring Cam Follower Eccentric Adjustment

NOTE: If the roller is too close to the restoring cam, it may bind against the cam during print shaft rotation. If too much clearance exists, the typehead may not be restored as quickly as it should and blurred characters may result.

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

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

PRINT MECHANISM - LATE STYLE

1. Adjustments one through five remain exactly the same as they appear on the early style print mechanism. After completing these five adjustments, begin here with adjustment number six.

6. Carrier Support (long carriage machines) - Adjust both ends of the support vertically to maintain .001" to .004" clearance with the bottom of the ribbon feed bracket along the entire length of the writing line (Fig. 142.1).

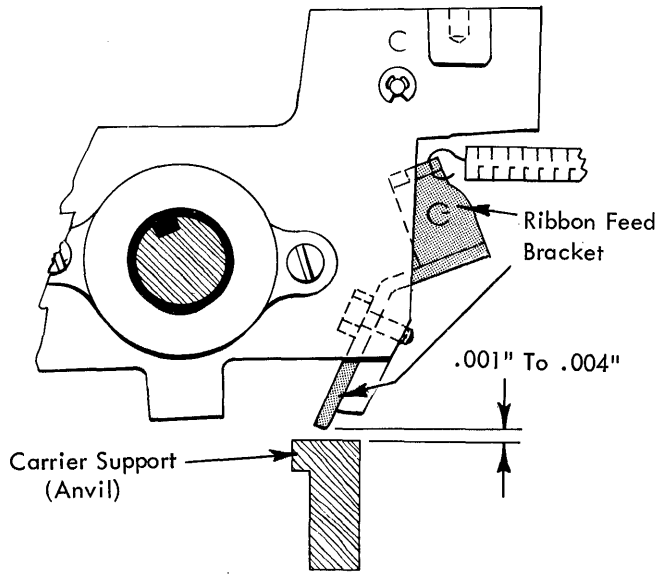


FIGURE 142.1 Carrier Support (Long Carriage Machines)

The support is secured to the machine power frame by two binding screws at each end. Elongated holes in the machine power frame enables the support to be adjusted vertically. This adjustment serves the same purpose as the carrier buffers on the early level machines.

7. Print Cam Follower Stop Screw - Adjust the cam follower stop screw so that the print cam follower roller clears the print cam by .020" when the machine is at rest (Fig. 142.2). This clearance ensures that the rocker will restore fully on every cycle. On dual velocity machines, this 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:

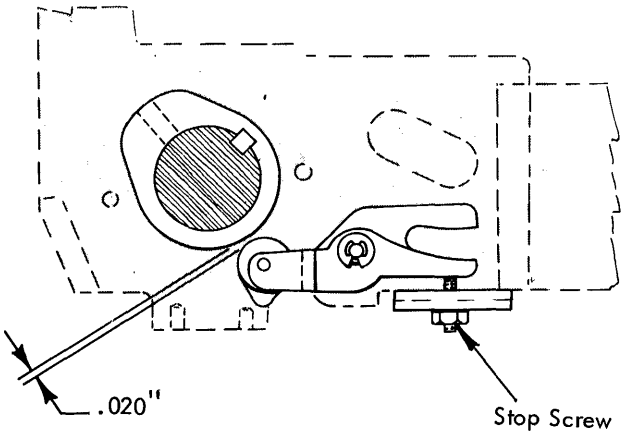


FIGURE 142.2 Print Cam Follower Stop Screw

NOTE: The following adjustments, thru and including number 11, apply only to printers with dual velocity keyboard.

a. With the machine resting on its back, 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 (Fig. 142.3).

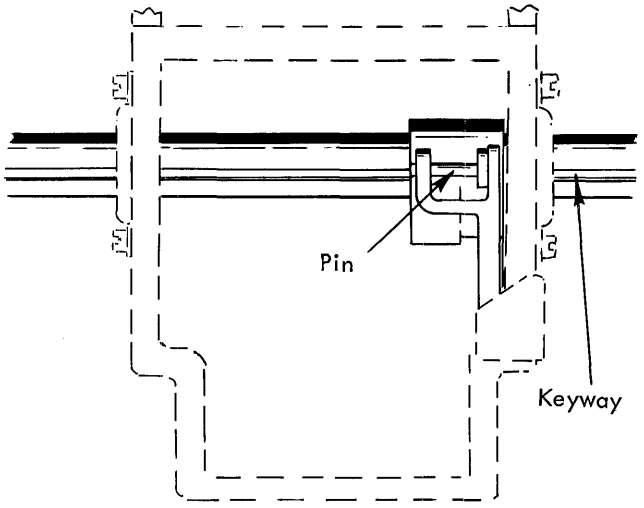


FIGURE 142.3 Keyway In Line With Roller

b. 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.)

c. With the machine resting on its back, place a .001" or .002" feeler gauge between the print cam and the follower roller (Fig. 142.4). This can be accomplished by manually holding the rocker toward the platen while inserting the feeler gauge from the front of the carrier (to the right of the carrier pointer) just above the line lock bracket. With the gauge in position, allow the rocker to come back to rest. The feeler gauge 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 gauge as it is withdrawn.

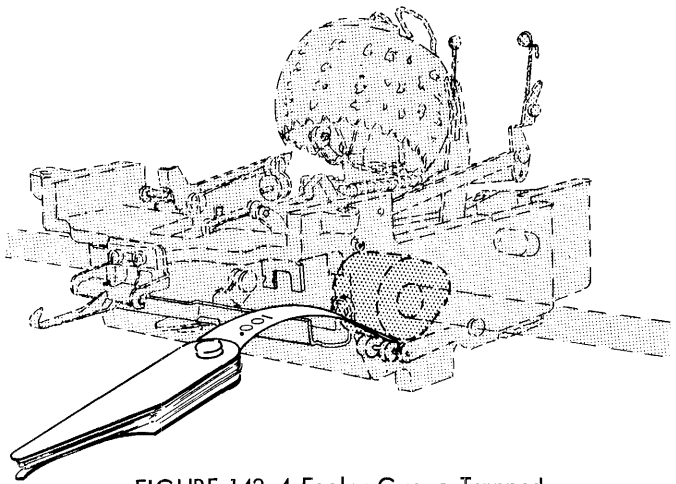


FIGURE 142.4 Feeler Guage Trapped

d. Tighten the locking nut without moving the screw.

NOTE: This adjustment may be checked by applying a light film of #17 grease on the print cam (in the area indicated in Fig. 142.5) 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" (Fig. 142.5) which is the beginning of the second low dwell on the print cam.

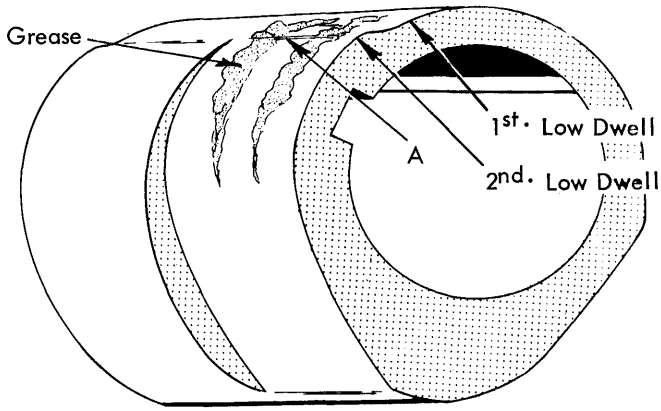


FIGURE 142.5 Roller Track In Grease

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 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. This will create excessive noise and wear along with an adverse effect on the typehead impact velocity.

If the roller track begins after point "A", the roller rests too far away from the first low dwell of the print cam and a loss in typehead velocity may result.

8. Velocity Control Cable Adjustments - The velocity control cable is adjusted to satisfy the following conditions:

a. 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 .010" recessed with the right hand edge of the clamp (Fig. 142.6). This adjustment prevents the yoke actuating lever from choking off against the cable sheath.

b. Carrier Cable Guide - Position the cable guide horizontal and as high as possible without binding the cable against the carrier (Fig. 142.7). This adjustment holds the cable up as high as possible yet allows it to slide freely front and rear as the carrier moves along the writing line.

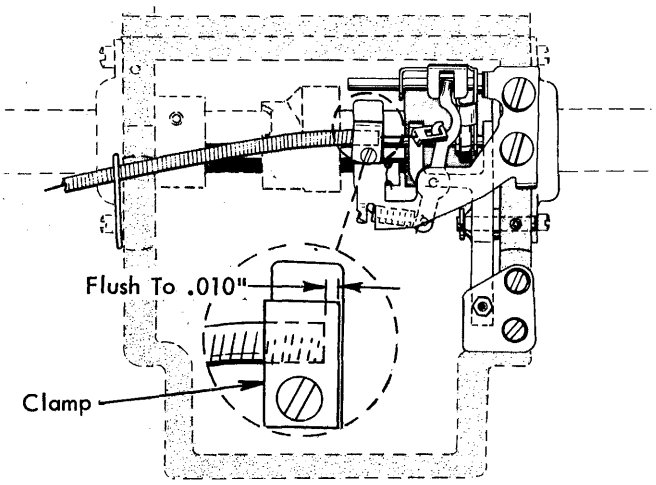


FIGURE 142.6 Carrier Cable Clamp

c. Carrier Cable Deflector - Form the deflector front or rear to prevent the cable from getting behind the carrier (Fig. 142.7). Check along the entire writing line to make certain that the deflector does not rub on the powerframe.

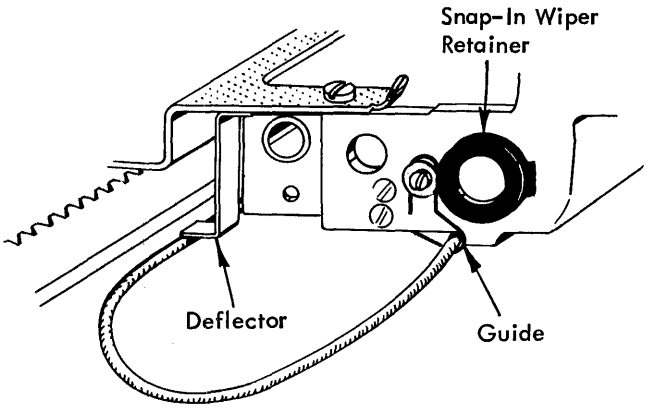


FIGURE 142.7 Carrier Cable Guide

d. Center Cable Clamp - Position the cable sheath left or right within the center cable clamp so that the bend in the cable will just touch the machine sideframe (left) when the carrier is resting two spaces from the extreme left hand margin. This adjustment allows the carrier to operate freely along the entire length of the writing line and allows the velocity control cable to operate with a minimum of flexing.

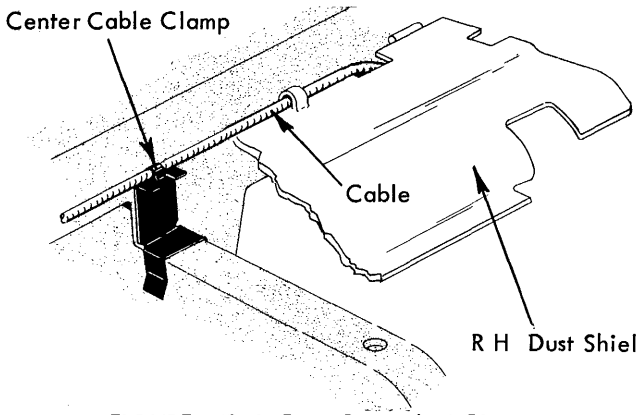


FIGURE 142.8 Dust Cover And Clamp

e. Keyboard Cable Clamp - Loosen the clamp screw (Fig. 142.9) and move the cable sheath forward or back under the clamp to satisfy the following condition:

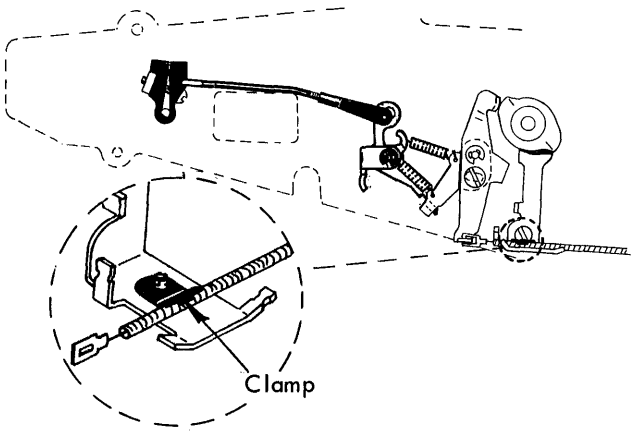


FIGURE 142.9 Keyboard Cable Clamp

When a low velocity character 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 .030" to .040" (Fig. 142.10). Moving the cable sheath to the rear will produce more motion to the roller by reducing the amount of lost motion felt within the oversized eyelets of the cable.

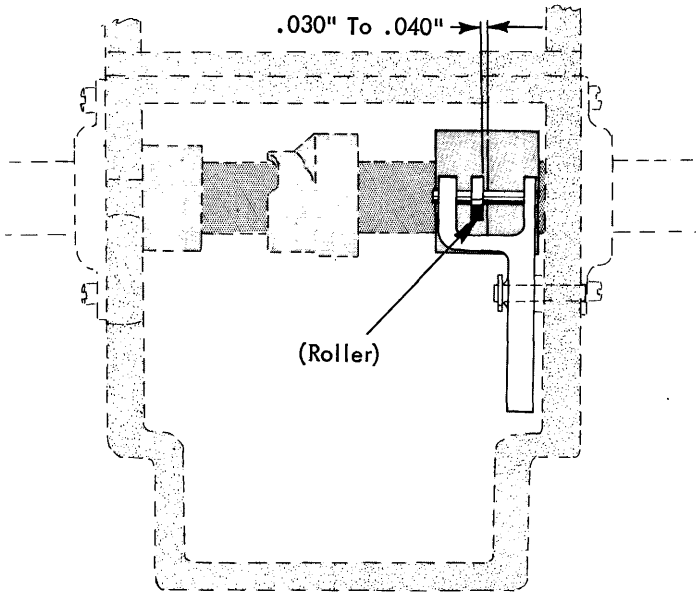


FIGURE 142.10 Roller Shifted To Low Velocity Lobe

NOTE: This adjustment may be checked by alternately cycling a low and high velocity character after applying a light film of #17 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. Make certain that the roller restores fully under the high velocity lobe when the machine is at rest.

9. Low Velocity Latch Link - Adjust the low velocity latch link (Fig. 142.11) in the following manner: 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, be sure to hold the link toward the rear of the machine so that 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.

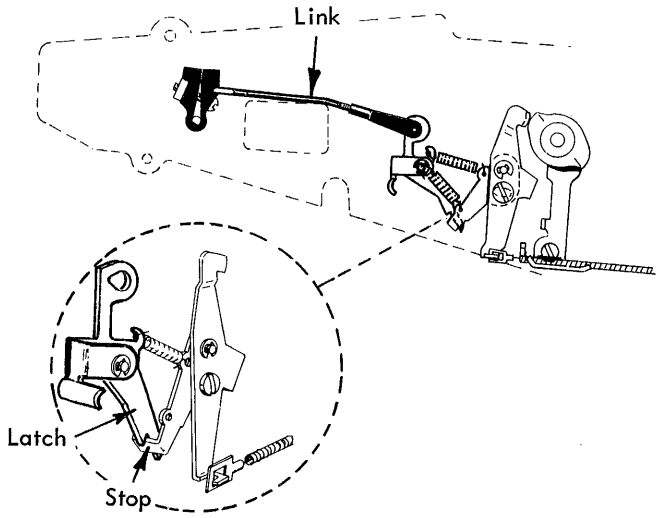


FIGURE 142.11 Low Velocity Latch Link

10. Low Velocity Cam Adjustment - The cam should be adjusted radially on the filter shaft so that the following condition will exist: When a low velocity character is slowly hand-cycled, the low velocity latch should clear the adjusting stop on the cam follower by .008" to .012" (Fig. 142.12) just as the cam follower begins to move down off the high dwell of the low velocity cam. Advance or retard the cam to satisfy this condition.

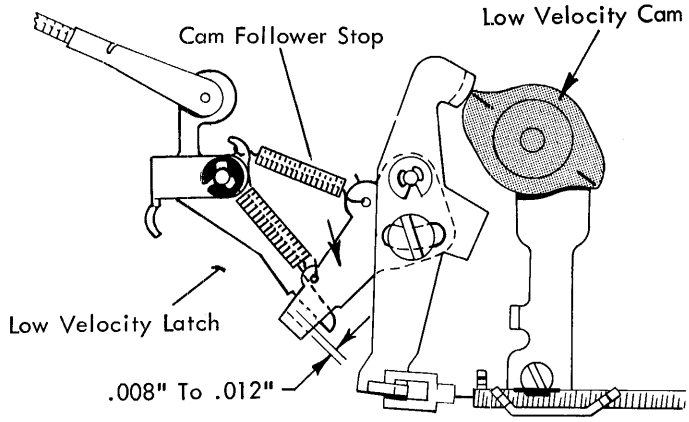


FIGURE 142.12 Low Velocity Cam Adjustment

This adjustment can be easily made in the following manner:

a. Slowly hand-cycle a low velocity character until one of the scribe marks on the cam is in line with the center of the shoe on the cam follower (Fig. 142.12).

b. Without moving the cam, loosen its set screws and then slightly advance or retard the filter shaft (within the cam) until the .008" to .012" between the latch and the stop is obtained. Advancing the filter shaft will increase the clearance; retarding will decrease it.

c. Tighten the low velocity cam set screws. Make sure that the cam does not move in relation to the follower. Also make certain that the cam is positioned laterally on the filter shaft so that it is centered between the cable anchor bracket and the shift release arm.

NOTE: This adjustment ensures that the print cam follower roller will shift to the low velocity lobe at the earliest possible time during a low velocity print cycle.

CAUTION: "Safety" - be sure to disconnect the line cord before attempting to rotate the filter shaft by hand.

11. Low Velocity Cam Follower Stop - With the cycle shaft latched at rest, adjust the stop for .008" to .012" clearance with the low velocity latch (Fig. 142.13). Loosen the binding screw "A" to make this adjustment.

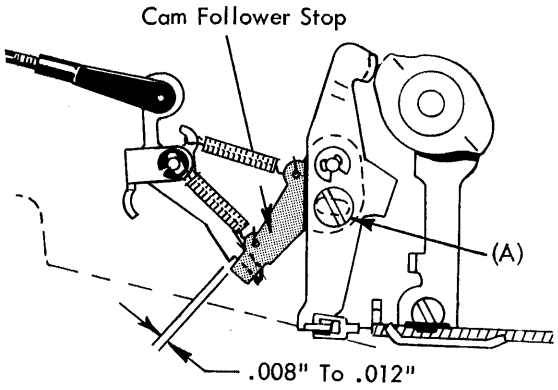


FIGURE 142.13 Cam Follower Adjusting Stop

NOTE: Too little clearance may prevent latching of the low velocity latch resulting in a continuous low velocity operation for all characters. Too much clearance might allow a slight pull to be produced on the cable during a high velocity operation which could shift the follower roller partially onto the low velocity lobe.

12. Printers Without Dual Velocity

a. Powered Travel - With the cycle shaft latched at rest and 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 .250" exists between the platen and the center of the "home" character (Fig. 142.14). This clearance may be measured with the foot of the Hooverometer which is approximately .250". When measuring the adjustment, remove the tilt ring play by depressing the typehead lightly toward the front of the machine.

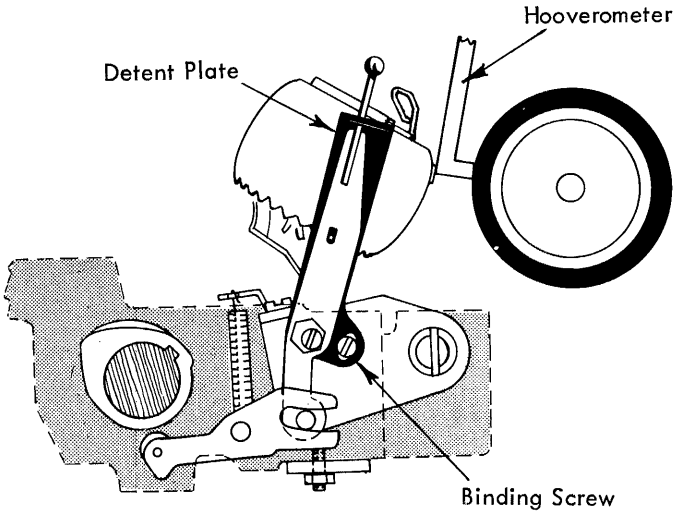


FIGURE 142.14 Powered Travel

b. Free Flight - 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 .035" of 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 (Fig. 142.15). Keep the high part of the eccentric toward the front of the machine.

13. Printers With Dual Velocity

a. Powered Travel - With the cycle shaft latched at rest and 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 back until a clearance of .250" exists between the platen and the center of the "home" character (Fig. 142.14). This clearance can easily be measured with the foot of the Hooverometer which is approximately .250". When measuring the adjustment, remove the tilt ring play by depressing lightly on the rear of the tilt ring.

b. Free Flight - 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 .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 (Fig. 142.15). Keep the high part of the eccentric forward.

NOTE: The pusher end of the large spring hook measures approximately .033" and may be used to gauge this clearance. When measuring this clearance, remove the tilt ring play by depressing the typehead lightly toward the front of the machine.

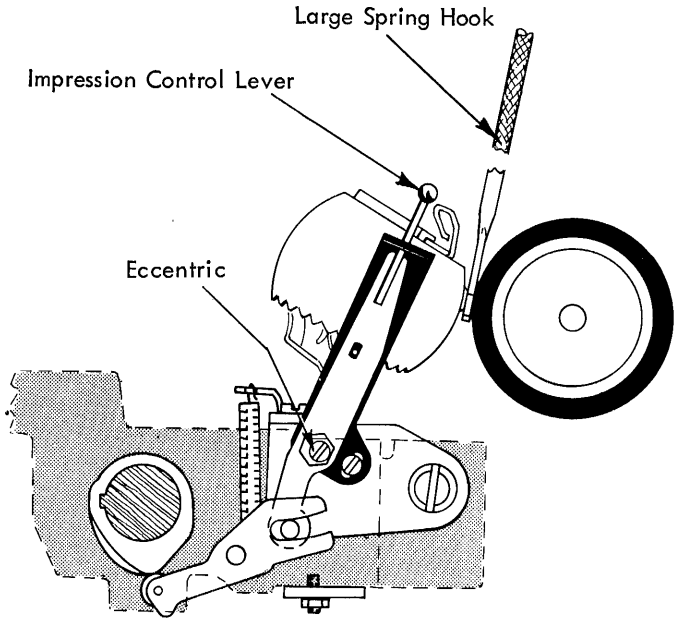


FIGURE 142.15 Free Flight

CAUTION: Each of these adjustments (powered travel and free flight) directly affect each other and must be adjusted alternately until both are correct.

14. Dual Velocity Magnet Assembly (Removed)

a. Adjust the pivot plate for .001" to .003" between the armature and the yoke with the armature attracted (Fig. 142.16). This will ensure a free armature.

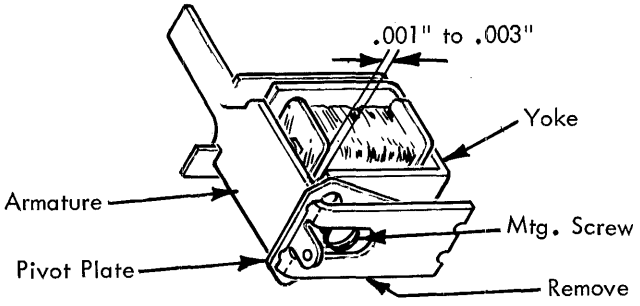


FIGURE 142.16 Pivot Plate

b. Check to see that the residual is flush against the yoke (Fig. 142.17).

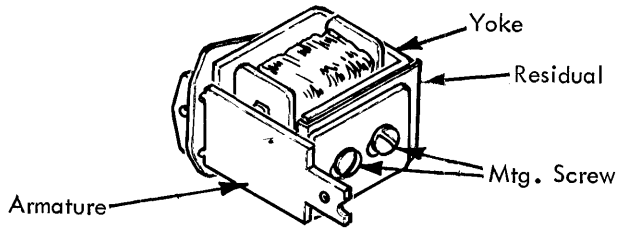


FIGURE 142.17 Residual

c. Position the backstop for .030" to .035" between the armature and yoke with the magnet de-energized (Fig. 142.18).

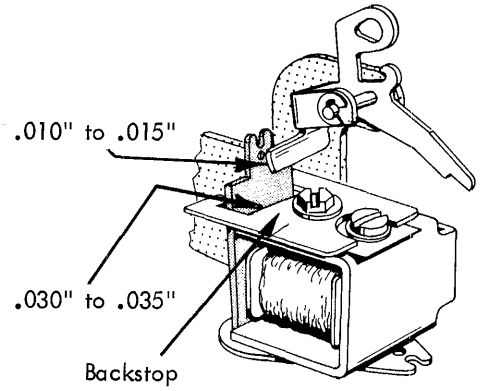


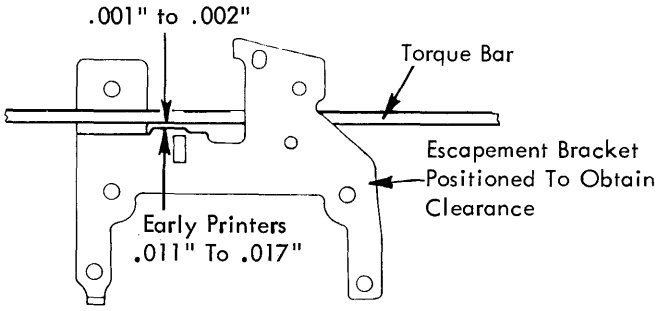
FIGURE 142.18 Dual Velocity Magnet Assembly

15. Dual Velocity Magnet Assembly (Installed) - With the armature held in a de-energized position, adjust the magnet front to rear to obtain .010" to .015" clearance between the armature and the low velocity latch (Fig. 142.18).

ESCAPEMENT MECHANISM

1. Escapement Bracket (Printers With Tab)

a. With the carrier to the left, adjust the escapement bracket front to rear so that .001" to .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 (Fig. 143). Early printers which do not have a raised area should be adjusted for .011" to .017" between the escapement bracket and tab torque bar. To aid in adjustment on 767, remove or loosen the tab torque bar support bracket.



Check Entire Length Of Writing Line
For Possible Warped Torque Bar

FIGURE 143. Escapement Bracket (With Tab)

b. With the carrier to the right, form the extension on the tab rack plate so that .001" to .002" exists between the raised area of the escapement bracket and the tab torque bar. This is the extension which supports the tab torque bar on the right side (Fig. 144). Note: This part is case hardened on early machines. Use caution when forming. Adjustment a. should be rechecked if this extension is formed.

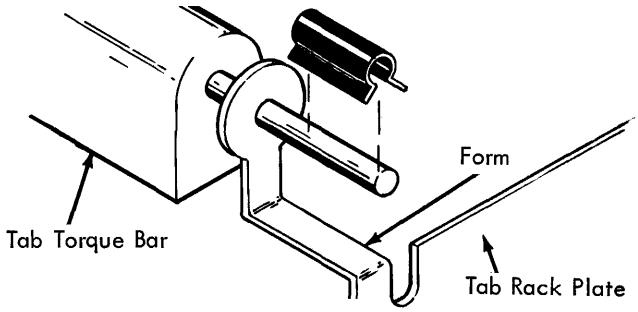


FIGURE 144. Tab Rack Plate

NOTE: 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 (Printers Without Tab) - Position the escapement bracket so that a 5" screwdriver blade spans the distance between the rocker shaft set screws and escapement bracket as shown in Fig. 145. Be sure and check both sides.

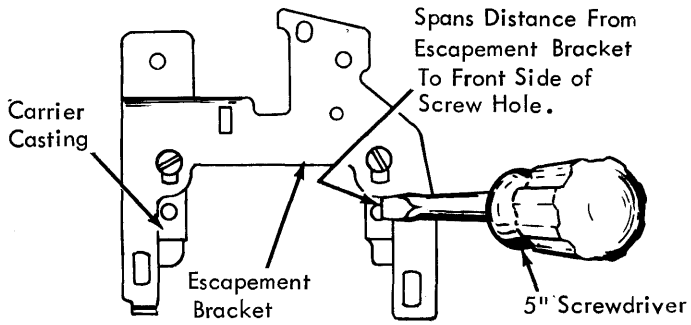


FIGURE 145. Escapement Bracket (Without Tab)

2. Escapement Torque Bar Stop

a. Late - The torque bar stop located at the right end of the torque bar should be adjusted for a rest position clearance of .008" to .010" between the torque bar and the lug on the escapement pawl (Fig. 146).

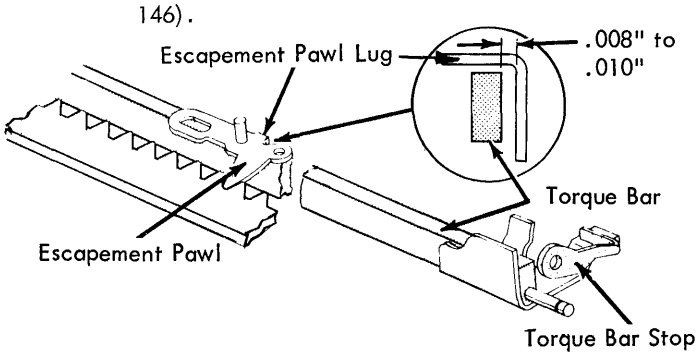


FIGURE 146. Torque Bar Stop (Late)

b. Early - Form the torque bar stop located at the left end of the torque bar so that a clearance of .002" to .006" exists between the torque bar and the lug on the escapement pawl (Fig. 147).

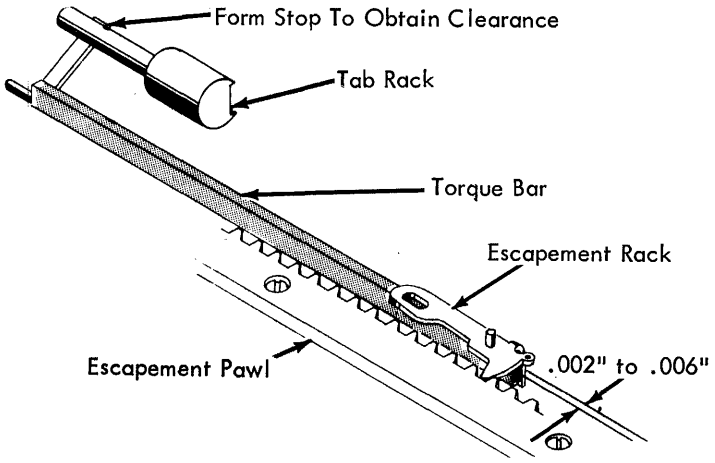


FIGURE 147. Torque Bar Stop (Early)

The escapement cam used with the new style escapement mechanism provides greater available travel for all escapement parts; therefore more clearance is permissible and desirable between the torque bar and the escapement pawl lug.

CAUTION: Make certain that the escapement trigger does 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, on long carriage machines, the torque bar back stop. Neither one of these should be touching the torque bar when the stop adjustment is being made.

3. Pawl Mounting Stud - Rotate the pawl mounting stud so that it clears the escapement torque bar by .001" at the closest point along the writing line (Fig. 148). Keep the high part of the eccentric toward the left so that the force of the torque bar will tend to tighten the stud instead of loosen it.

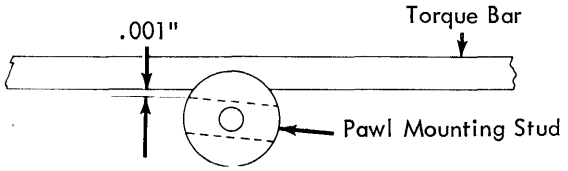


FIGURE 148. Pawl Mounting Stud Adjustment

4. Torque Bar Back Stop (long carriages only) - Adjust the back stop forward or back on its mounting stud so that there is a .001" to .005" clearance with the torque bar (Fig. 149).

NOTE: Position carrier so back stop is opposite pawl mounting stud.

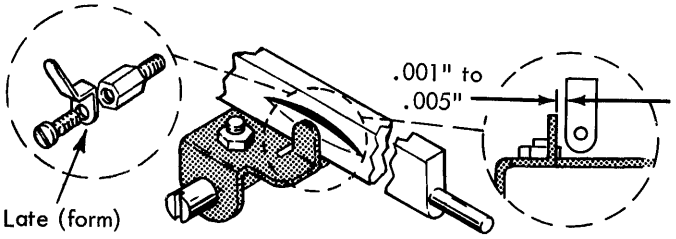


FIGURE 149. Torque Bar Backstop

For 767 adjust escapement torque bar backstops front to rear for .001" motion of torque bar between pawl mounting stud and backstops when carrier is positioned at each backstop. Position stops vertically to contact torque bar no higher than the center of lower radius of torque bar.

5. Pivot Pin Eccentric (found on early level machines only) The eccentric collar should be adjusted with the high point up so that it just touches the operational latch bracket (Fig. 150). 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 that the end play of the pivot pin will be .002" to .005".

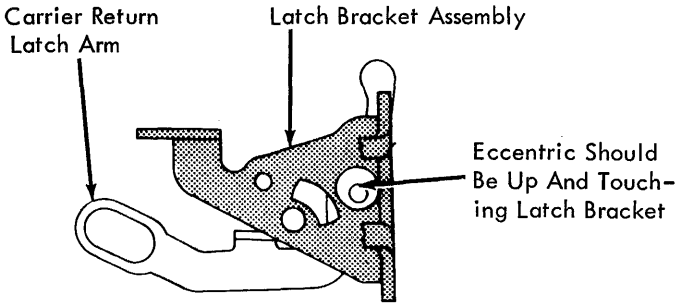


FIGURE 150. Pivot Pin Eccentric
(Early Level Machines Only)

NOTE: The eccentric may require a readjustment if the rest position of the pivot pin is changed during carrier return adjustments.

6. 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 (Fig. 151).

The cam is accessible from the top by inserting the Bristol wrench between the carrier return and backspace keylevers just in front of the margin rack.

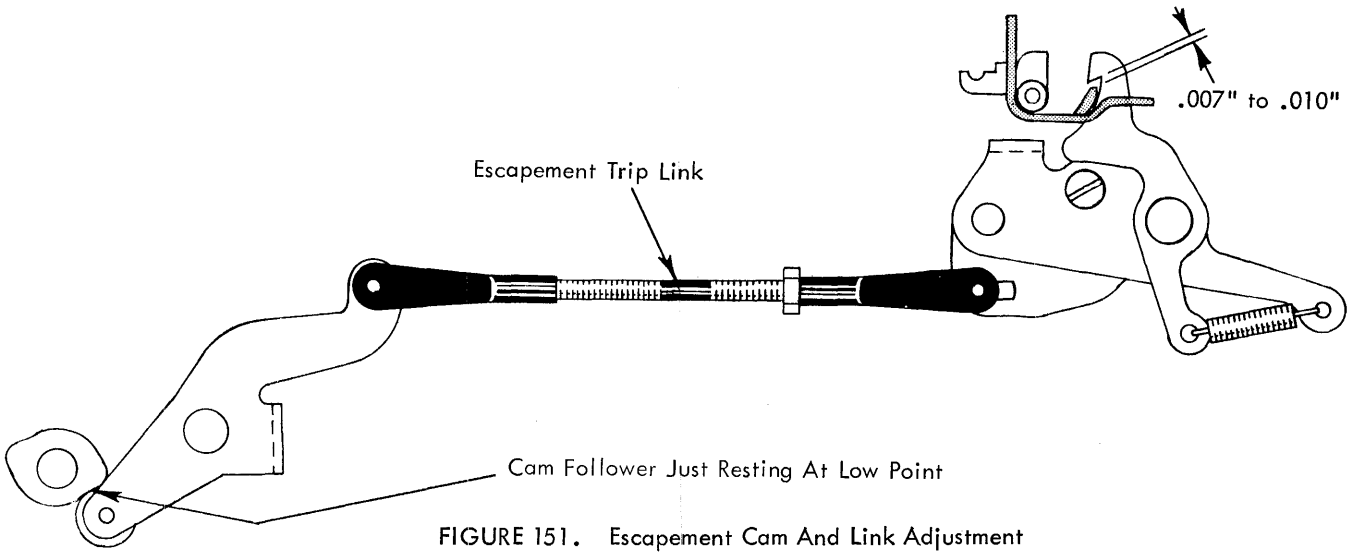


FIGURE 151. Escapement Cam And Link Adjustment

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 insure that the escapement cam is not resting past the low point. To insure 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 of the 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. The spacebar mechanism would then be disabled.

On machines equipped with the old style spacebar lockout mechanism, the lockout cam adjustment must be checked each time the escapement cam adjustment is changed. Advancing or retarding the escapement cam could allow the lockout cam to disable the spacebar mechanism.

CAUTION: On machines equipped with the old style spacebar lockout mechanism, a lateral position of the escapement cam on the filter shaft must be maintained. When the machine is at rest the lateral position of the escapement cam should allow .050" to .060" left to right movement of the spacebar lockout cam.

7. Escapement Trip Link - Adjust the trip link so that a clearance of .007" to .010" exists between the torque bar lug and the hook of the escapement trigger in the rest position (Fig. 151).

CAUTION: In adjusting the escapement trip link be sure that the trigger lever stop (if present) and the adjustable screw in the spacebar latch lever do not restrict the upward travel of the trigger lever. (Reference Spacebar mechanism adjustment #2.)

The adjustment insures that the torque bar will always be rotated far enough to trip the pawls from their racks.

If excessive clearance is present, 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 trip to occur too early in the cycle. The trip should not occur before the print action.

8. Escapement Trigger Action - Adjust the trigger guide (early style machines) or the trigger knock-off eccentric stud (late machines) so that the escapement trigger will become disengaged from the torque bar lug when the escapement pawl clears the rack by .010" to .015" (Fig. 152).

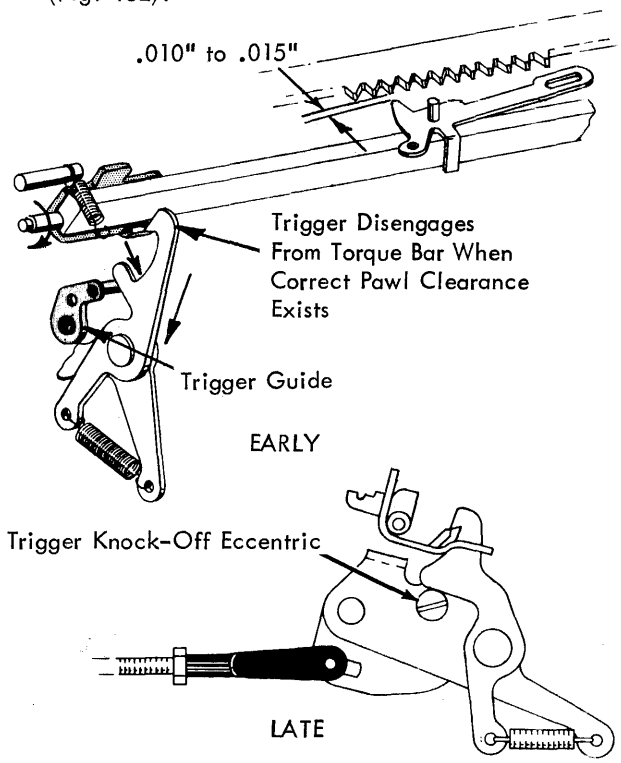


FIGURE 152. Escapement Trigger Guide Adjustment

9. Trigger Lever Upstop (long carriage machines) - With the machine at rest and a clearance of .007" to .010" existing between the trigger and the lug on the torque bar, adjust the trigger lever upstop so that it has a clearance of .001" to .005" with the trigger lever (Fig. 153).

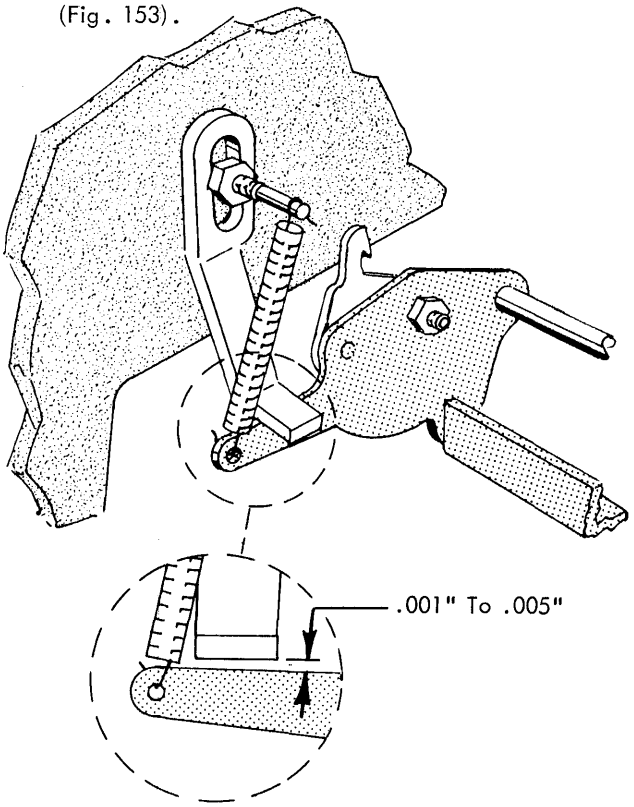


FIGURE 153. Trigger Lever Upstop (Long Carriage Only)

The trigger upstop prevents the trigger lever from bouncing as it returns to its rest position.

MAINSPRING AND CORDS

1. Gear Mesh - The proper gear mesh between the escapement cord drum and the carrier return pinion involves two adjustments. Both must be considered together.

   a. Adjust the operational shaft laterally so that the crown surfaces of the escapement cord drum gear and the carrier return pinion are even (Fig. 154). On the 11 inch machines, the position of the operational cam ratchet and the shift clutch arbor. On long carriage machines the position is controlled by a collar set screwed to the shaft and the shift clutch arbor. Be sure to maintain .002" to .004" end play in the operational shaft.

   b. The escapement cord drum gear should be adjusted forward or back to obtain .002" to .004" backlash at the point of tightest mesh with the carrier return pinion. Be sure that no binds exist throughout the travel of the carrier (Fig. 154).

   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 that no end play exists in the escapement shaft before attempting the gear mesh adjustment.

   NOTE: No attempt should be made to adjust the cord tension with the escapement cord drum because the drum is set-screwed to a flat spot on the escapement shaft.

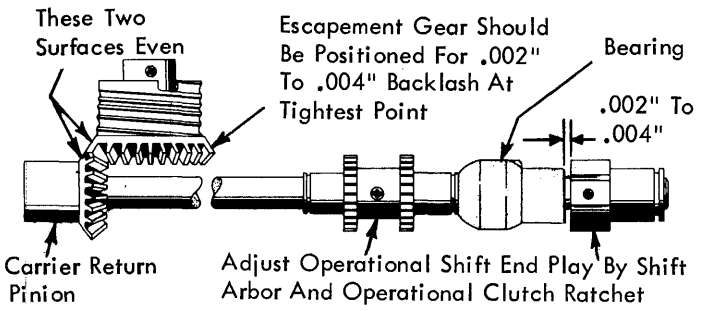


FIGURE 154. Gear Mesh And Operational Shaft Adjustment

2. Tab Governor Pinion - Adjust the tab governor pinion to have .002" to .004" backlash at the point of closest mesh with the escapement cord drum gear. Adjust the pinion by moving both the tab governor hub and collar located on each side of the pinion. The pinion should have a minimum of end play yet still rotate freely (Fig. 155).

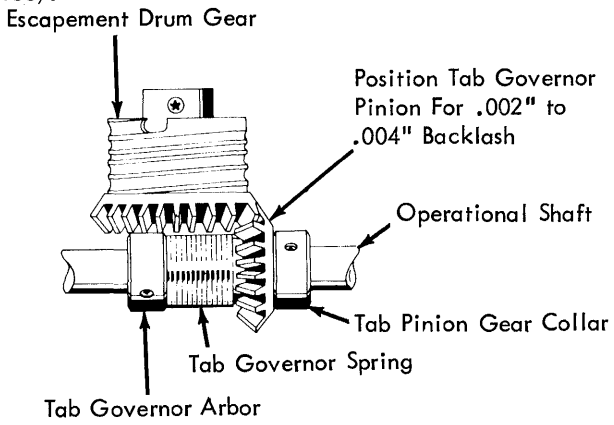


FIGURE 155. Tab Governor Pinion

3. Cord Tension - With the cords properly threaded (Fig. 156A & B) adjust carrier return drum until the flange of the right hand transport pulley is clearing side frame by 1/8 to 1/4" (Fig. 156C).

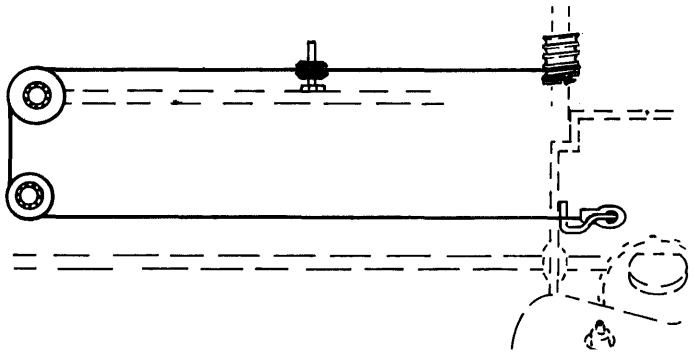


FIGURE 156A. Carrier Return Cord Threading

A time saving method of transport card adjustment may be accomplished by tying a knot in the end of the cord as close to the hook as possible.

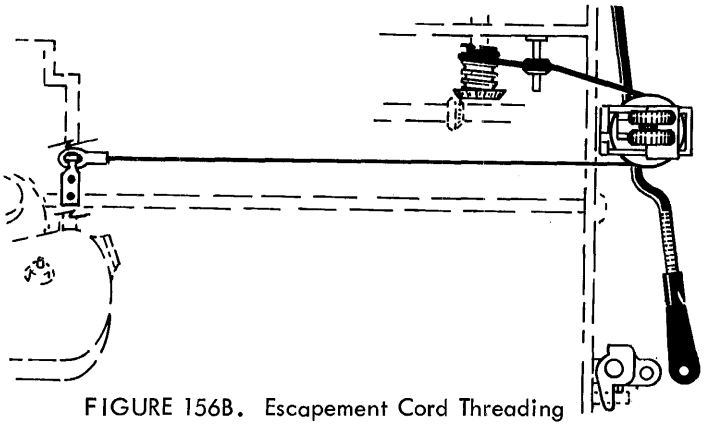


FIGURE 156B. Escapement Cord Threading

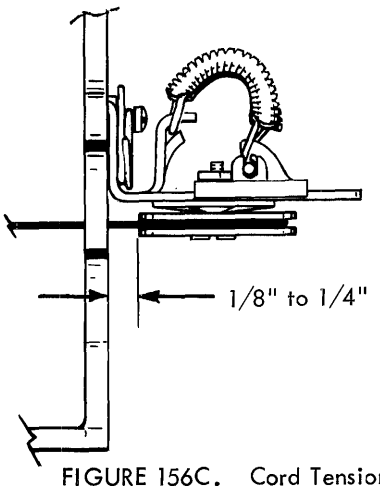


FIGURE 156C. Cord Tension

The position of the pulley insures that it will not contact the cover as it compensates for the cord stretch. Adjusting the pulley nearer the powerframe puts an unnecessary load on the cords.

CAUTION: Be sure to remove all end play from the escapement shaft before tightening the carrier return cord drum. End play is removed by holding the escapement shaft forward while the cord drum is moved to the rear against the rear bearing.

NOTE: The eccentric mounting stud 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 toward the left slightly.

4. Mainspring Tension - The mainspring tension should be 1/2 to 3/4 pounds measured at the carrier as it escapes through the line lock load at the extreme right hand margin. Adjust by turning the mainspring cage. The capacitor (if present) and the cage stop screw must be removed in order to make the adjustment.

NOTE: An approximate setting (for all machines except 100 inch mainspring) can be obtained by making 5 full turns on the mainspring with the carrier at the extreme right hand limit of its travel. On printers with 100 inch mainspring, 6-2/3 to 7-2/3 turns will be necessary. (100 inch spring has 100 stamped on mainspring cage).

CAUTION: The mainspring should be handled 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.

OPERATIONAL CONTROL MECHANISM

1. Keylever Pawl Overlap - Adjust each keylever pawl guide stud so that all the keylever pawls, except the index keylever pawl, overlap their respective interposers by .035" to .045" with both parts at rest (Fig. 157). The index keylever pawl guide should be adjusted for .040" to .050" overlap. The overlap insures proper repeat/non-repeat action.

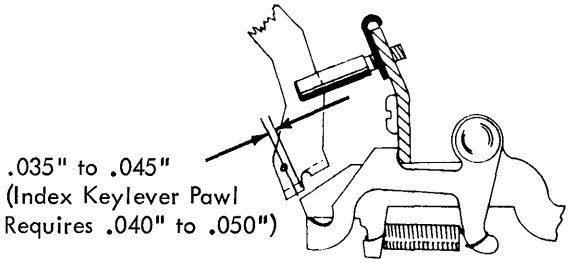


FIGURE 157. Keylever Pawl Overlap Adjustment

2. Keylever Pawl To Interposer Clearance

   a. Adjust the height of the interposers by positioning the keylever pawl guide bracket up or down to obtain a clearance of .020" to .025" between the index keylever pawl and the index interposer at rest (Fig. 158). The keylever pawl guide bracket should be kept horizontal.

   b. The adjusting slot in the carrier return, backspace and tab keylevers should be formed to obtain .020" to .025" clearance between the keylever pawl and the interposer at rest (Fig. 158).

   c. Adjust spacebar lever eccentric with the high part forward to obtain a keylever pawl to interposer clearance of .005" to .015" (Fig. 158).

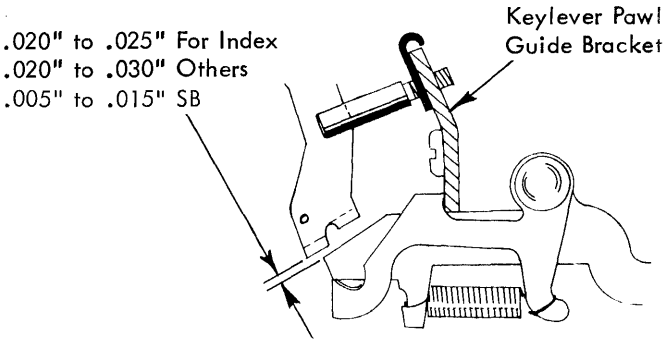


FIGURE 158. Keylever Pawl To Interposer Clearance Adjustment

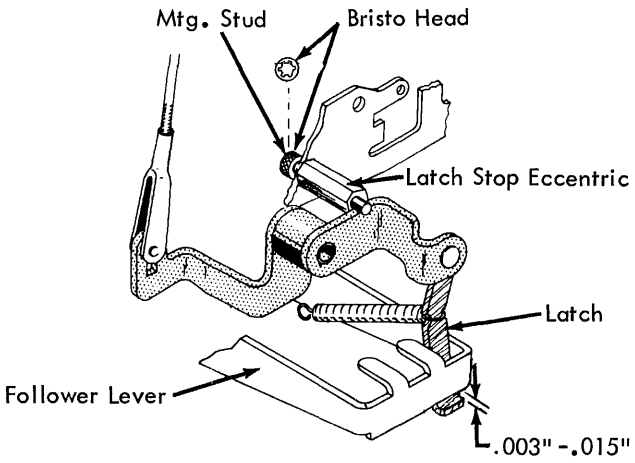


FIGURE 159A. Tab Latch Height

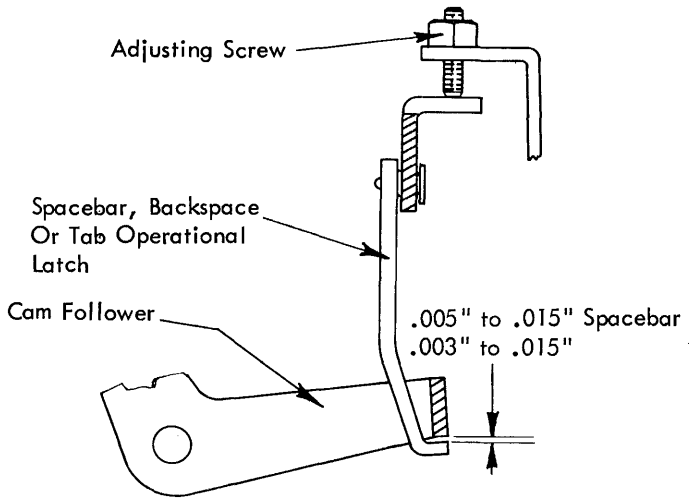


FIGURE 159B. Latch Height

3. Operational Latch Height - The adjustable latch screws (eccentric stop on tab latch Fig. 159A) for the backspace, spacebar, and tab operational latches should be adjusted so that the latches will pass under the cam follower lever with a clearance of .003" to .015" (Fig. 159B). The carrier return operational latch adjustable stop should be adjusted so that the latch will pass under the cam follower with .003" to .010" clearance (Fig. 160).

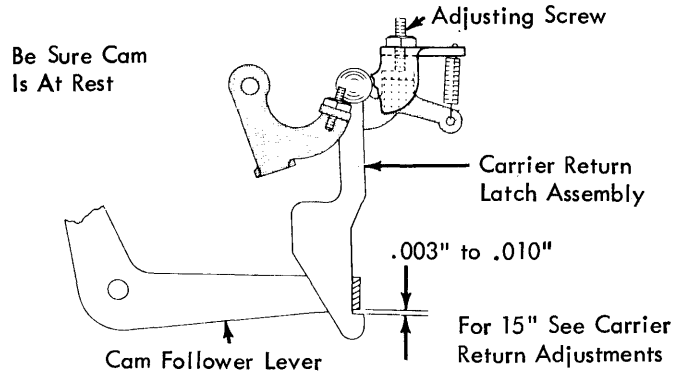


FIGURE 160. Latch Height (11 Inch)

NOTE: Be sure that the cams are at rest when this clearance is observed. The high side of the specification is preferred.

NOTE: The clearances may be observed by pulling the latches to the rear with a spring hook while the machine is at rest.

4. Interposer Adjusting Screws - Adjust the interposer adjusting screws so that a front to rear clearance of .015" to .020" exists between all the operational latches and their respective cam followers, with the exception of the spacebar latch. The spacebar latch should have a clearance of .025" to .035" (Fig. 161).

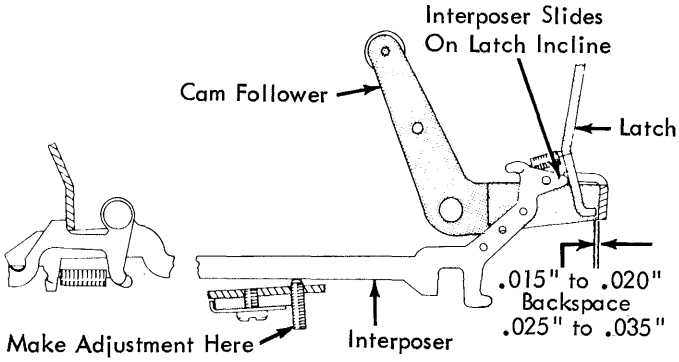


FIGURE 161. Interposer Adjusting Screw

NOTE: Machines which have the carrier return latch spring loaded to the rear (under the cam follower) should be adjusted as follows:

a. Hold the carrier return latch to the front against its interposer. (The interposer should be latched at rest).

b. Adjust the interposer adjusting screw for .035" to .045" between the latch and cam follower.

c. Release the interposer and proceed with the next adjustment.

NOTE: The operational interposer springs should be placed in the center hole at the rear of the interposer. (Fig. 164).

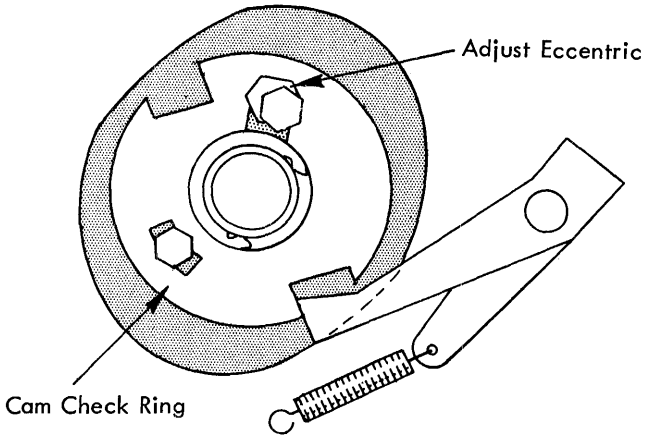
The adjustment directly affects the timing between the cam release and the positioning of the operational latches under the cam follower. Excessive clearance can allow the cam follower to move down at the rear before the latch has moved fully under the follower.

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.

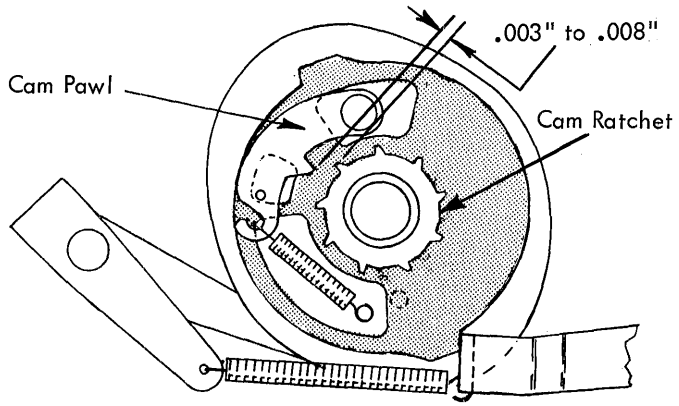
All of the operational interposer springs should be placed in the middle hole at the rear of the interposer.

CAUTION: 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 rechecked after this adjustment.

5. Cam Check Ring - Adjust the cam check ring eccentric (Fig. 162A) so that a clearance of .003" to .008" exists between the tip of the cam pawl and the teeth of the cam ratchet with the cam latched in the rest position (Fig. 162B). Keep the high part of the eccentric radially outward. The check ring mounting screws must be loosened before the adjustment can be made.



A. LEFT SIDE OF CAM



B. RIGHT SIDE OF CAM

FIGURE 162. Cam Check Ring Adjustment

The adjustment insures that the pawl will clear the ratchet and that the check ring will latch positively at the completion of each cam operation.

6. Clutch Release Arm Stop Pad (Fig. 163) - 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.

Make certain that the interposers are latched forward and are not in contact with the clutch release arms when observing this adjustment.

NOTE: On long carriage machines the operational clutch ratchet must be positioned laterally on the operational shaft so that each clutch release arm will take an equal lateral bite on its respective clutch wheel. This insures that neither clutch release arm can slip sideways off its respective clutch wheel causing an unwanted cam operation. This condition is most serious on the carrier return/index cam as it will cause an index operation to occur each time the cam is released.

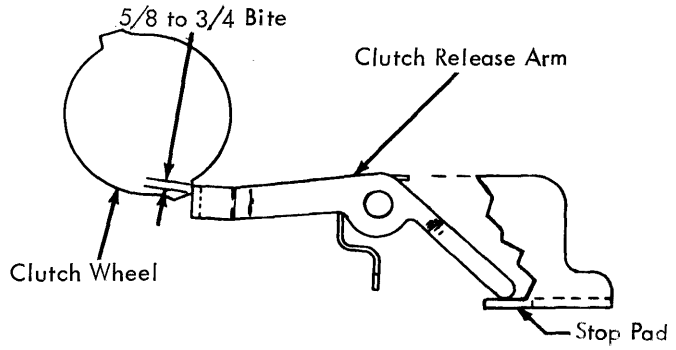


FIGURE 163. Clutch Release Arm Stop Pad

7. Clutch Release Arm (Fig. 164) - The lug at the bottom of each clutch release arm should be formed so that it clears the interposer lug by .025" to .035" on Carrier Return, Index and .035" to .045" on Tab, Backspace, and Spacebar. On 767 printer BS adjust clearance for .040" to .050".

NOTE: The interposers and cams must be latched when the adjustment is observed.

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 result in an incomplete operation. Excessive clearance could allow the interposer to reach the limit of its travel before the cam is released.

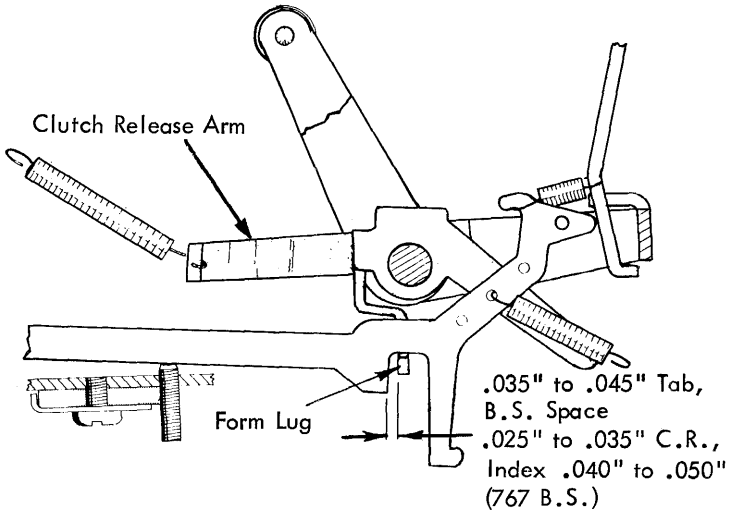


FIGURE 164. Clutch Release Arms

NOTE: The clearance may be judged with the use of the push end of the large spring hook. The end of the spring hook is approximately .035" thick.

8. Interposer Restoring Bail - Form the lug at each side of the restoring bail so that the interposers will be restored forward .010" to .030" past the latching point (Fig. 165) when either cam is operated. Be sure to check the interposers at each side and form the lug on the side being checked.

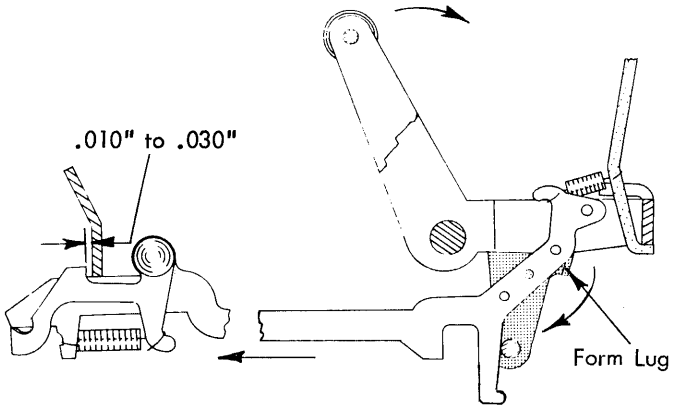


FIGURE 165. Interposer Restoring Bail Adjustment

The adjustment insures positive relatching of the interposers without excessive overthrow.

NOTE: The lugs should be formed forward or back to obtain the adjustment. Forming the lugs forward increases the throw of the interposers. Too much forming will cause them to break.

OPERATIONAL MAGNET ASSEMBLY (Early Style)

1. Tab, Backspace, and Index Magnets (Fig. 166 & 167) -

   a. Backspace Pivot Plate - Position, vertically, so that the armature (manually attracted) clears its yoke by .001" to .003" (all three screws must be loose). Position, horizontally, so that all armatures center their yokes.

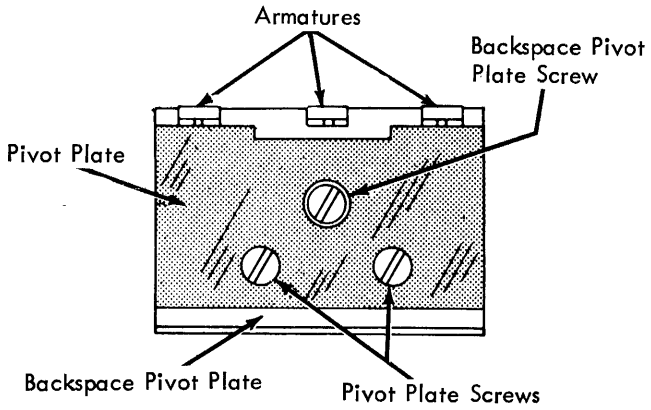


FIGURE 166. B/S Pivot Plate Location

   b. Pivot Plate - Tighten the backspace pivot plate screw and position so that the left and right armatures clear their yokes by .001" to .003".

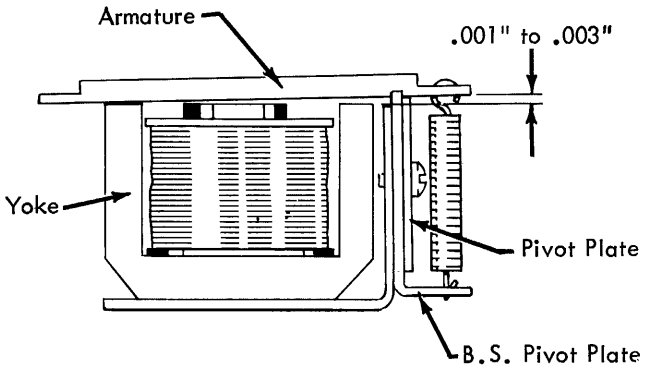


FIGURE 167. Backspace Pivot Plate

2. Carrier Return and Space Bar Magnet Pivot Plate (Fig. 168) - Position as follows:

   a. Vertically - so that the left and right armatures clear their yokes by .001" to .003".

   b. Horizontally - so that the armatures center their guide slots.

Adjustments 1 and 2 provide free operation of the armatures and prevent binding or choke-off.

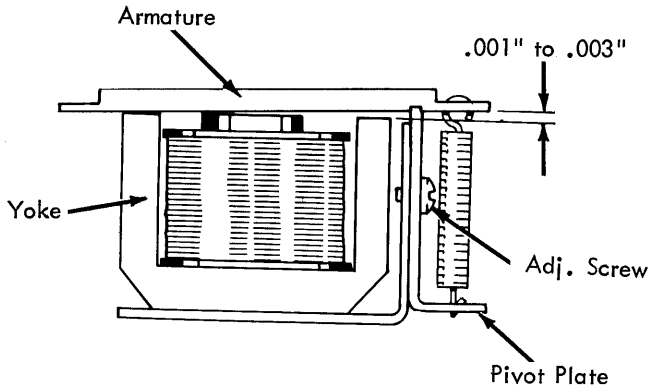


FIGURE 168. Pivot Plate

3. Armature Backstop (Fig. 169) - Position (armatures at rest) so that the armatures clear their yokes by .020" to .025".

This adjustment provides sufficient motion to unlatch the interposers and also insures the armatures will be attracted by the magnet coils when they are energized.

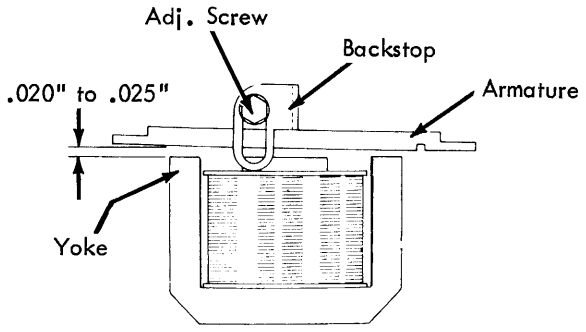


FIGURE 169. Armature Backstop

4. Magnet Unit Position - Position as follows:

a. Left to Right - so that the armatures are directly beneath their corresponding interposers (Fig. 170).

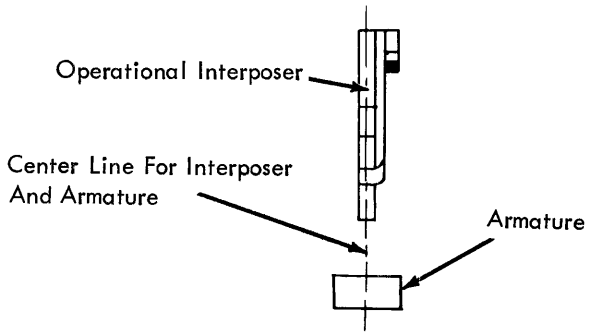


FIGURE 170. Left To Right

b. Front to Rear - so that the armature link holes are slightly to the rear of the interposer link holes (Fig. 171).

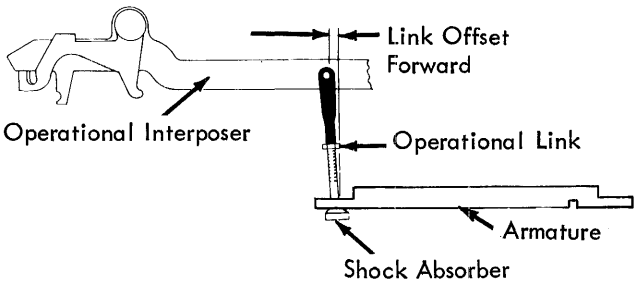


FIGURE 171. Front To Rear

Having the trip link offset insures unlatching of the interposer since the link pulls downward and also to the rear.

5. Pull Link (Fig. 172) - Adjust the operational pull links so that a .002" to .010" clearance exists between the interposer latch bracket and the interposer latch at the point of relatching.

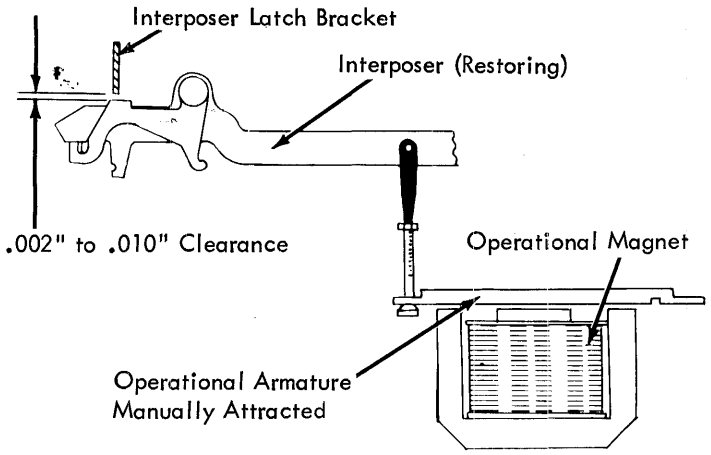


FIGURE 172. Check, Trip Link

NOTE: Test this adjustment by manually attracting the armature and turning the operational shaft so that the interposer is being restored toward the front.

With all parts at rest (Fig. 173) be sure a clearance exists between the pull link and the armature.

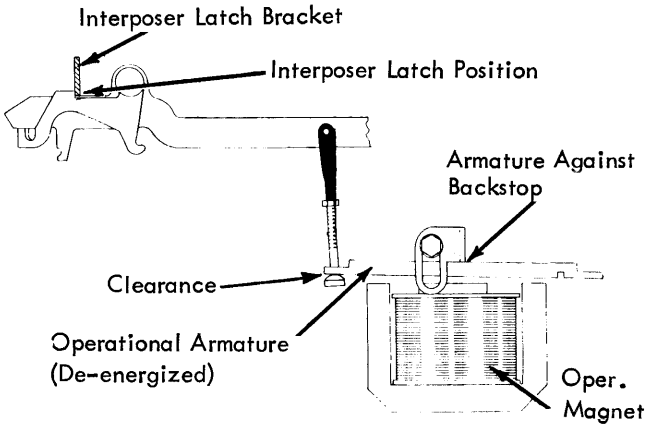


FIGURE 173. Trip Link

The pull link must be approximately 1/2 turn too long to insure that the armature is moving prior to picking up the load of the interposer. A trip link adjusted too short can cause an intermittent operation or complete failure to release.

OPERATIONAL MAGNET ASSEMBLY (LATE STYLE)

1. Pivot Plate (Late Style) All Magnets- Position so that the armatures (manually attracted) rest on the non-magnetic shim (Fig. 128.1). This will provide .001" to .003" clearance between the armature and the yoke. Early production units not incorporating this shim should be adjusted for .001" to .003" clearance between the armature and the yoke.

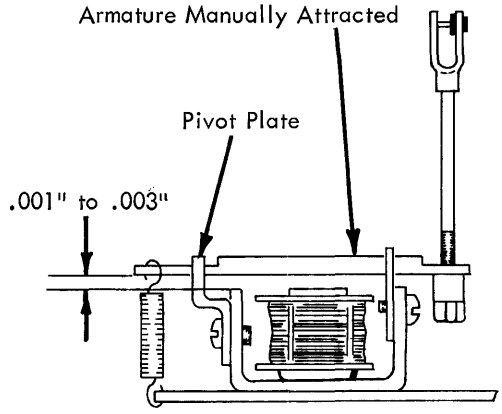


FIGURE 173.1 Pivot Plate

2. Armature Backstop (Late Style) (Fig. 173.2) -

Position, vertically, so that the armatures (at rest) clear their yokes by .020" to .025".

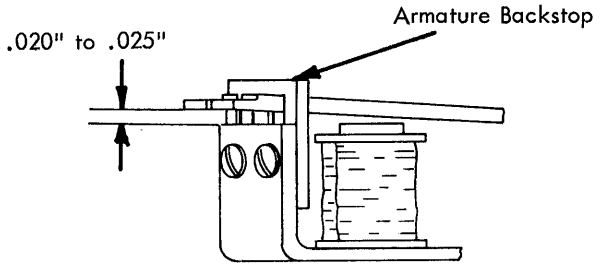


FIGURE 173.2 Armature Backstop

3. Magnet Unit Position - Position as follows:

a. Left to Right - so that the armatures are directly beneath their corresponding interposers (Fig. 173.3).

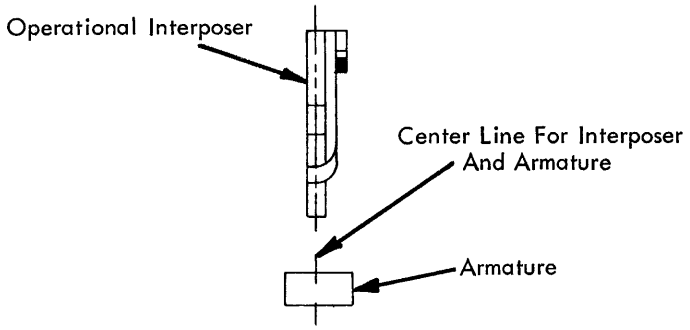


FIGURE 173.3 Left To Right

b. Front to Rear - so that the armature link holes are slightly to the rear of the interposer link holes (Fig. 173.4).

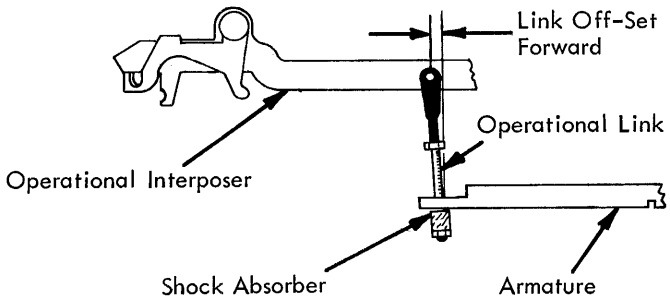


FIGURE 173.4. Front to Rear

Having the trip link offset insures unlatching of the interposer since the link pulls downward and also to the rear.

4. Pull Link (Fig. 173.5) - Adjust the operational pull links so that a .002" to .010" clearance exists between the interposer latch bracket and the interposer latch at the point of relatching.

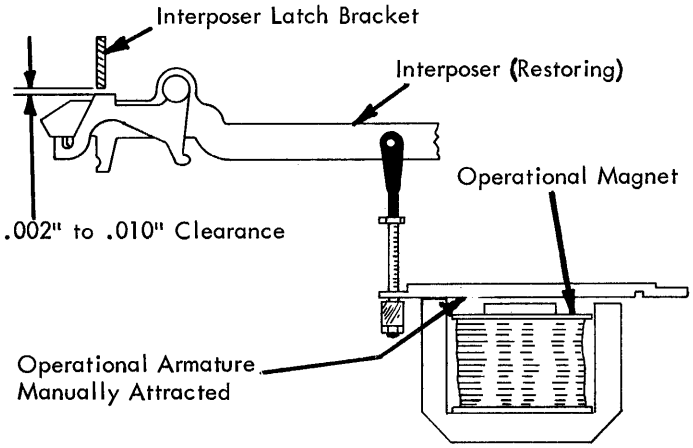


FIGURE 173.5. Check, Trip Link

NOTE: Test this adjustment by manually attracting the armature and turning the operational shaft so that the interposer is being restored toward the front.

With all parts at rest (Fig. 173.6) be sure a clearance exists between the pull link and the armature.

The pull link must be approximately 1/2 turn too long to insure that the armature is moving prior to picking up the load of the interposer. A trip link adjusted too short can cause an intermittent operation or complete failure to release.

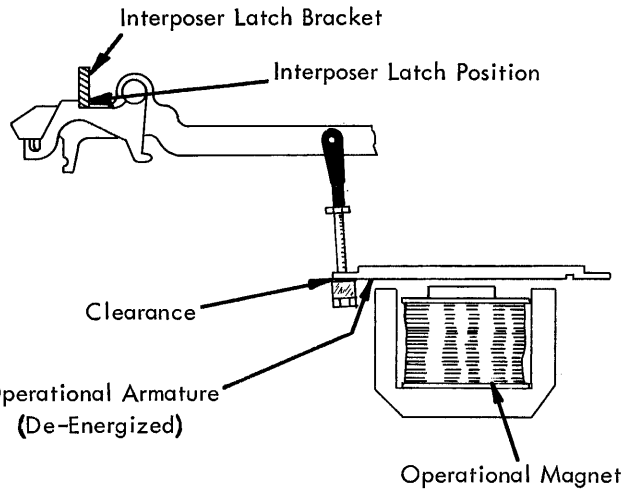


FIGURE 173.6. Trip Link

OPERATIONAL CONTACT AND LATCH ASSEMBLY ADJUSTMENTS (UNIT REMOVED)

1. Contact Strap Position (Fig. 174) - With the contacts latched, position the straps under the two mounting screws for the following conditions:

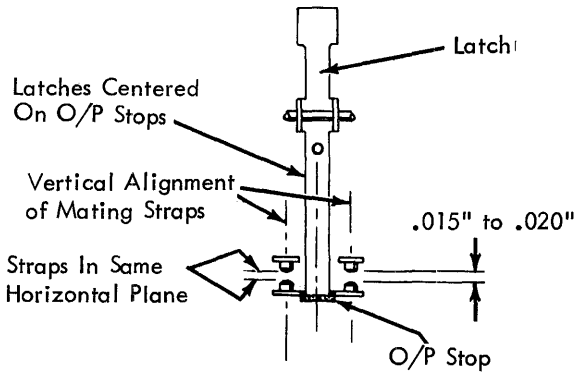


FIGURE 174. Contact Air Gap

a. Latches centered on O/P stops.
b. Vertical alignment of mating contacts.
c. All contacts of each stack must lie in the same horizontal plane (individual forming may be required.)

2. Contact Air Gap (Fig. 174) - Rotate the contact mounting bracket under its four screws for .015" to .020" contact air gap - see Fig. 175 for mounting screws.

3. Normally Open Contact Rise (Fig. 175) - With the contacts unlatched, form the N/O straps for .005" minimum rise.

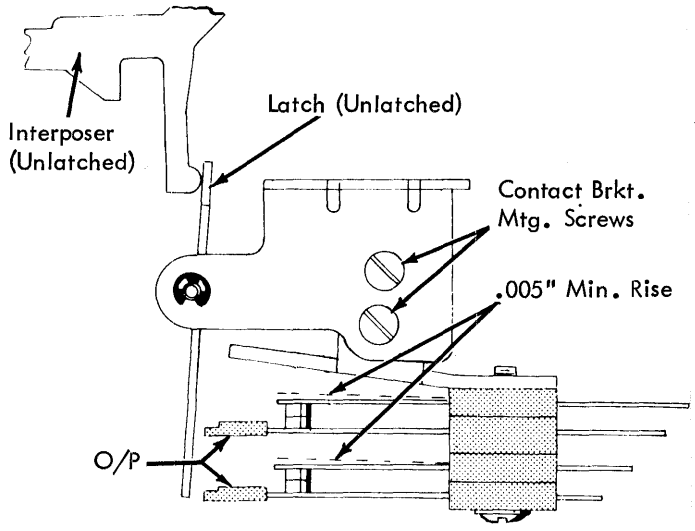


FIGURE 175. N/O Contact Rise

4. Latch Stop (Present on Late Models) Fig. 176 - Position so that the end of the O/P stops are flush with the forward latch surface.

NOTE: Form individual latches as required in the area shown in Fig. 176.

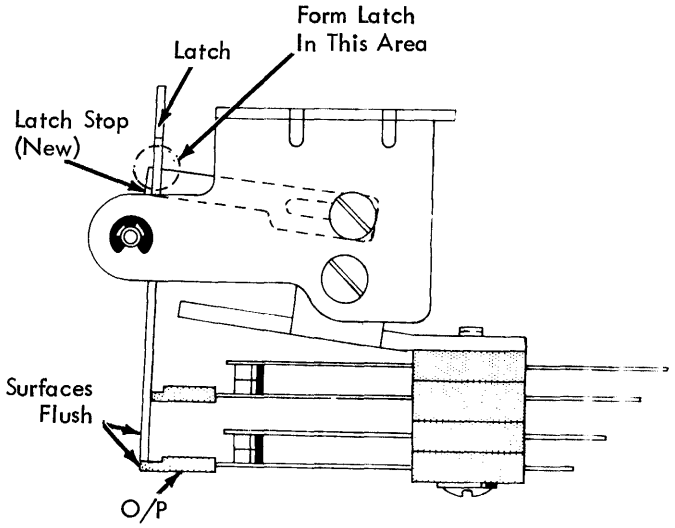


FIGURE 176. Latch Stop

OPERATIONAL CONTACT AND LATCH ASSEMBLY ADJUSTMENTS (UNIT INSTALLED)

1a. Assembly (with latch stop) Position (Fig. 177) - With the operational interposer released, position the unit (front to rear) so that the latches clear the O/P stops by .005" to .015".

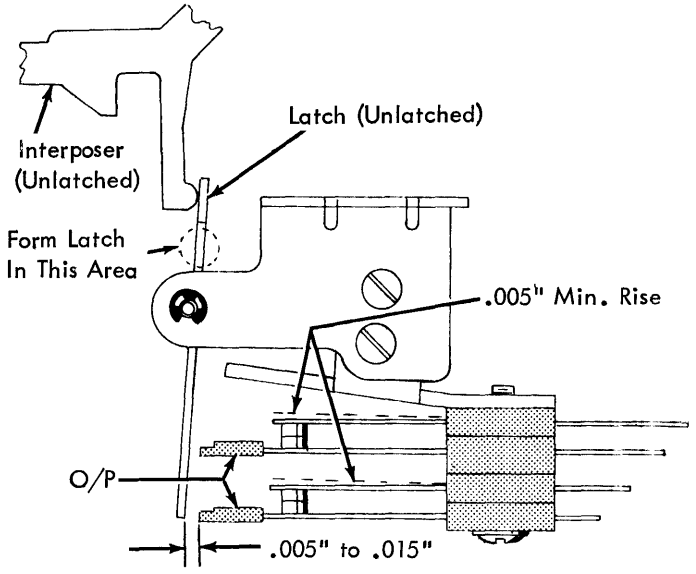


FIGURE 177. Assembly Position (With Latch Stop)

1b. Assembly (without latch stop) Position (Fig. 178) - With the contacts latched, position the assembly (front to rear) for the following inter-related conditions.

a. The latch just touches the interposer extension.
b. The forward latch surface is flush with the end of the O/P stop.

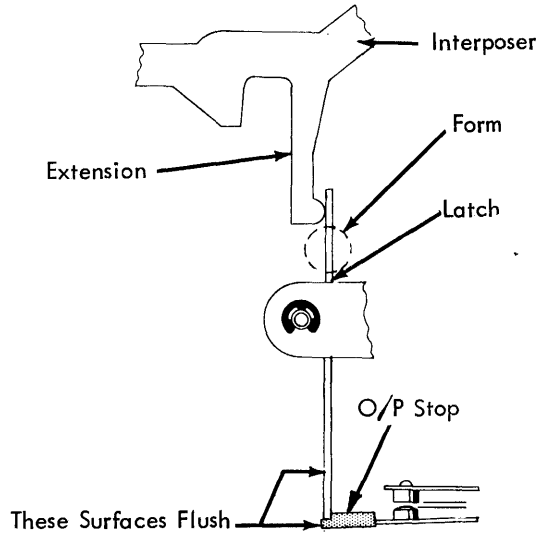


FIGURE 178. Assembly Position (Without Stop)

2. Bail Eccentric (Fig. 179) - Adjust (all operational functions restored) so that the latches clear the O/P stops by .001" to .008".

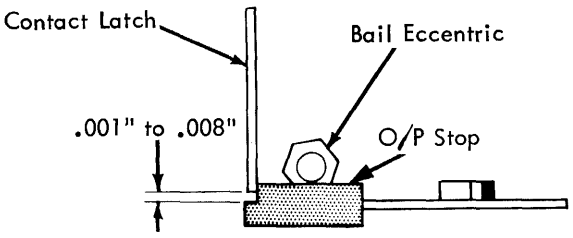


FIGURE 179. Bail Eccentric

3. Parallel Actuating Bails (Fig. 180) - Form the actuating arm slot as required to provide equal latch to O/P stop clearances where a bail actuates more than one contact.

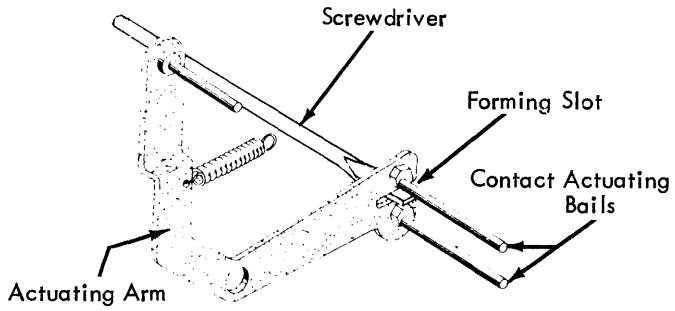


FIGURE 180. Parallel Actuating Bail

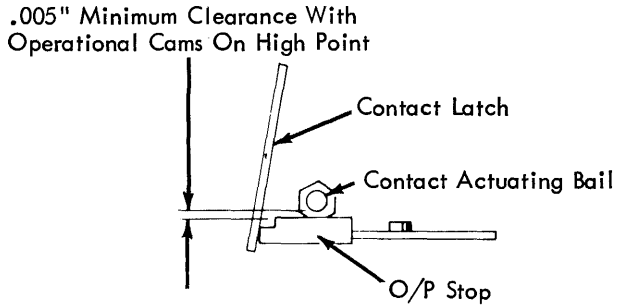


FIGURE 181. Check On Eccentric Bail

NOTE: With the operational cams on their high points, the actuating bails must clear the O/P stops by a minimum of .005" (Fig. 181).

This condition should have been satisfied by previous adjustments and is required in order to provide adequate contact rise.

OPERATIONAL CONTACT AND LATCH ASSEMBLY ADJUSTMENTS (Late Style)

1. Operational Link (Fig. 181.1) - Adjust the links (with the cams latched at rest) so that the contact actuators will have .001" to .010" travel before bottoming. This can be checked by pulling on the actuating arm and observing .001" to .010" motion of the actuator as shown in figure 181.1.

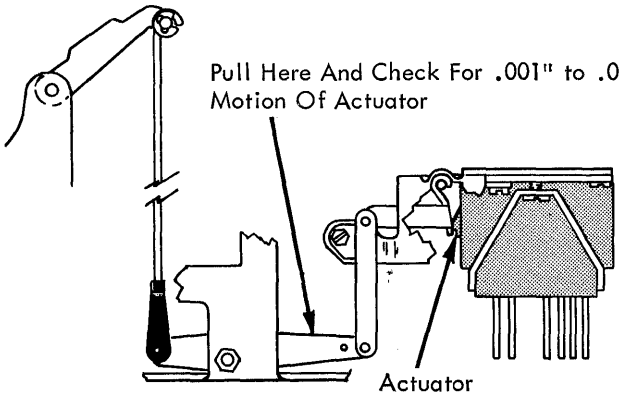


FIGURE 181.1 Operational Link

2. Contact Latches (Fig. 181.2) - Form the tails of the interposer followers so that the latches will clear the step on the actuator by .001" minumum with the interposers latched.

NOTE: The bottom of the latches should not be below the bottom of the actuator.

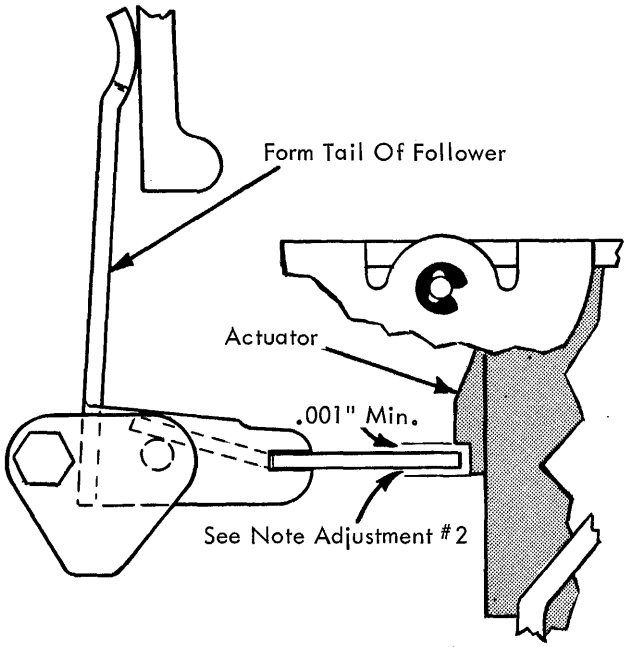


FIGURE 181.2 Contact Latches

3. Adjusting Plates (Fig. 181.3) - The actuator latch adjusting plates should be adjusted so that the actuator latches clear the rise on the actuator by .005" to .015" (With the operational cams latches at rest).

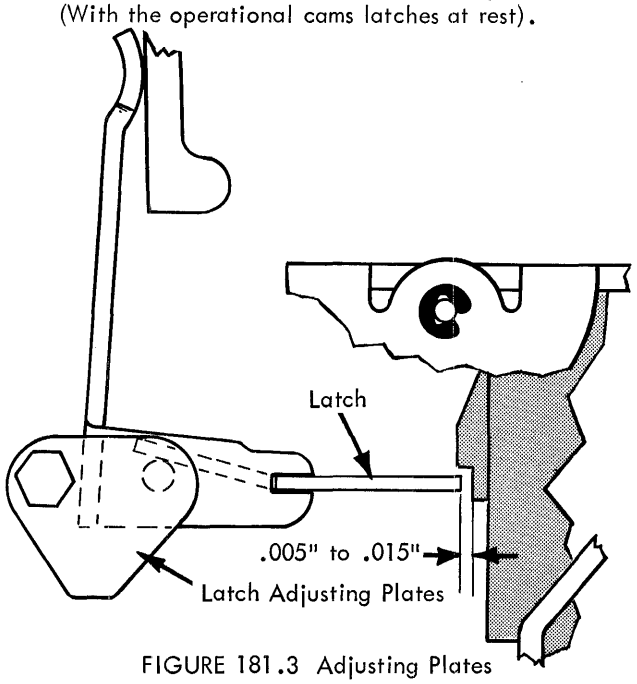


FIGURE 181.3 Adjusting Plates

OPERATIONAL FEEDBACK CONTACTS (C-5, C-6)

1. Position the O/P's centrally under the actuator tabs (Fig. 182).

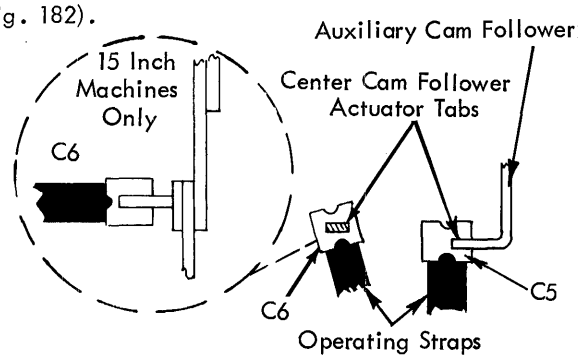
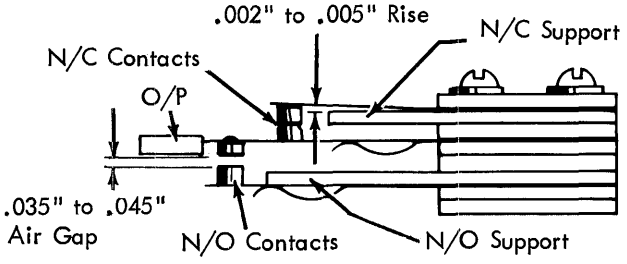


FIGURE 182. Operating Straps

2. Form the N/C supports so that the O/P's lift the N/C contacts .002" to .005" (Fig. 183).

3. Form the N/O supports for .035" to .045" air gaps between the O/P and N/O contacts (Fig. 183).



NOTE: .035" to .045" air gap may have to be altered to obtain timing.

FIGURE 183. Feedback Contacts

4. Form or adjust the contact mounting bracket (up or down) for make and break times (Fig. 183). Refer to the timing charts for contact timing and duration.

TIMING CHART

Machine	C-5 N/O Make	C-5 N/O Break	C-6 N/O Make	C-6 N/O Break
ET 731	55 ± 5	130 ± 5	170 ± 5	305 ± 5
ET 735	55 ± 5	130 ± 5	170 ± 5	305 ± 5
MTST-775	55 ± 5	130 ± 5	170 ± 5	305 ± 5

FIGURE 184. Timing Chart

SPACEBAR MECHANISM

1. All print escapement and operational control adjustments must be correct before attampting adjustments of the spacebar.

2. Spacebar Latch Lever Screw - Adjust the screw so that .007" to .010" clearance exists between the escapement trigger and the escapement torque bar (Fig. 185A). Disconnect the escapement trip link before making this adjustment.

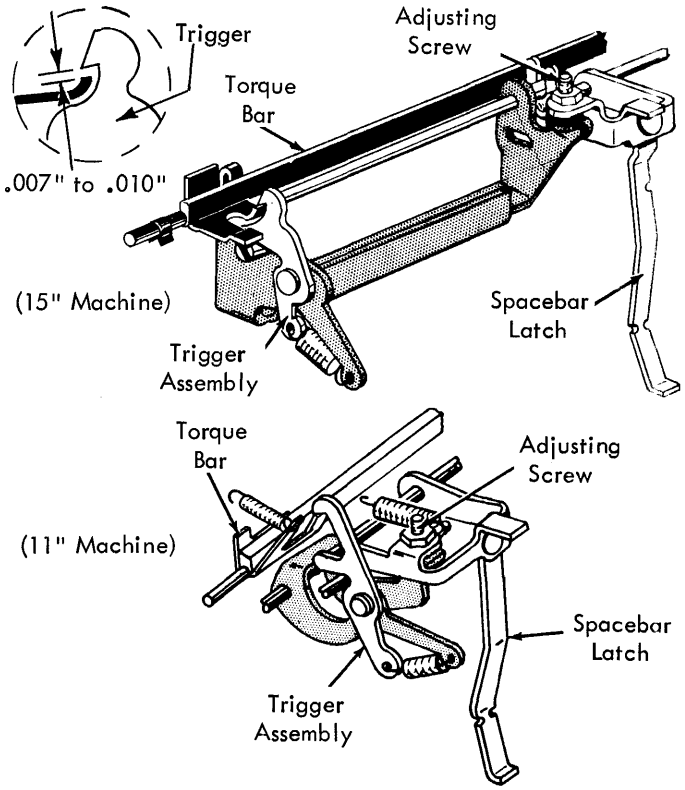


FIGURE 185A. Spacebar Latch Lever Screw

On long carriage machines the trigger upstop should be moved up out of the way when making this adjustment. After completing the adjustment the upstop should be adjusted so that it clears the trigger lever by .001" to .005" (Fig. 185B).

This adjustment insures that the trigger will properly reset over the lug on the escapement torque bar at the completion of each spacebar operation. It also insures that there will be a maximum transfer of motion from the spacebar operational latch to the trigger lever assembly, thereby placing a sufficient amount of wear potential into the system (which is felt as trigger overthrow).

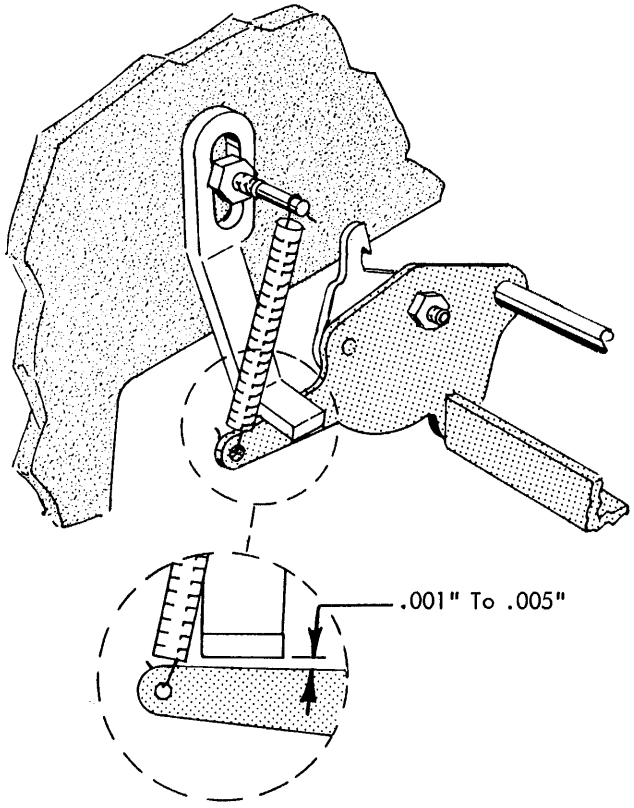


FIGURE 185B. Trigger Upstop

3. Spacebar Guide Stud

a. Early Style - Adjust the guide stud to operate freely in the spacebar stem throughout the full travel of the spacebar (Fig. 186).

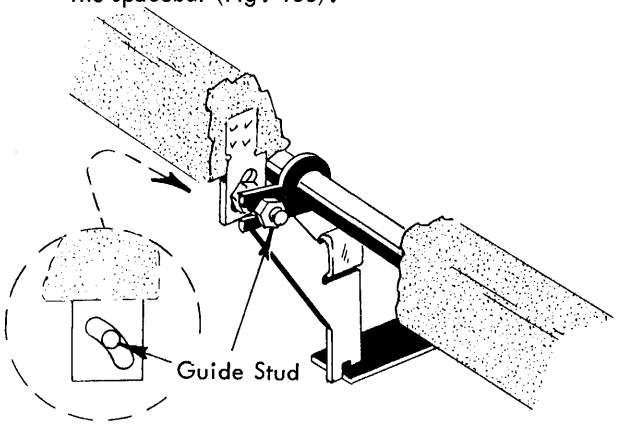


FIGURE 186. Guide Stud (Early Style)

The guide stud is accessible if the 2 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.

b. Late Style - Adjust the guide stud (Fig. 187) forward or back in its elongated mounting hole so that 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 depressed fourth row keybutton.

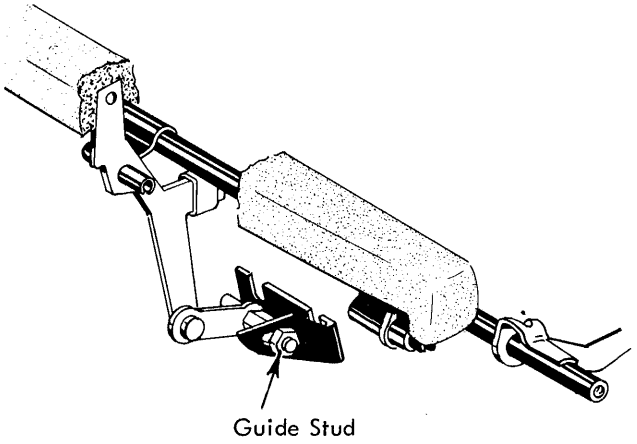


FIGURE 187. Guide Stud (Late Style)

Make certain that the guide stud mounting bracket is adiusted so that the stabilizing link on the bottom of the spacebar stem does not bind on the guide stud.

4. Spacebar Return Spring

a. Early Style - Adjust the return spring front to rear so that the top of the spacebar is level. The spring should be formed up or down so that a weight of 2-1/2 ounces will just fail to trip the spacebar interposer (Fig. 188). The medium screwdriver, which weighs 2-1/2 ounces, can be used for this check.

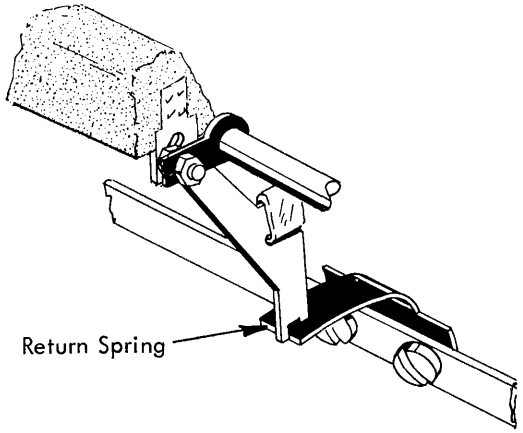


FIGURE 188. Spacebar Return Spring (Early Style)

b. Late Style - Position the spring in one of the three holes in the carrier return/backspace repeat bail so that the spacebar interposer can be tripped by a 2-3/4 to 3-1/4 ounce load (Fig. 189).

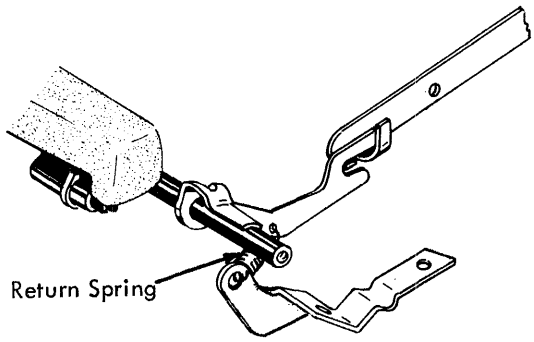


FIGURE 189. Spacebar Return Spring (Late Style)

5. Spacebar Repeat Stop (Optional)

a. Early Style - Adjust the stop to obtain .001" to .005" clearance between the spacebar repeat arm and the spacebar shaft at the time a single operation occurs (Fig. 190).

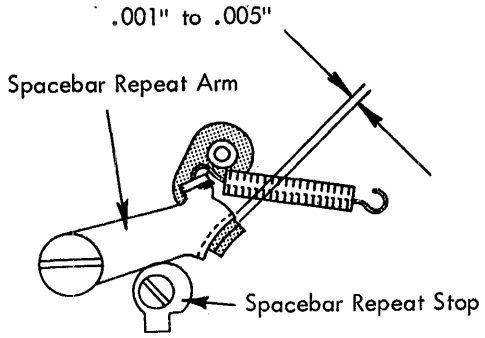


FIGURE 190. Spacebar Repeat Stop (Early Style)

b. Late Style - The spring anchor should be adjusted up or down so that .001" to .005" clearance exists between the spring and the anchor, when a single operation takes place as the spacebar is depressed slowly (Fig. 191).

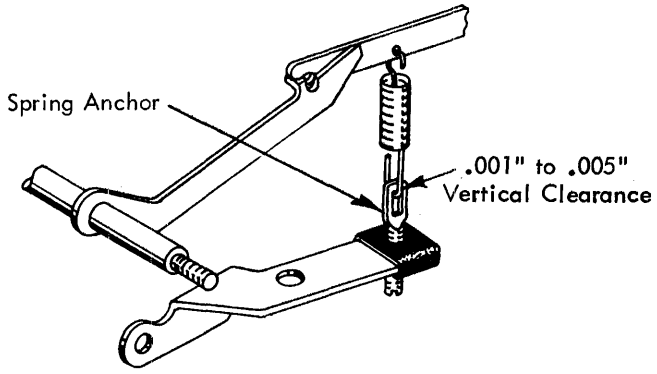


FIGURE 191. Spacebar Repeat Stop (Late Style)

6. Spacebar Final Stop - Adjust or form the stop to obtain .005" to .010" clearance between the stop and the spacebar center stem with the spacebar depressed to just trip the spacebar interposer (Fig. 192). On current level machines the final stop has been eliminated and the repeat lug is broken off the keylever pawl.

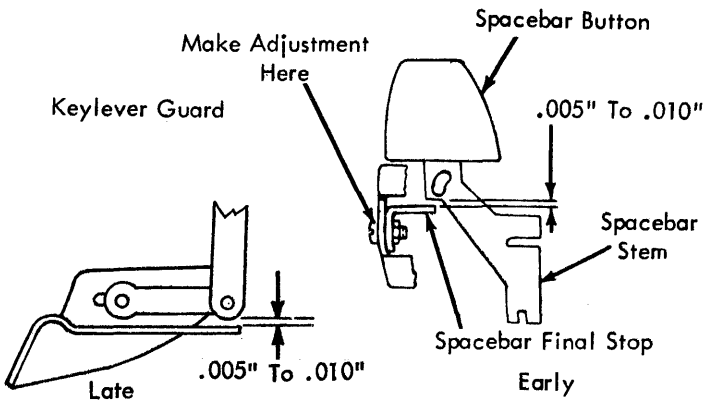


FIGURE 192. Spacebar Final Stop

7. Spacebar Interlock Mechanism (Early Style) - Perform the following adjustments:

a. 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 .050" to .060" lateral motion remaining toward the left (Fig. 193).

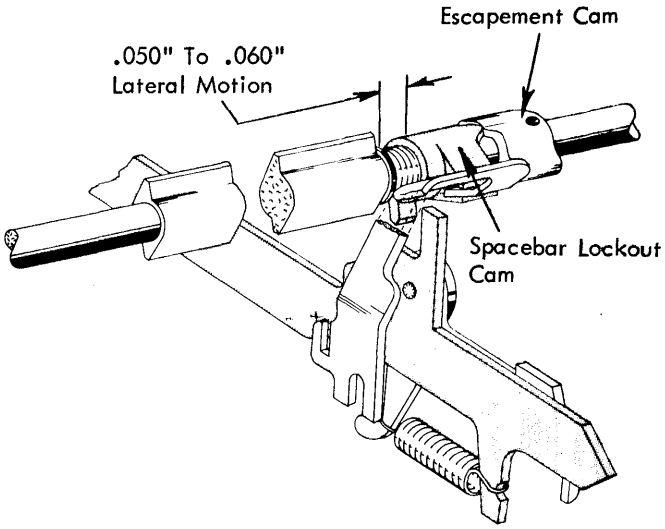


FIGURE 193. Lateral Adjustment Of The Escapement Cam

Be sure to maintain the proper radial position of the escapement cam. It should be adjusted so that 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.

b. Lockout Cam Guide - Adjust the guide up or down so that the spacebar interposer will be allowed to move to the rear .020" to .030" when the interposer is unlatched (Fig. 194). The filter shaft must be rotated until the lockout cam moves fully to the right to check this adjustment.

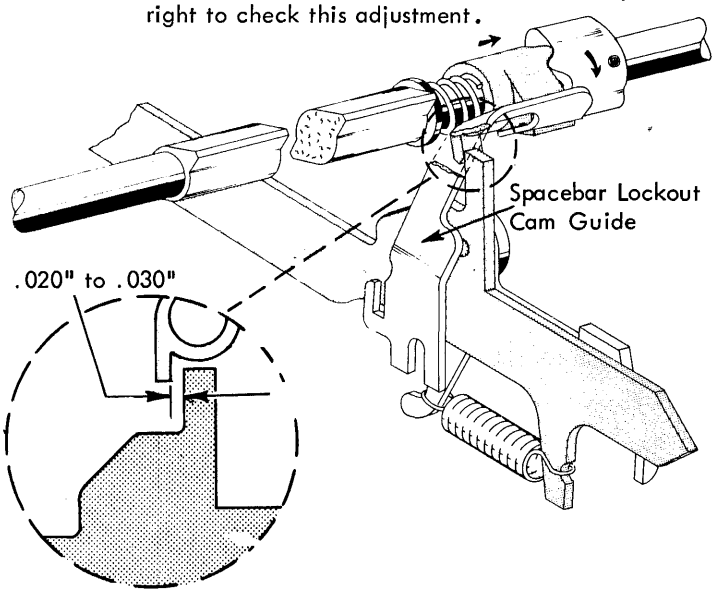


FIGURE 194. Spacebar Lockout Cam Guide Adjustment

CAUTION: Make certain that the spacebar interposer, when released and interlocked, clears the clutch release arm by .005" to .020".

c. Spacebar Interposer Guide - Adjust the interposer guide left or right to obtain .015" to .025" clearance between the interposer and the lockout cam (Fig. 195). The filter shaft should be in its rest position and the spacebar interposer released to the rear when making this adjustment.

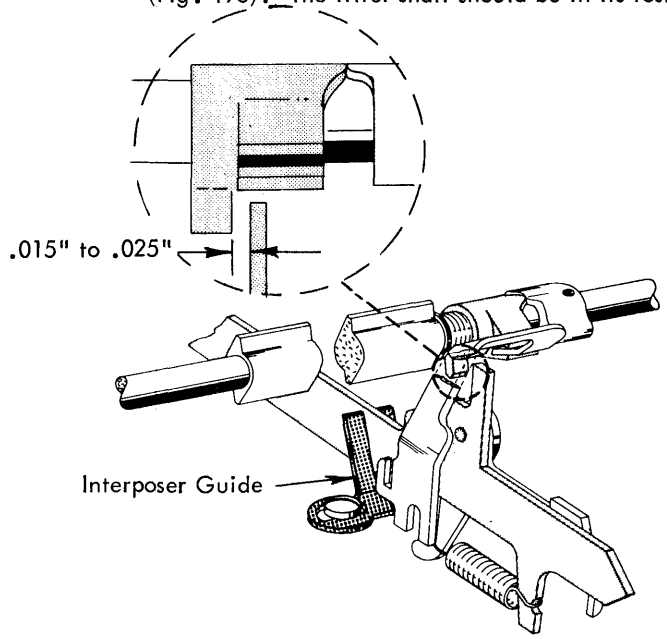


FIGURE 195. Spacebar Interposer Guide Adjustment

8. Spacebar Interlock Mechanism (Late Style) - Perform the following adjustments:

a. With the machine latched at rest adjust the spacebar interlock cam radially on the filter shaft so that the tip of the interlock interposer rests on the high point of the cam (Fig. 196).

Also, position the interlock cam laterally on the filter shaft so that the cam is against the flutes of the filter shaft and the set screw is toward the right hand side of the machine.

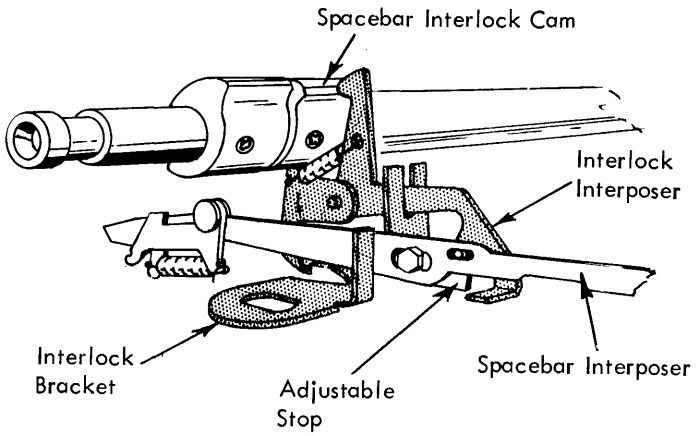


FIGURE 196. Spacebar Interlock Mechanism (Late Style)

b. 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 .040" to .050" between the interlock interposer and the adjustable stop on the spacebar interposer (Fig. 197).

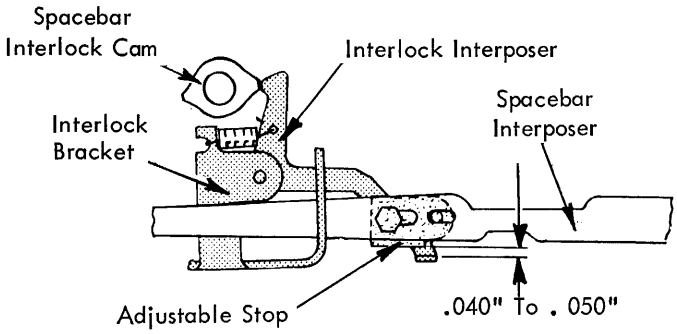


FIGURE 197. Interlock Bracket Adjustment

c. Position the adjustable stop on the spacebar interposer forward or back so that .020" to .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 (Fig. 198).

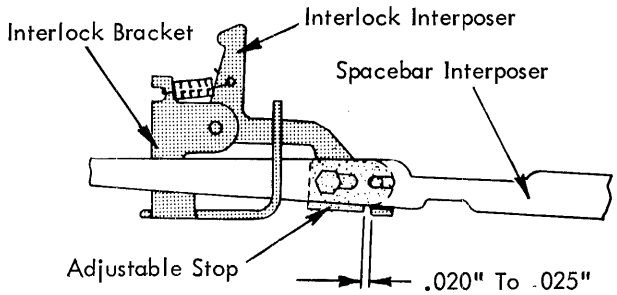


FIGURE 198. Adjustable Stop

BACKSPACE MECHANISM

1. Be sure that print escapement and operational control adjustments are correct before attempting backspace adjustments.

2. Tab Lever Stop - The rest position of the tab lever is controlled by a lug on the escapement bracket called the tab lever stop (Fig. 199). The stop should be formed front or rear so that a clearance of .001" to .003" exists between the vertical lug on the tab lever and the backspace pawl when the backspace pawl is bottomed in its rack.

   The tab lever stop may be formed by inserting the T-bender from the upper right side. It will be necessary to force the tab torque bar to the rear in order to insert the T-bender.

   This adjustment insures that the backspace pawl will not be prevented from bottoming in its rack during a backspace operation. The tab lever rest position also directly affects the adjustments of the tab mechanism. It determines how much motion must be provided to the tab lever to properly remove the backspace and escapement pawls from their racks during a tab operation.

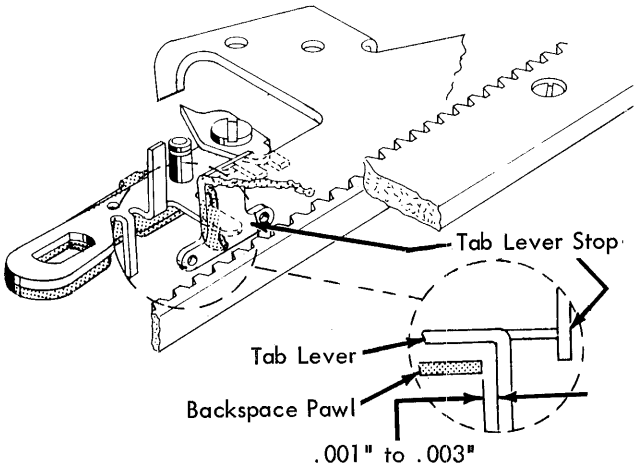


FIGURE 199. Tab Lever Stop Adjustment

3. Backspace Rack - With the backspace rack in the rest position, a clearance of .005" to .015" should exist between the working surfaces of the rack tooth and the backspace pawl (Fig. 200). Adjust the hexagon headed stud in the backspace bellcrank to obtain this condition.

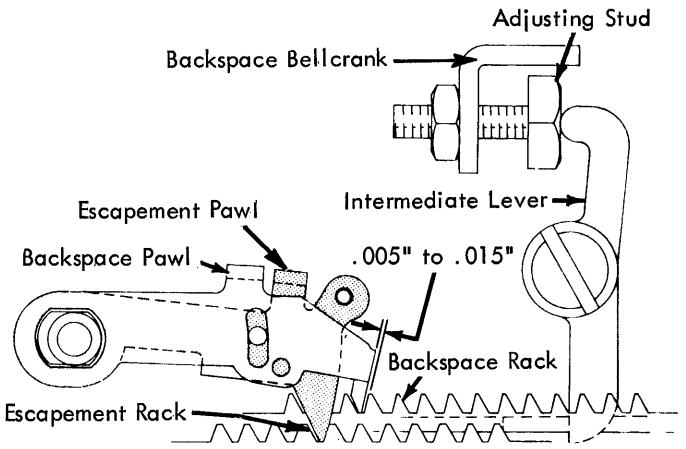


FIGURE 200. Backspace Rack Adjustment

The adjustment minimizes lost motion in the mechanism and insures 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 a backspace rack tooth. Partial spacing will result if the carrier alternates holding on the escapement pawl and the backspace pawl.

The adjustment may be gauged 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. The check should be made at both extreme positions of the carrier so as to include the difference in mainspring tension in the check. Check the resetting of the pawl at both positions by operating the backspace bellcrank manually and releasing it slowly.

4. Intermediate Lever (Late Style - Identify by presence of C-5 auxiliary cam follower) - With the backspace cam manually operated to the high point, the escapement pawl should just fail to drop into the preceding rack tooth causing the manual backspace operation to fail. Adjust the intermediate lever pivot screw forward or back in its elongated mounting hole to obtain this condition (Fig. 201).

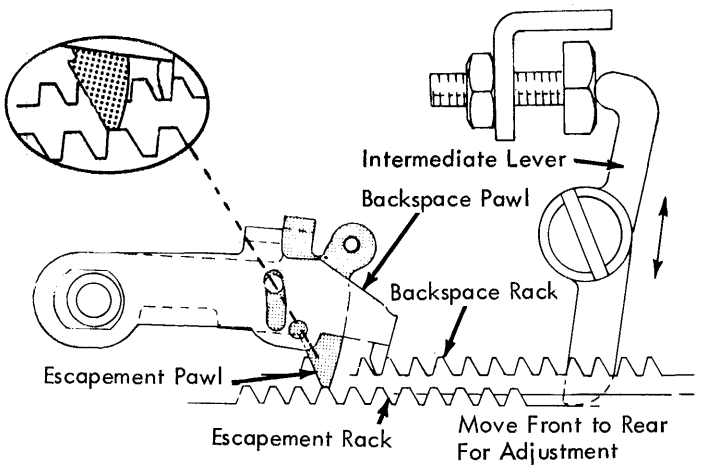


FIGURE 201. Intermediate Lever Adjustment (Late Level)

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 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 pawl to properly overthrow and drop into the preceding rack tooth) for a positive operation.

Too much motion to the backspace rack will cause double backspacing. Check the operation at both ends of the carriage so as to include the variation in the mainspring tension.

CAUTION: 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: On 11 inch machines below serial number 4012015, the contour or rise to the spacebar backspace operational cam is slightly different than those 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 this 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 .005" to .010" (Fig. 202). Obtain this condition by adjusting the intermediate lever forward or back in its elongated mounting hole.

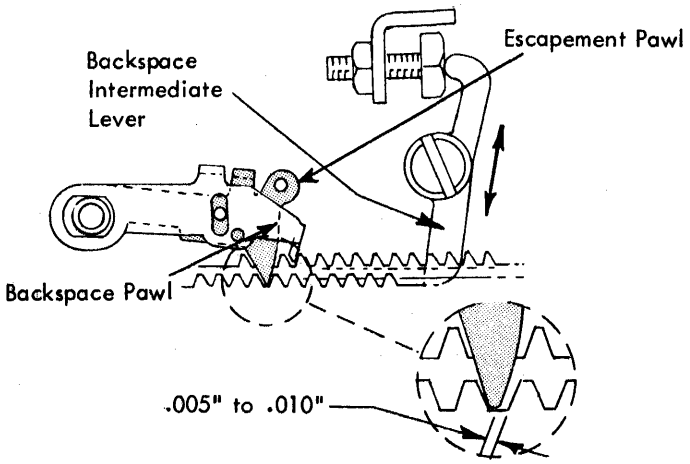


FIGURE 202. Intermediate Lever (Early Level)

CARRIER RETURN MECHANISM

Be sure that the print escapement and operational control adjustments are correct before attempting the carrier return adjustments.

1. Carrier Return Latch Height (11 inch machine) - With the carrier return/index cam at rest, adjust the carrier return latch height by the adjusting screw on the backplate (Fig. 203) so that the latch will pass under the cam follower by .001" to .010" when it is released to the rear.

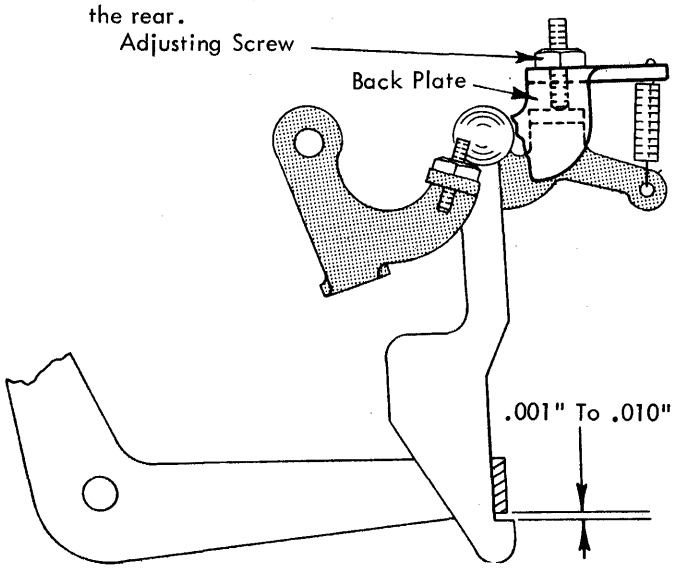


FIGURE 203. Carrier Return Latch Height Adjustment (11 Inch Machine)

The latch height adjustment insures maximum throw for the latch and that it will move under the cam follower freely.

CAUTION: 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 adjustment #4 in the Operational Control section.

NOTE: On long carriage machines the carrier return latch height cannot be obtained until after the correct pawl clearance and clutch latch overthrow adjustment is obtained.

1.1 Carrier Return Latch Height Late Style (11 Inch Machine) With the carrier return cam at rest, adjust the carrier return latch height by the adjusting screw on the carrier return adjusting plate so that the latch will pass under the cam follower by .003" to .015" (Fig. 203.1).

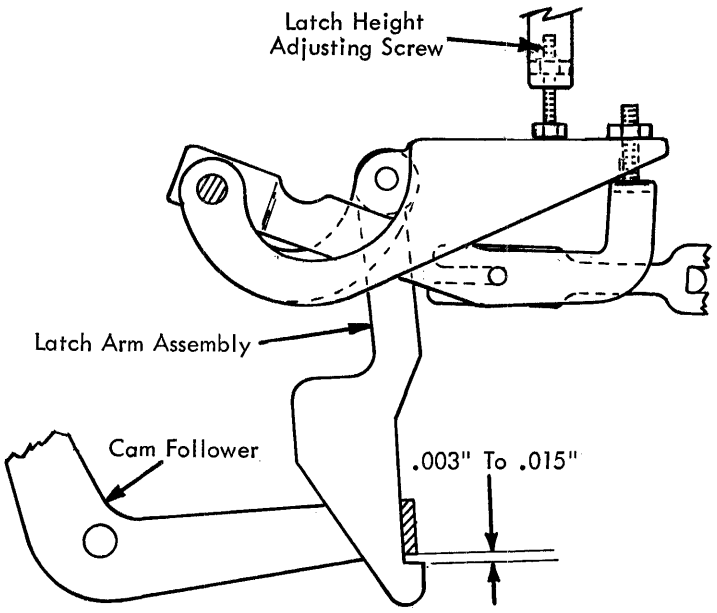


FIGURE 203.1 Carrier Return Latch Height (11 Inch Late Style)

1.2 Carrier Return Latch Height Late Style (15 Inch Machine)

a. Carrier Return Lever - Position the carrier return lever laterally on the operational pivot pin so that the carrier return latch will hang vertical without binding against its interposer (Fig. 203.2). Be sure to tighten the screw in the lever onto the flat portion of the pin.

b. Carrier Return Latch Arm Assembly Adjusting Screw - 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 .003" to .015" (Fig. 203.2).

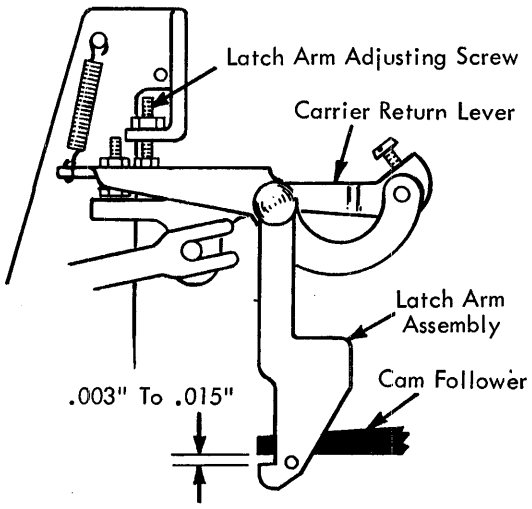


FIGURE 203.2 Carrier Return Latch Height (15 Inch Late Style)

The latch height adjustment insures maximum throw for the latch and that it will move under the cam follower freely.

CAUTION: Any change in 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 Adjustment #4 in the operational control section.

2. Pawl Clearance - Adjust the clutch latch eccentric so that the escapement pawl will clear the rack teeth by .005" to .020" when the latch is being held down by the keeper (Fig. 204).

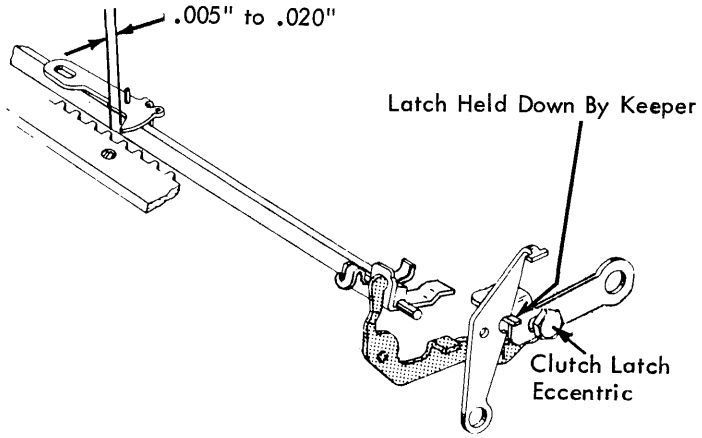
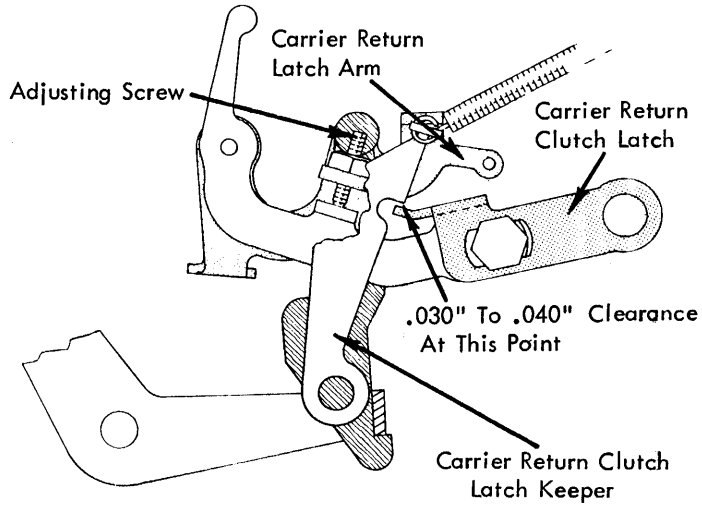


FIGURE 204. Pawl Clearance Adjustment

This adjustment insures that the escapement pawl will not drag along the rack during a carrier return and that the pawl will be allowed to re-enter the rack quickly at the completion of the return operation.

3. Clutch Latch Overthrow (11 inch machine only) - With the platen and feed rolls installed and the index selector lever set in the double index 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 .030" to .040" (Fig. 205). Adjust the carrier return latch arm adjusting screw to obtain this condition.



(Early Style)

FIGURE 205. Clutch Latch Overthrow Adjustment (11 Inch)

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.

3.1 Clutch Latch Overthrow Late Style - 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 .010" to .020" (Fig. 205.1). Adjust the carrier return latch arm adjusting screw to obtain this condition.

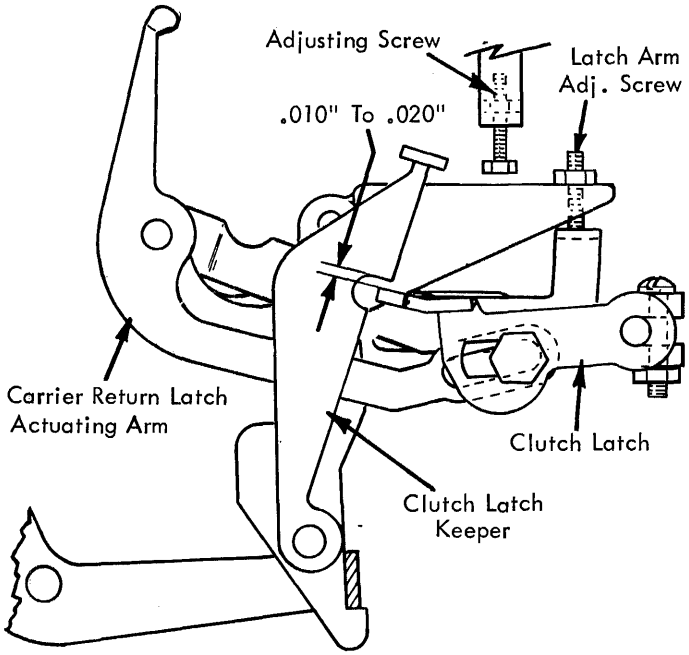


FIGURE 205.1 Clutch Latch Overthrow Adjustment (Late Style)

4. Clutch Latch Overthrow (15 inch machine
Use the following procedure to obtain the correct clutch latch overthrow and operational latch height.

a. Carrier Return Lever - Position the carrier return lever (Fig. 206) laterally on the latch actuating arm pin so that the carrier return latch will hang vertical without binding against its interposer. Be sure to tighten the Bristol screw in the lever onto the flat portion of the pin.

b. Carrier Return Latch Arm Adjusting Screw (overthrow) - With the carrier return cam on the high point adjust the latch arm adjusting screw (Fig. 206) so that the clutch latch will overthrow the latching surface of the keeper by .030" to .040". Be sure that the platen and feed rolls are installed and the index selector lever is in the double index position when checking this adjustment.

c. Carrier Return Latch Actuating Arm Adjusting Screw (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 .003" to .010" (Fig. 207). Maintain a clearance between carrier return latch arm and torque bar.

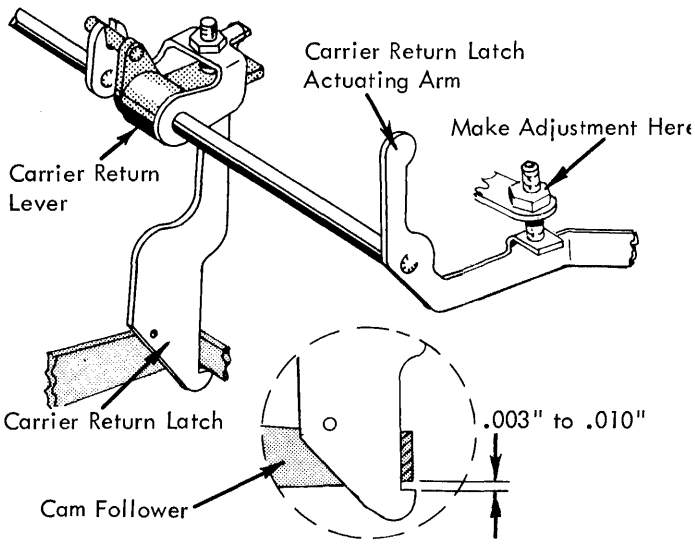


FIGURE 207. Carrier Return Latch Height (15 Inch Machine)

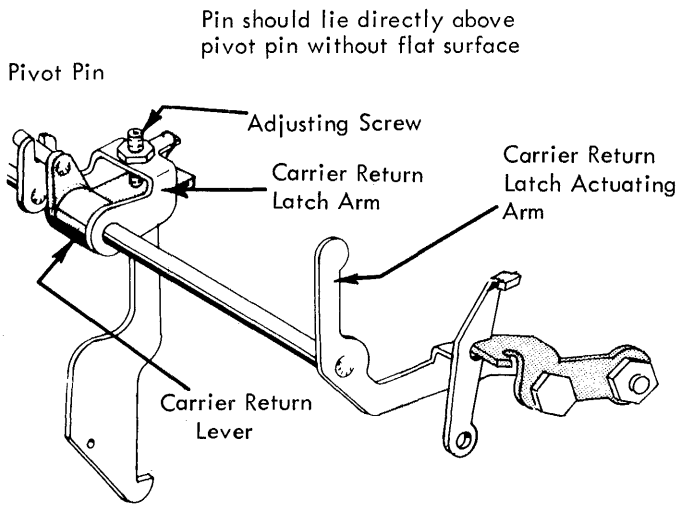


FIGURE 206. Clutch Latch Overthrow Adjustment (15 Inch Machine)

CAUTION: 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 adjustment #4 in the Operational Control section.

NOTE: On a limited number of 15 inch machines equipped with the early style 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 early production latch actuating arms should be replaced, before attempting to make the carrier return adjustment. The flat surface machined on the left end of the pin is required to establish the proper radial position of the carrier return lever on the pin (with respect to the latch actuating arm), and insures that the carrier return lever cannot slip on the pin.

5. Carrier Return Shoe - Adjust the carrier return actuating arm bracket left or right so that the carrier return shoe overlaps the last 3 coils on the right hand end of the clutch spring. Covering the last 3 coils insures that all the coils of the spring will be used in the clutch operation (Fig. 208).

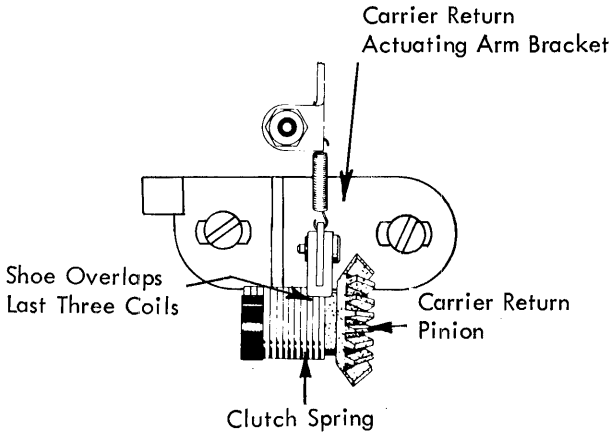


FIGURE 208. Carrier Return Shoe

6. 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 will be horizontal when the machine is at rest (Fig. 209).

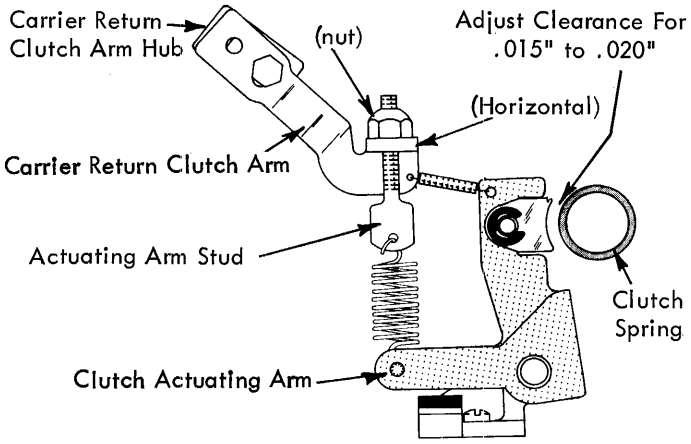


FIGURE 209. Carrier Return Actuating Arm Adjustment

7. Shoe Clearance - The nylon shoe on the clutch actuating arm should clear the carrier return clutch spring by .015" to .020" when the machine is at rest (Fig. 209). Adjust the nut on the actuating arm stud to obtain the proper clearance.

NOTE: In no case should the shoe to clutch spring clearance be less than .015".

8. Overbank Adjustment

a. Early Style - With the carrier held fully to the left against the margin stop, a clearance of .003" to 008" should exist between the working surfaces of the escapement pawl and the escapement rack tooth (Fig. 210). Adjust the left hand margin rack bushing to obtain this condition (Fig. 211).

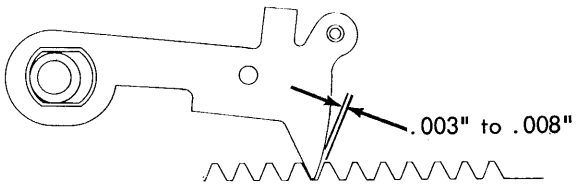


FIGURE 210. Escapement Pawl Check

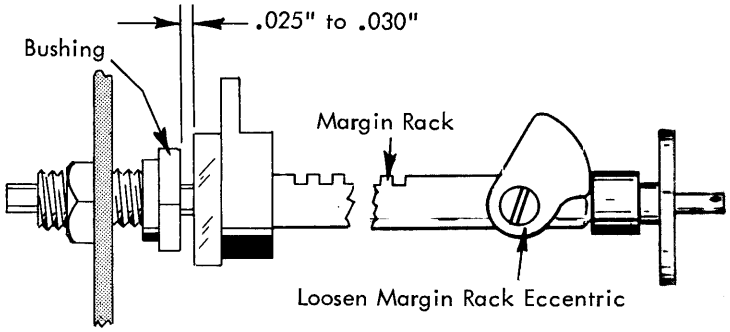


FIGURE 211. Overbank Adjustment (Early)

The overbank adjustment insures that the escapement pawl will enter the correct escapement rack tooth when the carrier return clutch is unlatched at the left margin. The adjustment may be observed 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 .025" to .030" with the carrier resting at the left margin. The right hand margin rack eccentric should be loose when making this adjustment (Fig. 212) so that the left margin stop will be against the stop latch on the carrier. The .025" to .030" compensates for the .022" floating action in the escapement pawl. (The correct adjustment for the margin rack eccentric is covered under the Margin Control section.)

NOTE: Any change in overbank on machines equipped with this old style margin rack assembly will directly affect the clutch unlatching adjustment.

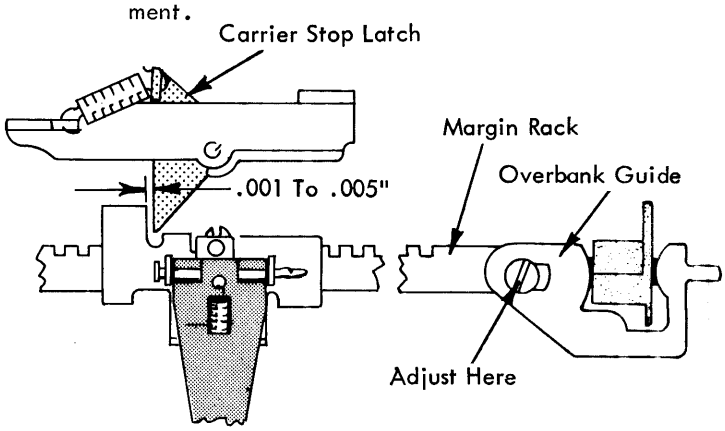


FIGURE 212. Margin Rack Overbank Guide Adjustment (Late)

b. Late Style - With the carrier resting at the left margin stop, adjust the margin rack overbank guide (Fig. 212) left or right on the margin rack to obtain a clearance of .001" to .005" between the stop latch on the carrier and the left hand margin stop. On machines equipped with a floating stop latch, the floating action of the latch must be removed, by pulling the latch to the right with a spring hook, before this clearance can be observed.

The adjustment of the overbank guide on the margin rack determines the rest position of the margin rack. The adjustment insures 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, plus the amount of lateral motion that the guide permits the rack (due to the design of the guide) during a carrier return operation, automatically provides the carrier with the overbank required for proper escapement pawl re-entry at the completion of a carrier return operation.

9. Clutch Unlatching - With either style margin rack held to its extreme left position, the carrier return latch keeper should clear the latch by .005" to .015" at the unlatching point (Fig. 213). 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.

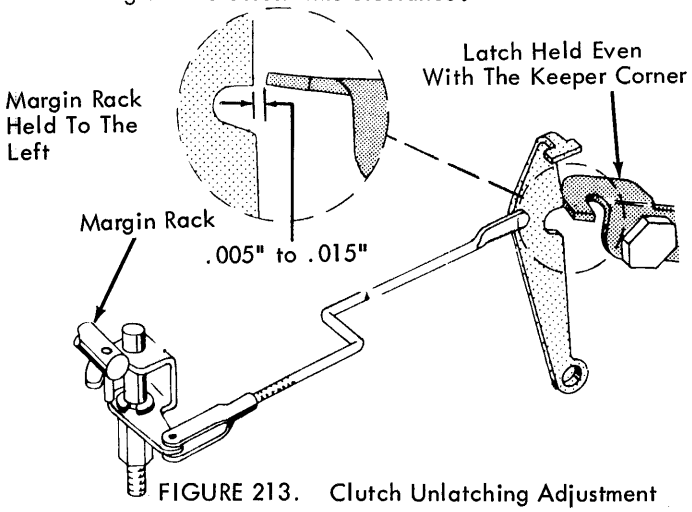


FIGURE 213. Clutch Unlatching Adjustment

NOTE: Should the clutch fail to properly latch (on machines equipped with the Early Style margin rack) after the clutch unlatching adjustment has been completed, check the margin rack eccentric adjustment which is located in the Margin Control section. The eccentric may be holding the rack too far to the left restricting the margin rack motion thereby reducing the amount of bite that the latch may take on the keeper.

10. Torque Limiter - The torque limiter should transmit 1 to 2 pounds pull on the carrier as the carrier is unlatching the clutch at the left margin.

If a spring scale is available, the adjustment may be checked by holding against the carrier with the push end of the scale and allowing the carrier to slowly unlatch the clutch at the left margin.

If no scale is available, the torque may be estimated by holding the carrier while the clutch is engaged. The torque limiter should slip readily yet return the carrier positively without any hesitation when the carrier is released.

The adjustment is made by adjusting 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 limited hub by positioning the torque limiter spring clamp.

NOTE: The carrier return clutch arbor should have an end play of .004" to .006" between the torque limiter hub and the C-clip on the operational shaft. Adjust the play by positioning the torque limiter hub laterally on the shaft. The end play can be adjusted easily if the torque limiter spring is moved to the right, off the torque limiter hub.

11. Carrier Return Interlock Contact -

a. Form the N/C support so that the O/P lifts the N/C contact .002" to .005" (Fig. 214).
b. Form the N/O support so that the O/P clears the N/O contact .035" to .045" (Fig. 214).

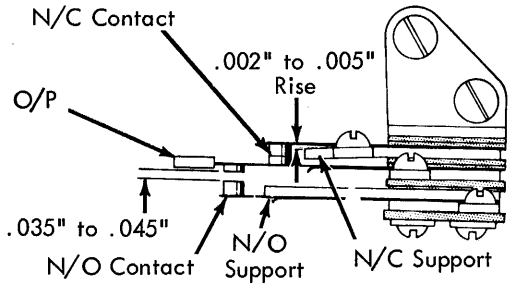


FIGURE 214. Carrier Return Interlock Inactive

c. With the carrier return clutch latched, position the mounting bracket so that the N/O contact rises .010" to .020" from the N/O support (Fig. 215).

NOTE: The N/O contacts must remain closed during return of the carrier to the left margin.

Excessive rise on the contact straps will cause the contacts to bounce.

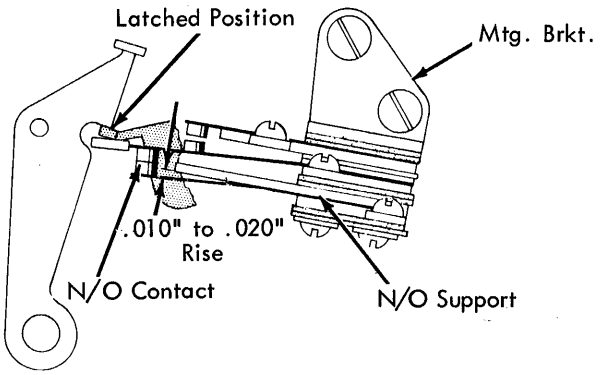


FIGURE 215. Carrier Return Interlock Active

NOTE: 835 Printer Interlock contact timing - make at 200° ± 20°.

INDEX MECHANISM - (LATE)

1. All operational control adjustments must be correct before any attempt is made to adjust the index mechanism.

2. Multiplying Lever Stop - (Fig. 216) - Adjust the multiplying lever stop front or rear to produce .360" to .375" (approximately 3/8") motion to the index link when the carrier return/index cam is operated to its high point (platen removed).

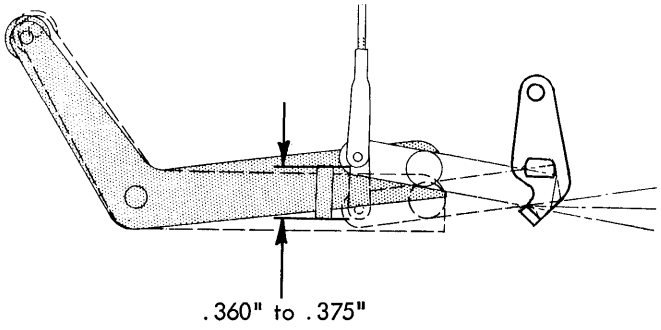


FIGURE 216. Multiplying Lever Stop (Late Style)

NOTE: This adjustment may be measured with the Hooverometer and a feeler gauge. The handle of the Hooverometer is .375" wide.

Figure 217 illustrates the first level multiplying lever stop used on the new style index mechanism. This stop should be adjusted both horizontally and vertically. The stop is adjusted vertically so that 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.

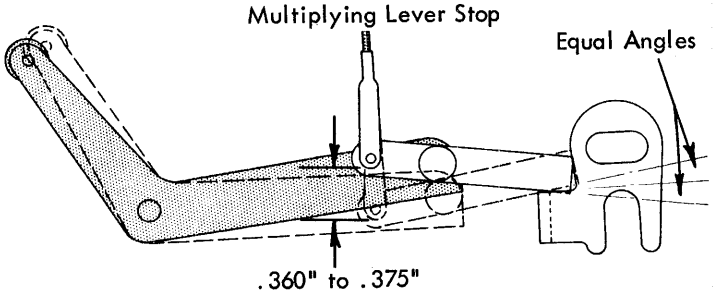


FIGURE 217. Multiplying Lever Stop (Early Level)

3. Index Link - Use the following procedure to adjust the index link:

   a. As a preliminary step, loosen the platen overthrow stop and move it to the front (Fig. 218).

   b. 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 re-enter 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.

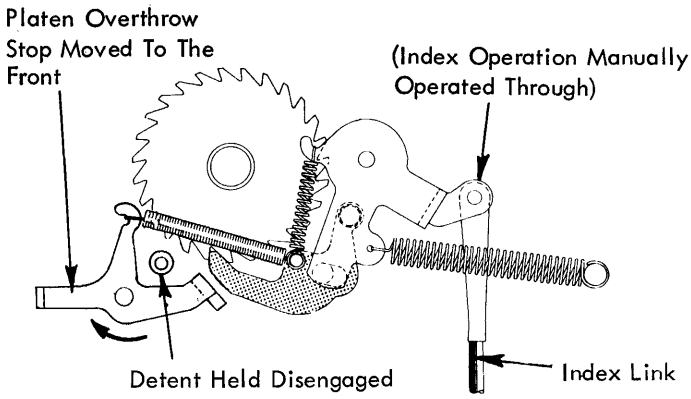


FIGURE 218. Index Link Adjustment

4. Platen Overthrow Stop - With the index cam rotated to its high point, adjust the platen overthrow stop to clear the index pawl by .005" to .020" (Fig. 219).

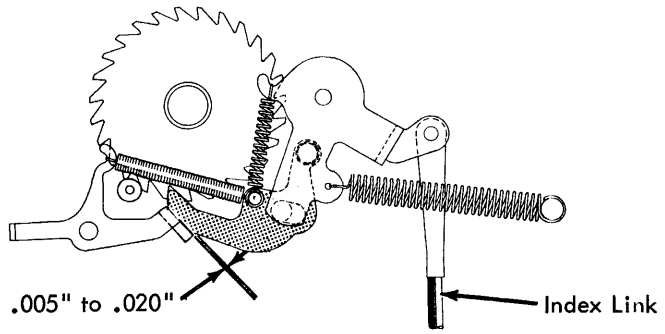


FIGURE 219. Platen Overthrow Stop Index Selector Cam

5. Index Selection Cam

   a. With the index cam latched at rest and the selection lever in the double line space position, adjust the selection cam front to rear so that the index pawl clears the platen ratchet by .015" to .050" (Fig. 220).

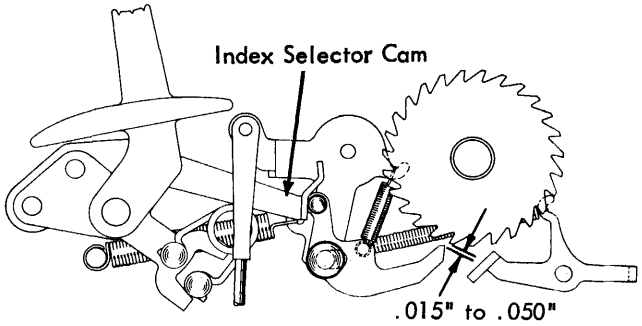


FIGURE 220. Index Selection Cam Adjustment

   b. Adjust the selection cam up or down so that the index pawl is centered on the cam surface with the selection lever in the single line space position (Fig. 221).

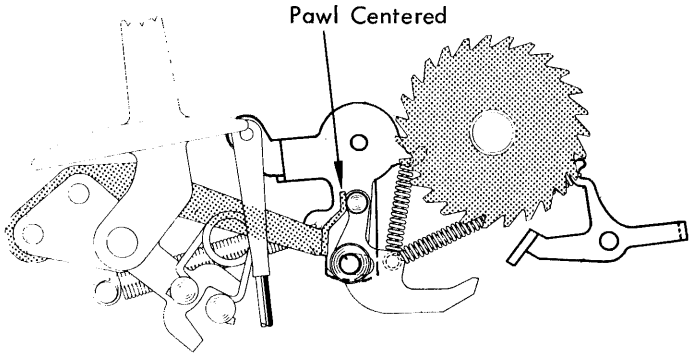


FIGURE 221. Vertical Adjustment Of Index Selection Cam

INDEX MECHANISM (EARLY STYLE)

1. All operational control adjustments must be correct before any attempt is made to adjust the index mechanism.

2. Index Link and Index Link Stud

   a. As a preliminary setting position the index link stud in the middle of the slot in the pawl carrier. The setting provides an average leverage ratio for the pawl carrier. Subsequent adjustments may require that the position be altered slightly.

   b. With the index selection lever in the single line space position, adjust the index link so that the index pawl bottoms in the ratchet against a tooth after .030" rise on the index cam (Fig. 222). 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 the cam follower (Fig. 222).

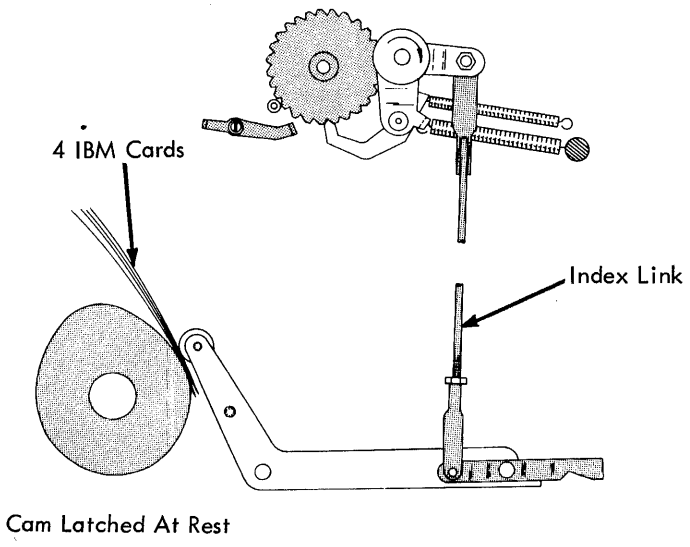


FIGURE 222. Index Link Adjustment

   c. Adjust the index link stud forward or back in the slot of the pawl carrier so that one full tooth of motion is given the index pawl after it starts to drive the platen (Fig. 223).

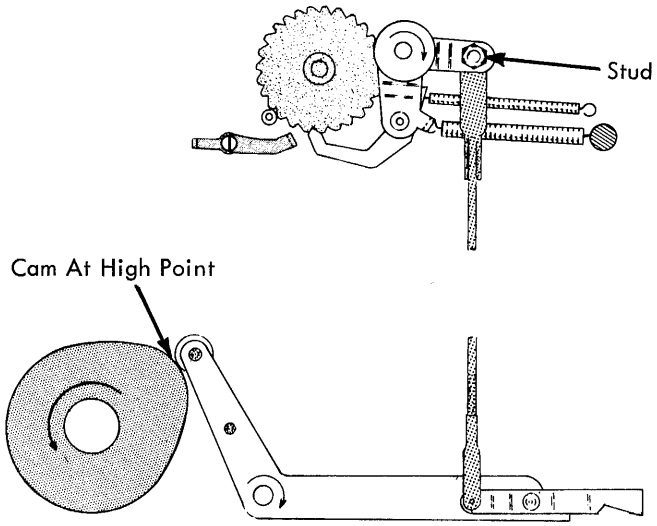


FIGURE 223. Index Link Stud Adjustment

NOTE: Adjustment of the index link and link stud must be considered together. Make these adjustments alternately until both are correct.

The upper index pawl stop must allow the index pawl to bottom in the ratchet.

3. Upper Index Pawl Stop - With the index cam latched adjust the upper index pawl stop so that the index pawl clears the ratchet by .015" to .030" (Fig. 224).

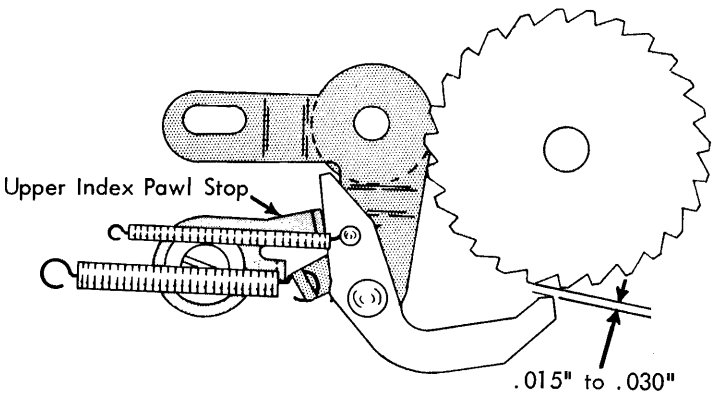


FIGURE 224. Upper Index Pawl Stop Adjustment

4. Multiplying Control Lever

a. As a preliminary setting, position the multiplying control lever stop front to rear so that its elongated hole is centered (Fig. 225). The adjustment provides an average leverage ratio for the multiplying lever. Subsequent adjustments may require that the front to rear position be changed slightly.

b. 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.

c. Adjust the multiplying control lever stop front to rear so that two full teeth of motion is given the index pawl after it starts to drive the platen (Fig. 225).

CAUTION: Be sure that the indexing action is not choked off by the platen overthrow stop.

5. Platen Overthrow Stop - Adjust the stop forward or back so that .005" clearance exists between the stop and the pawl when the cam is on its high point (Fig. 225).

6. Index Selection Lever - Adjust the index selection lever link so that the lever lines up with the double mark on the case when the lever is in the double line space position (Fig. 225).

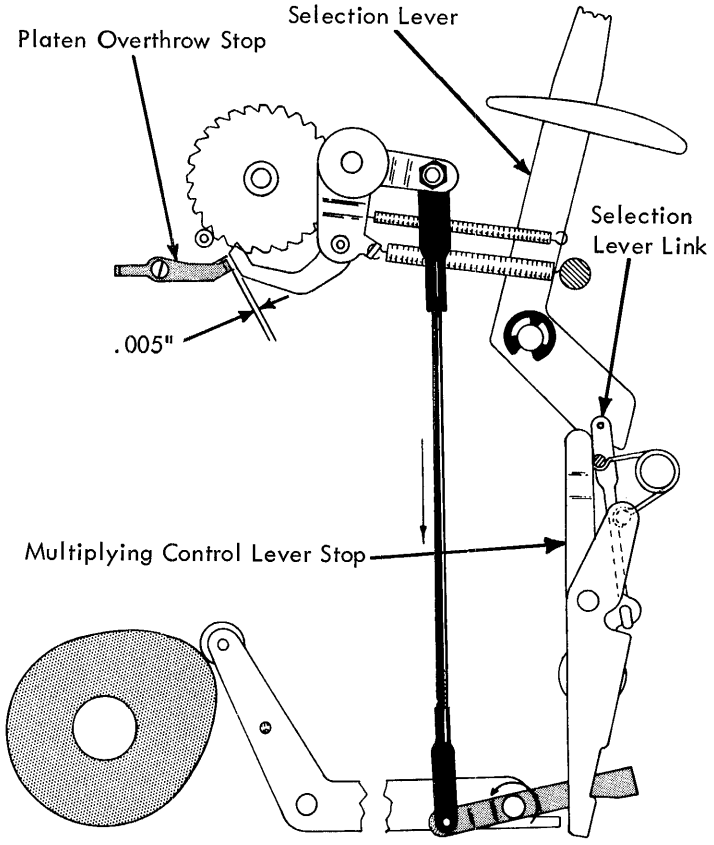


FIGURE 225. Index Travel Adjustment

TABULATOR SET AND CLEAR MECHANISM

1. Tab Rack Bellcrank - Adjust the bellcrank 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 (Fig. 226). Latch the tab lever to the rear to check this adjustment.

CAUTION: Be sure that the tab set and clear lever is fully seated on top of the two pivot pins on the left side of the powerframe.

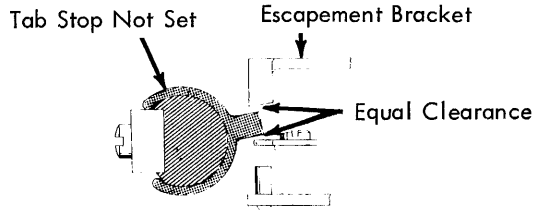


FIGURE 226. Tab Rack Bellcrank Adjustment

2. Tab Set and Clear Link - Adjust the link so that 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 that 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" machines the intermediate lever should be vertical within .015".

3. Set and Clear Arm Stops - For the stop lugs on the set and clear lever bracket (Fig. 227) 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 the tab set and clear arm cannot pivot sideways out of engagement with the tab rack bellcrank.

NOTE: On the early style tab set and clear mechanism the stop lugs were anchored and adjusted by two screws on the outside of the powerframe.

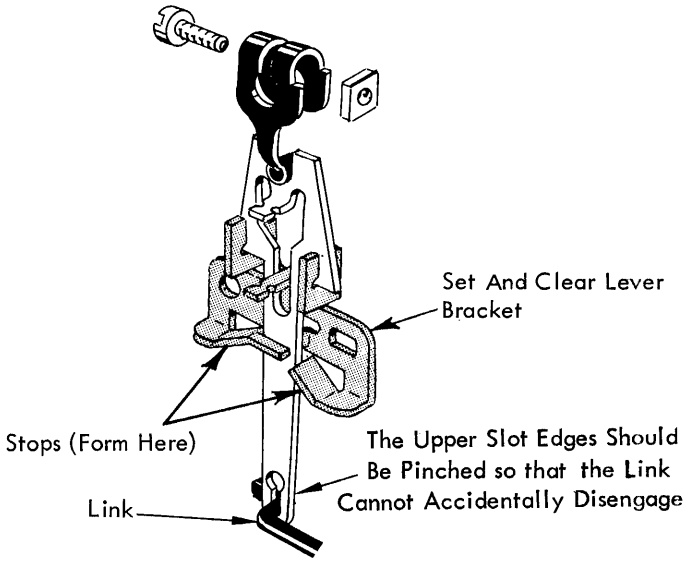


FIGURE 227. Set And Clear Arm Stops

4. Tab Rack Brake - Adjust the tab rack brake so that the tab rack will not flip past the rest position when 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 is located just inside the powerframe at the left end of the tab rack. The brake should be formed, if necessary, to spring load the tab rack toward the RH side of the machine.

CAUTION: The index detent lever will rest against the tab rack with the platen removed. Be sure the lever is clear of the tab rack when the brake adjustment is checked.

5. Gang Clear Finger (Ref. Fig. 228A)

a. Adjust the gang clear finger front to rear to obtain .001" to .020" clearance (Fig. 228B) between its tip and the nearest tab stop when all the tab stops are set.

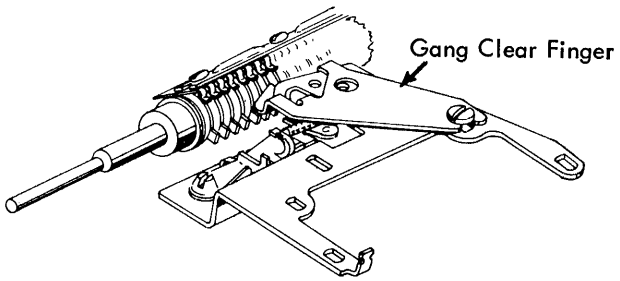


FIGURE 228A Gang Clear Finger

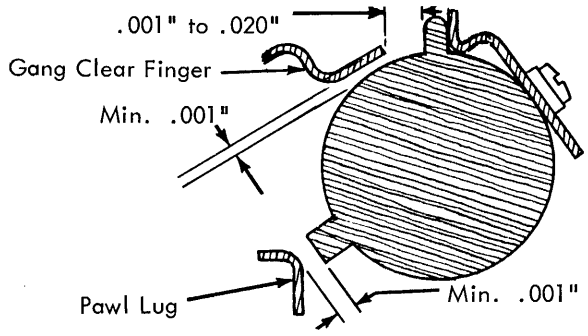


FIGURE 228B. Gang Clear

b. Form the end of the gang clear finger to obtain a minimum of .001" clearance (Fig. 228B) 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.

c. Check for a minimum of .001" clearance (Fig. 228B) between lugs on the rear of the escapement and backspace pawls and any set tab stop when the tab rack is rotated to the clear position and the pawls removed from the rack, as in a carrier return operation. If this clearance is not present, recheck 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 right or left slightly to insure positive clearing of desired stop. The tab stop directly to the left may also be cleared or partially cleared.

TABULATOR MECHANISM (LATE STYLE)

1. Interlock Switch (Fig. 229)

a. With the torque bar in the rest position, form the horizontal lug on the left end of the tab torque bar so that .010" - .015" exists between the tab switch trigger and its latching surface.

b. Tab interlock switch bracket. Adjust by its mounting screws for two conditions.

1. 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.

2. Front to rear so that .001" - .002" clearance exists between the tab switch trigger and the rear edge of the tab torque bar extension.

c. Adjust the switch by its mounting screws for .002" to .008" clearance between the switch plunger and trigger.

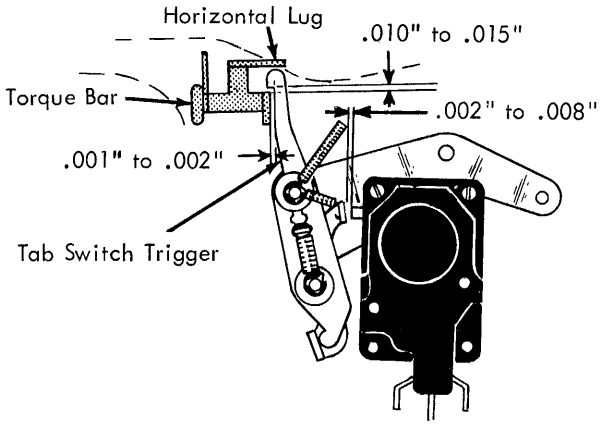


FIGURE 229. Tab Interlock Switch

2. Escapement Bracket (Fig. 143) - Observe the .001" - .002" clearance between the escapement bracket and the tab torque bar. If this adjustment is incorrect, all escapement adjustments should be made before proceeding with the tab adjustments.

NOTE: This adjustment should be checked with the overthrow stop and retaining plate removed from the printer. Leave the overthrow stop and retaining plate off for the following adjustments.

3. Tab Lever Stop (Fig. 230) - Form the stop on the escapement bracket to obtain .001" - .006" 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 .001" to .007" between vertical lug on the tab lever and the escapement pawl.

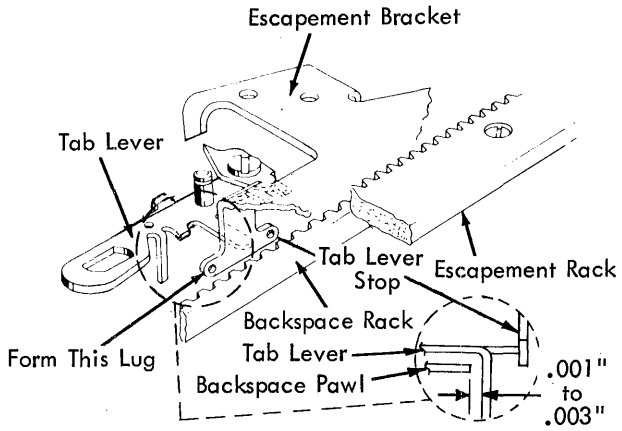


FIGURE 230. Tab Lever Stop

4. Escapement Torque Bar Stop - Observe an .008" - .010" clearance between the escapement torque bar and the lug of the escapement pawl (Fig. 146). Check the pawl mounting stud for .001" clearance between it and the escapement torque bar (Fig. 148). This adjustment should be checked at the left and right sides of the printer. On 15" printers, final adjustment should be made with a pawl mounting stud directly opposite the escapement torque bar back-up (Fig. 149).

5. Tab Lever Pawl (Fig. 231) - Adjust the pawl forward or back on the tab lever so that the tip of the pawl clears a set tab stop by .035" to .050". This adjustment should be checked on the left, center, and right of carrier travel.

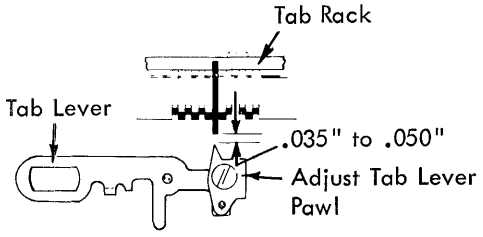


FIGURE 231. Tab Lever Pawl

6. Tab Rack (Fig. 232) - With the tab cam on its high point, adjust the tab rack left to right for .005" - .020" clearance between a set tab stop and the side of the tab lever pawl.

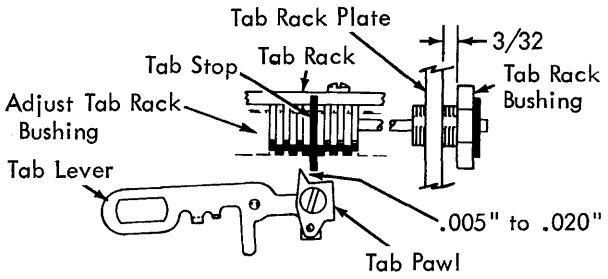


FIGURE 232. Tab Rack Bushing

7. Pawl Clearance (Fig. 233) - The upright lug of the tab latch should be formed forward or back so that the tip of the escapement pawl clears the escapement rack teeth by .005" - .015" when the tab lever is latched to the rear.

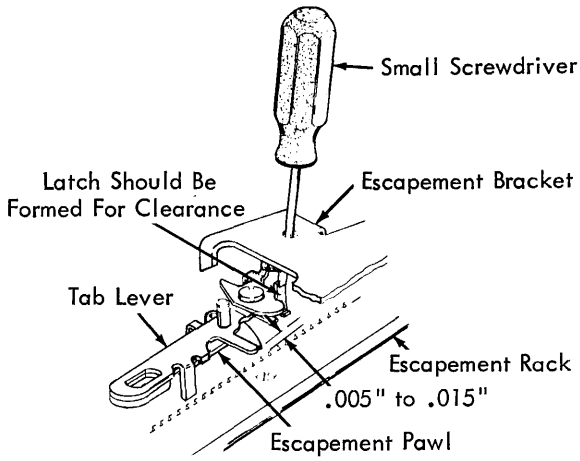


FIGURE 233. Pawl Clearance Adjustment

8. Carrier Return Tab Interlock (Fig. 234) - 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 .005" - .025". The rear lug of the tab latch should be formed forward or back to obtain this condition.

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 again be checked to ensure that it is not touching the escapement torque bar.

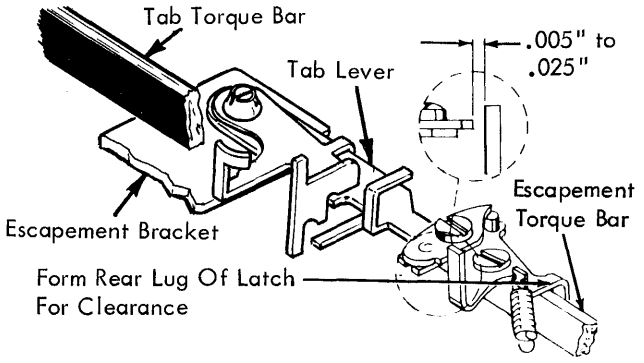


FIGURE 234. Interlock

9. Tab Trigger Extension (Fig. 235) - Form the front (curved) lug of the tab trigger to obtain .016" - .023" clearance between this lug and the tab torque bar with all parts at rest.

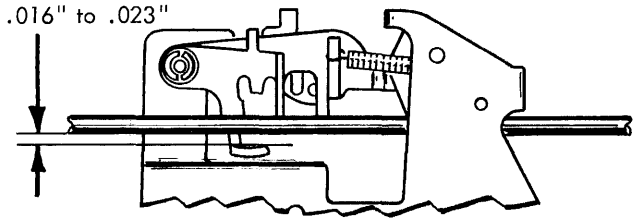


FIGURE 235. Tab Trigger Extension

10. Tab Lever Overthrow (Fig. 236) - With the tab cam on its high point, adjust the torque bar actuating link for .005" - .010" overthrow between the tab latch and tab lever.

NOTE: The carrier should be tapped lightly to the left before checking this adjustment. It should also be checked with the carrier in the center of its travel. Be sure that the overthrow stud (Fig. 237) does not interfere with this adjustment.

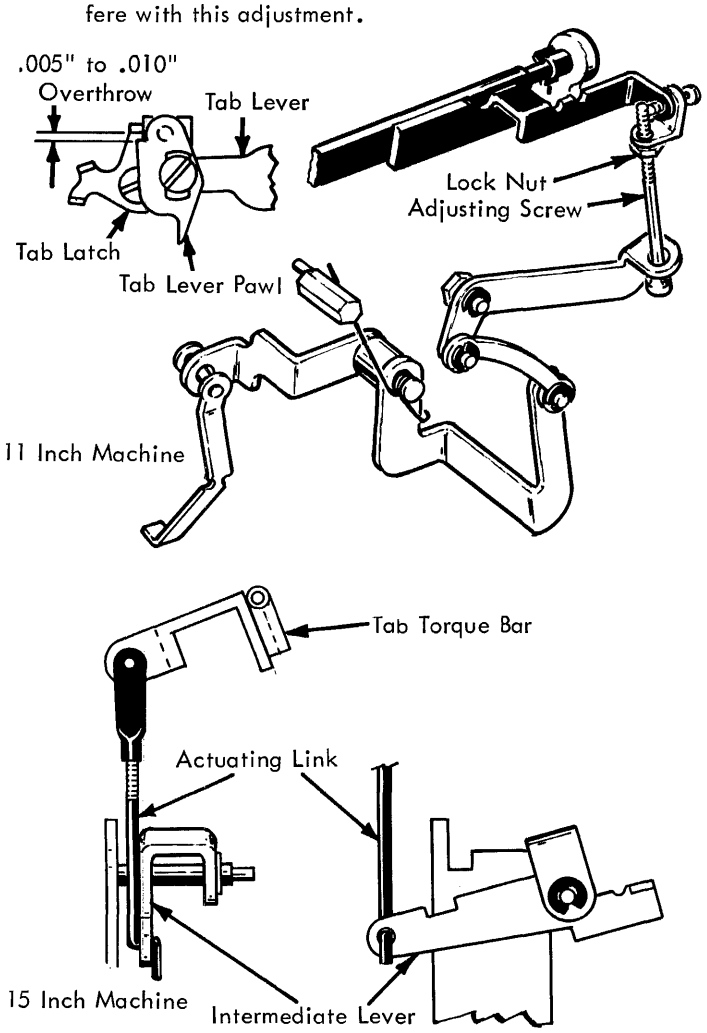


FIGURE 236. Tab Latch Adjustment

11. Tab Lever Overthrow Stop and Retaining Plate (Fig. 237) - Replace the tab torque bar overthrow stop and retaining plate and position it so that the overthrow lug falls directly in line with the upper lug on the tab trigger and retaining plate when positioned against the torque bar maintains .001" - .002" clearance between the torque bar and escapement bracket. The outer lug or overthrow stop should then be formed for .005" - .010" clearance between the tab lever trigger and the overthrow lug with the tab cam on its high point.

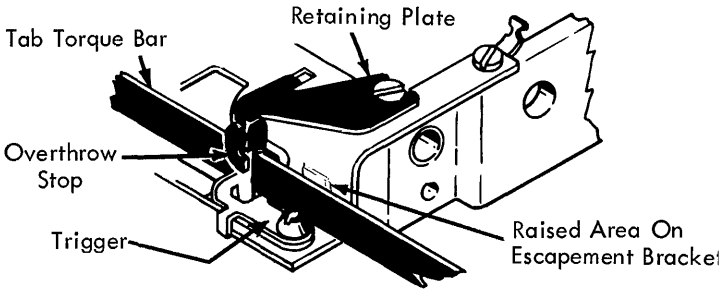


FIGURE 237. Tab Lever Overthrow Stop & Retaining Plate

12. Torque Bar Overthrow Stud (Fig. 238) - With the tab cam on its high point, form the upright lug on the LH end of the torque bar for a clearance of .001" - .010" between this lug and the overthrow stud.

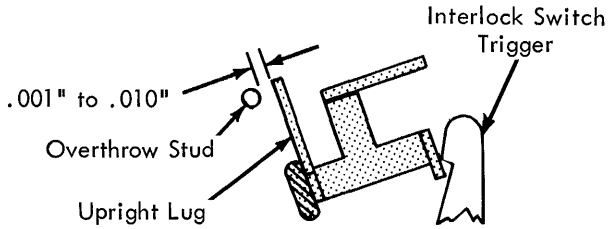


FIGURE 238. Torque Bar Overthrow Stud

TABULATOR MECHANISM (EARLY)

1. Tab Lever Stop - Form the stop on the escapement bracket (Fig. 239) to obtain .001" to .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.

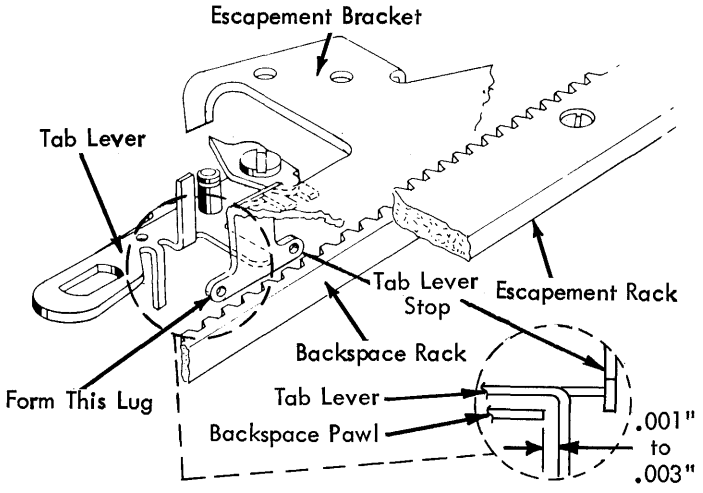


FIGURE 239. Tab Lever Stop

This small clearance insures 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 tabulation operation.

2. Tab Lever Pawl - Adjust the pawl forward or back on the tab lever so that the tip of the pawl clears a SET tab stop by .035" to .045" with the tab lever at rest (Fig. 240).

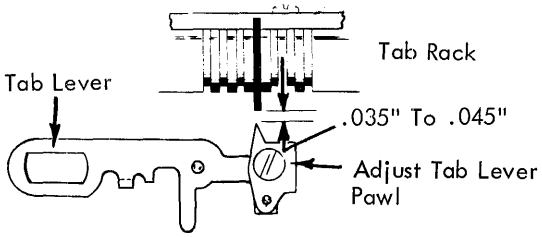


FIGURE 240. Tab Lever Pawl

The adjustment of the tab lever pawl has an effect on 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.

The adjustment of the tab lever pawl can be measured by using the push-end of the large spring hook. The push-end is approximately .035" thick.

3. Tab Rack - Adjust the tab rack left or right for a clearance of .005" to .020" between the tip of the tab lever pawl and a set tab stop with the tab lever latched out. This adjustment is made by the tab rack bushing on the RH end of the tab rack. The clearance may be observed by holding the carrier and latching the tab lever out (Fig. 241).

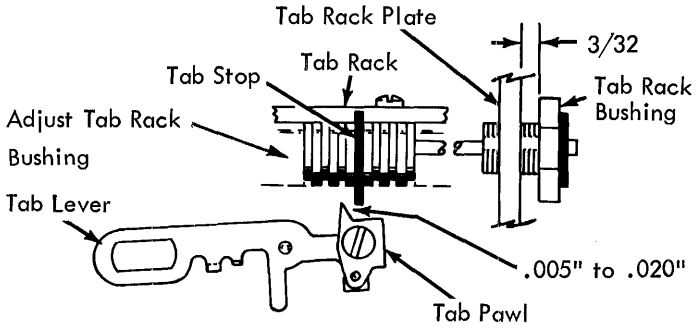


FIGURE 241. Tab Rack Bushing

NOTE: The head of the tab rack bushing should clear the tab rack plate by about 3/32" when the adjustment is complete.

The tab rack adjustment sets up a condition whereby the escapement pawl will be released into the escapement rack at the right time to safely engage the correct tooth. If the tab rack were too far to the left, the tab lever would contact the set tab stop sooner and release the escapement pawl into the rack earlier than it should. The pawl could enter the wrong escapement rack tooth and stop the carrier one space to the left of the desired stopping point. The carrier could stop one space too far to the right if the tab rack were adjusted too far to the right.

4. Pawl Clearance - The upright lug of the tab latch should be formed forward or back so that the tip of the escapement pawl clears the escapement rack teeth by .005" to .010" when the tab lever is latched to the rear.

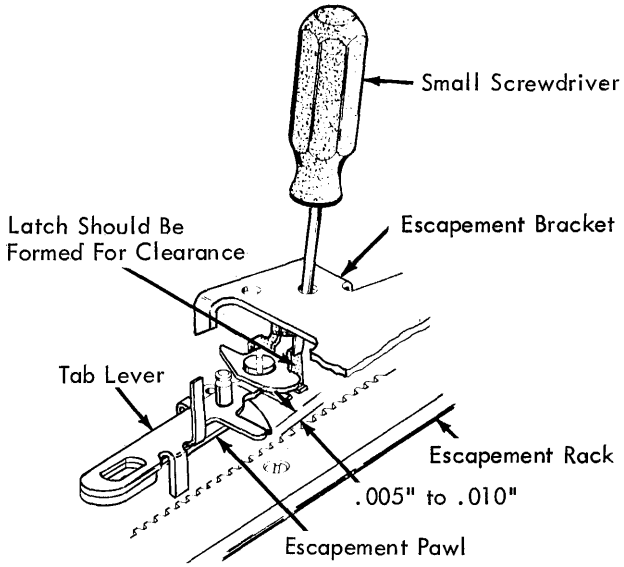


FIGURE 242. Pawl Clearance Adjustment

The adjustment insures that the escapement pawl will re-enter the rack quickly to minimize the chances of entering the wrong rack tooth. If excessive clearance is present, it is also possible that the tab keylever and associated parts might not have enough throw to positively latch the tab lever each time.

The upright lug of the tab latch may be formed with the 3" screwdriver by using it as a lever through the hole in the escapement bracket (Fig. 242). If excessive forming is required, recheck and refine the adjustment of the tab lever pawl.

5. Adjusting Plate, 11 Inch Machine (Fig. 242.1) - Position as follows:

a. Front to Rear - so that the actuator link and clevis clears the power frame.

NOTE: Clearance must be observed throughout full motion of the tab bellcrank.

b. With the tab interposer released and the backspace cam on its high point, rotate the torque bar (relative to the adjusting plate) so that the tab lever overthrows the tab latch by .005" to .010". Check to make sure the tab lever overthrow stop or the tab torque bar overthrow stud do not limit this adjustment.

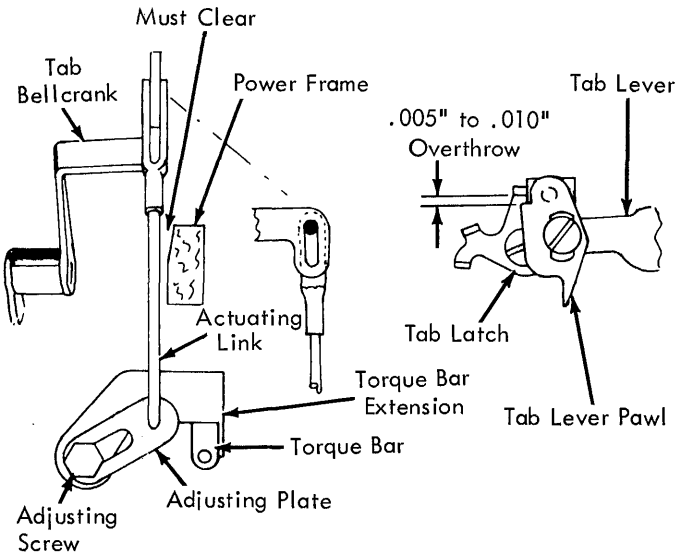


FIGURE 242.1. Adjusting Plate, 11 Inch Machine

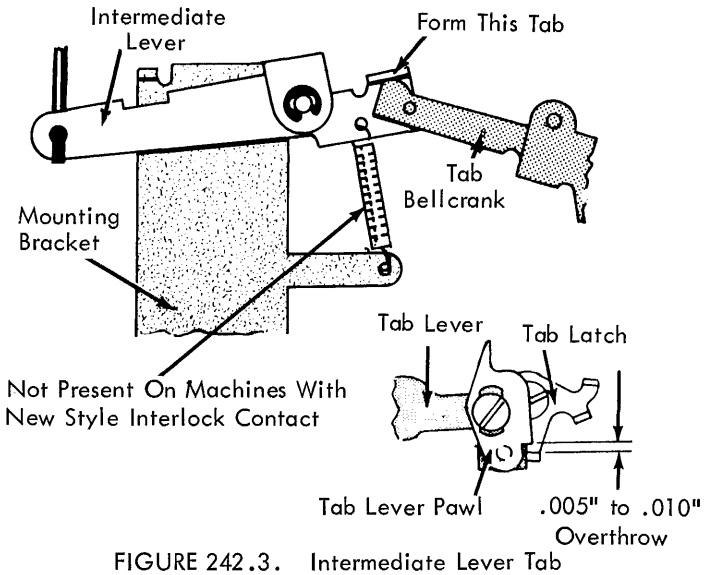


FIGURE 242.3. Intermediate Lever Tab

5. Actuating Link, 15" Machine (Fig. 242.2) - With the backspace cam latched and the intermediate lever resting against its upstop, adjust the actuating link clevis so that the tab torque bar hangs vertically.

NOTE: On machines with new style interlock contact form the upstop up out of the way.

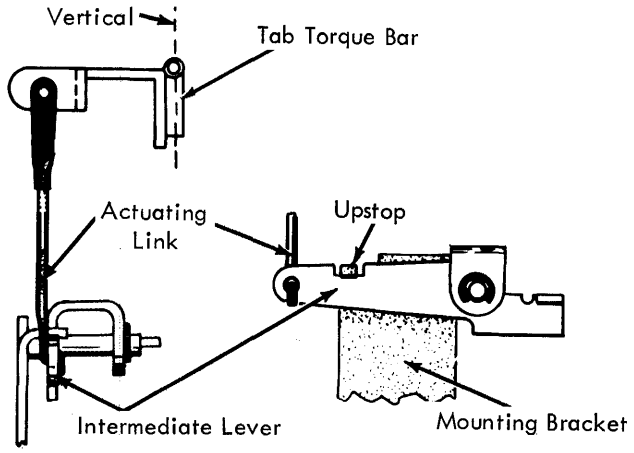


FIGURE 242.2. Actuating Link, 15" Machine

7. Intermediate Lever Tab, 15" Machine (Fig. 242.3) - With the tab interposer released and the backspace cam on its high point, form the intermediate lever tab so that the tab lever pawl overthrows the tab latch by .005" to .010".

8. Lockout Lever (Fig. 242.4) - Position to clear the torque bar by .005" to .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.

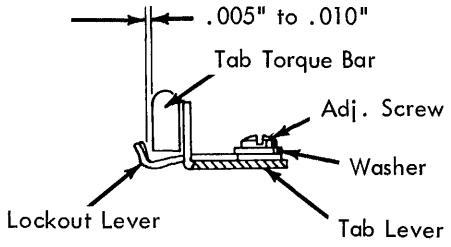


FIGURE 242.4. Lockout Lever

9. Tab Torque Bar Support (Fig. 242.5) - With the tab torque bar at rest, position the torque bar support (relative to the escapement plate) to clear the torque bar by .001" to .006"

The purpose of the torque bar support is the same as the retaining plate on the late style (Fig. 236).

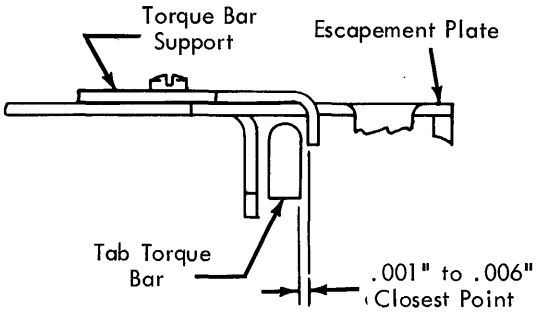


FIGURE 242.5. Tab Torque Bar Support

10. Tab Lever Overthrow Stop (Fig. 242.6) - Adjust forward or back so that .005" to .015" clearance exists between the lug of the tab lever and the overthrow stop when the tab lever is latched to the rear.

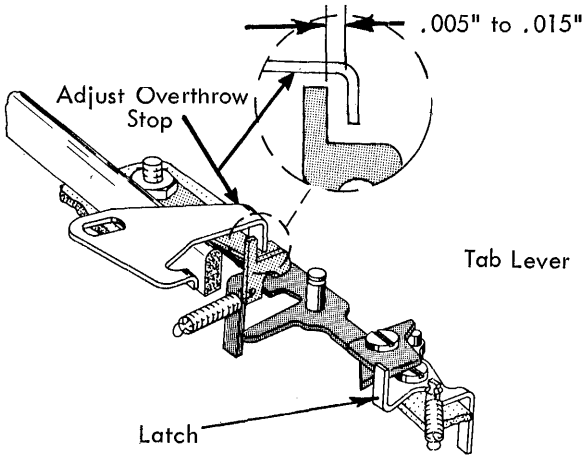


FIGURE 242.6 Tab Lever Overthrow Stop (Early)

11. Carrier Return/Tab Interlock (Fig. 242.7) - With the carrier return clutch latched, the upright lug of the tab latch should clear the end of the tab lever pawl by .005" to .025". The rear lug of the tab latch should be formed forward or back to obtain this condition.

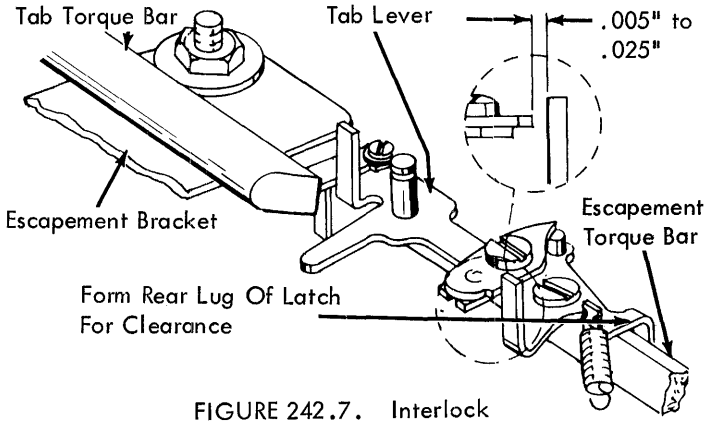


FIGURE 242.7. Interlock

The lug on the tab latch may be formed by using the push end of the large spring hook as a T-bender.

The adjustment insures 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.

12. Tab Interlock Contact

a. Form (in circled area) the actuating wire (left or right) so that it contacts the actuating arm near the right angle bend (Fig. 243).

b. With the tab interposer released and the backspace cam on its high point, position the mounting bracket (front to rear) so that the actuating arm overlaps (.040" minimum) the actuating wire (Fig. 243). This insures that the actuating wire does not get above the actuating arm.

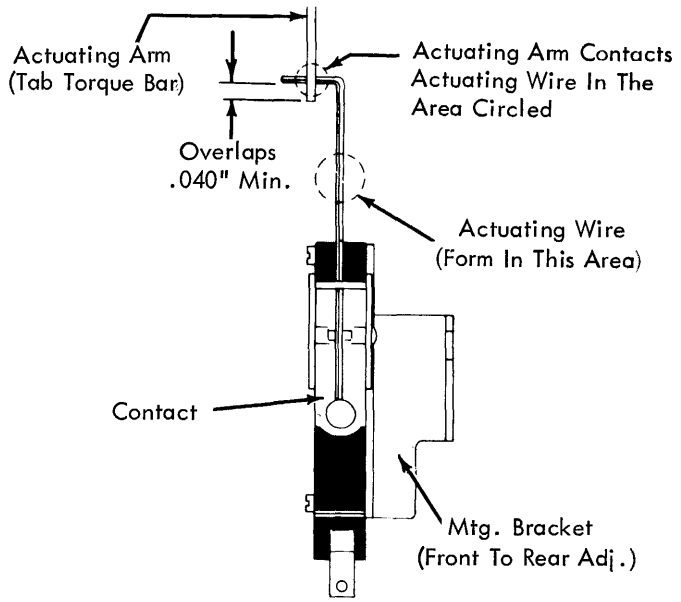


FIGURE 243. Interlock Contact

c. As the tab torque bar restores, position the mounting bracket (up or down) so that the contact actuating wire travels .031" to .062" after the contact transfers (Fig. 244). This is done to insure that machine vibration does not cause the contact to transfer.

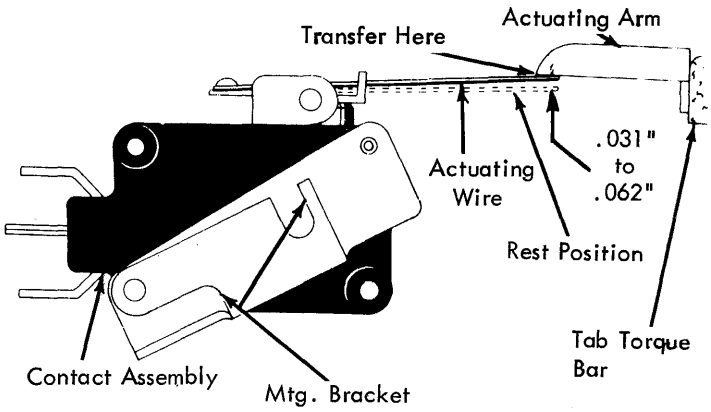


FIGURE 244. Interlock Contact

NOTE: During initiation of a tab operation, the switch must transfer (up position) before the backspace cam reaches its high point. Torque bar bounce must not retransfer the contact while the tab lever is latched out.

MARGIN CONTROL MECHANISM

1. Margin Rack Overbank Guide - With the carrier resting at the left hand margin, adjust the overbank guide (Fig. 245) left or right on the margin rack to obtain .001" to .005" clearance between the margin stop and the margin stop latch on the carrier when the margin rack is in its rest position (Fig. 245). When observing this clearance remove the floating action of the margin stop latch by pulling the stop latch to the right with a spring hook.

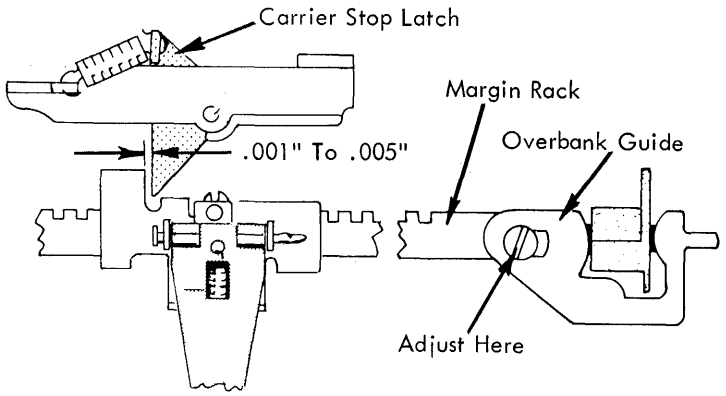


FIGURE 245. Margin Rack Overbank Guide

The adjustment insures 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 equipped with an early style 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 .001" to .005" clearance between the margin stop and the stop latch on the carrier.

2. Margin Release (11 Inch Machine)

a. Early - 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 (Fig. 246). Then tighten the Bristol screw.

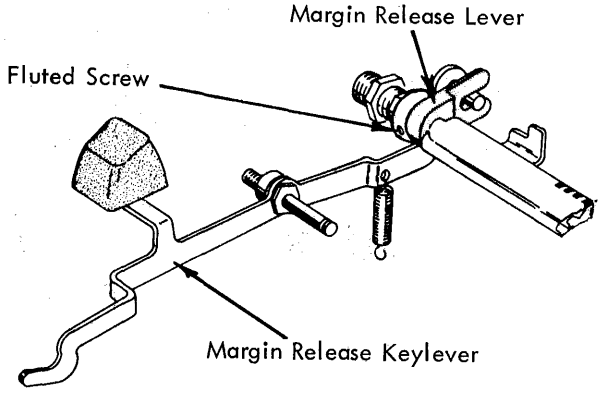


FIGURE 246. Margin Release Mechanism (11 Inch - Early)

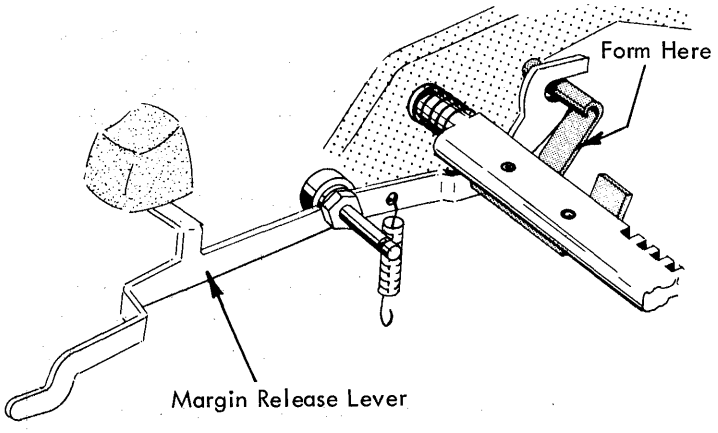


FIGURE 247. Margin Release Mechanism (11 Inch - Late)

b. Late - Form the margin set lever stop, which is fastened to the left end of the margin rack, so that the margin rack is level when the margin release keylever is at rest (Fig. 247).

3. Margin Release (15 Inch Machine)

a. Early

1. With the margin release keylever at rest, loosen the left hand margin release lever and adjust it radially about its shaft so that the top surface of the margin release lever (Fig. 248) is parallel with the slope of the sideframe. The lever should also be positioned laterally on its shaft so that it operates freely without restricting the margin rack motion when the rack is pushed to the left into its overbank position.

2. 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 (Fig. 248). Then tighten the fluted screw.

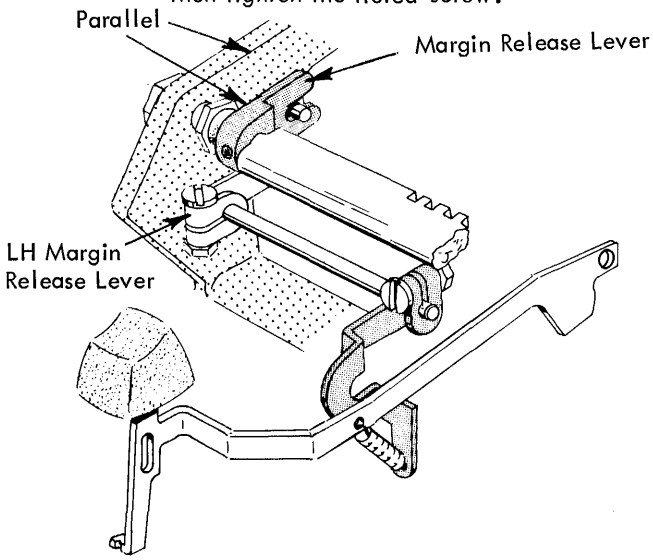


FIGURE 248. Margin Release Mechanism (15 Inch - Early)

b. Late - Position the left hand margin release lever:

1. 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 (Fig. 249).

2. Radially so that 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).

4. Margin Stop Final Stop

a. Early - Form the lug on the final stop (which is welded to the bottom side of the margin rack) to obtain a clearance of .001" to .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.

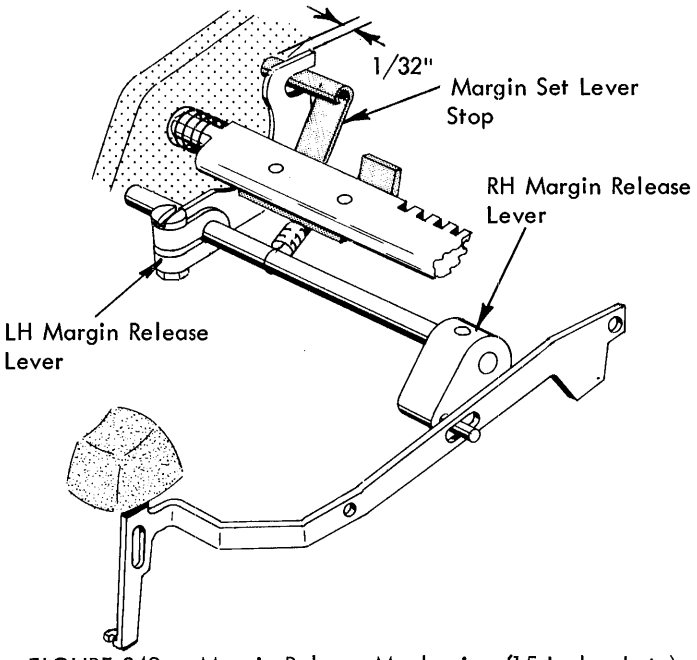


FIGURE 249. Margin Release Mechanism (15 Inch - Late)

b. Late - Position the margin set lever stop left or right on the margin rack so that it will clear the margin stop by .001" to .010" when the margin stop pin is fully seated in the extreme left hand tooth of the margin rack.

The adjustment insures that the margin stop pin will always seat itself in the tooth of the rack when the margin stop is pushed to the left against the final stop.

5. Bell Ringer Bail Adjusting Plate (Fig. 250, Late) - Position the adjusting plate so that the bellringer bail is parallel to the margin rack.

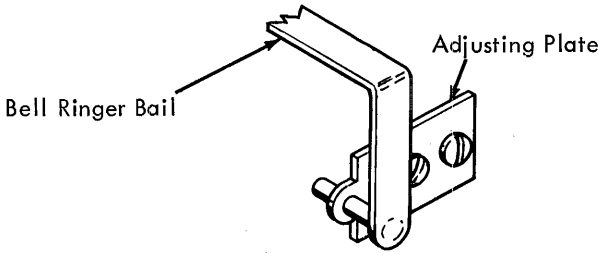


FIGURE 250. Bell Ringer Bail Adjusting Plate

6. Bellringer Bail Lever

a. Early - With the carrier positioned away from the right hand margin stop, adjust the bell bail lever located on the left end of the bellringer bail to have .005" to .020" clearance with the bell clapper

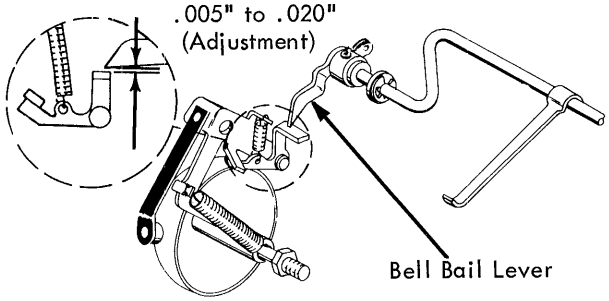


FIGURE 251. Bell Bail Lever (Early)

bellcrank lever when the bail is at rest against the bail stop. The bail stop is located at the right end of the bail. (Fig. 251).

b. Late - With the carrier positioned away from the right hand margin stop, adjust the bell bail lever located on the left end of the bellringer 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 .005" to .020" will exist between the bellringer bail and the bellringer bellcrank (Fig. 252).

c. Machines Without Bell - The bail stop located on the right end of the bail should be adjusted so the bellringer bail is not moved until the bellringer bellcrank begins to rise on the final ramp of the line lock bracket.

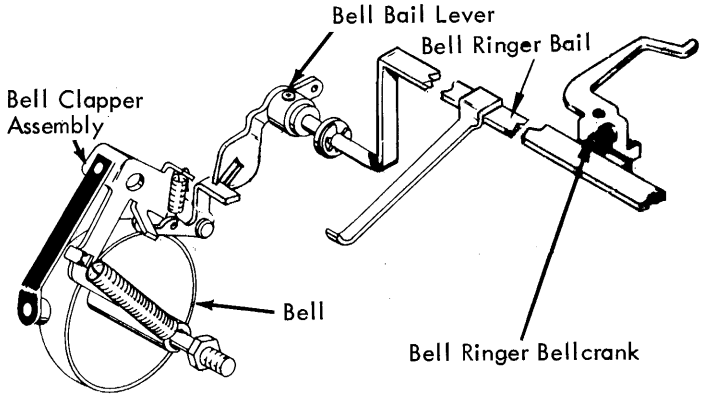


FIGURE 252. Bell Bail Lever (Late)

NOTE: When adjusting the bellringer bail lever be sure to maintain .002" to .004" end play in the bell ringer bail.

7. Line Lock Bracket - Adjust the line lock bracket up or down so that the bellringer bellcrank will ride .047" to .062" from the bottom as the carrier moves into the line lock position (Fig. 253A).

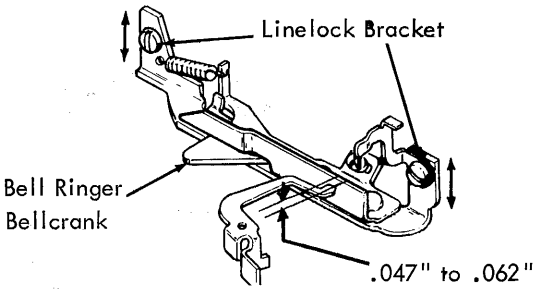


FIGURE 253A. Line Lock Bracket

The adjustment insures that the bellringer bellcrank will remain in contact with the camming surface of the line lock bracket throughout the line lock operation. It also insures that the bellringer bellcrank will ride back over the line lock bracket if the carrier is returned from a position to the right of the right hand margin.

8. Bell Clapper Bellcrank Lever - The bell should ring one space before the bellringer 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 (Fig. 253B). The forming adjustment changes the amount of bite between the bail lever and the bell clapper bellcrank lever.

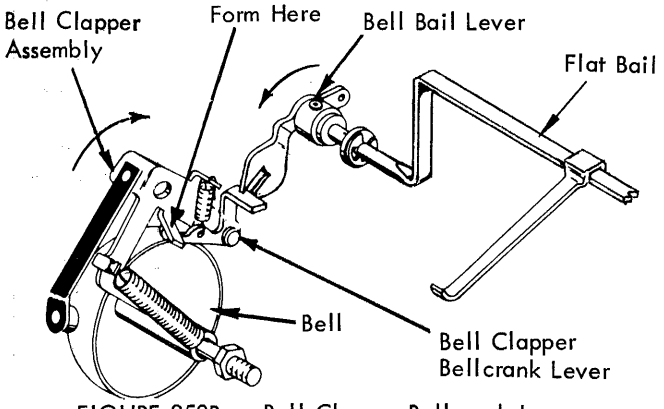


FIGURE 253B. Bell Clapper Bellcrank Lever

9. Line Lock Bracket Adjustable Plate (Fig. 254) - 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.

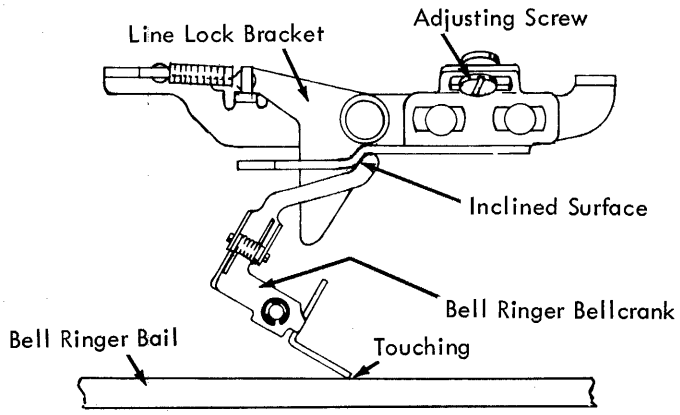


FIGURE 254. Line Lock Bracket

9.1 Line Lock Bracket Adjustable Plate (Late Style) (Fig. 254.1) - Position, with carrier in the next to last column to obtain .001" to .010" between the inclined surface and the bellringer bellcrank.

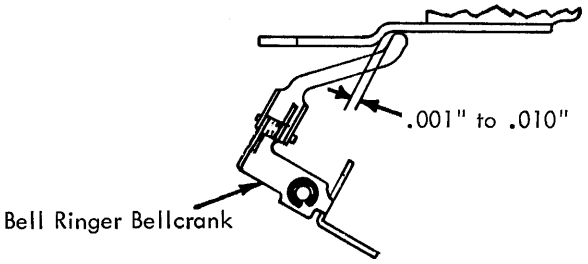


FIGURE 254.1 Line Lock Bracket

10. Line Lock - Form the line lock actuating arm on the bellringer bail so that the line lock interposer is fully depressed when the carrier pointer is in line with the mark on the right hand margin stop (Fig. 255).

CAUTION: 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.

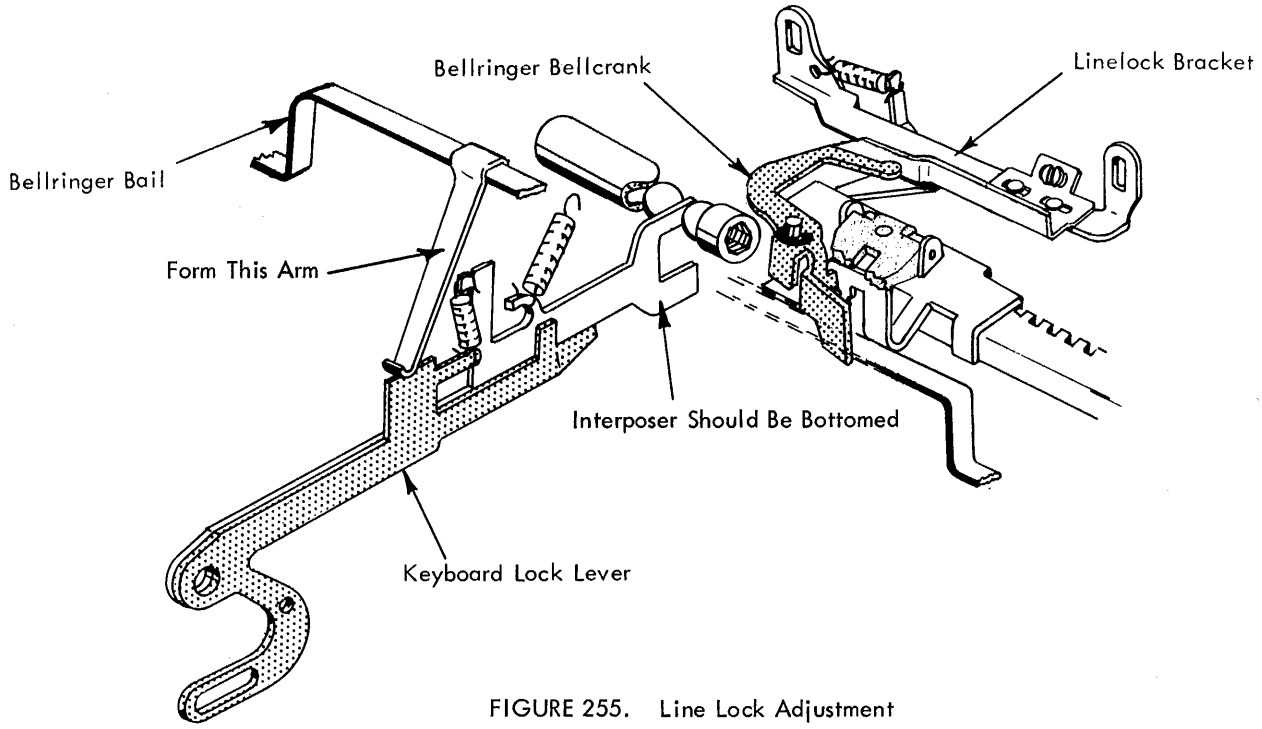


FIGURE 255. Line Lock Adjustment

LAST COLUMN CONTACT

1. Last Column Contacts (Fig. 256, Early)

   a. Form the N/C support so that the O/P (at rest) produces a slight rise of the N/C contact.

   b. Form the N/O support so that the N/O contact clears the O/P by .020" to .030".

   c. Position (carrier in next to last space) the contact actuator on the bellringer bail so that it just touches the O/P. When positioning the actuator, all back lash must be held out of the actuator to line lock bracket linkage.

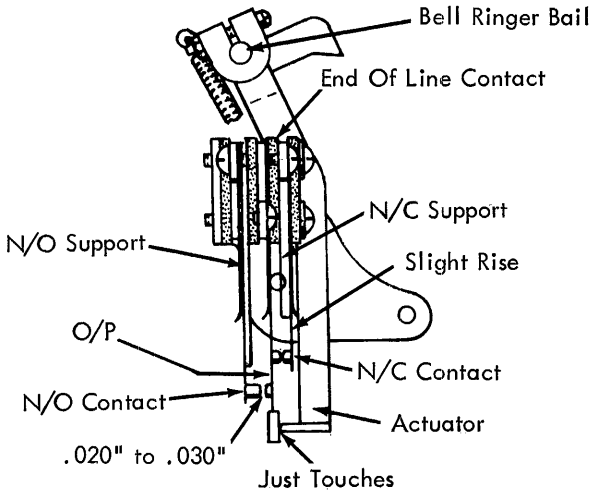


FIGURE 256. Last Column Contact Adjustment (Early)

NOTE: To place the carrier in the next to last space, proceed as follows:

1. Space to the right until the right hand margin setting locks the keyboard.

2. Backspace two spaces.

   d. As the carrier moves from the next to last space, check for the following conditions (Fig. 257).

      1. The contact transfer must be complete (and without bounce) within one space.

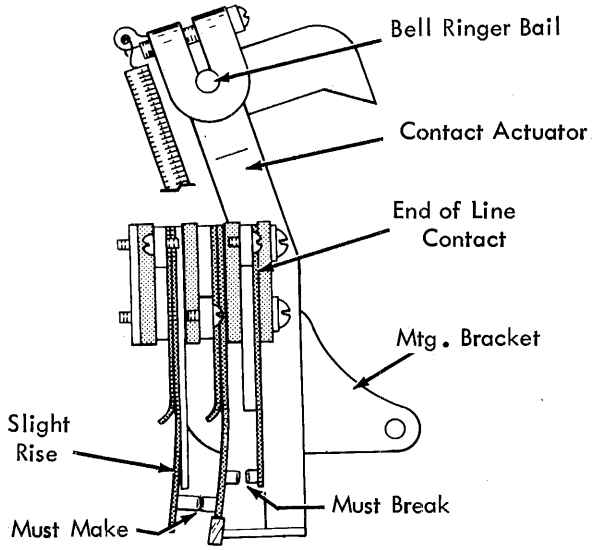


FIGURE 257. Last Column Contact Adjustment (Early)

      2. N/C contact must break.

      3. O/P must lift the N/O contact sufficiently to insure reliable make.

2. Last Column Contact (Fig. 258)

   a. With the carrier in the next to last space, the contact actuator arm shall be adjusted to give a .010" to .020" clearance between the switch wire and the actuator arm with the switch at its re-transfer point.

   b. The actuator arm shall be adjusted to give a .060" to .094" left to right clearance between the actuator arm and the formed angle on the switch wire.

   c. The contact backup spring shall be so adjusted that the actuator arm will contact the backup spring .250" to .312" before it contacts the switch wire.

3. Region Switch (MT/ST) - This switch should be adjusted so that it makes as the bell rings (Fig. 253). The make of this switch should be 10 to 13 spaces prior to the last column contact making.

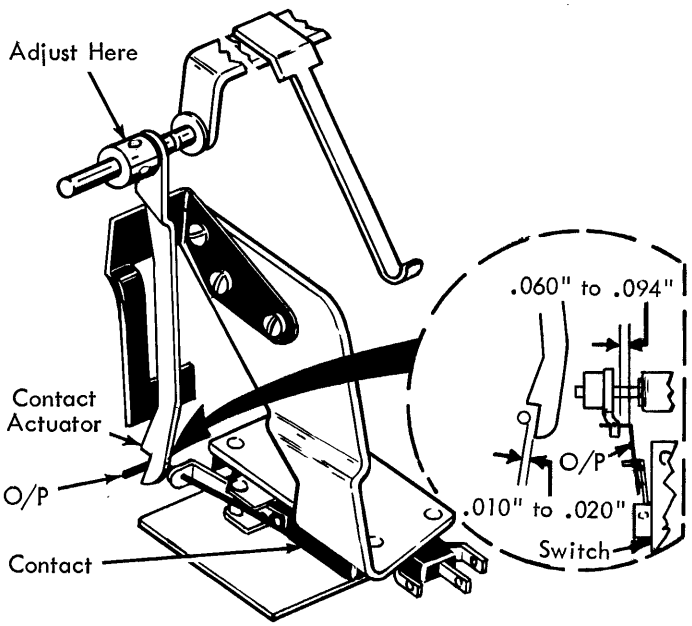


FIGURE 258. Last Column Contact (Late)

4. Last Column Contact (Late) (Fig. 258.2) - With carrier in the last column, the actuator screw shall be adjusted to obtain the following:

   A. Transfer the switch and have a .010" minimum overthrow when escaping from the last column and it will re-transfer with a backspace operation.

   B. Provide a .005" minimum clearance between the actuator screw and the switch plunger, with carrier in last column.

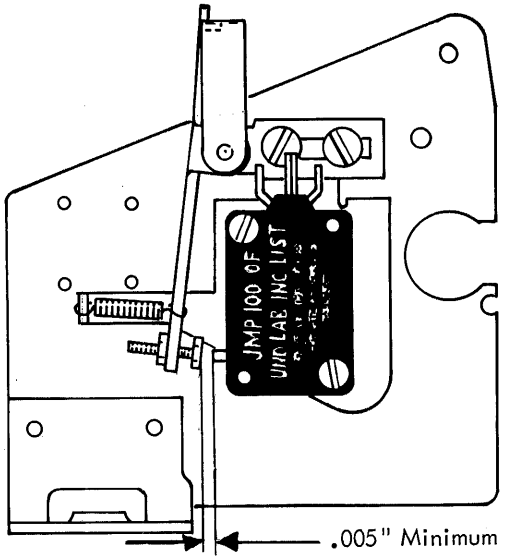


FIGURE 258.1 Last Column Contact (Late)

PAPER FEED MECHANISM

NOTE: For pin feed platen machines, use adjustments 7, 8, and 10 only.

1. Before any paper feed adjustments are attempted, the position of the platen MUST be correct.

2. Paper Feed Braces (early paper feed mechanism 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 (Fig. 259).

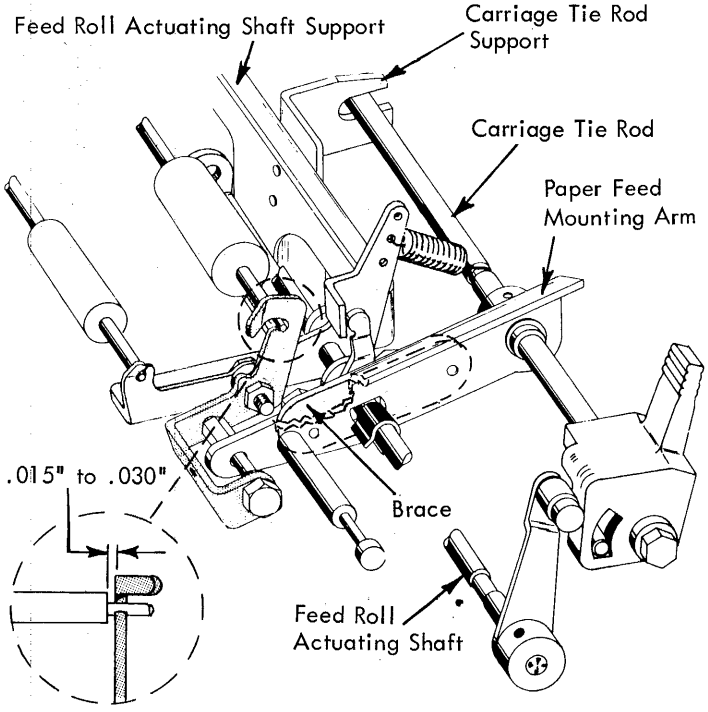


FIGURE 259. Paper Feed Mechanism

3. Paper Feed Supports

a. Early Paper Feed Mechanism - 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 (Fig. 259). The feed roll actuating shaft support should be loose when the tie rod support is adjusted.

b. Late Paper Feed Mechanism - With the feed roll tension springs disconnected, the center support bracket (Fig. 260) should be positioned 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.

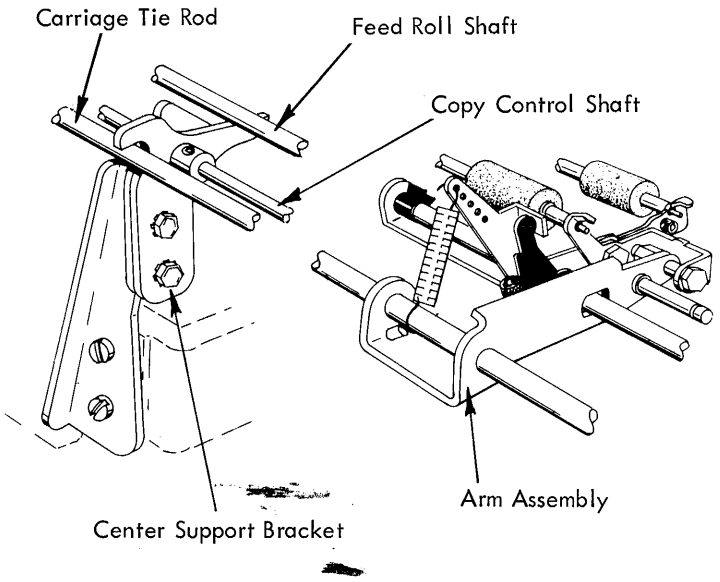


FIGURE 260. Center Support Bracket

4. Feed Roll Tension - Place the feed roll tension springs in the hole of the front feed roll arms that will provide the following tension measured at the front feed roll pivot points.

11 inch machine - 2-3/4 to 3-1/4 pounds
15 inch machine - 2 to 2-1/2 pounds

5. Feed Roll Side Play

a. Early - The right hand paper feed mounting arm on the 11 inch machine and the left and right hand paper feed mounting arms on the 15 inch machine should be adjusted to provide the rear feed roll shafts with an end play of .015" to .030" when the feed rolls are against the platen (Fig. 259).

b. Late - The right hand front feed roll arm assembly on the 11 inch machine and the left and right hand 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 (Fig. 260).

6. Feed Roll Adjustment

a. Early - 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 .008" to .012" between the front feed rolls and the platen (Fig. 261). The clearance should be equal on both ends of the feed roll.

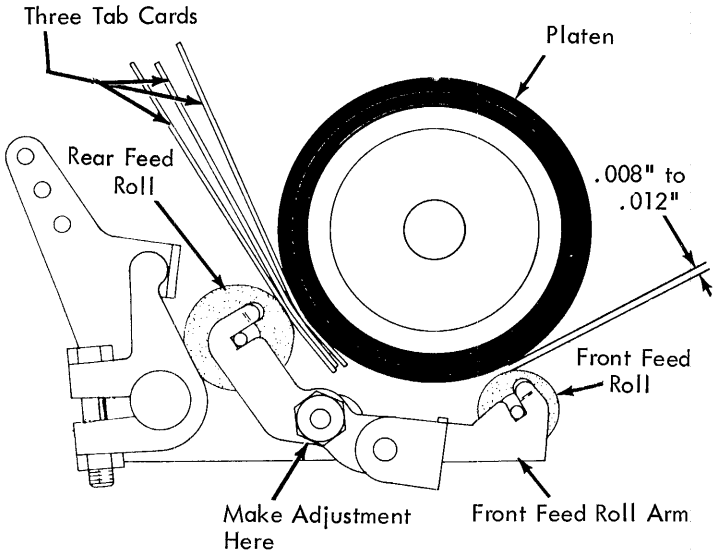


FIGURE 261. Feed Roll Adjusting Eccentrics (Early)

b. Late - The front feed roll adjusting arms should be adjusted as follows: When two tab cards are placed between the front feed rolls and the platen, the rear feed rolls should clear the platen (Fig. 262). When one tab card is placed between the front feed rolls and the platen, the rear feed rolls should touch the platen.

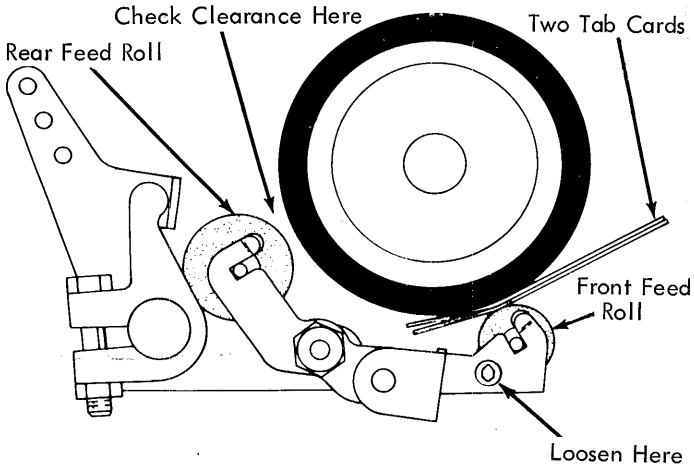


FIGURE 262. Feed Roll Adjusting Arm (Late)

7. Paper Release - Adjust the feed roll release arm (Fig. 263) to obtain a release clearance of .055" to .065" between the rear feed roll and the platen.

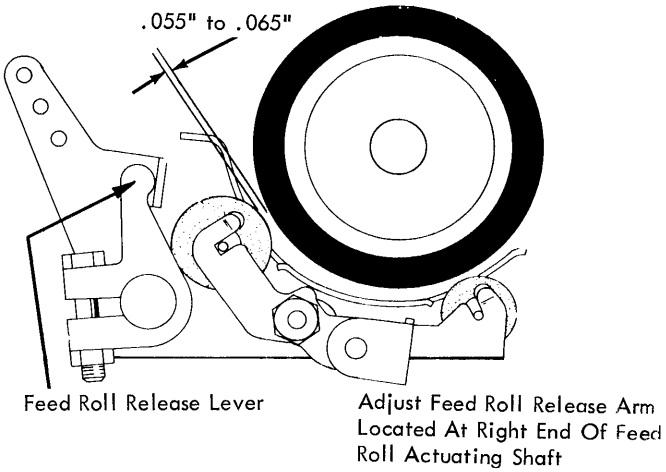


FIGURE 263. Paper Release Adjustment

Excessive clearance can cause interference between the front feed roll and the carrier; whereas insufficient clearance will not permit straightening of thick paper packs.

NOTE: The clearance should be the same at each end of the feed roll. The clearance can be equalized by adjusting either the left or right feed roll release lever (Fig. 263).

8. Deflector - Position the deflector by forming the deflector supporting tabs on the front and rear feed roll arms so that a clearance of .010" to .020" exists between the front and rear of the deflector and the platen (Fig. 264). 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.

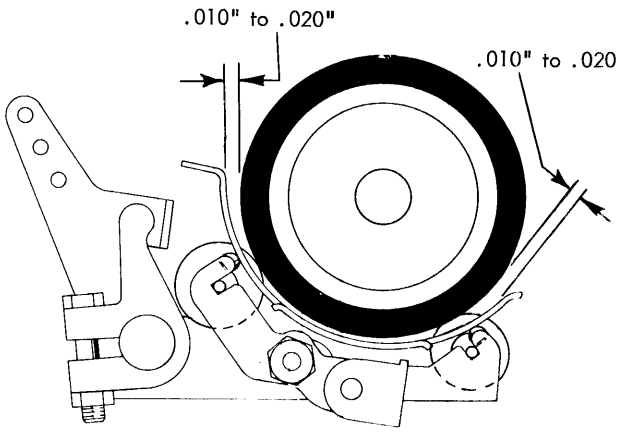


FIGURE 264. Deflector Adjustment

9. Paper Bail

a. Bail Shaft - The shaft should be positioned in the right hand bail arm so that each arm can be pulled forward the same distance from the platen before the entire bail begins to move.

The adjustment insures that both bail rollers will have equal pressure against the platen.

b. Bail Stop - The lugs that stop the rearward movement of the paper bail arms should be formed to obtain a .005" to .010" clearance between the lugs and the bail arms when the copy control lever is at its extreme rear position.

The adjustment prevents interference between the bail arms and the line gage card holder when the platen is removed.

c. Retaining Clips - The retaining clips on the right and left-hand bail lever mounting studs shall be installed to give .002" to .006" end play to each bail lever.

10. Line Gage Card Holder

a. Adjust the line gage card holder forward or back for a .005" to .010" clearance with the platen.

b. The vertical adjustment should be such that the graduated edge is parallel to and .002" to .005" below the feet of the typed characters when viewed from the operator's position.

c. 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 hand card holders should be lined up with the bottom of a series of V's.

11. Paper Switch - Position the paper switch mounting bracket for two conditions:

a. The paper switch arm should be centered in the cover slot (Fig. 264.1).

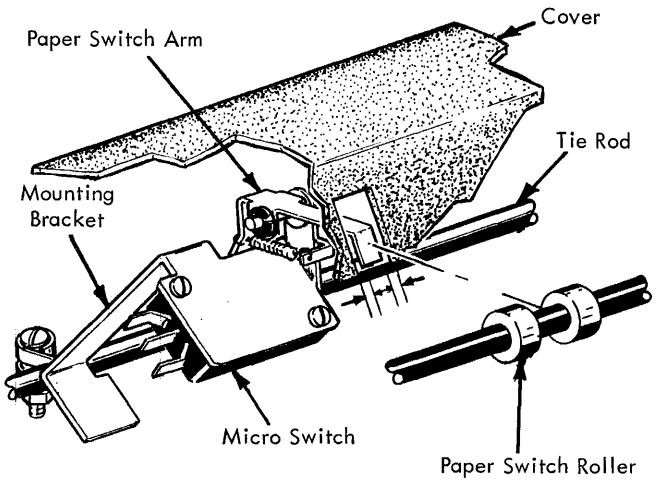


FIGURE 264.1 Paper Switch

b. The status switch should transfer and re-transfer during its travel in the slot of the paper switch roller (Fig. 264-B).

NOTE: The top portion of the paper switch arm should be approximately horizontal.

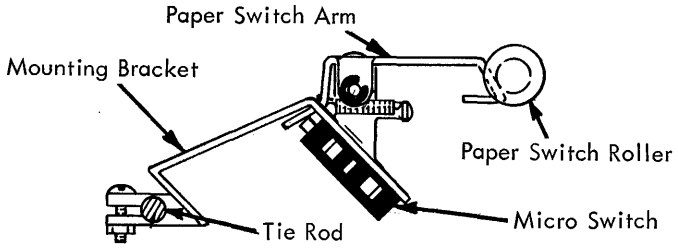


FIGURE 264.2 Paper Switch (Side View)

FABRIC RIBBON MECHANISM

1. Centering Springs - With the ribbon reverse interposer centered, form the lugs of the ribbon feed plate for .003" to .005" clearance in the centering spring loops (Fig. 265).

The adjustment insures that the springs are not extended when at rest and that they will properly restore the mechanism after a reverse operation.

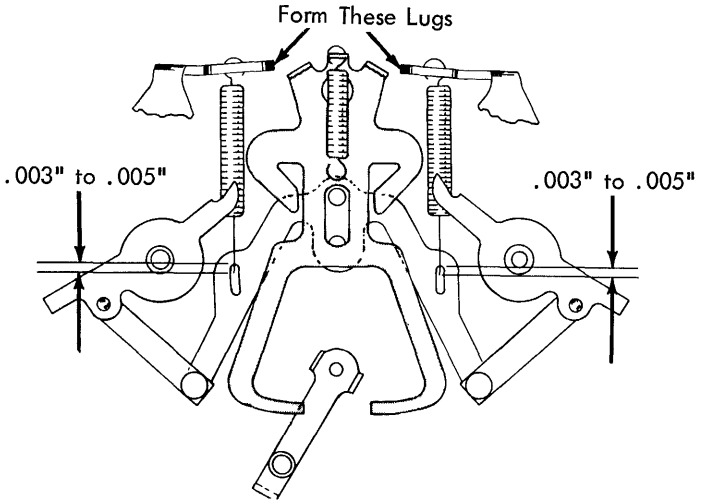


FIGURE 265. Centering Springs Adjustment

2. 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 (Fig. 266).

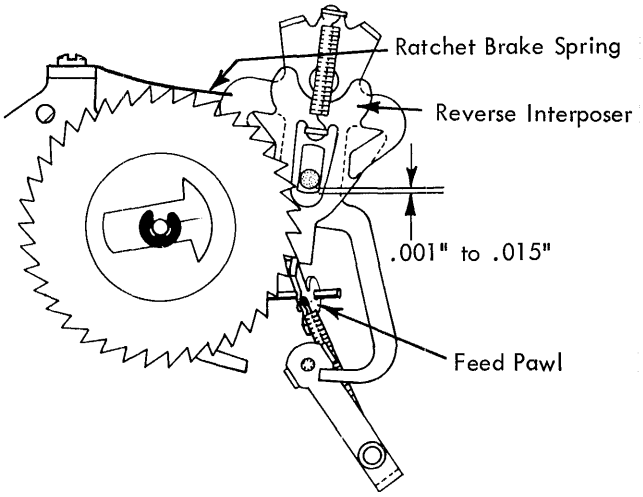


FIGURE 266. Ribbon Feed Plate Adjustment

The ratchets should be checked alternately with the cartridge removed. The check as described is merely a method of testing for the correct braking action of the springs and has little to do with the reversing action.

3. 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 back so that the ribbon feed pawl holds the reverse interposer within .001" to .015" of its total travel (Fig. 266).

The adjustment not only insures sufficient throw for a reversing operation, but also gives optimum ribbon feed results by determining the rest and active positions for the pawl.

CAUTION: After completing the adjustment, manually cycle a character to check that two teeth feed is obtained plus .005" to .020" overthrow.

Be sure that the feed pawl does not contact the interposer lever as the pawl is manually reversed from side to side.

4. 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 .001" to .010" lateral movement of the cartridge.

5. 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 to the high lift position (Fig. 267). The ribbon lift cam should be at the low point when the check is made.

The adjustment insures the same relative throw for both the high and low lift positions.

6. Ribbon Lift Control Link - Adjust the link forward or back by means of the clevis so that the underscore will

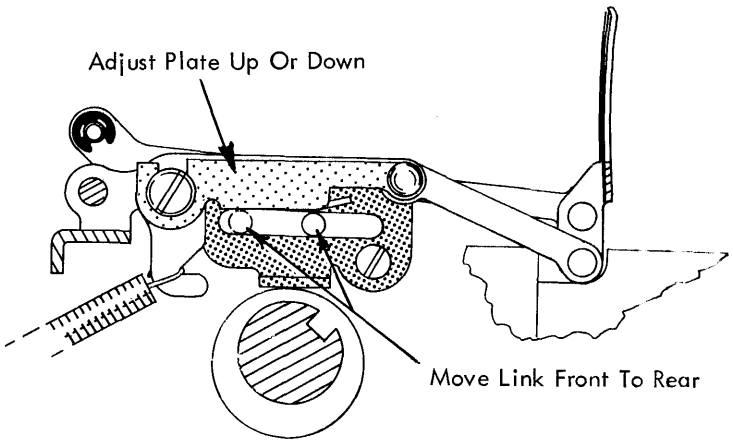


FIGURE 267. Ribbon Lift Guide Plate Adjustment

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.

CAUTION: 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.

7. 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.

8. Stencil Lockout (Fig. 268) - 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 .010" clearance with the lug on the cam follower.

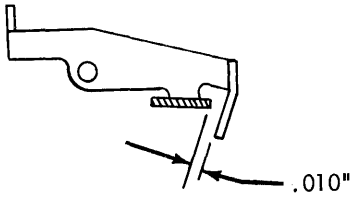


FIGURE 268. Stencil Locking

RIBBON SHIFT MECHANISM

1. Magnet Adjustments (2 Magnet)

   a. With the armatures energized, position the hinge plates so that the armatures clear the magnet yokes by .003" to .005" (Fig. 269).

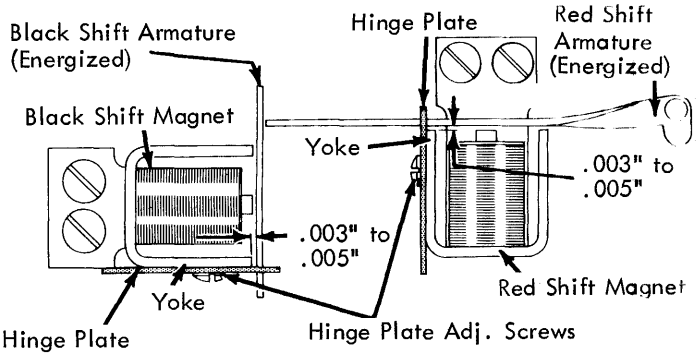


FIGURE 269. Hinge Plates

b. With the armatures energized, position the armature stops so that the armatures clear the magnet yoke by .003" to .005" (Fig. 270).

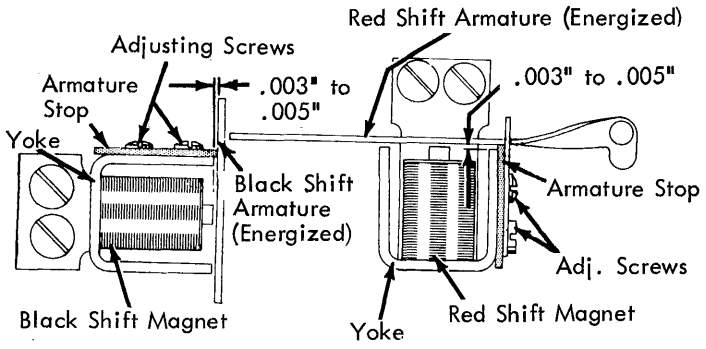


FIGURE 270. Armature Stops

2. Black Shift Magnet - With the black shift magnet armature energized and the red shift magnet armature de-energized, position the black shift magnet for a clearance of .010" between the black and red shift armatures (Fig. 271).

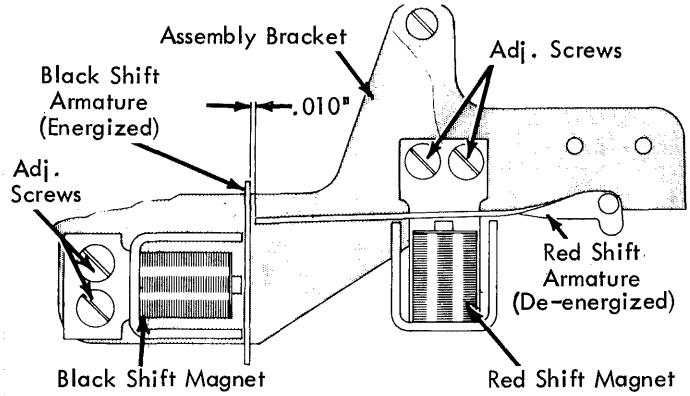


FIGURE 271. Magnet Positioning

NOTE: With the red shift armature energized and the black shift armature de-energized, the black shift armature must overthrow the red shift armature by .003" to .006" (Fig. 272).

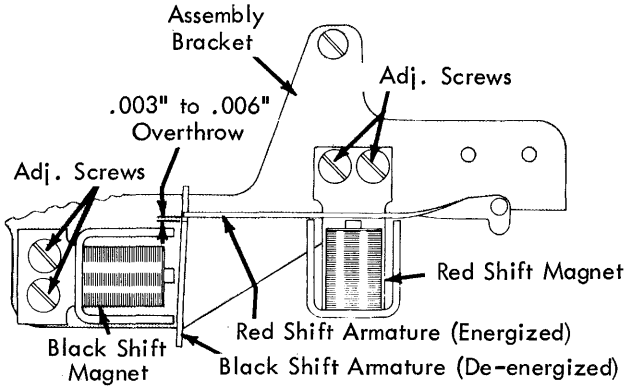


FIGURE 272. Black Shift Armature Overthrow

3. Magnet Adjustments (1 Magnet, Fig. 273) - With the red shift magnet armature energized, position the hinge plate and armature stop so that the armature clears the yoke (both inner and outer poles) by .003" to .005".

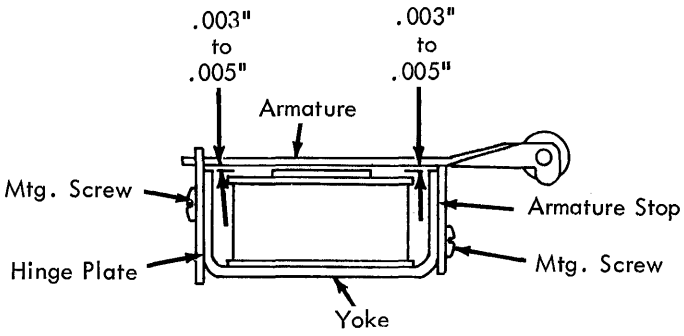


FIGURE 273. Magnet Adjustments (1 Magnet)

4. Pivot Arm (Fig. 274) - 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 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 a black and red ribbon.

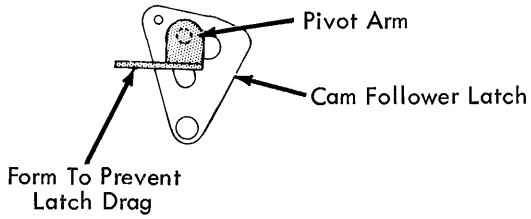


FIGURE 274. Pivot Arm

5. Right Hand Pulley (Fig. 275 & 276) - With the red shift armature energized, position the right hand pulley pivot to obtain .002" to .005" clearance between the stud and follower latch slot.

NOTE: The pulley nut must be loosened before adjusting the pivot screw.

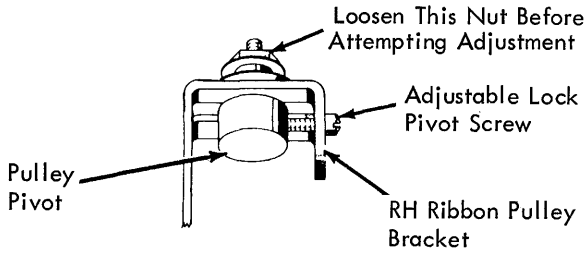


FIGURE 275. Right Hand Pulley

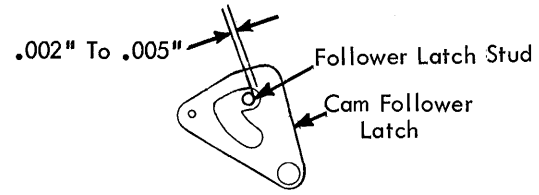


FIGURE 276. Cam Follower Latch

6. Red Shift Armature Backstop (Fig. 277 & 278) - With the armature de-energized, position the red shift armature backstop to obtain .002" to .005" clearance between the stud and the follower latch slot.

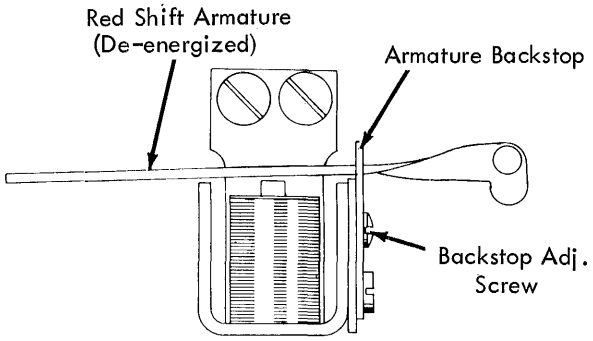


FIGURE 277. Red Shift Armature Backstop

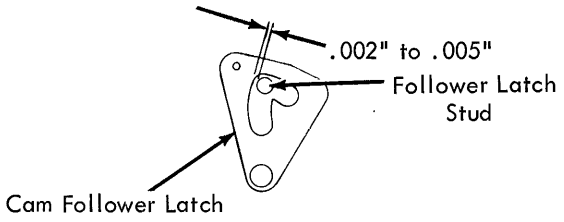


FIGURE 278. Cam Follower Latch

7. Ribbon Mode Contacts (Fig. 279) -

a. Form the O/P so that it lifts the N/C contact by .005" to .008".

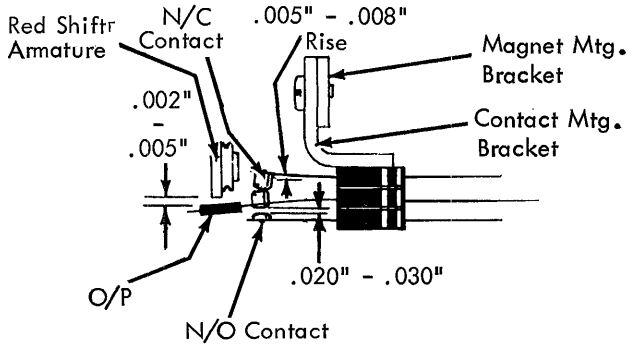


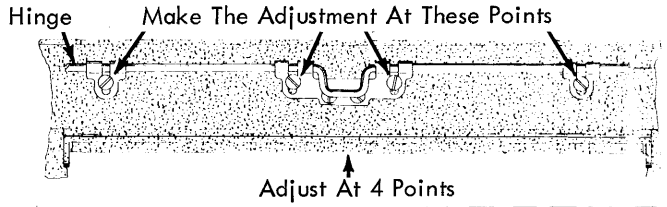
FIGURE 279. Ribbon Transmit Contact Assembly

b. Form the N/O contact so that it clears the O/P by .020" to .030".

c. Position the contact mounting bracket on the magnet mounting bracket so that red shift armature (at rest) clears the O/P pad by .002" to .005".

Excessive wipe on the N/O contact may cause failure of the red 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 overthrow to latch the mechanism on red ribbon.

1. Top Cover Hinge - The hinge should be adjusted so that the contour of the top cover matches the contour of the center cover (Fig. 280).



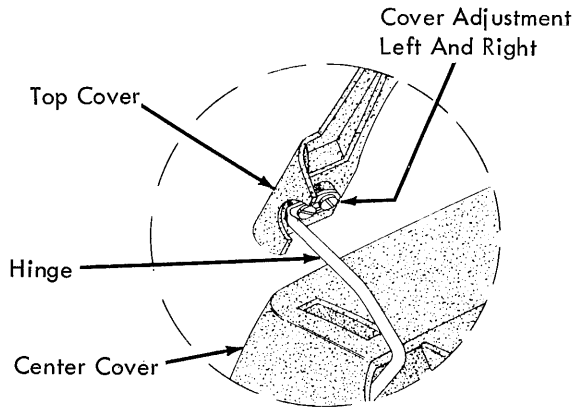


FIGURE 280. Top Cover Hinge

2. Center Cover Latch (Fig. 281) - Position so that the top cover is latched securely in the closed position.

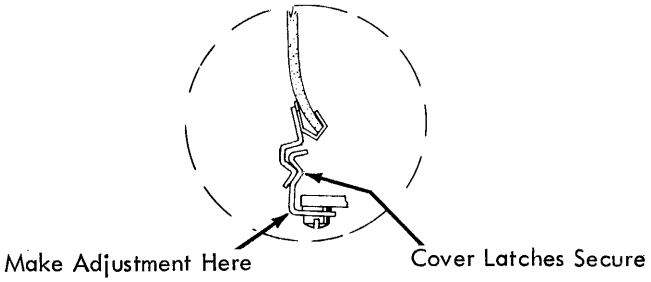


FIGURE 281. Center Cover Latch

3. Hinge Spring (Fig. 282) - Position so that the top cover will be detented and held in the open position.

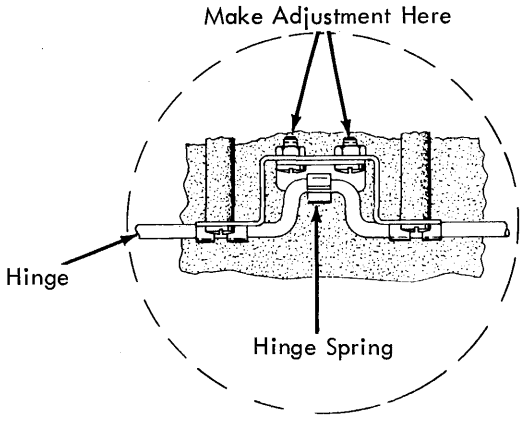


FIGURE 282. Hinge Spring

4. Center Cover Mounts - Adjust the center cover mounts so that with the machine suspended in the covers the following four requirements are met:

   a. All of the openings for keybuttons will have equal clearance on each side.

   b. The platen will clear the covers in the extreme front or rear position.

   c. The clearance between the paper guide and the deflector will be .020" to .040" (Fig. 283).

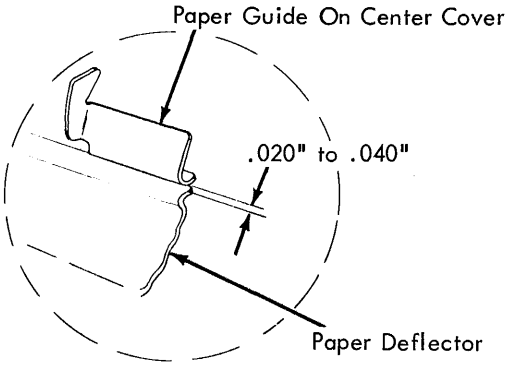


FIGURE 283. Shock Mounts

   d. The top of the spacebar will be 1-3/8" above the bottom of the center cover section.

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.

5. Tilt-Up Covers - With the printer resting in the bottom cover position the printer relative to is mounting brackets (Fig. 284) for the following conditions:

   a. The keybuttons have equal front and rear clearance with the center cover (Fig. 284).

   b. The platen clears the covers in the extreme front and rear positions (Fig. 284).

   c. The paper guide clears the deflector .020" to .040" (Fig. 284).

   d. The top of the space bar should be approximately 1-1/2" above the top edge of the bottom cover (Fig. 284).

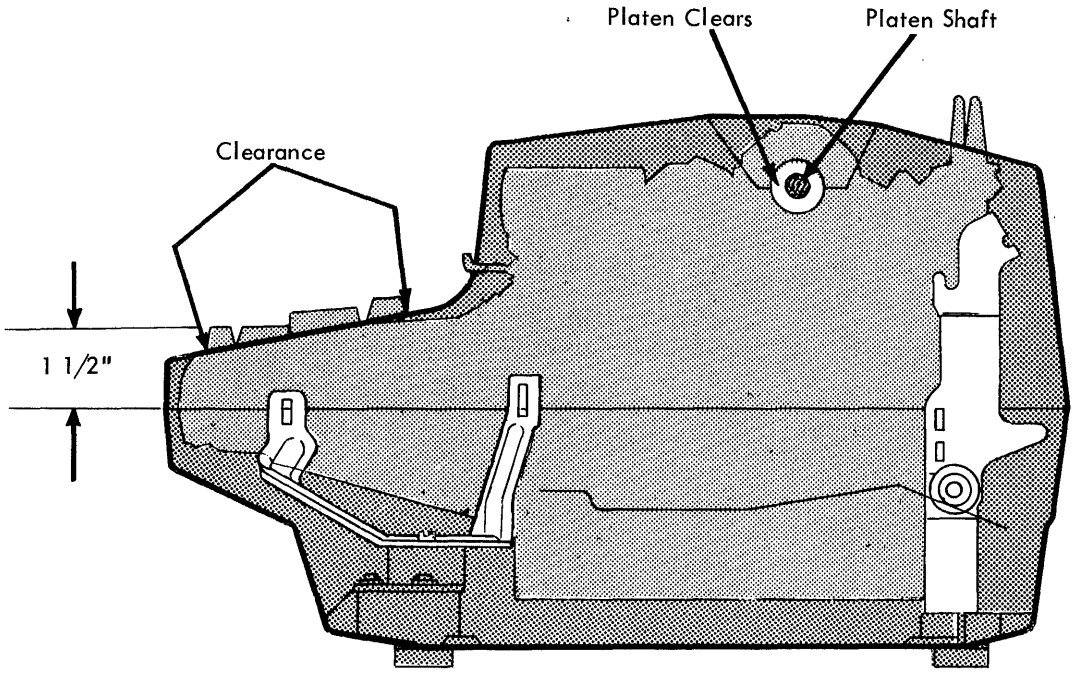


FIGURE 284. Tilt Up Covers

IBM®

OPD CUSTOMER ENGINEERING
Selectric I/O Reference Manual
Section 3

Reprinted July, 1966

F/N 241-5310-0

CONTENTS

REMOVAL SECTION 3

CYCLE CLUTCH AND CYCLE SHAFT REMOVAL

1. Remove the covers and ring mount (not shown).
2. Position the carrier to the extreme right.
3. Remove the degree wheel pointer (#1, Figure 1).
4. Remove the degree wheel (#2, Figure 1).
5. Remove the gear guard (#3, Figure 1).
6. Remove the left dust cover (not shown).
7. Remove the two screws (#1, Figure 2) that hold the contact plate to the frame. Remove the contact assembly and hold it to the front with a rubber band.
8. Remove the two pivot screws (#1, Figure 3).
9. Remove the front screw from the C1 - C2 contact assembly (#1, Figure 4) and swing the assembly down out of the way of the bearing plate.
10. Remove the cycle-clutch check pawl and spring (#1, Figure 5).
11. Remove the bronze intermediate gear (#3, Figure 4).
12. Remove the three bearing-plate screws (#2, Figure 4).
13. Remove the C1 - C2 cams (#4, Figure 4) and the cycle shaft gear (behind the C1 - C2 cams).
14. Remove the bearing plate (#5, Figure 4) by prying it away from the frame (front end first) with a screwdriver and sliding it off the cycle shaft.
15. Force the positive bail down with a screwdriver (#2, Figure 5), making sure all the latches are under the bail. Insert a bristol wrench through the lower left bearing plate mounting hole (#2, Figure 4) over the top of the bail to hold it down.
    NOTE: Do not remove the positive bail restoring spring.
16. Remove the cycle shaft, pushing the Negative 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.
17. Remove the shims from the old shaft and put them on the new one. Be sure the flexible nylon shim is the first one put on.
18. The following adjustments should be checked after the cycle-shaft is replaced:
    a. Idler Gears
    b. Cycle Shaft End Play
    c. Cycle-Clutch Spring
    d. Cycle-Clutch Latch Bite
    e. Damper Spring
    f. Filter Shaft Timing
    g. Print Shaft Timing
    h. C1 and C2 Contact Timing

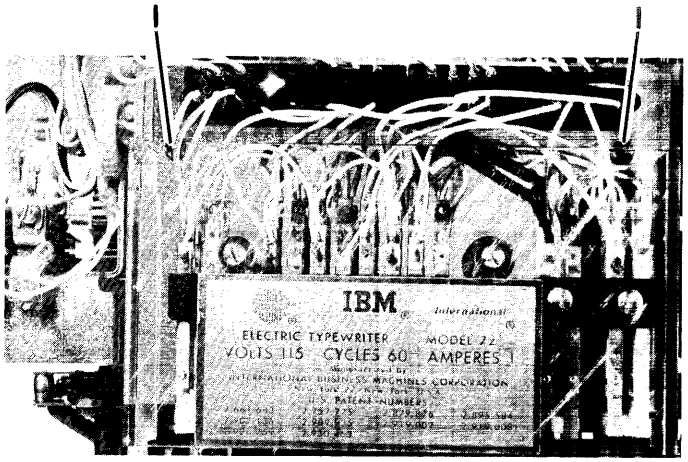


Figure 2. Cycle Clutch and Cycle Shaft Removal

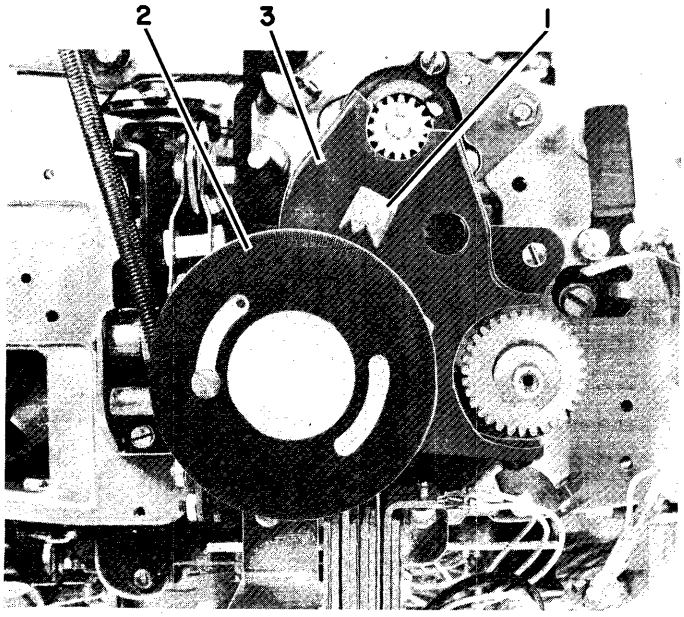


Figure 1. Cycle Clutch and Cycle Shaft Removal

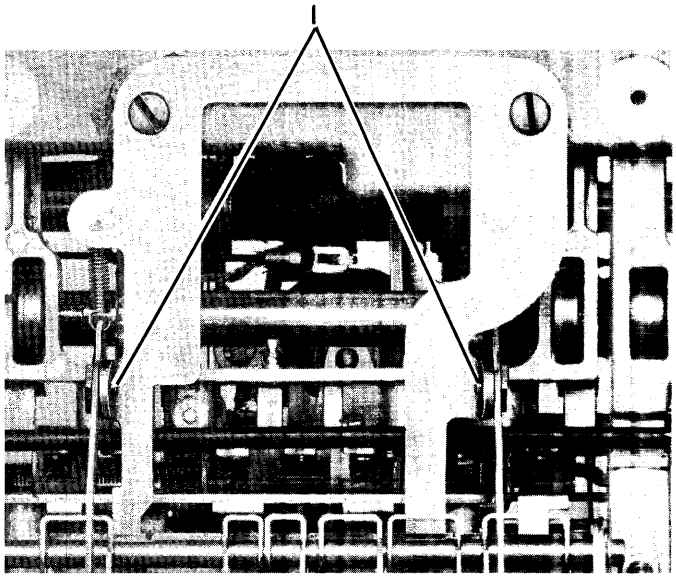


Figure 3. Cycle Clutch and Cycle Shaft Removal

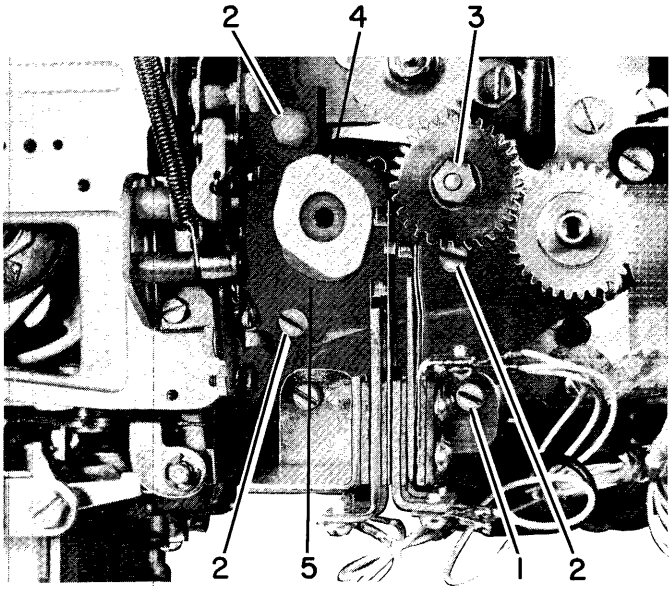


Figure 4. Cycle Clutch and Cycle Shaft Removal

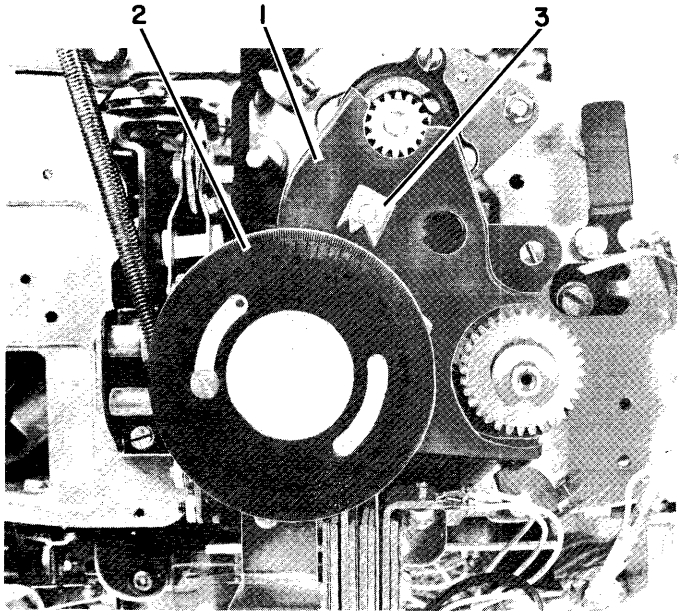


Figure 6. Belt Replacement

BELT REPLACEMENT

1. Position the carrier to the extreme right.
2. Remove the degree-wheel pointer (#3, Figure 6).
3. Remove the degree-wheel (#2, Figure 6).
4. Remove the gear guard (#1, Figure 6).
5. Remove the left dust cover (not shown).
6. Remove the two screws (#1, Figure 7) that hold the plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
7. Remove the cycle-clutch check pawl and spring (#1, Figure 8).
8. Remove the front screw from the C1 and C2 contact assembly (#1, Figure 9) and swing the assembly down.
9. Remove the bronze intermediate gear (#3, Figure 9).
10. Remove the three bearing plate screws (#2, Figure 9) and remove the bearing plate.
11. Cut the old belt and remove it from the machine.
12. Force the positive bail down with a screwdriver (#1, Fig-

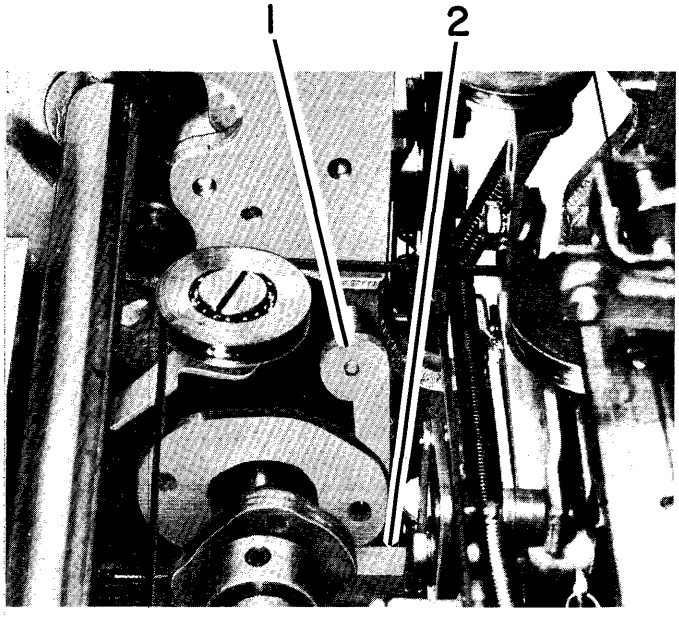


Figure 5. Cycle Clutch and Cycle Shaft Removal

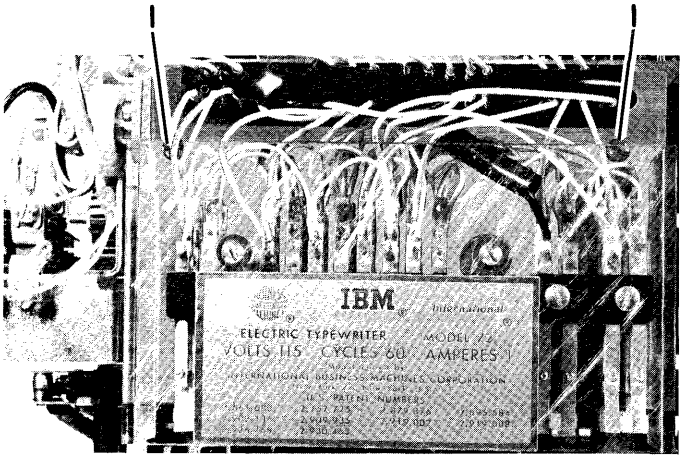


Figure 7. Belt Replacement

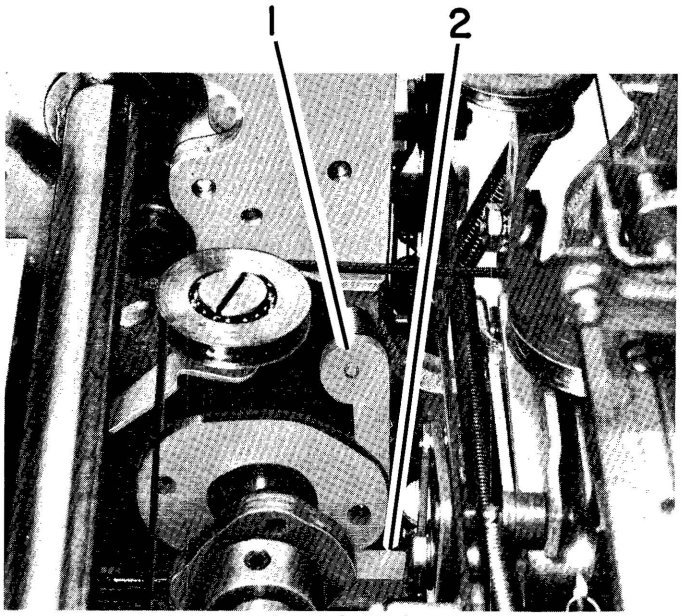


Figure 8. Belt Replacement

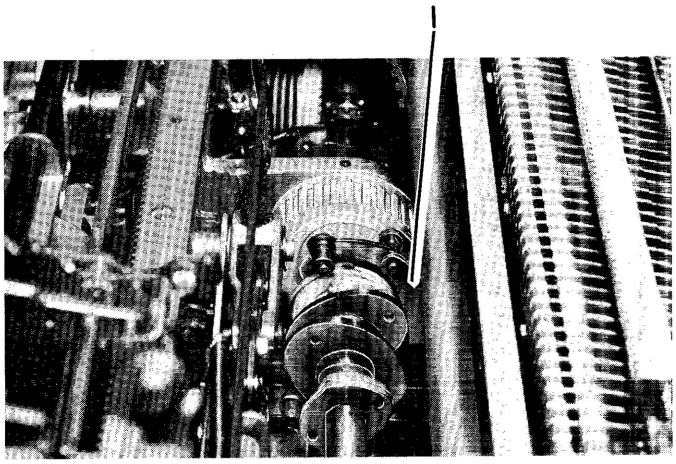


Figure 10. Belt Replacement

ure 11) making sure all the latches are under the bail. Insert a bristol wrench through the lower left bearing plate mounting hole over the top of the bail to hold it down.

13. Loosen the two cycle-clutch latch-bracket mounting screws (#1, Figure 10). Slip the new belt through the bearing plate hole, around the shaft, and over across the cycle shaft to the cycle-clutch latch (Figure 11). Work it between the latch and the cycle-clutch sleeve.
14. Loosen the motor mount and slip the belt over the centrifugal clutch.
15. The following adjustments should be checked after the belt is replaced:
    a. Idler gears
    b. Damper spring
    c. Filter shaft timing
    d. Print shaft timing
    e. C1 and C2 contact timing
    f. Cycle clutch latch bracket height

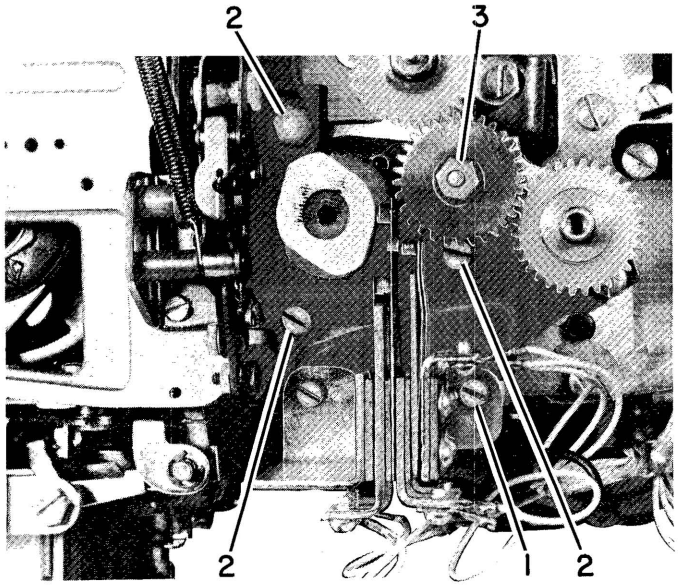


Figure 9. Belt Replacement

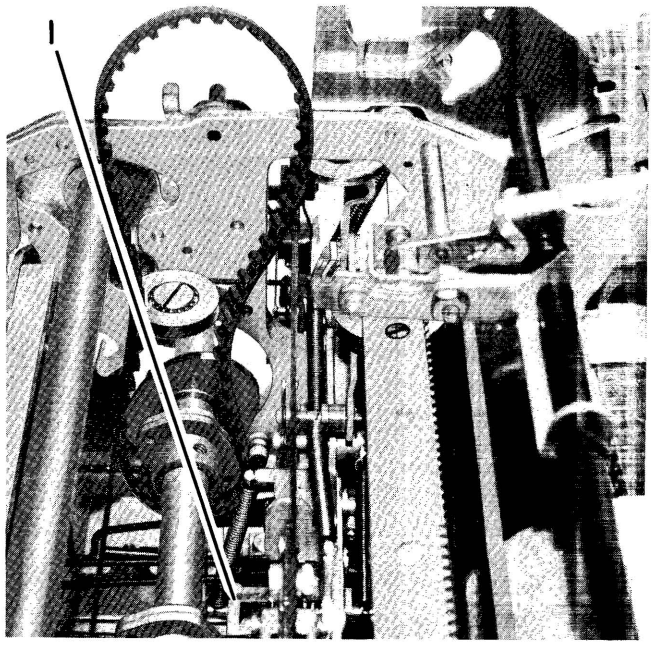


Figure 11. Belt Replacement

ROTATE SPRING REPLACEMENT

1. Remove the left dust cover.
2. Remove the ribbon cartridge.
3. Center the carrier over the camshaft.
4. Remove the two screws (#1, Figure 12) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
5. Remove the two nuts (#1, Figure 13), one on newer machines, immediately to the right of the yoke on the carrier, remove the black clip from under the nut (#2, Figure 13) and gradually remove the tension from the rotate spring.
6. a. On older machines, back out the two screws (#1, Figure 14) on the right 1/4" and remove the screw on the left, which is under the cycle shaft (#2, Figure 14).
   b. On newer machines, remove the lower right and left screws and back out the upper right screw 1/4" (Figure 14).

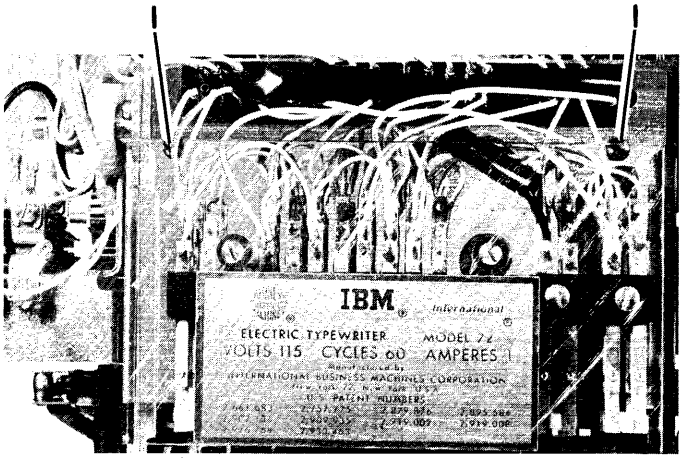


Figure 12. Rotate Spring Replacement

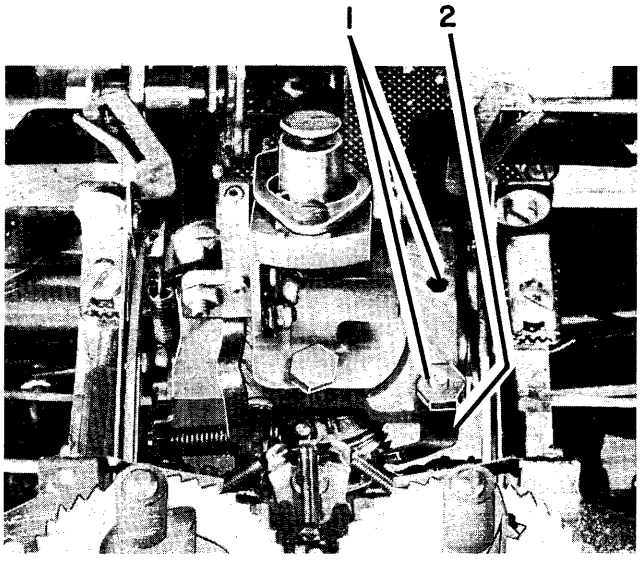


Figure 13. Rotate Spring Replacement

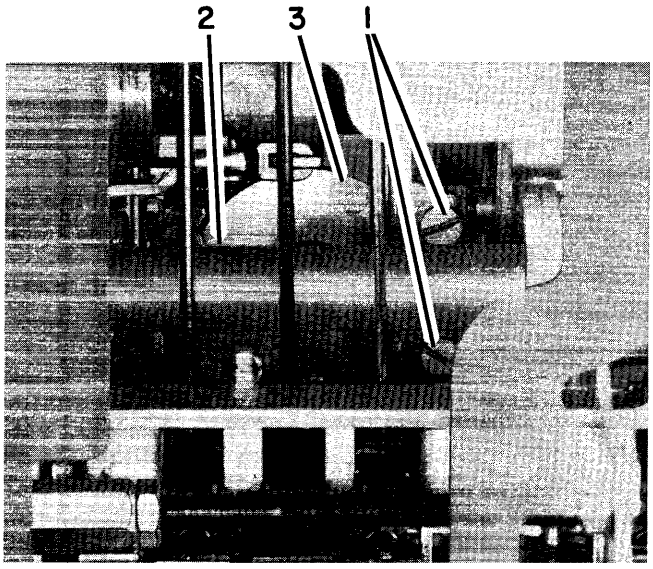


Figure 14. Rotate Spring Replacement

7. Remove the striker and rotate-spring retaining plate (#3, Figure 14). The rotate spring can now be removed.
   NOTE: In newer machines there may be a spring clip (PN 1141238) that prevents the spring from being trapped in the pulley notch. If not, one should be added on reassembly.
8. NOTE: On some machines it may be necessary to shim the retaining plate and striker because they will cause the new rotate spring to bind.
9. The following adjustments should be checked after the rotate-spring is replaced:
   a. Rotate Spring Tension
   b. Typehead Homing
   c. Damper Spring

LOWER BALL SOCKET AND TILT RING REMOVAL

1. Remove the left dust cover and ribbon cartridge. Center the carrier over the cycle shaft.
2. Shift into upper case.
3. Remove the two screws (#1, Figure 12) that hold the print contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
4. Half cycle a 0-rotate 1-tilt character. Note which position the tilt detent is in for replacement and be sure the machine is still in upper case.
5. Loosen the two set screws (#1, Figure 15).
6. Remove the two pivot pins (#2, Figure 15).
7. Remove the tilt ring (#3, Figure 15) and remove the ball joint.
8. Loosen the rotate pulley set screw (#1, Figure 16).
9. Use the butt end of a small spring hook as a follower to push out the lower ball socket (#2, Figure 16). 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.
10. 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

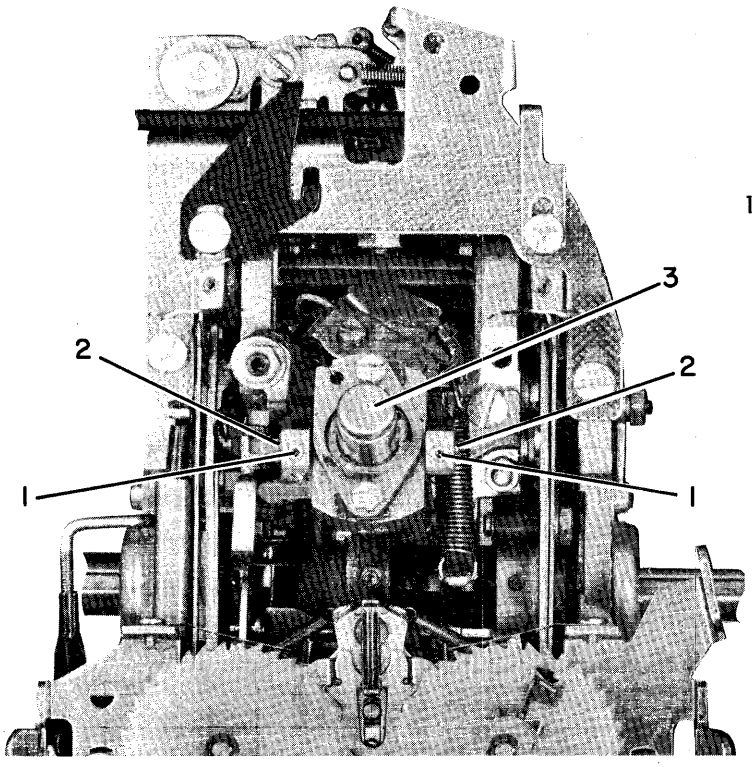


Figure 15. Lower Ball Socket and Tilt Ring Removal

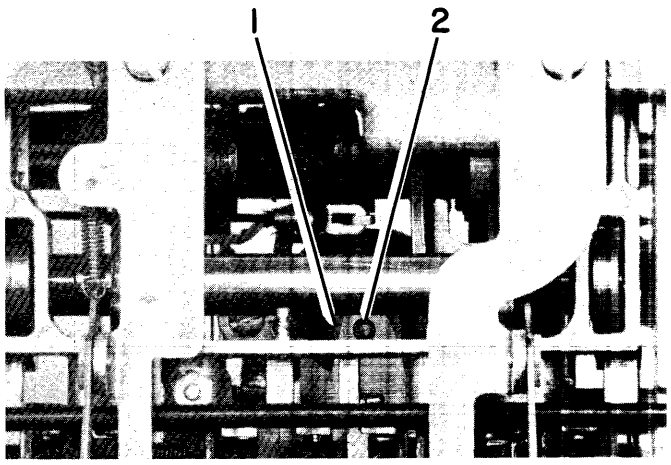


Figure 16. Lower Ball Socket and Tilt Ring Removal

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. Pull the tilt ring toward the front of the machine and turn the rotate pulley until the T-slot is accessible (#1, Figure 17).
5. Insert the rotate tape, eyelet first (#2, Figure 17), between the rotate pulley and the right side of the yoke from beneath the ribbon mechanism.
6. Pull the tape through and insert the T-tip of the tape into the T-slot of the pulley (#1, Figure 18).
7. Thread the tape around the rotate-arm pulley, top to front, keeping it under the carrier-return cord, around the shift-arm pulley, and anchor it to the carrier.
8. Connect the tilt-pulley spring with the open end to the rear (#2, Figure 19).
9. Restore the 2 pounds of rotate-spring tension.
10. Check the typehead homing adjustment.

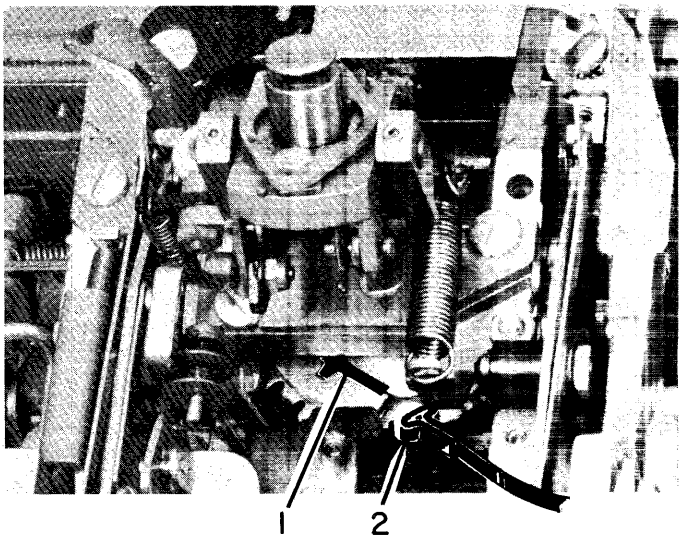


Figure 17. Rotate Tape Replacement

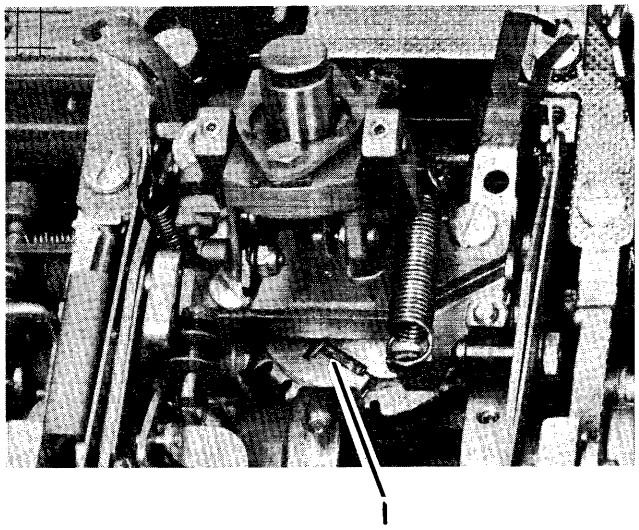


Figure 18. Rotate Tape Replacement

TILT TAPE REPLACEMENT

NOTE: Photos and procedures are for Gearless Tilt. Gear type may vary slightly.

1. Remove the left and right dust covers.
2. Position the carrier 3" from the left frame.
3. Half cycle a zero rotate, 0 Tilt character (to lock rotate spring tension).
4. Remove the broken pieces of tape from the machine.
5. Place the eyelet on the tilt pulley bellcrank (#1, Figure 19).
6. Thread the tape around the left tilt-arm pulley, right tilt-arm pulley, and take up the slack in the tape.
7. Withdraw the rotate detent, turn the head counterclockwise to relieve the rotate-tape tension, tilt the head to the front, and restore the detent.
8. Remove the tape retaining pin from the carrier and insert the tilt tape, keeping it on top of the rotate tape.
9. Restore the typehead to the rest position.
10. Check the tilt detent adjustment. (R.H. Tilt Pulley)

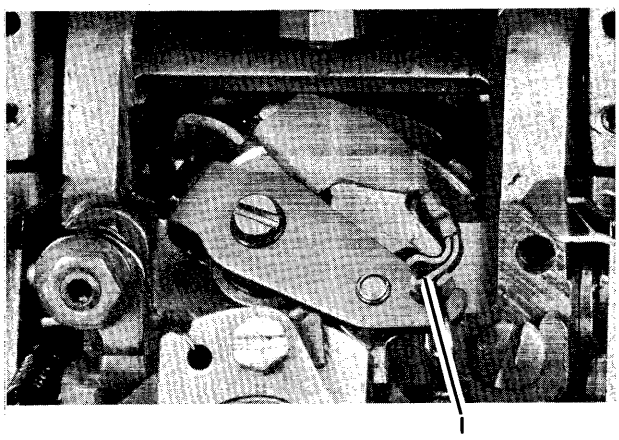


Figure 19. Tilt Tape Replacement

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 (#1, Figure 21) that hold the plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
4. Disconnect the clevises and remove them from the links (#2, Figure 20).
5. Remove the springs from the rotate interposers (#1, Figure 20).
6. Disconnect the rotate link at both ends and remove it (#1, Figure 22).
7. Remove the latch-bail spring (#2, Figure 22).
8. Remove the motor.
9. Remove the rotate-latch springs (#1, Figure 23).
10. Pull out the rotate links (#2, Figure 23).
11. Remove the check-latch spring (#3, Figure 23).
12. Remove the guide-bracket mounting stud and screw (#4, Figure 23).
13. Remove the balance-arm mounting stud (#1, Figure 24).
14. Disconnect the minus-five bail drive link from the right end of the balance arm (#2, Figure 24).
15. Disconnect the tilt-differential spring (#3, Figure 24).
16. Rotate the cycle shaft until the cam followers are on the low points of the cams.
17. Remove the rotate-differential assembly.
18. The following adjustments should be checked after the rotate-selection-differential assembly is replaced:
    a. Typehead Homing
    b. Rotate Latch Clearance
    c. Rotate Differential Guides

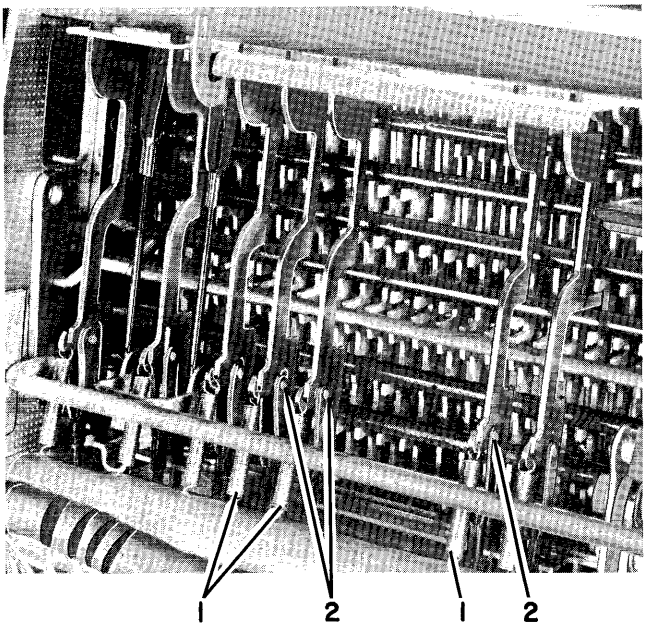


Figure 20. Rotate Selection Differential Removal

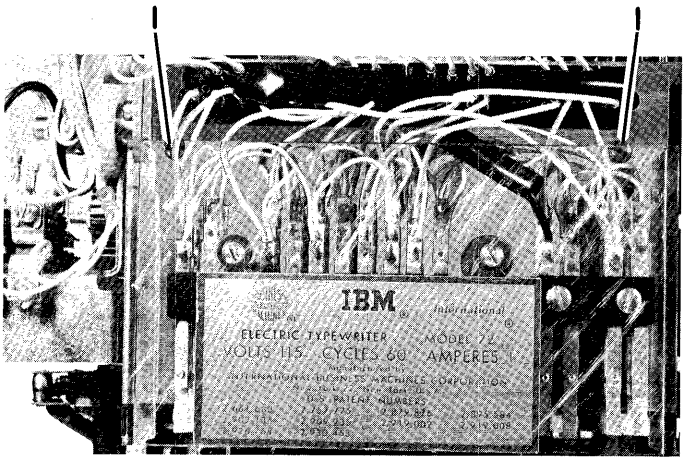


Figure 21. Rotate Selection Differential Removal

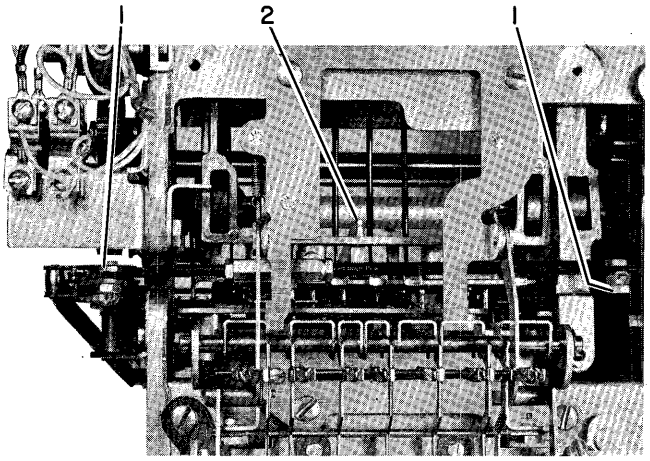


Figure 22. Rotate Selection Differential Removal

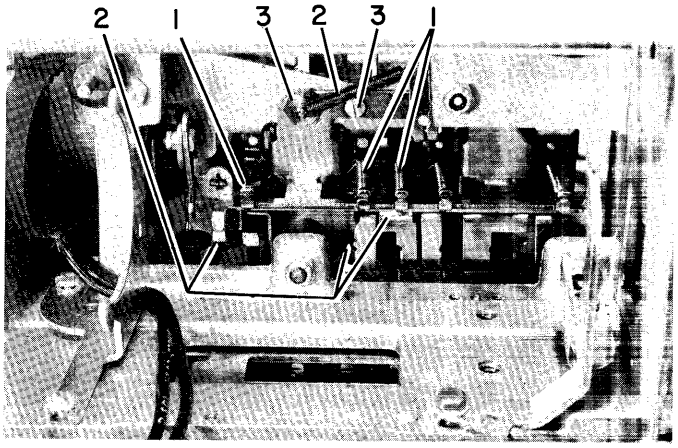


Figure 23. Rotate Selection Differential Removal

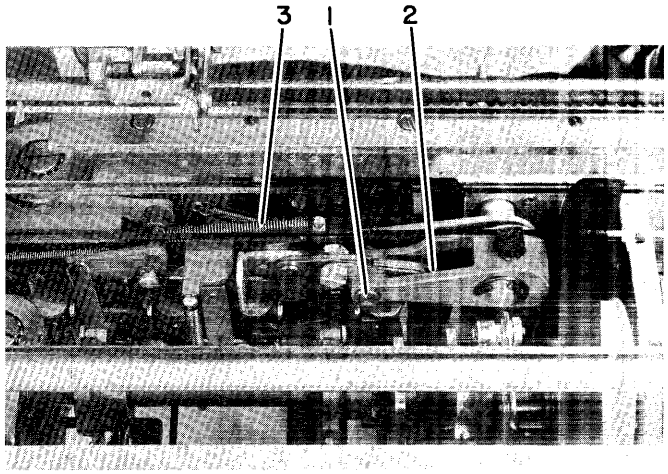


Figure 24. Rotate Selection Differential Removal

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 (#1, Figure 25).
4. Disconnect the clevises and remove them from the links (#2, Figure 25).
5. Remove the motor.
6. Remove the tilt-latch springs (#1, Figure 26).
7. Remove the tilt links (#2, Figure 26).
8. Remove the positive bail spring (#1, Figure 27).
9. Remove the tilt-differential spring (#2, Figure 27).
10. Remove the rotate-arm spring (#3, Figure 27).
11. Remove the two C-clips and remove the tilt-differential assembly (#4, Figure 27).
12. The following adjustments should be checked after the tilt-differential assembly is replaced.
    a. Tilt Detenting
    b. Latch Clearance
    c. Rotate Differential Guides

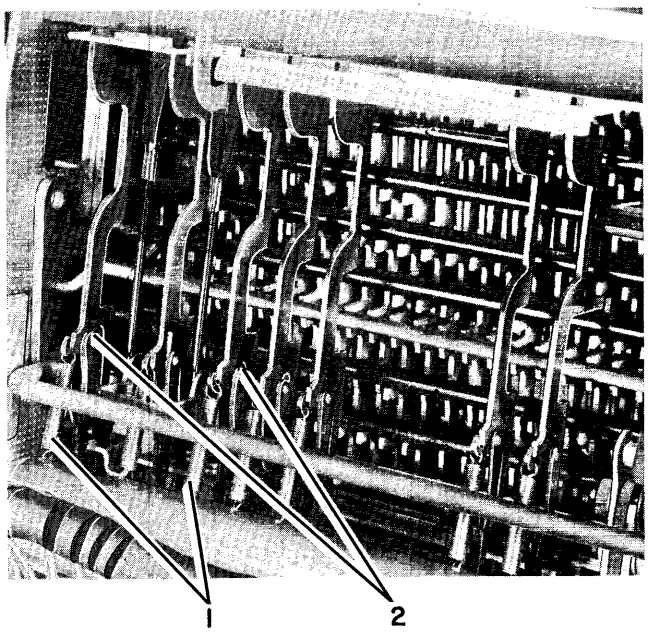


Figure 25. Tilt Selection Differential Removal

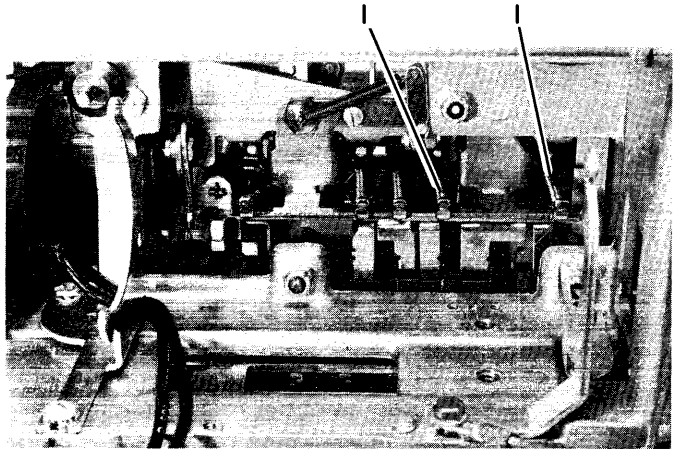


Figure 26. Tilt Selection Differential Removal

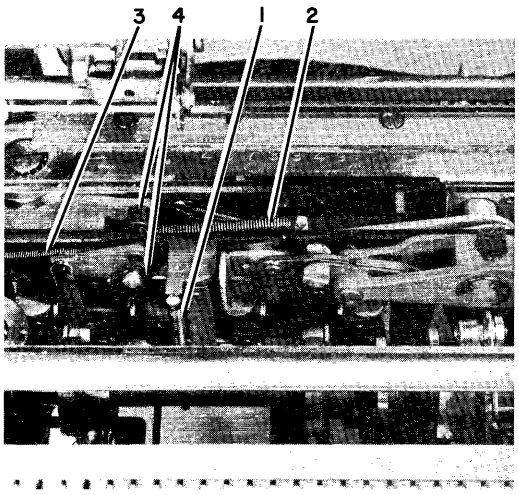


Figure 27. Tilt Selection Differential Removal

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 the springs from the interposers (#1, Figure 28).
4. Disconnect the clevises and remove them from the links (#2, Figure 28).
5. Remove the two screws (#1, Figure 29) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.

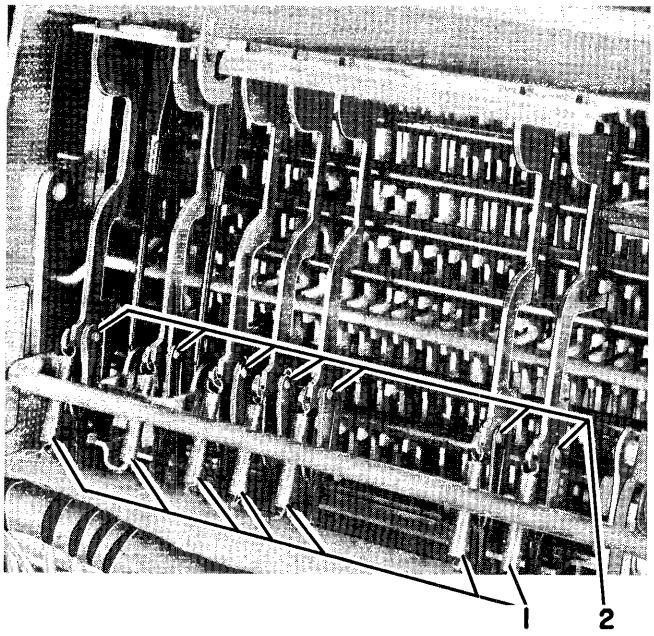


Figure 28. Differential Plate Removal

6. Unhook the check-latch-link spring (#1, Figure 30).
7. Remove the rotate-arm link (#2, Figure 30).
8. Scribe the position of the pusher-arm plate to the power frame and remove the four mounting screws (#3, Figure 30).
9. Remove the positive bail spring (#4, Figure 30).
10. Carefully remove the pusher-arm-plate assembly.
11. Remove the motor.
12. Remove all latch springs (#1, Figure 31).
13. Remove all latch links (#2, Figure 31).
14. Remove the left-hand motor mount (#3, Figure 31).
15. Remove the four differential mounting nuts (#4, Figure 31). NOTE: Do not lose the wedge in the lower-left mounting stud.
16. Complete the Cycle-Shaft Removal section.
17. Remove the cycle-clutch latch bracket (#1, Figure 32).
18. Remove the C-clip from the negative latch link (#2, Figure 32).
19. Remove the C-clip from the tilt-link stud (#3, Figure 32).
20. Remove the rotate-arm spring (#4, Figure 32).
21. Detach the check-latch clevis (#5, Figure 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

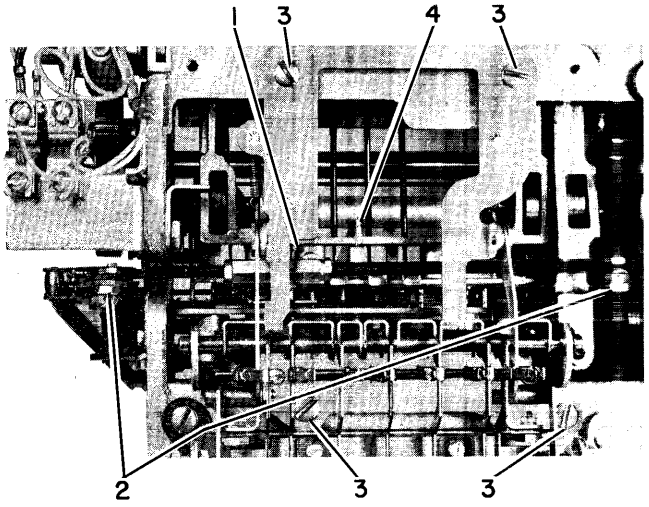


Figure 30. Differential Plate Removal

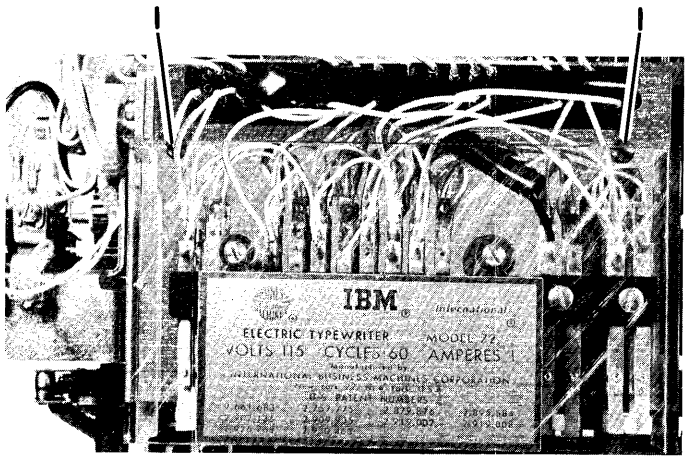


Figure 29. Differential Plate Removal

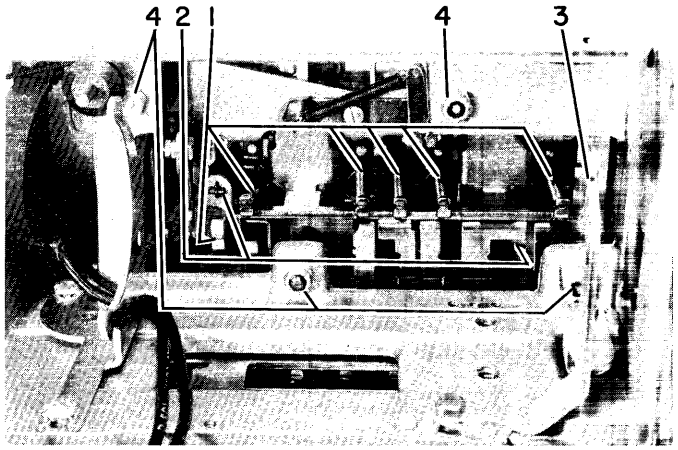


Figure 31. Differential Plate Removal

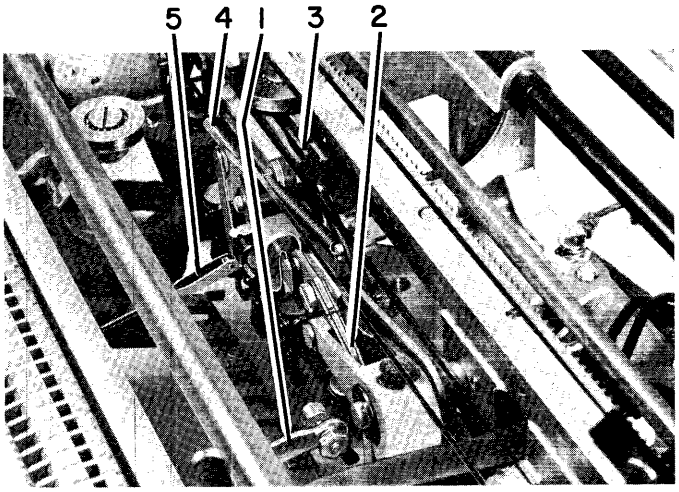


Figure 32. Differential Plate Removal

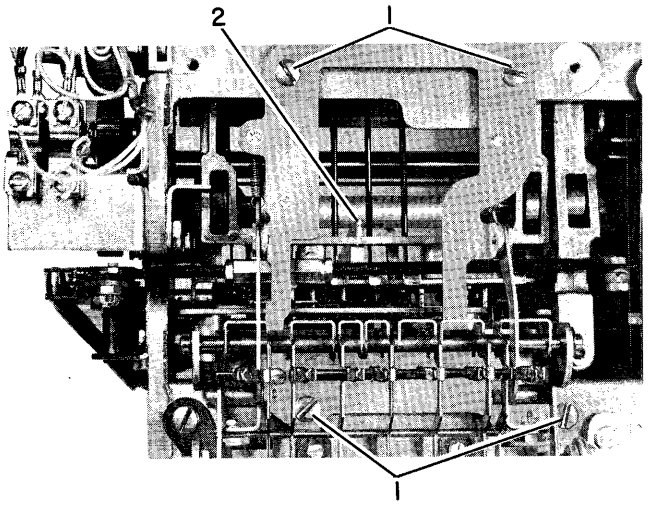


Figure 34. Selector Bail Removal

SELECTOR BAIL REMOVAL

1. Remove the two screws (#1, Figure 33) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
2. Scribe the power frame, remove the four mounting screws (#1, Figure 34), and carefully remove the pusher-arm assembly.
3. Remove the positive bail spring (#2, Figure 34) and pull the bail down.
4. Remove all the C-clips from the positive bail shaft (#1, Figure 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 Selector-Bail is replaced.
   a. Latch Clearance
   b. Bail Down-Stop

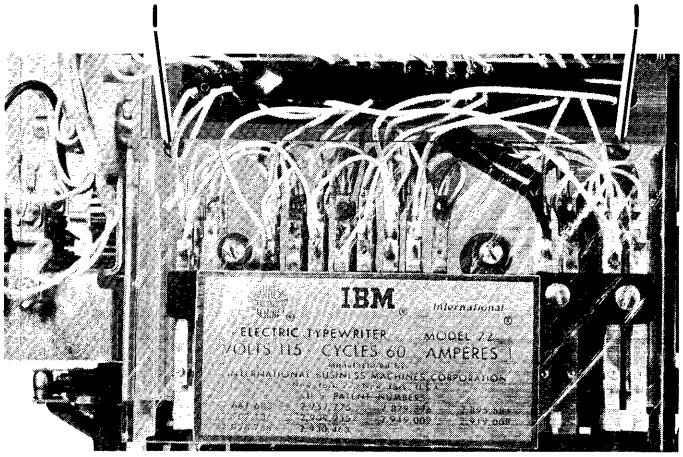


Figure 33. Selector Bail Removal

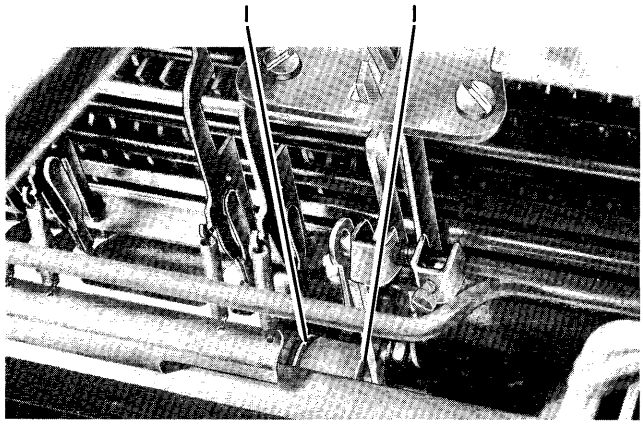


Figure 35. Selector Bail Removal

PRINT MAGNET ASSEMBLY REMOVAL

1. Disconnect the cycle-clutch trip link (#1, Figure 36).
2. Remove the support leg in the lower left corner (#2, Figure 36).
3. Remove the four mounting screws (#3, Figure 36).
4. Carefully remove the magnet assembly.

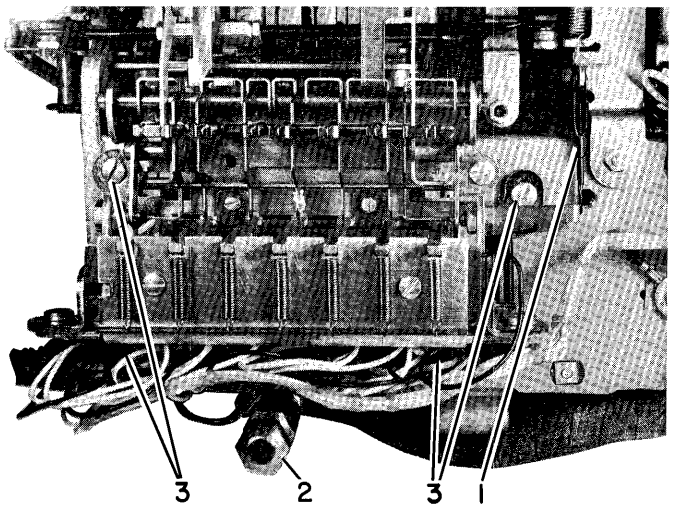


Figure 36. Print Magnet Assembly Removal

LATCH PUSHER REMOVAL

1. Remove the two screws (#1, Figure 37) that hold the contact plate to the frame. Remove the contact assembly, holding it to the front with a rubber band.
2. Disconnect the pusher springs (#1, Figure 38).
3. Remove the C-clip on the end of the shaft (#2, Figure 38) and remove the shaft until the desired pusher is free.
4. The following adjustments should be checked after a latch-pusher is replaced.
   a. Latch to pusher clearance
   b. Latch-pusher to armature clearance

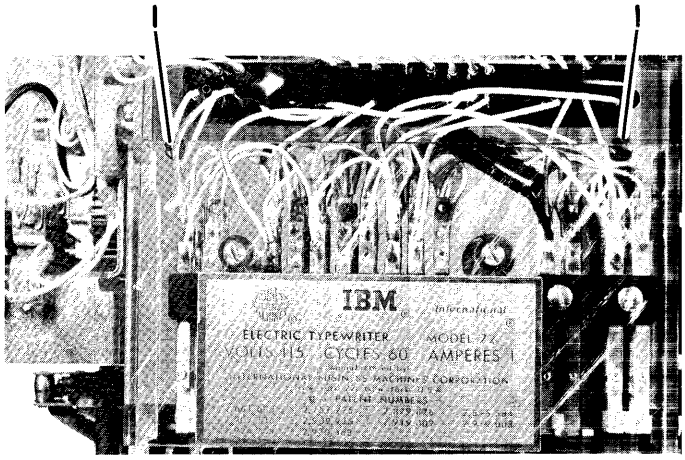


Figure 37. Latch Pusher Removal

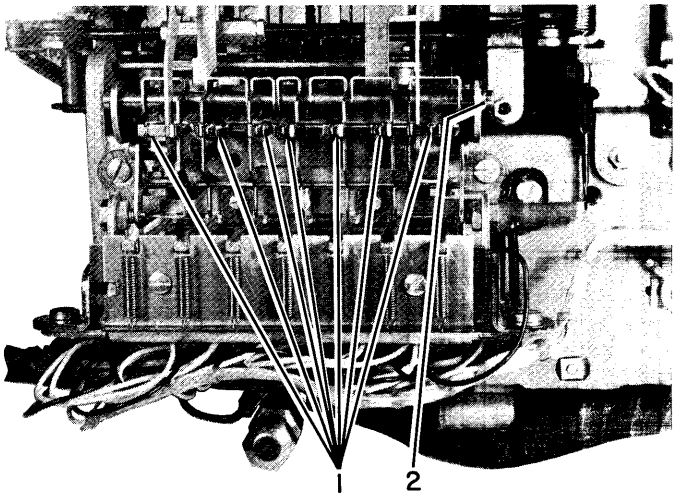


Figure 38. Latch Pusher Removal

SHIFT MAGNET ASSEMBLY REMOVAL

1. Remove the spring from the hold armature (#1, Figure 39).
2. Loosen the front mounting stud (#2, Figure 39).
3. Loosen the rear mounting screw (#3, Figure 39).
4. Slide the assembly forward and remove it.
5. The following adjustments should be checked after the shift magnet assembly is removed.
   a. Shift-magnet assembly adjustments

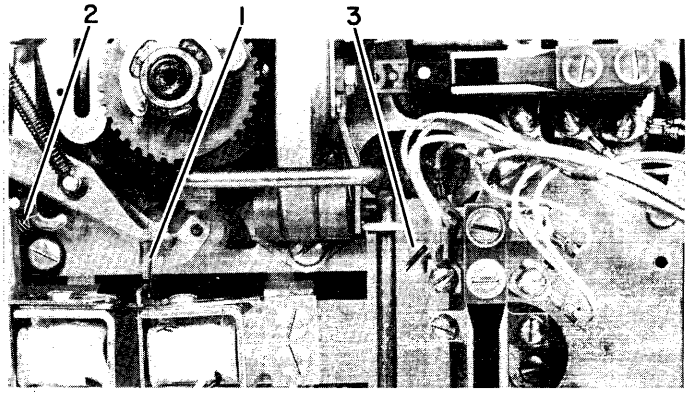


Figure 39. Shift Magnet Assembly Removal

BACKSPACE RACK REMOVAL

1. Remove the motor.
2. Remove the backspace-rack spring (#1, Figure 40).
3. Remove the three backspace-rack mounting studs (#2, Figure 40), one of which is not shown, and remove the rack.
4. The following adjustments should be checked after the backspace rack is replaced.
   a. Tab-Lever Stop
   b. Backspace Rack
   c. Intermediate Lever

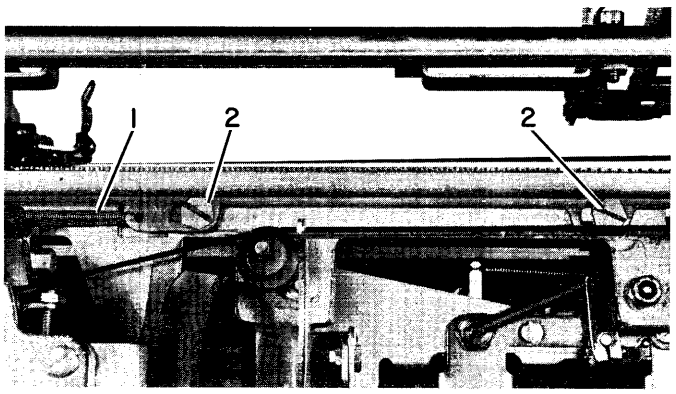


Figure 40. Backspace Rack Removal

SHIFT ARM REMOVAL

1. Position the carrier to the left and remove the right dust cover.
2. Remove the shift-contact assembly (#1, Figure 41).
3. Remove the shift-arm brace (#2, Figure 41).
4. Loosen the set screws that hold the shift-arm pivot (#3, Figure 41).
5. Rotate the head counterclockwise, remove the tape from the shift-arm pulley, and put 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

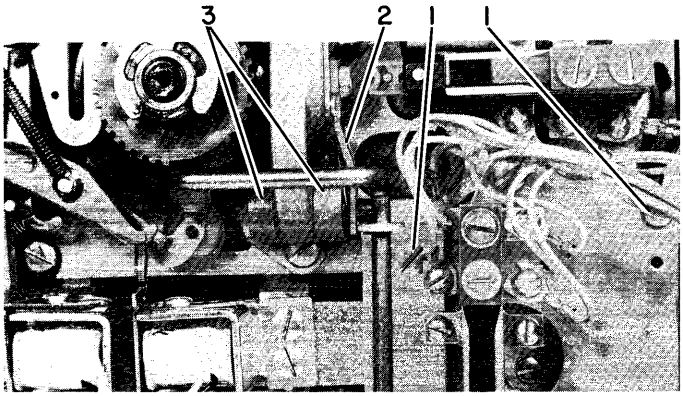


Figure 41. Shift Arm Removal

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 (#1, Figure 42).
3. Remove all C-clips from the check pawl shaft (#2, Figure 42).
4. Slide the shaft to the left until the desired part is free.
   NOTE: Remove springs only as necessary.

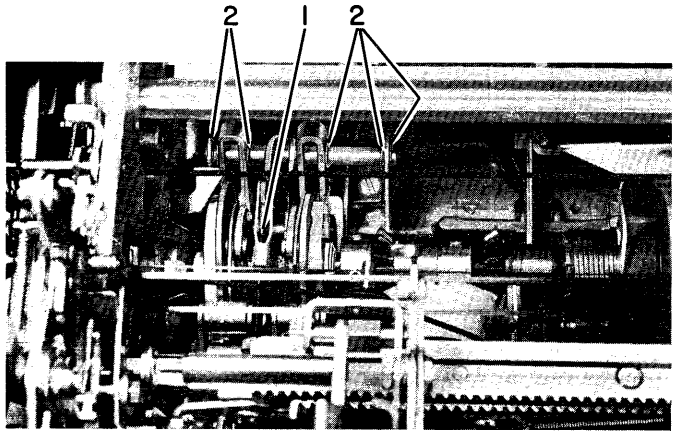


Figure 42. Operational Cam Check Pawl and Escapement Cam Follower Removal

OPERATIONAL CAM FOLLOWER REMOVAL

1. Remove the C-clips from the cam-follower pivot shaft (#1, Figure 43).
2. Remove the auxiliary cam-follower spring (#2, Figure 43).
3. Work the shaft to the right until the desired part is free.

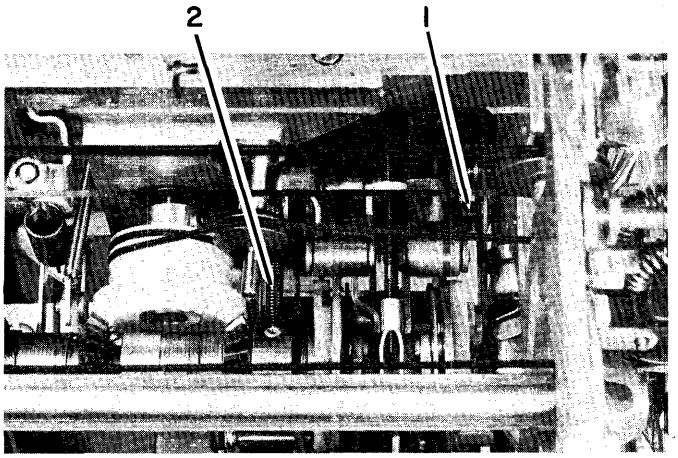


Figure 43. Operational Cam Follower Removal

OPERATIONAL MAGNET ASSEMBLY REMOVAL

1. Perform the Shift-Magnet-Assembly Removal.
2. Remove the actuator-arm spring (#1, Figure 45).
3. Remove the two mounting screws (#2, Figure 45).
4. Remove the actuator-arm pivot screw (#3, Figure 45).
5. Remove the armature-link clevises (#4, Figure 45).
6. Remove the mounting screw (#1, Figure 46).
7. Remove the nut (#2, Figure 46) and carefully remove the magnet assembly.

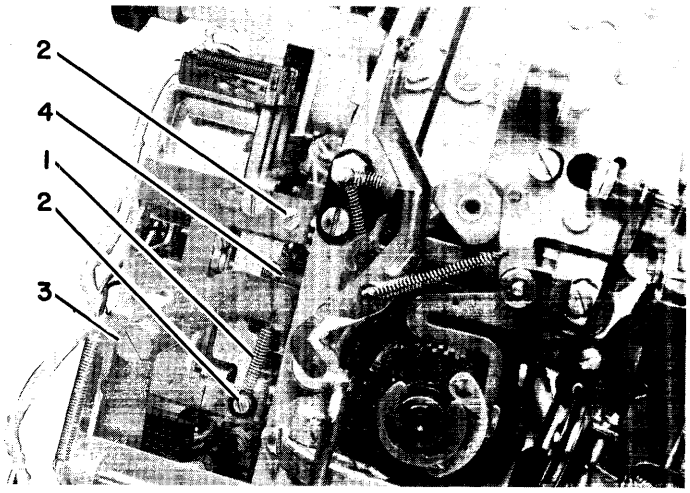


Figure 45. Operational Magnet Assembly Removal

OPERATIONAL CONTACT REMOVAL

1. Remove the right rear mounting leg (#1, Figure 44).
2. Remove the two mounting screws (#2, Figure 44) and remove the contact assembly.

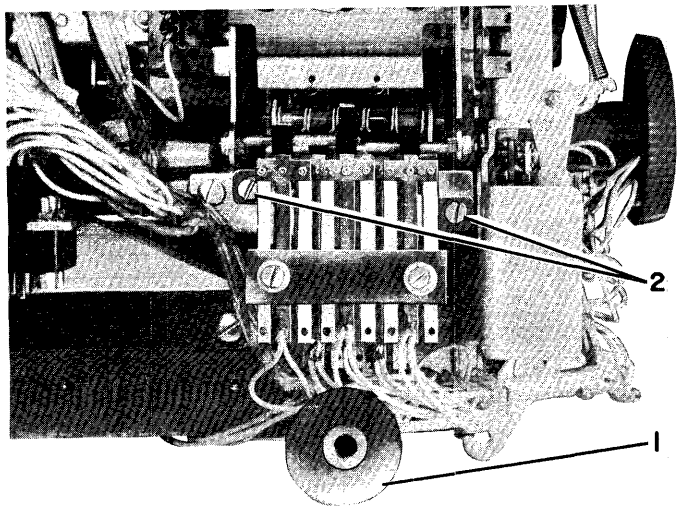


Figure 44. Operational Contact Removal

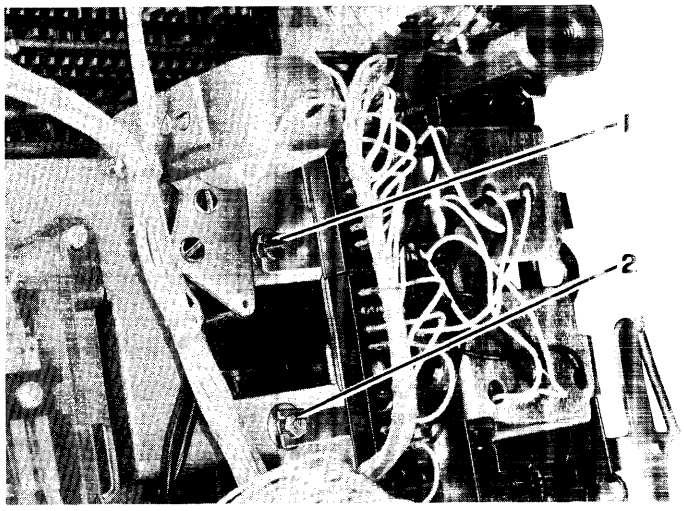


Figure 46. Operational Magnet Assembly Removal

OPERATIONAL LATCH BRACKET REMOVAL

1. Remove the feedback-contact-assembly bracket by loosening the two screws (#1, Figure 47).
2. Remove the mainspring and hub (#2, Figure 47). CAUTION: Care must be used when unwinding and removing main spring.
3. Disconnect the backspace-latch spring (not shown).
4. Remove the back plate (#3, Figure 47).
5. Disconnect the backspace-rack spring (#1, Figure 48).
6. Disconnect the cam-follower spring (#2, Figure 48).
7. Disconnect the spacebar and tab-latch springs (#3, Figure 48).
8. Disconnect the tab-bellcrank link clevis (not shown).

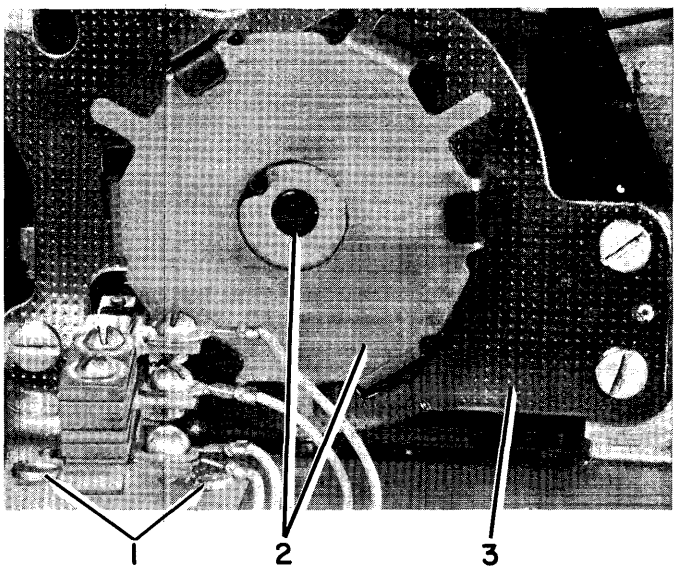


Figure 47. Operational Latch Bracket Removal

9. Disconnect the detent spring (#4, Figure 48).
10. Disconnect the carrier-return latch spring (#5, Figure 48)
11. Remove the index-selection link (#6, Figure 48).
12. Remove the carrier-return eccentric by removing the eccentric nut (#7, Figure 48).
13. Remove the escapement link (#8, Figure 48).
14. Disconnect the carrier-return actuating spring and carrier-return actuating-arm spring (#9, Figure 48).
15. Remove the escapement-torque-bar restoring spring (#10, Figure 48).
16. Remove the two mounting screws (the left one is not visible) and one nut (#11, Figure 48).
17. Work the operational-latch bracket out of the machine.
18. The following adjustments should be checked after the operational-latch-bracket is replaced.
    a. C5 and C6 Timing
    b. Mainspring Tension

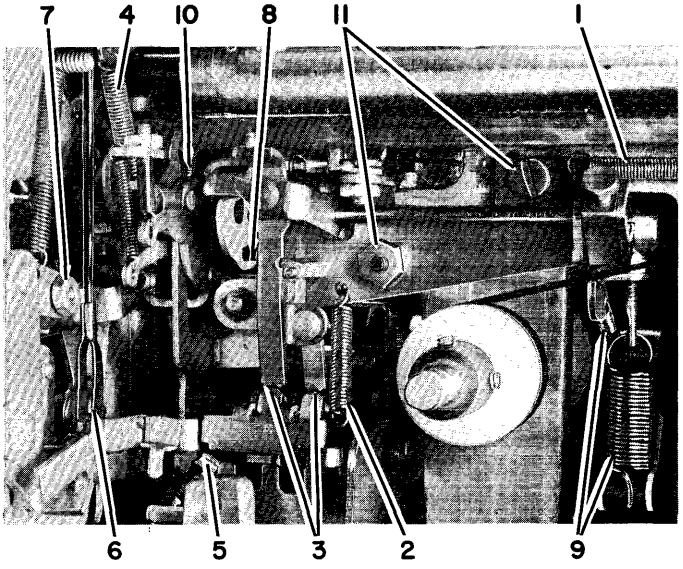


Figure 48. Operational Latch Bracket Removal

SHIFT CAM REMOVAL

1. Turn the typehead counterclockwise and remove the relaxed rotate tape from the shift-arm pulley and put it around the tilt pulley.
2. Remove the lower-case armature spring (#1, Figure 49).
3. Remove the cam-follower spring (#2, Figure 49).
4. Loosen the set screws and remove the cam follower arm (#3, Figure 49).
5. Remove the three springs (#5, Figure 49).
6. Remove the interlock C-clip (#6, Figure 49).
7. Remove the detent (#7, Figure 49).
8. Remove the C-clip from the shaft and remove the ratchet (#8, Figure 49).
9. Disconnect the shift link (#9, Figure 49).
10. Remove the shift-release arm (#10, Figure 49).
11. Remove the shift-clutch spring (behind the ratchet). NOTE: Observe the spring position for replacement.
12. Remove the shift arbor (#11, Figure 49). NOTE: Do not rotate the shaft backward.
13. Remove the shift cam (#12, Figure 49).
14. The following adjustments should be checked after the shift-cam is replaced.
    a. All shift mechanism adjustments
    b. Shift Magnet Assembly
    c. Upper Case Typehead Homing

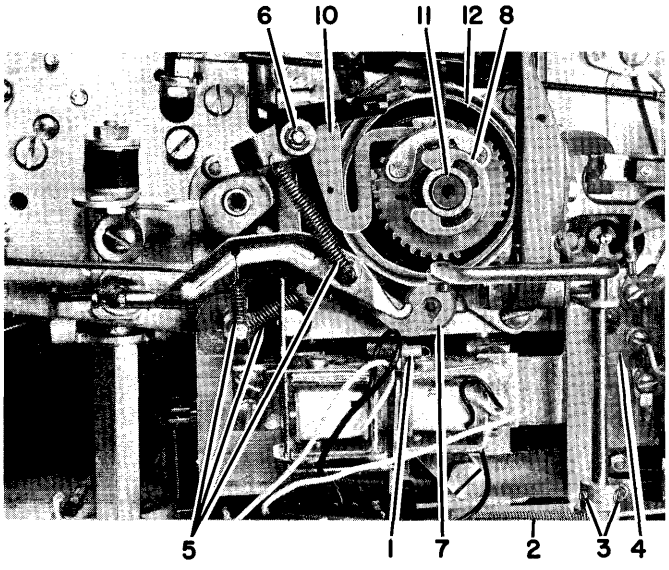
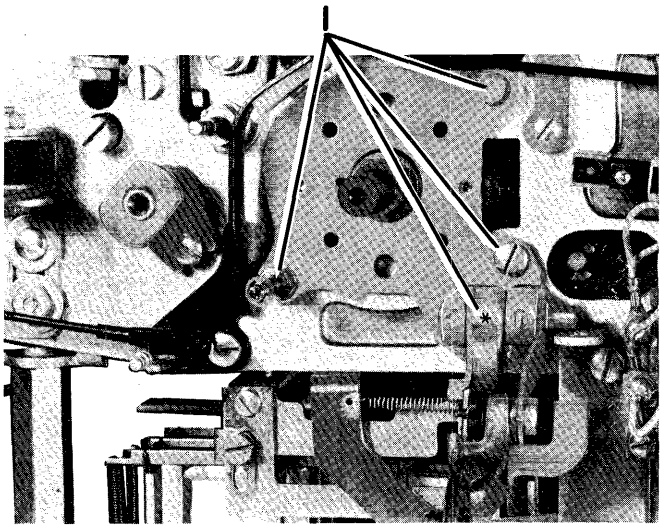


Figure 49. Shift Cam Removal

OPERATIONAL SHAFT REMOVAL

1. Complete the Shift-Cam Removal.
2. Remove the two lugs and two screws from the bearing mounting plate (#1, Figure 50) and slide the plate off.
3. Disconnect escapement link.
4. Work the operational shaft to the right until it clears the cycle clutch pulley hub, then lift shaft out the top.
5. The following adjustments should be checked after the operational shaft is replaced.
   a. All Shift Mechanism Adjustments
   b. Shift Magnet Assembly
   c. Upper Case Typehead Homing
   d. Gear Mesh



* Screw is hidden behind SHIFT ARM

Figure 50. Operational Shaft Removal

OPERATIONAL INTERPOSER BRACKET REMOVAL

1. Complete the Shift-Cam Removal.
2. Complete the Operational-Magnet Removal.
3. Complete the Operational-Shaft Removal.
4. Complete the Operational-Latch-Bracket Removal.
5. Remove the six (two shown) mounting screws (#1, Figure 51).
6. Remove the C5 Auxiliary Cam Follower.
7. Remove the key-lever pawl guides from the operational-interposer bracket (not shown).
8. Work bracket assembly out through rear of machine.
9. The following adjustments should be checked after the operational-interposer-bracket assembly is replaced.
   a. All Shift Mechanism Adjustments
   b. Shift Magnet Assembly
   c. Upper Case Typehead Homing
   d. Gear Mesh
   e. Operational Latch Pivot Pin Eccentric
   f. Escapement Trigger Guide
   g. Mainspring Tension
   h. Keylever Pawl to Interposer Clearance
   i. Operational Latch Height
   j. Backspace Rack
   k. Pawl Clearance
   l. Clutch Latch Overthrow
   m. Carrier Return Actuating Arm
   n. Multiplying Control Lever

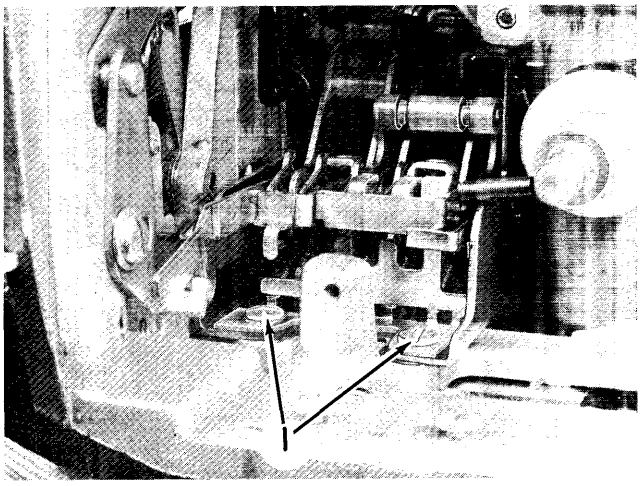


Figure 51. Operational Interposer Bracket Removal

CARRIER SHOE REMOVAL

1. Remove the two card-holder screws (#1, Figure 52).
2. Remove the two escapement-bracket screws (#2, Figure 52).
3. Work the carrier out from under the escapement bracket to the right.

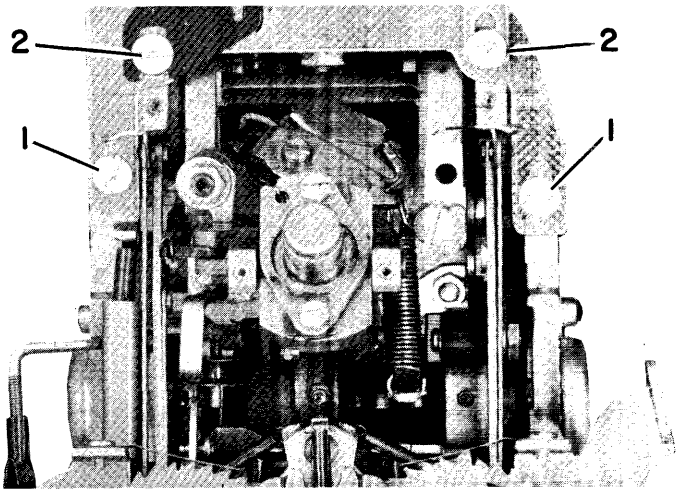


Figure 52. Carrier Shoe Removal

4. Remove the nut from the carrier-shoe stud and remove the shoe (#1, Figure 53).
5. The following adjustments should be checked after the carrier-shoe is replaced.
   a. Carrier Shoe
   b. Escapement Bracket

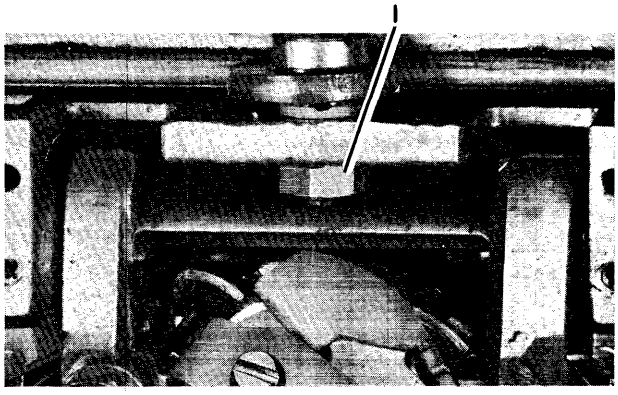


Figure 53. Carrier Shoe Removal

INTERPOSER REMOVAL

1. Align the carrier over the line lock interposer (#1, Figure 55).
2. Disconnect the operational keylever springs, carrier-return spring, and backspace spring (#2, Figure 55).
3. Remove keylever upstop (#4, Figure 55).
4. Remove the spacebar equalizing rod (#5, Figure 55).
5. Remove the bell bail lever (#6, Figure 55).
6. Remove the bell ringer bail (#7, Figure 55).
7. Remove the margin rack (#8, Figure 55).
8. Slip sound deadening over operational keybuttons (#9, Figure 55).

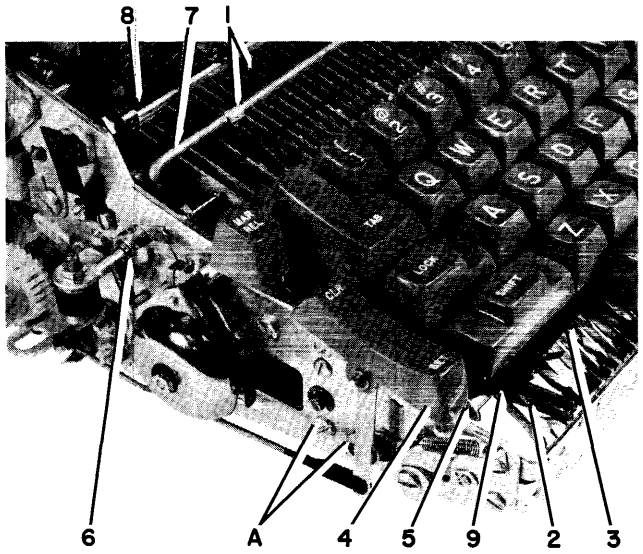


Figure 55. Interposer Removal

9. Push the fulcrum rod to the interposer being removed with a fulcrum rod tool (#1, Figure 56).
10. Remove the spring from the interposer being removed (#2, Figure 56).
11. To remove the line lock interposer, it is necessary to remove the screws marked "A" on Figure 55 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

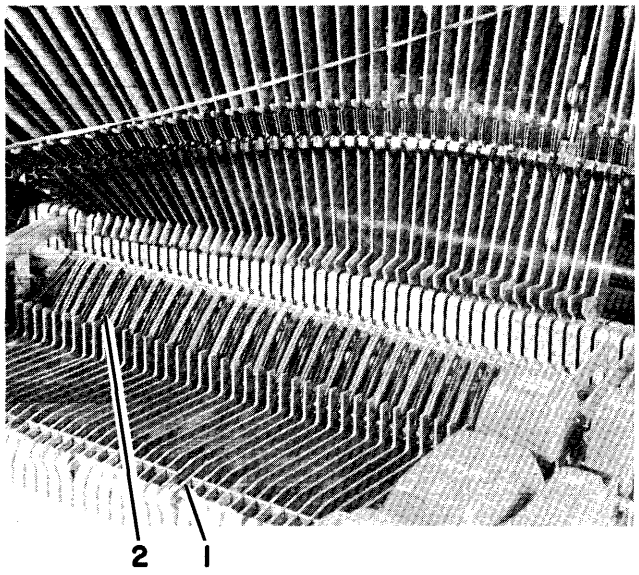


Figure 56. Interposer Removal

CARRIER AND ROCKER REMOVAL

1. Remove mounting screws (#1, Figure 57).
2. Remove card holders (#1, Figure 58).
3. Disconnect ribbon lift spring (#3, Figure 58).
4. Release rotate spring tension (#4, Figure 58).
5. Remove tilt pulley spring (#5, Figure 58).
6. Remove tape anchor screw (#6, Figure 58).
7. Remove tapes (#7, Figure 58).
8. Remove tape wiper (#8, Figure 58) if present.

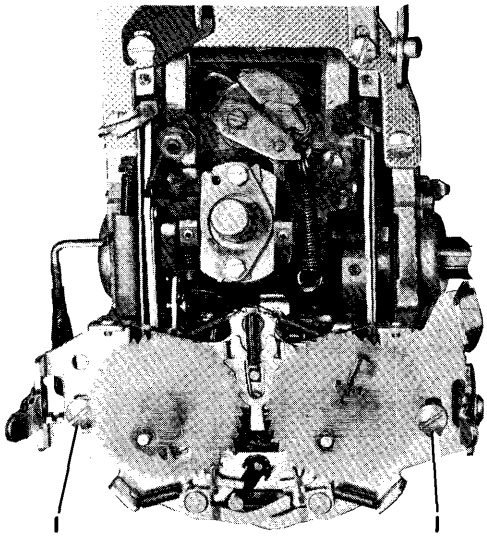


Figure 57. Carrier and Rocker Removal

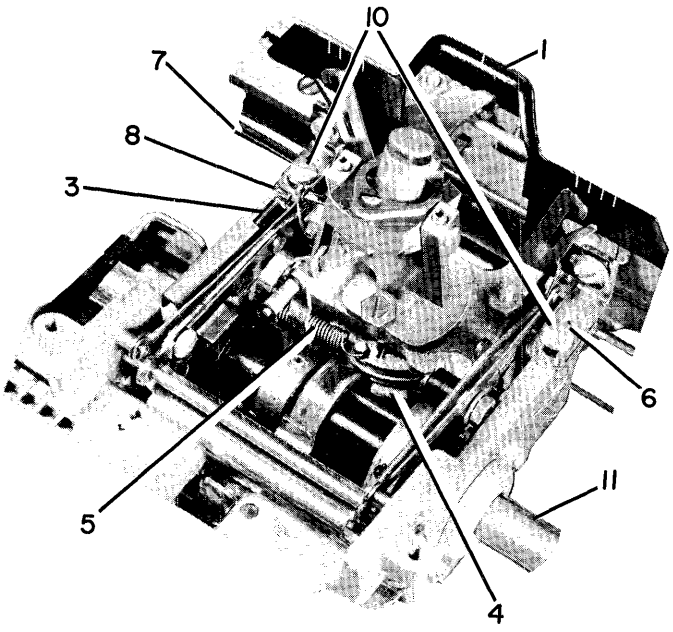


Figure 58. Carrier and Rocker Removal

9. Remove escapement bracket mounting screws (#10, Figure 58).
10. Remove transport spring bracket screw (#1, Figure 59).
11. Remove print shaft gear (not shown).
12. Remove print shaft (#11, Figure 58).
13. Remove Carrier & Rocker assembly.

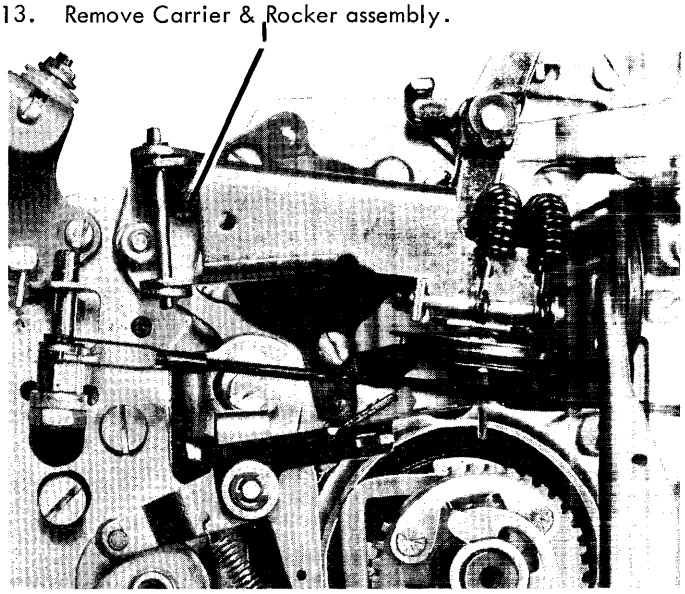


Figure 59. Carrier and Rocker Removal

NOTE: If rocker removal is necessary, complete the following steps:

14. Remove anvil striker (#1, Figure 60).
15. Remove rotate spring, cage and pulley (#2, Figure 60).
16. Remove tape guide (#3, Figure 60).
17. Remove "C" clip on rocker shaft (#4, Figure 60).
18. Loosen rocker shaft set screw and remove rocker shaft (#5, Figure 60).
19. Check carrier & rocker and alignment adjustments after reassembly.

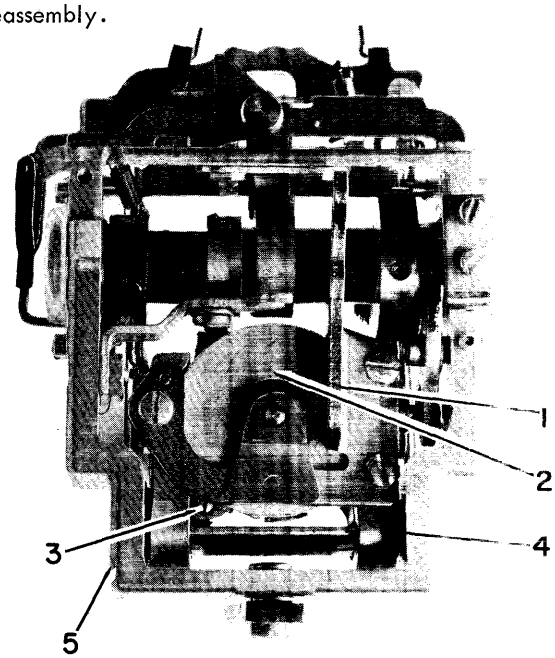


Figure 60. Carrier and Rocker Removal

CYCLE CLUTCH PULLEY REMOVAL (EARLY)

1. Perform the Cycle-Clutch and Cycle-Shaft removal.
2. Remove the "C" clip from the rotate bellcrank pivot pin (#1, Figure 61).
3. Disconnect the rotate link from the rotate bellcrank (not shown).
4. Remove "C" clip and remove pivot pin (#2, Figure 61).
5. Push down on the rotate balance arm (#3, Figure 61) and lift up on the rotate bellcrank until the two are clear of each other and then remove the bellcrank.
6. Remove the cycle-clutch-latch spring (not shown).
7. Remove the "C" clip which holds the cycle-clutch-latch link to the cycle-clutch latch and disconnect the link from the latch (not shown).
8. Remove the bottom latch screw, loosen the top latch screw and slide the latch up and out (#4, Figure 61).
9. Take the belt off the pulley and remove the pulley (#5, Figure 61).
10. The following adjustments should be checked after the cycle-clutch pulley is 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 and C2 Contact Timing

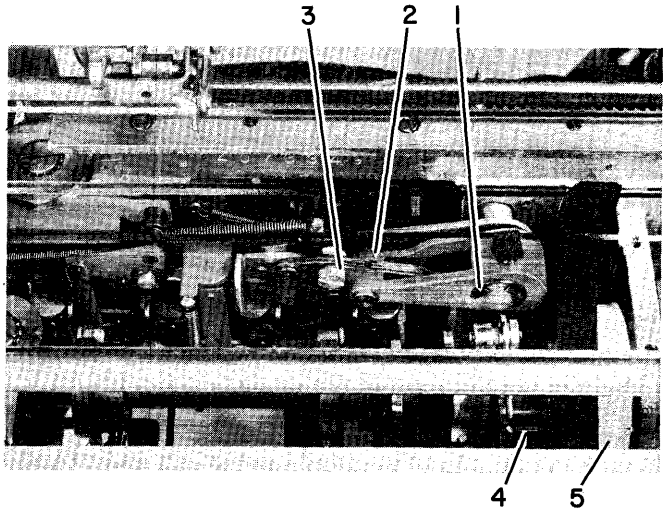


Figure 61. Cycle Clutch Pulley Removal

CYCLE CLUTCH PULLEY REMOVAL (LATE)

1. Perform the Cycle-Clutch and Cycle-Shaft removal.
2. Remove belt from pulley.
3. Remove two set screws from pulley. One on top of the other used as a lock screw.
4. Remove cycle clutch hub from pulley.
5. Perform section 10 of early style cycle clutch removal.

CORD REPLACEMENT

NOTE: Remove the main spring.

NOTE: Cut pre-stretched cords to following lengths for 11" & 15" machines:

Tab cords 11 inch machines = 18-3/4
Tab cords 15 inch machines = 23-1/2

Carrier Return 11 inch machines = 18-3/4
Carrier Return 15 inch machines - Cord should be correct length.

Above lengths allow 1" for Figure 8 knot.

1. With the carrier to the extreme right, feed the carrier return cord around the pulleys and connect to cord drum (#1, Figure 62).
2. Connect carrier return cord to carrier using long nose pliers and spring hook (#2, Figure 62).
3. Disconnect clutch unlatching link (#1, Figure 63).
4. Manually latch the clutch and turn the machine by hand until the carrier is pulled fully to the left.
5. Connect the escapement cord to the drum with about 1 turn of the cord on the drum (#2, Figure 63).
6. Connect the end of the cord to the carrier and then place it on the pulleys (#3, Figure 63).
7. Connect the clutch unlatching link.
8. Replace and adjust the main spring (5 turns) with the carrier resting at the extreme RH margin.

CORD ADJUSTMENT

A time saving method of transport card adjustment may be accomplished by tying a knot in the end of the cord as close to the hook as possible.

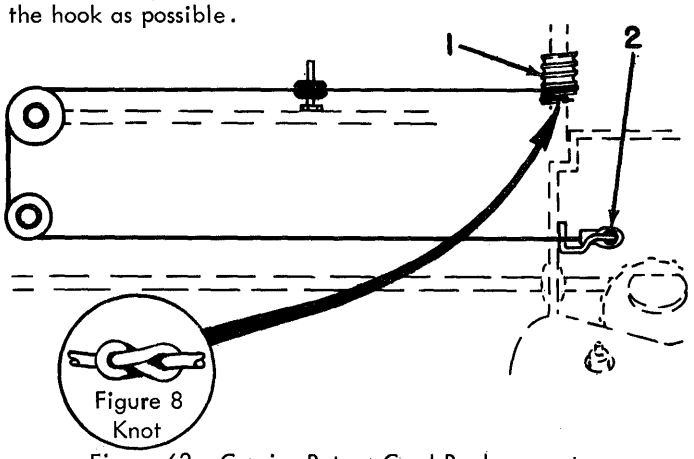


Figure 62. Carrier Return Cord Replacement

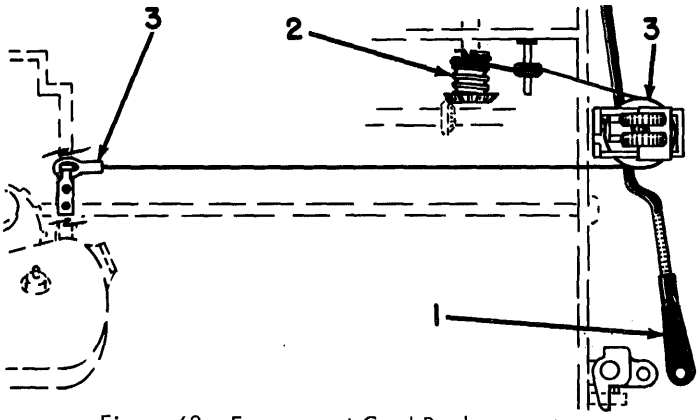


Figure 63. Escapement Cord Replacement

OPD CUSTOMER ENGINEERING
Selectric I/O Reference Manual
Section 4

Reprinted July, 1966

F/N 241-5311-0

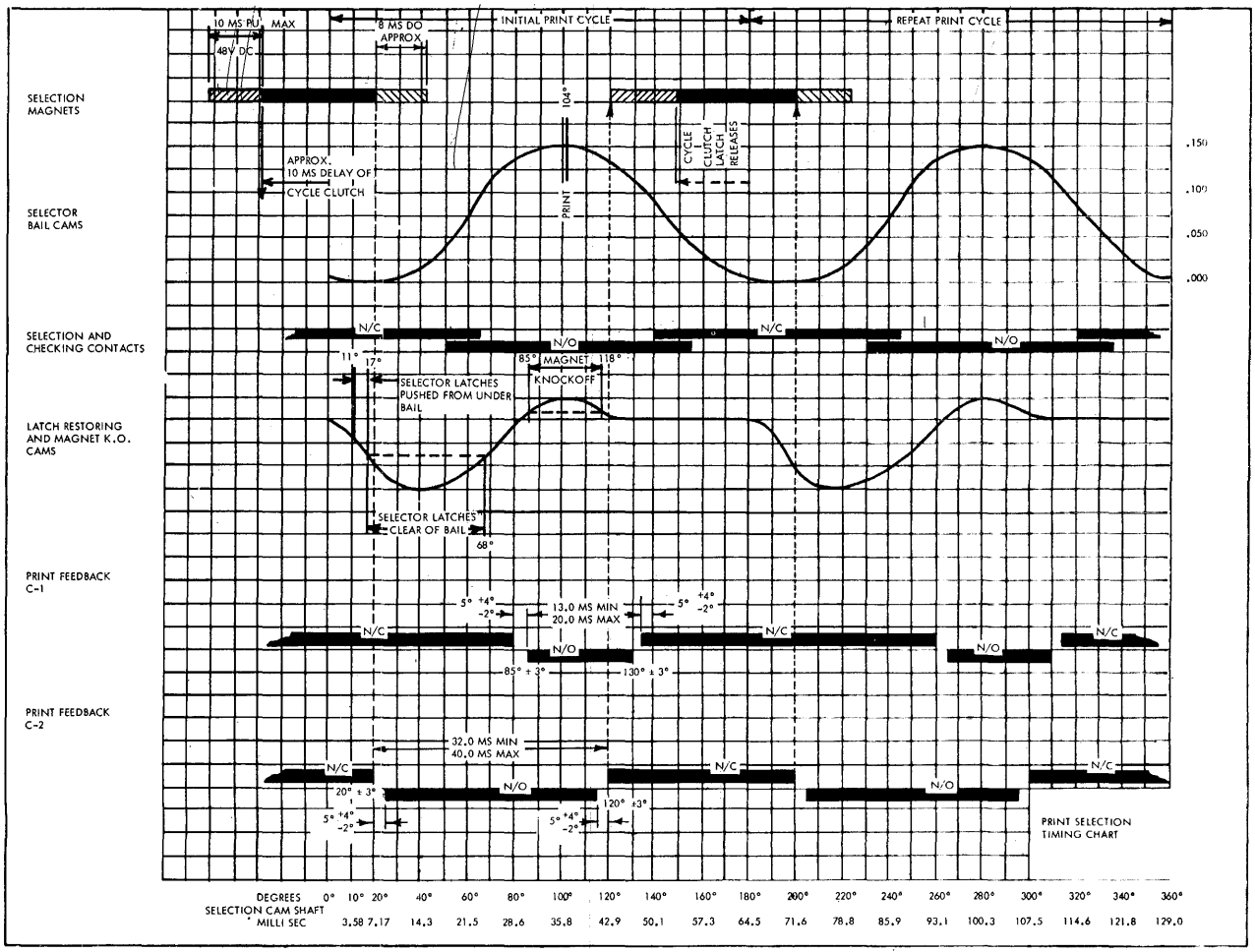
CONTENTS

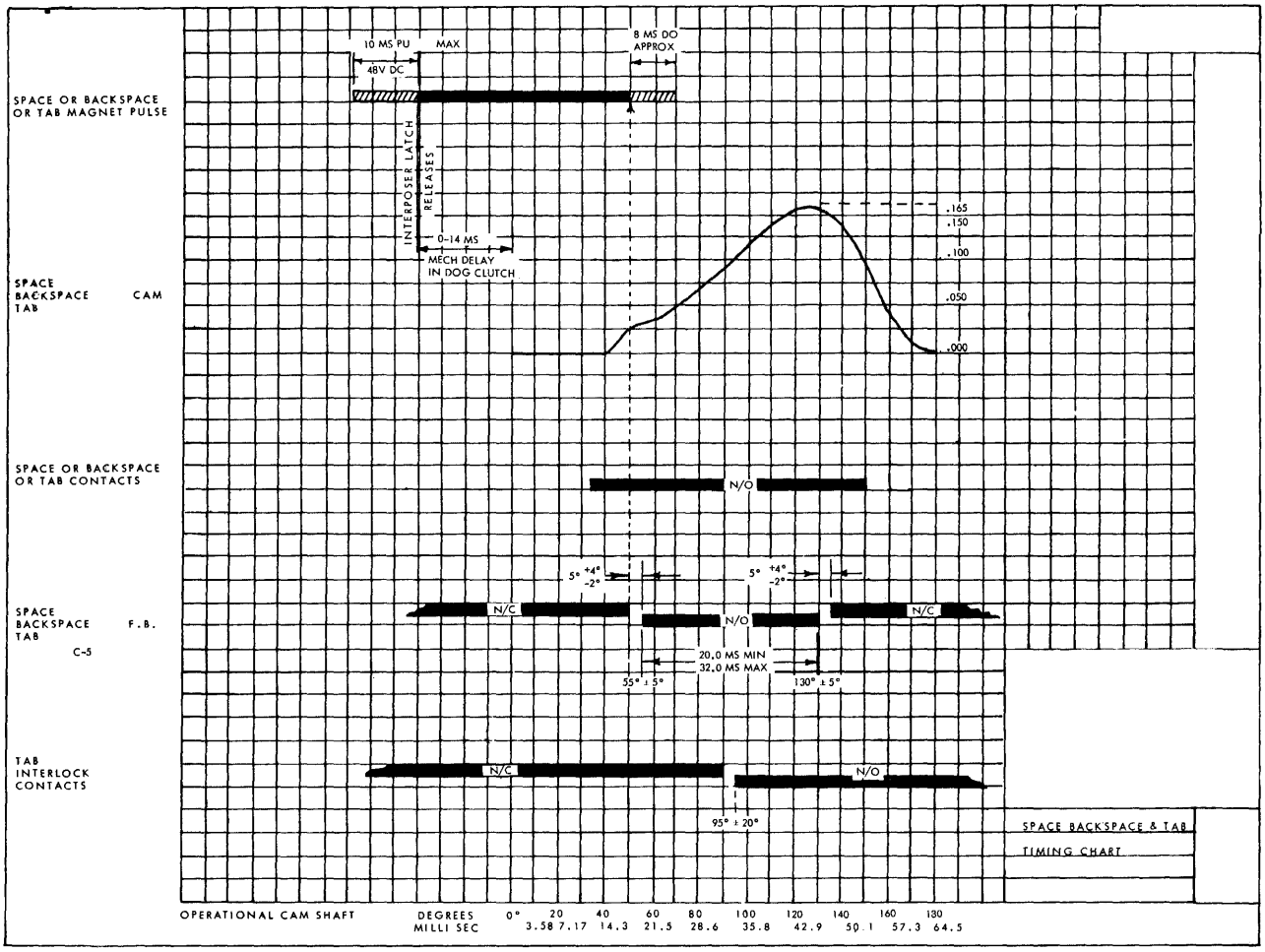
SECTION 4 PRODUCT SPECIFICATION (73)

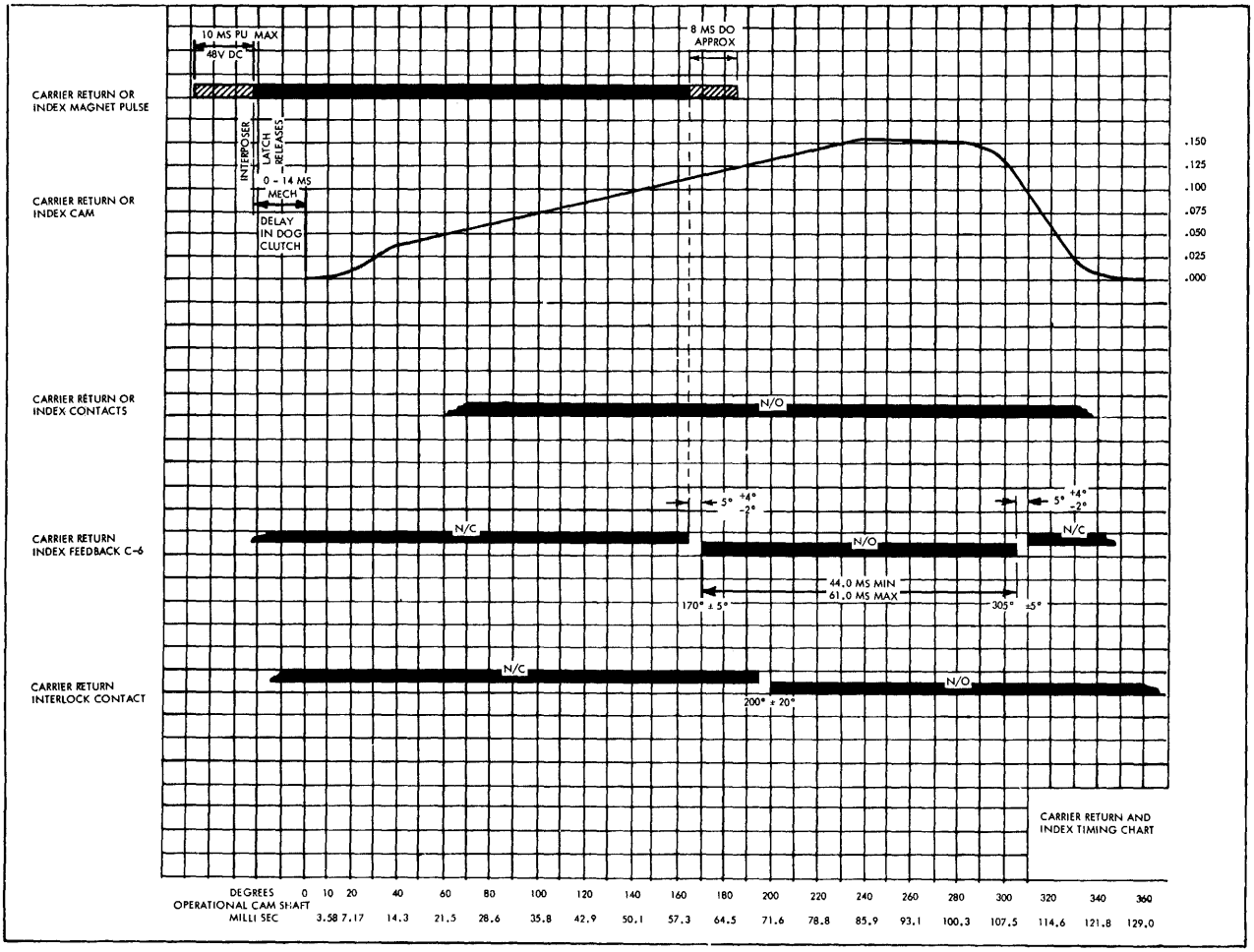
ELECTRICAL SPECIFICATIONS			
Component	Voltage[1]	Current[2]	D.C. Resistance (Ohms)
Motor	115	1.0 amp	
K/B Lock Solenoid	48	160	329 to 397
Ribbon Shift Magnet (1Magnet)	48	160	345 to 455
Red Ribbon Shift (2 Magnet) and U.C. Shift Magnets	48	250	221 to 259
All Other Magnets	48	125	432 to 518
All Contacts	Shall operate with 10 volts at 40 ma. or 48 volts with 300 ma.		

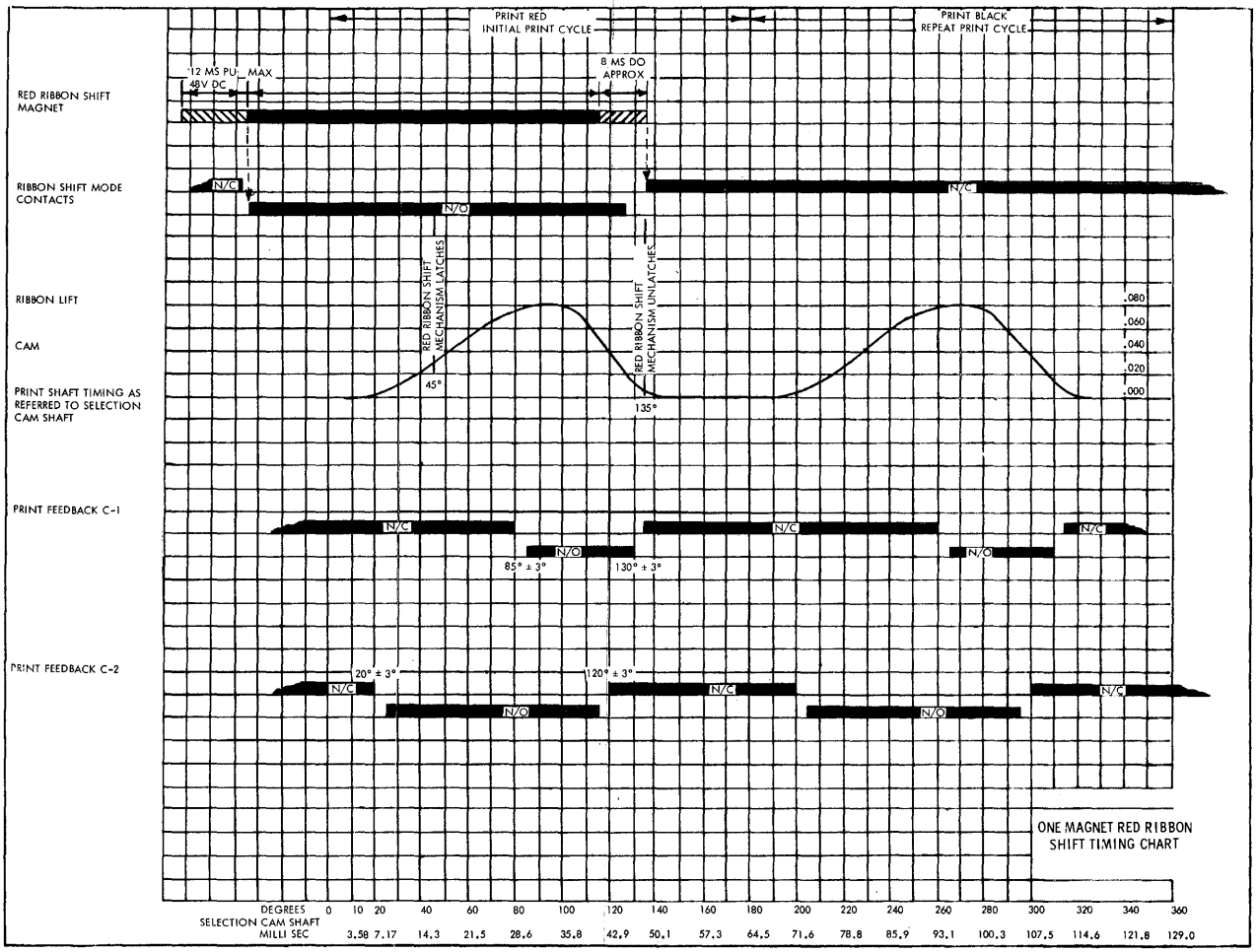
1. Machine must perform all functions at ± 10% of specified voltages.
2. Maximum currents at (in ma.) specified operating voltages.

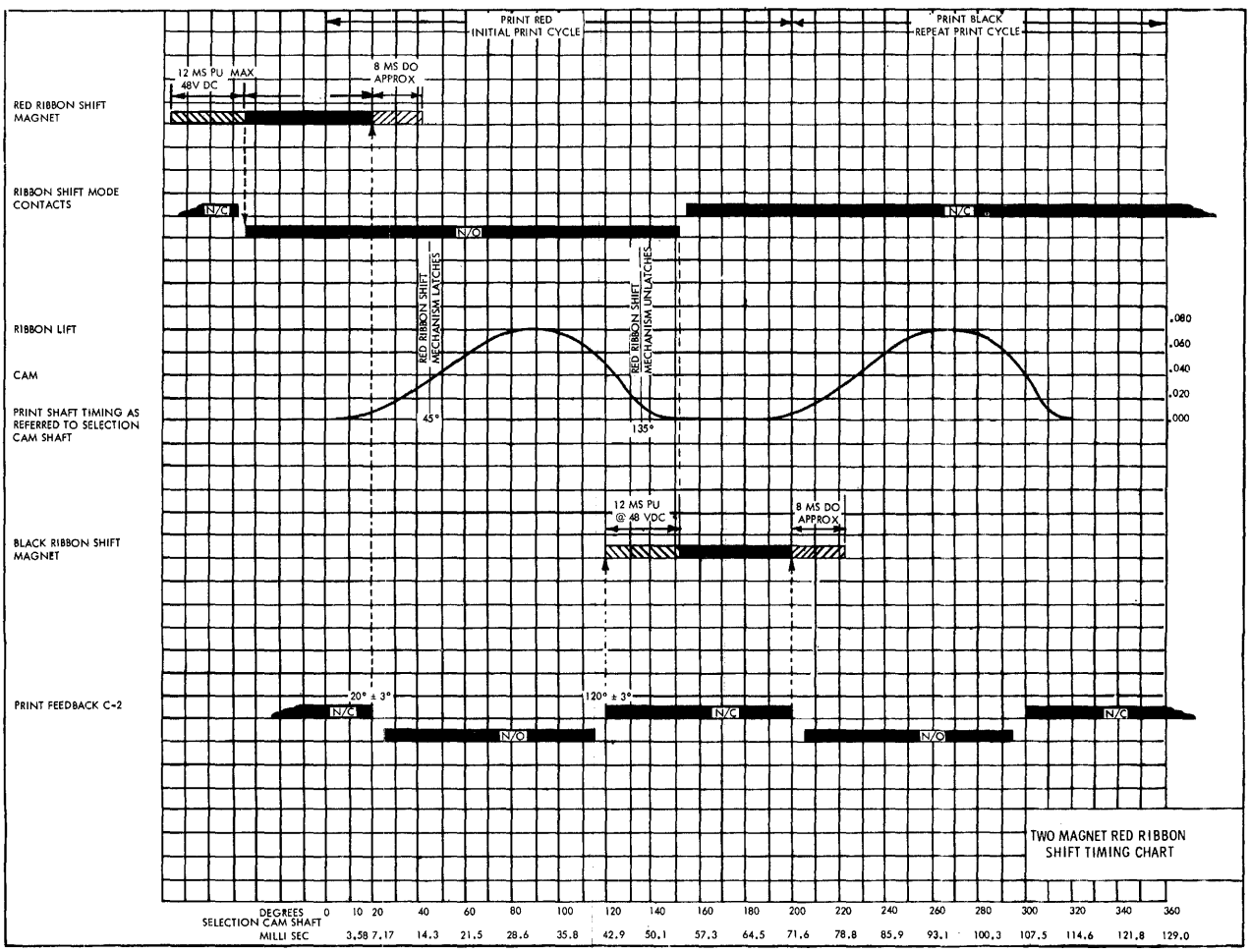
Magnet and Solenoid Operating Speeds	
Component	Maximum Pick Time (48 V DC)
K/B Lock Solenoid	55 ms.
Red Ribbon Shift Magnet (1 or 2 magnet mechanism)	12 ms.
All Other Magnets	10 ms.

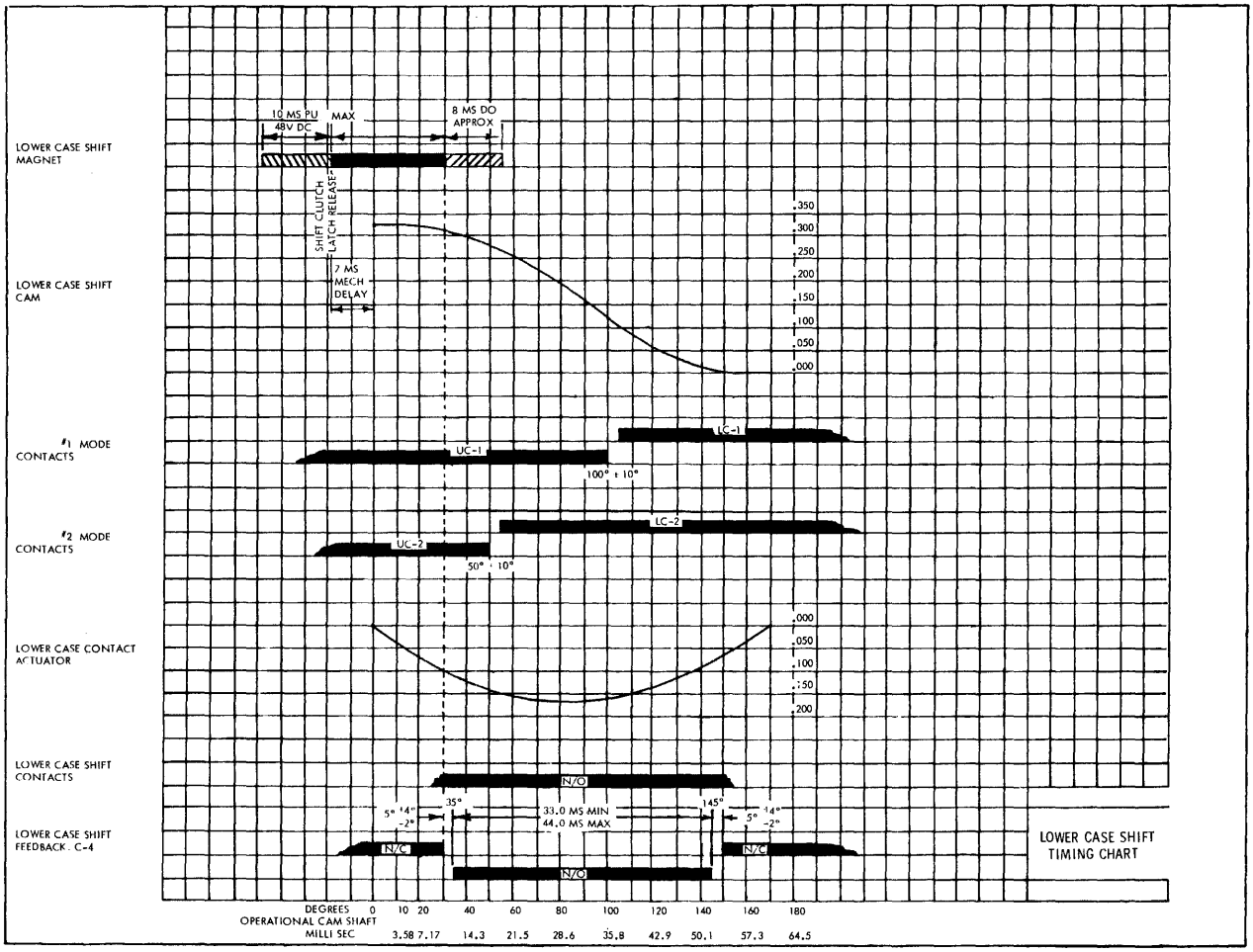


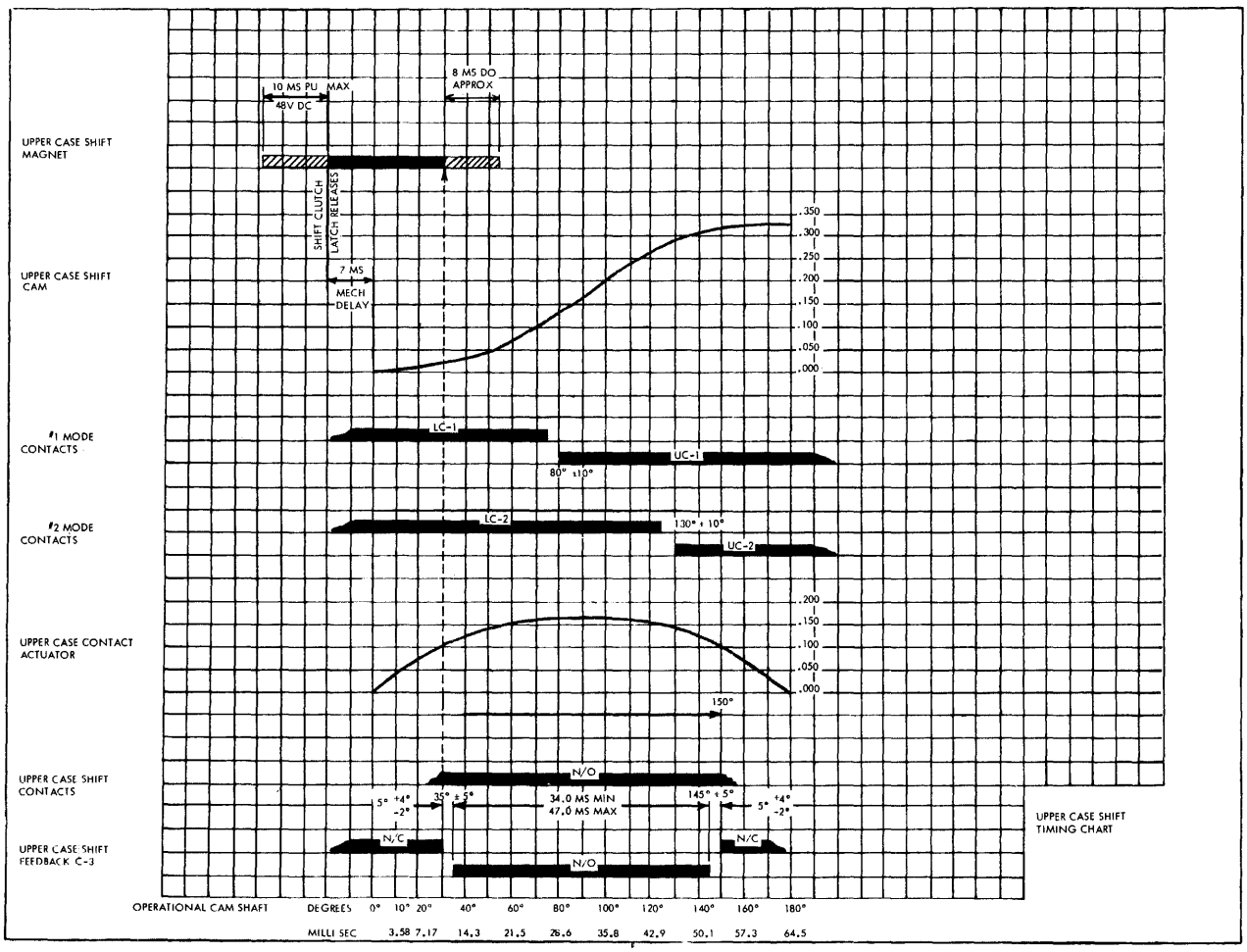

SPACE OR BACKSPACE OR TAB MAGNET PULSE
10 MS PU MAX
48V DC
8 MS DO APPROX
INTERPOSER LATCH RELEASES
0-14 MS MECH DELAY IN DOG CLUTCH
SPACE BACKSPACE CAM TAB
.165
.150
.100
.050
.000
SPACE OR BACKSPACE OR TAB CONTACTS
N/O
5° +4° -2°
5° +4° -2°
SPACE BACKSPACE F.B. TAB C-5
N/C
N/O
N/C
20.0 MS MIN
32.0 MS MAX
55° ± 5°
130° ± 5°
TAB INTERLOCK CONTACTS
N/C
N/O
95° ± 20°
SPACE BACKSPACE & TAB TIMING CHART
OPERATIONAL CAM SHAFT
DEGREES 0° 20 40 60 80 100 120 140 160 180
MILLI SEC 3.58 7.17 14.3 21.5 28.6 35.8 42.9 50.1 57.3 64.5


CARRIER RETURN OR INDEX MAGNET PULSE
10 MS PU MAX
48V DC
8 MS DO APPROX
INTERPOSER LATCH RELEASES
0 - 14 MS MECH DELAY IN DOG CLUTCH
CARRIER RETURN OR INDEX CAM
.150
.125
.100
.075
.050
.025
.000
CARRIER RETURN OR INDEX CONTACTS
N/O
5° +4° -2°
5° +4° -2°
CARRIER RETURN INDEX FEEDBACK C-6
N/C
N/O
N/C
44.0 MS MIN
61.0 MS MAX
170° ± 5°
305° ±5°
CARRIER RETURN INTERLOCK CONTACT
N/C
N/O
200° ± 20°
CARRIER RETURN AND INDEX TIMING CHART
DEGREES 0 10 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
OPERATIONAL CAM SHAFT
MILLI SEC 3.58 7.17 14.3 21.5 28.6 35.8 42.9 50.1 57.3 64.5 71.6 78.8 85.9 93.1 100.3 107.5 114.6 121.8 129.0

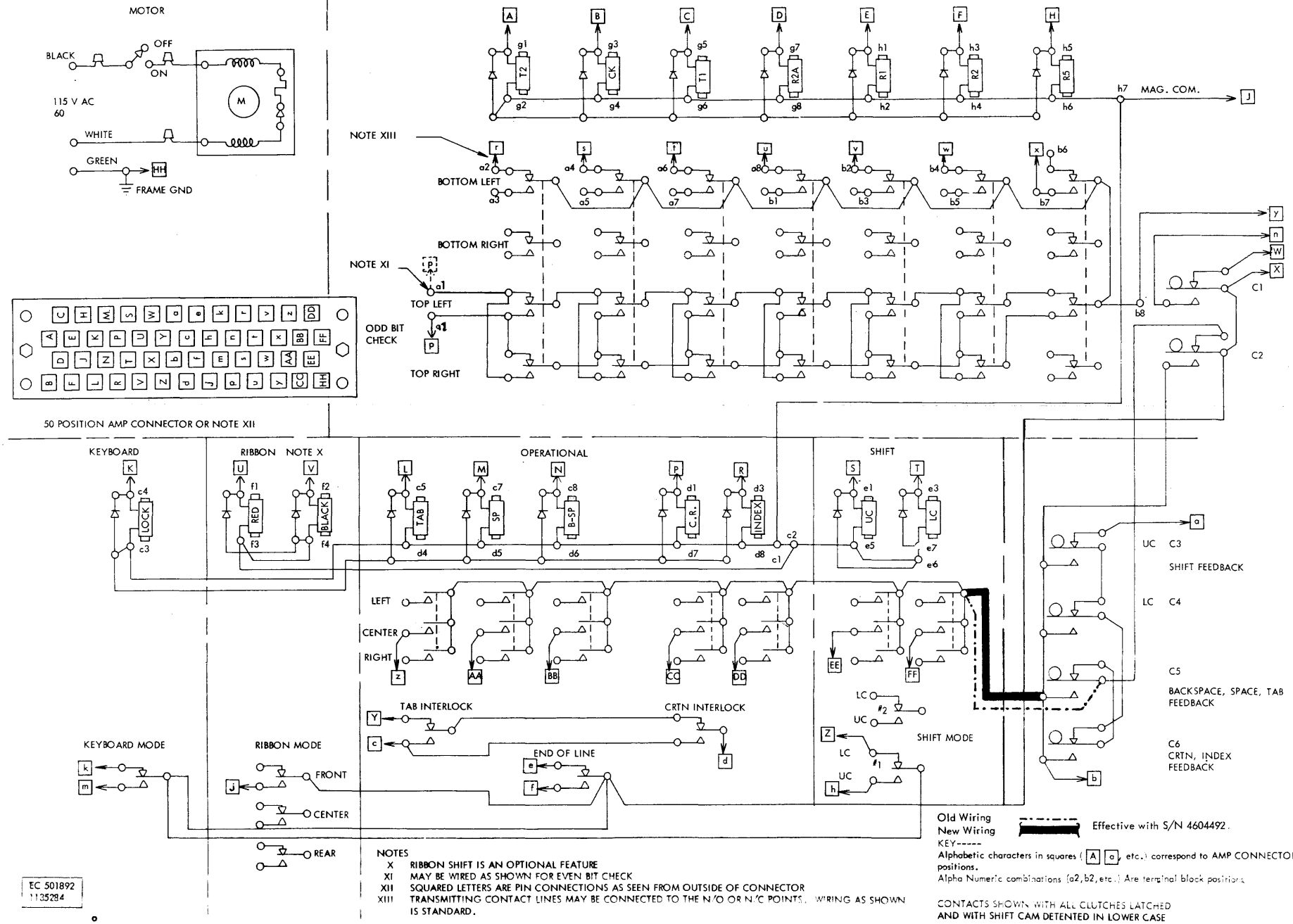

PRINT RED
INITIAL PRINT CYCLE
PRINT BLACK
REPEAT PRINT CYCLE
12 MS PU MAX
48V DC
8 MS DO
APPROX
RED RIBBON SHIFT
MAGNET
RIBBON SHIFT MODE
CONTACTS
N/C
N/O
RIBBON LIFT
CAM
PRINT SHAFT TIMING AS
REFERRED TO SELECTION
CAM SHAFT
RED RIBBON SHIFT
MECHANISM LATCHES
RED RIBBON SHIFT
MECHANISM UNLATCHES
45°
135°
.080
.060
.040
.020
.000
PRINT FEEDBACK C-1
85° ± 3°
130° ± 3°
PRINT FEEDBACK C-2
20° ± 3°
120° ± 3°
ONE MAGNET RED RIBBON
SHIFT TIMING CHART
DEGREES
SELECTION CAM SHAFT
MILLI SEC
0 10 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
3.58 7.17 14.3 21.5 28.6 35.8 42.9 50.1 57.3 64.5 71.6 78.8 85.9 93.1 100.3 107.5 114.6 121.8 129.0


PRINT RED
INITIAL PRINT CYCLE
PRINT BLACK
REPEAT PRINT CYCLE
12 MS PU MAX
48V DC
8 MS DO
APPROX
RED RIBBON SHIFT
MAGNET
RIBBON SHIFT MODE
CONTACTS
N/C
N/O
RIBBON LIFT
CAM
PRINT SHAFT TIMING AS
REFERRED TO SELECTION
CAM SHAFT
RED RIBBON SHIFT
MECHANISM LATCHES
RED RIBBON SHIFT
MECHANISM UNLATCHES
45°
135°
.080
.060
.040
.020
.000
12 MS PU
@ 48 VDC
8 MS DO
APPROX
BLACK RIBBON SHIFT
MAGNET
PRINT FEEDBACK C-2
20° ± 3°
120° ± 3°
TWO MAGNET RED RIBBON
SHIFT TIMING CHART
DEGREES
SELECTION CAM SHAFT
MILLI SEC
0 10 20 40 60 80 100 120 140 160 180 200 220 240 260 280 300 320 340 360
3.58 7.17 14.3 21.5 28.6 35.8 42.9 50.1 57.3 64.5 71.6 78.8 85.9 93.1 100.3 107.5 114.6 121.8 129.0


LOWER CASE SHIFT MAGNET
10 MS PU 48V DC
MAX
8 MS DO APPROX
SHIFT CLUTCH LATCH RELEASES
LOWER CASE SHIFT CAM
7 MS MECH DELAY
.350
.300
.250
.200
.150
.100
.050
.000
#1 MODE CONTACTS
LC-1
UC-1
100° ± 10°
#2 MODE CONTACTS
LC-2
UC-2
50° ± 10°
LOWER CASE CONTACT ACTUATOR
.000
.050
.100
.150
.200
LOWER CASE SHIFT CONTACTS
N/O
5° +4° -2°
35°
33.0 MS MIN
44.0 MS MAX
145°
5° +4° -2°
LOWER CASE SHIFT FEEDBACK C-4
N/C
N/C
N/O
LOWER CASE SHIFT TIMING CHART
OPERATIONAL CAM SHAFT
DEGREES 0 10 20 40 60 80 100 120 140 160 180
MILLI SEC 3.58 7.17 14.3 21.5 28.6 35.8 42.9 50.1 57.3 64.5


UPPER CASE SHIFT MAGNET
10 MS PU 48V DC
MAX
8 MS DO APPROX
SHIFT CLUTCH LATCH RELEASES
UPPER CASE SHIFT CAM
7 MS MECH DELAY
.350
.300
.250
.200
.150
.100
.050
.000
#1 MODE CONTACTS
LC-1
UC-1
80° ±10°
#2 MODE CONTACTS
LC-2
130° ± 10°
UC-2
UPPER CASE CONTACT ACTUATOR
.200
.150
.100
.050
.000
150°
UPPER CASE SHIFT CONTACTS
N/O
5° +4° -2°
35° ± 5°
34.0 MS MIN
47.0 MS MAX
145° ± 5°
5° +4° -2°
UPPER CASE SHIFT FEEDBACK C-3
N/C
N/C
N/O
UPPER CASE SHIFT TIMING CHART
OPERATIONAL CAM SHAFT
DEGREES 0° 10° 20° 40° 60° 80° 100° 120° 140° 160° 180°
MILLI SEC 3.58 7.17 14.3 21.5 28.6 35.8 42.9 50.1 57.3 64.5

CORRESPONDENCE WIRING DIAGRAM



EC 501892
1135284

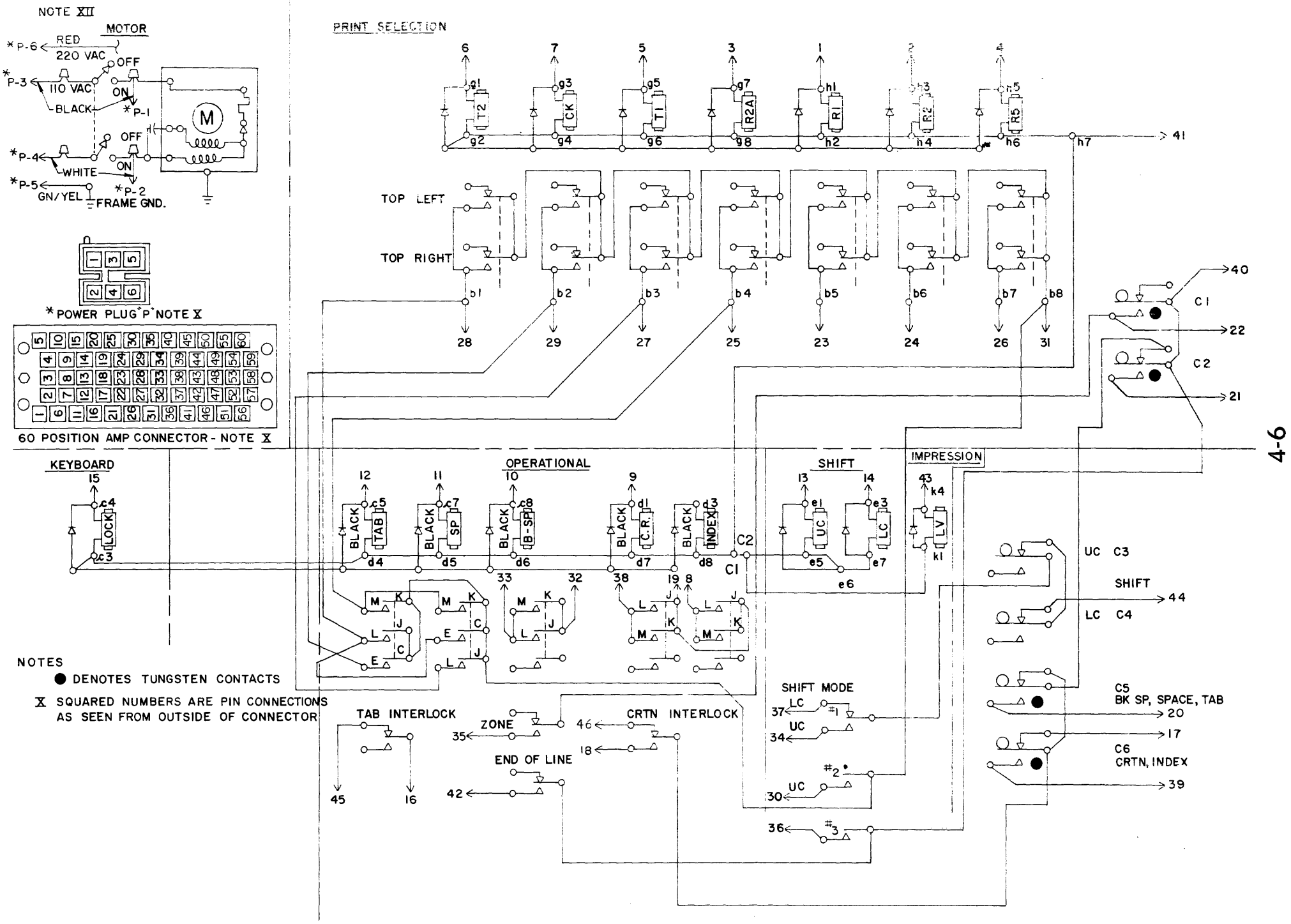
NOTES

- X RIBBON SHIFT IS AN OPTIONAL FEATURE
- XI MAY BE WIRED AS SHOWN FOR EVEN BIT CHECK
- XII SQUARED LETTERS ARE PIN CONNECTIONS AS SEEN FROM OUTSIDE OF CONNECTOR
- XIII TRANSMITTING CONTACT LINES MAY BE CONNECTED TO THE N/O OR N/C POINTS. WIRING AS SHOWN IS STANDARD.

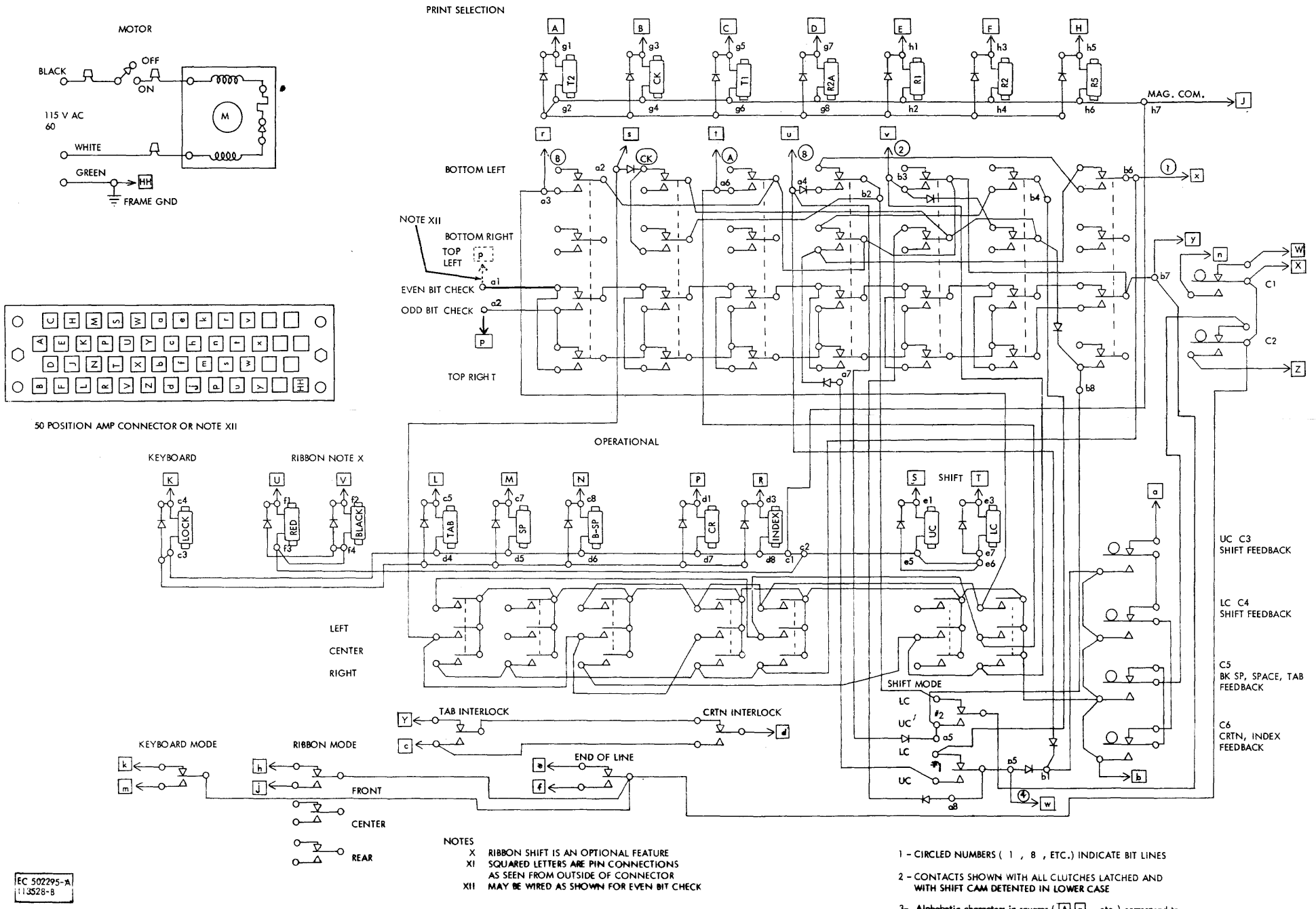
Old Wiring
New Wiring — Effective with S/N 4604492.

KEY-----
Alphabetic characters in squares (A a, etc.) correspond to AMP CONNECTOR positions.
Alpha Numeric combinations (a2, b2, etc.) Are terminal block positions

CONTACTS SHOWN WITH ALL CLUTCHES LATCHED AND WITH SHIFT CAM DETENTED IN LOWER CASE


NOTE XII
MOTOR
*P-6
RED
220 VAC
OFF
*P-3
110 VAC
ON
BLACK
*P-1
M
OFF
*P-4
WHITE
ON
*P-5
GN/YEL
*P-2
FRAME GND.
*POWER PLUG "P" NOTE X
60 POSITION AMP CONNECTOR - NOTE X
PRINT SELECTION
T2
CK
T1
R2A
R1
R2
R5
TOP LEFT
TOP RIGHT
KEYBOARD
LOCK
OPERATIONAL
TAB
SP
B-SP
C.R.
INDEX
SHIFT
UC
LC
IMPRESSION
LV
C1
C2
UC C3
SHIFT
LC C4
C5
BK SP, SPACE, TAB
C6
CRTN, INDEX
TAB INTERLOCK
ZONE
CRTN INTERLOCK
END OF LINE
SHIFT MODE
NOTES
● DENOTES TUNGSTEN CONTACTS
X SQUARED NUMBERS ARE PIN CONNECTIONS AS SEEN FROM OUTSIDE OF CONNECTOR

BCD WIRING DIAGRAM



NOTES

X RIBBON SHIFT IS AN OPTIONAL FEATURE

XI SQUARED LETTERS ARE PIN CONNECTIONS AS SEEN FROM OUTSIDE OF CONNECTOR

XII MAY BE WIRED AS SHOWN FOR EVEN BIT CHECK

1 - CIRCLED NUMBERS (1 , 8 , ETC.) INDICATE BIT LINES

2 - CONTACTS SHOWN WITH ALL CLUTCHES LATCHED AND WITH SHIFT CAM DETENTED IN LOWER CASE

3- Alphabetic characters in squares (A a , etc.) correspond to AMP CONNECTOR positions.

EC 502295-A
113528-B

SELECTION AND TILT-ROTATE SCHEDULE

BCD KEYBOARD											CORRESPONDENCE KEYBOARD										
UC	LC	T2	CK	T1	R2A	R1	R2	R5	TLT	ROT	UC	LC	T2	CK	T1	R2A	R1	R2	R5	TLT	ROT
■	A	0	1	0	1	1	1	1	3	-5	A	a	0	0	1	1	0	0	1	2	-2
■	B	0	1	0	1	0	1		3	+1	B	b	1	0	0	0	0	0		1	+5
■	C	0	0	0	1	0	1	1	3	-4	C	c	1	0	0	1	0	0	1	1	-2
■	D	0	1	0	1	1	0		3	+2	D	d	1	1	0	1	1	0	1	1	-3
■	E	0	0	0	1	1	0	1	3	-3	E	e	1	0	0	1	1	0		1	+2
■	F	0	0	0	1	0	0		3	+3	F	f	0	0	0	1	0	1	1	3	-4
?	G	0	1	0	1	0	0	1	3	-2	G	g	0	1	0	1	1	1	1	3	-5
¤	H	0	1	0	0	1	0	1	3	-1	H	h	1	1	0	0	1	0		1	+4
[	I	0	0	0	0	1	0		3	+4	I	i	0	1	1	1	0	0		2	+3
■	J	0	0	1	1	1	1	1	2	-5	J	j	0	0	0	1	1	1		3	0
■	K	0	0	1	1	0	1		2	+1	K	k	1	1	0	1	0	0		1	+3
■	L	0	1	1	1	0	1	1	2	-4	L	l	1	0	0	0	1	0	1	1	-1
■	M	0	0	1	1	1	0		2	+2	M	m	0	0	1	1	1	1	1	2	-5
■	N	0	1	1	1	1	0	1	2	-3	N	n	1	0	0	1	0	1		1	+1
■	O	0	1	1	1	0	0		2	+3	O	o	0	0	1	0	1	0	1	2	-1
¦	P	0	0	1	1	0	0	1	2	-2	P	p	0	1	0	1	1	0		3	+2
※	Q	0	0	1	0	1	0	1	2	-1	Q	q	0	0	0	1	0	0		3	+3
]	R	0	1	1	0	1	0		2	+4	R	r	0	1	1	1	1	0	1	2	-3
■	S	1	0	0	1	0	1		1	+1	S	s	0	1	1	0	1	0		2	+4
■	T	1	1	0	1	0	1	1	1	-4	T	t	1	1	0	1	1	1		1	0
■	U	1	0	0	1	1	0		1	+2	U	u	1	1	0	1	0	1	1	1	-4
■	V	1	1	0	1	1	0	1	1	-3	V	v	0	1	1	1	0	1	1	2	-4
■	W	1	1	0	1	0	0		1	+3	W	w	0	0	1	0	0	0		2	+5
‡	X	1	0	0	1	0	0	1	1	-2	X	x	1	0	0	1	1	1	1	1	-5
%	Y	1	0	0	0	1	0	1	1	-1	Y	y	0	0	0	0	1	0		3	+4
≈	Z	1	1	0	0	1	0		1	+4	Z	z	1	0	1	1	1	1		0	0
■	1	1	1	1	1	1	1	1	0	-5	[	]	1	1	1	1	1	1	1	0	-5
■	2	1	1	1	1	0	1		0	+1	@	2	1	1	1	1	0	1		0	+1
■	3	1	0	1	1	0	1	1	0	-4	#	3	1	0	1	1	0	1	1	0	-4
■	4	1	1	1	1	1	0		0	+2	$	4	1	1	1	0	1	0	1	0	-1
■	5	1	0	1	1	1	0	1	0	-3	%	5	1	1	1	1	1	0		0	+2
■	6	1	0	1	1	0	0		0	+3	ç	6	1	0	1	1	0	0		0	+3
■	7	1	1	1	1	0	0	1	0	-2	&	7	1	0	1	1	1	0	1	0	-3
@	8	1	1	1	0	1	0	1	0	-1	*	8	1	1	1	1	1	0	1	0	-2
:	9	1	0	1	0	1	0		0	+4	(	9	1	1	1	0	0	0		0	+5
>	Ø	1	0	1	0	0	0	1	0	0	)	0	1	0	1	0	1	0		0	+4
;	-	0	1	1	1	1	1		2	0	_	-	0	1	0	0	0	0		3	+5
√	#	1	1	1	0	0	0		0	+5	+	=	0	1	0	1	0	1		3	+1
/	ß	1	1	0	1	1	1		1	0	°	!	0	1	1	1	1	1		2	0
<	£	0	0	0	1	1	1		3	0	:	;	0	0	0	1	1	0	1	3	-3
△	$	0	0	1	0	0	0		2	+5	"	'	0	0	1	1	1	0		2	+2
‡	,	1	0	0	0	0	0		1	+5	,	,	0	1	0	1	0	0	1	3	-2
‡	.	0	1	0	0	0	0		3	+5	.	.	0	0	1	1	0	1		2	+1
■	/	1	0	0	1	1	1	1	1	-5	?	/	0	1	0	0	1	0	1	3	-1

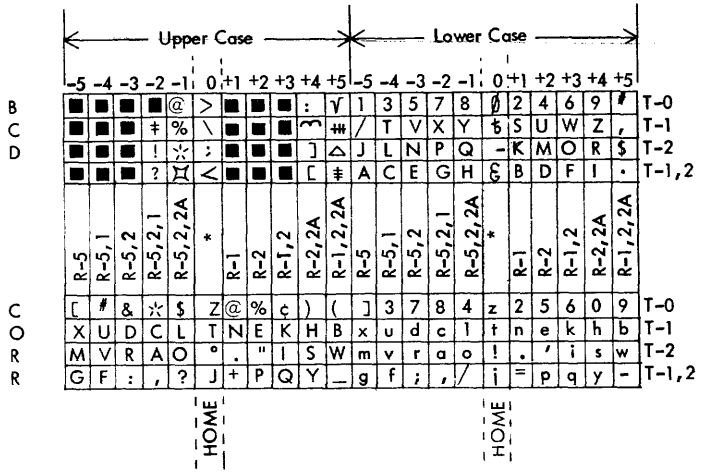
0 in Square* - Indicates; 1. Selection Contact Transferred
2. Latches Active

1 in Square* - Indicates Selection Magnet Energized

*Exception - 1 in R5 Column Indicates Both Selection Contact Transferred and Magnet Energized.

TYPEHEAD LAYOUT

T - #'s = Tilt latches active
R - #'s = Rotate latches active



*With one exception, home position (Zero Rotate) selection on the 73 Series is identical to the 72 Series - i.e., no rotate latches are active. On the BCD machine, home position, during zero tilt only (Ø & >), is selected by the cancellation method - i.e., all rotate latches are active (see the Selection and Tilt Rotate Schedule

On the BCD machine only, the symbol > (Greater Than) may be used to check type head homing.

BCD MACHINE

CHARACTER	CASE	ALPHABETIC & NUMERIC BIT CODE 1	2	4	8	A	B	CK	NOTE
■	U								1
A	L	1	0	0	0	1	1	0	
■	U								1
B	L	0	1	0	0	1	1	0	
■	U								1
C	L	1	1	0	0	1	1	1	
■	U								1
D	L	0	0	1	0	1	1	0	
■	U								1
E	L	1	0	1	0	1	1	1	
■	U								1
F	L	0	1	1	0	1	1	1	
?	U	0	1	0	1	1	1	1	
G	L	1	1	1	0	1	1	0	
¤	U	0	0	1	1	1	1	1	
H	L	0	0	0	1	1	1	0	
[	U	1	0	1	1	1	1	0	
I	L	1	0	0	1	1	1	1	
■	U								1
J	L	1	0	0	0	0	1	1	
■	U								1
K	L	0	1	0	0	0	1	1	
■	U								1
L	L	1	1	0	0	0	1	0	
■	U								1
M	L	0	0	1	0	0	1	1	
■	U								1
N	L	1	0	1	0	0	1	0	
■	U								1
O	L	0	1	1	0	0	1	0	
!	U	0	1	0	1	0	1	0	
P	L	1	1	1	0	0	1	1	
⁘	U	0	0	1	1	0	1	0	
Q	L	0	0	0	1	0	1	1	
]	U	1	0	1	1	0	1	1	
R	L	1	0	0	1	0	1	0	
■	U								1
S	L	0	1	0	0	1	0	1	
■	U								1
T	L	1	1	0	0	1	0	0	
■	U								1
U	L	0	0	1	0	1	0	1	
■	U								1
V	L	1	0	1	0	1	0	0	
■	U								1
W	L	0	1	1	0	1	0	0	
‡	U	0	1	0	1	1	0	0	
X	L	1	1	1	0	1	0	1	
%	U	0	0	1	1	1	0	0	
Y	L	0	0	0	1	1	0	1	
~	U	1	0	1	1	1	0	1	
Z	L	1	0	0	1	1	0	0	
■	U								1
1	L	1	0	0	0	0	0	0	
■	U								1
2	L	0	1	0	0	0	0	0	
■	U								1
3	L	1	1	0	0	0	0	1	
■	U								1
4	L	0	0	1	0	0	0	0	
■	U								1
5	L	1	0	1	0	0	0	1	
■	U								1
6	L	0	1	1	0	0	0	1	
■	U								1
7	L	1	1	1	0	0	0	0	
@	U	0	0	1	1	0	0	1	
8	L	0	0	0	1	0	0	0	
:	U	1	0	1	1	0	0	0	
9	L	1	0	0	1	0	0	1	
>	U	0	1	1	1	0	0	0	
Ø	L	0	1	0	1	0	0	1	
;	U	0	1	1	1	0	1	1	
-	L	0	0	0	0	0	1	0	
√	U	1	1	1	1	0	0	1	
#	L	1	1	0	1	0	0	0	
\	U	0	1	1	1	1	0	1	
¢	L	0	0	0	0	1	0	0	
<	U	0	1	1	1	1	1	0	
&	L	0	0	0	0	1	1	1	
Δ	U	1	1	1	1	0	1	0	
$	L	1	1	0	1	0	1	1	
⌗	U	1	1	1	1	1	0	0	
,	L	1	1	0	1	1	0	1	
‡	U	1	1	1	1	1	1	1	
.	L	1	1	0	1	1	1	0	
■	U								1
/	L	1	0	0	0	1	0	1	

NOTES:

1. Selecting this type head position in upper case will generate an invalid code. The Bit Check may appear either odd or even.
2. Bits are formed by contact closure (print selection transmitting and shift mode) between terminal "Y" and the bit lines (see BCD Wiring Diagram, page 20).
3. All bits formed by selection of any alphabetic or numeric character are indicated by "1".

BCD MACHINE

OPERATION	OPERATIONAL BIT CODE 1	2	4	8	A	B	CK
Space	1	0	1	1	0	0	0
Backspace	0	1	1	1	0	1	1
Tab	1	0	1	1	1	0	1
C. R.	1	0	1	1	0	1	1
Index	1	0	1	1	1	1	0
U.C. SH.	0	1	1	1	0	0	0
L.C. SH.	0	1	1	1	1	1	0

NOTES:

1. Both a 4 and an 8 Bit are transmitted during each operational function. Closing any N/O operational feedback contact (C3, C4, C5, or C6) connects terminal X (see BCD Wiring Diagram, page 7) to lines 4 and 8.
2. All other bits for operational functions are generated by closure of the operational transmitting contacts and are gated by either C3, C4, C5, or C6.

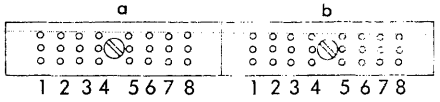
BCD MACHINE

CONTACTS INVOLVED IN GENERATION OF ALPHA-NUMERIC BITS

BIT	TERM. IN	THROUGH DIODES, PRINT SELECTION TRANSMITTING AND SHIFT MODE CONTACTS	TERM. OUT	CASE
1	1	R5 N/C & R2A* N/O	y	U or L
		R5 N/O & R2A N/C & #2 N/C	y	L
2	2	R1 N/O	y	U or L
		D & R2* N/C & D & #2 N/O	y	U
4	4	#1 N/O & D & R2A* N/O	y	U
		#1 N/C & R2 N/O & R2A* N/C	y	L
		D & R1* N/C & D & #2 N/O	y	U
8	8	D & #2 N/O	y	U
		D & R2A N/O & #2 N/C	y	L
A	A	T1 N/O	y	U or L
B	B	T2 N/O	y	U or L
CK	CK	D & CK* N/O & #2 N/C	y	L
		D & CK N/C & D & #2 N/O	y	U

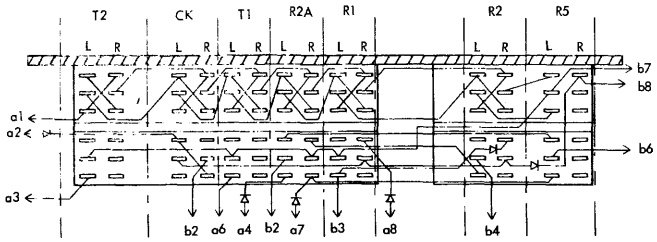
NOTES:

1. Asterisked (*) rotate contacts are bottom right - all others are bottom left.
2. Circuits through N/O Tilt, Rotate, and #1 & #2 Mode contacts indicate that the contact is transferred.
3. Circuits through N/C Tilt, Rotate, and #1 & #2 Mode contacts indicate that the contact is not transferred.

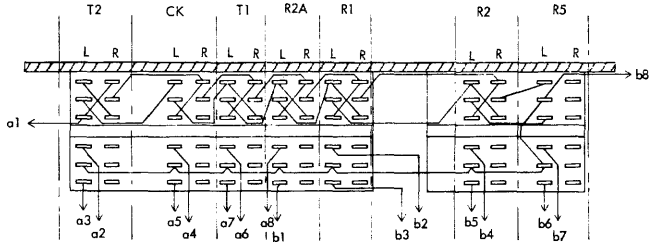


SEL CONT TERM BLOCK

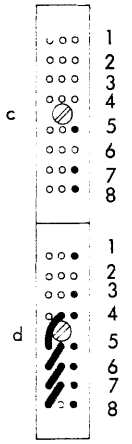
TERMINAL END VIEW OF SELECTION CONTACTS



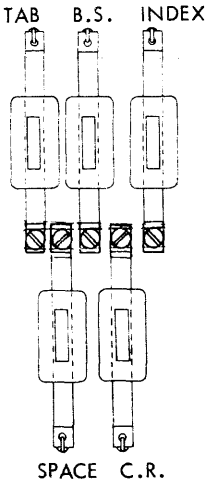
BCD



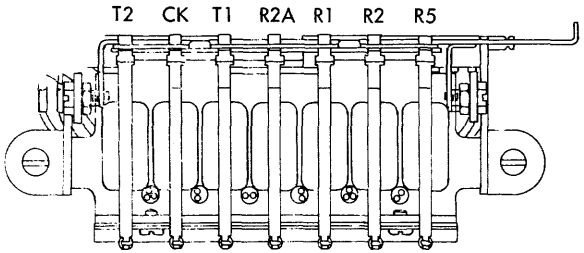
CORRESPONDENCE



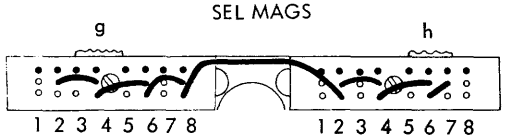
OPER TERM BLOCK



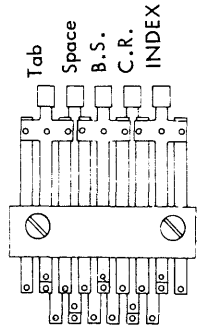
OPER MAGS



SEL MAGS



SEL MAG TERM BLOCK



OPERATIONAL TRANSMITTING CONTACTS

SELECTION MAGNET WIRING CHART		
COIL	BLACK LEAD	WHITE LEAD
T2	g-2	g-1
CHECK	g-4	g-3
T1	g-6	g-5
R2A	g-8	g-7
R1	h-2	h-1
R2	h-4	h-3
-R5	h-6	h-5

OPERATIONAL MAGNET WIRING CHART		
COIL	BLACK LEAD	WHITE LEAD
TAB	d-4	c-5
SPACE	d-5	c-7
BACKSPACE	d-6	c-8
CARRIER RETURN	d-7	d-1
INDEX	d-8	d-3

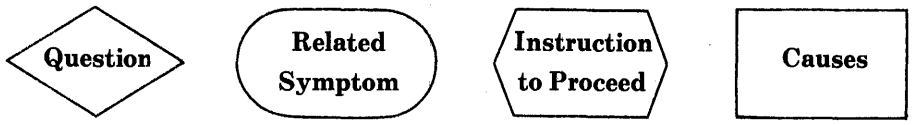
IBM

OPD CUSTOMER ENGINEERING
Selectric I/O Reference Manual
Section 5

This publication is a copy of the FE Service Index. It is a valuable service aid to the CE who is trouble-shooting the Selectric I/O.

Included are diagnostic flow charts which follow the sequence of operation and point out the area of adjustment(s) required to resolve I/O malfunctions. The numbers found in the blocks on each chart refer to a specific adjustment or service hint (S.H.). When additional information is required, the "Selectric" I/O Reference Manual should be consulted.

When diagnostic charts are not effective a brief narrative and illustration are used.



F/N 241-5302-0
Reprinted July, 1966

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Selectric I/O Diagnostic Aid
Section 5

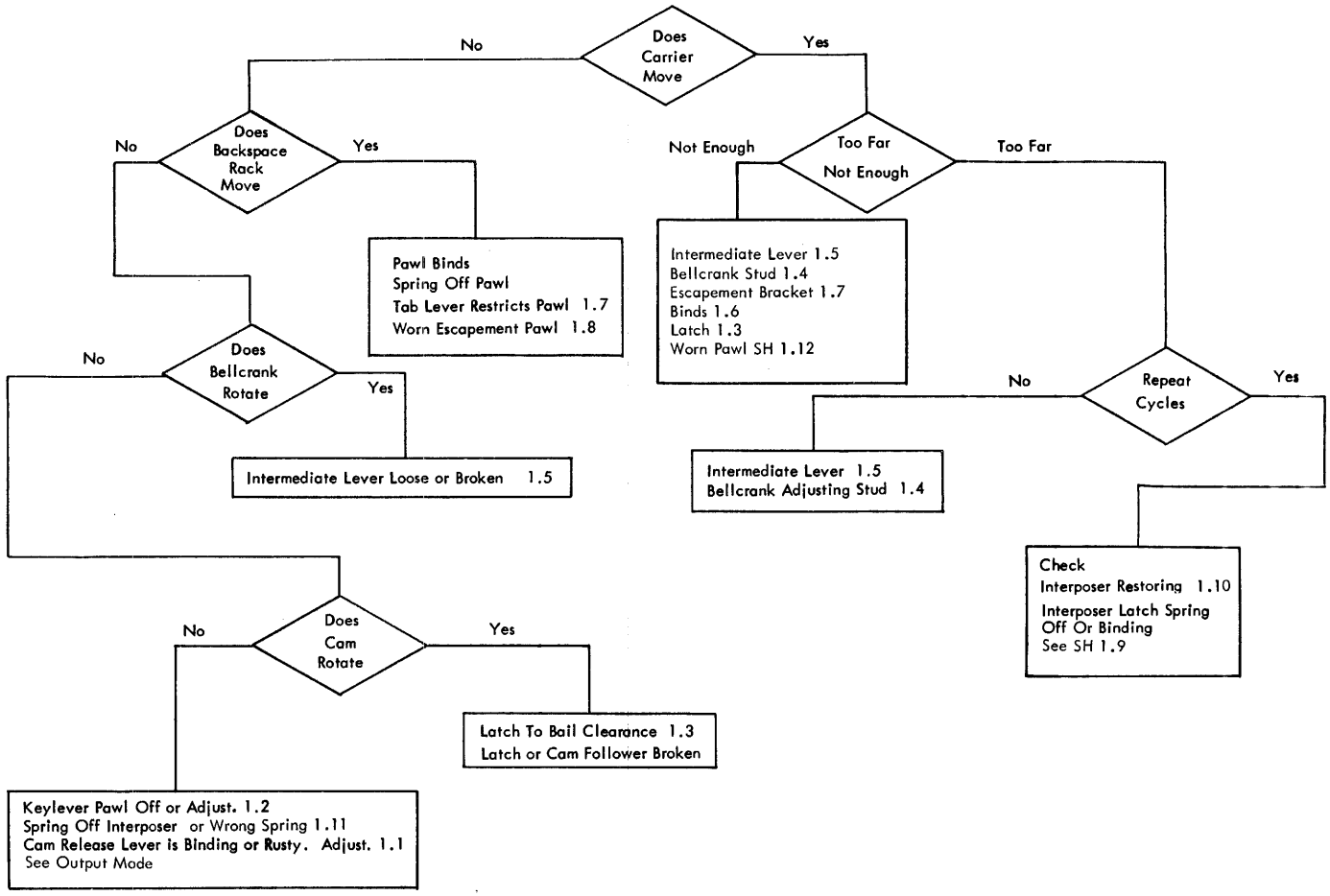


Figure 1.0

BACKSPACE

1.0 Backspace Adjustments

1.1 With the interposer and cam latched, form the Release Lug to obtain .035" - .045" clearance between the Interposer Lug and the Release Lever Lug.

1.2 The Keylever Pawl clears the interposer by .020" - .025".

1.3 The latch to bail clearance should be:
- a. .003" - .015" Space/Backspace.
- b. .003" - .010" Carrier Return/Index.
- c. .003" - .015" Tab or Wordmark.

1.4 Adjust the Intermediate Lever adjusting screw to obtain .005" - .015" between the B/S Rack and B/S Pawl with all parts at rest. This adjustment is used to position the Backspace Rack at rest. It MUST NOT be used to determine the throw of the backspace rack.

1.5 Adjust the intermediate lever, front to rear, so that the escapement pawl does not fall into the next rack tooth when hand cycling. The escapement pawl should ride to a point just before it drops into the rack tooth.

1.6 Binds - Check the following:
- a. Feed roll 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 is off its pulley.
- f. Pinion Gear.

1.7 Adjust Tab Lever stop on the escapement pawl mounting bracket so that both pawls bottom fully in the rack and the extension lug on the tab lever clears the pawls by .001" - .003".

1.8 Backspace may go a full space but a worn escapement pawl will cause the carrier to skip ahead 1/2 space. See Fig. 3.1. Look for this condition under powered operation. To prevent a reoccurrence, replace the escapement pawl AND rack.

1.9 S.H. OPERATIONAL CAMS

Effective with SELECTRIC I/O Printer S/N 4609595, a new operational cam and ratchet will be in production. The cam ratchet has been extended and the bearing surface within the cam has been elongated to provide longer bearing life. The cam wheel mounting stud has also been extended so as to provide greater release lever bite on the cam wheel. The improved bite will eliminate extra cycles of the Operational cams caused by the release lever slipping off the side of the clutch wheel.

Part No.	Description
1159886	CR cam
1159267	SB cam
1159269	Ratchet

1.10 S.H. OPERATIONAL INTERPOSER RESTORE BAIL

When the operational interposer restore bail requires readjustment to insure positive overthrow of the interposers on their latching surface, it is no longer necessary to form the lugs on the 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 .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 S.H. OPERATIONAL INTERPOSER SPRINGS

The operational interposer springs have been redesigned to provide greater spring tension and more reliable tripping of the operational cams. When failures in the operational area are encountered and it is suspected that these springs are failing to properly trip the operational cams, all the interposer springs should be replaced with the following new part numbers.

NOTE: The operational cam pawls should be checked frequently for wear. They should be replaced approximately every 15 months in machines experiencing normal usage. Machines experiencing heavy usage such as 24 hour/day operation will require that these pawls be replaced more frequently.

Part No.	Description
150047	Spring, spacebar interposer
1134948	Spring, operational interposer (all except space)

Note: Occasional malselections may also be caused due to failure of the interposer to trip the space cam. This can happen 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 S.H. BACKSPACE CAM PAWL WEAR

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.

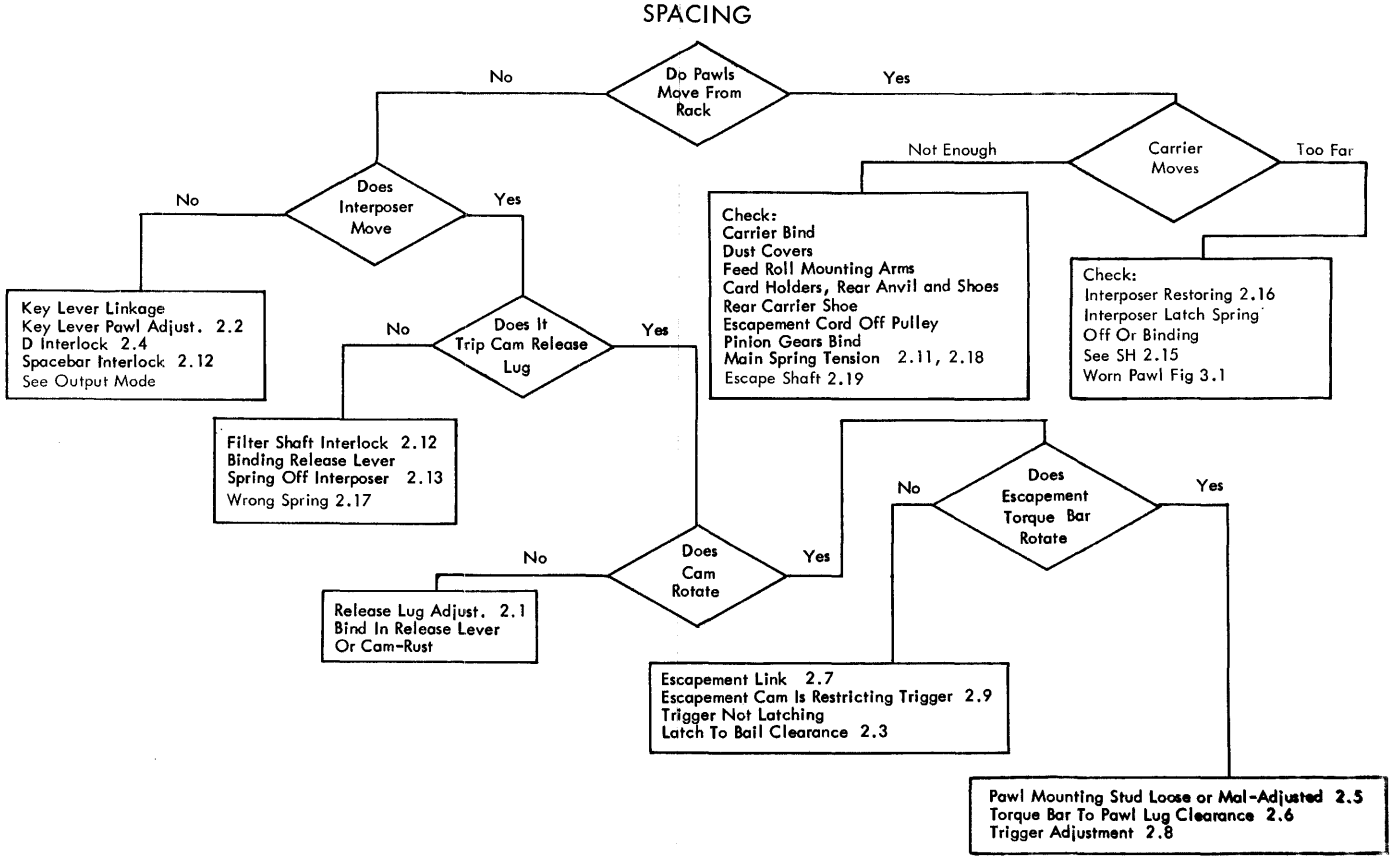


Figure 2.0

SPACING

2.0 Spacebar Adjustments

2.1 With the interposer and cam latched, form the Release Lug to obtain .035" - .045" clearance between the Interposer Lug and the Release Lever Lug.

2.2 The Keylever Pawl should clear the interposer by .020" - .030".

The backstop should be adjusted so that the keylever pawl operates freely (.035" bite).

2.3 The latch to bail clearance should be:
a. .003" - .015" Space/Backspace.
b. .003" - .010" Carrier Return/Index.
c. .003" - .015" Tab or Wordmark.

2.4 The lockout shaft may flip over if the lockout shaft link is allowed to move to the left or right. A clip, PN 1138464, may be installed on the lockout bail to limit any movement.

2.5 The pawl mounting stud should clear the Escapement Torque Bar by .001" at the closest point.

2.6 The Torque Bar should clear the Release Lug by .002" - .010". Later models use high side of spec.

2.7 The Escapement Link should span the gap between the Escapement Cam Follower Arm and the Spacebar Trigger Lever.

2.8 The trigger should disengage from the Torque Bar when the pawls are .010" - .015" from the rack.

2.9 Escapement should occur after printing and after the typehead has moved away from the platen by 1/4" to 1/2".

2.10 Escapement Shaft binds may be relieved by tapping the bearings on the Escapement Shaft to improve the bearing alignment.

2.11 The Mainspring tension should be 1/2 to 3/4 Lbs. at R.H. margin. See 2.18.

2.12 Position the escapement cam left or right to leave .020" - .030" lateral motion in the Lockout Cam when it is on the high point of the Escapement Cam. Adjust the Lockout Cam to allow .020" - .030" front to rear motion in the Interposer when the Lockout Cam is engaged. Adjust the Interposer Guide Bracket for .015" - .025" clearance between the Interposer and Lockout when the Lockout is at rest. (Note: For the late level Interlock - see Reference Manual.)

2.13 The Spacebar Interposer spring should be in the middle hole of the Interposer. See 2.17.

2.14 S.H. INTERMITTENT FAILURE TO SPACE

Intermittent space failures can be caused by excessive cycle clutch overthrow or incorrect print escapement cam timing.

2.15 S.H. OPERATIONAL CAMS (EXTRA CYCLES)

The cam wheel mounting stud has been extended so as to provide greater release lever bite on the cam wheel. The improved bite will eliminate extra cycles of the Operational cams caused by the release lever slipping off the side of the clutch wheel.

Part No.	Description
1159886	CR cam
1159267	SB cam
1159269	Ratchet

NOTE: The operational cam pawls should be checked frequently for wear. They should be replaced approximately every 15 months in machines experiencing normal usage. Machines experiencing heavy usage such as 24 hour/day operation will require that these pawls be replaced more frequently.

2.16 S.H. OPERATIONAL INTERPOSER RESTORE BAIL ADJUSTMENT

When the operational interposer restore bail requires readjustment to insure positive overthrow of the interposers on their latching surface, it is no longer necessary to form the lugs on the operational interposer restoring bail in the area where each interposer contacts the restore bail when being replaced. This clip will provide approximately .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.

2.17 S.H. OPERATIONAL INTERPOSER SPRINGS

The operational interposer springs have been redesigned to provide greater spring tension and more reliable tripping of the operational cams. When failures in the operational area are encountered and it is suspected that these springs are failing to properly trip the operational cams, all the interposer springs should be replaced with the following new part numbers.

Part No.	Description
150047	Spring, spacebar interposer
1134948	Spring, operational interposer (all except space)

Note: Occasional malselections may also be caused due to failure of the interposer to trip the space cam. This can happen 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.

2.18 S. H. 100" MAIN SPRING

Effective with I/O printer S/N 4607171, all Selectric I/O printers will incorporate a 100" mainspring.

The old 75" mainspring, PN 1124519, will no longer be used. The new 100" mainspring, PN 1164342, will be available for field replacement and is directly interchangeable with the old 75" mainspring.

The new 100" mainspring may easily be identified by the "100" stamped on the rear of the mainspring cage.

This new spring will add greater torque to the carrier escapement and tab operations.

2.19 S.H. ESCAPEMENT SHAFT BEARINGS DRY (USE #10)

Tap shaft lightly to re-align.

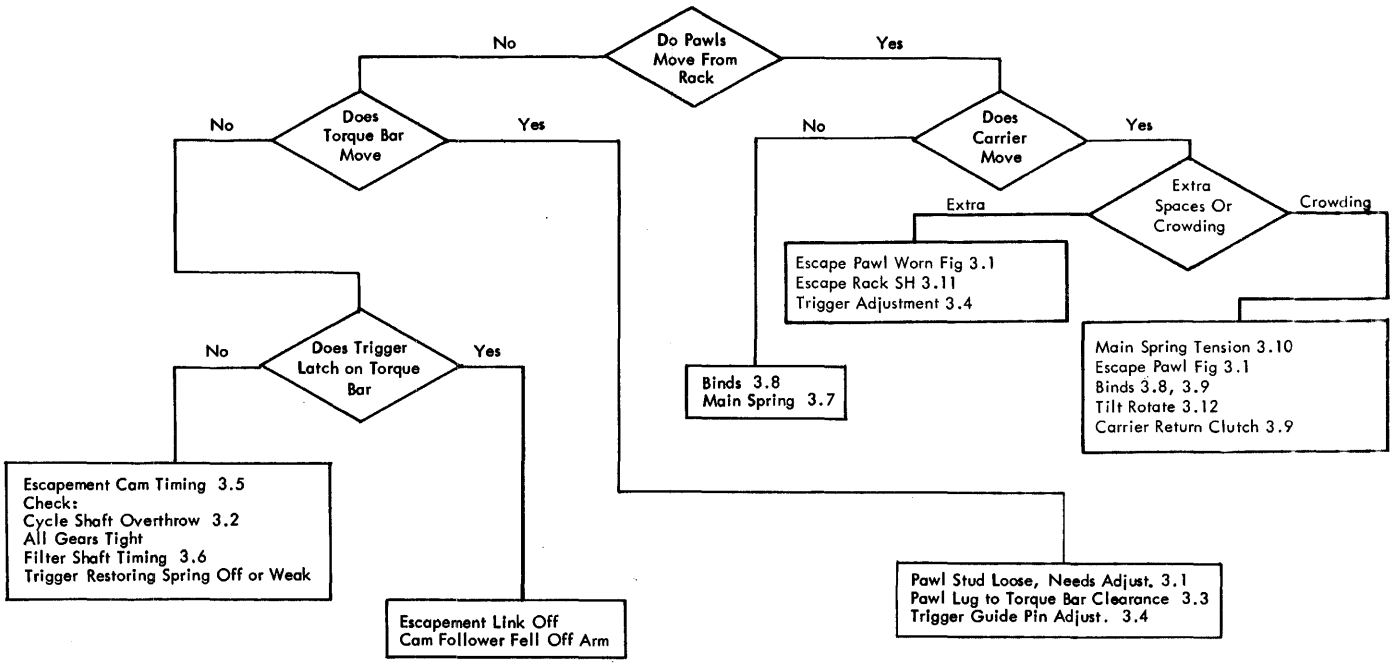


Figure 3.0

PRINT ESCAPEMENT

3.0 Print Escapement Adjustments

3.1 The Pawl Mounting Stud should clear the Escapement Torque Bar by .001" at the closest point.

3.2 The cycle shaft overthrow should be .007" to .015" (1 to 3 degrees).

3.3 The Torque Bar should clear the Pawl Release Lug by .002" - .010". Later models use high side of Spec.

3.4 The Trigger should disengage from the Torque Bar when the pawls are .010" - .015" from the rack.

3.5 Escapement should occur after printing and after the Typehead has moved away from the Platen by 1/4" - 1/2".

3.6 With an Interposer latched down and the Filter Shaft Gear held in a driven direction, there should be .010" - .015" clearance between the Interposer and the Filter Shaft Blade.

3.7 The mainspring tension should be 1/2 to 3/4 Lbs.

3.8 Binds - Check the following:
- a. Feed Roll Mounting Arm hits the Tab Overthrow Stop.
- b. Dust Covers - Card Holders.
- c. Anvil and front Carrier Shoes.
- d. Rear Carrier Shoe.
- e. Escapement Cord is off of its pulley.
- f. Pinion Gear.
- g. Escapement shaft bearings.

A worn pawl will be notched and polished at point "A".

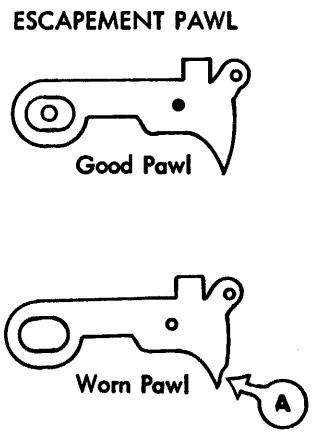


Figure 3.1

3.9 S.H. CARRIER RETURN SPRING CLUTCH

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.

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

3.10 S.H. MAIN SPRING

Effective with I/O Printer S/N 4607171, all Selectric I/O printers will incorporate a 100" mainspring.

The old 75" mainspring, PN 1124519, will no longer be used. The new 100" mainspring, PN 1164342, will be available for field replacement and is directly interchangeable with the old 75" mainspring.

The new 100" mainspring may easily be identified by the "100" stamped on the rear of the mainspring cage.

This new spring will add greater torque to the carrier escapement and tab operations.

3.11 S.H. ESCAPEMENT RACK

The pawl holding angle has been increased to improve escapement pawl life. The angle of inclination for the SELECTRIC I/O production escapement rack teeth has been reduced to 14°. This change has the effect of an increased escapement pawl to escapement rack holding angle, without necessitating a major change of design or of adjustment.

The 14° escapement rack has a milled notch (Fig. A) on the LH end. The new part numbers are listed below and should be added to your Keyboard or Keyboardless I/O Printer Parts Catalog.

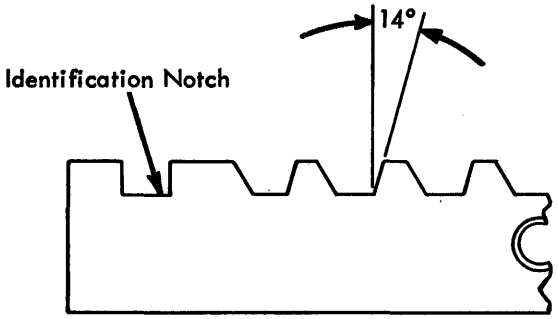


Figure 3.2

Part No.	Description
1124083	Rack, 10P, 11 in.
1124109	Rack, 12P, 11 in.
1128032	Rack, 10P, 15 in.
1128037	Rack, 12P, 15 in.

Adjustments

14° escapement racks should be installed parallel to the print shaft. Measure the distance between the rack and the print shaft at each end, using a Hooverometer as shown in Fig. B. Set the Hooverometer to the #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.

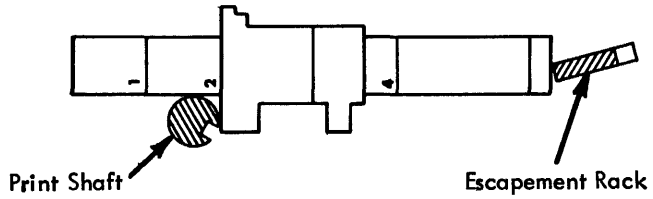


Figure 3.3

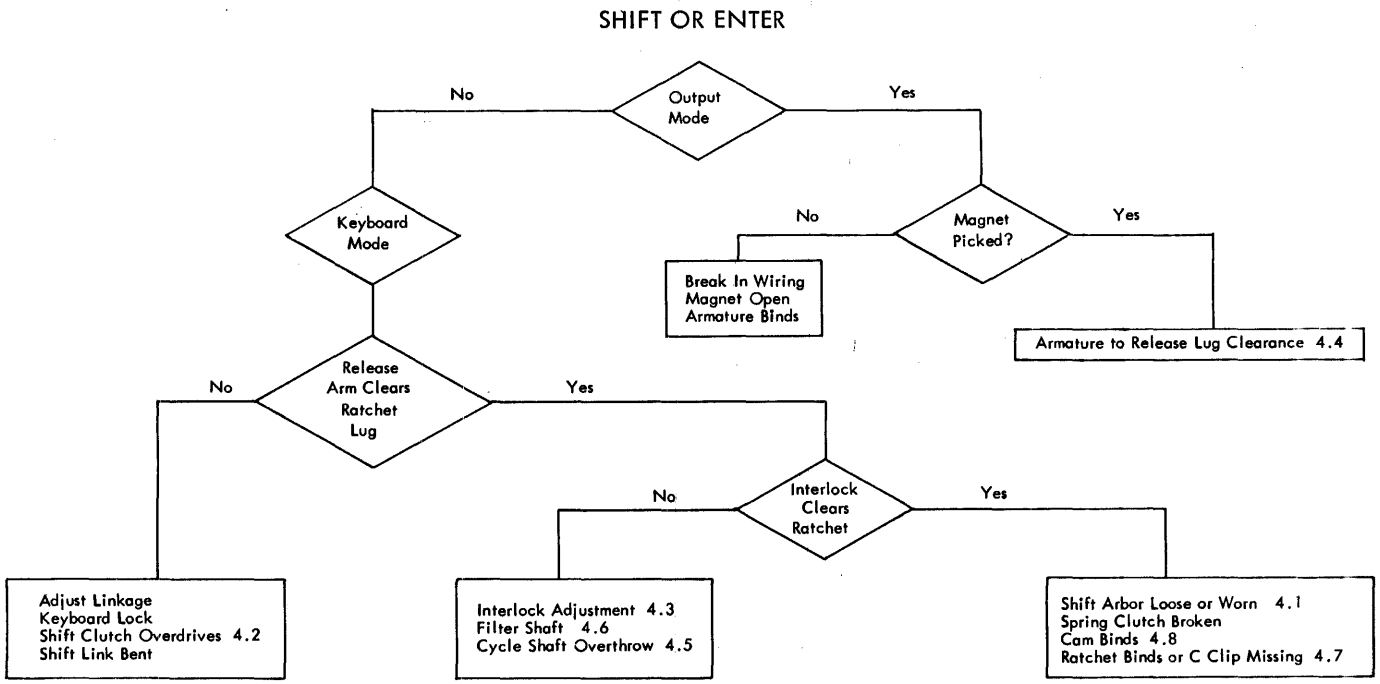


Figure 4.0

SHIFT OR ENTER

4.0 Shift (or Enter) Adjustments

4.1 The shaft end play should be .002" - .004". If the Shift Arbor comes loose, a new set screw is available (PN 257969) which will lock the arbor securely on the shaft.

4.2 The Shift Ratchet should rotate .028" - .059" when released. Under power, the Shift Cam should reach a detented position with the detent held away from the Shift Cam. See S.H. 4.10.

4.3 .040" - .060" clearance between the ratchet and the interlock. Adjust the Interlock Cam.

4.4 .002" - .008" clearance between the Upper Case (U.C.) Armature and the Release Arm Pin. See S.H. 4.9.

4.5 The cycle shaft overthrow should be .007" to .015" (1 to 3 degrees).

4.6 With an interposer latched down and the Filter Shaft Gear held in a driven direction, there should be .010' - .015" clearance between the Interposer and the Filter Shaft Blade. If the filter shaft timing is wrong, the Shift Interlock Cam should be checked and readjusted. (Adjustment 4.3).

4.7 Binds in the Shift Cam may be caused by maladjustment of the Shift Back-up Roller. Adjust for .002" - .004" clearance between the cam in lower case. A Spring Hook Pusher end may be used to adjust the Back-up Roller eccentric stud.

4.8 S.H. SHIFT LOCK-UP IN UPPER CASE

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

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

4.9 S.H. SHIFT CLUTCH SPRING ADJUSTMENT

1. Install shift clutch spring; allow the retaining plate screws to remain loose.
2. Place shift cam in Upper Case position and hold in detented position.
3. Install clutch ratchet (Upper Case position) so that its lug is toward the front of the machine ahead of the release arm lug.
4. 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.

5. Remove the clutch ratchet and, without disturbing the setting, tighten one screw in the retaining plate. Do not allow the cam to become undetented.

6. 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).

7. Set the overthrow stop clearance (.010"-.025") and securely lock the other retaining plate screw.

4.10 S.H. SHIFT NOISE CAUSED BY ROUGH SHIFT ARBOR

A rubbing noise in the shift mechanism may be caused 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 set screws in the arbor and move it to the right on the operational shaft and tighten the set screws. Turn the machine on and polish the end of the arbor with a stone or crocus cloth. Position the arbor for the correct .002" to .004" clearance with the bearing and reassemble the shift mechanism.

NOTE: Be sure parts are free of emery dust before relubricating and assembling.

4.11 S.H. SHIFT ARM ROLLER WEAR

If wear on the shift arm roller is experienced, 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 S.H. SHIFT BACKUP ROLLER

If the machine is locked up because the shift clutch spring loop is caught between the arbor and the cam, the backup roller adjustment should be checked. It has been found that a maladjusted shift backup roller allows the right hand 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 S.H. SHIFT BACKUP ROLLER ECCENTRIC SHAFT

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

4.14 S.H. CHECK FOR SHIFT DRIVE ADJUSTMENT

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 trouble-free operation.

4.15 S.H. SHIFT ARM BRACE ADJUSTMENT

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. Insure that shift arm pulley maintains at least 1/16" clearance to the tilt pulley bracket.

4.16 S.H. SHIFT STOP SCREW SPACER

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 S.H. SHIFT INTERLOCK ARM ASSEMBLY

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 easily removed with a file or flexstone.

4.18 S.H. C7 CAM

The shift clutch ratchet has been redesigned to accommodate a new C-7 cam for 1052 and 1053 SELECTRIC I/O Printers. The new PN is 1159409. This part will replace old PN 1128218. The shift clutch ratchet requires the use of a new C-7 cam and mounting hardware.

This re-design eliminates the breakage problem encountered with the early level C7 cam.

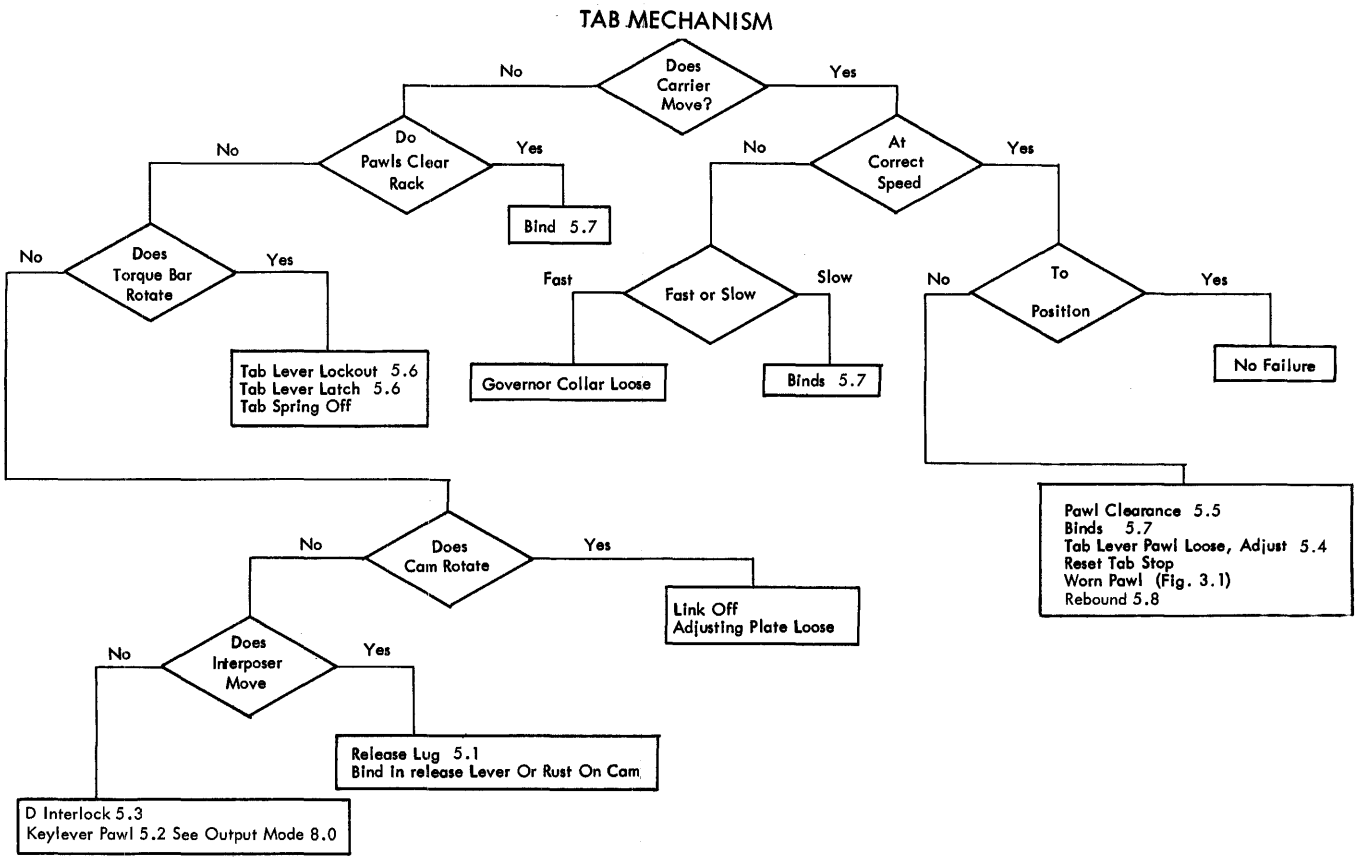
Part No.	Description
1159408	Cam, C-7
1159409	Ratchet
1159262	Screw, Cam Mtg.
257985	Washer
1127163	Nut

4.19 S.H. SHIFT TO UPPER CASE

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 upper case in output mode.

4.20 S.H.

The Lower Case Armature may stay attracted to the core due to oil or residual magnetism. This will prevent latching in upper case and therefore cause a simultaneous shift to lower case and print operation. Clean the Armature and core. Readjust the armature stop for .003" - .008" clearance between the armature and core. It is desirable to maintain the adjustment close to the high limit.



● Figure 5.0

TAB MECHANISM

5.0 Tab Adjustments

5.1 With the interposer and cam latched, form the Release Lug to obtain .035" - .045" clearance between the Interposer Lug and the Release Lug.

5.2 The Keylever Pawl should clear the interposer by .020" - .030".

The backstop should be adjusted so that the Keylever Pawls operate freely with .035" - .045" overlap.

5.3 The lockout shaft may flip over if the lockout shaft link is allowed to move left or right. A clip, PN 1138464, may be installed on the lockout bail to prevent lateral movement. (Old style).

5.4 The Tab Lever should clear a "set" Tab Stop by .035" - .045" with the Tab Lever at rest.

5.5 Form the upright lug of the Tab Latch for .005" - .010" clearance between the Escapement Pawl and the Escapement Rack.

5.6 The Tab Lever should overthrow the Tab Latch by .005" - .010".

5.7 Binds - Check the following:

a. Feed Roll Mounting Arm hits the Tab Overthrow Stop.
b. Dust Covers - Card Holders.
c. Anvil and Front Carrier Shoes.
d. Rear Carrier Shoe.
e. Escapement Cord is off of its pulley.
f. Pinion Gear.
g. The mainspring tension should be 1/2 to 3/4 Lbs. See S.H. 2.18.
h. Pawl mounting stud binding on escape torque bar.

5.8 S.H. REBOUND

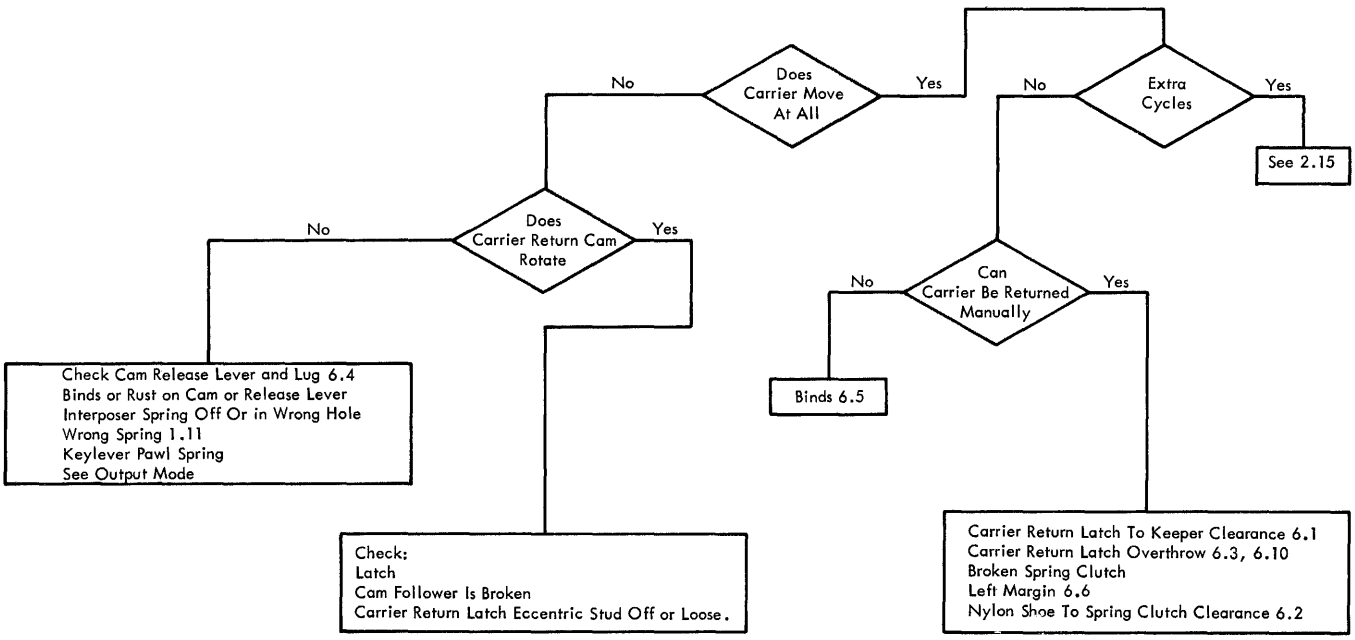
When you are spacing in the area of 12-15 spaces between set tab stops it is possible for tab rebound to occur. Most often the carrier will rebound 1/2 space and land on the backspace pawl. No permanent resolution is available for this problem - Watch your CEM's.

The following temporary fixes may be used:

1. Increase to a maximum the tension on the R.H. cord pulley.

2. Break off the backspace pawl if this function is not used.

3. Install the spring loaded carrier shoe B/M 1272015. Caution! This bill must not be installed if the customer tabs to the extreme R.H. side of the Printer (5 spaces safety margin should be left).



●Figure 6.0

CARRIER RETURN

6.0 Carrier Return Adjustments

6.1 With the Margin Rack held to the left, adjust the unlatching link so that the keeper clears the actuating arm by .005" - .015".

6.2 Adjust for a minimum of .010", maximum of .020" clearance between the C/R Shoe and the Spring Clutch. Note: The Carrier Return Spring Clutch Clamp may be off or broken.

6.3 Adjust the Carrier Return Arm Screw for .030"-.040" overthrow between the latch and the keeper with the C/R Cam on the high point. The latch overthrow is affected by platen load; therefore, insure that the Platen is installed when making this adjustment.

6.4 With the interposer and cam latched, the release arm lug should clear the interposer by .025" - .035".

6.5 Binds - Check the following:
a. Feed Roll Mounting Arm hits the Tab Overthrow Stop.
b. Dust Covers - Card Holders.
c. Anvil and Front Carrier Shoes.
d. Rear Carrier Shoe.
e. Escapement Cord is off its pulley.
f. Pinion Gear.

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. (Fig. 3.1)

6.7 S.H.

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.

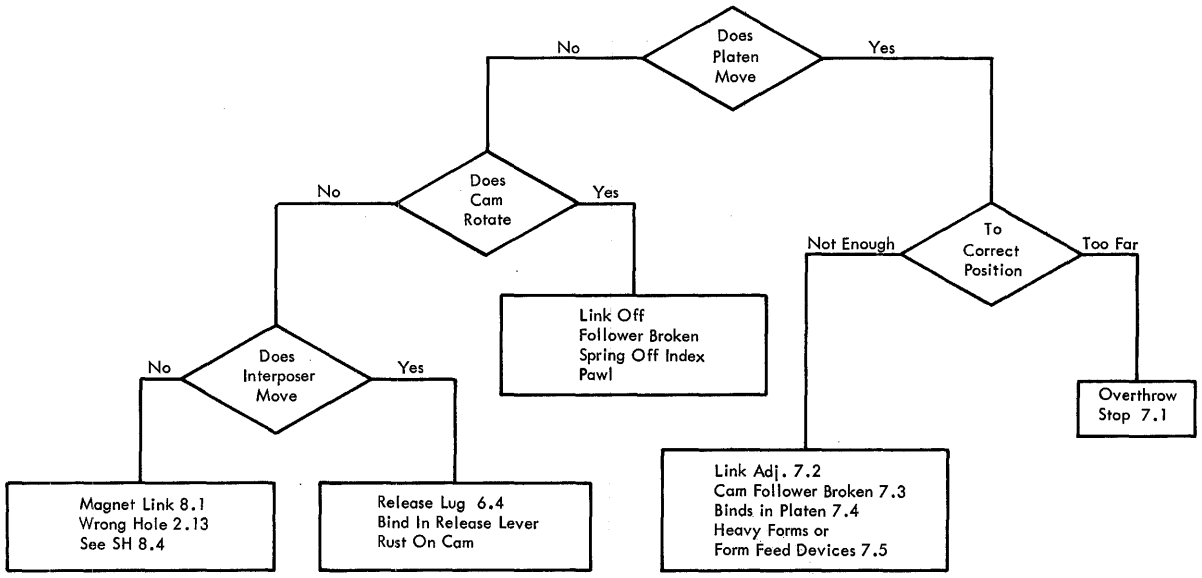
The Carrier Return Pinion and Spring Clutch must also be free of rust, dirt and oil. Excess oil will cause sluggish Tab and Escapement operation.

6.8 S. H. TORQUE LIMITER

Adjust the Extension Spring for 1 - 2 lb. 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 P/N 1115382 and readjust.

6.9 S.H. CARRIER RETURN FAILURES

Some partial return failures can be traced to a rounded edge on the CR latch. If this problem is experienced, replace the latch, PN 1128168. Current production latches have been reworked to eliminate this possibility.



● Figure 7.0

INDEX

7.0 Index Adjustments

7.1 With the Index Cam on high point the stop should clear the Index Pawl by .005".

7.2 The detent should not move the platen when removed and re-inserted when cam is on high point.

7.3 Check for broken weld at rear.

7.4 S.H. IMPROVED RH PLATEN BUSHING

A new R.H. platen bushing has been released to the Assembly Line which will eliminate the wear problem which previously existed in this area. The PN of the new platen bushing will be the same as the old one, PN 1128523. A new grip ring must be used to secure the new style RH platen bushing. The grip ring part number is 311072.

7.5 S.H. HEAVY FORMS W/FORMS FEED DEVICES

A special index lever and operational shaft stabilizer are available for use in high torque applications. Use B/M 1272719.

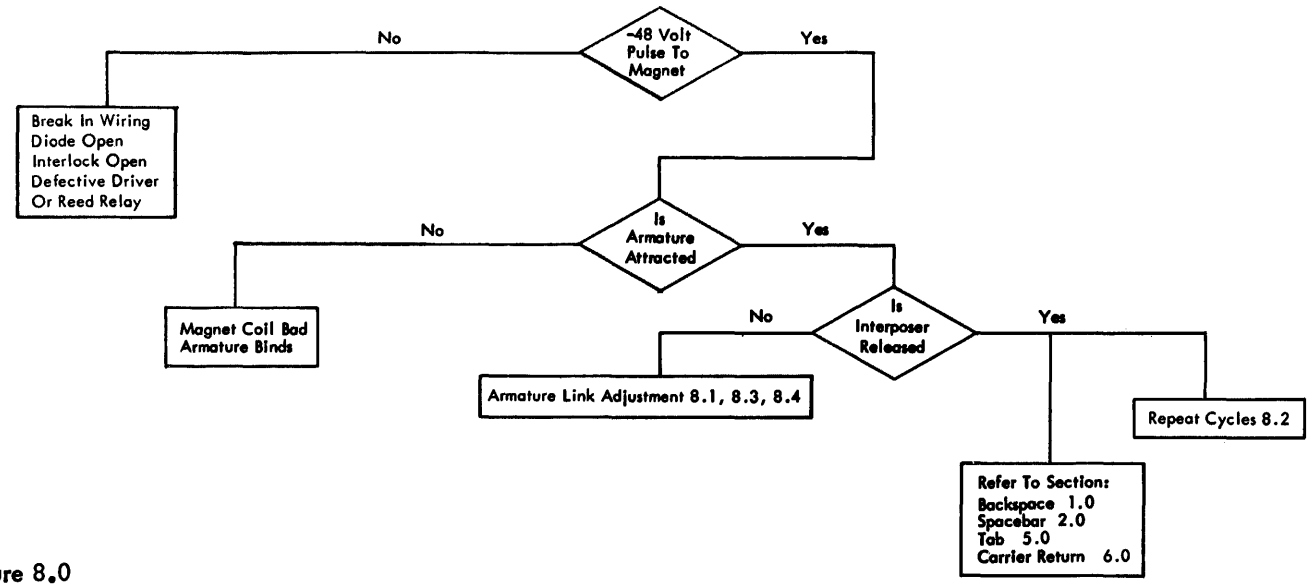


Figure 8.0

OPERATIONAL AREA IN OUTPUT MODE

8.0 Operational Adjustments

8.1 Adjust the Armature Link so that the interposer clears the latch bracket by .005" - .010" with the magnet energized.

8.2 REPEAT CYCLES MAY BE CAUSED BY:

a. The armature sealing to the core. Adjust the armature pivot plate for .002" - .005" armature to yoke clearance. It is desirable to maintain the adjustment close to the high limit to insure that the armature does not contact the core.
b. Insufficient interposer restoring action (2.16)
c. Interposer latch binding or spring off.
d. Release lever slips off cam wheel.

The cam wheel mounting stud has been extended so as to provide greater release lever bite on the cam wheel. The improved bite will eliminate extra cycles of the Operational cams caused by the release lever slipping off the side of the clutch wheel.

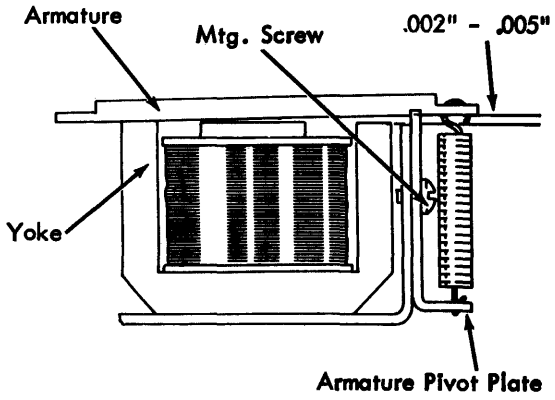


Figure 8.1

Part No.	Description
1159268	CR cam
1159267	SB cam
1159269	Ratchet

8.3 OPERATIONAL INTERPOSER LINKS

The illustration below 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 lock nut, 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 lock nut contacts it, giving it a very small locking surface.

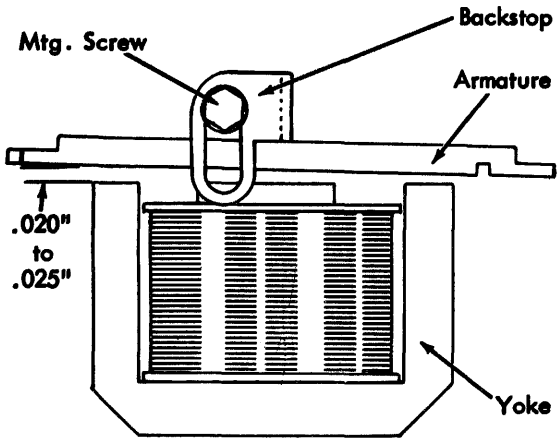


Figure 8.2

The Customer Engineer will usually make his adjustment, tighten the lock nut, and find his adjustment has changed several days later. This is due to the limited engagement of the nut on the clevis. Whenever you are making this adjustment, check the clevis to be sure there is no burr on the bottom and if there is, remove the clevis and file the burr away.

This burr cannot be removed due to manufacturing tolerances. A new design is anticipated very shortly.

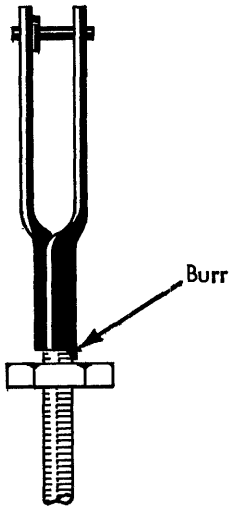


Figure 8.3

8.4 S.H. THREADING OF ARMATURE BY INTERPOSER LINKS

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.

OPERATIONAL AREA

9.0 Operational Notes

9.1 REPEAT FUNCTIONS

There are no repeat functions 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 NYLON CORD DRUM

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 INTERPOSER HEIGHT

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 1/2 turn.

9.4 S.H. EXCESSIVE UP AND DOWN PLAY AT THE LH END OF THE OPERATIONAL SHAFT

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

9.5 S.H. OPERATIONAL SHAFT REMOVAL

1. Remove shift clutch ratchet and clutch spring. Do not disturb the clutch arbor.
2. Loosen set screws in: Torque limiter hub, tab governor hub, tab governor collar, operational cam ratchet (and R.H. shaft collar if long carriage).
3. Remove clip from C.R. pinion spring.
4. Push torque limiter hub to the left as far as possible; then spread the coils on the CR pinion spring and, with the pusher end of a springhook, push the left hand pinion retainer off the shaft.
5. Move the pinion gear to the left and remove the retainer clip at the right side.
6. The operational shaft may now be pulled out through the shaft bearing toward the right. Any part mounted on the shaft or around it may be easily removed or replaced.

Since the shift clutch arbor has not been loosened from the shaft, upon reinstallation the shaft need only be pushed inward until the shift clutch arbor bears against the shift bearing (.002" - .004" end play) to insure placing the carrier return pinion gear back into the same position as before disassembly. None of the shift mechanism has been removed; therefore, no shift adjustments need be remade or checked.

In order to reset the operational cams in their original position use the "tracks" on the cam follower rollers as a guide. With ratchets which have only the set screw, be certain the screw is tightened to the flat side on the operational shaft.

Reset the tab governor hub and collar, observing the proper mesh and end play adjustments.

After re-installation of the C-clip retainers on either side of the carrier return pinion gear, move the torque limiter hub to the right as far as possible. Then spread the torque limiter spring loops and insert a .005" feeler gage blade between the torque limiter hub and the torque limiter arbor. Tighten the torque limiter hub, then remove the gage.

Install the clip which fastens the CR pinion spring to the torque limiter arbor.

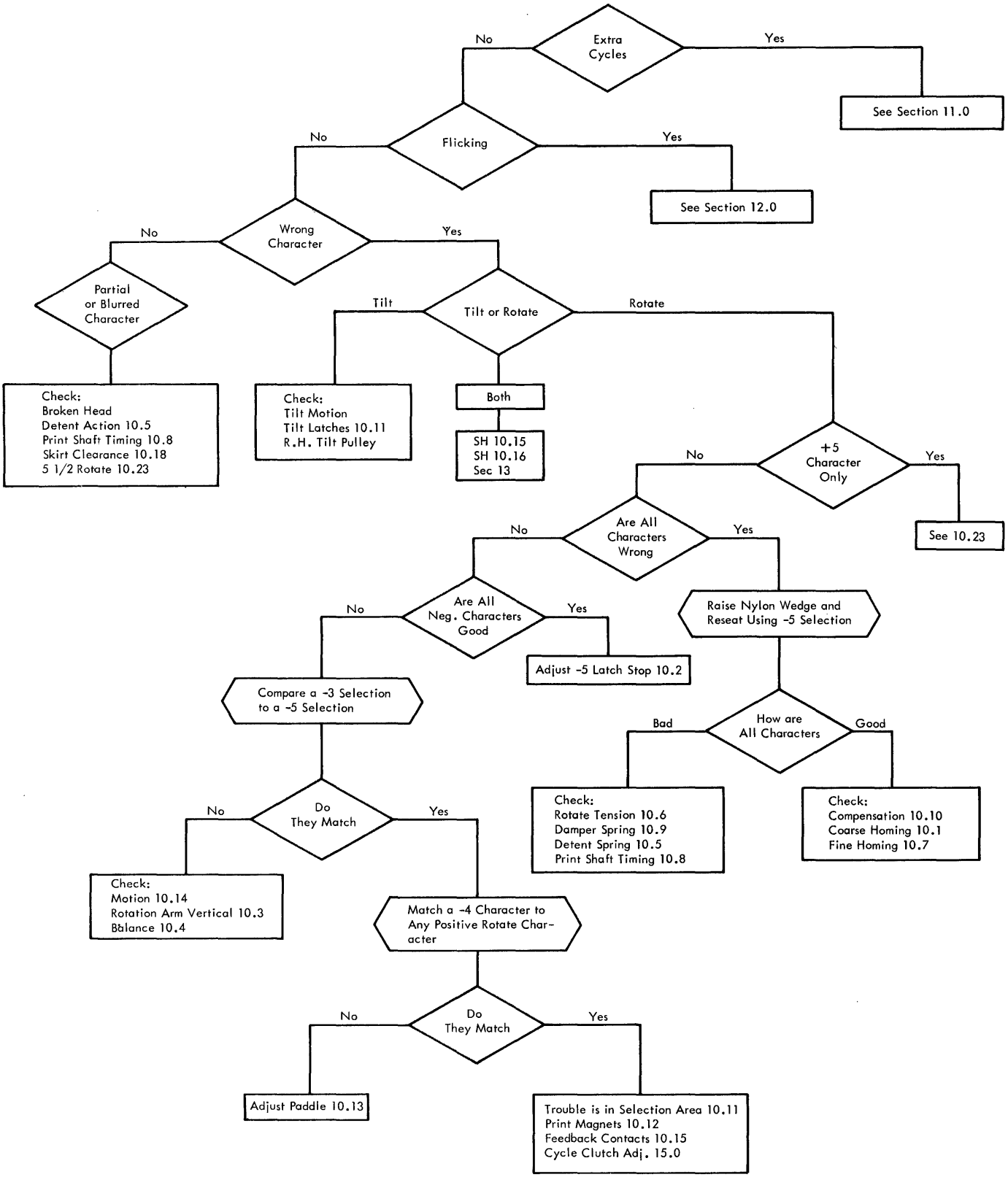


Figure 10.0

MAL-SELECTION

10.0 Mal-Selection Adjustments

10.1 Loosen the set screw in the Rotate Pulley and set the home position so that the detent enters the head .015" down the slope, with the head play removed in a clockwise direction. See 10.21.

10.2 .002" - .005" clearance between the -5 latch and its stop. (Should reset at same time as positive latches).

10.3 Half cycle a zero rotate character and adjust the rotate link so that the pointer on the rotate arm matches the #1 scribe on the Hooverometer, when the Hooverometer is depressed against the damper spring.

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

10.5 The detents should seat fully with no side play.

10.6 2 lbs. with a -5 character half-cycled.

10.7 Adjust the Rotate Arm Eccentric so that a half-cycled -5 selection matches a half-cycled home selection.

10.8 Adjust the print shaft timing so that the detent enters and leaves all rotate positions without rubbing on the skirt.

10.9 The Damper Spring must not bind on the Paper Bail Stud. Adjust the Damper Spring Stop 1/8" - 1/16" from bottom of the spring. A -5 selection should fully compress the Damper Spring.

10.10 COMPENSATOR WEDGE

Overcompensation may occur whenever (a) the system receives a sudden shock which unloads the rotate arm, (b) the detent enters the wrong typehead notch prior to rotate completion, (c) the detent enters the wrong notch after rotate completion. If the wedge drops too far (overcompensateds) check:

a. Excessive head play.
b. Shift timing adjustments.
c. Fine timing and skirt clearance #10.8.
d. Binding or sticking rotate spring.
e. Binding rotate eccentric arm shoulder.
f. Binding or sticking damper spring #10.9.
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 #10.6.

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 #10.7.

10.11 Selection System Check (See Section 13.0).

10.12 Print Magnets (See Section 14.0).

10.13 Form the paddle so that home detenting matches the -4 detenting.

10.14 Adjust the Rotate Arm length so that a -3 character detents the same as a +5 character.

10.15 S.H. MAL-SELECTION

Random mal-selection may result if the C-5 contacts open during a print operation.

What actually happens is that a given pulse of between 30 and 40 milliseconds is placed on the print magnets, 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 mal-selection will occur since the armature has restored and has not selected the proper latches.

One specific instance of the C-5 contact breaker opening during a print operation is when the C-5 contacts are adjusted too far to the right. The C-5 contacts are operated by a cam follower. The follower is curved until it reaches a flat portion which in turn 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.

10.16 S.H. MAL-SELECTION

Random parity and selection errors can be caused by loose or broken selector latch extensions. A change has been processed to improve the riveting process used to attach the latches and extensions (see 13.4).

10.17 S.H. FREEING THE ROTATE PULLEY

An easy method of freeing the rotate pulley from the lower ball socket after loosening the set screw is to tap a screwdriver placed on the lower end of the ball socket.

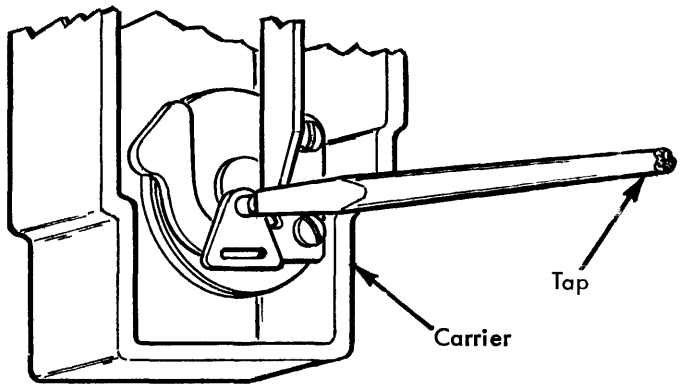


Figure 10.1

NOTE: Be certain to maintain the .002" to .004" end play of the lower ball socket when the set screw is tightened.

10.18 SKIRT CLEARANCE

While manually half-cycling a 2 tilt, +5 rotate character, there should be .025" - .035" clearance between the Rotate Detent and any tooth on the type element. To obtain this clearance, half-cycle any character and rotate the Detent Actuating Lever Mounting Stud so that the Detent Actuating Lever is all the way to the rear, then adjust the detent cam on the print sleeve for .001" clearance between the low dwell of the cam and the cam follower.

Redesigned Detent Actuating Lever and Support

Current production detent actuating levers have been enlarged to accept a larger shoulder and flange on the support mounting screw. Using larger washers, these parts have improved stability, resulting in reduced exposure to breakage and loss of typehead skirt clearance.

The part numbers remain unchanged. However, 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. B/M 1272176 includes the following parts:

Part No.	Description
1128493	Washer
1128458	Lever, Detent Actuating
1128495	Screw, Detent Actuating Arm

Note: Production machines will use a large nut, PN 1134842, on the top section to the detent actuating arm screw. It is not necessary to use this nut for field installation.

10.19 ADJUSTMENT CHANGES - TILT SELECTION

On gearless tilt machines, adjust the RH tilt pulley with a 0 tilt, 0 rotate character half-cycled, so that the tilt detent enters .004" - .008" to the rear of the center notch, with all tilt ring backlash held lightly to the rear.

Machines prior to gearless tilt continue to be adjusted for tilt detent entry of .002" - .004" to the rear.

10.20 WEAR COMPENSATOR - OVERCOMPENSATION/ ROLLER DROP

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 TYPEHEAD HOMING ON MACHINES WITHOUT SHIFT OPERATION

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 ANALYZING PRINT FAILURES

Some cases of Mal-Selection 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 temporarily to analyze the failure. The standard ET type elements print a different character for each tilt and rotate selection.

10.23 MAL-SELECTION AT +5 ROTATE

Occasional mal-selections at the plus five rotate band on the typehead can be caused by:

1. Variations of cycle shaft speed. A sudden increase in momentum of the cycle shaft may cause the typehead to rotate beyond the plus five detenting position. If the motor clutch pawl slips off a tooth of the motor pulley during the beginning of a plus five rotate operation, the cycle shaft will slow up for an instant: when the pawl re-engages 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.

2. 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 will be listed below:

1. The motor pulley has been redesigned as shown in Figure 1 below. The engagement area on the pulley for the motor pawl has been increased so as to alleviate the possibility of the pawl slipping out of the tooth. All machines in the Field should be using the motor pulley illustrated below. Old style motor pulleys are easily recognizable since they will not have this flattened notch as illustrated.

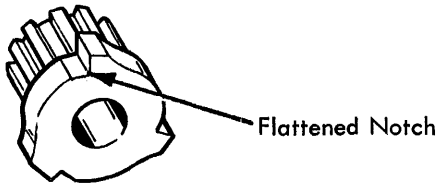


Figure 10.2

2. SELECTRIC I/O Printer CEM #9 announced an improved typehead ball joint which tightened up the specification on typehead play. This new ball joint with .045" head play will also help to alleviate the possibility of the typehead over-rotating.

3. If an excessively bad case of plus five and one-half rotate is encountered, the following adjustment procedures, which are not the normal specifications, may be used:

   A. The rotate spring tension may be increased to 34 ounces (Mod. 1062 only). All other printers should favor high side of normal spec. (32 ounces).

   B. The skirt clearance should be adjusted so as to favor the low side of the spec. (.023")

   C. The typehead homing may be readjusted so as to increase the negative or clockwise direction of the typehead as the detent enters. Example: With the machine half-cycled to a plus five character, and all clockwise play taken out of the head, the detent should enter approximately .022" from the center of the notch. This will effectively split the homing so that the detent will enter .002" to the left and right side of the notch.

   D. The condition called out in 15.10 may also result in plus five 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.

   E. The motor belt must also be kept within its specifications for tightness.

   F. 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. The over-rotating condition is being actively investigated by Engineering, and any more improvements or refinements of adjustments will be released to the Field as soon as they are available.

EXTRA CYCLES (MECHANICAL KEYBOARD ONLY)

11.0 Extra Cycles

Extra cycles may be defined as an unwanted +5 rotate, 3 tilt character selection (usually a period). The most common causes of Extra Cycles are listed below in order of probability.

11.1 CYCLE CLUTCH LATCH LINK PAWL BITE

The pawl must overlap its keeper by 1/2 the thickness of the keeper. (Adjust the bail upstop).

11.2 CYCLE CLUTCH LATCH RESTORING

Adjust so that the pawl overthrows the keeper by .025" - .030". Caution - Excessive overthrow will also cause extra cycles because the pawl will bounce off the keeper.

NOTE: The nylon cam may not provide equal restoring motion on both lobes. Adjust the overthrow to meet the specifications on the lobe which provides the least motion. If the two lobes cause more than .020" difference in restoring overthrow, the nylon cam should be replaced. The nylon cams are now being ground to closer tolerances.

11.3

Insufficient or excessive latch bite or a worn latch will cause extra cycles. Adjust the entire keeper bracket assembly (front to rear) to obtain .030"-.035" latch bite on the sleeve. This is equal to the thickness of the latch. Caution - If this adjustment is changed readjust per Section 11.2.

11.4 BINDS IN THE CYCLE BAIL

The bail must be free to rotate about its axis on both the right and the left side. If a bind is suspected, remove the bail and polish the ends with crocus cloth.

FLICKING MECHANICAL KEYBOARD ONLY

12.0 Flicking

Flicking is an erroneous character induced by the operator. It is usually a +5 rotate, 3 tilt selection (period for most systems) and is caused by the operator tapping a keybutton which drives the cycle bail down, but does not latch an interposer. The Cycle Clutch Pawl will release and cause a +5 rotate, 3 tilt selection.

12.1 ADJUSTMENTS TO MINIMIZE FLICKING

The cycle clutch latch link pawl should clear its keeper by .001" - .002" as it is unlatched by an interposer. This adjustment may be observed through

the hole in the right side frame. An interposer must be latched down while holding the cycle clutch link. Allow the link to move forward slowly and look for .001" - .002" clearance between the pawl and the keeper. This must be checked on both sides of the keyboard and must be the same across the keyboard.

NOTE: If this adjustment is changed, the pawl bite must be checked.

Pawl bite should not exceed 1/2 the thickness of the keeper. Adjust the cycle bail upstop. This will maintain a clearance of .010" - .020" between the cycle bail and the interposers. With this clearance the cycle bail will not be able to bounce on the interposers.

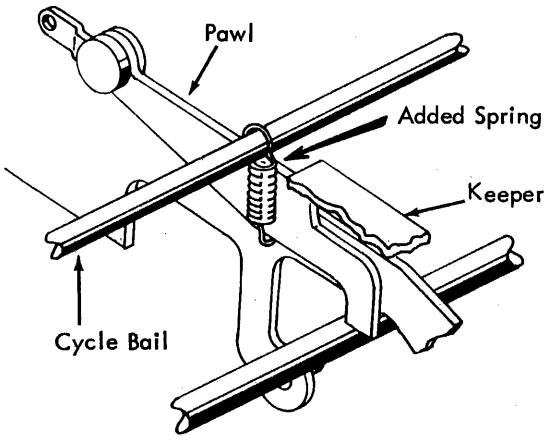


Figure 12.0

A spring, PN 1090343, may be added between the cycle clutch trip bail and the cycle clutch pawl to reduce bail bounce (Fig. 12.1).

Interposer latch springs:
a. Must not be bent or malformed.
b. Must overlap the interposer by a minimum of .050" when the interposer is latched down.

SELECTION SYSTEM CHECK FOR MAL-SELECTION

13.0 Selection System Check for Mal-Selection

*13.1 INTERPOSER TO FILTER SHAFT CLEARANCE

The vertical clearance should be .025" - .030" when the interposer is unlatched.

*13.2 SELECTOR LATCH INTERPOSER TO SELECTOR BAIL CLEARANCE

Form the interposer stops to obtain .001" clearance. If this adjustment is made, the latch links MUST be readjusted.

ADJUST AS FOLLOWS:

The selection latches should hang vertically with maximum overlap on the bail plate. The links should have only .001" - .002" lost motion in them and must not restrict the overhang of the latches.

* Mechanical Keyboard Only.

13.3 SELECTION LATCHES

All latch springs must be secure. Check the latch extension to pusher clearance. This should be .035" for all latch pushers except the check latch which is .020" - .025".

There have been instances where the Check Latch will jump on top of the positive bail causing sustained mal-selection. No latches can be operated since the check latch is holding the bail down. This condition can also occur if the Selection Bail Downstop is maladjusted. With the machine latched at half-cycle there should be .001" - .010" clearance between the bail and the downstop. The vertical clearance between the check latch and the bail should be increased to .020" - .025" if this occurs.

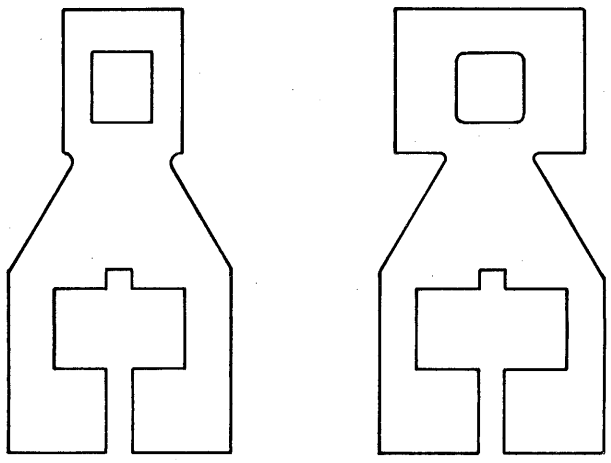
13.4 SELECTOR LATCH EXTENSIONS

Mal-selection can be caused by loose or broken Selector Latch Extensions (sometimes referred to as Black Latch Extensions).

Improper heating during the manufacturing process created bending stresses on the corners of the square hole in the extension.

All new production machines incorporate a new Selector Latch Extension which has a larger structural surface and a rounded corner hole to prevent breakage, and insure positive positioning of the extension.

The new extensions may be recognized by their larger size (see illustration).



Early Style Late Style

Figure 13.0

13.5 MAL-SELECTION OR PARITY ERRORS

Mal-selection or parity errors may be caused by the latch pushers contacting their latch extensions when an unselected pusher is against its armature. There should be a minimum of .002" clearance (Fig. 1A) between the pusher and the latch extension when the pusher is against its armature. To check this adjustment, turn machine power off, trip the cycle clutch, and hand cycle a few degrees through a cycle. The pusher cam follower should be on the low dwell of the pusher cam.

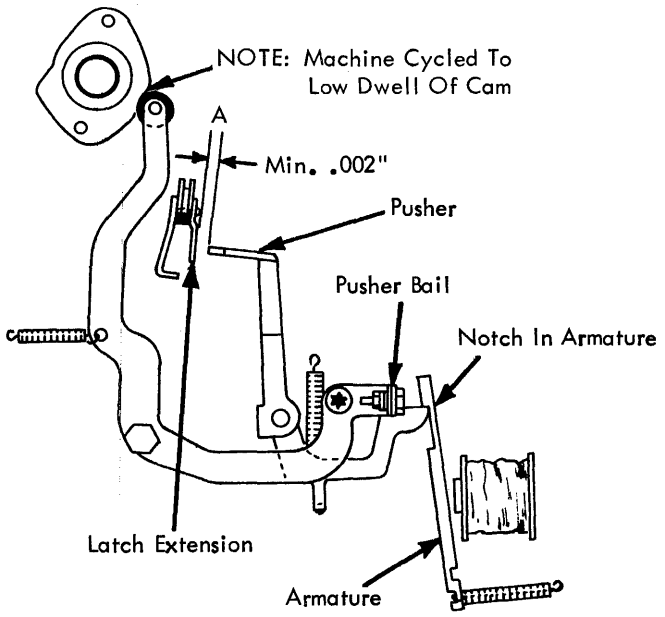
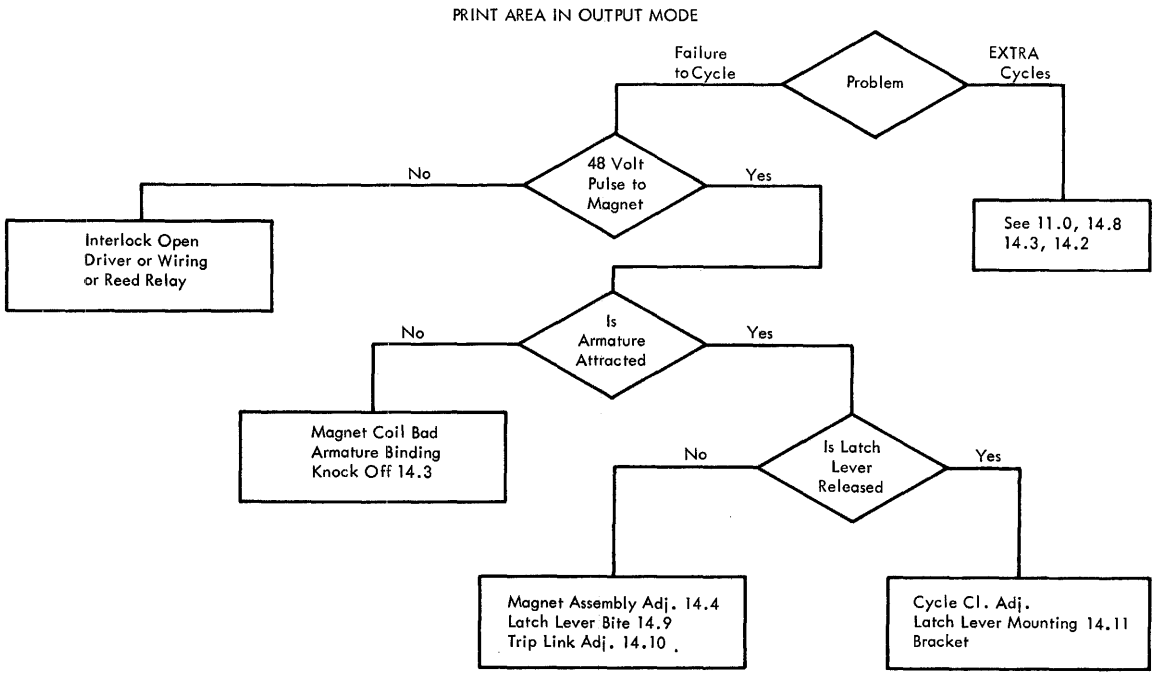


Figure 13.1



● Figure 14.0

PRINT MAGNETS

14.0 Print Magnets

14.1 The pusher to latch clearance must be .035" for all pushers except the Check Latch which is .020" - .025".

14.2 The armatures must not bind when depressed manually. Check for oil, dirt, residual magnetism, and bent armatures.

When operating the armatures manually, be careful not to bend or deform them.

14.3 The Cycle Trip Bail Knockoff Extensions must clear the knockoff eccentrics by .003" - .008" when an armature is manually attracted.

14.4 A clearance of .001" - .010" must be maintained on the horizontal and vertical latching surfaces of the armatures.

14.5 PRINT MAGNET ADJUSTMENT

An improved method of checking the backstop adjustment is:

Manually attract the magnet armature and insert a feeler gage between the armature and backstop (see Figure below). When checking it by this method the clearance should be .046" to .049". If the adjustment is found to be correct all preceding adjustments must be checked. It will be necessary to remove the magnet assembly for previous adjustments.

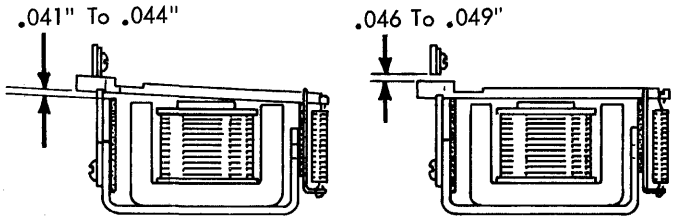


Figure 14.1

14.6 All armatures must not contact their cores when energized. Adjust the stops and pivot plate for .004" - .008" clearance between the armatures and yokes.

14.7 CYCLE CLUTCH TRIP

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.

14.8 S.H. EXTRA CYCLES

If the normal routine of print magnet, keyboard, and cycle clutch adjustments fail to alleviate an extra cycle condition, 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. There have been a few isolated instances where the cycle clutch trip bail has been found to be warped or out of alignment in the center portion.

The adjustment of the cycle clutch trip bail is made by depressing the extreme right and left hand armatures and observing a clearance of .003" to .008" between the cycle trip bail knock-off and the knock-off eccentrics. Check the cycle trip bail knock-off by depressing and holding a center armature, hand cycle the machine through an operation and observe the manually held armature. There should be a slight rise in this armature at the knock-off point. If there is no rise, adjust the knock-off eccentrics to the minimum .003" clearance. A center armature should again be depressed and checked for knock-off. If knock-off is still not present, the cycle trip bail, PN 1135135, should be replaced with a new one.

14.9 The latch lever should bite the thickness of the trip lever lug.

14.10 With an armature manually attracted the latch lever should clear the trip lever by .020".

14.11 The trip lever should clear the latch by .003" to .010".

14.11 The trip lever should clear the latch by .003" to .010".
NOTE: This adjustment applies only to Keyboard Printers. See Reference Manual for Keyboardless adjustments.

CYCLE CLUTCH

15.0 Cycle Clutch - Adjustments & Special Notes

15.1 CYCLE SHAFT END PLAY

The cycle shaft end play should be .001" - .003" (tap the shaft very LIGHTLY to insure proper seating).

15.2 LATCH HEIGHT

The cycle clutch latch height must always be checked before attempting cycle clutch collar adjustment (Fig. 15.1). If the latch is too high, extra cycles may occur. If the latch is too low, the cycle clutch may not unlatch.

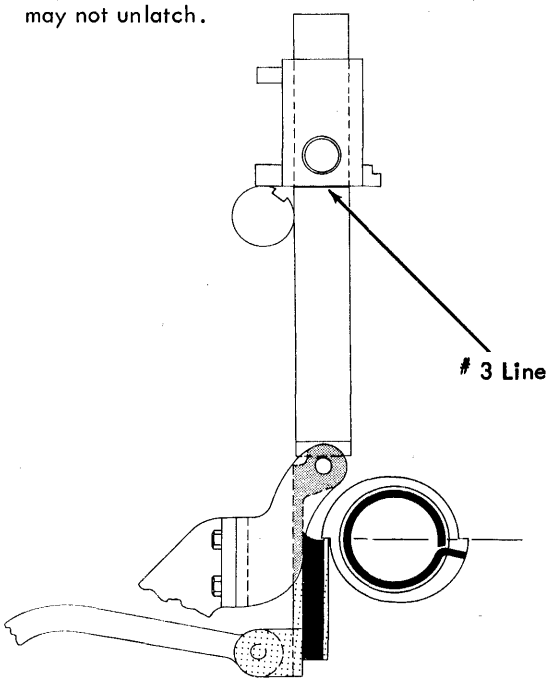


Figure 15.0

Cycle clutch latch wear can be caused by the latching surface not being parallel to the cycle clutch sleeve. To insure that the latch is parallel to the sleeve, it should be adjusted in the following manner:

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.

4. Tighten the cycle clutch latch mounting screws.

Keeping the sleeve surface in contact with the latch surface will insure that the latch will remain parallel to the sleeve while you are adjusting its height.

15.3 CYCLE CLUTCH COLLAR ADJUSTMENT

The Cycle Clutch Collar should be rotated back or front to allow the spring clutch to disengage from the cycle shaft 3/32" to 1/8" before the Cycle Shaft Ratchet latches on its check pawl. This adjustment is accomplished as follows:

a. Loosen the Cycle Clutch Overthrow Stop (white nylon cam).

b. Slowly hand cycle a -5 rotate, 0 tilt character. When the cycle shaft stops turning, mark a reference point on a print shaft gear tooth and its bearing. Unlatch the Cycle Clutch and very slowly rotate the Cycle Shaft until the check pawl falls into the ratchet on the Cycle Shaft. Once again, observe the print shaft gear - it should have moved 1/2 to 3/4 of a tooth.

c. Tighten the collar, being sure to allow .010" - .015" end play in the Cycle Clutch Sleeve.

d. Adjust the Cycle Clutch Overthrow Stop (white nylon cam), front to rear, to allow .007" to .015" rotary motion of the Cycle Shaft when it is latched up. This clearance may also be observed on the degree wheel as 1 to 3 degrees.

15.4 CYCLE CLUTCH RESTORING ADJUSTMENT

An easy method of adjusting the restoring cam roller is as follows:

1. Loosen the restoring cam roller nut and allow the roller to drop free.

2. Hand cycle the machine until the roller is on the high point of the cam.

3. Place the pusher end of a large spring hook between the cycle clutch latch pawl and the keeper. (Insert the spring hook through the hole in the RH side of the keyboard and over the switch leads to hold it in place.)

4. Place the machine on its feet and holding the roller firmly against the cam, tighten the locking nut.

5. Remove the spring hook and check for the proper clearance of .020" to .025" between the latch pawl and the keeper, on the cam lobe providing the smaller clearance.

NOTE: Insure that the keeper is adjusted for proper latch bite before you adjust the roller.

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

a. Worn Spring Clutch (Replace).
A new style, heavier cycle clutch spring is available for field replacement. It may be identified by its bronze color. A complete new cycle shaft assembly, PN 1266830 (13") or PN 1266831 (15") should be used when making this change since the new assembly is pre-adjusted and includes the following new parts: (1) spring (2) collar (3) restore cam (4) sleeve. The new shaft is black colored.
b. Lack of spring clutch lubrication (use #23).
c. Binds in the operational shaft or shift clutch assembly.
d. Bind or lack of lubrication in the drive gears (remove, clean, 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. Rounded Cycle Pulley Arbor
Before replacing cycle clutch spring, be sure to 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 detected, replace with hub and pulley assembly, PN 1135619.
CAUTION: 1135619 is an I/O part number. Do not use standard "Selectric" 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 CYCLE CLUTCH PULLEY AND HUB ASSEMBLY

The Cycle Clutch Pulley can be oversize. 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 oversize.

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 oversize pulley should be replaced, following the procedure outlined in the Reference Manual.

15.7 POWER FRAME CENTER BEARING

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 hole and drill a #32 hole through the upper part of the bronze bearing. Be sure to 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.

Note: Before and after assembly, the center bearing should be lubricated with #10 oil. The pulley should be inserted in the bearing before replacing the felt wick.

15.8 CYCLE CLUTCH RESTORE CAM REPLACEMENT

There have been instances where the cycle clutch restore cam will break or warp and require immediate replacement. A time-saving method of replacing the cycle clutch restore cam when it is not necessary to remove the cycle shaft is outlined below.

1. Remove the two locking screws and clips from the white nylon restore cam.

2. Cut the white nylon restore cam with a pair of dykes or wire cutters and remove the sections of the cam from the shaft.

3. Using a fine hacksaw or coping saw blade, cut a new cycle clutch restore cam as shown in Figure 1.

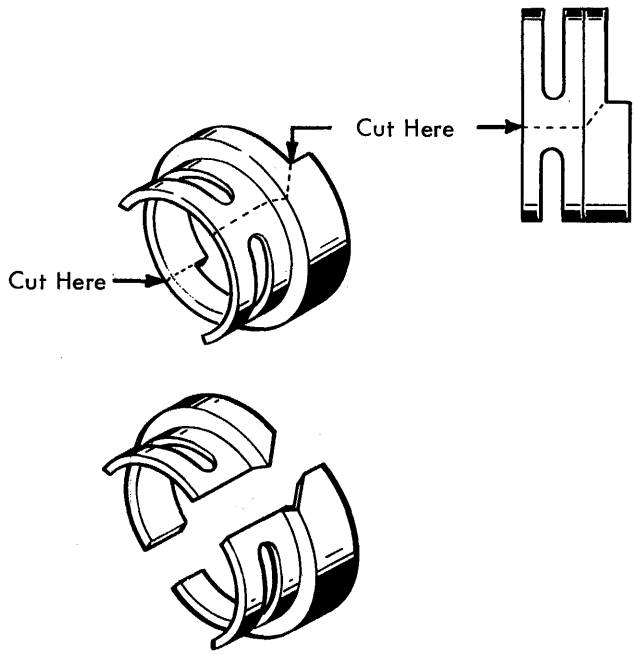


Figure 15.1

4. 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.

5. Adjust the overthrow of the cycle shaft for .007" to .015" (3° to 5°) of rotary motion. 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 set screw to adjust the overthrow on that particular lobe. When both sides are the same, re-tighten the set screws.

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 fix and the white nylon restore cam should be replaced the next time the cycle shaft is removed for spring clutch replacement or pulley replacement.

The new cycle clutch restore cam may be ordered under Part No. 1135995.

15.9 CYCLE CLUTCH INHIBITOR

The new style cycle clutch inhibitor mechanism which will be used on all keyboardless SELECTRIC I/O Printers has been illustrated below.

The adjustments are as follows:

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

2. The inhibitor pawl mounting bracket should be adjusted so that the inhibitor pawl clears the cycle clutch latch by .030" to .035" with all parts at rest.

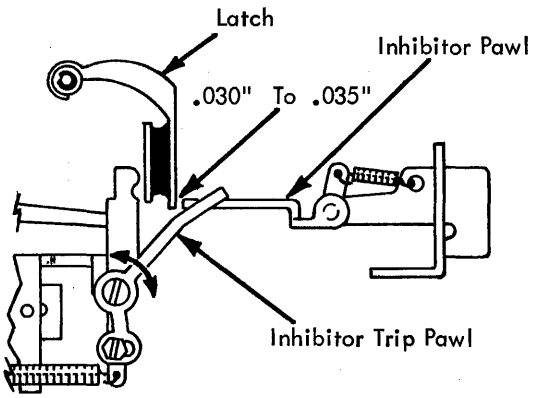


Figure 15.2

15.10 CYCLE CLUTCH CHECK PAWL

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. We previously recommended increasing the spring tension on the cycle clutch check pawl to alleviate this problem.

A new check pawl has now been released for use on the SELECTRIC I/O Printer with an improved engaging surface. The new check pawl is easily identifiable from the old one by the deepened notch at the checking area. An illustration is shown below:

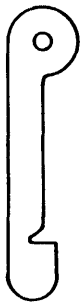


Figure 15.3

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, and it is easily observed. It may still be necessary to increase the spring tension by either forming the spring tip down at a 45° angle, or by winding the check pawl spring up one additional turn. Increasing the spring tension will, however, accelerate wear of the check pawl and ratchet.

If a problem is encountered where the cycle shaft will not reliably detent, even after the check pawl has been replaced and the spring has been wound up, it will then be necessary to replace the entire cycle shaft assembly.

The PN 1123675 will remain the same.

15.11 CYCLE CLUTCH SLIPPAGE

Slow or sluggish cycle operation may be encountered 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.

1. Excessive cycle shaft end play - end play should be .001" to .003".

2. Oil on spring - the proper lubrication for the spring is #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 the cycle pulley hub. The whole assembly should be relubricated thoroughly with #23 grease.

3. Incorrect adjustment of cycle clutch spring.
   a. Opening of the spring too soon will cause slippage.
   b. The cycle clutch spring should be adjusted left or right to maintain .005" 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.
   c. The cycle clutch collar should be adjusted left or right to allow a minimum of .008" 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.

4. Worn spring (15.5).

15.12 CYCLE CLUTCH LATCH BREAKAGE

We have received several reports of the cycle clutch latch breaking in the area of its pivot point. This breakage is due to forming the cycle clutch latch extension which mounts the restoring roller. When a cycle clutch latch is mounted in the SELECTRIC I/O Printer, it has a tendency to mount non parallel to the sleeve angling to the left. This creates a problem wherein the cycle clutch latch restore roller will contact the cycle clutch collar mounting screw. The past fix for this problem was to form the cycle clutch latch extension to the right so it would track the cam properly. This method of adjustment will break the cycle clutch latch extension or will break the cycle clutch latch at its pivot point since the latch is a hardened part. This method of adjustment also fails to make the cycle clutch latch parallel to the cycle clutch sleeve.

The proper adjustment of this mechanism is as follows: The duckbill pliers should be inserted at the point where the cycle clutch latch bracket mounts to the selector bail mounting bracket. The pliers can then easily move the entire cycle clutch latch bracket to the left or right by a twisting motion. This will ensure that the latch is parallel to the sleeve and it will also ensure that the restore roller moves far enough to the right so as not to contact the screw in the cycle clutch collar.

This procedure is presently being used on the I/O Assembly Line, with excellent results. It is very possible, however, that there are many SELECTRIC I/O Printers in the field whose latches were formed using the old method. It is possible that breakage of those cycle clutch latches will result. They should be replaced using a hardened latch and the new adjustment procedure followed.

The cycle clutch latch assembly part number is 1135124.

TAPES

16.0 Broken Tapes

When a tape breaks, the cause should be isolated to prevent a reoccurrence. The following list outlines the causes of tape breakage.

16.1 ROTATE TAPE

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 TILT TAPE

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 R.H. Tilt Pulley Stud.

Most common causes.

16.3 S.H. TAPE BREAKAGE OR MAL-SELECTION

A curled end or a ragged leading edge on a rotate or tilt tape will indicate one of the following:

1. Shift arm not parallel to the carrier.
2. 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:

1. The rotate eccentric stud on the paper bail spring.
2. The rotate arm itself on the damper spring stop.
3. The tilt tape rubbing across the head of the carrier shoe eccentric stud when the carrier is at the extreme left hand.

16.4 SPRING LOADED TILT ARM

All current production Selectric I/O Printers will have a spring loaded, left-hand 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 during removal or installation of 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 S.H. ROTATE TAPE

The Rotate Tape should twist "top to the front" as it leaves the left side of the Carrier.

16.6 S.H. TAPE INSTALLATION

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, and pulled through until the "T" can easily be inserted.

16.7 S.H. TAPE WIPER

The Tape Wiper on the left side of the Carrier must be removed. It causes flexing of the tapes which can result in mal-selection and eventually tape breakage.

16.8 S.H. OLD LEVEL TILT

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 hand 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 GEARLESS TILT PULLEY/BELLCRANK

An improved tilt pulley and bellcrank has entered production. 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.

This new design tilt pulley/bellcrank, B/M 1280498, is available for field replacement. In order to preclude a third level of tapes, all former gearless tilt tapes and tilt pulleys have been made obsolete. When replacement parts are necessary, a complete conver-

sion to the current level will be required. Time and parts for this conversion may be charged to Code 32.

B/M 1280498 includes the following parts:

Ref.	Part No.	Description
1	1164310	Pulley, Tilt
2	1128455	Stud, Tilt Pulley(redesigned)
3	1164099	Washer, Felt
4	1164158	Washer, Spacer

When ordering the above bill of material, it will be necessary to order a new tilt tape to be used in conjunction with the above bill. The new tilt tape part numbers are as follows:

Ref.	Part No.	Description
5	1164314	Tape, 11" Printers
5	1164316	Tape, 15" Printers

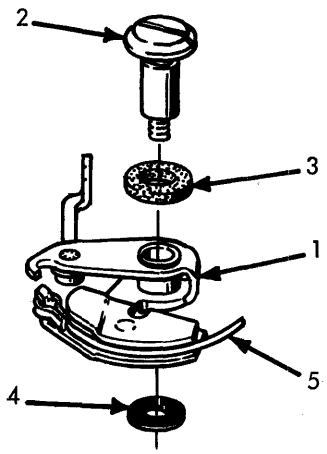


Figure 16.0

Installation: 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 #23 grease and the felt washer kept dry. The purpose of this washer is to keep erasures out of the pivot bushing.

MECHANICAL KEYBOARD LOCKUP

17.0 Mechanical Keyboard Lockup

17.1 The most common causes for Keyboard Lockup are:

a. The Cycle Clutch Latch Link Pawl doesn't clear the keeper with an interposer latched down. (Section 10.0).
b. Filter shaft timing adjustment.
c. Cycle shaft overthrow adjustment (Adjustment 4.5).
d. Latch motion restricted by restoring roller. (Section 15.0).
e. Cycle clutch adjustments - latch binding (Section 15.0).
f. Character interrupter adjustment. Old Style - See Ref. Man. New Style - See 17.2.
g. The Linelock Interposer binds in the Selector Compensator (clean and lubricate).

17.2 KEYBOARD LOCKUP

Keyboard lockup will result from excessive overlap of the cycle clutch pawl stop on the cycle clutch pawl. All SELECTRIC I/O Printers should be checked using a new specification of 1/3 to 1/2 overlap of the pawl stop on the cycle clutch pawl (see illustration). Be sure to maintain the .010" to .020" vertical adjustment.

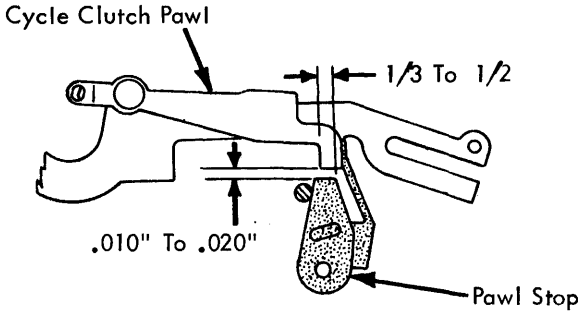


Figure 17.0

TRANSMIT ERRORS

18.0 Transmit Errors

18.1 S.H. TRANSMIT CONTACTS

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

18.2 The transmit contact air gaps should be .020".

18.3 The C1 and C2 contacts must not bridge (N/O and N/C make at the same time.) For C1 and C2 timing see the applicable systems Reference Manual.

18.4 PRINT SELECTION CONTACT ACTUATORS

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.

MACHINE LOCKUP

19.0 Machine Lockup

19.1 The most common causes of Machine Lockup are:

a. The Cycle Clutch Spring may be broken, out of adjustment (Section 15.0), or is in need of lubrication.
b. Idler gear binding. Remove and lubricate with #10 oil.
c. Remove the type element, then recheck for lockup. If no lockup is encountered, all typehead motion adjustments and print shaft timing must be checked.
d. The Print Sleeve and bearings may be dry or worn.
e. Binds in the Carrier and Rocker Assembly.
f. Check the Print Cam Follower for binds.
g. Oversize Cycle Clutch Pulley and Hub Assembly. (Section 15.5)
h. Shift Cam Back-Up Roller adjustment. (Section 4.8)
i. Operation Shaft binds or Shift Cam adjustment. (Section 4.0)
j. Shift Spring Clutch is dry or requires adjustment. (Section 4.0)
k. Dry center bearing. (Section 15.7).

FAILURE TO START

20.0 Failure to Start

If motor attempts to drive, check:

20.1 Centrifugal Clutch Binding (See Also 21.3)

a. I/O PRINTER CENTRIFUGAL CLUTCH
A sintered iron pulley with a Mylar ® insert and nylon clutch pawls has been released to eliminate motor clutch lockup and pulley wear.

The nylon pawls are used to eliminate wear on the teeth of the bronze pulley.

The sintered iron pulley has a slightly larger inside diameter to accept the Mylar ® sleeve.

When replacing the motor pulley, clean the motor shaft thoroughly to prevent future binding. A piece of fine emery cloth may be used while running the motor. Remove any abrasive material, using IBM cleaning fluid, prior to assembly.

NOTE: If emery cloth is used to clean the motor shaft, the entire pawl assembly must be removed, as a safety hazard is present if the emery cloth contacts the moving pawls and springs.

Lubricate the new sintered iron pulley with IBM #10 oil during initial assembly and thereafter as required.

All parts necessary to convert to the new clutch assembly are available under B/M 1272045.

b. Cycle Clutch Pulley oversize.
c. Dry or binding Center Bearing (15.7).
d. Binding Operational Shaft
e. Dry or binding Shift Clutch

20.2 Motor Fails to Drive

1. Thermal cut-out open.
2. Dry motor bearings.

20.3 Capacitor Start Motor

In order to eliminate problems which have existed with the shaded pole motor and clutch, an improved capacitor start motor is available for use in instances where repetitive failures have been encountered with the previous clutch arrangement. The new capacitor start motor uses a 4 mfd. capacitor which provides much greater starting torque than previous capacitor start motors. This new capacitor start motor will start the I/O under any load conditions with normal line voltages.

Parts may be ordered as follows:

Part No.	Description
1166082	Motor, 115V, 60 Cycle
1272458	B/M, Motor+Mounting

NOTE: This B/M contains motor and all hardware and a template necessary to mount the motor.

20.4 Worn or Broken Belt

Drive belts may be breaking 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. It is also recommended that an extra belt be placed on the cycle shaft.

The belt should be slipped over the cycle shaft and tied with wire or lacing cord as illustrated below.

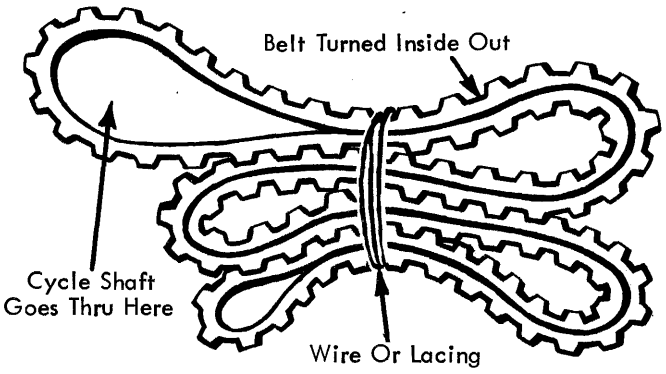


Figure 20.0

The motor belt should be turned inside-out so that the smooth portion of the belt is rubbing on the cycle shaft. It should be folded over as shown below and wrapped, and then left hanging under the cycle shaft and slightly toward the front of the machine. Since it will be difficult to describe exactly how to fold and wrap the belt, you must insure that after the

spare belt has been placed on the shaft, it does not interfere with the positive bail or the selector latch links and is not too tight around the cycle shaft as to cause rotation of the spare belt.

CONTACT ASSEMBLIES

21.0 Contact Assemblies

See the applicable Systems Manual for all specifications.

21.1 S.H. CLEANING

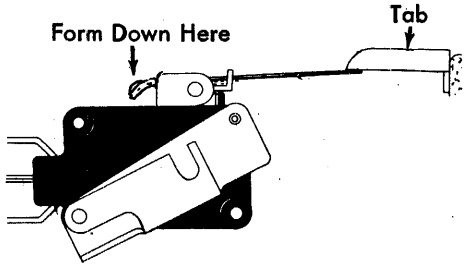
a. The contacts must not bridge or bounce.
b. The contacts must be clean, especially the N/C contacts as they tend to build up a residue.
c. The contacts should be cleaned with IBM cleaning fluid and wiped dry with clean bond paper. Caution - Do not use files, abrasives, or burnishing tools to clean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

21.2 S.H. OILY CONTACTS

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

21.3 S.H. TAB INTERLOCK MICRO-SWITCH

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 22.1). See the I/O Printer Reference Manual for the specific adjustments.



Tab Micro Switch

Figure 21.0

21.4 S.H. C5 AND C6 CONTACT SHIELD

In order to prevent contamination such as dirt, oil, and grease from entering C5 and C6 contacts, a shield has been provided. The new shield, PN 1159536, will be included in all future production I/O Printers.

This shield may be field installed if a new mainspring assembly is used since the old mainspring assembly would interfere with its installation. The new mainspring assembly may be ordered under PN 1164342. The contact shields may be installed under the present contact mounting screws.

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

Part No.	Description
1159536	Shield, Contact
1164342	Mainspring Assembly

21.5 Contact Timings may be set with a meter. (See applicable Systems Reference Manual.)

To detect contact bounce or a marginal bridging condition a scope must be used.

SELECTRIC I/O PRINTER TOOLS AND REFERENCE MATERIAL

22.0 SELECTRIC I/O PRINTER TOOLS AND REFERENCE MATERIAL

It is necessary to have the proper tools, reference material, and parts catalogs to properly service the Selectic I/O Printer.

The following is the list of the required tools. These tools should be used even though similar tools are available as standard issues, since OP has supplied us with "special" thin wrenches for work in difficult areas.

Part No.	Qty.	Description
158645	1	Grease Gun
450813	1	Grease Gun Nozzle - cycle clutch
450818	1	Screwdriver 8"
452798	1	Keybutton Removal Tool
460870	1	Scale (Rotate Tension)
1145391	1	Hand Cycle Wheel
1280441	1	1/2 oz. tube - IBM #23
1280442	1	1 lb. can - IBM #23
1280443	1	4 oz. can - IBM #10
1280444	1	1 pint can - IBM #10
9900005	2	Wrench 1/4" x 5/16" (Special)
9900028	1	6 Flute Wrench #4 (Rotate Pulley)
*9900034	1	Oiler for IBM #10
*9900059	1	Spring Hook
*9900060	1	Screw Starter
9900061	1	5/16" Spintite
9900090	2	3/4" x 5/8" Wrench (pin feed plate)
9900103	1	6 Flute #10 Wrench (Cycle Clutch)
9900105	1	Small Spring Hook
9900210	1	Spring Hook (Spring Holding)
9900216	1	6 Flute Wrench #2 (Gearless Tilt)
9900111	1	1/8" x 5/32" Wrench
9900112	1	Hooverometer
9900173	1	4 Flute Wrench #2 (C1-C2)
9900190	1	T-Bender (Form pushers)
9900200	1	6 Flute #6 Wrench
9900208	1	3/16" x 7/32" Wrench
9900255	1	6 Flute Wrench #133

*If these tools are already included in the standard tool issue, they need not be ordered.

22.1 SPRING SCALE - ZERO CALIBRATION

Many adjustments made in the field require the use of spring scale, PN 9900012. Reports indicate that the accuracy of the scale is impaired due to the zero adjustment being incorrect 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 #4 Allen screw. 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.

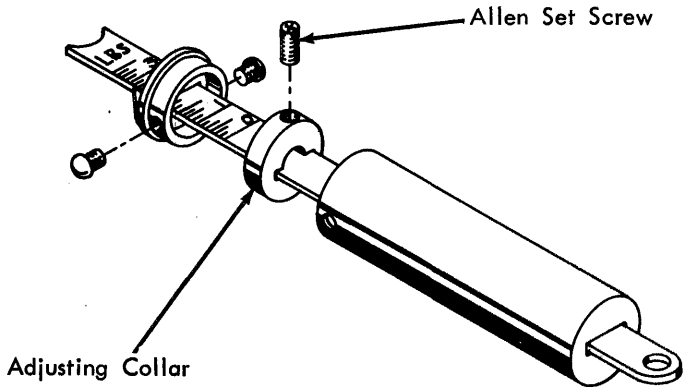


Figure 22.0

PREVENTIVE MAINTENANCE

23.0 Preventive Maintenance

For complete PM procedures see the Reference Manual #225-1726 (Keyboard) and #255-3207 (Keyboardless). The following method of "cycle" inspection is recommended. The I/O Printer should be PM'd four times a year for single shift operation. The frequency should be increased in direct proportion to shift usage. Each inspection should include a complete lubrication as outlined in the Reference Manual. Each inspection should cover a different area of mechanical check and adjustment.

1st Inspection -- Cycle Clutch, Tilt Mechanism, Ribbon Mechanism
2nd Inspection -- Keyboard Area, Rotate Mechanism, Detenting
3rd Inspection -- Scoping - Print Magnets, Operational Magnets, Contacts
4th Inspection -- Operational Area

23.1 The following items require special attention:

a. Motor and Motor Pulley.
b. Cycle Clutch Spring and Arbor.
c. Driven pulley hub and bearing.
d. Operational Cam Bearings.
e. Operational Shaft and Shift Cam Bearings.
f. Shift Clutch Spring and Arbor.

These items should be lubricated every 8 weeks for shift usage.

23.2 LUBRICATION

Two new lubricants have been released to replace all present lubricants for the SELECTRIC I/O Printer. The first new lubricant is IBM #23. This will be supplied in 1/2 ounce tubes and in 1 lb. cans. It should be used wherever Sil-X or a grease was previously recommended. In most cases the IBM #23 in the 1 lb. can should be used in conjunction with the grease gun, PN 158645, and the special nozzle, PN 450813. Don't forget to use this special nozzle on the cycle clutch grease hole located between the negative 5 cam and the RH positive cam.

The second new lubricant, IBM #10, should be used wherever an ET #6 or IBM #9 oil was previously specified.

The new IBM #10 oil can be identified by a red cap on the cam.

The new IBM #23 grease can be identified by the cap on the 1/2 oz. tube and the one pound can will be clearly marked IBM #23.

Machines with high shift usage require more frequent lubrication than machines used for single shift operation. The following areas are primarily affected by idling time, since only the operational shaft is driven.

1. Motor and motor pulley.
2. Cycle clutch spring and arbor.
3. Driven pulley hub and bearing.*
4. Operational cam bearings.
5. RH operational shaft and shift cam bearing.
6. Shift clutch arbor and spring.

When power is on 24 hours daily, we recommend lubrication of items 1 thru 6 every eight weeks. Note: Lubrication must be applied judiciously to eliminate migration or "spin-off" into electrical contact areas.

IBM No.	Part No.	Description
23	1280441	1/2 oz. tube - IBM #23
23	1280442	1 lb. can - IBM #23
10	1280443	4 oz. can - IBM #10
10	1280444	1 pt. can - IBM #10

The above part numbers are available in Mechanicsburg, and all EPC's.

* See S.H. 15.7

24.0 OLSA

There are times, because of customer requirements, or other considerations, when on-line service time must be held to a minimum.

Therefore, the need will arise for OLSA. Many Customer Engineers have replaced a Selectric I/O in a system with a spare machine and have then been faced with a situation whereby the I/O will apparently perform satisfactorily on OLSA but will not operate "On Line".

This Section is designed to illustrate the usefulness and diagnostic abilities hidden within the OLSA. Several of the main items are:

1. Using OLSA as an exercizer.
2. Diagnosing mechanical problems.
3. OLSA Servicing Aids for the Selectric .
4. Scoping procedures for OLSA and the I/O.

In order to use OLSA effectively, obtain as much information about the failure as possible.

1. Before the Selectric is pulled off the system, be sure that it is a Selectric problem.
2. Use every available moment of on-line time to diagnose the symptoms.
3. Endeavor to duplicate the failure under known conditions.
4. Obtain print-outs when available, showing the Selectric mal-function.
5. Use error indications and CE test panels when available to help you determine what area in the Selectric might be causing the trouble.
6. Ask, especially on keyboard machines -- Does it fail only on output? -- Does it fail only on input? -- Or, has it failed both on output and input?
7. Listen -- Does print clutch operation sound erratic rather than rhythmic? Is the machine excessively noisy in one area or during any one operation? Does machine seem to be slower in performing any one operation than others?

If you know:

1. Under what conditions the failure occurred.
2. What general areas might have caused the failure.
3. What symptoms the failure caused.

Then you should be able to use OLSA to:

1. Duplicate the conditions that brought on the failure.
2. Pinpoint the failing mechanism or component.
3. Know when the malfunction has been eliminated.

25.0 OLSA Service Hints

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

25.1 HAND CYCLING

Turn ET motor switch off.

Set desired operation on function switch.

Set desired character on tilt rotate switch.

Push Start.

Use hand cycle wheel on Selectric I/O.

Assume your printer is intermittently failing to space. Print escapement is okay, 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 the Selectric and observe:

1. Space magnet armature pick.
2. Space interposer unlatching clearance and movement to rear.
3. Cycle release arm trips.
4. Space operational latch is pushed under operational cam follower bail.
5. Space clutch pawls drop into ratchet and cam turns.
6. Escapement torque bar pulls escapement pawls from rack.
7. Carrier moves one space.
8. Escapement trigger re-latches on escapement torque bar lever.

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

25.2 S.H. ONE ARMATURE TEST

Purpose: Check ability of magnet assembly to trip cycle clutch with only one print magnet energized.

1. Function Switch: Print Alternate
   Tilt and Rotate Print T3 RØ
   Print Alternate T1 R+5

   On print cycles, R-5 only will be energized. On print alternate cycles, T-2 only will be energized.

2. 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 Service Hint 14.8. If neither test will run, hand cycle through the operation and follow the print area in output mode flow chart.

25.3 S.H. ALL ARMATURE TEST

Purpose: Check print area for extra cycles, caused by magnet assembly failures.

Function Switch: Print Space
Tilt and Rotate TO R-5

A failure will appear as a T3 R5 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 S.H. DYNAMIC HALF CYCLING

Use OLSA tilt and rotate switches and the Hooverometer handle to dynamically half-cycle while checking detent and alignment adjustments. On keyboardless machines, this is a more dependable method than hand selecting the print magnet armatures.

25.5 S.H. CONTACT FAILURES

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.

It is of the utmost importance that contacts be correctly timed, in proper adjustment, clean, and bounce free.

Contact timing can be checked with a meter while hand cycling the machine. Tests have shown that contacts timed under hand power show little or no change when later checked dynamically.

Contact bridging* can also be checked with a meter but this can be regarded only as a preliminary check.

*Bridging -- Operating point makes contact with normally open point before it breaks contact with normally closed point.

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 Figure 19.

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

Dirty contact points will also 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.

26.0 SAFETY

Sound 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.

27.0 SCOPING PROCEDURES WITH OLSA

Magnet Pick Time

Condition 1 -- Print Select Magnets
Internally wired in OLSA are 47 Ω resistors in series with the print select magnets. It is the voltage grop 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 signal starting at ground and rising to a positive level.

Condition 2 -- All Other Selectric I/O Magnets
To scope any other magnet, it is required that a 47 ohm resistor be temporarily wired in series with the magnet pick coil.

NOTE: A tool will be made available shortly to provide this feature.

This device can be kept with the OLSA. To use, remove the magnet pick coil wire from its edge connector in the Selectric. Clip this wire to the alligator clip attached to the resistor. Insert the pin connector on the other side of the resistor into the edge connector on the Selectric. Scope across the two pins on the epoxy block.

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

27.1 SCOPING MECHANICAL TIMINGS

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. Feedback timings should be checked with a meter to insure that they are correct according to your machine specifications. Timings in degrees can be converted to milliseconds by referring to conversion chart, page 10.

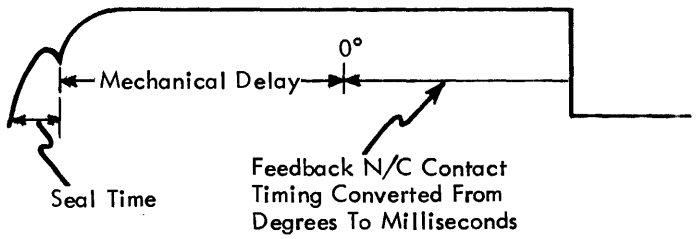


Figure 27.0

DEGREE TO MILLISECOND CONVERSION CHART

DEGREES TO MILLISECONDS

1	.358	31	11.098	61	21.838	91	32.578	121	43.318	151	54.058
2	.716	32	11.456	62	22.196	92	32.936	122	43.676	152	54.416
3	1.074	33	11.814	63	22.554	93	33.294	123	44.034	153	54.774
4	1.432	34	12.172	64	22.912	94	33.652	124	44.392	154	55.132
5	1.790	35	12.530	65	23.270	95	34.010	125	44.750	155	55.490
6	2.148	36	12.888	66	23.628	96	34.368	126	45.108	156	55.848
7	2.506	37	13.246	67	23.986	97	34.726	127	45.466	157	56.206
8	2.864	38	13.604	68	24.344	98	35.084	128	45.824	158	56.564
9	3.222	39	13.962	69	24.702	99	35.442	129	46.182	159	56.922
10	3.580	40	14.320	70	25.060	100	35.800	130	46.540	160	57.280
11	3.938	41	14.678	71	25.418	101	36.158	131	46.898	161	57.638
12	4.296	42	15.036	72	25.776	102	36.516	132	47.256	162	57.996
13	4.654	43	15.394	73	26.134	103	36.874	133	47.614	163	58.354
14	5.012	44	15.752	74	26.492	104	37.232	134	47.972	164	58.712
15	5.370	45	16.110	75	26.850	105	37.590	135	48.330	165	59.070
16	5.728	46	16.468	76	27.208	106	37.948	136	48.688	166	59.428
17	6.086	47	16.826	77	27.566	107	38.306	137	49.046	167	59.786
18	6.444	48	17.184	78	27.924	108	38.664	138	49.404	168	60.144
19	6.802	49	17.542	79	28.282	109	39.022	139	49.762	169	60.502
20	7.160	50	17.900	80	28.640	110	39.380	140	50.120	170	60.860
21	7.518	51	18.258	81	28.998	111	39.738	141	50.478	171	61.218
22	7.876	52	18.616	82	29.356	112	40.096	142	50.836	172	61.576
23	8.234	53	18.974	83	29.714	113	40.454	143	51.194	173	61.934
24	8.592	54	19.332	84	30.072	114	40.812	144	51.552	174	62.292
25	8.950	55	19.690	85	30.430	115	41.170	145	51.910	175	62.650
26	9.308	56	20.048	86	30.788	116	41.528	146	52.268	176	63.008
27	9.666	57	20.406	87	31.146	117	41.886	147	52.626	177	63.366
28	10.024	58	20.764	88	31.504	118	42.244	148	52.984	178	63.724
29	10.382	59	21.122	89	31.862	119	42.602	149	53.342	179	64.082
30	10.740	60	21.480	90	32.220	120	42.960	150	53.700	180	64.440

CHARACTER RATE VS. CYCLE TIME

13.0 - 76.9	13.5 - 74.0	14.0 - 71.4	14.5 - 69.0	15.0 - 66.7
13.1 - 76.3	13.6 - 73.5	14.1 - 70.9	14.6 - 68.5	15.1 - 66.2
13.2 - 75.8	13.7 - 73.0	14.2 - 70.4	14.7 - 68.0	15.2 - 65.8
13.3 - 75.2	13.8 - 72.5	14.3 - 69.9	14.8 - 67.5	15.3 - 65.4
13.4 - 74.6	13.9 - 72.0	14.4 - 69.5	14.9 - 67.1	15.4 - 65.0
				15.5 - 64.5

Figure 27.1

28.0 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.

28.2 Clutch Operating Speed

Mechanism	Max. Mechanical Delay
Print Cycle Clutch	10 ms.
Operational Cycle Clutch	14 ms.
Shift Clutch	7 ms.

29.0 Selectric I/O Modes of Operation

29.1 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 signalled that the previous cycle is almost complete and the printer is ready for another character.

29.2 Open Ended

In the open ended mode of operation, the character rate is fixed, independent of 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 has the capability of running 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.

30.0 OSCILLOSCOPE INTERPRETATIONS

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

PRINT MAGNET R2A (ONE ARMATURE PICKED)

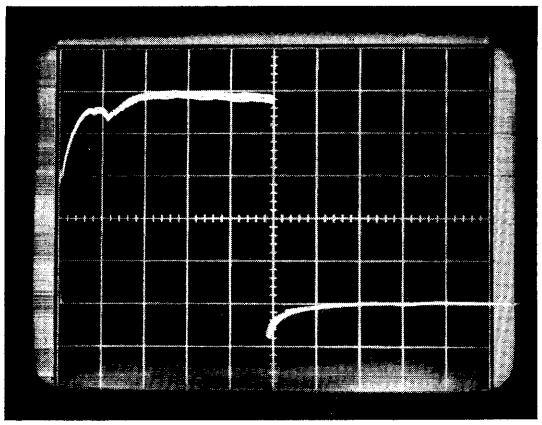


Figure 30.0

Scope:	Mag Common	OLSA Function:	Print Space
Ref.	R2A Test Jack	Tilt & Rotate:	T3 / R+3
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

PRINT MAGNET R2A (ALL ARMATURES PICKED)

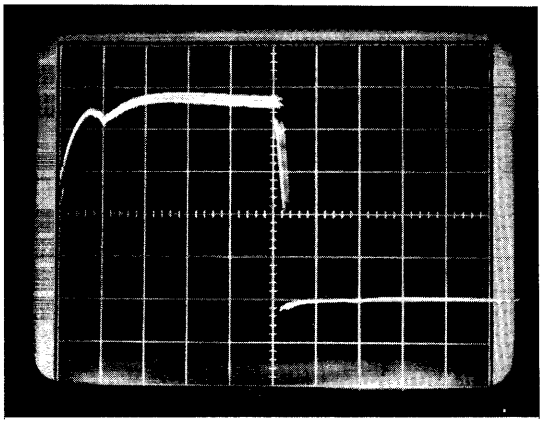


Figure 30.1

Scope:	Mag Common	OLSA Function:	Print Space
Ref.	R2A Test Jack	Tilt & Rotate:	TO R-5
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

SLUGGISH PRINT ARMATURE CAUSED BY MALADJUSTED TRIP LEVER BITE

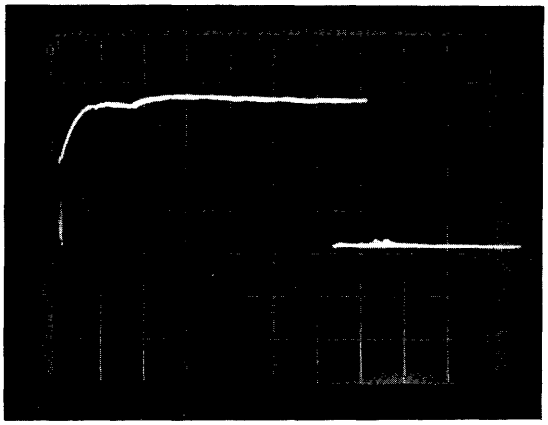


Figure 30.2

CARRIER RETURN/INDEX

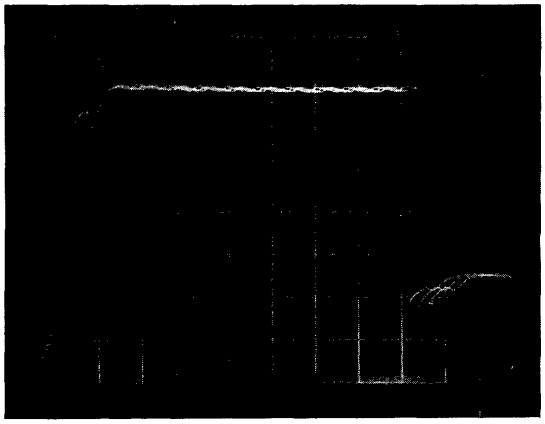


Figure 30.3

Scope:	Across Register in Series w/Mag Coil	OLSA Function: Print CR
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

SPACE/BACKSPACE/TAB

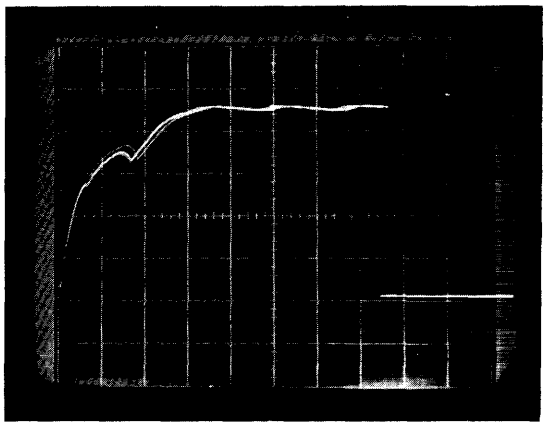


Figure 30.4

Scope:	Across resistor in Series with Mag Coil	OLSA Function: Print Space
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	
		27.7 ms
Total Mechanical Delay		9.3 ms

EXCESSIVE MECHANICAL DELAY

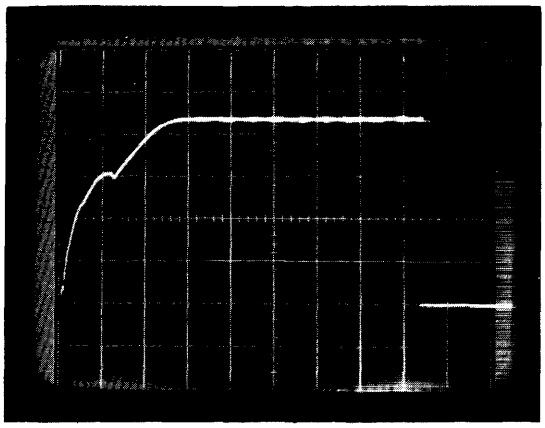


Figure 30.5

Time Base: 5 ms/cm

Time from start of pick to feed-back		42.5 ms
Magnet Seal Time	6.5 ms	
Feedback Contact Opens at 55°	19.7 ms	
		26.2 ms
Total Mechanical Delay		16.3 ms

DOG CLUTCH PAWL AND RATCHET CHECK

The distance in time between the teeth of the dog clutch ratchet is 14 ms. Normal operational cycles will vary in time depending on 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.

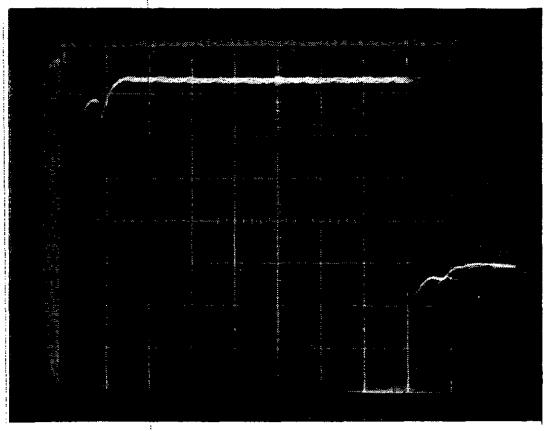


Figure 30.6

Scope: Across resistor in series with magnet coil.

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

LOWER CASE MAGNET

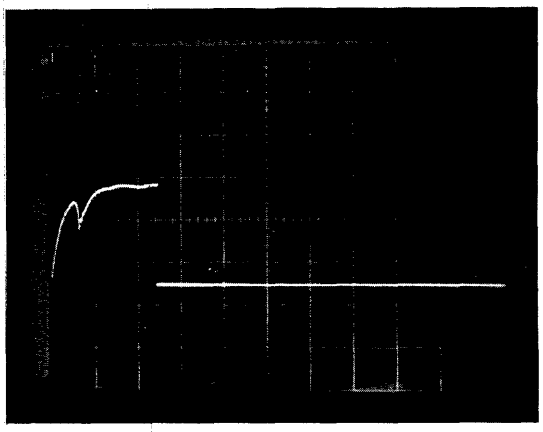


Figure 30.7

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

U.C. MAGNET

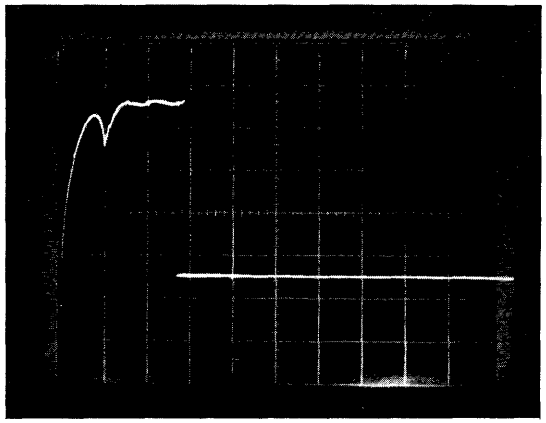


Figure 30.8

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

MACHINE SPEED CHECK

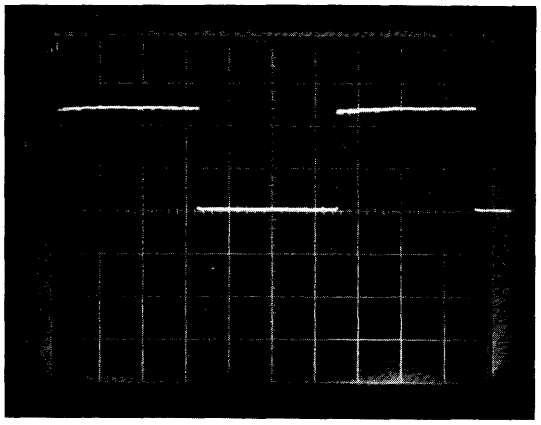


Figure 30.9

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

C1 N/O POINT

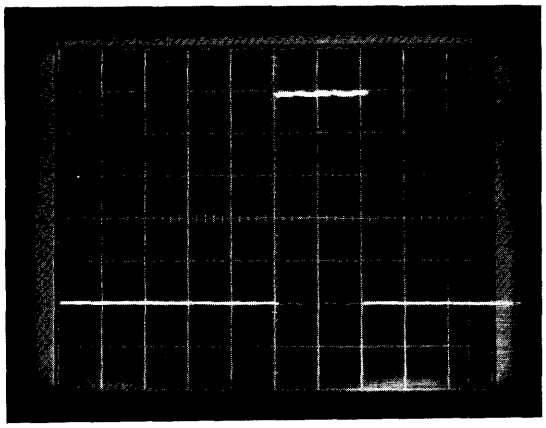


Figure 30.10

BOUNCING C1 N/O POINT

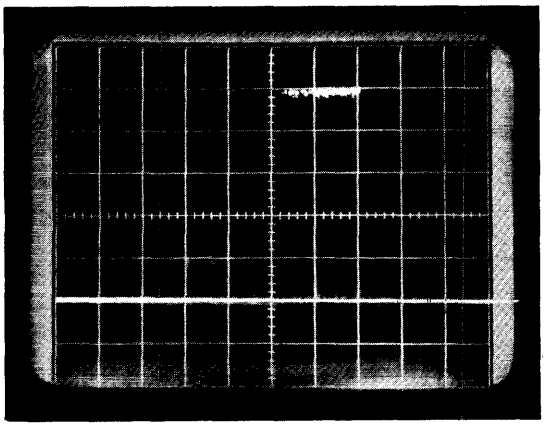


Figure 30.11

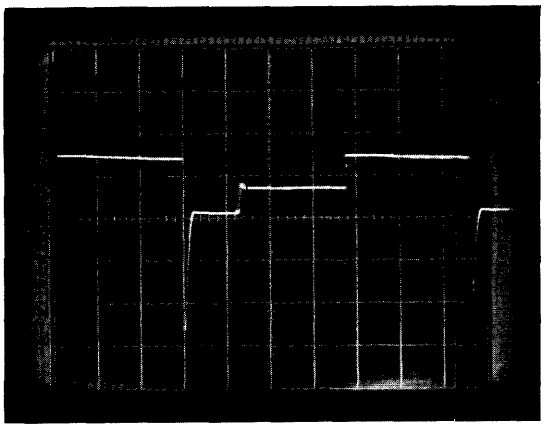


Figure 30.12

Scope: C2 o/p

Ref: Power Supply Common

Time Base: 10 ms/div

Vent Amp: 5 volt/cm with 10X attenuated probe

Shown is the scope pattern seen on C2 operating point when Selectric I/O is attached to OLSA. This is a normal signal reflecting inductive spikes generated by OLSA relays. These spikes do not originate in the Selectric I/O.

30.1 Refer to Figure 30.4

Magnet Seal Time	8.0 ms
C5 N/C opens at 55° converted to ms	19.7 ms
Total	27.7 ms

27.7 ms is total of everything but mechanical delay.

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 maximum)

30.2 Refer to Figure 30.5

Magnet Seal Time	6.5 ms
C5 N/C opens at 55° converted to ms	19.7 ms
Total	26.2 ms

26.2 ms is total of everything but mechanical delay.

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 maximum)

Why is 9.3 ms okay but 16.3 ms 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 cycle starts.

Figure 30.4

Normal Mechanical Delay	9.3 ms
Magnet Seal Time	8.0 ms
0° to 130°	46.5 ms
Total of	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.

30.3 Figure 30.5

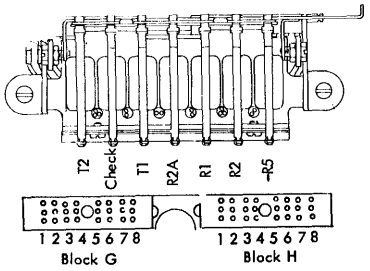
Excessive Mechanical Delay	16.3 ms
Magnet Seal Time	6.5 ms
0° to 130°	46.5 ms
Total of	69.3 ms

This printer, then, would be able to accept the next character in 69.3 ms or for this one cycle at 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.

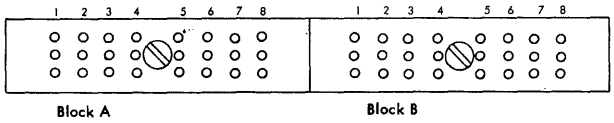
30.4 S.H.

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

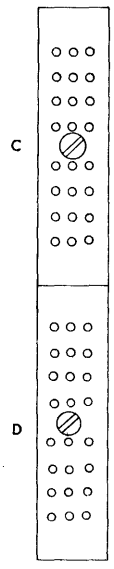
31.0 I/O Component Location



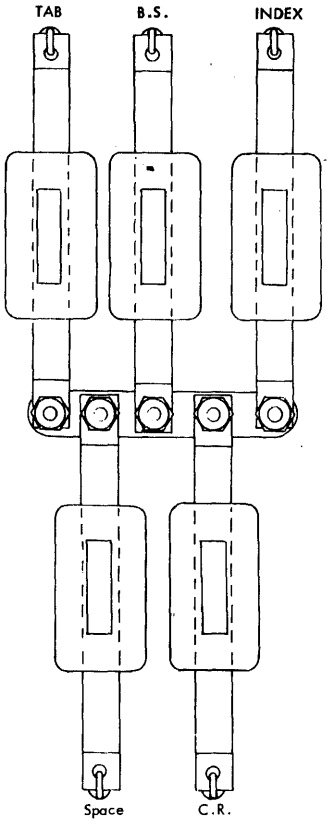
Print Selection Magnet Assembly



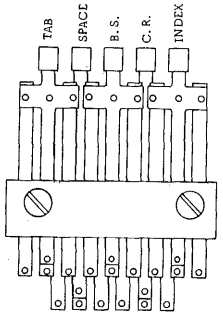
Selection Contact Terminal Blocks



Operational Terminal Block



Operational Magnets



Operational Magnet Contacts

Figure 31.0

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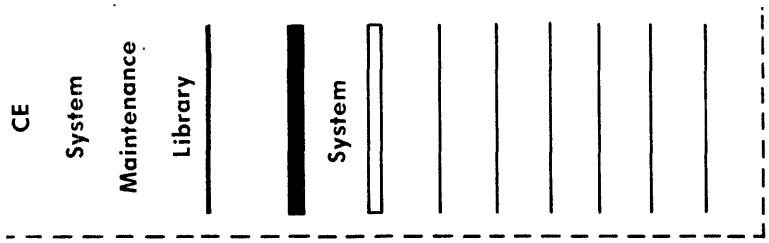

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