IBM OPD CUSTOMER ENGINEERING

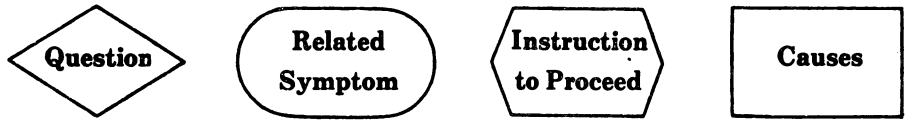
I/O Reference Manual

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 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 I/O Reference Manual should be consulted.

When diagnostic charts are not effective a brief narrative and illustration are used.



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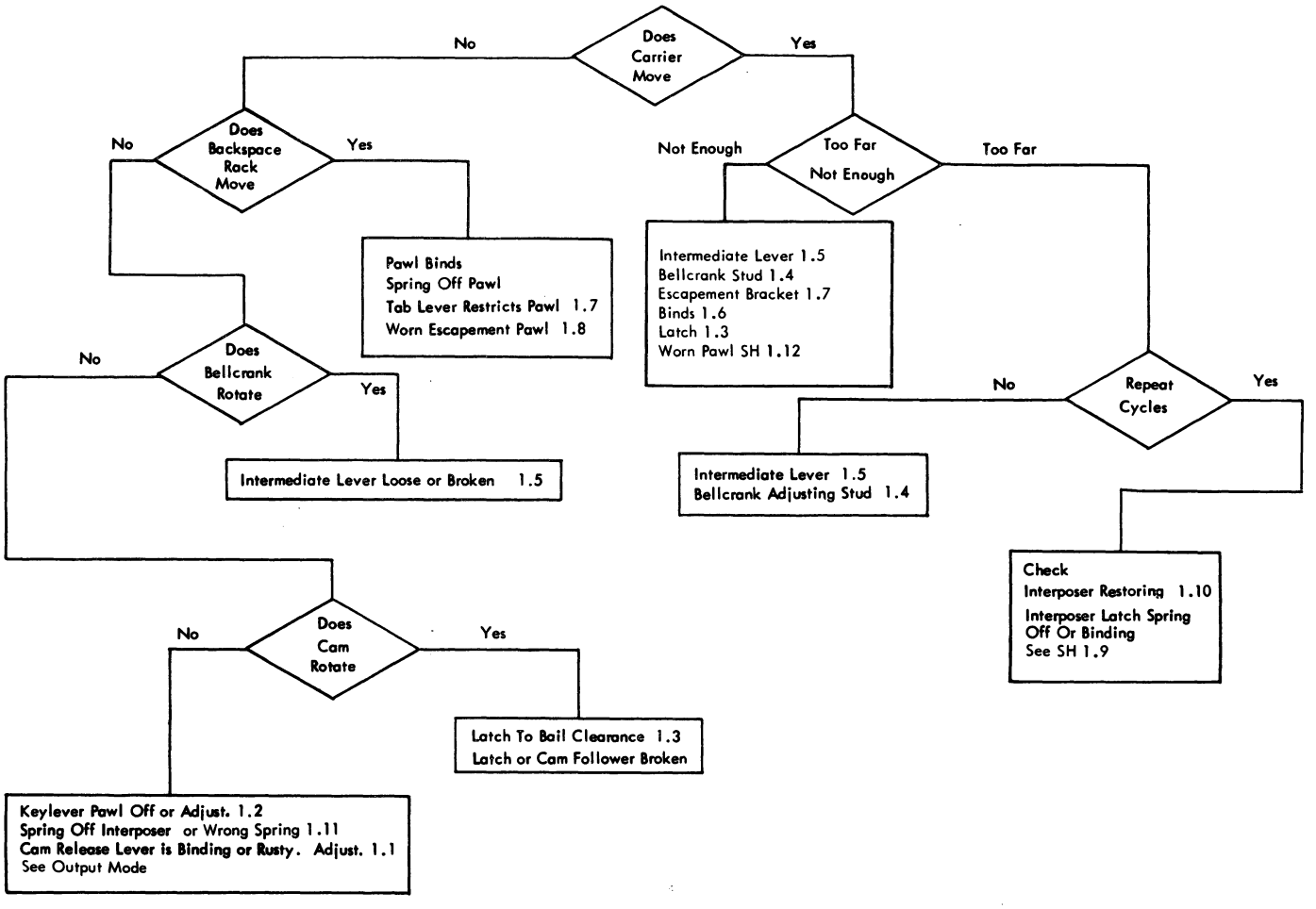


Figure 1.0

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.

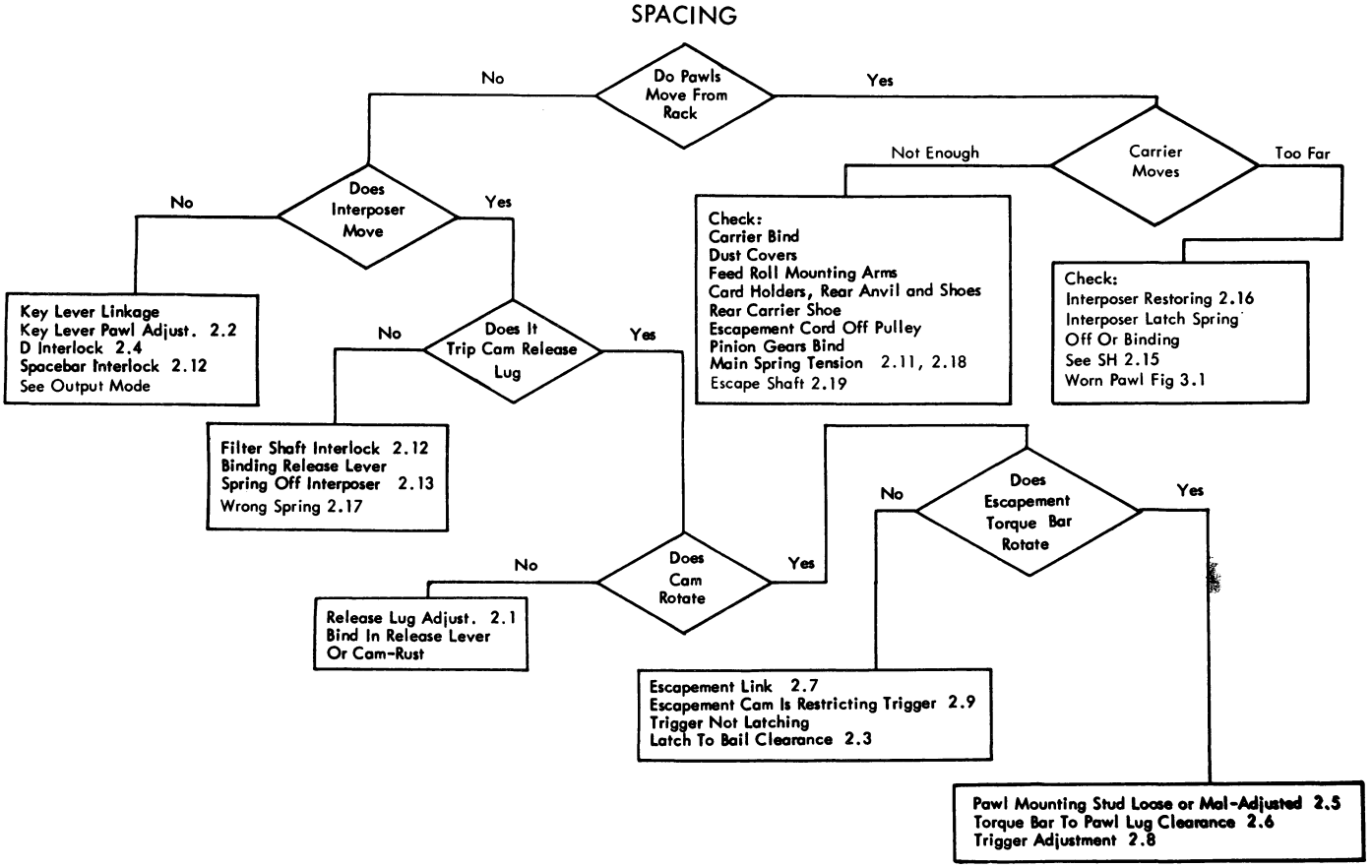


Figure 2.0

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.

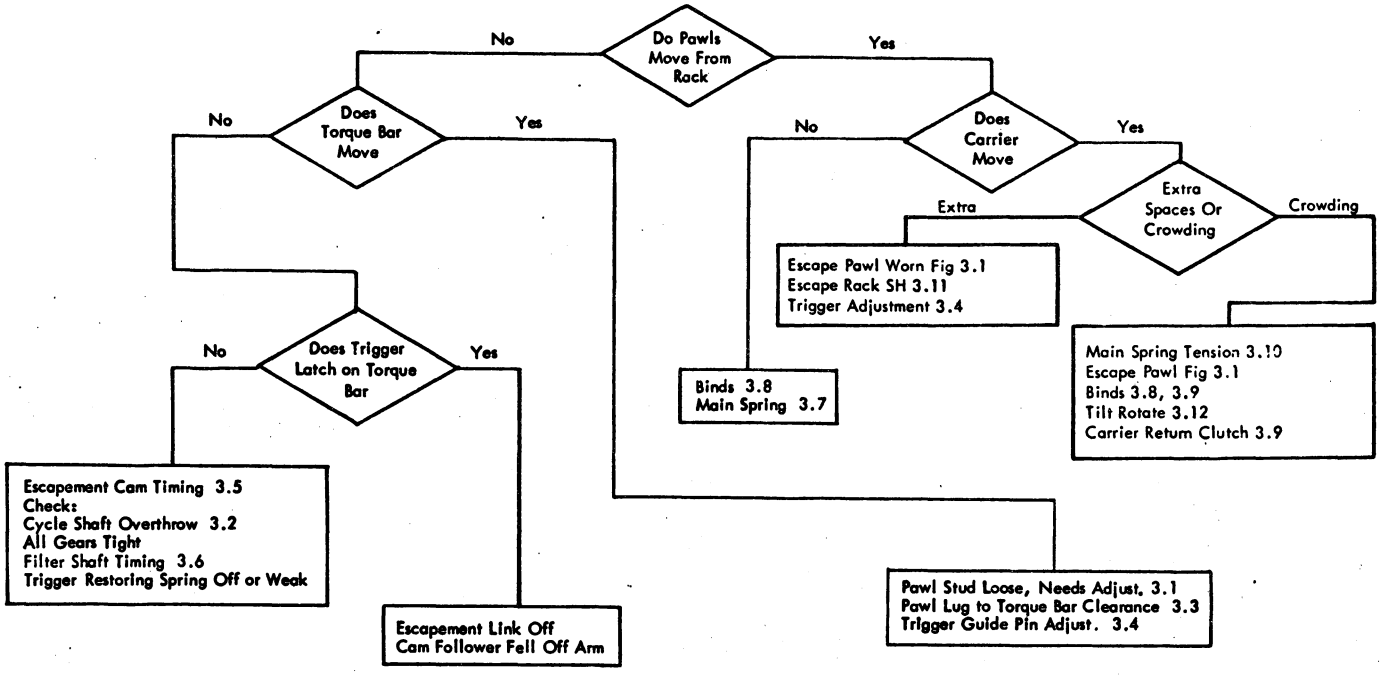


Figure 3.0

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".

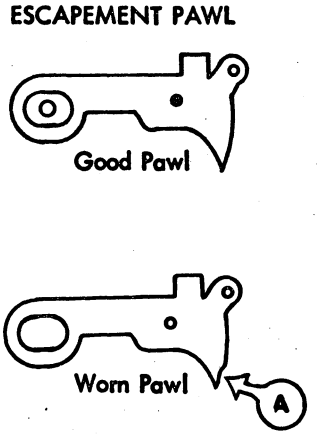


Figure 3.1

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.

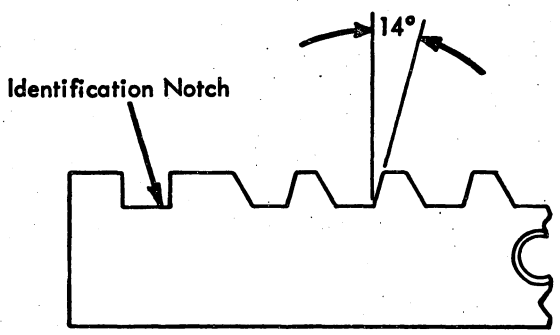


Figure 3.2

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.

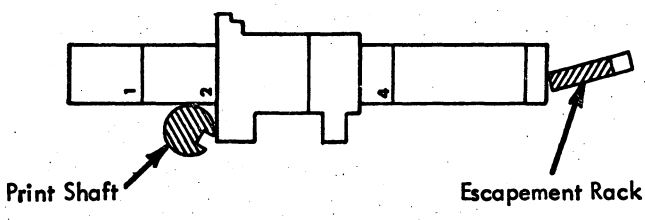


Figure 3.3

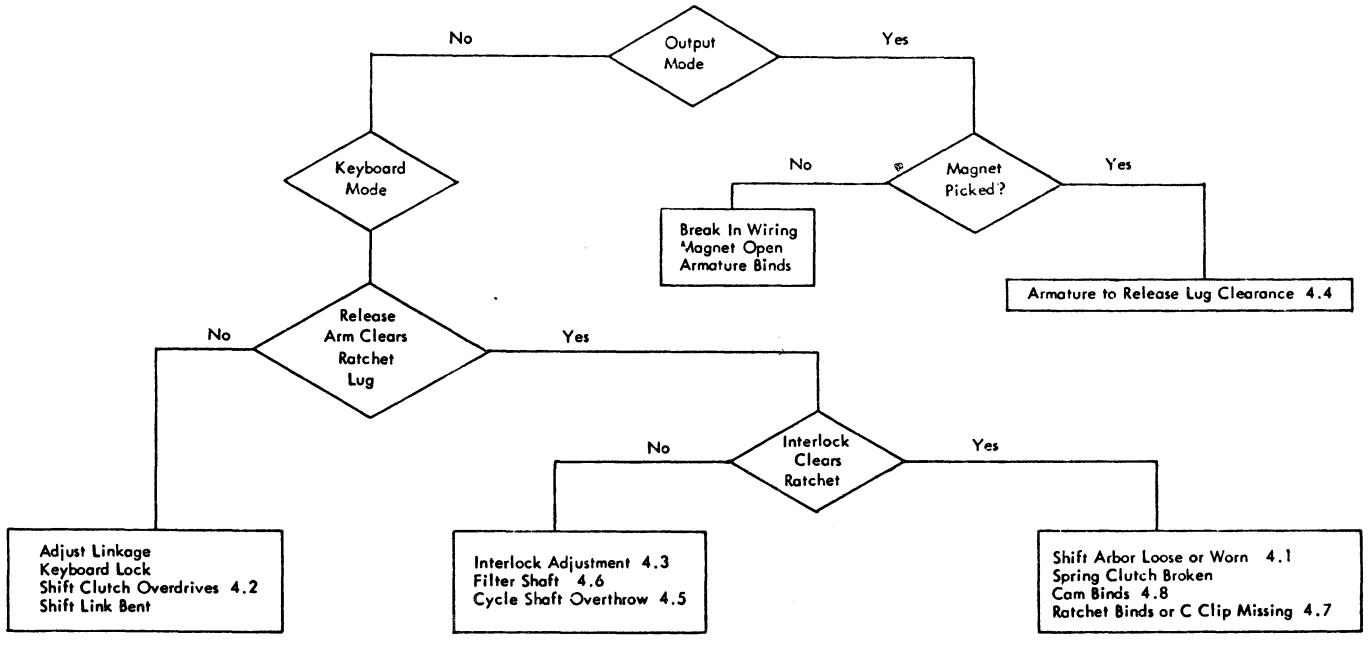


Figure 4.0

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.

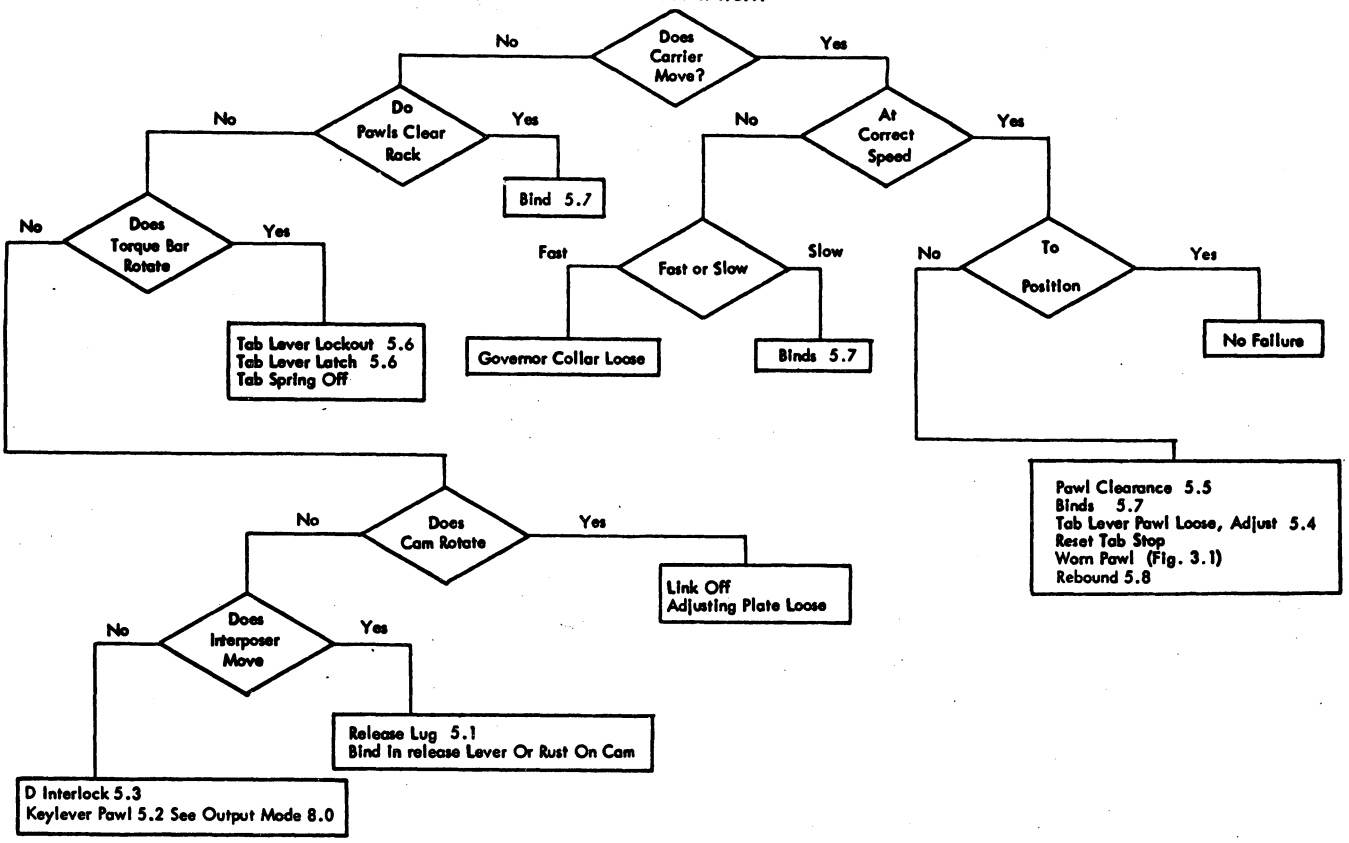
Part No.	Description
1159408	Cam, C-7
1159409	Ratchet
1159262	Screw, Cam Mtg.
257985	Washer
1127163	Nut

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

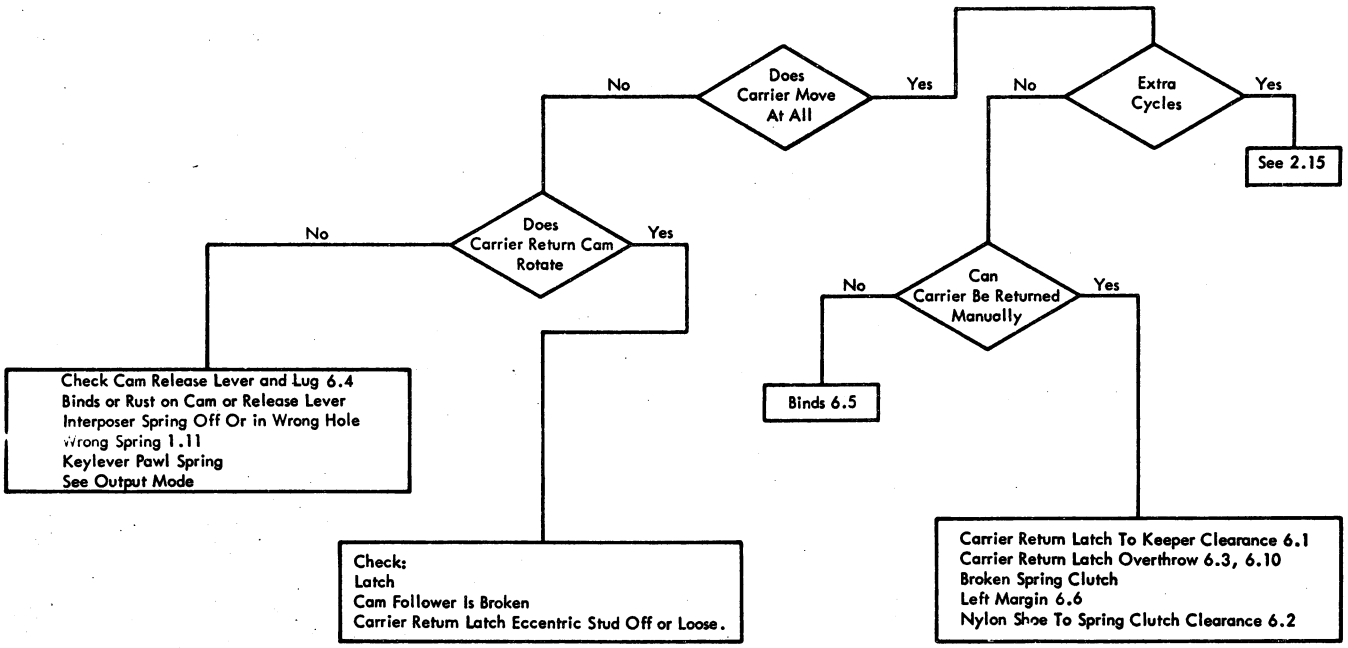
When you are spacing in the area of 12-15 spaces between set tab stops it is possible for tab rebound to occur. Most often the carrier will rebound 1/2 space and land on the backspace pawl. No permanent resolution is available for this problem - Watch your CEM's.

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.

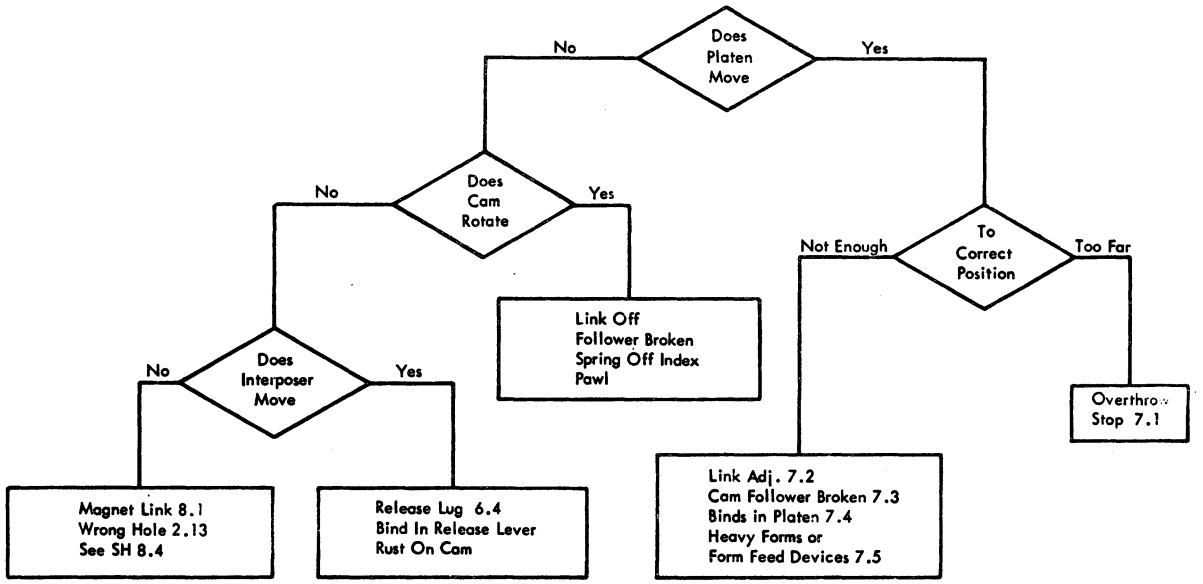
The Carrier Return Pinion and Spring Clutch must also be free of rust, dirt and oil. Excess oil will cause sluggish Tab and Escapement operation.

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

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OPERATIONAL AREA IN OUTPUT MODE

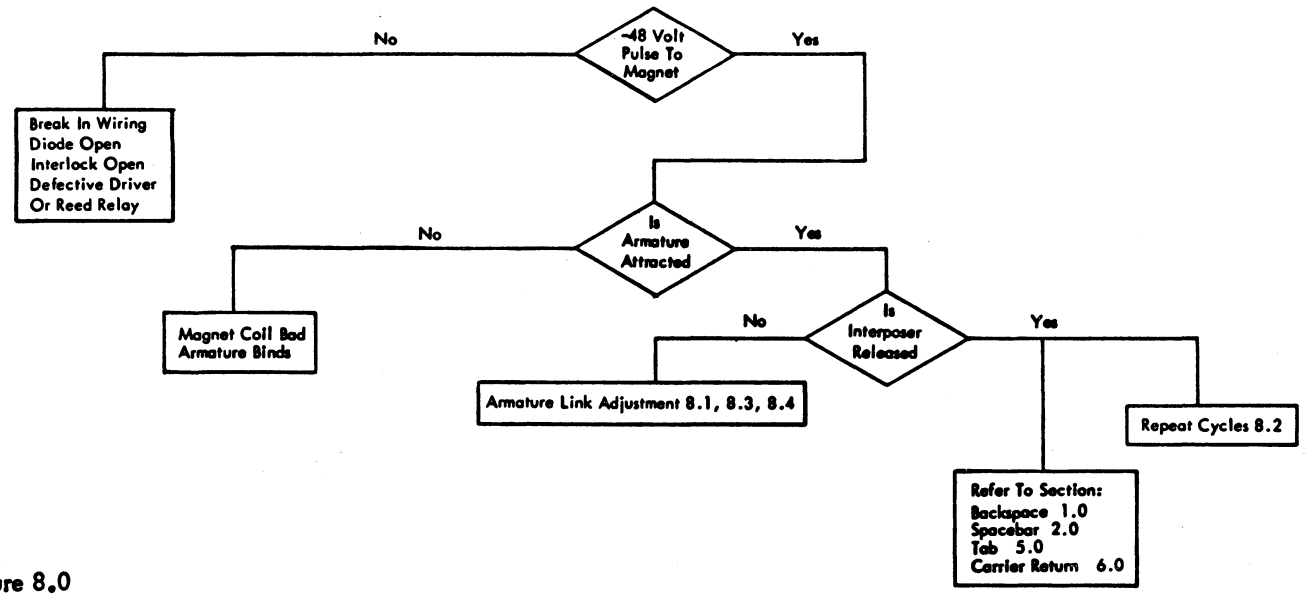


Figure 8.0

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.

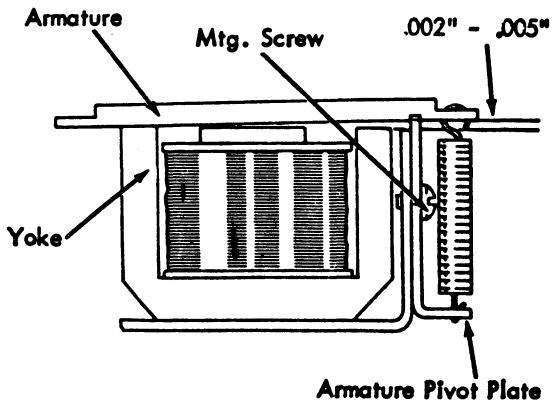


Figure 8.1

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.

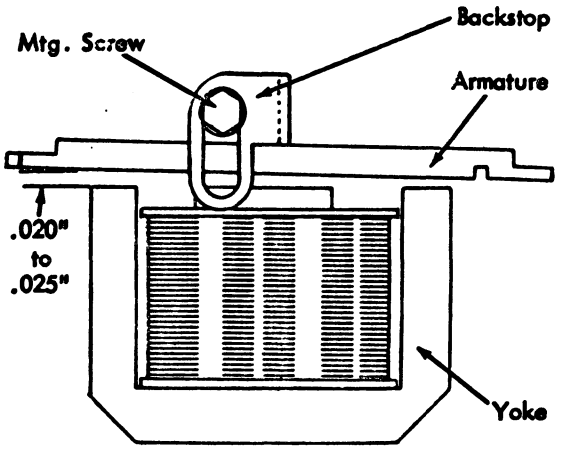


Figure 8.2

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.

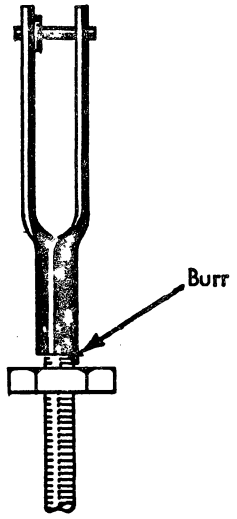


Figure 8.3

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.

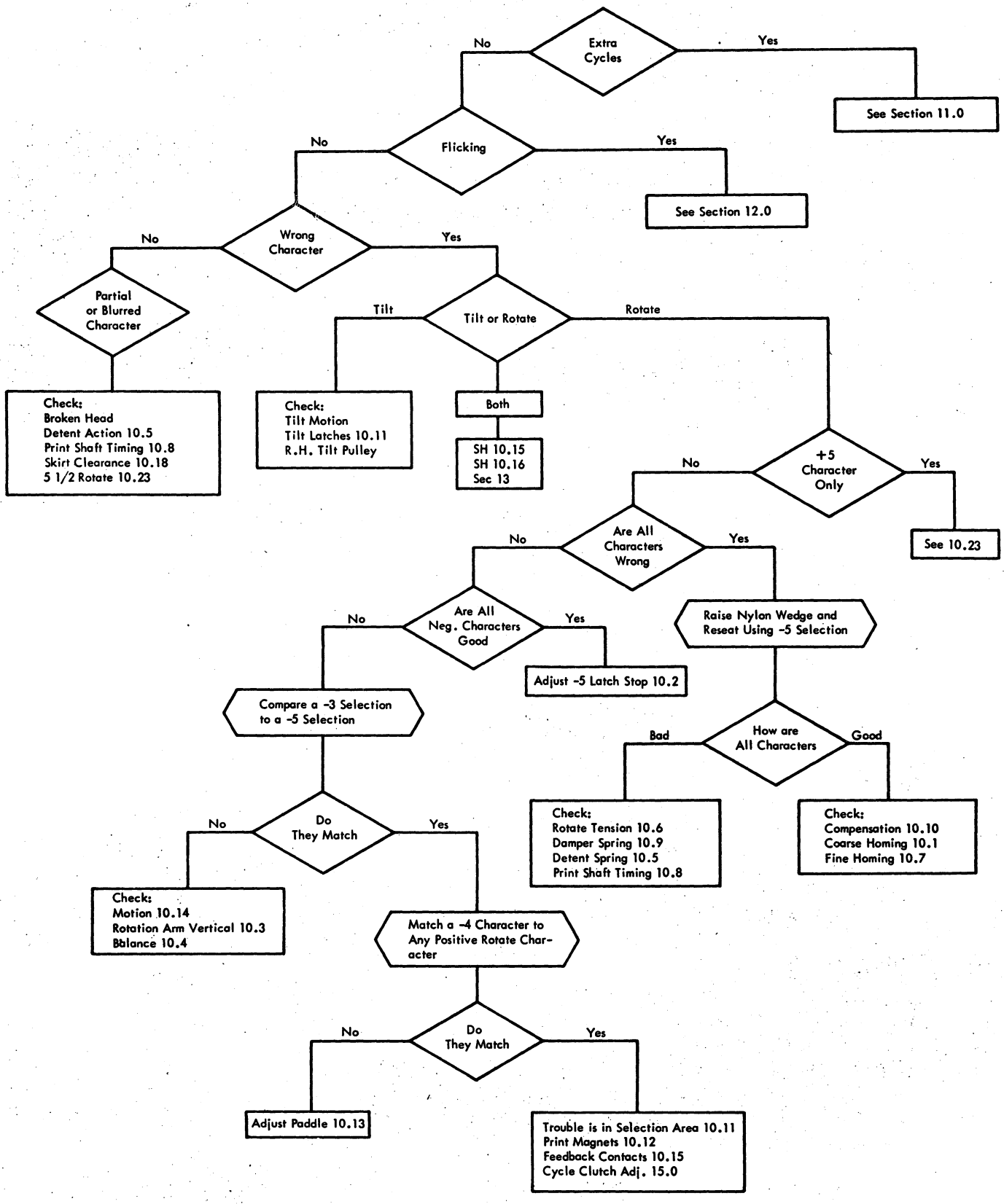


Figure 10.0

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.

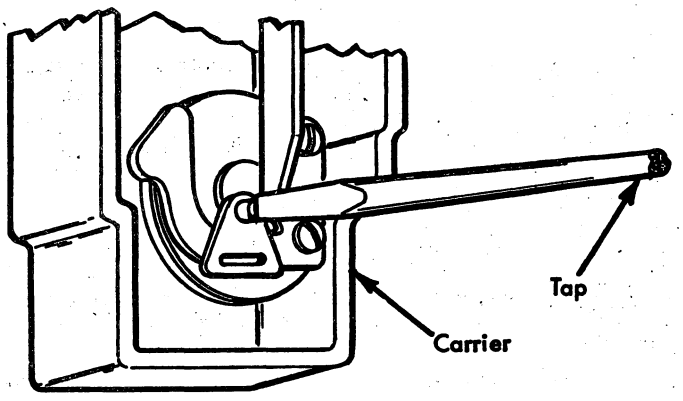


Figure 10.1

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.

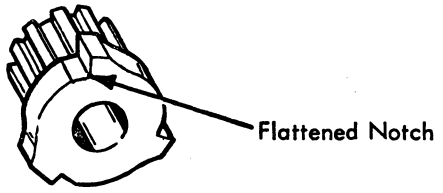


Figure 10.2

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.

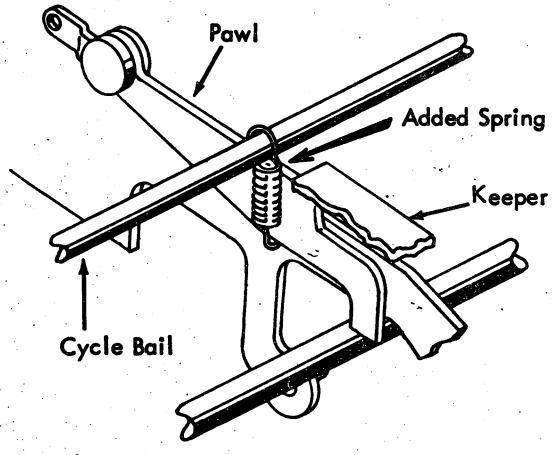


Figure 12.0

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).

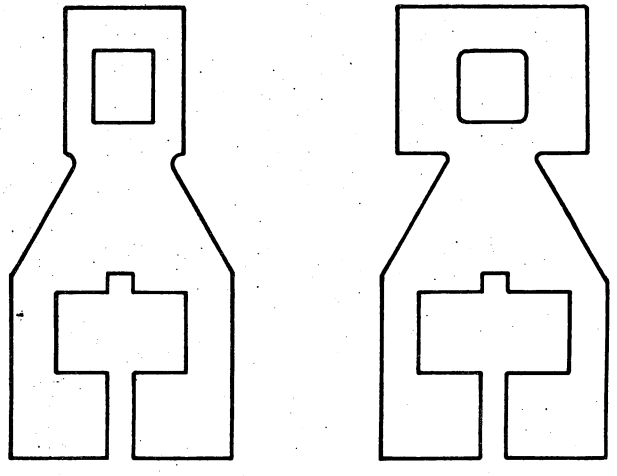


Figure 13.0

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.

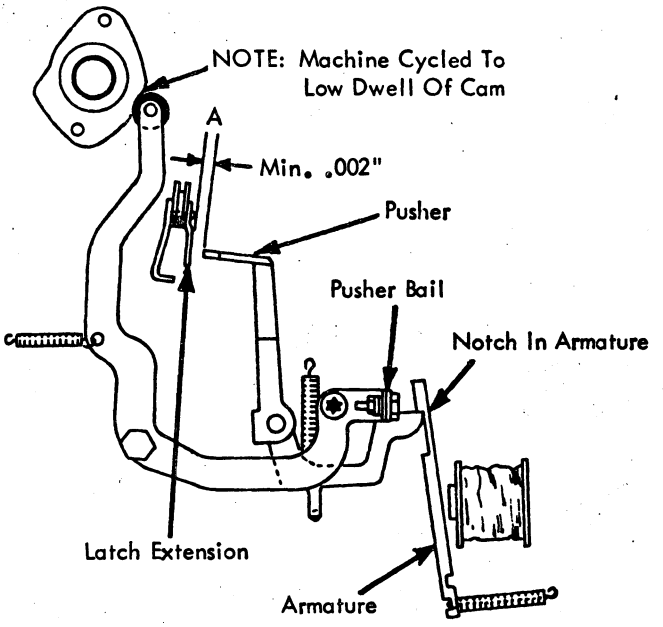
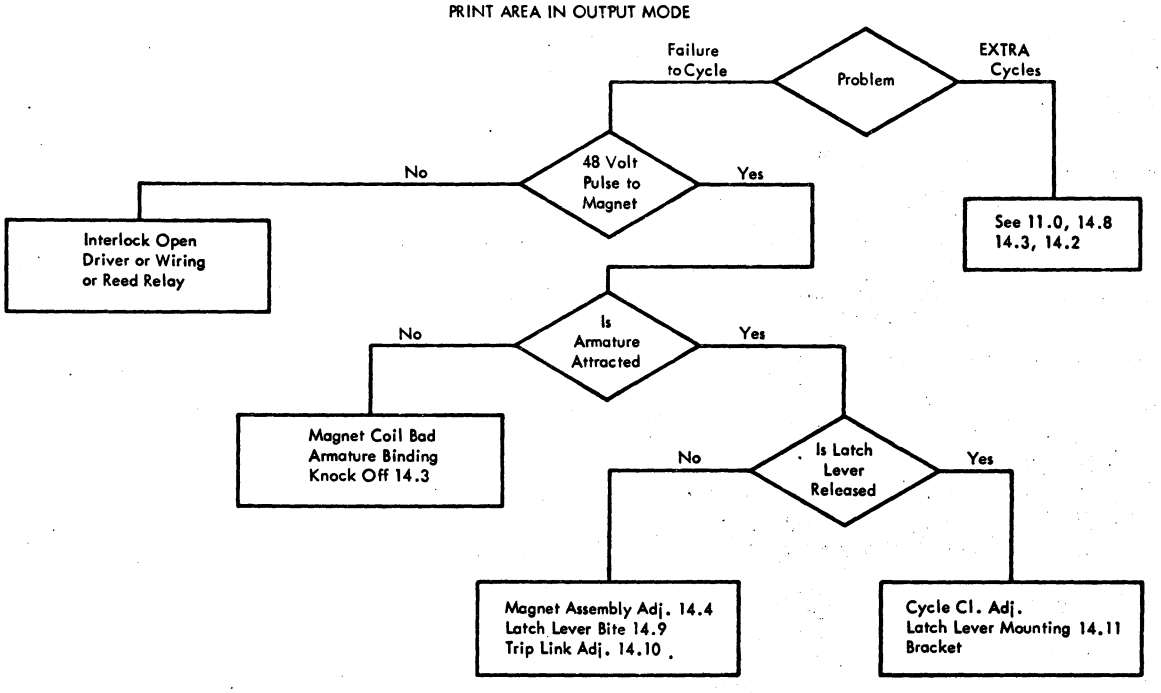


Figure 13.1



● 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.

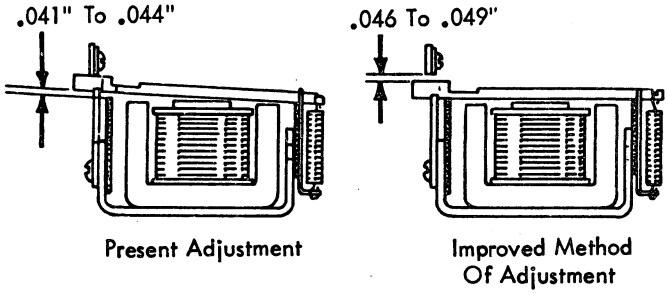


Figure 14.1

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.

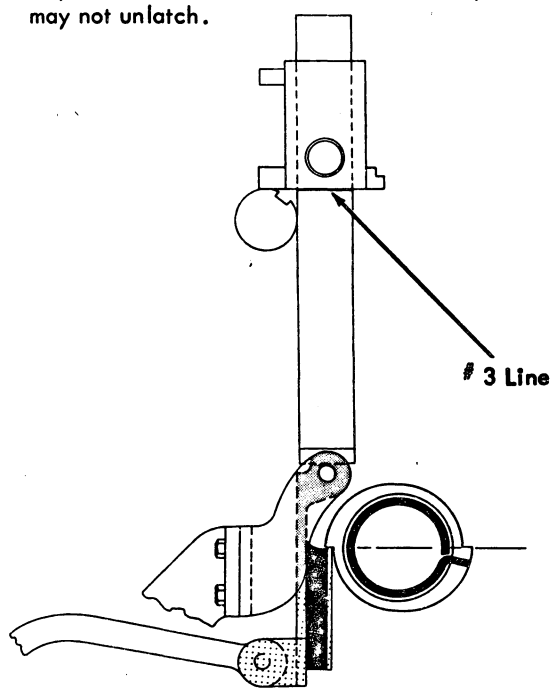


Figure 15.0

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 puli 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.

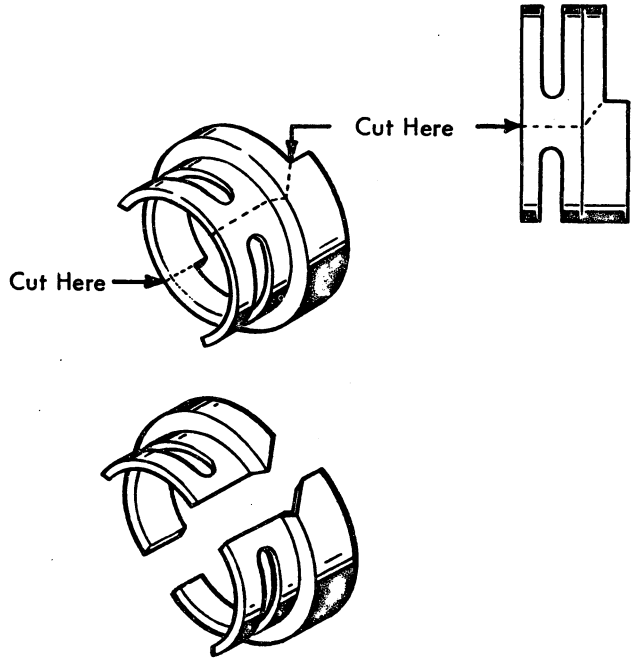


Figure 15.1

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.

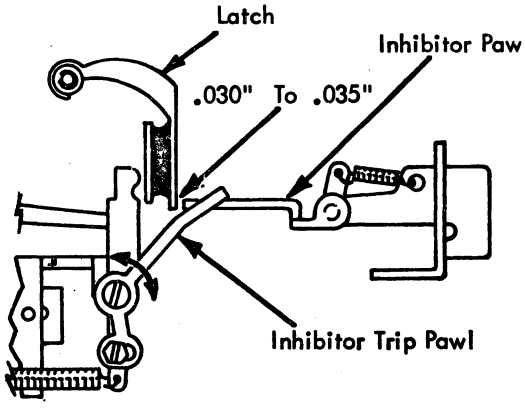


Figure 15.2

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:

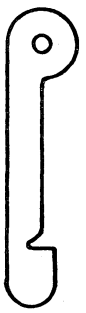


Figure 15.3

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-

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

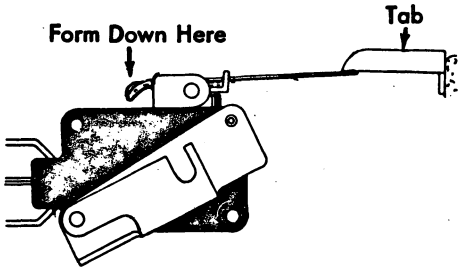
a. The contacts must not bridge or bounce.
b. The contacts must be clean, especially the N/C contacts as they tend to build up a residue.
c. The contacts should be cleaned with IBM cleaning fluid and wiped dry with clean bond paper. Caution - Do not use files, abrasives, or burnishing tools to clean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

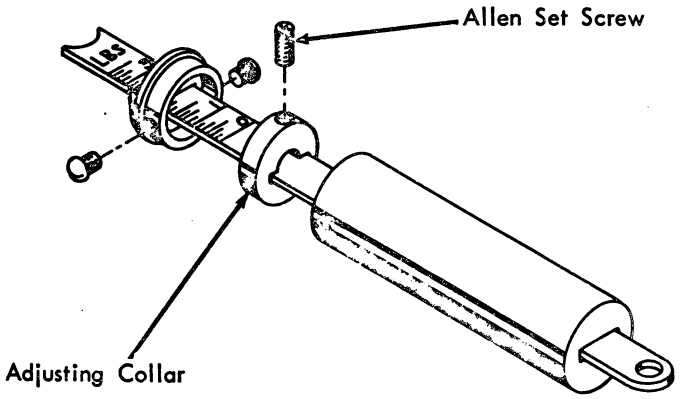


Figure 22.0

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.

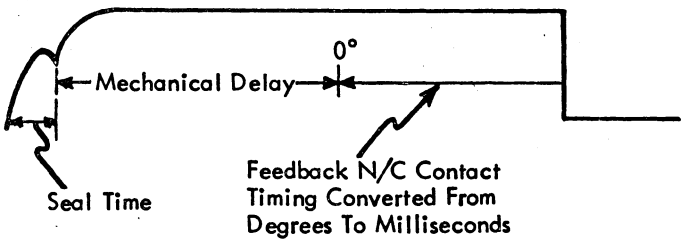


Figure 27.0

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)

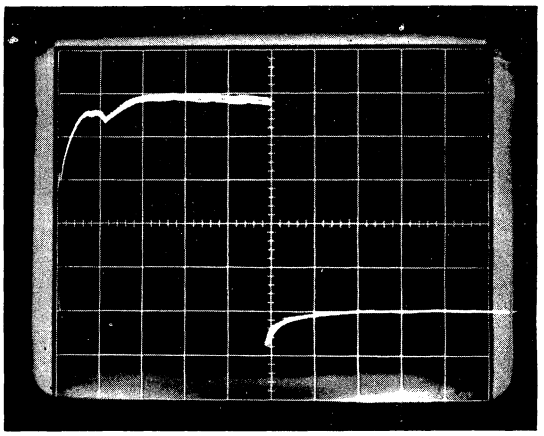


Figure 30.0

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)

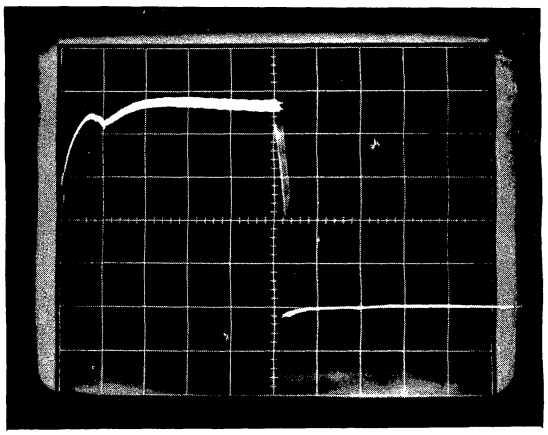


Figure 30.1

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

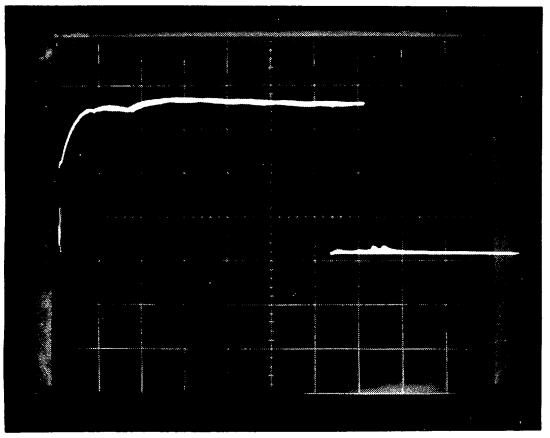


Figure 30.2

CARRIER RETURN/INDEX

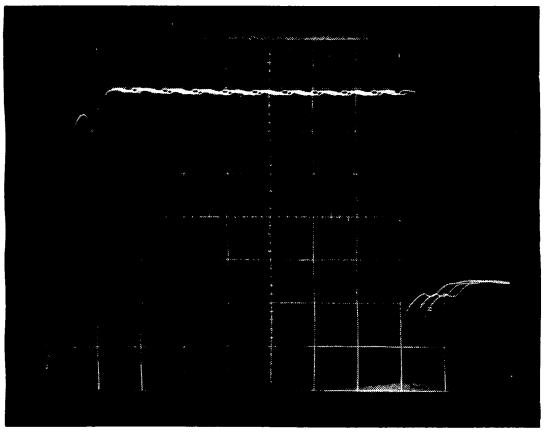


Figure 30.3

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		62.0 ms (avg.)
Magnet seal time	8.2 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

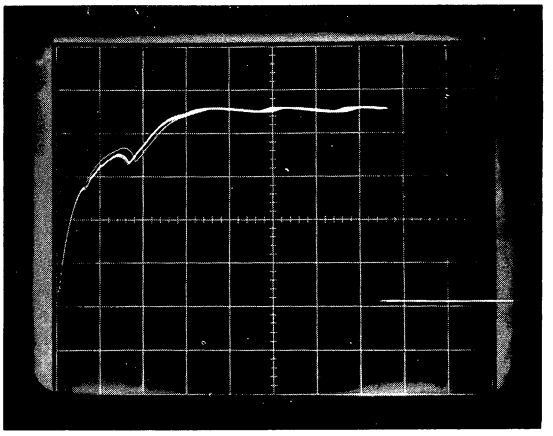


Figure 30.4

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

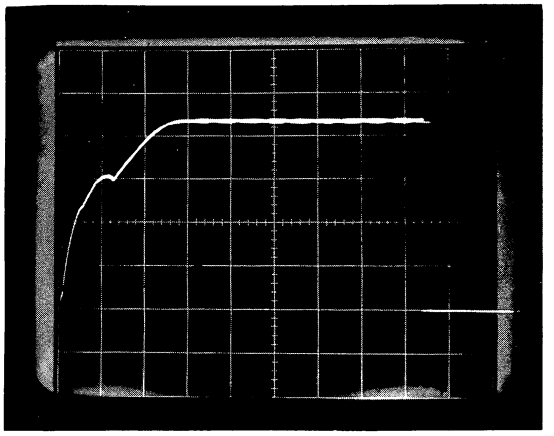


Figure 30.5

Time Base:	5 ms/cm	
Time from start of pick to feedback		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.

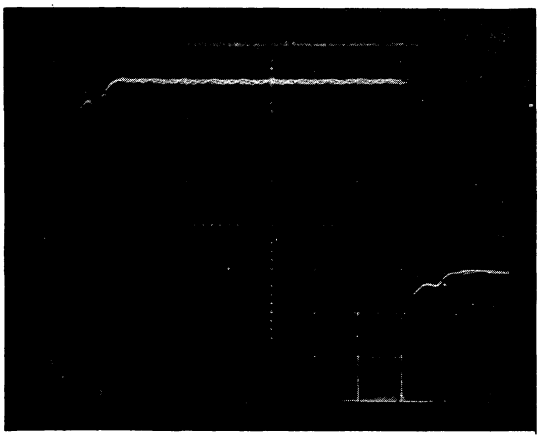


Figure 30.6

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

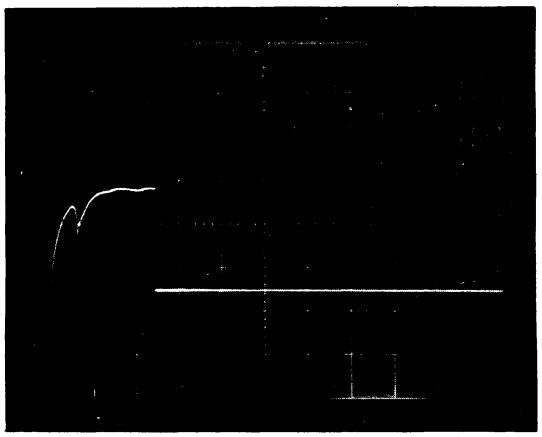


Figure 30.7

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

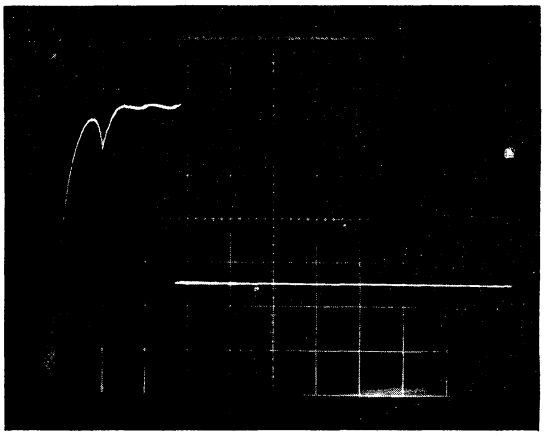


Figure 30.8

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

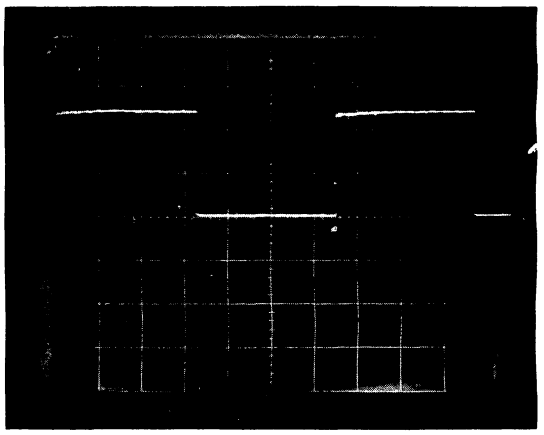


Figure 30.9

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

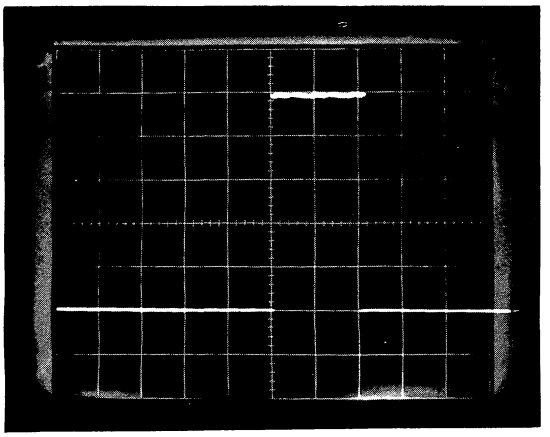


Figure 30.10

BOUNCING C1 N/O POINT

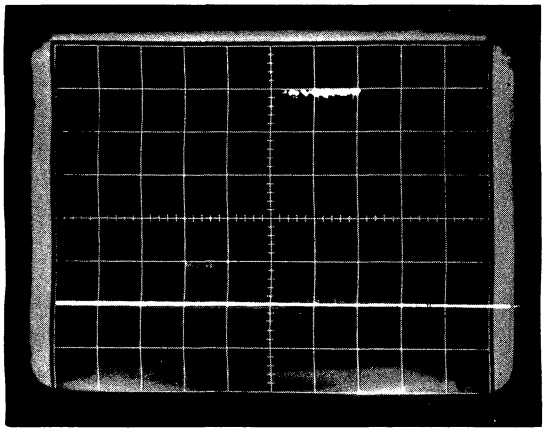


Figure 30.11

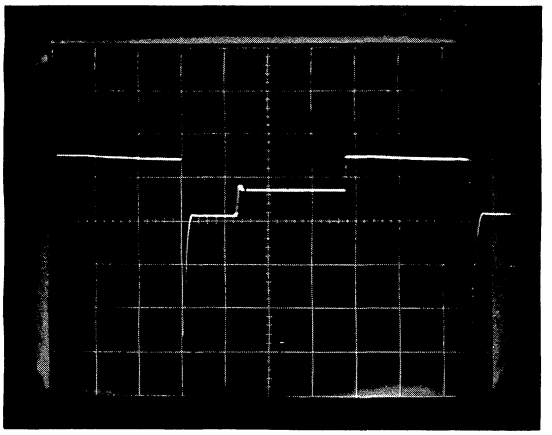


Figure 30.12

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

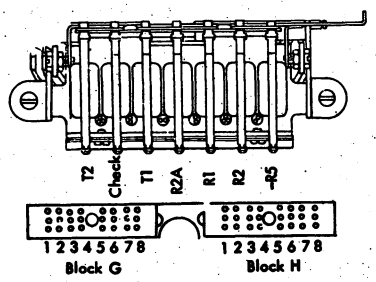
Excessive Mechanical Delay	16.3 ms
Magnet Seal Time	6.5 ms
0° to 130°	46.5 ms
Total of	69.3 ms

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.

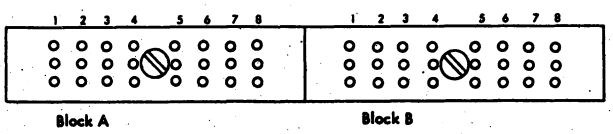
30.4 S.H.

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

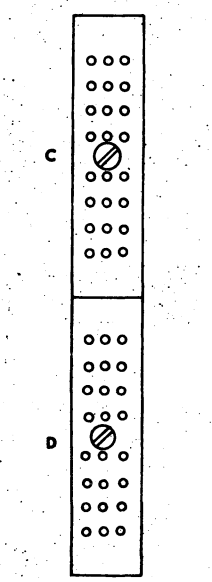
31.0 I/O Component Location



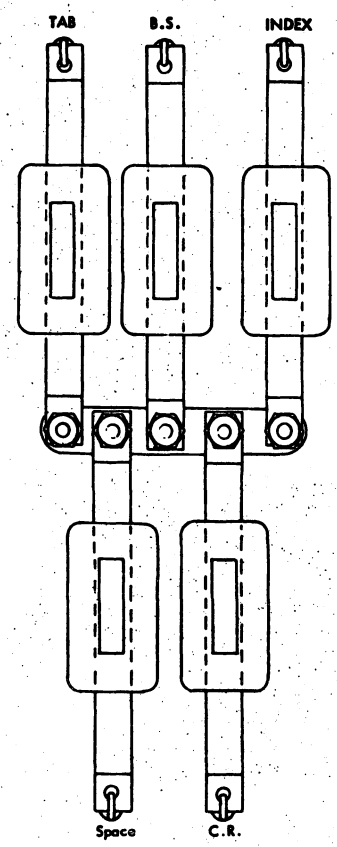
Print Selection Magnet Assembly



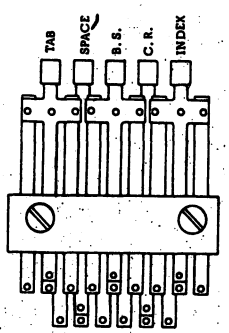
Selection Contact Terminal Blocks



Operational Terminal Block



Operational Magnets



Operational Magnet Contacts

Figure 31.0