IBM

IBM Electronic Typewriter

Service Manual

S544-4014-0

IBM Electronic Typewriter 50

IBM Electronic Typewriter 60

IBM Electronic Typewriter 75

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SAFETY PRECAUTIONS

All IBM customer service representatives are expected to take every safety precaution possible and observe the following safety practices when servicing IBM equipment.

Mechanical Safety:

1. *Safety glasses must be worn.*
2. *All safety devices, such as guards, shields, signs, and ground wires, must be restored after maintenance. When a guard or shield is removed to observe or make an adjustment, that shield must be replaced when work in the area is completed.*
3. *Watches, rings, necklaces, ID bracelets, or other jewelry must be removed when servicing the machine.*
4. *Care must be used when working near moving parts. Keep hair away from moving parts. Avoid wearing loose clothing that might be caught in the machine. Shirt sleeves must be kept buttoned or rolled above the elbows. Ties must be tucked in the shirt or have a tie clasp approximately three inches from the end. Tie chains are not recommended.*

Electrical Safety:

1. *The equipment referenced in this manual may use high voltages. Check voltage labels!*
2. *Safety glasses must be worn when checking energized circuits.*
3. *If a circuit is disconnected for servicing or parts replacement, it must be reconnected and tested before allowing the use of the machine.*
4. *Power should be removed from the machine for servicing whenever possible. Remember, when checking voltages, avoid contacting ground potential, such as metal floor strips or machine frame.*
5. *Meter continuity check should be used instead of voltage checks whenever possible.*
6. *Do not apply power to any part, component, or subassembly when it is not physically mounted in the machine.*

General Safety:

1. *Each customer service representative is responsible for ensuring that no action on his/her part makes the product unsafe or exposes customer personnel to hazards.*
2. *Store the removed machine covers in a safe, out-of-the-way place where no one can trip over them.*
3. *If you must leave the machine in a down condition, always install the covers and disconnect the power before leaving the customer's office.*
4. *Always place the CSR tool kit away from walk areas where no one can trip over it.*
5. *Maintain safe conditions in the area of the machine while performing and after completing maintenance.*
6. *Before starting the equipment, make sure fellow CSRs and customer personnel are not in a hazardous position.*
7. *All machine covers must be in place before returning the machine to the customer.*

NOTE: Refer to the Safety CEMs relating to this product(s) for further safety precautions.

INTRODUCTION

This service manual is for U.S. and World Trade customer engineers and other service personnel. This manual describes the operational theory and presents a sequence of adjustments to help service the IBM Electronic Typewriter.

The adjustment, diagnostic and parts manual (APM) should be used with this manual. Anyone using this manual should be familiar with the operator instructions and understand the theory of operation as described in this manual.

The Machine Introduction section describes the functions and applications of the machine and its features.

The Operating Instructions section helps determine whether there is a machine malfunction or an operator instruction problem.

The Functional Check section is in a sequence so important functions of the machine can be checked for proper operation. However, this check does not necessarily follow the sequence of operational theory and adjustments within the manual. The functional check should be used to help locate problems on the machine.

Each mechanism contains the theory of operation and the adjustments. Adjustments for each mechanism follow the theory of operation.

The adjustments should be made in the sequence as shown. After making an adjustment, all the following adjustments for that mechanism must be checked to make sure the adjustment does not affect later adjustments. The part to be adjusted and the direction the part must be adjusted are printed in red. When required, the view and mode or condition of the equipment is noted. Adjustment sequences or tolerances may sometimes differ from adjustments in other related publications; however, the publication with the latest date should normally be considered the most current.

The meter readings were taken with an IBM meter (P/N 9900157).

The Removals section shows a sequence of instructions for parts removal. The parts can be reassembled by reversing the removal steps.

If a detailed drawing of an assembly is required, use the parts catalog section.

All drawings are right front views unless otherwise noted.

The keybutton symbols referred to in some parts of this manual are the U.S. Correspondence arrangement and may differ from symbols used on other keyboard arrangements.

Follow all safety procedures when servicing the machine.

Install all guards and shields after servicing.

Warning: Keep hair, fingers and personal objects (such as bracelets, necklaces and neckties) out of the machine when the machine is on.

IBM ELECTRONIC TYPEWRITER
SERVICE MANUAL CONTENTS
(Alphabetical)

Continued

REMOVALS

MACHINE INTRODUCTION

The IBM Electronic Typewriter Model 75 is a 96-character, single-element machine. The electronic logic in the machine reduces the amount of mechanical parts and increases the applications of the typewriter, compared with non-electronic machines. Both 15.5 inch (394 mm) and 19.1 inch (485 mm) machines are available.

The machine is designed for applications similar to the IBM Electronic Typewriter Models 50 and 60 and the IBM Memory Typewriter. The machine also provides some new features in addition to the features of the Model 50/60.

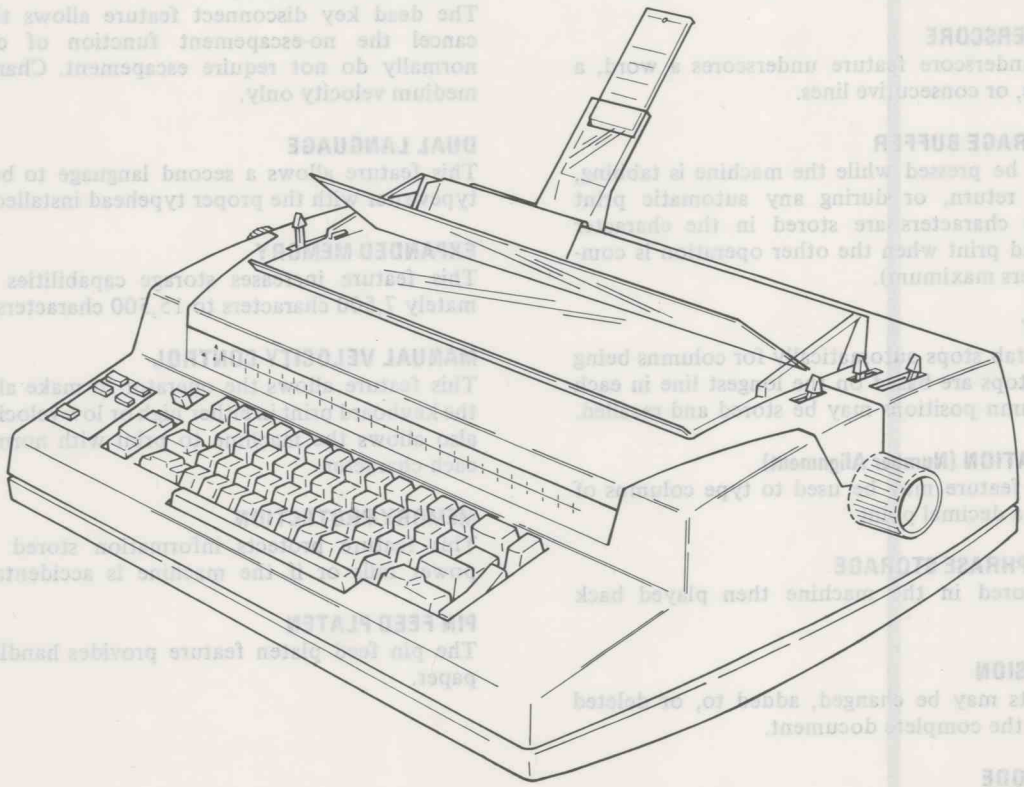
As text is entered at the keyboard, it passes through the electronics which sends electrical signals to the carrier and electromagnets within the machine. The Model 75 can store 7,500 characters in the electronic storage.

STANDARD FEATURES OF THE IBM ELECTRONIC TYPEWRITER 75

- AUTOMATIC CARRIER RETURN
- AUTOMATIC CENTERING
- AUTOMATIC INDENT
- AUTOMATIC LINE ERROR CORRECTION
- AUTOMATIC TAB GRID
- AUTOMATIC UNDERSCORE
- CHARACTER STORAGE BUFFER
- COLUMN LAYOUT
- DECIMAL TABULATION
- DOCUMENT AND PHRASE STORAGE
- DOCUMENT REVISION
- HYPHENATION MODE
- LIGHTED MARGIN SCALES
- MESSAGE LIGHTS
- NO PRINT
- PITCH SELECTION
- PRESELECTIVE PHRASE PLAYBACK
- SEMI-AUTOMATIC PAPER INSERTION

OPTIONAL FEATURES

- CARDHOLDING PLATEN
- DEAD KEY DISCONNECT
- DUAL LANGUAGE
- EXPANDED MEMORY
- MANUAL VELOCITY CONTROL
- MEMORY PROTECTION
- PIN FEED PLATEN



STANDARD FEATURES OF THE IBM ELECTRONIC TYPEWRITER

AUTOMATIC CARRIER RETURN
The carrier returns automatically if the Auto Rtn light is on, and a character follows a spacebar or hyphen when the carrier is five spaces to the left of the right margin. The character following the spacebar or hyphen prints at the left margin after the carrier return is completed.

During playback, this feature may also be used with a new right margin to change the line length of the played back text.

AUTOMATIC CENTERING
Headings or text may be centered automatically when a center code is entered before the headings or text.

AUTOMATIC INDENT
The carrier automatically returns to the indent position after the carrier return and when a coded tab has been entered.

AUTOMATIC LINE ERROR CORRECTION
Printed characters in a line may be corrected by depressing only the backspace correction keybutton, provided the carrier has not returned.

AUTOMATIC TAB GRID
A grid of tab stops one inch apart is automatically set when the machine is turned on. This grid is set when all other tab stops are cleared or when the standard tabs code is entered. Each of the four pitch selections has a separate tab grid.

AUTOMATIC UNDERSCORE
The automatic underscore feature underscores a word, a line, part of a line, or consecutive lines.

CHARACTER STORAGE BUFFER
Keybuttons may be pressed while the machine is tabbing, during a carrier return, or during any automatic print operation. These characters are stored in the character storage buffer and print when the other operation is complete (31 characters maximum).

COLUMN LAYOUT
This feature sets tab stops automatically for columns being typed. The tab stops are based on the longest line in each column. The column positions may be stored and recalled.

DECIMAL TABULATION (Number Alignment)
The decimal tab feature may be used to type columns of figures aligned to a decimal point.

DOCUMENT AND PHRASE STORAGE
Text may be stored in the machine then played back automatically.

DOCUMENT REVISION
Stored documents may be changed, added to, or deleted without retyping the complete document.

HYPHENATION MODE
When the Hyphenate light is on, the machine will stop automatic playback if the next word to be printed would go past the right margin. A decision may then be made and playback started again.

LIGHTED MARGIN SCALES
The margin scale for the pitch selected is lighted when the main power and motor switches are on.

MESSAGE LIGHTS
The lighted words on the message panel indicate the mode of the machine.

NO PRINT
If the no-print code is entered, any typed text does not print on the paper. This feature may be used to store characters to be corrected in line memory.

PITCH SELECTION
Both 10-pitch and 12-pitch typestyles may be used. Two sets of tab stops and margins may be stored in each pitch.

PRESELECTIVE PHRASE PLAYBACK
While the machine is printing text from phrase storage, other phrases may be programmed to play back in sequence.

SEMI-AUTOMATIC PAPER INSERTION
The index mechanism automatically positions the paper at the first writing line when the paper bail arm is moved to the full forward position, then released.

OPTIONAL FEATURES

CARDHOLDING PLATEN
The platen securely holds the top or bottom of stiff cards.

DEAD KEY DISCONNECT
The dead key disconnect feature allows the operator to cancel the no-escapement function of characters that normally do not require escapement. Characters print in medium velocity only.

DUAL LANGUAGE
This feature allows a second language to be typed on the typewriter with the proper typehead installed.

EXPANDED MEMORY
This feature increases storage capabilities from approximately 7,500 characters to 15,500 characters.

MANUAL VELOCITY CONTROL
This feature allows the operator to make all characters on the keyboard print in either high or low velocity. This feature also allows the machine to print with normal velocity for each character.

MEMORY PROTECTION
This feature protects information stored in memory if power fails or if the machine is accidentally unplugged.

PIN FEED PLATEN
The pin feed platen feature provides handling of pin feed paper.

This section is designed as a guide to aid the Customer Engineer in determining whether there is a machine malfunction or an operator instruction problem. This is not a complete operator's manual. If further information is needed, refer to the IBM Electronic Typewriter operating instruction manuals and reference manuals.

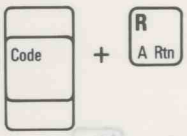
The operating instructions in this section apply to the operations of the Model 75 only. They are in addition to the Model 50 and 60 operations or are operated differently.

Symbols on keybuttons referred to in this section are U.S. Correspondence arrangement and may differ from the symbols on some other keyboard arrangements.

AUTOMATIC CARRIER RETURN

The automatic carrier return feature is similar to the Model 60, but is automatically turned on when power is applied to the typewriter. A right margin should be set for the automatic carrier return. To turn the automatic carrier return off, the operator must keyboard two coded *R*'s.

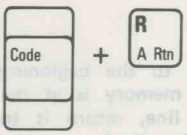
TO TURN AUTOMATIC CARRIER RETURN OFF:



(Two Times)

Auto Rtn light goes out.

TO TURN AUTOMATIC CARRIER RETURN ON:



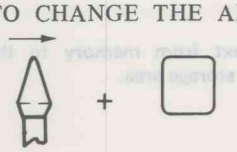
Auto Rtn light comes on.

SEMI-AUTOMATIC PAPER INSERTION

The semi-automatic paper insertion feature operates the index mechanism to feed paper to a preset position. To operate the feature, place paper at the rear of the platen, then move the paper bail lever to the fully forward position. The platen will be indexed six line spaces. When the lever is released the platen will rotate until the top of the paper is one inch above the writing line.

The amount of paper inserted may be changed by holding the paper bail lever fully forward and depressing a numbered keybutton. A keyboarded *0* (zero) will result in the top edge of the paper aligning with the writing line. Each number from *1* (one) to *9* (nine) will increase the distance from the writing line to the top of the paper by 1/2" (12.70mm).

TO CHANGE THE AMOUNT OF PAPER INSERTION:



Paper will move to preset position when semi-automatic paper insertion is operated.

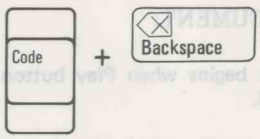
Paper Bail Lever Fully Forward

0 To 9 Keybutton

CHARACTER STORAGE BUFFER

The Model 75 character storage buffer electronically stores up to 31 keyboarded characters in memory while the printer is performing another operation. This allows the operator to continue keyboarding during a carrier return, a tab or a playback operation.

MARGIN RELEASE

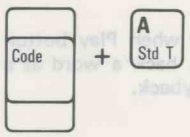


Carrier moves left through the left margin and operates like a margin release.

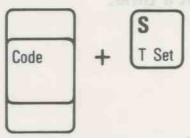
(At The Left Margin)

TAB GRID

A standard one-inch tab grid is set when the main power switch is turned on. If other tab stops are set, the grid will be cleared when the carrier is returned. A coded *A* will reset the standard tab grid and clear all previously set tab stops.

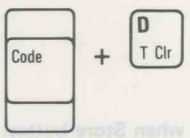


Sets standard tab grid and clears all set tab stops in the pitch selected.



Sets single tab stops.

NOTE: Carrier return then clears the tab grid and sets a tab stop at the extreme right of the machine.



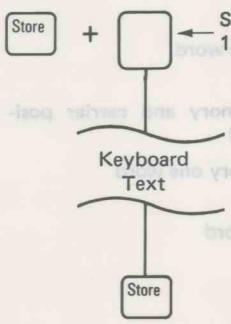
Clears single tab stops. If all tab stops are cleared, the tab grid is restored automatically.

WORKING WITH MEMORY

Text may be stored in a phrase storage area of memory by using a number for identification of that phrase. The numbers *1* to *99* may be used.

Text may be stored in a document storage area of memory by using a letter for identification of that document. The letters *A* to *Z* may be used.

TO STORE TEXT:



When the buttons are released, the phrase or Document light comes on and the machine is in phrase or document mode.

Text enters memory and prints on paper.

Phrase or Document light off. The machine is no longer in phrase or document mode.

NOTE: It is possible to store in phrase and document at the same time. To do so, the document storage area must be selected first, then the phrase storage area. To end the phrase storage, depress the Store button, and the Phrase light will go out. At this point you may end Document Storage by pushing Store again or you may select another phrase storage area by holding down the Store button and depressing another numbered keybutton.

TO PLAY BACK PHRASE OR DOCUMENT:

Store + ☐ (Storage Area 1-99 Or A-Z)

Operation begins when Play button is released.

Typewriter will play back all text in storage area unless stop code is read.

To Stop Playback:

Play

Playback stops at the next space.

To Play Back A Word:

Play

Operation begins when Play button is released. Plays back a word at a time, or stops playback.

To Play Back A Line:

Play + " ' Line

Plays back a line at a time.

To Play Back All Text In Storage Area:

Play + ? / All

Plays back all of text, or continues to end of text.

TO REVISE A DOCUMENT:

Store + ☐ (Storage Area A-Z)

Operation begins when Store button is released. Document light on. Storage area is selected.

To make revisions within a document, locate the memory to the position where the change is required, then keyboard or delete text. When text is added to memory, it does not erase other text from memory.

When the Document light is on, depressing and releasing these buttons causes the typewriter to:

Play — Play back one word

Adv — Advance memory and carrier position one word

Rtn — Return memory one word

Del — Delete one word

When the document light is on, the combination of these buttons causes the typewriter to:

Play + " ' Line — Play back one line or remainder of one line.

Play + ? / All — Play back all text or remaining text in a storage area.

Play + [ ] To + Keyboard First Word(s) Of Line + Play — Play back text up to word(s) keyboarded.

Adv + " ' Line — Advance memory to the beginning of the next line.

Adv + ? / All — Advance memory to end of text in storage area.

Adv + [ ] To + Keyboard First Word(s) Of Line + Adv — Advances memory to start of that line.

Rtn + " ' Line — Return memory to the beginning of the line. (If memory is at the beginning of a line, return is to beginning of previous line).

Rtn + ? / All — Returns memory to the beginning of the storage area.

Del + [ ] To + Keyboard First Word(s) Of Line + Del — Returns memory to start of that line.

Del + " ' Line — Deletes text from memory to the beginning of the next line.

Del + ? / All — Deletes text from memory to the end of the storage area.

Del + [ ] To + Keyboard First Word(s) Of Line + Del

Deletes text from memory to that line.

Store

Document light off when button is released (if Phrase light is off).

Del +

Document Storage Area A-Z

Deletes all information in that storage area.

TO REVISE A PHRASE:

Store +

Document Storage Area A-Z

Document light on when the Store button is released. (Select a document storage area not in use and empty.)

Adv +

Phrase Storage Area 1-99

Phrase text is copied into the document storage area when Adv button is released. (The phrase text is also in phrase storage area.)

Memory is at the end of that text in the document storage area.

Revise Text

Revise text. (See procedures in "TO REVISE A DOCUMENT" section.)

Rtn +

Phrase Storage Area 1-99

Revised text is stored in phrase storage area when Rtn button is released.

NOTE: This will erase all text already stored in that phrase storage area.

Del +

Document Storage Area A-Z

Text is deleted from document storage area when Del button is released.

AUTOMATIC CARRIER RETURN

Code + R A Rtn

Auto Rtn light on. Machine is in automatic carrier return mode.

NOTE: A right margin must be set for automatic carrier return operation.

NOTE: Automatic carrier return is automatically set when the main power switch is turned on. To turn off automatic carrier return, the operator must keyboard two *R*'s.

To Clear Automatic Carrier Return And Hyphenate:

Code + R A Rtn

Automatic carrier return and hyphenate are cleared.

HYPHENATE FEATURE

The Hyphenate feature is used with the Automatic Carrier Return.

TO OPERATE HYPHENATE FEATURE DURING PLAYBACK:

(If Auto Rtn Light Is Off):

Code + R A Rtn + R A Rtn

Auto Rtn light and Hyphenate light turned on. Machine is in Hyphenate mode.

When the Hyphenate light is on during playback, the machine will stop if the next word to be printed would go past the set right margin. At this point the operator has three choices.

1. TO KEEP THE WORD ON THAT LINE:

Play + ? / All

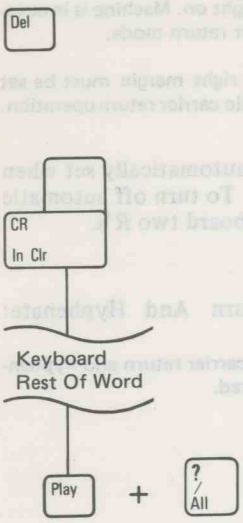
Word prints on same line.

2. TO PUT THE WORD ON THE NEXT LINE:

CR In Clr Then Play + ? / All

Carrier returns to next line and playout continues.

3. TO HYPHENATE THE WORD:



Delete the word to be hyphenated from playout. Type the first part of the word and a hyphen.

NOTE: The word is deleted from memory if the document light is on.

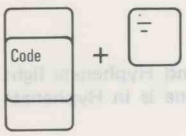
The carrier returns to next line.

Word prints on paper.

Playout continues.

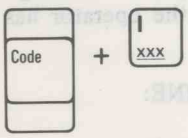
NOTE: If words or numbers with required hyphens are stored, the code and hyphen button should be used. This will prevent the automatic deletion of the hyphen when the word or number is played back and is located within the line.

TO OPERATE A REQUIRED HYPHEN:



Hyphen prints. Required hyphen is stored in memory. (In operator's manual it is called a permanent hyphen.)

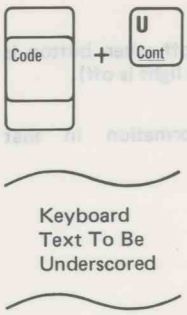
WORD UNDERSCORE

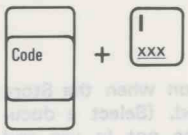


Machine automatically underscores a word. (This is the same as the Model 50/60 but the keybutton has XXX symbols.

CONTINUOUS UNDERSCORE

With the carrier positioned where the underscore should start.

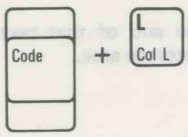




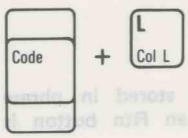
Carrier will move back to where underscore is to start then underscore the line.

If the next line is to be continuously underscored, depress carrier return instead of Code and XXX. Each subsequent line will be automatically underscored when the carrier return is depressed until Code + XXX is used.

COLUMN LAYOUT



Column layout light on. Instructs typewriter to set column layout. (This is similar to the Model 50/60 but an indicator light comes on when column layout is coded.)

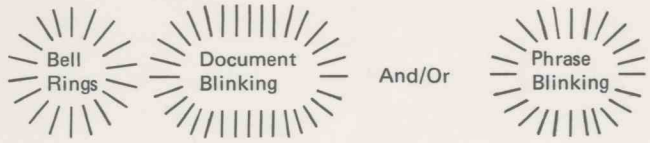


Columns light goes off and original tabs are restored.

NOTE: While centering or using tab to type a column (columns light on) at the right margin, the Auto Return light will go off, then come back on after a carrier return.

BLINKING LIGHTS AND BELL

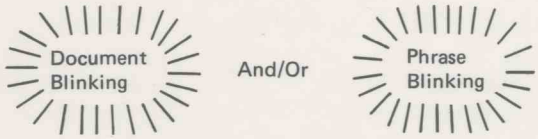
Bell rings three times, and Document and/or Phrase lights blink (during text storage):



This indicates that there is only space for one hundred characters or functions in memory.

NOTE: To complete storage of a document or phrase, it may be necessary to delete some text from another storage area. (Refer to "TO REVISE A DOCUMENT.") After a storage area is deleted for this reason, the machine automatically returns to the original document at the position where the bell rang.

Document and/or Phrase lights blinking:



This indicates less than one hundred characters or functions in Memory.

Bell rings one time when keyboarding:

This indicates that the carrier is one-half inch from the right margin.

Bell rings one time when using Adv To, Rtn To, Play To, or Del To:

This indicates that the machine cannot find a line in memory starting with the word(s) keyboarded.

Bell rings one time when play button is depressed after the Del button during Hyphenate decision in playout:

This is a warning that the word to be hyphenated will not be printed.

Bell rings each time a keybutton is depressed:
(Phrase and/or Document lights blinking)

This indicates that the memory is full and no more text may be stored until a storage area is deleted.

Bell rings when coded *L* is depressed.

This indicates that the machine is in continuous underscore mode. Continuous underscore mode must be cancelled to continue with column layout.

NOTE: If multiple space bars and/or backspaces are used to fill memory, when played back, the carrier does not space or backspace the same as when stored. Also, if lines contain only spacebars and/or tabs between carrier returns, the index does not operate when the carrier returns and that line is not stored in memory.

Hyphenate light blinking:

This indicates that a hyphenation decision is necessary to continue with playback.

FUNCTIONAL CHECK

USE THE FUNCTIONAL CHECK BEFORE AND AFTER EVERY SERVICE CALL

This check will help when servicing a machine, particularly when the symptom is not known. When any part of the check indicates a failure, or possible failure, the correct diagnostic aid may be referred to for the cause.

Before making any repairs, it is necessary to isolate the failing area. A complete Functional Check is suggested.

NOTE: Check with the operator before turning main power off.

VISUAL INSPECTION

Look at the machine carefully for any loose, damaged or missing parts. Also, look for foreign material in the machine, such as pencils, erasers and paper clips.

POWER SWITCH/MOTOR SWITCH

1. Turn the power switch on.
2. Turn the motor switch on; the machine should POR just before the switch detents. The carrier will automatically advance to the set left margin if the power switch was already on.

With the motor on, there should be no excessive noise from the machine.

PAPER INSERTION

With paper placed to the rear of the platen, move the paper bail lever to the fully forward position, then release. The platen should index to the proper writing line. The paper should feed straight and not wrinkle or tear.

PAPER RELEASE

Pull the paper bail forward. Make sure the feed rolls hold the paper tightly. Pull the paper release lever forward. The paper should be free to move around the platen and left or right.

DETENT RELEASE

Pull the detent release lever forward. Make sure the platen rotates and the detent disengages from the ratchet.

PLATEN VARIABLE

Push the left platen knob to the right. The platen should now turn freely. The ratchet should engage the platen when the knob is released.

KEYBOARD

Perform a strikeup of every character. All keybuttons should move down easily and the correct character should print before the keybutton stops.

REPEAT CHARACTERS

Lightly press the Hyphen/Underscore keybutton. The correct character should print one time only. The character should repeat when more pressure is applied. Excessive pressure on the keybutton should not stop the repeat operation. Repeat this step for all other repeat characters and Spacebar, Backspace, Carrier Return and Index.

TAB

Operate the tab. The carrier should move to the right before the keybutton stops.

SHIFT

Type alternate uppercase and lowercase characters. The characters should print in the proper case.

Slowly press the shift lock. The button should lock down just as, or slightly after, a shift occurs.

Lock the shift in uppercase and type a full line of underscores. The lock should not release.

The shift should unlock when either shift button is lightly pressed. Allow the shift button to move up. The machine should shift to lowercase before the shift button stops moving up.

PRINTER

Set the right margin at 70/84; return to 0. Press Code and keyboard two uppercase *C*'s. Allow the Printer Exerciser to play back for several lines. Check the playback for the following conditions:

a. The correct characters should have printed.
b. All characters should have even color and impression.
c. No characters should be visibly out of position.
d. There should be even spacing between characters and no overlap.
e. There should be no excessive noise.

The bell should not ring and the machine should continue the Printer Exercise until the motor switch is turned off.

LINESPACING

Type several lines of underscores in all linespace lever positions. The space between the lines should be even for all linespace lever positions. The lever should detent in all positions.

PITCH SELECTION

The carrier should move to the set left margin when the pitch selection lever is moved to a different position.

Make sure the correct margin is lighted in each pitch selection.

SCALES

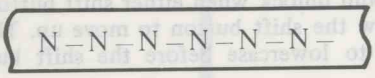
Type a line of *V*'s in uppercase, 10P or 12P. The horizontal lines on the cardholder should be parallel to the line of *V*'s.

The points on the bottom of the *V*'s should align with the vertical lines on the cardholder. Press the cardholder release lever. The cardholder should pivot up, allowing it to be easily removed. Reinstall the cardholder.

Operate the carrier return to the far left side. The carrier pointer should align with the 0 on the front scale.

ERROR CORRECTION

1. Type a few characters, then press the correcting keybutton one time. The image must be completely removed from the paper (or covered up if cover-up tape is used).
2. Type another character. It should be in the same position as the original character. Repeat this step several times on the writing line.
3. Type several underscored characters. Press the correcting keybutton and allow it to repeat. All characters must be removed from the paper.



The correcting tape should look like the following example:

The characters should not overlap and should be positioned on the ribbon with a clearance from the top and bottom edge.

RIBBON SYSTEM

Look at the ribbon you have been using and the typed samples. The pattern on a film ribbon should look like the following example:

The characters should not overlap and should be positioned on the ribbon with a clearance from the top and bottom edge. Inspect the copy for ribbon flaking and ribbon particles.

With a Tech III ribbon installed on the machine, inspect the ribbon pattern. The characters should overlap and there should be a clearance at the top and bottom edge of the ribbon. Type several lines of underscores. The type should not fade.

Inspect the ribbon in its path around the guides and rollers. There should be no folds in the ribbon.

Operate the spacebar. The ribbon should not feed.

Place the Stencil Control Lever in the stencil position and type several characters. The ribbon should not feed or lift.

CONTROL AND MESSAGE PANEL CHECK

1. Press Code + *R* three times – The print shaft should cycle each time. The Auto Return and Hyphenate messages will illuminate in the following sequence: Auto Return, Auto Return and Hyphenate, both off, then Auto Return.
2. Press Code + *L* – The print shaft will cycle. The Auto Return message goes out and the Columns message illuminates. Carrier return and press Code + *L* – Columns message goes off.

To perform a function using a control switch, hold the control switch down and press the required keybutton. Then release the control switch.

1. Press Store and a number (1-99). The print shaft cycles and the Phrase message illuminates. Depress the Store button. The print shaft cycles and the Phrase message goes off.
2. Press Store and a letter (A-Z). The Document message will come on and the print shaft will cycle.
3. Keyboard *AAA BBB CCC*.
4. Operate Rtn three times. The print shaft will cycle and the carrier will reposition.
5. Manually roll the paper up and operate Advance. The print shaft will cycle and the carrier will reposition.
6. Operate Del – The print shaft will cycle.
7. Operate Play – *CCC* plays out.
8. Operate Rtn twice – The print shaft cycles and the carrier repositions.
9. Operate Del twice – The print shaft cycles each time and deletes the remaining information.
10. Operate Store – The print shaft cycles and the Document message goes off.

PRINTER EXERCISER

TO START PRINTER EXERCISER – Set right margin at 70/84. Position carrier at zero on the margin scale. Shift to uppercase. Press two coded *C*'s.

NOTE: Printer Exerciser may differ on logic boards of a different level and/or language.

TO STOP PRINTER EXERCISER – Turn motor switch off.

NOTE: Do NOT turn motor switch off during a carrier return. It may damage the escapement mechanism or the electronics.

The Printer Exerciser has two parts: Part one prints a zero, cycles seven times in no-print (overstrikes the zero), and then executes one more cycle that may or may not correct the zero. Part two types:

[IBM Ribbons/

The driver board is checked during part 1 of the Printer Exerciser. If a failure occurs, the message panel lights come on momentarily and the test stops. This indicates a bad driver board or a short circuit in the carrier. If no problem is detected in part 1, the Printer Exerciser continues.

Part 2 of the Printer Exerciser is a selection, print and alignment check. During part 2, the electronics checks the time taken to do an escapement operation. If an escapement operation is slightly slow, the bell rings for each failure and the typewriter locks up intermittently. If an escapement operation is very slow, the machine will lock up and play-out will stop. (To start the Printer Exerciser again, turn motor switch off, then on, return to zero and start again.) If no problem is found by the electronics, the Printer Exerciser will repeat until stopped.

To return to normal typing, turn motor switch on. The carrier will return to zero on the margin scale, then advance to where the Printer Exerciser was stopped. At this point the machine will either complete part 1 of the Printer Exerciser or type two characters of part 2 before stopping. The machine is now ready for normal operations.

Models 50/60 Printer Exerciser

The Printer Exerciser should match the specifications described in the functional check (printer). To return to normal typing, turn the motor switch off and then on again. The carrier will return to zero and advance to the left margin.

Level 1 [IBM Ribbons/
Level 2 [IBM Ribbons/ –
Level 3 [IBM Ribbons/ – [IBM Ribbons (10 And 12 Pitch Only Model 50)

ADDITIONAL CHECKS, MODEL 60

1. Press Store plus a number. (Check with operator – do not use a storage area containing operator information.) The print shaft should cycle and the store light should come on. Press Store. The light should go off.

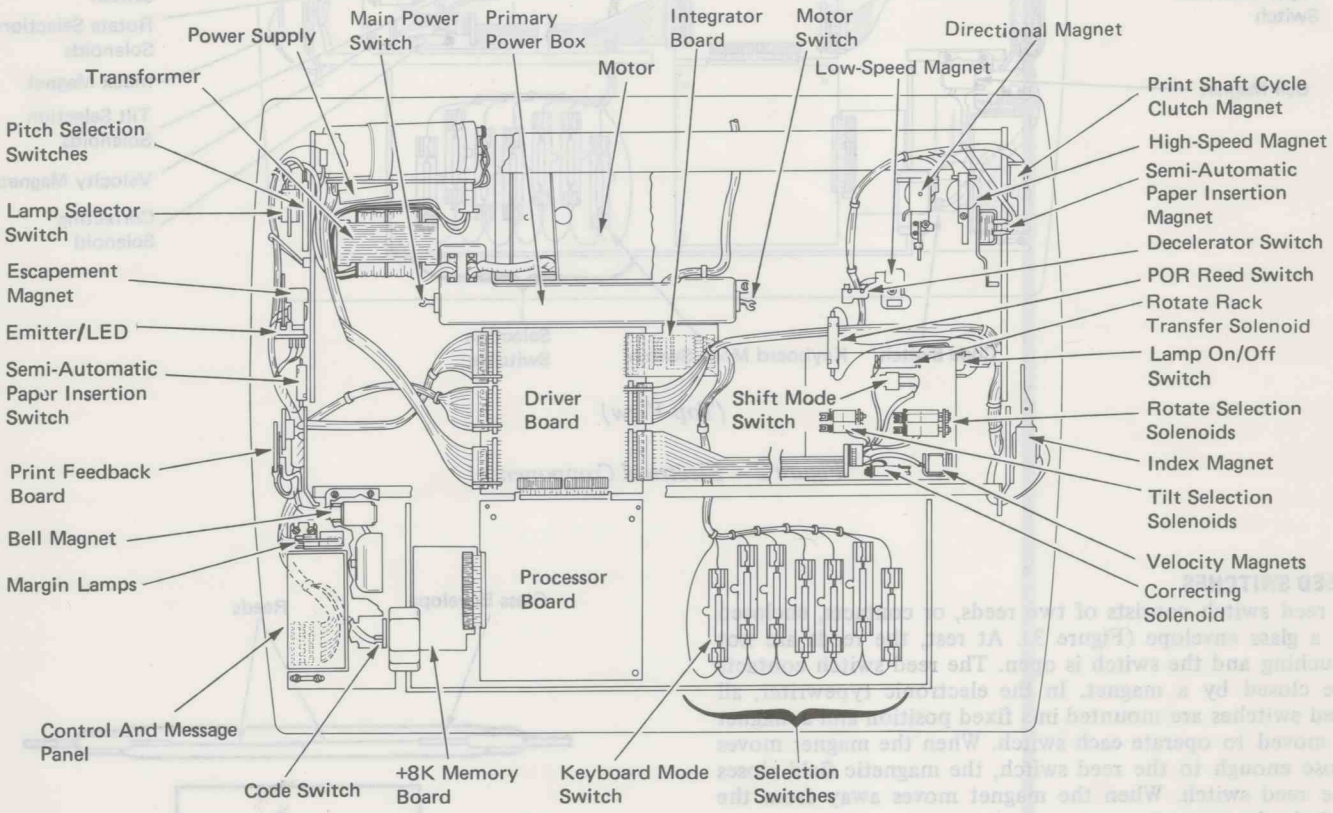
2. Press Del plus same number as step 1. The print shaft should cycle.

3. Latch down the Auto Rtn button. Set a right margin. Type through the margin. The carrier should automatically return after a character following a space or hyphen. With the Auto Rtn button up, the carrier should not return automatically.

ELECTRONICS AND ELECTRICAL WIRING OPERATIONAL THEORY

The four main components of electronics and electrical wiring are: primary power wiring, transformer and power supply, electronics, and machine wiring.

The primary power wiring distributes 115 VAC to the transformer and the motor. The transformer and power supply provide DC voltage for the electronics and 2.5 VAC for the margin lamps. The electronics consist of the electronic boards that provide the logic to control machine operations. The machine wiring connects the electrical components to the electronics. The electrical components are the magnets, solenoids, switches, lamps, and escapement LED.

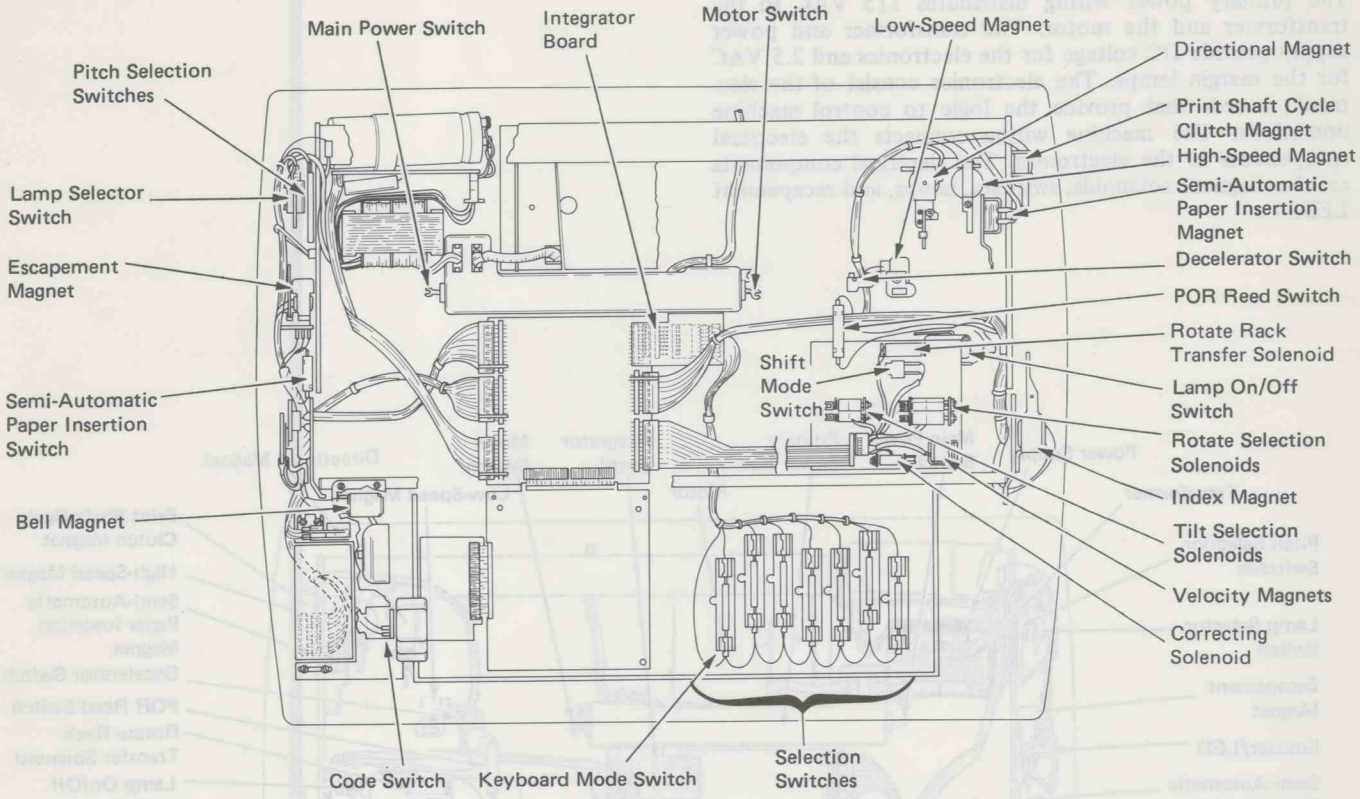


(Top View)

Figure 1 – Components Of Electronics And Electrical Wiring

ELECTRICAL COMPONENTS

The electrical components include reed switches, solenoids, and magnets. Reed switches indicate machine conditions to the electronics. Solenoids and magnets are energized and deenergized to begin a mechanical operation (Figure 2).



(Top View)

Figure 2 – Electrical Components

REED SWITCHES

A reed switch consists of two reeds, or contacts, enclosed in a glass envelope (Figure 3). At rest, the reeds are not touching and the switch is open. The reed switch contacts are closed by a magnet. In the electronic typewriter, all reed switches are mounted in a fixed position and a magnet is moved to operate each switch. When the magnet moves close enough to the reed switch, the magnetic field closes the reed switch. When the magnet moves away from the switch, the contacts open.

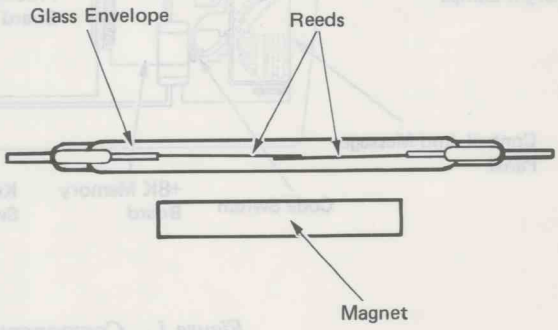
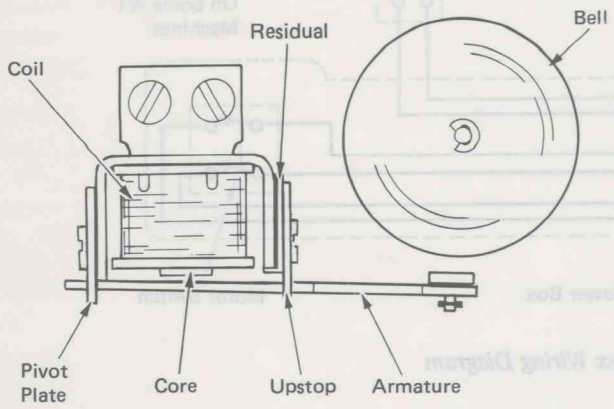


Figure 3 – Reed Switch Operation

MAGNETS

Magnets consist of a core, coil, armature, pivot plate, upstop, and residual (Figure 4). In the static condition, voltage is present at the coil. When the logic completes the magnet circuit to ground, current flows through the coil which magnetizes the core. When the core magnetizes, it attracts the armature. This is called energizing the magnet. The motion of the armature initiates mechanical operations; such as, releasing spring clutches, releasing cycle clutches, and ringing the margin bell. The upstop controls the distance the armature moves. The residual prevents the armature from touching the core and becoming magnetized.



(Right Side View)

Figure 4 – Magnets

SOLENOIDS

A solenoid consists of a coil, plunger, and air gap adjusting screw (Figure 5). A magnetic field is created when current flows through the coil. This is accomplished in the same manner as for magnets. This magnetic field pulls the plunger into the coil. This is called energizing the solenoid. The air gap adjusting screw increases the strength of the magnetic field. The air gap adjusting screw can be adjusted to prevent the plunger from touching the screw and becoming magnetized. Solenoids are used in the character selection mechanism and the correcting mechanism.

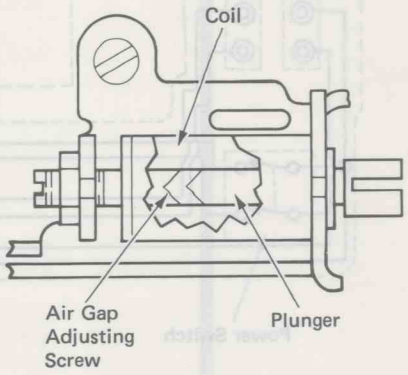


Figure 5 – Solenoid Operation

PRIMARY WIRING

The primary wiring distributes 115 VAC to the transformer connector and the motor connector. Primary wiring consists of the linecord, primary power box, motor switch, main power switch, and transformer and motor connectors (Figure 6). The main power switch provides power to the transformer connector and to the motor switch. With the main power switch on, the motor switch provides power to the motor connector. This system allows voltage to reach the electronics with the motor switch off.

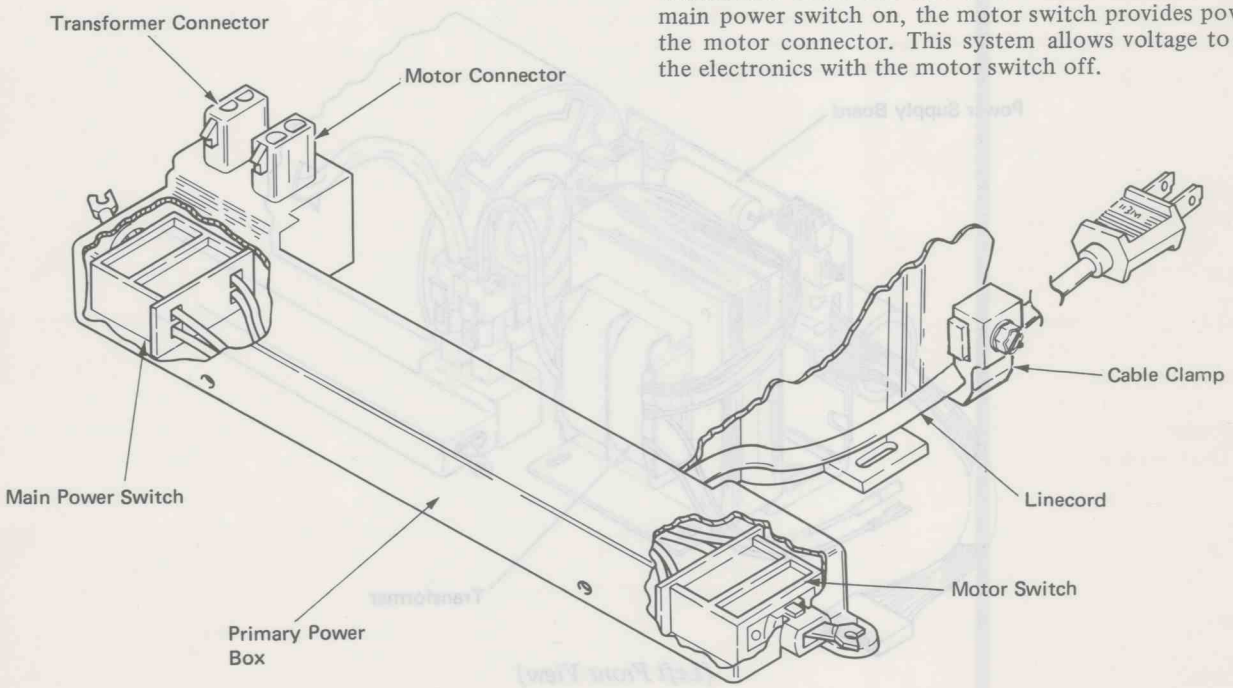


Figure 6 – Primary Power Box

The primary power box wiring diagram is shown in Figure 7.

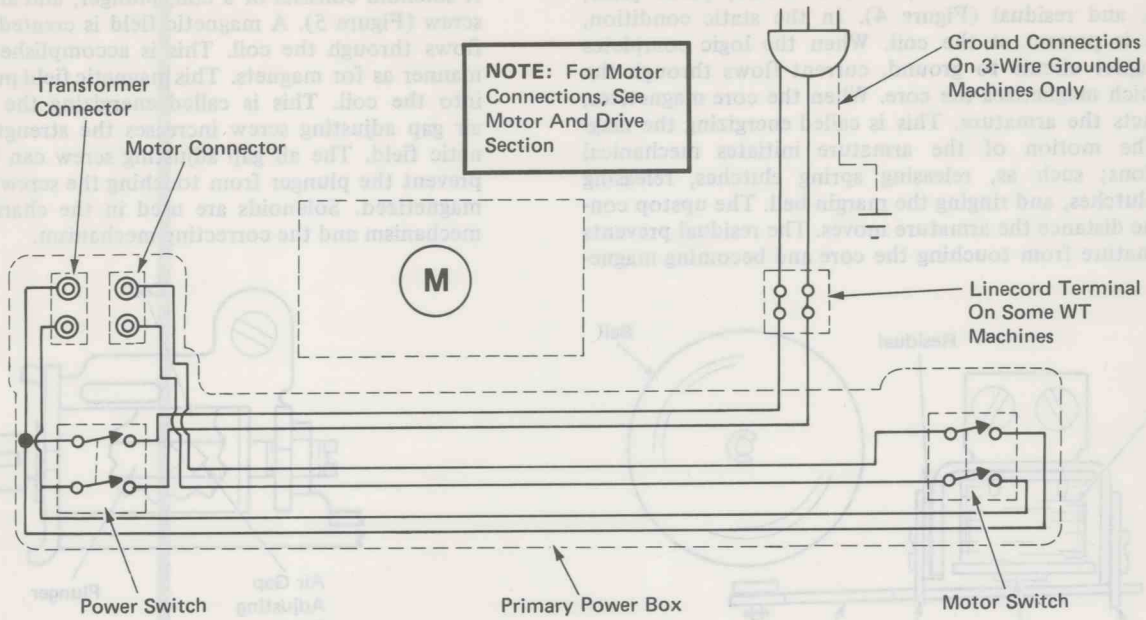
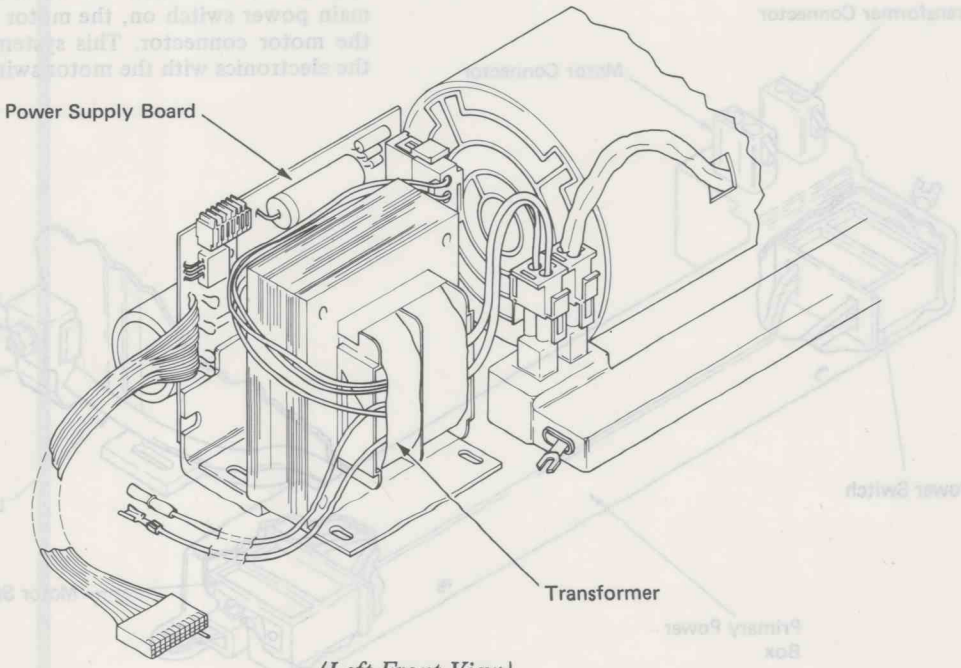


Figure 7 – Primary Power Box Wiring Diagram

TRANSFORMER AND POWER SUPPLY

The power supply includes the power supply board and the transformer. The power supply provides +5 VDC, -5 VDC, 8.5 VDC, and 13 VDC to the electronics (Figure 8). The power supply also provides the Power On Reset signal to the electronics. The Power On Reset is discussed later in this section.



(Left Front View)

Figure 8 – Power Supply

KEYBOARD CLUTCH

The keyboard clutch is a spring clutch (Figure 9). The drive arbor mounts to the upper shaft of the power module and rotates when the motor is on. When the clutch is released, it drives the filter bail drive cam.

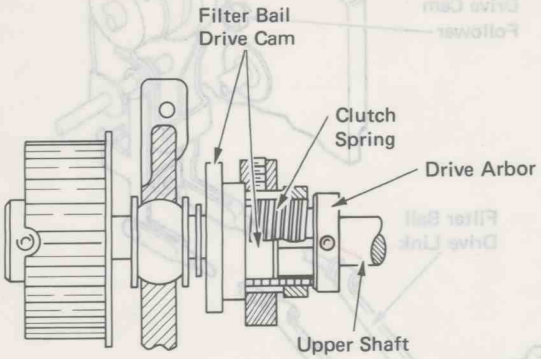
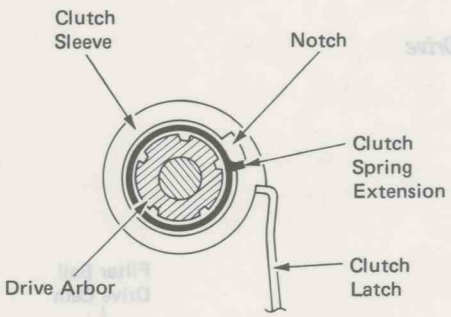


Figure 9 – Keyboard Clutch

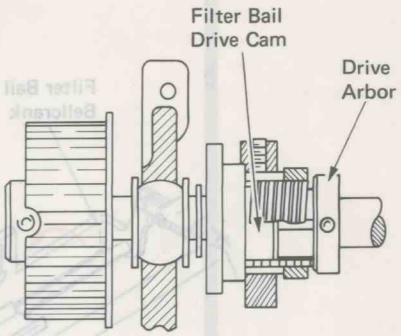
An extension on the right end of the clutch spring fits into a notch in the clutch sleeve (Figure 10). The clutch latch engages the clutch sleeve to hold the clutch spring disengaged from the drive arbor.



(Right Side View)

Figure 10 – Keyboard Clutch Spring – Disengaged

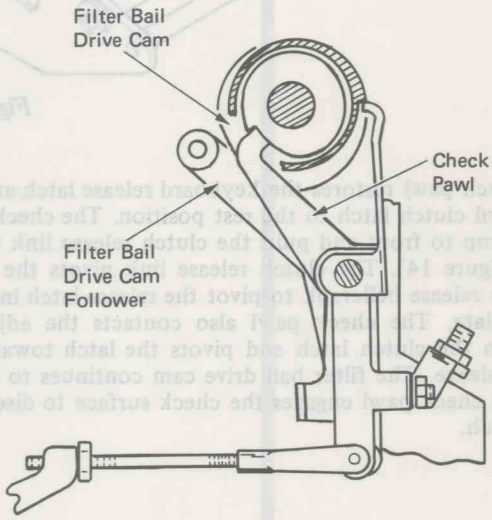
When the clutch latch releases the clutch sleeve, the clutch engages the drive arbor and rotates the filter bail drive cam (Figure 11).



(Front View)

Figure 11 – Keyboard Clutch Spring – Engaged

The filter bail drive cam has two drive surfaces. One surface pivots the filter bail drive cam follower and the other surface pivots the check pawl (Figure 12).



(Right Side View)

Figure 12 – Filter Bail Drive Cam

The filter bail drive cam follower pivots top to front and pulls the filter bail drive link to the rear (Figure 13). The filter bail drive link moves to the rear and pivots the filter bail bellcrank to drive the filter bail forward.

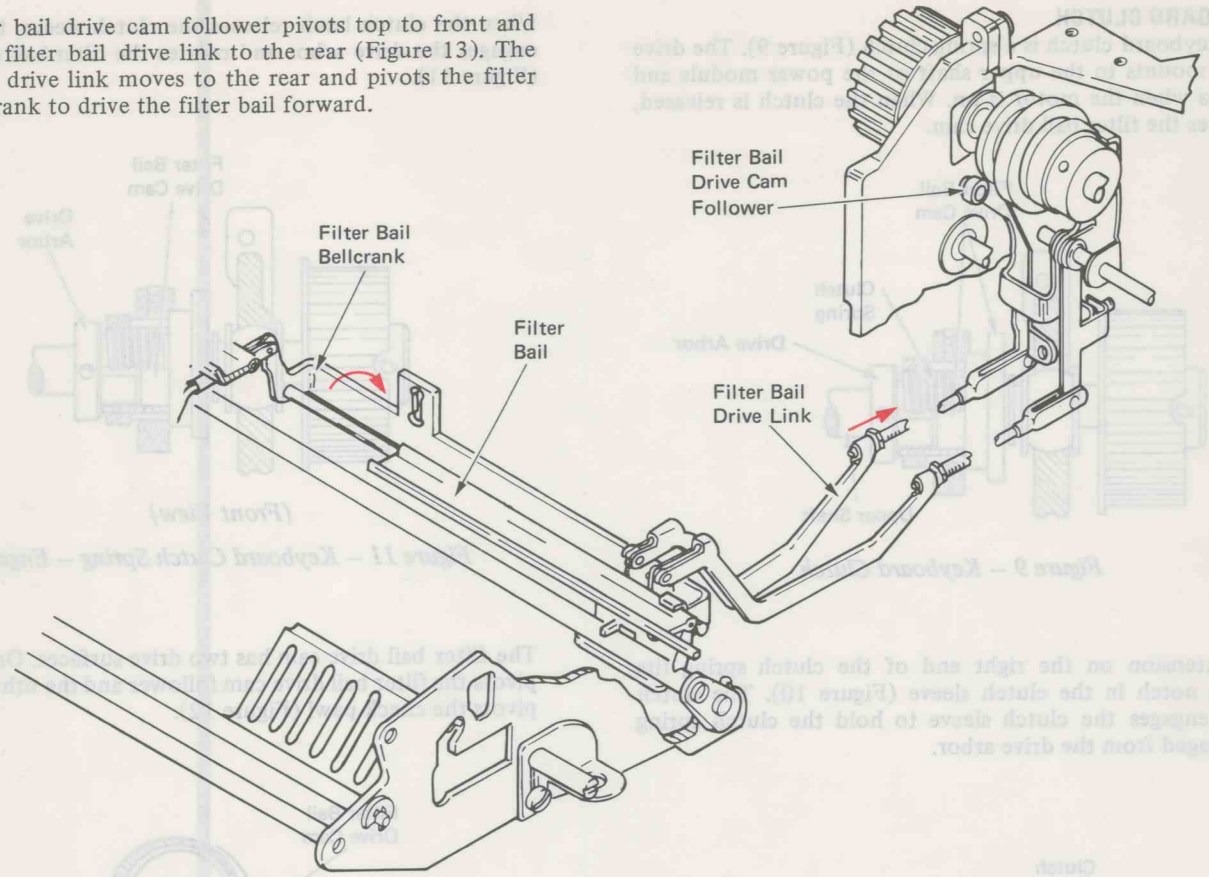
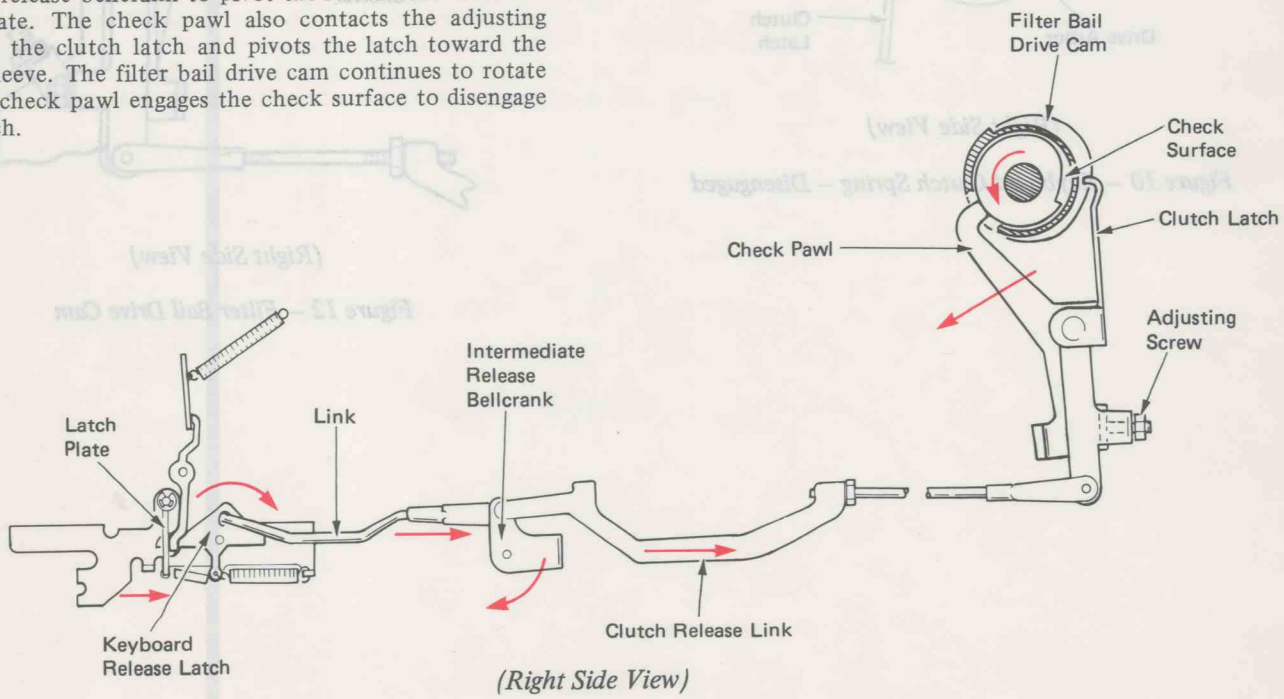


Figure 13 – Filter Bail Drive

The check pawl restores the keyboard release latch and the keyboard clutch latch to the rest position. The check pawl pivots top to front and pulls the clutch release link to the rear (Figure 14). The clutch release link pivots the intermediate release bellcrank to pivot the release latch into the latch plate. The check pawl also contacts the adjusting screw in the clutch latch and pivots the latch toward the clutch sleeve. The filter bail drive cam continues to rotate and the check pawl engages the check surface to disengage the clutch.



(Right Side View)

Figure 14 – Release Latch Restoring

The transformer provides 40 VAC to the power supply and 2.5 VAC to the margin lamp circuit (Figure 9). The margin lamp circuit is discussed in the Margins section.

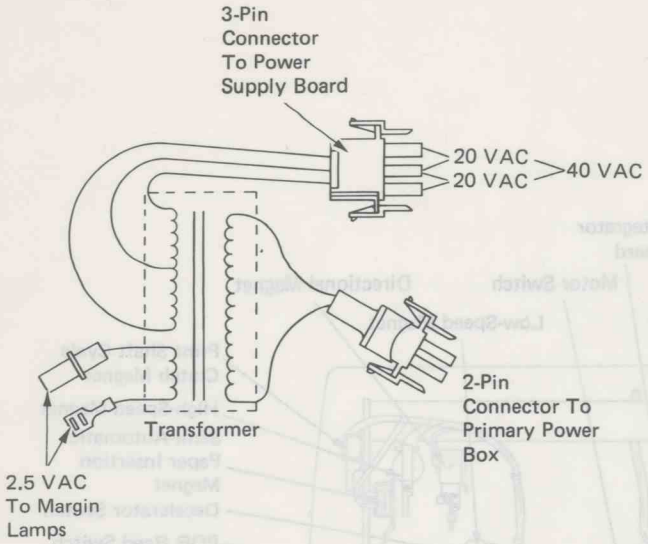


Figure 9 – Transformer Wiring

ELECTRONICS

The electronics includes the driver board, processor board, integrator board and the +8K board, if installed (Figure 10). The driver board, processor board, and +8K board contain the logic to control machine operations. The integrator board filters signals from the keyboard reed switches.

The electronic boards receive input from the keyboard switches, control panel switches, print feedback switch, semi-automatic paper feed switch, pitch selection switches, shift mode switch, POR switch, code switch, and emitter board. The switches indicate the status of the machine to the electronics or instruct the electronics to perform a machine operation. Signals from the emitter board monitor the position of the carrier. The keyboard signals the electronics to energize or deenergize magnets and solenoids to perform machine operations.

The electronics contains two types of logic: Read Only Storage (ROS) and Random Access Memory (RAM). ROS logic is programmed into the electronics and cannot be changed. When a machine function, such as spacebar, is required, the ROS logic initiates the sequence of machine operations to complete the function. RAM logic is the electronic memory of the machine and can be changed. RAM logic stores text, margin settings, and tab settings.

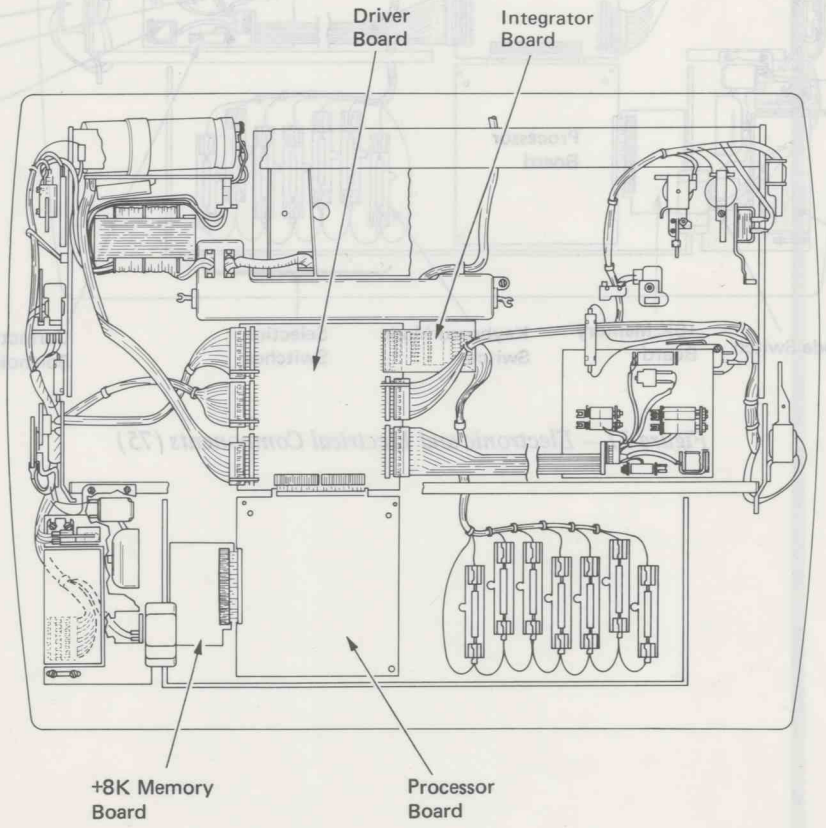


Figure 10 – Electronic Boards

MACHINE WIRING/COMPONENT LAYOUT

The machine wiring connects the electrical components to the electronics. The locations of all the electrical and electronic components in the Model 75 are shown in Figure 11.

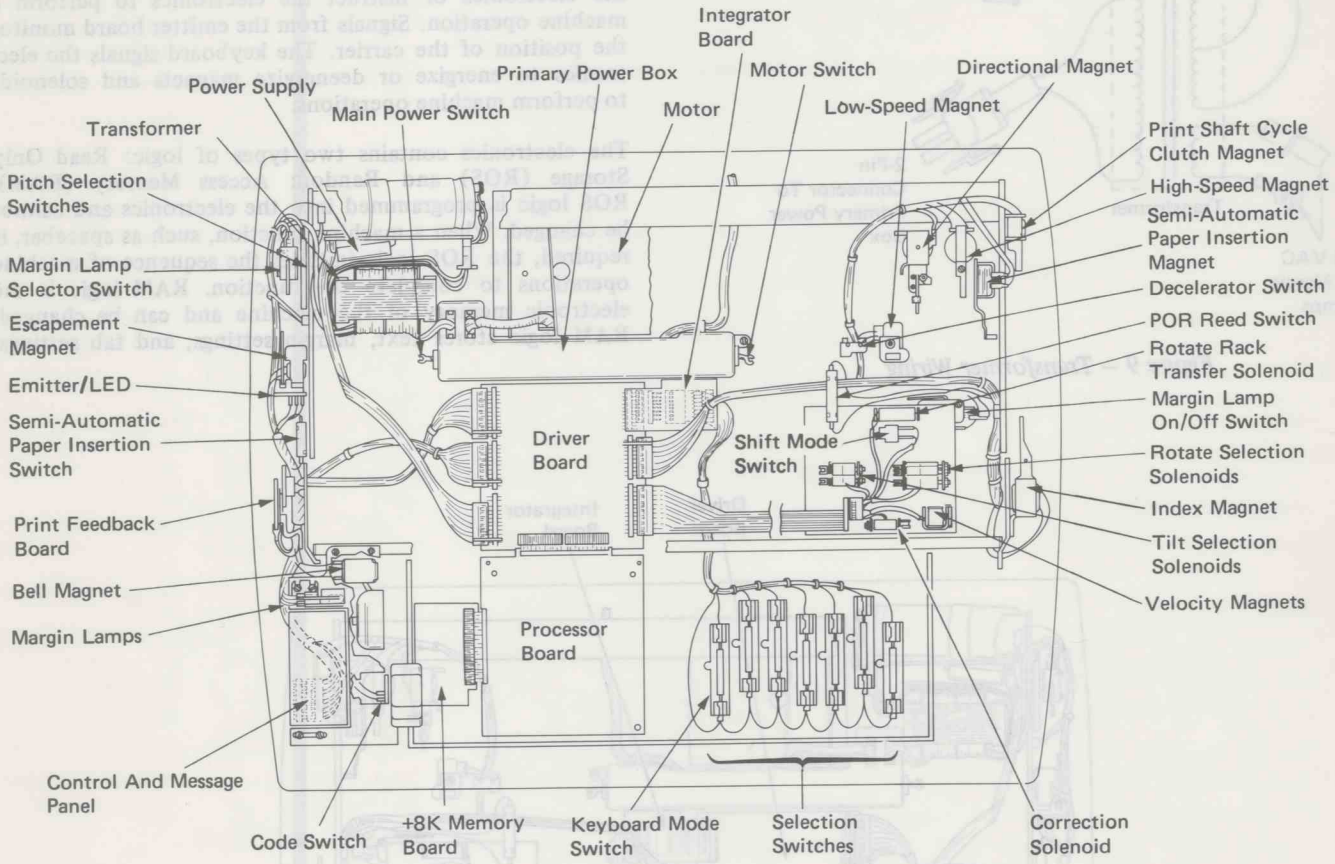


Figure 11 – Electronic and Electrical Components (75)

The location of electrical and electronic components for the Models 50 and 60 are shown in Figure 12.

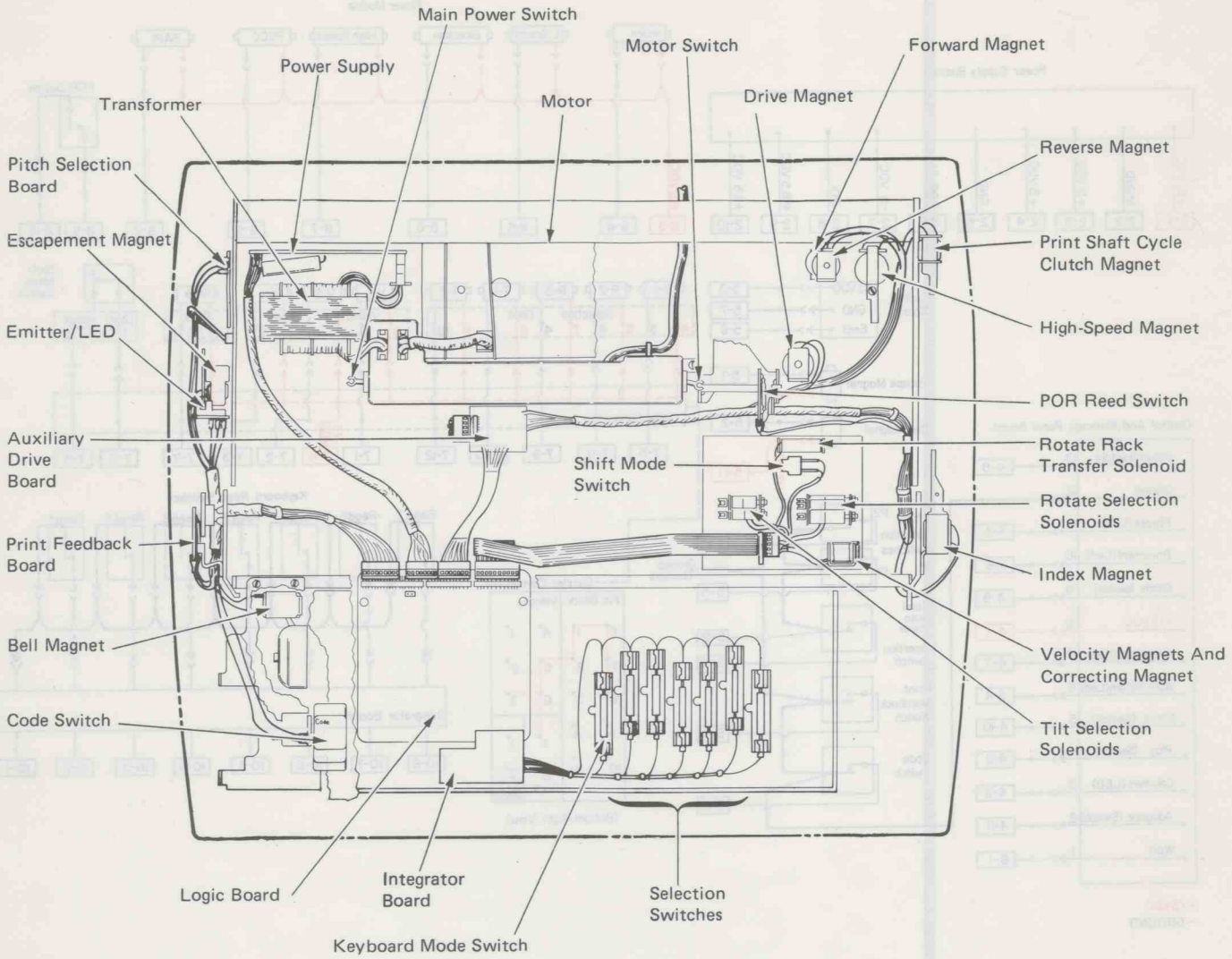


Figure 12 – Electronic And Electrical Components (50/60)

The wiring diagram shows the electrical components and how the components are connected (Figure 13). The first number indicates the connector and the second number indicates the pin. The wiring diagram also shows the pin layout for the carrier connector.

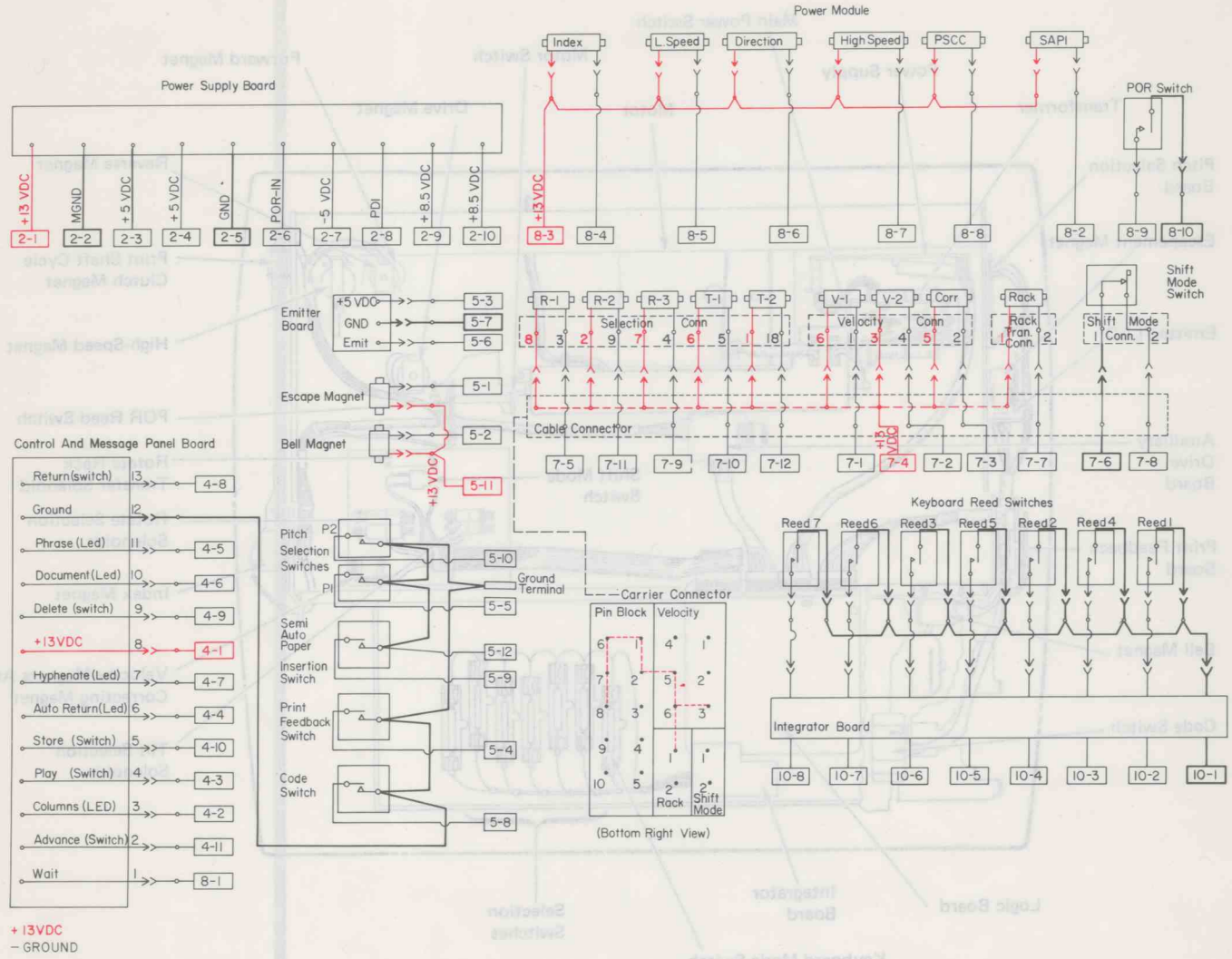


Figure 13 – Wiring Diagram (75)

The wiring diagram for Models 50 and 60 is shown in Figure 14.

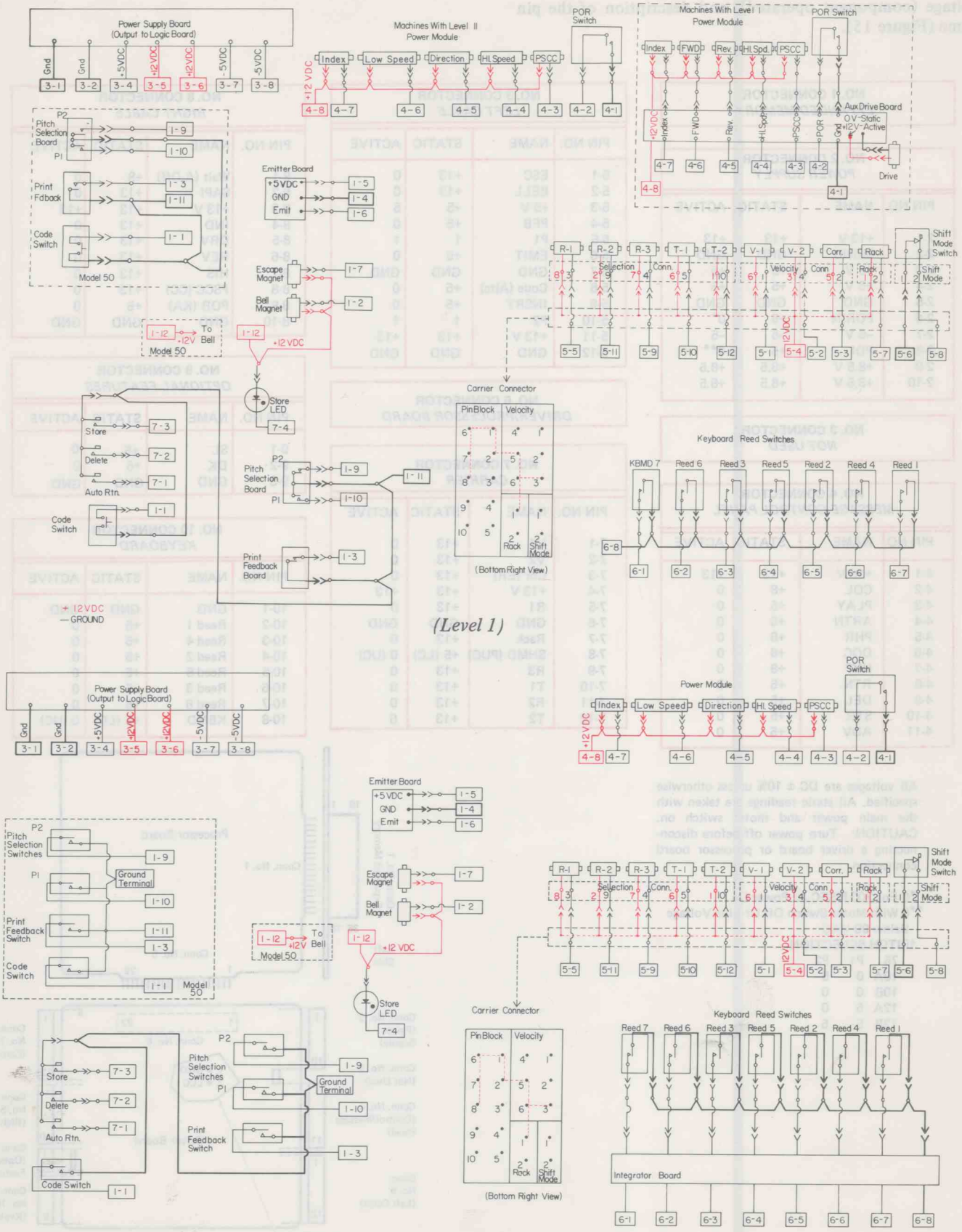


Figure 14 – Wiring Diagram (50/60)

WIRING DIAGRAM INDEX

The wiring diagram index shows the connector number, pin number, pin name, static voltage (machine at rest), active voltage (component operated), and description of the pin name (Figure 15).

NO. 1 CONNECTOR
EXPANDED MEMORY

NO. 2 CONNECTOR
POWER SUPPLY

PIN NO.	NAME	STATIC	ACTIVE
2-1	+13 V	+13	+13
2-2	MGND	GND	GND
2-3	+5 V	+5	+5
2-4	+5 V	+5	+5
2-5	GND	GND	GND
2-6	PORIN	+5	0*
2-7	–5 V	–5	–5
2-8	PDI	+5	0**
2-9	+8.5 V	+8.5	+8.5
2-10	+8.5 V	+8.5	+8.5

NO. 3 CONNECTOR
NOT USED

NO. 4 CONNECTOR
MESSAGE CONTROL PANEL

PIN NO.	NAME	STATIC	ACTIVE
4-1	+13 V	+13	+13
4-2	COL	+8	0
4-3	PLAY	+5	0
4-4	ARTN	+8	0
4-5	PHR	+8	0
4-6	DOC	+8	0
4-7	HYP	+8	0
4-8	RTN	+5	0
4-9	DEL	+5	0
4-10	STR	+5	0
4-11	ADV	+5	0

NO. 5 CONNECTOR
LEFT CABLE

PIN NO.	NAME	STATIC	ACTIVE
5-1	ESC	+13	0
5-2	BELL	+13	0
5-3	+5 V	+5	5
5-4	PFB	+5	0
5-5	P1	†	†
5-6	EMIT	+5	0
5-7	GND	GND	GND
5-8	Code (Altc)	+5	0
5-9	INSRT	+5	0
5-10	P2	†	†
5-11	+13 V	+13	+13
5-12	GND	GND	GND

NO. 6 CONNECTOR
DRIVER/PROCESSOR BOARD

NO. 7 CONNECTOR
CARRIER

PIN NO.	NAME	STATIC	ACTIVE
7-1	V1	+13	0
7-2	V2	+13	0
7-3	Cor (ER)	+13	0
7-4	+13 V	+13	+13
7-5	R1	+13	0
7-6	GND	GND	GND
7-7	Rack	+13	0
7-8	SHMD (PUC)	+5 (LC)	0 (UC)
7-9	R3	+13	0
7-10	T1	+13	0
7-11	R2	+13	0
7-12	T2	+13	0

NO. 8 CONNECTOR
RIGHT CABLE

PIN NO.	NAME	STATIC	ACTIVE
8-1	Wait (A Off)	+8	0
8-2	SAPI	+13	0
8-3	+13 V	+13	+13
8-4	IND	+13	0
8-5	DRV	+13	0
8-6	REV	+13	0
8-7	HIS	+13	0
8-8	PSCC (CC)	+13	0
8-9	POR (KA)	+5	0
8-10	GND	GND	GND

NO. 9 CONNECTOR
OPTIONAL FEATURES

PIN NO.	NAME	STATIC	ACTIVE
9-1	SL	+5	0
9-2	DK	+5	0
9-3	GND	GND	GND

NO. 10 CONNECTOR
KEYBOARD

PIN NO.	NAME	STATIC	ACTIVE
10-1	GND	GND	GND
10-2	Reed 1	+5	0
10-3	Reed 4	+5	0
10-4	Reed 2	+5	0
10-5	Reed 5	+5	0
10-6	Reed 3	+5	0
10-7	Reed 6	+5	0
10-8	KBMD	+5 (LC)	0 (UC)

All voltages are DC ± 10% unless otherwise specified. All static readings are taken with the main power and motor switch on. CAUTION: Turn power off before disconnecting a driver board or processor board connection.

*0 For 200 MSEC At Power On
**0 With Motor Switch Off Or Line Voltage Below 90 VAC
†PITCH SELECTION

75	P1	P2
10A	0	5
10B	0	0
12A	5	0
12B	5	5

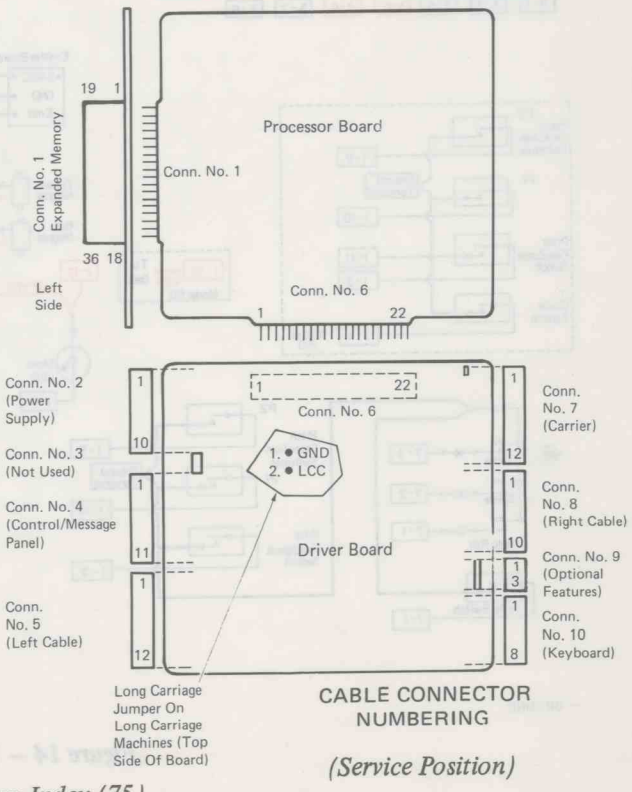


Figure 15 – Wiring Diagram Index (75)

The wiring diagram index for Models 50 and 60 is shown in Figure 16.

NO. 1 CONNECTOR
LEFT CABLE

PIN NO.	NAME	STATIC	ACTIVE
1-1	Code (Altc)	+5	0
1-2	Bell	+12	0
1-3	PFB	+5	0
1-4	GND	GND	GND
1-5	+5 VDC	+5	+5
1-6	Emit	+5	0
1-7	ESC	+12	0
1-8	Blank	—	—
1-9	P2	†	†
1-10	P1	†	†
1-11	GND	GND	GND
1-12	+12 VDC	+12	+12

NO. 2 CONNECTOR
OPTIONAL FEATURE

PIN NO.	NAME	STATIC	ACTIVE
2-1	GND	0	0
2-2	DKC	+5	0
2-3	SLC	+5	0

NO. 3 CONNECTOR
POWER SUPPLY

PIN NO.	NAME	STATIC	ACTIVE
3-1	GND	0	0
3-2	GND	0	0
3-3	Key	—	—
3-4	+5	+5	+5
3-5	+12	+12	+12
3-6	+12	+12	+12
3-7	-5V	-5V	-5V
3-8	-5V	-5V	-5V

NO. 4 CONNECTOR
RIGHT CABLE

PIN NO.	NAME	STATIC	ACTIVE
4-1	GND	0	0
4-2	POR (KA)	+5	0
4-3	PSCC	+12	0
4-4	HI Speed	+12	0
4-5	REV	+12	0
4-6	FWD*	+12	0
4-7	IND	+12	0
4-8	+12V	+12	+12

NO. 5 CONNECTOR
CARRIER

PIN NO.	NAME	STATIC	ACTIVE
5-1	V1	+12	0
5-2	V2	+12	0
5-3	Corr	+12	0
5-4	+12	+12	+12
5-5	R1	+12	0
5-6	GND	0	0
5-7	Rack	+12	0
5-8	SHMD (PUC)	+5 (LC)	0 (UC)
5-9	R3	+12	0
5-10	T1	+12	0
5-11	R2	+12	0
5-12	T2	+12	0

NO. 6 CONNECTOR
KEYBOARD

PIN NO.	NAME	STATIC	ACTIVE
6-1	KBMD	+5 (LC)	0 (UC)
6-2	Reed 6	+5	0
6-3	Reed 3	+5	0
6-4	Reed 5	+5	0
6-5	Reed 2	+5	0
6-6	Reed 4	+5	0
6-7	Reed 1	+5	0
6-8	GND	0	0

NO. 7 CONNECTOR
MODEL 60

PIN NO.	NAME	STATIC	ACTIVE
7-1	Auto Rtn	+5	0
7-2	Delete	+5	0
7-3	Store	+5	0
7-4	Store LED	+11.9	+10

All voltages are DC ± 10% unless otherwise specified. All static readings are taken with the main power and motor switches on.
CAUTION: Turn power off before disconnecting a logic board connector.

*Drive On Machines Without Auxiliary Drive Board

† PITCH SELECTION

50	60	P1	P2
10	10A	0V	5V
12	10B	0V	0V
PSN	12A	5V	0V
PS	12B	5V	5V

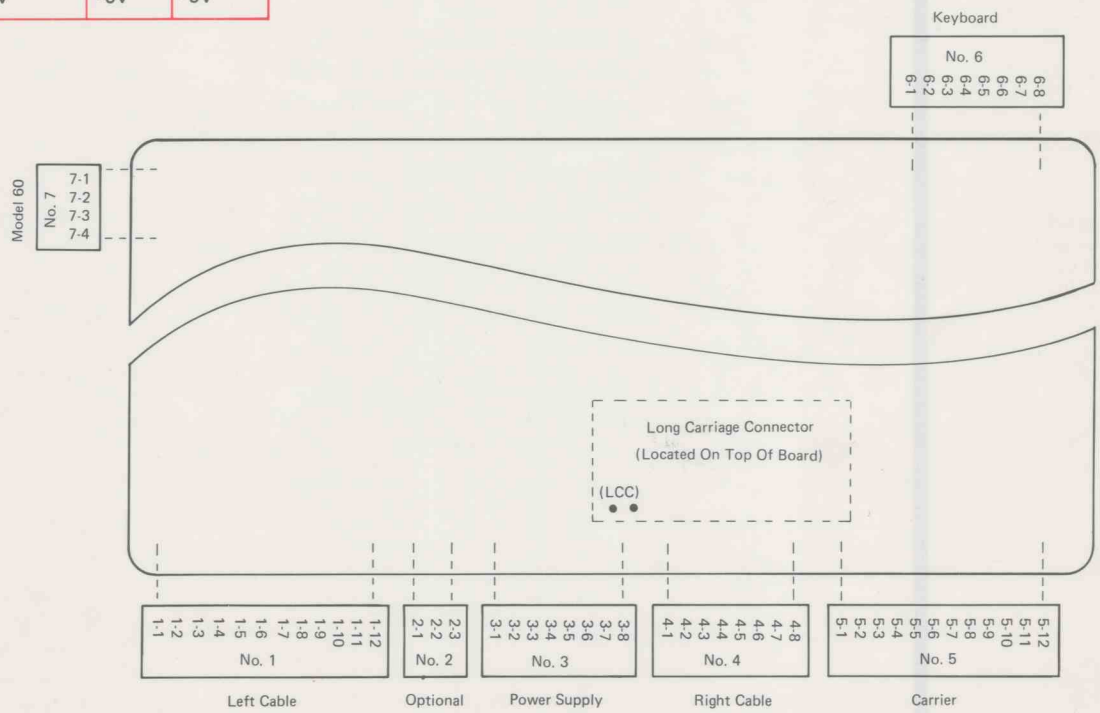


Figure 16 – Wiring Diagram Index (50/60)

POWER ON RESET

The power supply signals the electronics to perform a Power On Reset (POR) when the main power switch is turned on. The POR does not occur until power is also applied to the motor. The POR positions the carrier at the home position (home position is discussed in the Margins section) and clears the memory and all set margins and tabs. The POR also places the machine in the Auto Return mode and sets the semi-automatic paper insertion mode for one inch of paper feed.

MOTOR ON RESET

The Motor On Reset operation takes place when the motor switch is turned off and then on while the main power switch remains on. On the Model 75, the Motor On Reset operation moves the carrier to the home position, then returns the carrier to where it was prior to turning the motor switch off.

The Models 50 and 60 Motor On Reset operation moves the carrier to the home position, then to the left margin.

PITCH RESET

When the pitch selector lever is moved, a pitch reset occurs. The pitch reset operation moves the carrier to the left margin of the selected pitch. If no margin is set, the carrier moves to the home position.

PITCH RESET 50/60

The pitch reset operation moves the carrier to the home position, then to the left margin of the selected pitch. No pitch reset occurs on the Model 50 when the selector lever moves between PS and PSN.

LONG CARRIAGE CONNECTIONS

The electronics is the same in 15.5" and 19.1" machines. However, because the writing line is longer on the 19.1" machine, the long carriage jumper must be installed (Figure 17).

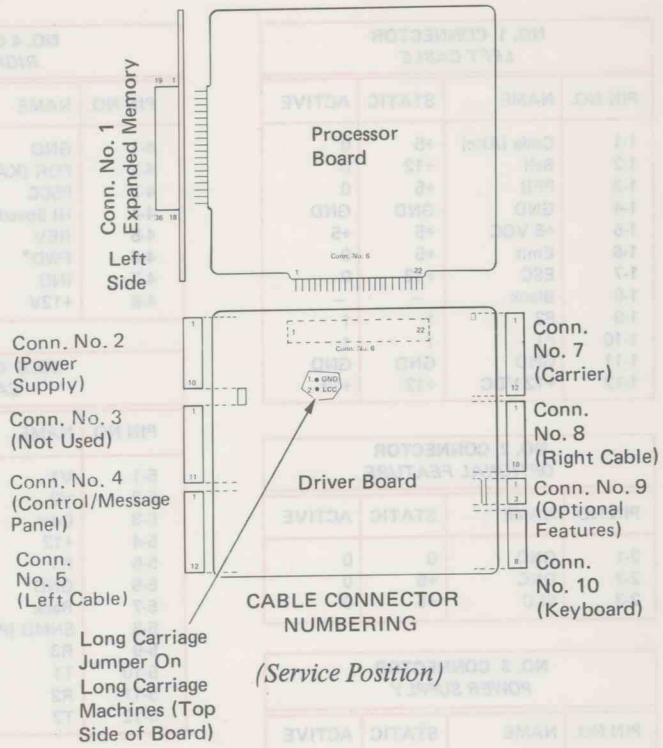


Figure 17 – Long Carriage Connectors

KEYBOARD OPERATIONAL THEORY

The keyboard sends codes to the electronics for each character and function to be typed. These codes are processed by the electronics to perform each machine operation.

The keyboard mechanism consists of four main assemblies: top section, center section, bottom section, and keyboard clutch (Figure 1). The top section consists of the keybuttons and keylevers. The center section consists of the selection interposers, the filter bail, and the compensator tube. The bottom section consists of the selection bails, the keyboard release mechanism, and the selection switches. The keyboard clutch provides motion to operate the keyboard and consists of a spring clutch and drive cam.

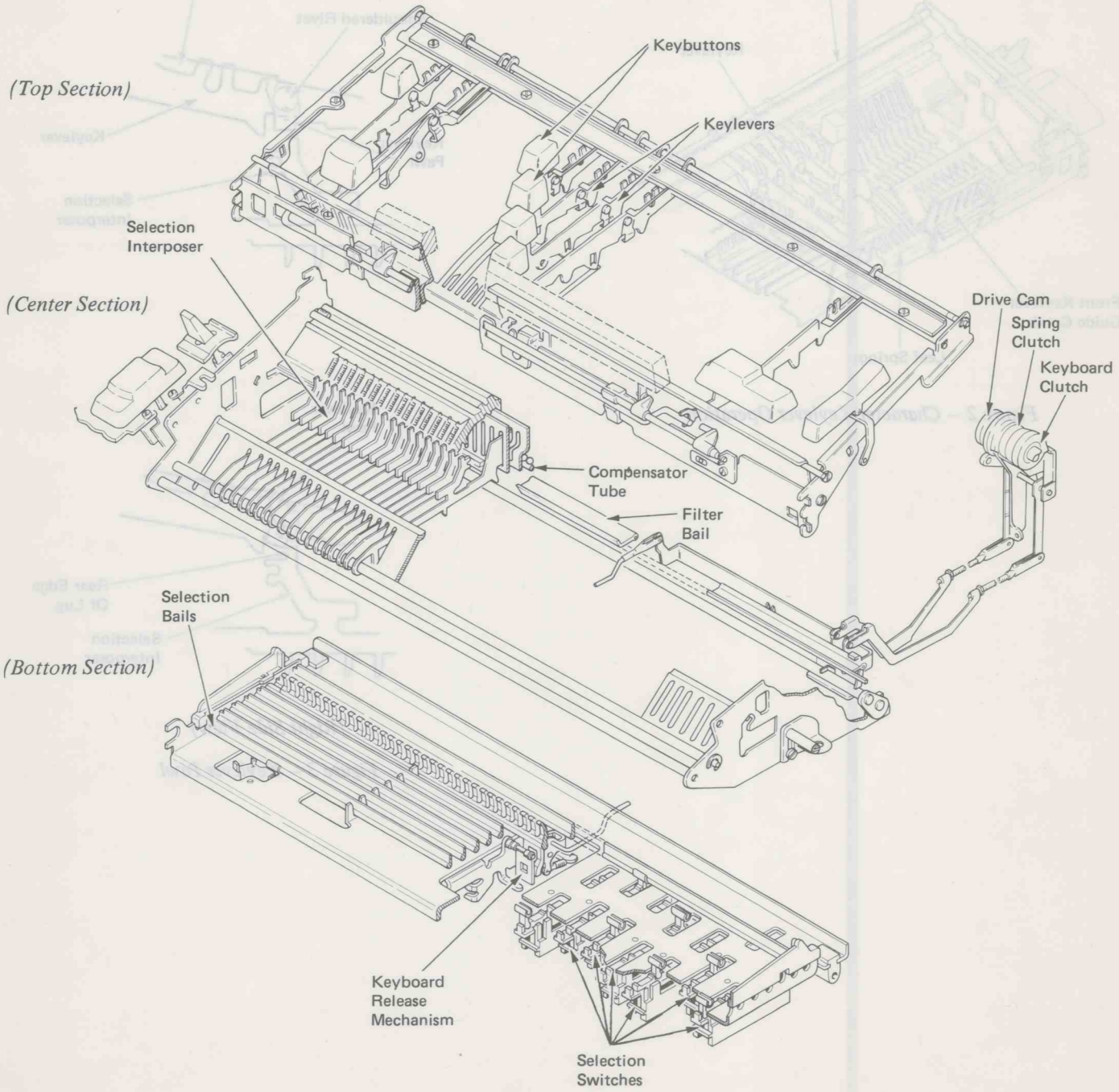


Figure 1 – Keyboard

CHARACTER KEYLEVER OPERATION

The keylevers pivot on a fulcrum rod at the rear of the keyboard (Figure 2). The front keylever guide comb limits the up-and-down motion of the keylevers.

Leaf springs hold the keylevers up in the rest position. The leaf springs vary in spring tension to offset leverage differences between the four rows of keylevers. Therefore, a similar force operates the keybuttons in each of the four rows.

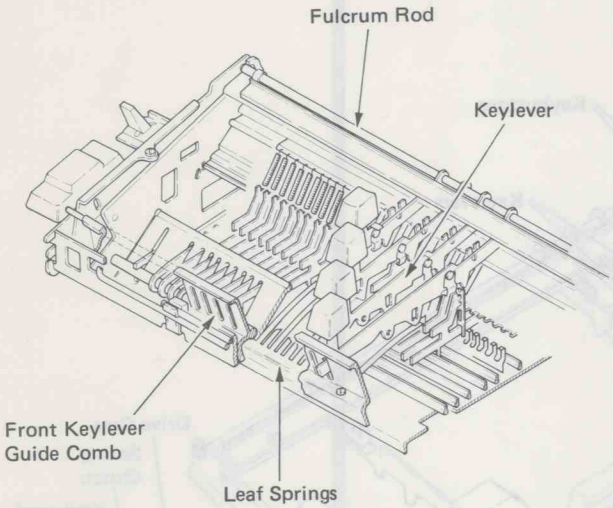
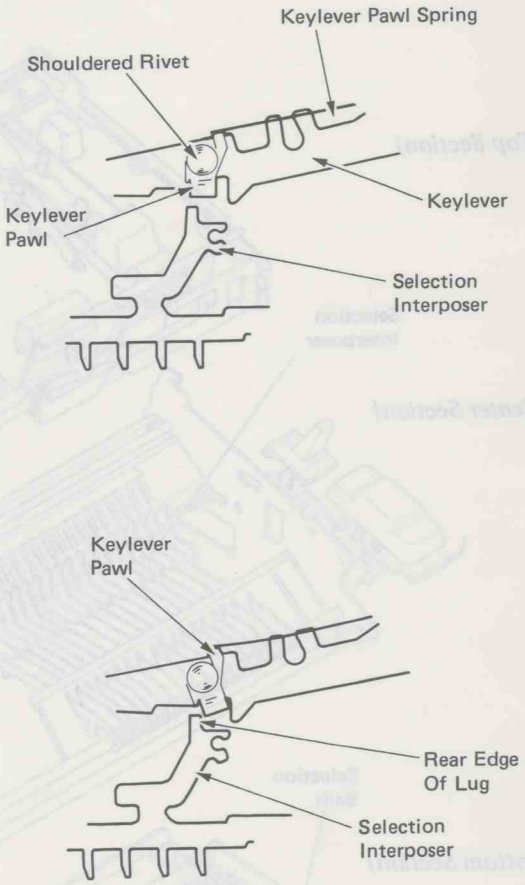


Figure 2 – Character Keylever Operation

A shouldered rivet attaches a keylever pawl to each keylever (Figure 3). The keylever pawl spring holds the keylever pawl above a selection interposer in the rest position. Pressing a keylever causes the keylever pawl to push the selection interposer down.

During a keyboard cycle, the interposer is driven toward the front of the machine and away from the keylever pawl. As the interposer restores to rest, it pivots the keylever pawl to the rear, if the keybutton is held down. When the button is released, the keylever pawl resets above the top of the interposer.



(Right Side View)

Figure 3 – Keylever Pawl

SELECTION INTERPOSER

The selection interposers pivot on a fulcrum rod at the front of the machine. The rear guide comb limits the up-and-down motion of the interposer. The interposers are spring loaded up and toward the rear by interposer latch springs (Figure 4). The top of each spring attaches to a spring anchor plate. The lower end of each spring attaches to an interposer latch on the interposer. The front guide comb maintains the left-to-right position of the interposers. The opening in the front of the interposer allows the interposer to move to the front and rear.

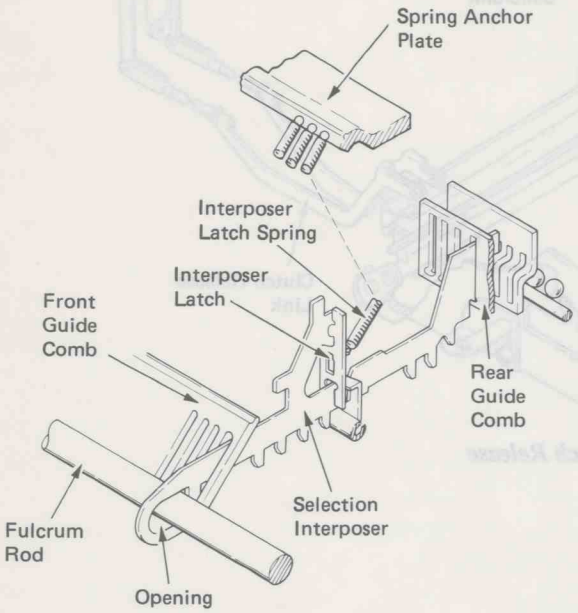


Figure 4 – Selection Interposer

When a keybutton is pressed, the keylever pawl pushes the interposer down (Figure 5). The interposer latches are mounted to the interposers and are spring loaded toward the rear. As the interposers move down, the latch is pulled under a lug on the interposer latch plate to latch the interposer down. This keeps the interposer down until a selection is completed. When in the latched position, the interposer drive lug will be in the path of the filter bail.

Each selection interposer has a different combination of selection lugs. The selection lugs operate selection bails during a selection operation. Each interposer also has a drive lug, a keyboard mode release lug, and a compensaor tube lug.

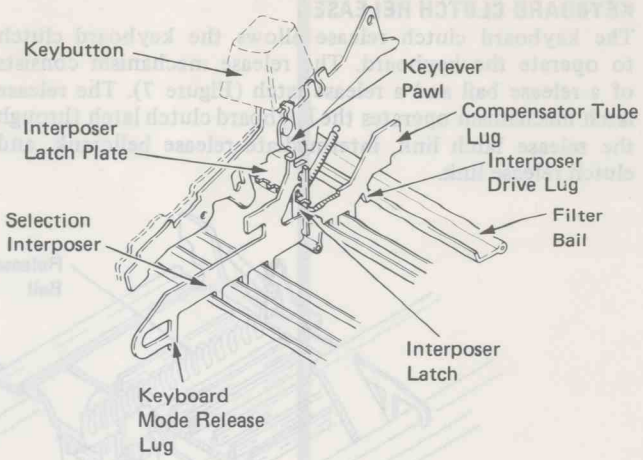
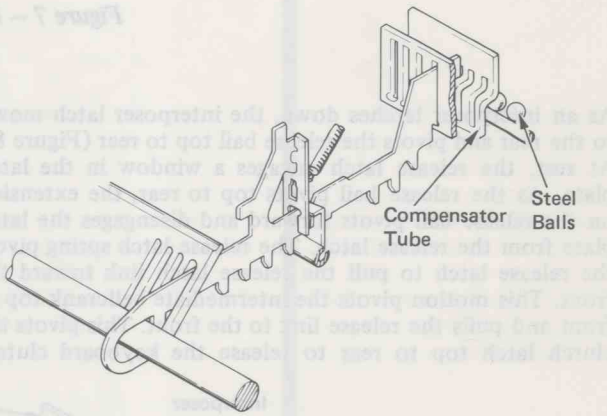
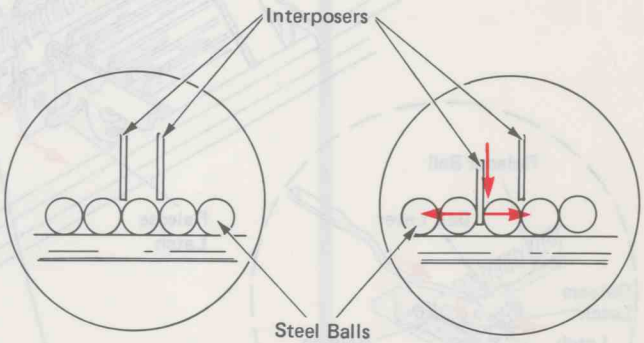


Figure 5 – Keylever and Interposer Operation

The compensator tube contains closely-spaced steel balls (Figure 6). When an interposer moves down, the balls move laterally to block the downward movement of any other interposer. This prevents more than one interposer from latching at a time.





(Front View)

Figure 6 – Compensator Tube

KEYBOARD CLUTCH RELEASE

The keyboard clutch release allows the keyboard clutch to operate the keyboard. The release mechanism consists of a release bail and a release latch (Figure 7). The release latch mechanism operates the keyboard clutch latch through the release latch link, intermediate release bellcrank, and clutch release link.

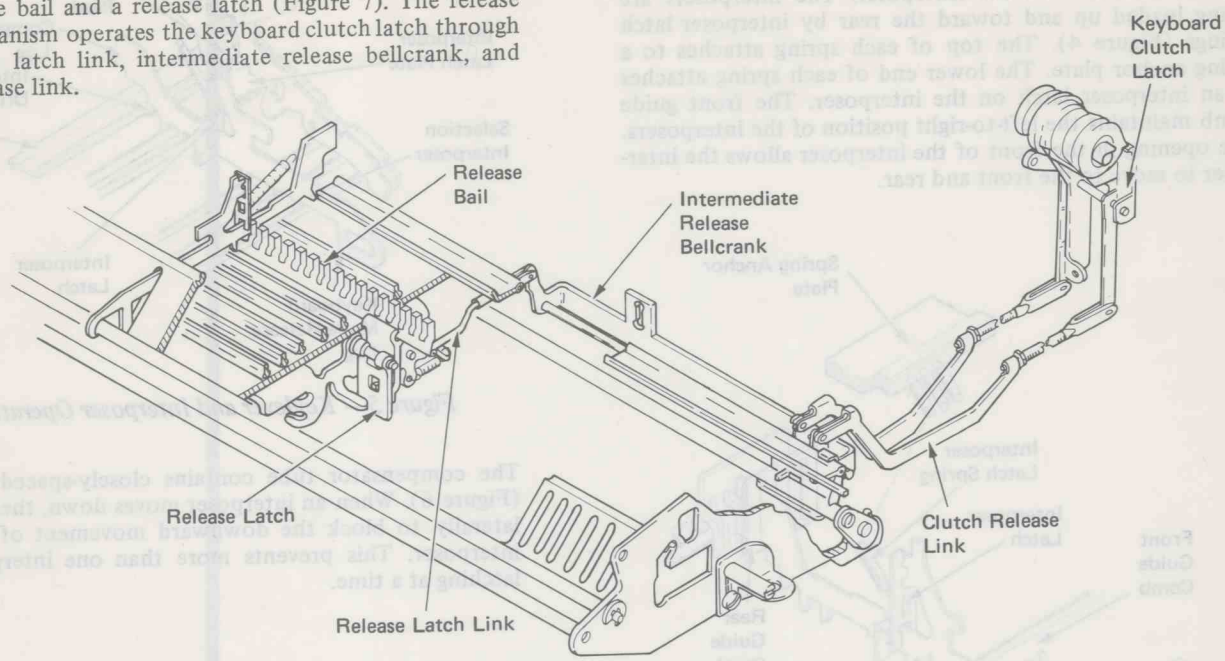


Figure 7 – Keyboard Clutch Release

As an interposer latches down, the interposer latch moves to the rear and pivots the release bail top to rear (Figure 8). At rest, the release latch engages a window in the latch plate. As the release bail pivots top to rear, the extension on the release bail pivots forward and disengages the latch plate from the release latch. The release latch spring pivots the release latch to pull the release latch link toward the front. This motion pivots the intermediate bellcrank top to front and pulls the release link to the front. This pivots the clutch latch top to rear to release the keyboard clutch.

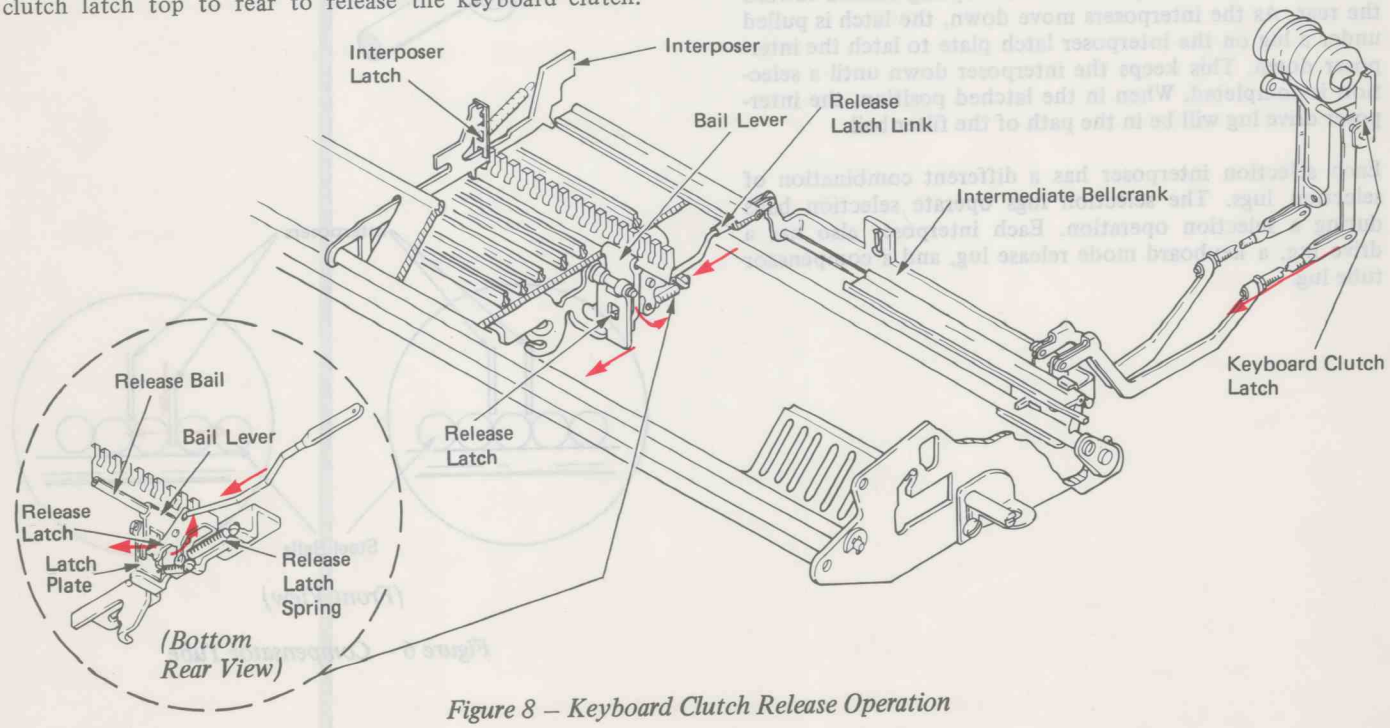


Figure 8 – Keyboard Clutch Release Operation

KEYBOARD CLUTCH

The keyboard clutch is a spring clutch (Figure 9). The drive arbor mounts to the upper shaft of the power module and rotates when the motor is on. When the clutch is released, it drives the filter bail drive cam.

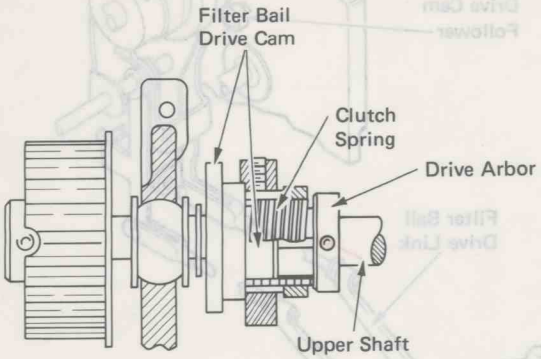
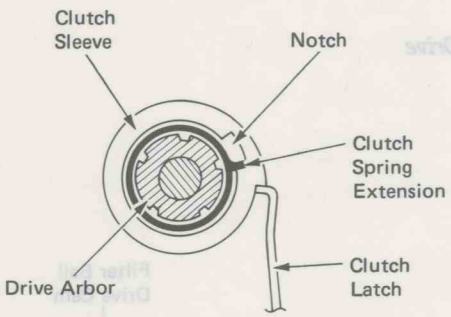


Figure 9 – Keyboard Clutch

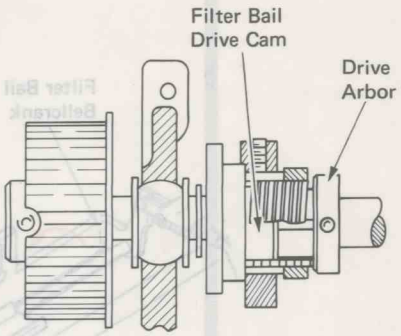
An extension on the right end of the clutch spring fits into a notch in the clutch sleeve (Figure 10). The clutch latch engages the clutch sleeve to hold the clutch spring disengaged from the drive arbor.



(Right Side View)

Figure 10 – Keyboard Clutch Spring – Disengaged

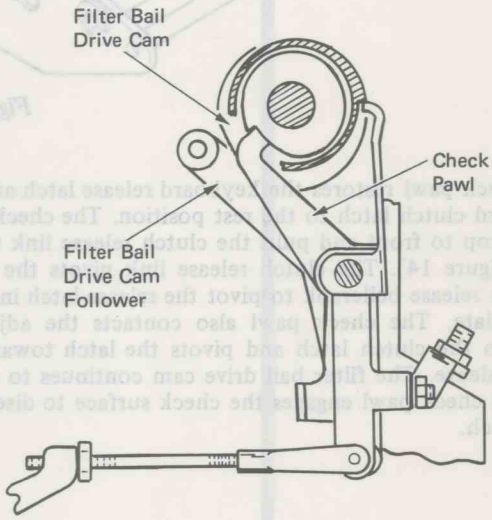
When the clutch latch releases the clutch sleeve, the clutch engages the drive arbor and rotates the filter bail drive cam (Figure 11).



(Front View)

Figure 11 – Keyboard Clutch Spring – Engaged

The filter bail drive cam has two drive surfaces. One surface pivots the filter bail drive cam follower and the other surface pivots the check pawl (Figure 12).



(Right Side View)

Figure 12 – Filter Bail Drive Cam

The filter bail drive cam follower pivots top to front and pulls the filter bail drive link to the rear (Figure 13). The filter bail drive link moves to the rear and pivots the filter bail bellcrank to drive the filter bail forward.

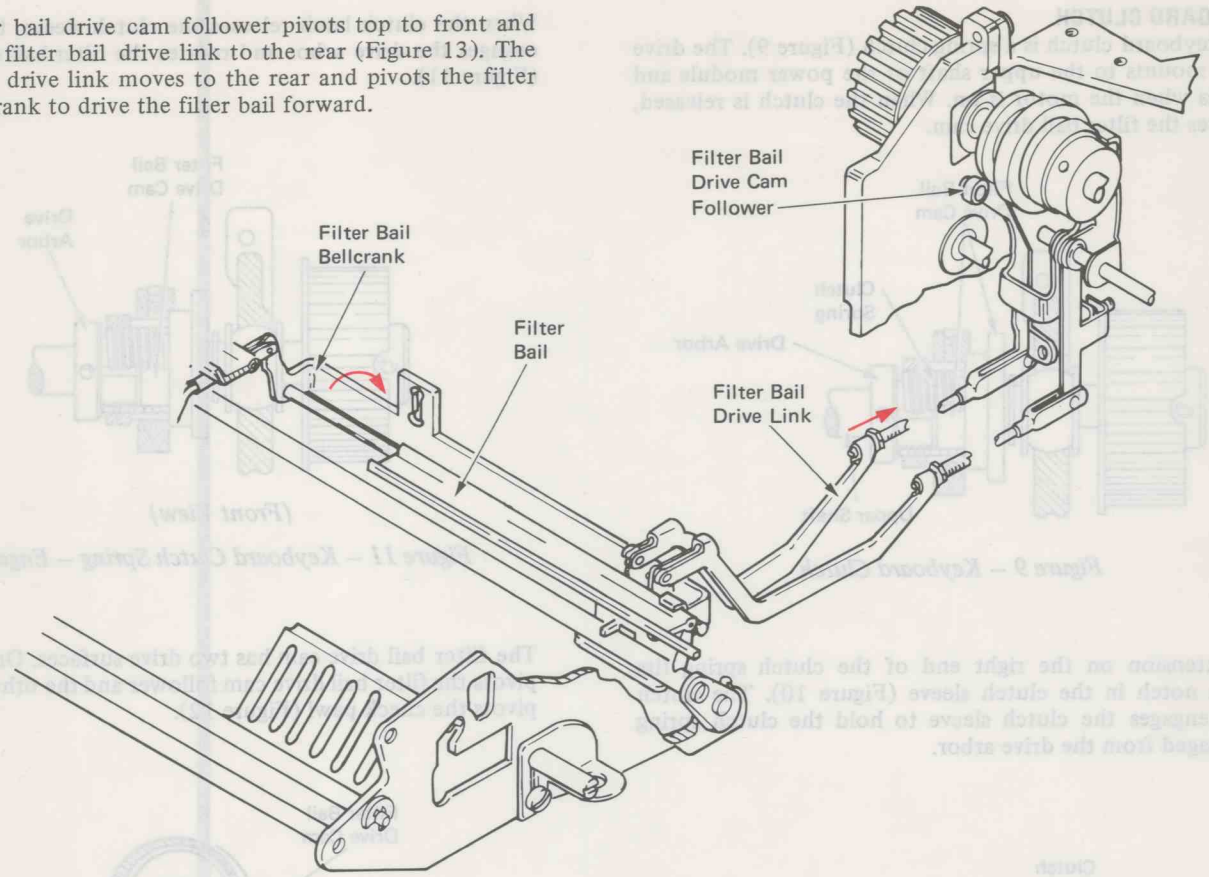
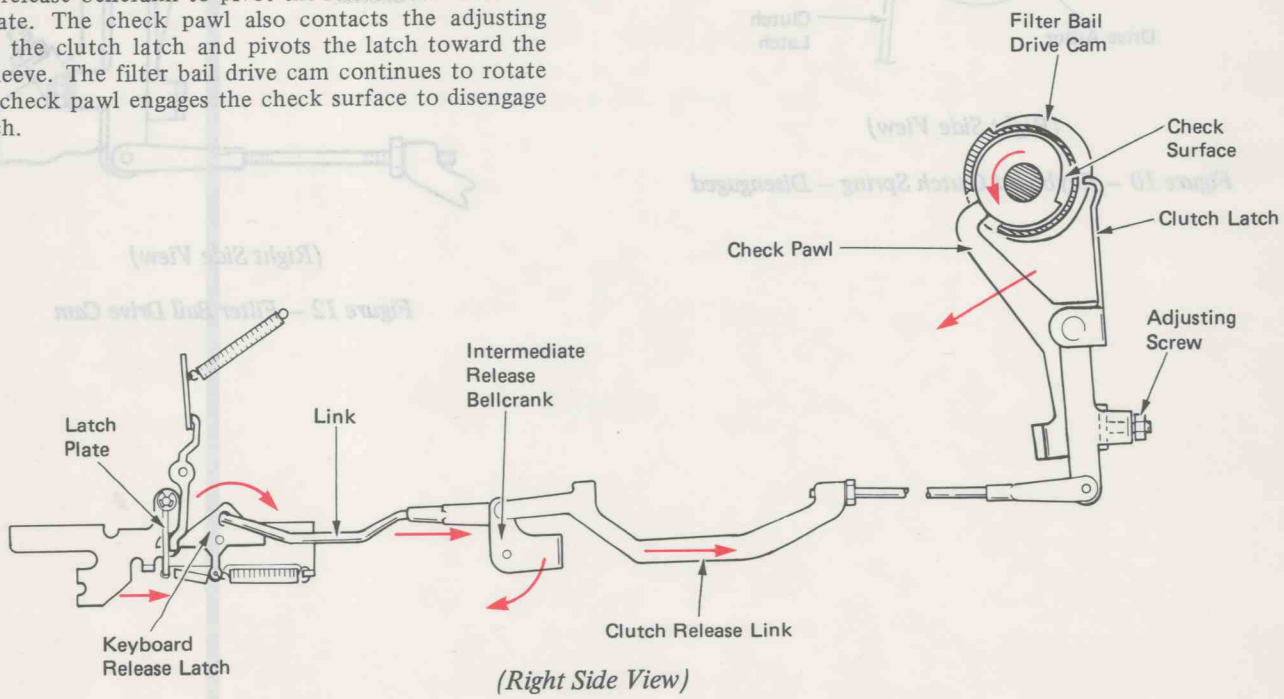


Figure 13 – Filter Bail Drive

The check pawl restores the keyboard release latch and the keyboard clutch latch to the rest position. The check pawl pivots top to front and pulls the clutch release link to the rear (Figure 14). The clutch release link pivots the intermediate release bellcrank to pivot the release latch into the latch plate. The check pawl also contacts the adjusting screw in the clutch latch and pivots the latch toward the clutch sleeve. The filter bail drive cam continues to rotate and the check pawl engages the check surface to disengage the clutch.



(Right Side View)

Figure 14 – Release Latch Restoring

FILTER BAIL

The filter bail drives the latched interposer forward. It extends through the sides of the keyboard (Figure 15). Two springs outside the keyboard end plates load the filter bail up. Two springs inside the keyboard end plates load the filter bail to the rear. The rear of the filter bail is supported by three extensions of the filter bail pivot shaft.

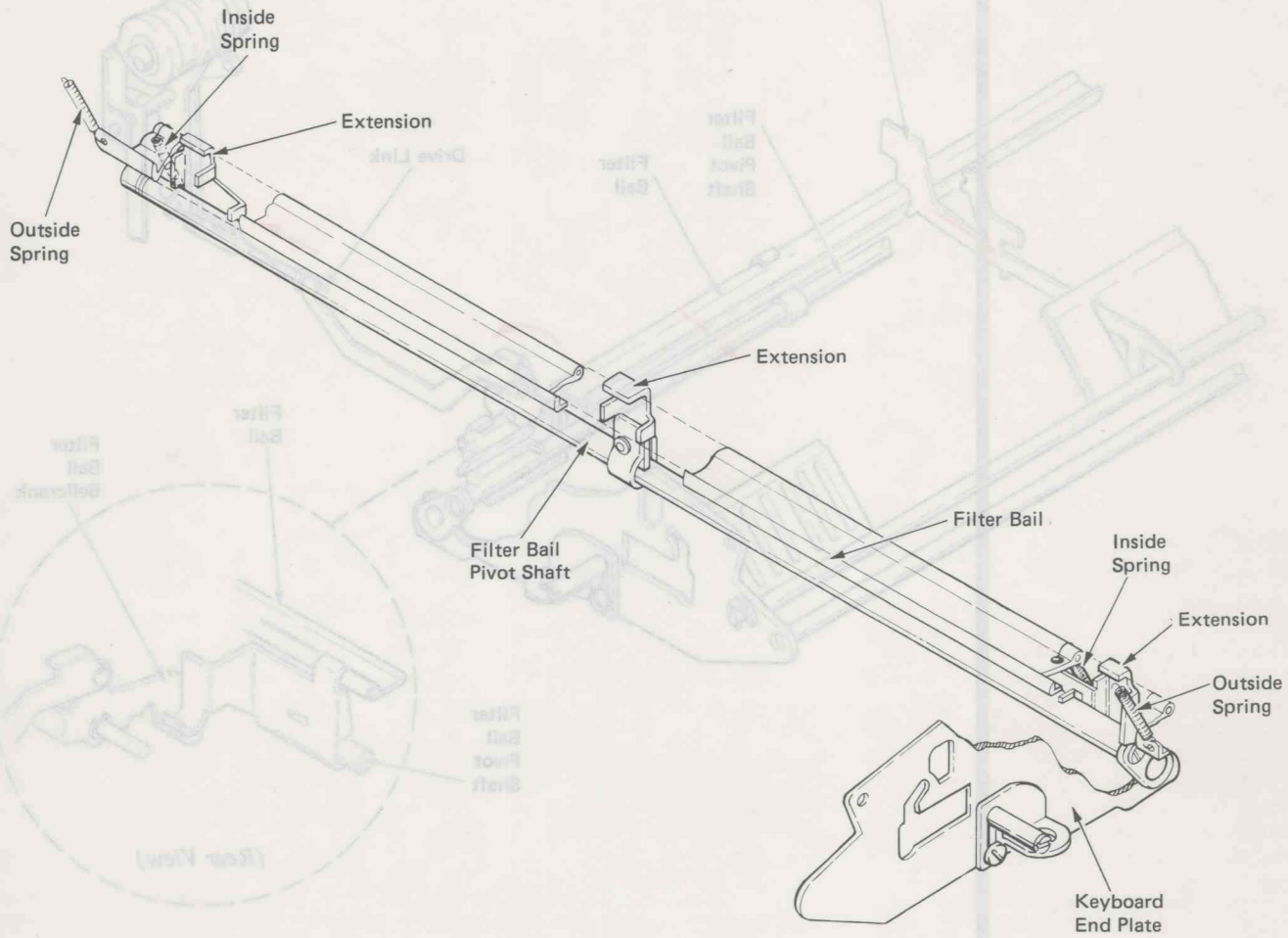


Figure 15 – Filter Bail

When the drive link is pulled to the rear during the keyboard clutch cycle, it pivots the filter bail bellcrank top to rear (Figure 16). The filter bail bellcrank drives the filter bail pivot shaft top to front. The filter bail pivot shaft drives the filter bail toward the front of the machine. As the filter bail moves forward, it drives the latched interposer forward.

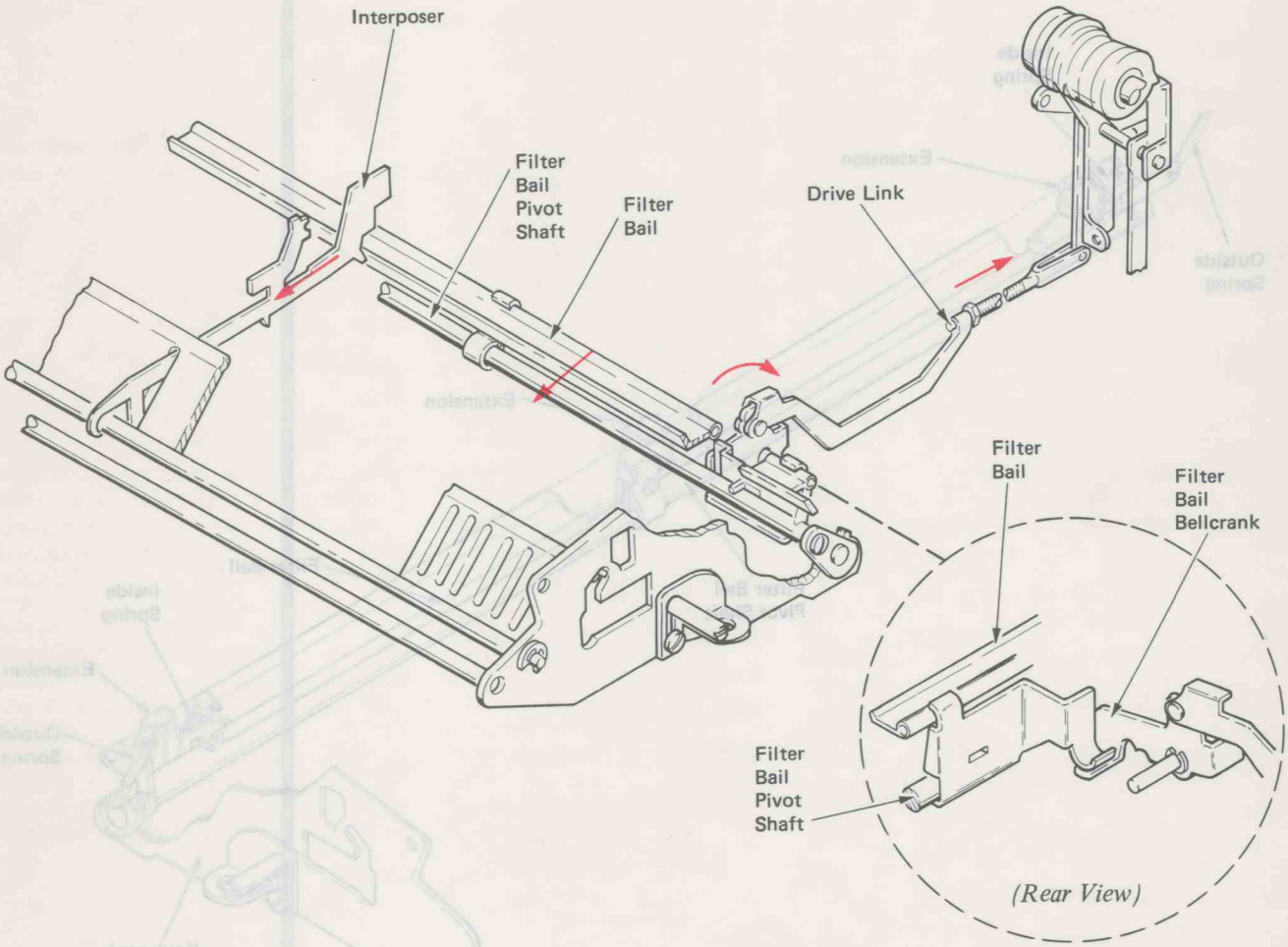
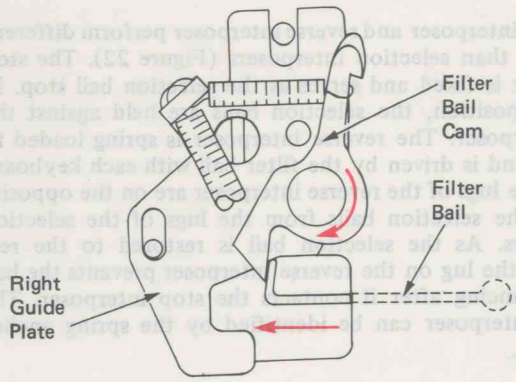


Figure 16 – Filter Bail Motion

FILTER BAIL CAM

The filter bail cam prevents the filter bail from contacting a latched interposer when it returns to rest. The filter bail cam is mounted on the right hand filter bail guide plate (Figure 17). As the filter bail moves forward, it pivots the filter bail cam top to rear.



(Right Side View)

Figure 17 – Filter Bail Cam

When the filter bail has moved past the tip of the filter bail cam, the cam is restored to rest by the restore spring (Figure 18).

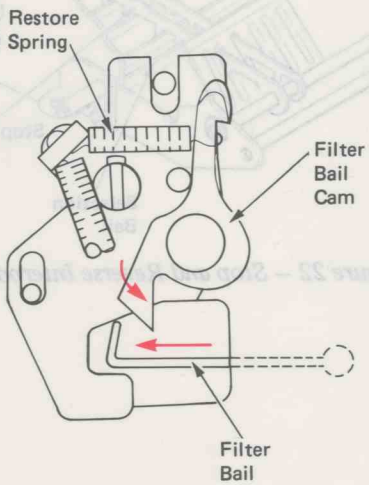


Figure 18 – Filter Bail Forward

As the filter bail restores to the rear, the filter bail cam deflects the filter bail down, below the drive lug of any latched interposer (Figure 19). This prevents the filter bail from contacting a latched interposer.

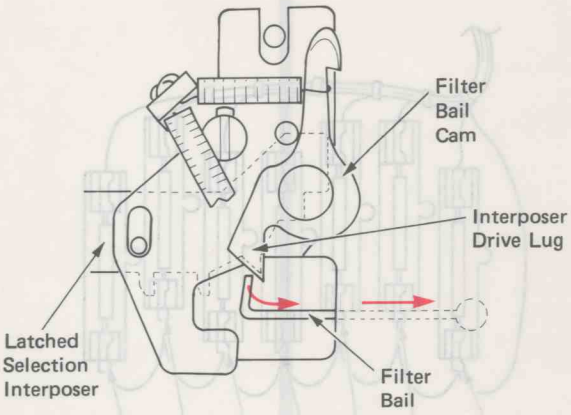
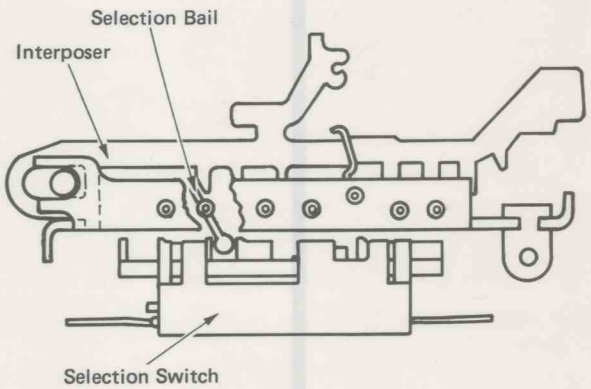


Figure 19 – Filter Bail Restoring

KEYBOARD SELECTION

Selection switches mounted to the keyboard bottom section indicate to the electronics which character or function has been selected by the operator. The switches are operated by selection bails which are driven by lugs on the interposers (Figure 20).

As the filter bail is driven forward during a keyboard cycle, it drives the latched interposer forward. The selection lugs on the interposer contact and pivot the selection bails. Each bail has a lug that engages a selection switch slider and operates the switch when the bail pivots. A magnet mounted to the slider causes the switch to close when the bail is pivoted by the interposer. Because each interposer has a different combination of selection lugs, a different combination of switches will be operated for each character or function.



(Left Side View)

Figure 20 – Keyboard Selection

Switches 1 through 6 are selection switches (Figure 21). Operating combinations of these switches supply a code to the electronics for each character or function selected at the keyboard. Switch 7 indicates to the electronics whether the character selected is uppercase or lowercase.

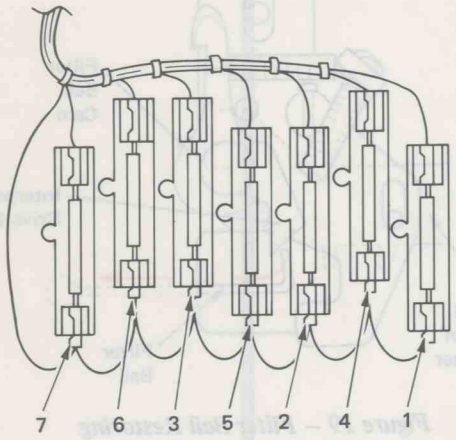


Figure 21 – Bail Switches

All selection switches must close within 5 milliseconds after the first switch closes. After 5 milliseconds, the electronics processes the code indicated by the closed switches. The electronics will then energize the necessary solenoids and magnets to print the character or to perform the function.

NOTE: The character selection solenoids are discussed in the Character Selection section.

The stop interposer and reverse interposer perform different functions than selection interposers (Figure 22). The stop interposer is fixed and serves as the selection bail stop. In the rest position, the selection bails are held against the stop interposer. The reverse interposer is spring loaded to the rear and is driven by the filter bail with each keyboard cycle. The lugs of the reverse interposer are on the opposite side of the selection bails from the lugs of the selection interposers. As the selection bail is restored to the rest position, the lug on the reverse interposer prevents the bail from bouncing after it contacts the stop interposer. The reverse interposer can be identified by the spring anchor extension.

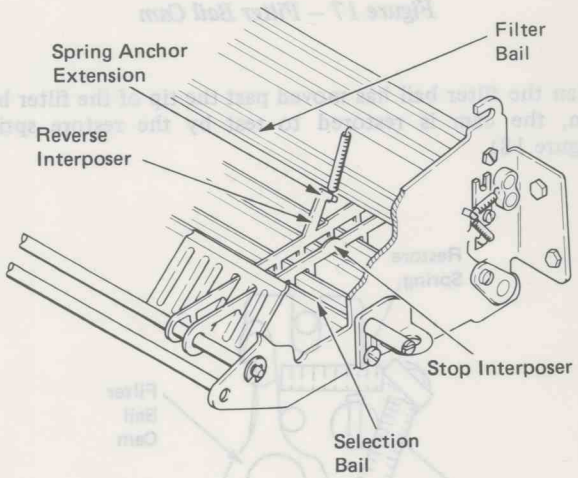


Figure 22 – Stop and Reverse Interposers

KEYBOARD MODE SWITCH

When a character keybutton is pressed, the keyboard mode switch indicates to the electronics whether the shift keybutton is in uppercase or lowercase.

The keyboard mode switch is mounted to the left of the other reed switches (Figure 23). The shift bail operates the keyboard mode switch. For a shift to uppercase, the uppercase interposer moves forward and pivots the shift bail. The keyboard mode latch latches the shift bail. While latched, the mode switch is closed. When the lowercase interposer moves, for a shift to lowercase, the keyboard mode release lug on the interposer unlatches the shift bail and the switch opens.

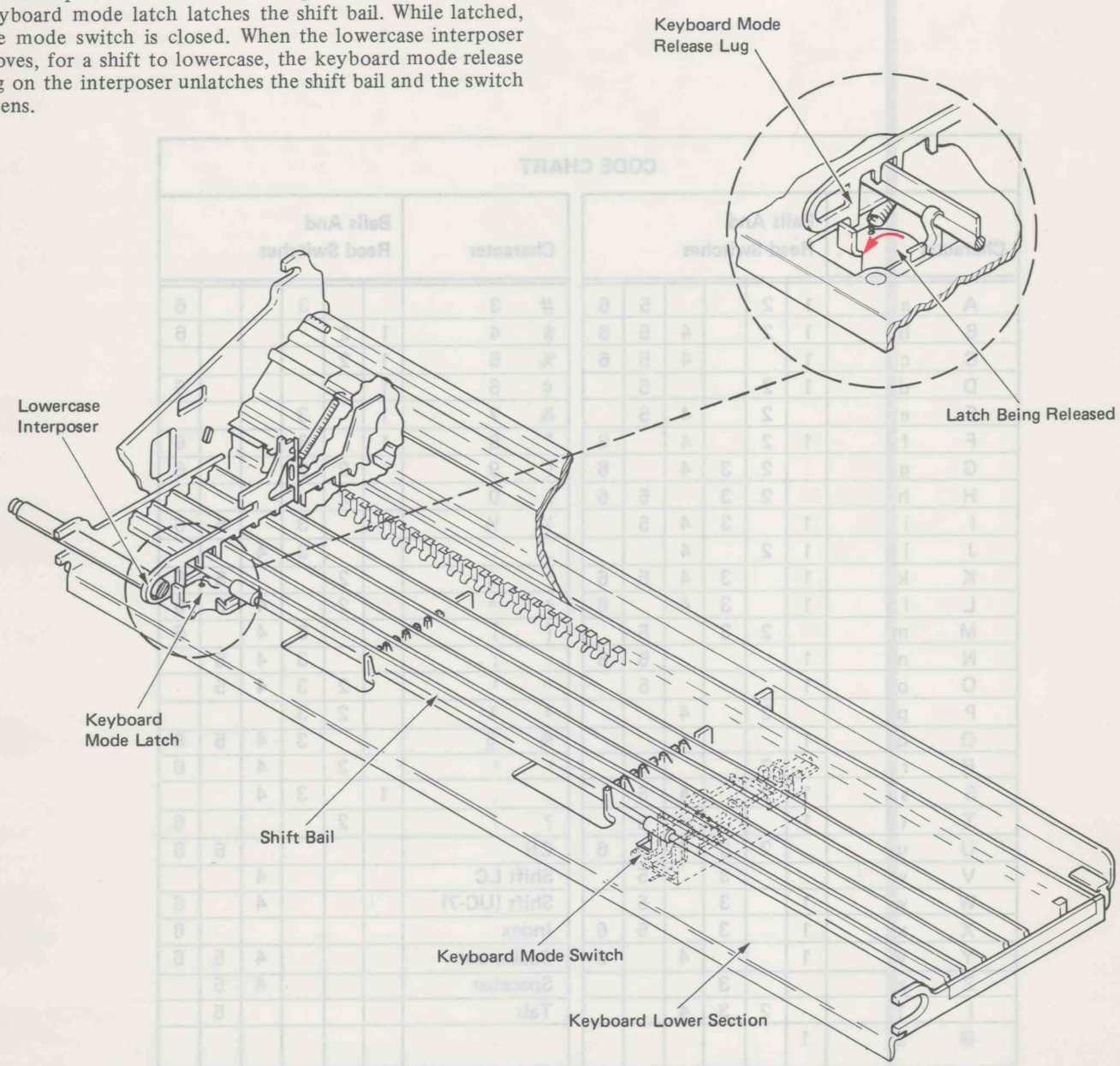


Figure 23 – Keyboard Mode Switch

CHARACTER CODE CHART

The Character Code Chart shows which selection switches control each character or function (Figure 24).

CODE CHART

Character	Bails And Reed Switches						Character	Bails And Reed Switches					
A a	1	2			5	6	# 3			3			6
B b	1	2		4	5	6	$ 4	1	2				6
C c	1			4	5	6	% 5	1	2				
D d	1	2			5		¢ 6	1					6
E e		2		4	5		& 7	1		3			
F f	1	2		4		6	* 8	1		3			6
G g		2	3	4		6	(9		2	3			6
H h		2	3		5	6	) 0		2				
I i	1		3	4	5		¼ ½			3		5	6
J j	1	2		4			_ -			3	4		
K k	1		3	4	5	6	° ±		2			5	6
L l	1		3	4		6	+ =		2		4	5	6
M m		2	3		5		[ ]			3	4		6
N n	1				5	6	: ;			3	4	5	
O o	1				5		" '		2	3	4	5	
P p		2		4			³ ²		2	3			
Q q	1			4			¶ §			3	4	5	6
R r		2			5		' '		2		4		6
S s	1	2		4	5		. .	1		3	4		
T t	1			4	5		? /		2				6
U u		2	3	4	5	6	CR					5	6
V v			3		5		Shift LC				4		
W w	1		3		5		Shift (UC-7)				4		6
X x	1		3		5	6	Index						6
Y y	1			4		6	Backspace				4	5	6
Z z			3				Spacebar				4	5	
! 1		2	3	4			Tab					5	
@ 2	1												

Figure 24 – Character Code Chart

REPEAT KEYLEVERS

The underscore, period, X, space, backspace, carrier return, and index, all have repeat keylevers (Figure 25).

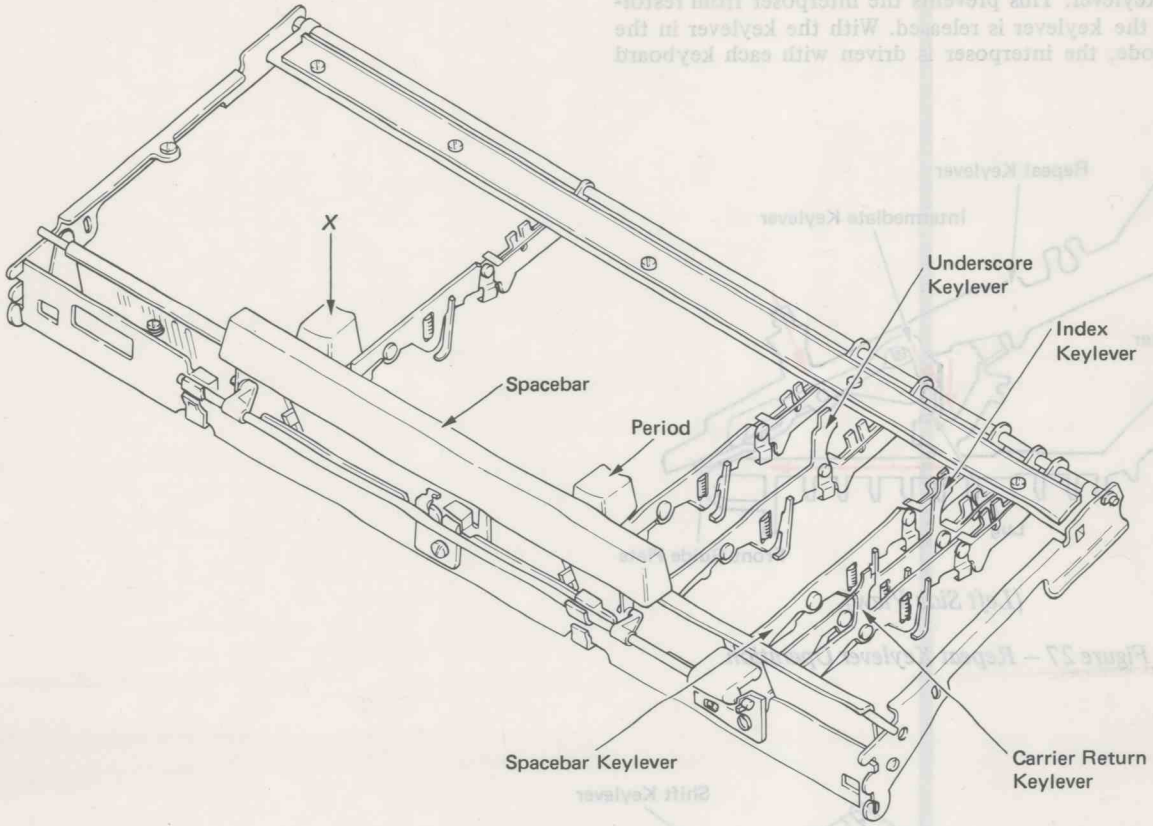
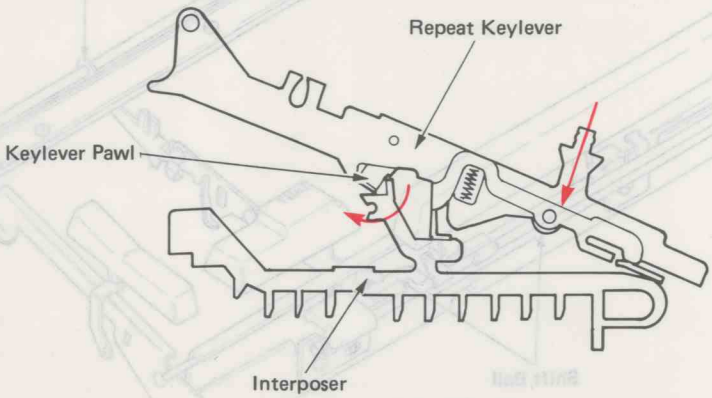


Figure 25 – Repeat Keylevers

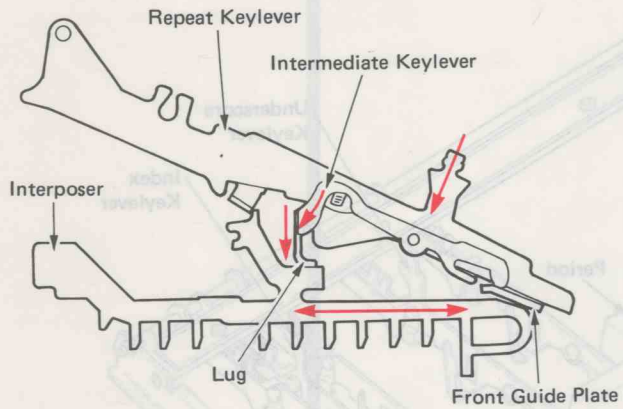
The repeat keylevers are two-piece keylevers (Figure 26). Pressing a repeat keybutton causes the keylever pawl to latch down the interposer for a single (nonrepeat) operation. Pressing the keylever further causes a repeat operation.



(Left Side View)

Figure 26 – Repeat Keylever Operation

Each repeat keylever has an intermediate keylever. Pressing the keybutton further causes the intermediate keylever to contact the front guide plate and pivot down at the rear (Figure 27). The intermediate keylever lug is aligned with the selection interposer. While the keybutton is held in the repeat position, the interposer is held down by the intermediate keylever. This prevents the interposer from restoring until the keylever is released. With the keylever in the repeat mode, the interposer is driven with each keyboard cycle.



(Left Side View)

Figure 27 – Repeat Keylever Operation

SHIFT KEYLEVERS

A shift keylever is located on each side of the keyboard (Figure 28). Either keylever can be used to produce a shift code. The shift bail connects the two keylevers together.

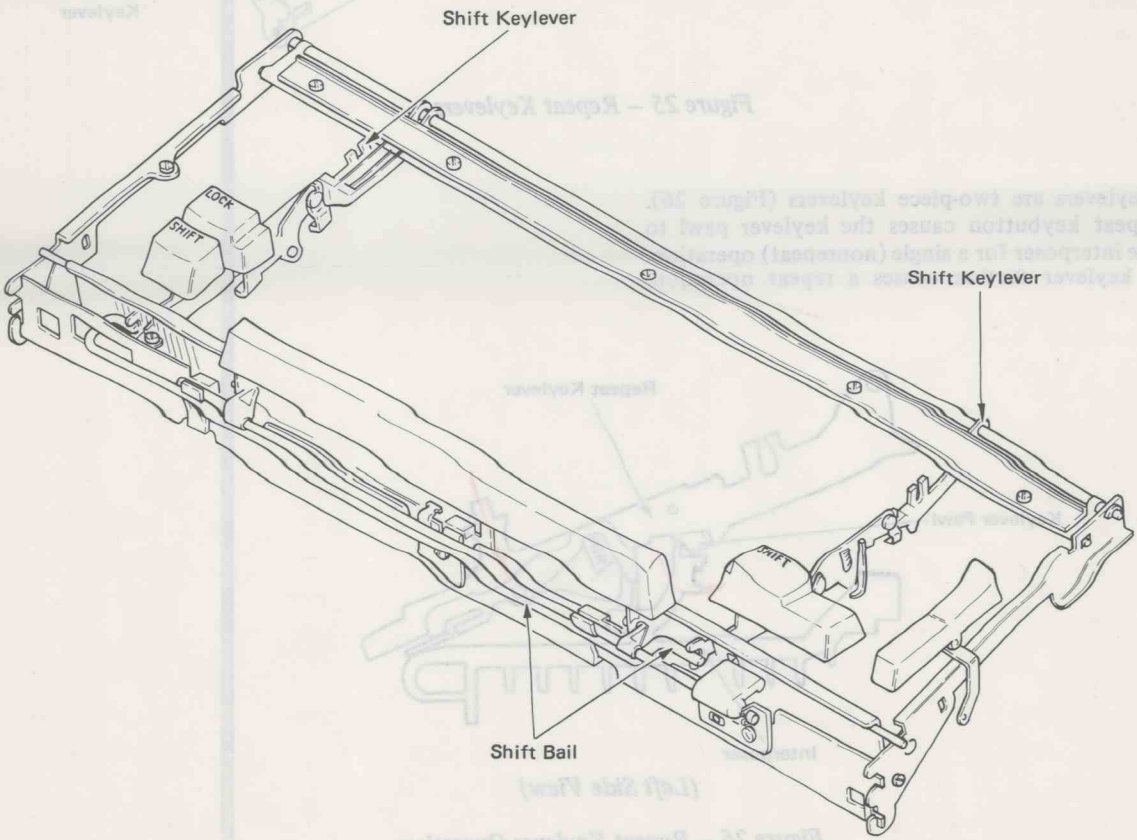
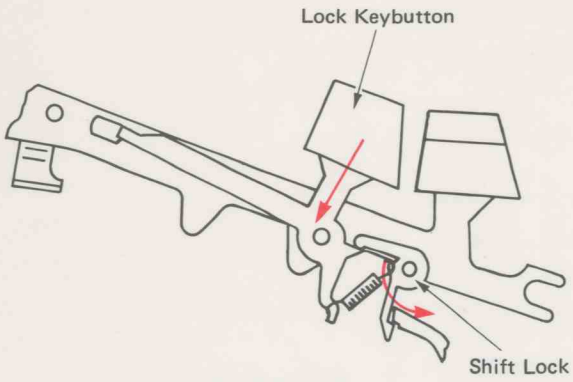


Figure 28 – Shift Keylevers

The left shift keylever has a shift lock mechanism so the operator can lock the keybutton down (Figure 29). The shift lock may be released by depressing and releasing either shift keybutton. Pressing and releasing either shift keybutton releases the shift lock.



(Left Side View)

Figure 29 – Shift Lock

The shift mechanism uses an uppercase selection interposer and a lowercase selection interposer (Figure 30). The uppercase interposer produces an uppercase shift code and latches the shift bail to hold the keyboard mode switch closed. The lowercase inerposer produces a lowercase shift code and unlatches the shift bail. When a shift keybutton is pressed, the shift keylever and uppercase interposer operate the same as character keylevers and interposers.

When the shift keybutton is released, the lowercase intermediate keylever moves the lowercase interposer. The lowercase intermediate keylever pivots on a rivet in the lowercase keylever.

In lowercase, spring tension holds down the intermediate keylever. In this position, the lowercase intermediate keylever pawl is down and behind the interposer lug (Figure 30).

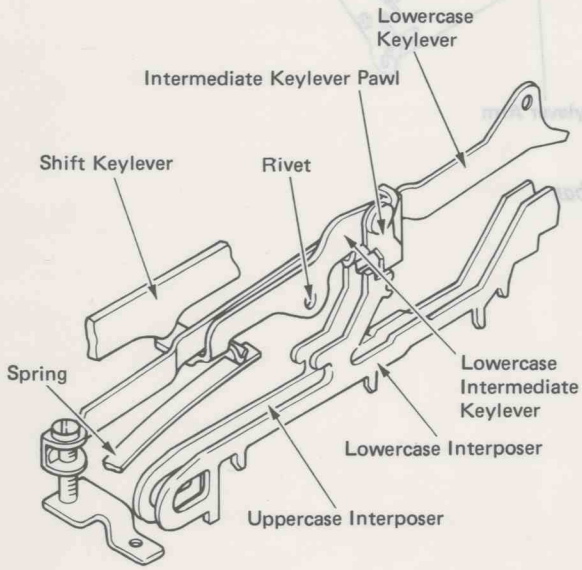


Figure 30 – Shift Key Operation

When the shift keybutton is pressed, the shift keylever presses the front end of the lowercase intermediate keylever (Figure 31). The intermediate keylever pivots up at the rear and the intermediate keylever pawl restores above the lowercase interposer.

When the shift keylever is released, a spring moves the rear of the lowercase intermediate keylever down. This moves the lowercase interposer and produces a lowercase shift code.

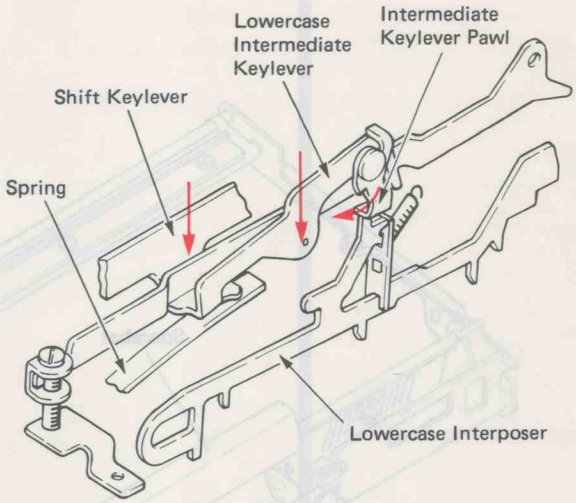


Figure 31 – Shift Key Down

SPACEBAR

The spacebar is mounted on the spacebar pivot shaft (Figure 32). When the spacebar is pressed, the pivot shaft rotates. The pivot shaft moves the keylever arm which moves the spacebar keylever downward. The spacebar operates the keyboard the same as a character keylever and causes a spacebar code to be sent to the electronics.

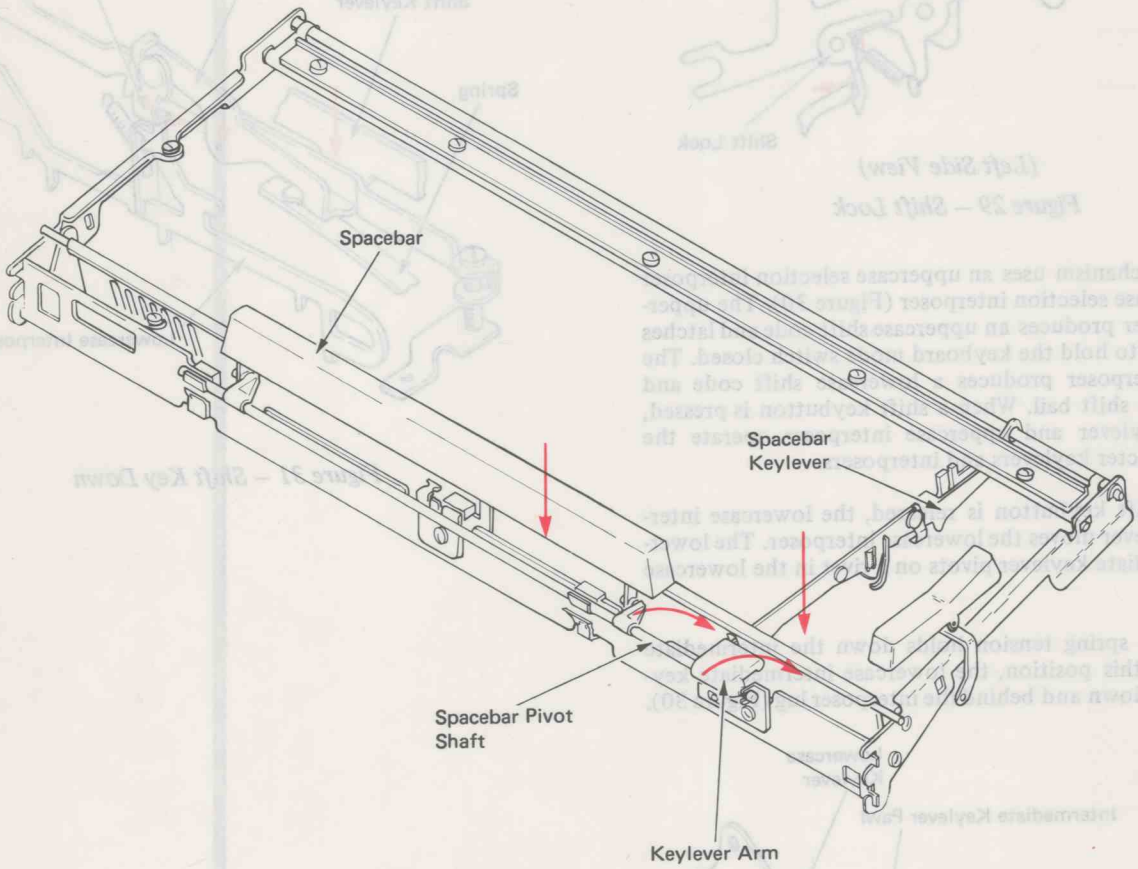


Figure 32 – Spacebar

MOTOR ON/OFF BUTTON AND KEYBOARD LOCK

The motor On/Off button and lever pivot on a stud at the right of the keyboard (Figure 33). A link connects the lever to the switch operating bail. The switch operating bail pivots on the shaft of the motor switch bracket. A link connects the operating bail to the motor switch. A magnet mounted on the switch operating bail operates the power on reset (POR) switch. When the On/Off button is off, the magnet closes the reed switch. When the button is on, the switch opens.

The keyboard lock bail prevents the interposer latches from releasing the keyboard release latch when the machine is off. The bail is located behind the interposer latches and pivots between the keyboard side frames.

The On/Off lever controls the position of the bail. When the On/Off lever is off, a link pivots the bail against the rear of the interposer latches. If a keybutton is pressed, the bail prevents the interposer latch from moving to the rear to release the keyboard latch.

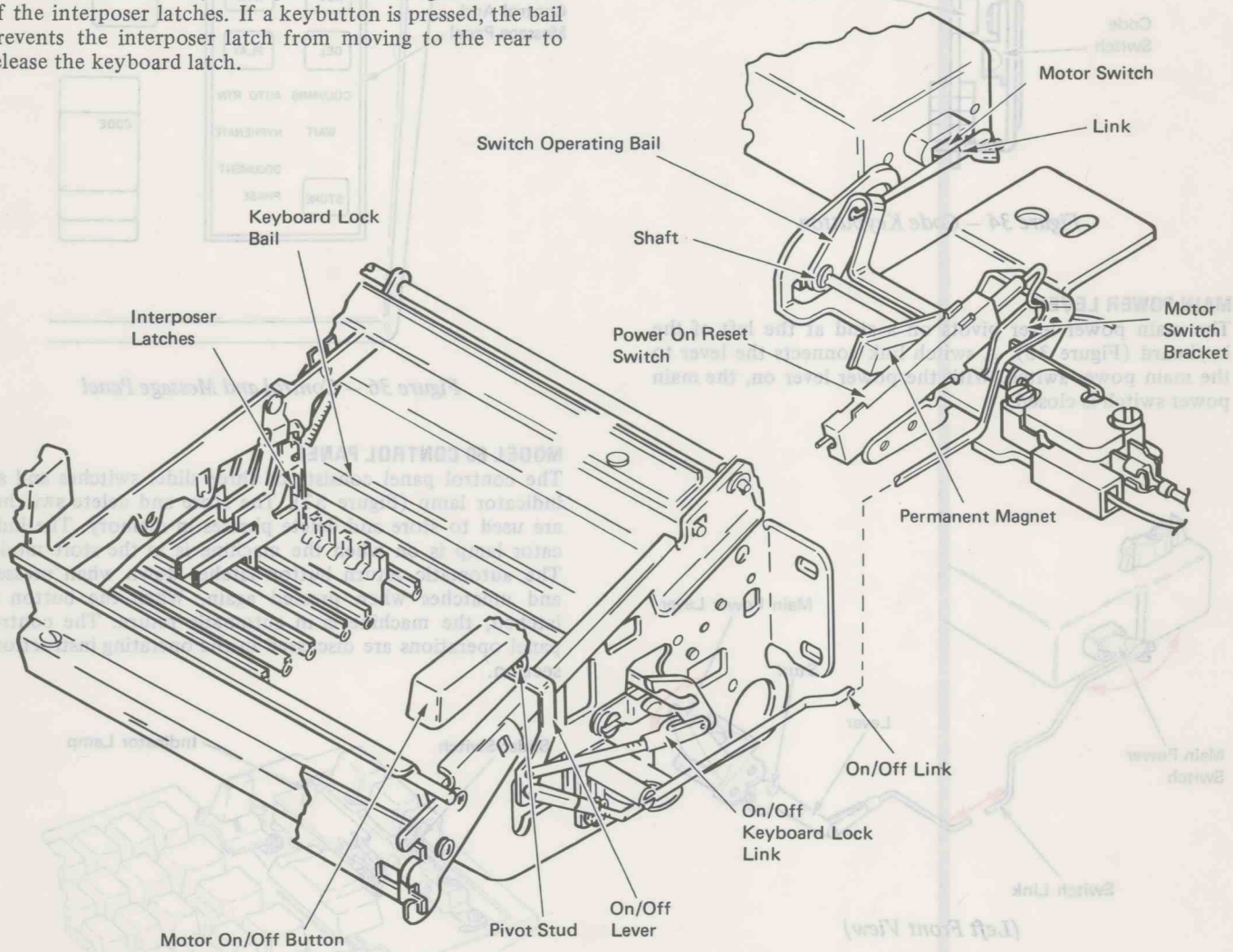


Figure 33 – Motor On/Off Switch and Keyboard Lock

CODE KEYBUTTON

The code switch changes character or function codes into machine operating codes. The code switch is operated by the code keybutton (Figure 34). When the code keybutton is pressed, the magnet closes the switch.

Holding the code keybutton down while pressing one of the function keybuttons produces a machine operating code. For example: Holding down the code keybutton and pressing the *I* keybutton underscores the last word typed.

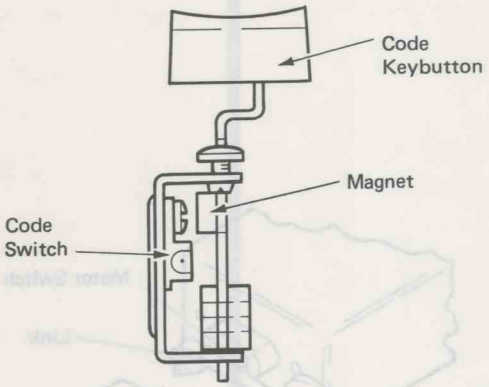
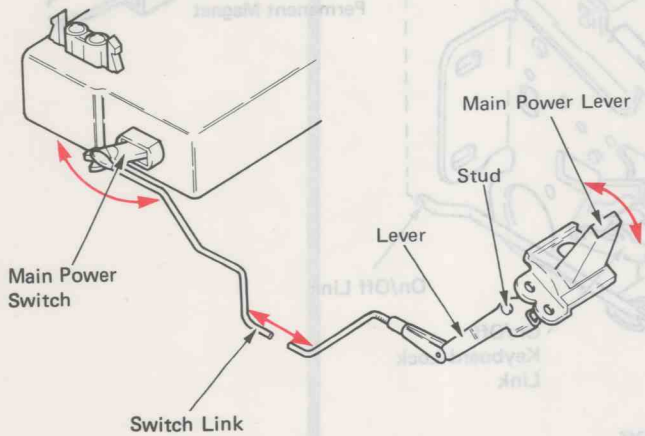


Figure 34 – Code Keybutton

MAIN POWER LEVER

The main power lever pivots on a stud at the left of the keyboard (Figure 35). A switch link connects the lever to the main power switch. With the power lever on, the main power switch is closed.



(Left Front View)

Figure 35 – Main Power Lever

CONTROL AND MESSAGE PANEL

The control and message panel contains control buttons, switches and message lights (Figure 36). The switches are operated by buttons to control the storage, revision, playback, and deletion of text in memory. The function of each button is discussed in the Operating Instructions section. The message lights indicate which mode the machine is in. The function of the control buttons and message lights is discussed in the Operating Instructions section.

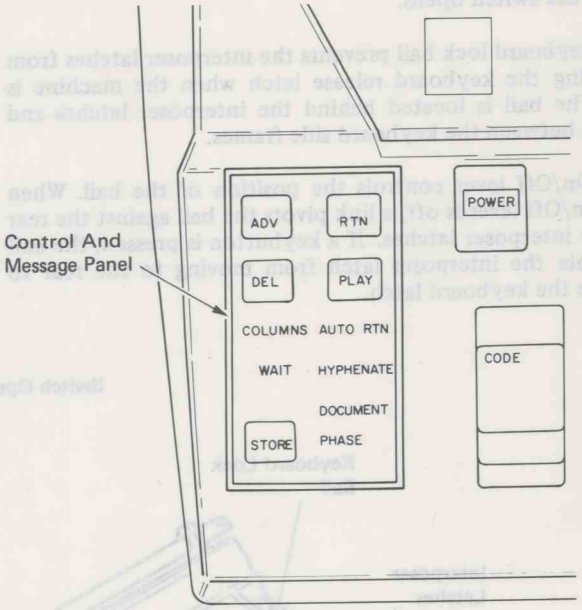


Figure 36 – Control and Message Panel

MODEL 60 CONTROL PANEL

The control panel consists of three slider switches and an indicator lamp (Figure 37). The store and delete switches are used to store and delete phrases in memory. The indicator lamp is on when the machine is in the store mode. The automatic return button latches down when pressed and unlatches when pressed again. When the button is latched, the machine is in automatic return. The control panel operations are discussed in the operating instructions section.

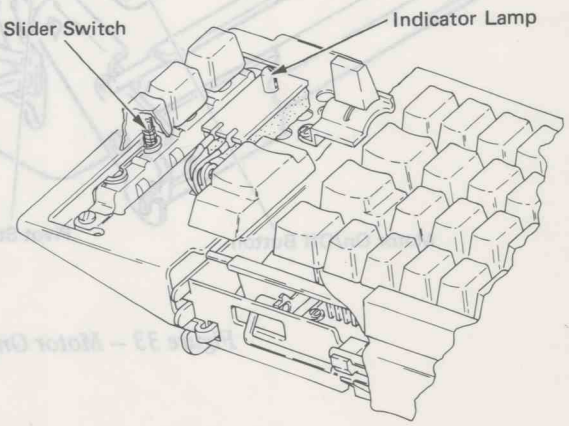
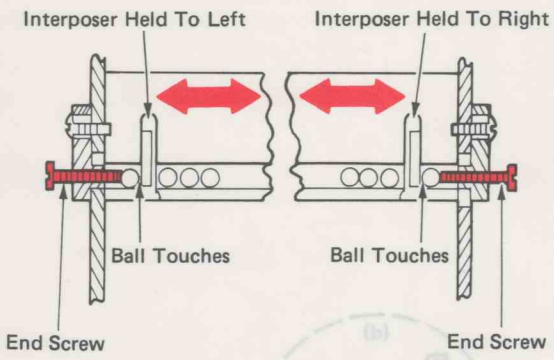


Figure 37 – Model 60 Control Panel

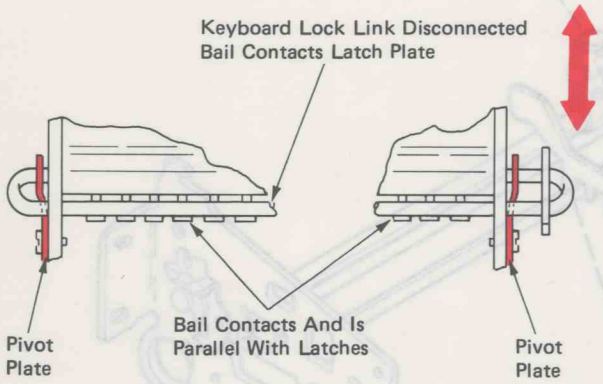
KEYBOARD ADJUSTMENTS

1. *Compensator Tube* – With an end interposer latched and held toward the outside of the keyboard, adjust the compensator end screws so the first ball contacts the interposer.



(Front View)

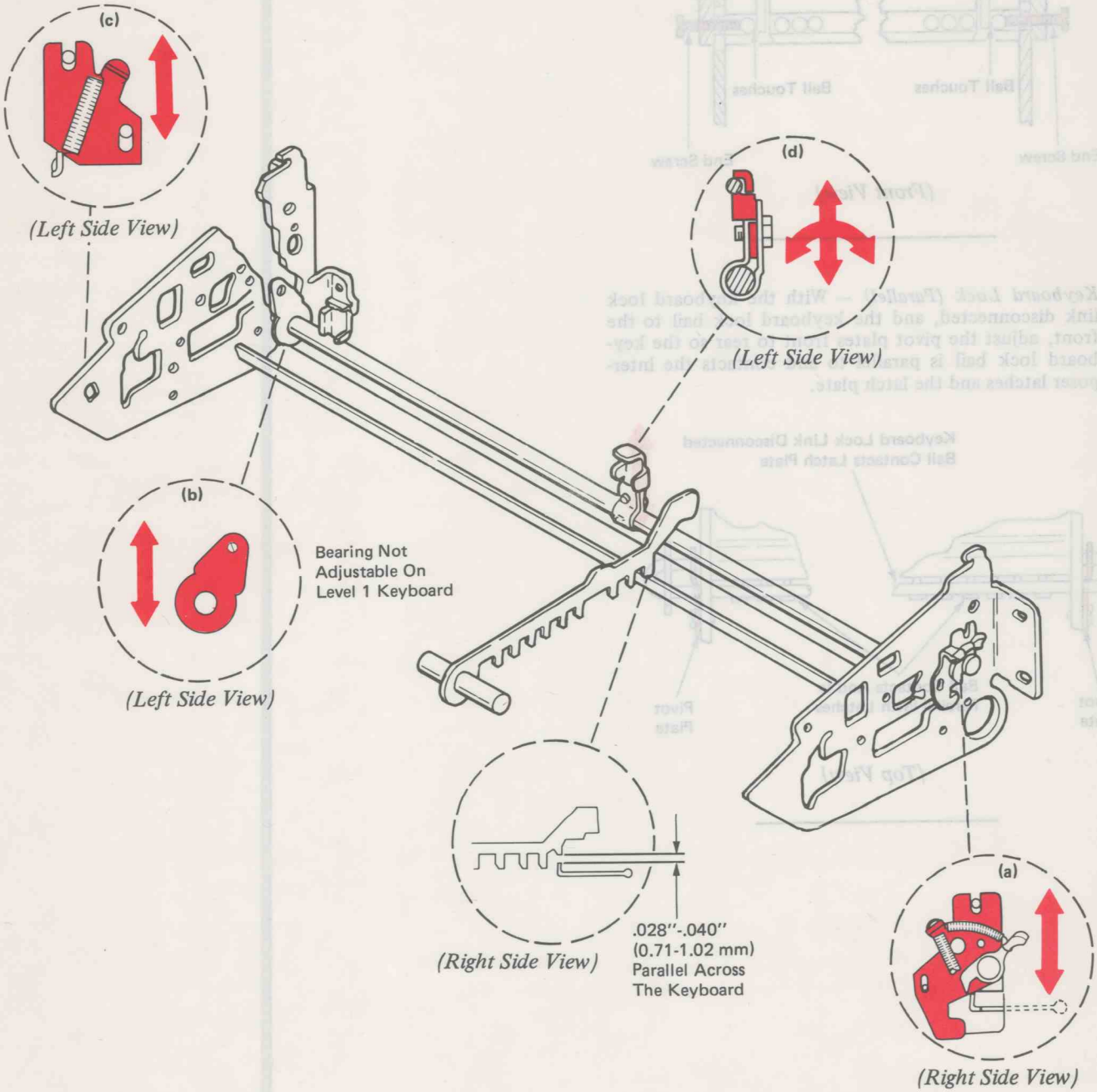
2. *Keyboard Lock (Parallel)* – With the keyboard lock link disconnected, and the keyboard lock bail to the front, adjust the pivot plates front to rear so the keyboard lock bail is parallel to and contacts the interposer latches and the latch plate.



(Top View)

3. *Filter Bail Height* – Adjust the filter bail guides and the filter bail center support up or down for a parallel clearance of .028"-.040" (0.71-1.02 mm) between the filter bail and the interposer drive lugs. Cycle the filter bail under the drive lugs to check this adjustment.

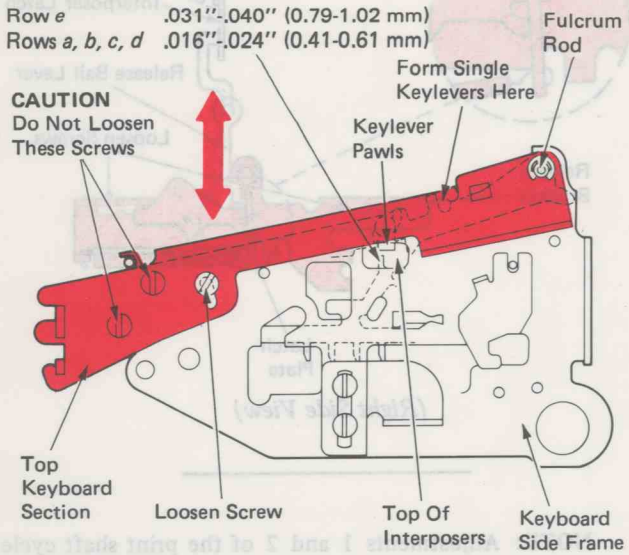
a. Loosen C and D.
b. Adjust A and B to get a parallel clearance.
c. Adjust C to just touch the filter bail.
d. Tighten D.



4. *Keylever Height* – Adjust the top section of the keyboard up or down for a clearance of .031"-.040" (0.79-1.02 mm) between the *e* row keylever pawls and the top of the interposers.

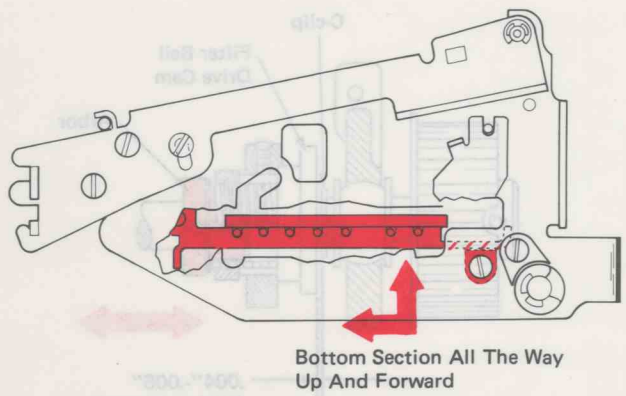
Each keylever may be formed for single keylever adjustment. Keylever pawl to interposer clearance in rows *a, b,* and *c* should be .016"-.024" (0.41-0.61 mm).

NOTE: The keylever height may be observed through the keyboard side frame. The keylever fulcrum rod must be fully engaged to the rear with the side frame locating lugs.



(Right Side View)

5. *Keyboard Bottom Section* – The bottom section should be positioned all the way up and forward.



(Right Side View)

6. *Reed Switch Modules* – Adjust the reed switch modules for a clearance of .001"-.005" (0.03-0.13 mm) between the slider and the selection bail lug.

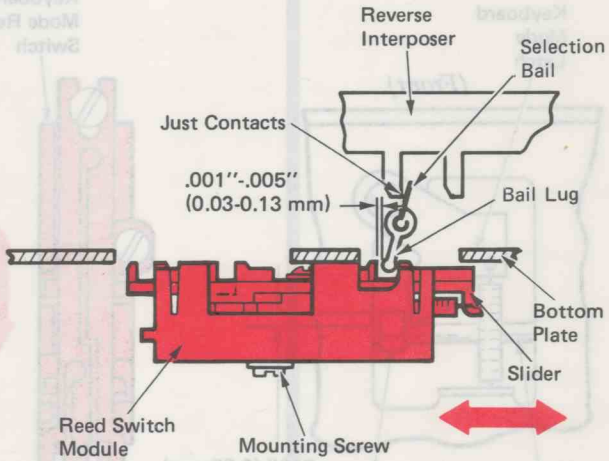
To make this adjustment:

a. Loosen all six selection reed switch assemblies.
b. Allow the reed switch assemblies to fall to their lowest position, against their selection bails.
c. Tighten the mounting screw on each switch assembly in this position.

To check this adjustment:

Depress each reed switch slider. Each slider should move .001"-.005" (0.03-.13 mm) before the reverse interposer starts to move. Observe the reverse interposer by looking between the leading edge of the keyboard bottom section and center section, at the right front corner of the keyboard. The reverse interposer is the third interposer from the right.

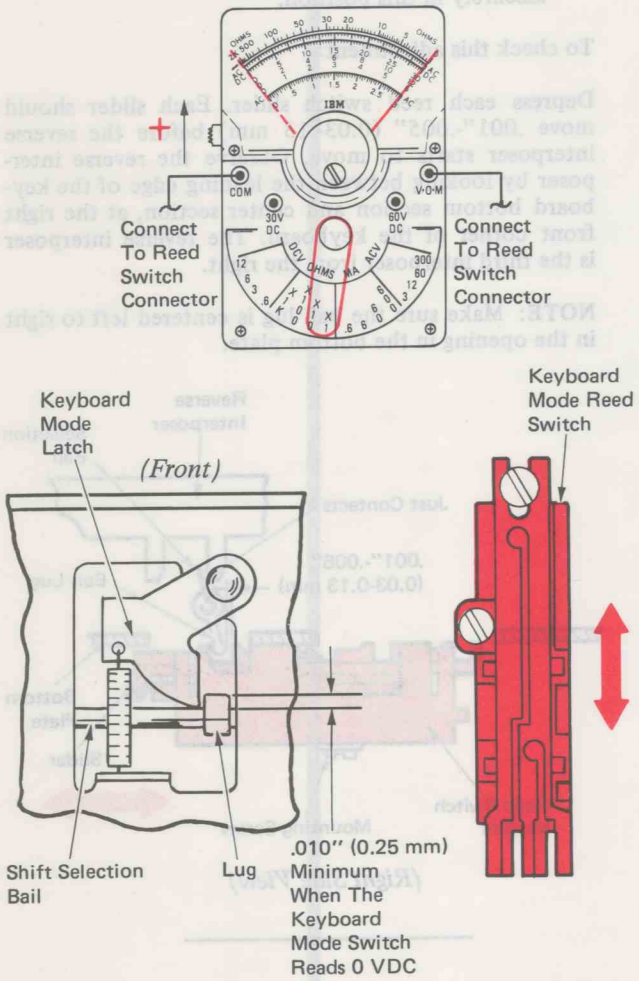
NOTE: Make sure the bail lug is centered left to right in the opening in the bottom plate.



(Right Side View)

7. *Keyboard Mode Switch* – Adjust the keyboard mode reed switch front to rear. As the shift selection bail pivots to the front, the switch should close when the shift selection bail lug is still engaged a minimum of .010" (0.25 mm) with the keyboard mode latch.

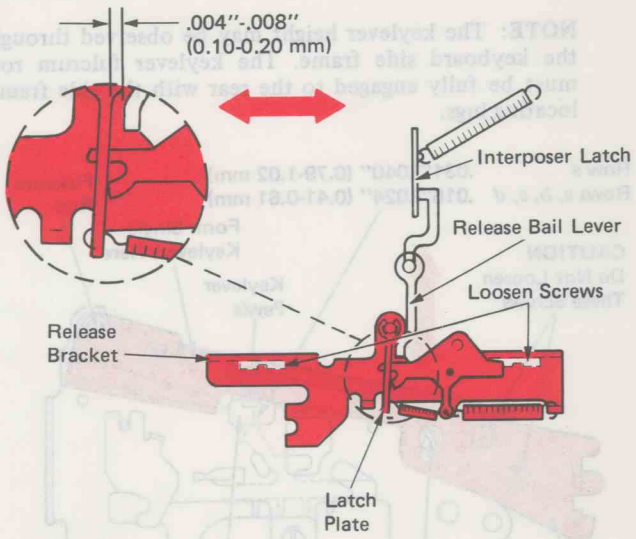
The reed switch must open reliably as the bail pivots back to the rest position.



(Bottom View)

8. *Release Bracket* – Adjust the release bracket front or rear for a clearance of .004"-.008" (0.10-0.20 mm) between the latch plate and the release bail.

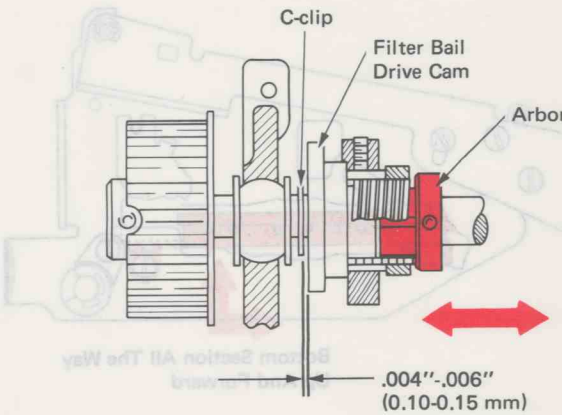
The release bail should be resting on the rear of the interposer latches while this adjustment is being made.



(Right Side View)

NOTE: Adjustments 1 and 2 of the print shaft cycle clutch mechanism must be correct before making the keyboard clutch adjustments. These two adjustments control the lateral position of the upper shaft.

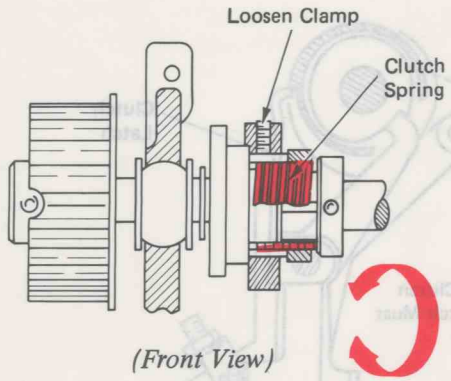
9. *Keyboard Clutch Arbor* – Adjust the arbor left or right for a clearance of .004"-.006" (0.10-0.15 mm) between the filter bail drive cam and the C-clip on the upper shaft.



(Front View)

10. *Keyboard Clutch Spring* – Adjust the clutch spring so the sleeve contacts the latch when the check pawl is .085"-.105" (2.16-2.67 mm) from the check pawl latching surface as the upper shaft is rotated by hand. To make this adjustment, loosen the clamp, then rotate the clutch spring.

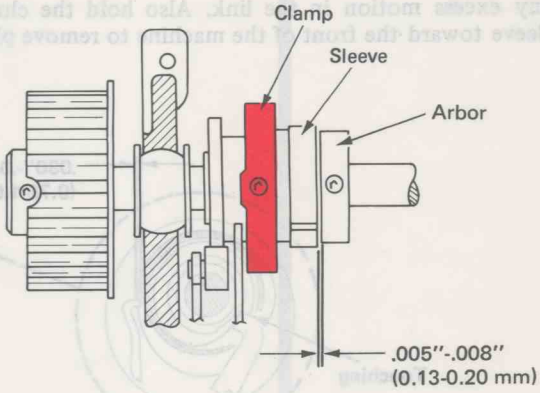
NOTE: After loosening the clamp, make sure adjustment 11 is correct, then tighten the clamp.



(Front View)

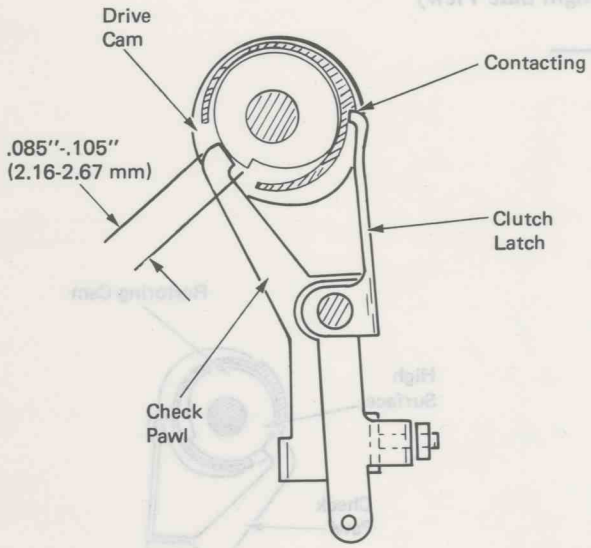
11. *Keyboard Clutch Sleeve* – Adjust the clamp left or right for a clearance of .005"-.008" (0.13-0.20 mm) between the sleeve and the arbor.

NOTE: Check adjustment 10 before tightening the clamp.

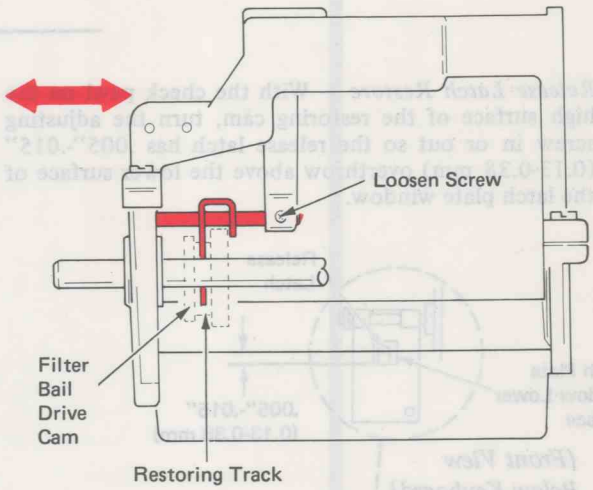


(Front View)

12. *Keyboard Check Pawl* – Adjust the keyboard check pawl left or right so it is centered in the restoring track of the filter bail drive cam.



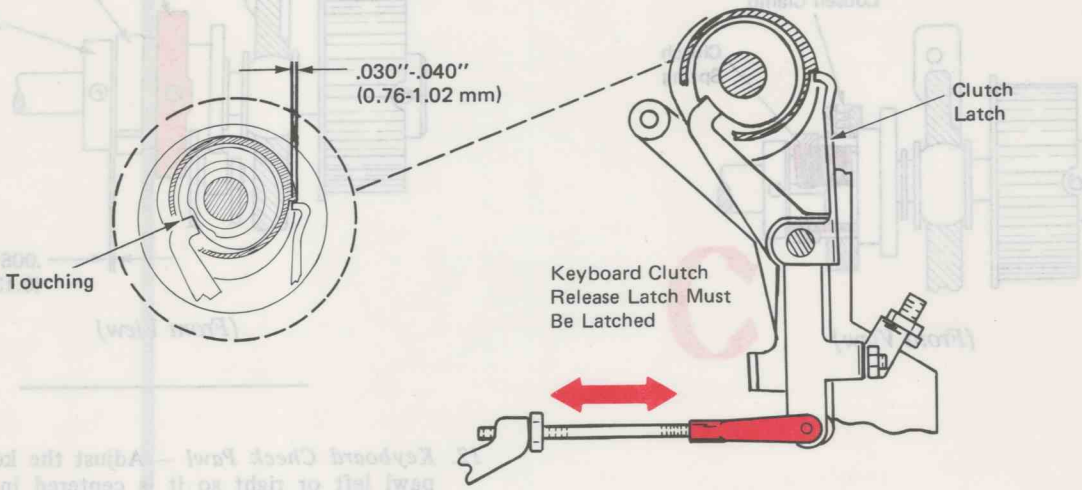
(Right Side View)



(Bottom View)

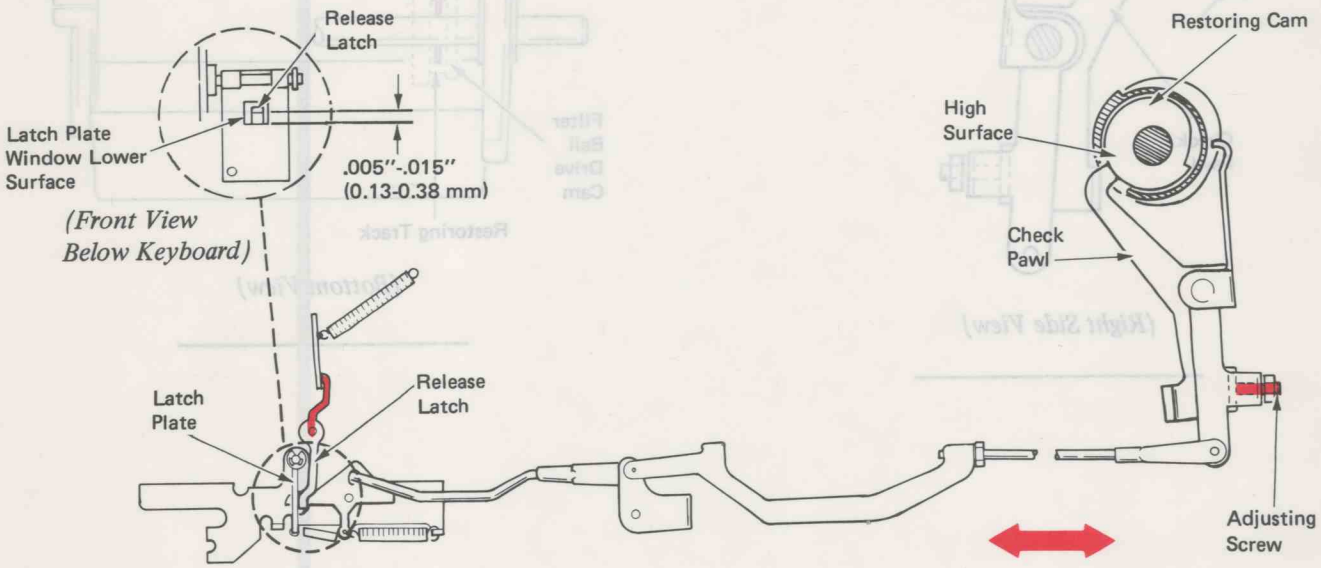
13. *Keyboard Clutch Latch* – Adjust the clutch release link so the latch engages the sleeve by .030"-.040" (0.76-1.02 mm).

When checking this adjustment, make sure the keyboard clutch release latch is resting in the latch plate window. Lightly hold the clutch latch toward the rear to remove any excess motion in the link. Also hold the clutch sleeve toward the front of the machine to remove play.

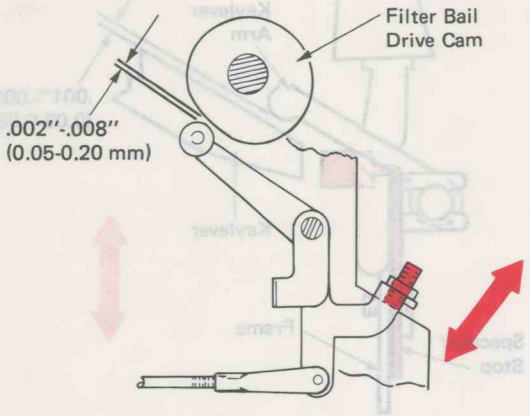


(Right Side View)

14. *Release Latch Restore* – With the check pawl on the high surface of the restoring cam, turn the adjusting screw in or out so the release latch has .005"-.015" (0.13-0.38 mm) overthrow above the lower surface of the latch plate window.



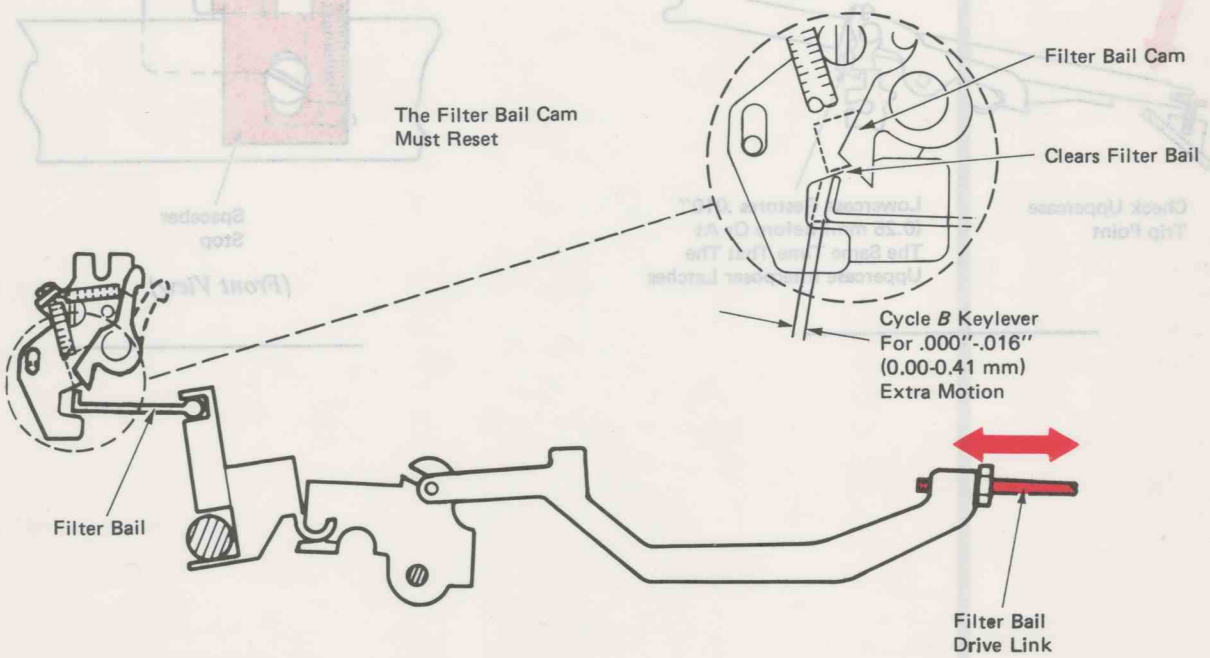
15. *Filter Bail Drive Cam Follower* – With the filter bail drive cam in the rest position and the clutch latched, adjust the cam follower stop screw in or out for a clearance of .002"-.008" (0.05-0.20 mm) between the cam follower roller and the drive cam.



(Right Side View)

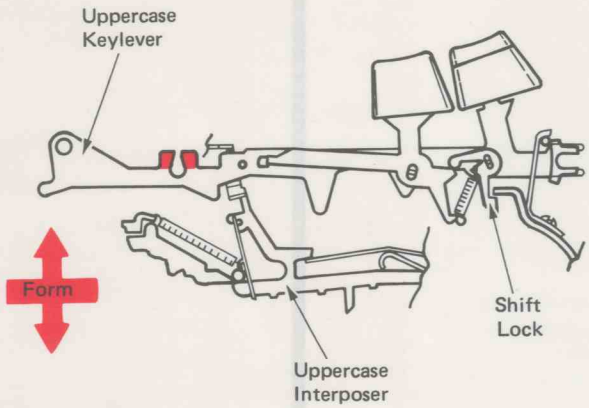
16. *Filter Bail Drive* – Adjust the filter bail drive link so the filter bail moves an additional .000"-.016" (0.00-0.41 mm), after the filter bail cam restores. Hand cycle the letter *B* to check this adjustment.

NOTE: The *B* interposer does not have to restore when hand cycled.



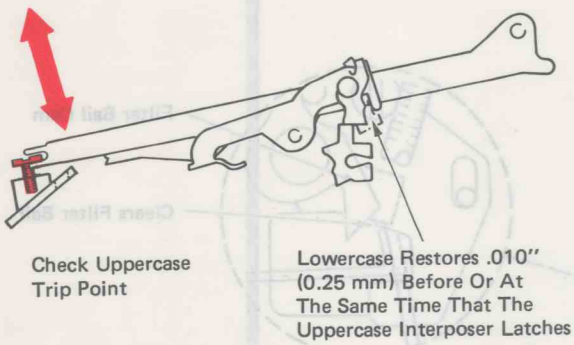
(Right Side View)

17. *Uppercase Keylever* – Form the uppercase keylever up or down so the shift locks at the same time the uppercase interposer is latched down.

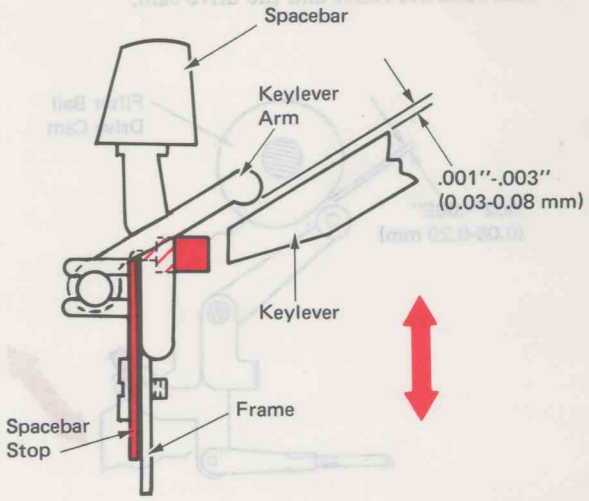


18. *Lowercase Keylever* – Adjust the keylever adjusting screw up or down. As the shift keybutton is pressed, the lowercase keylever pawl should restore .010" (0.25 mm) before, or at the same time, the uppercase interposer latches down.

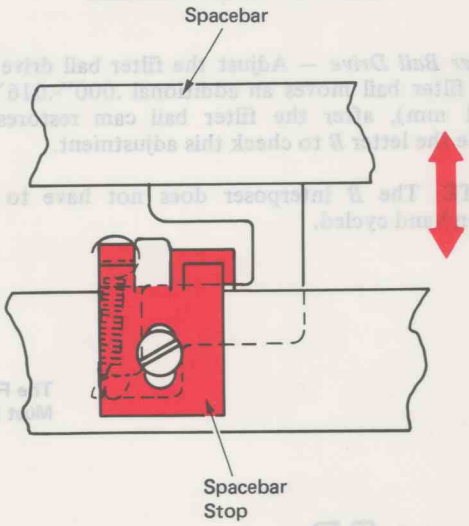
Look through the top of the keyboard to make this adjustment.



19. *Spacebar Height* – Adjust the spacebar stop up or down so the keylever arm clears the keylever by .001"-.003" (0.03-0.08 mm) when the spacebar is at rest.



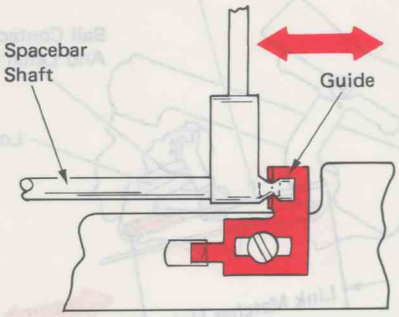
(Right Side View)



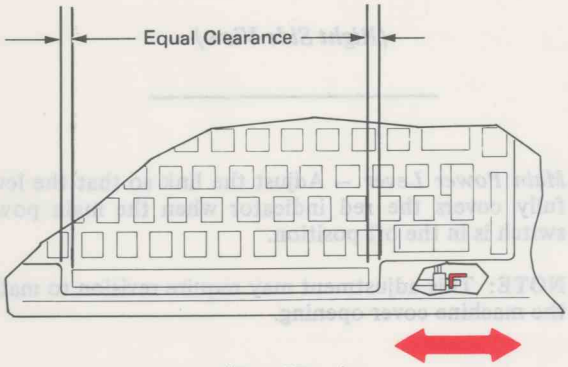
(Front View)

20. *Spacebar Left To Right* – Adjust the right spacebar shaft guide left or right so the spacebar is centered in the covers.

NOTE: Make sure the shock mount adjustment (adjustment 3B, Covers section) is correct before making this adjustment.



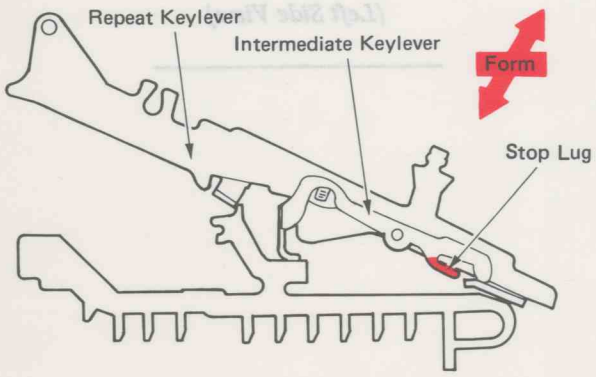
(Right Side View)



(Top View)

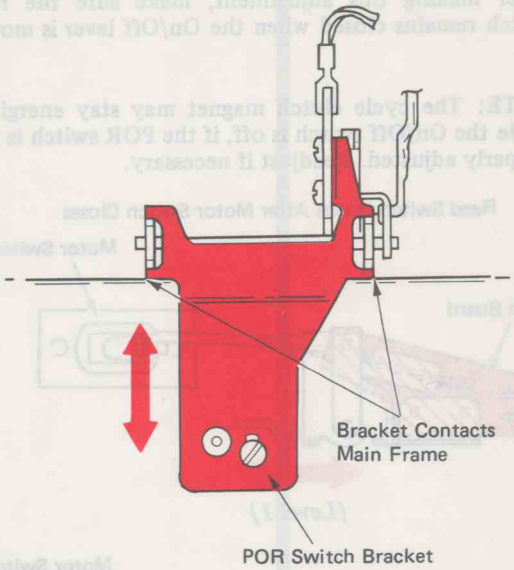
21. *Repeat Keylevers* – Press each repeat keylever to check repeat operation. If the keylever does not repeat, form the stop lug located on the intermediate keylever. Use downward pressure on the front of the keylevers to form the lug down.

CAUTION
This lug limits the downward motion of the intermediate keylever. If formed too far down, the interposer front and rear motion is limited when the keylever is held down in the repeat position. To adjust this lug upward, you must remove the top section of the keyboard.



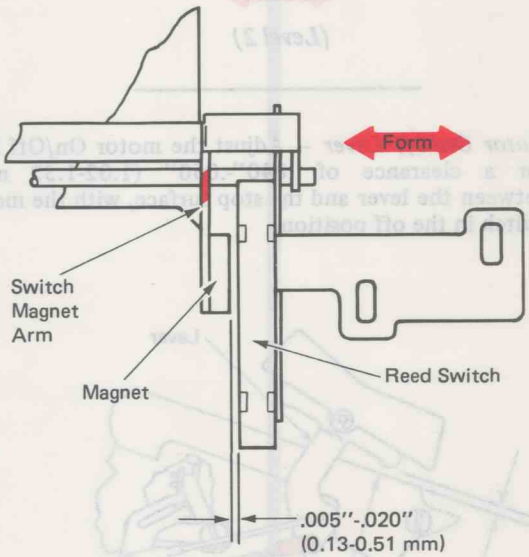
(Left View)

22. *POR Switch Bracket* – Adjust the bracket front to rear so that the vertical lugs on the bracket contact the main frame.



(Bottom View)

23. *POR Switch Magnet Clearance* – Form the switch magnet arm for a clearance of .005"-.020" (0.13-0.51 mm) between the reed switch and the magnet.

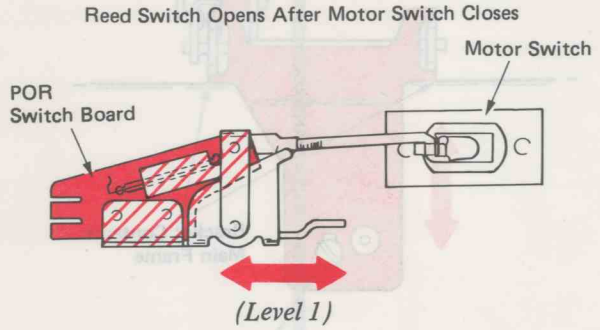


(Top View)

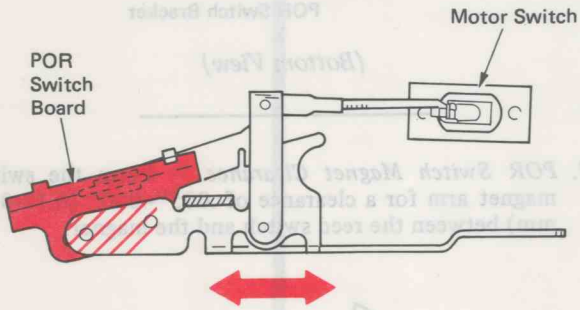
24. *POR Reed Switch* – Adjust the POR board front or rear so the POR reed switch opens after the motor switch closes, as the motor On/Off lever is pushed on.

After making this adjustment, make sure the reed switch remains closed when the On/Off lever is moved off.

NOTE: The cycle clutch magnet may stay energized while the On/Off switch is off, if the POR switch is not properly adjusted. Readjust if necessary.

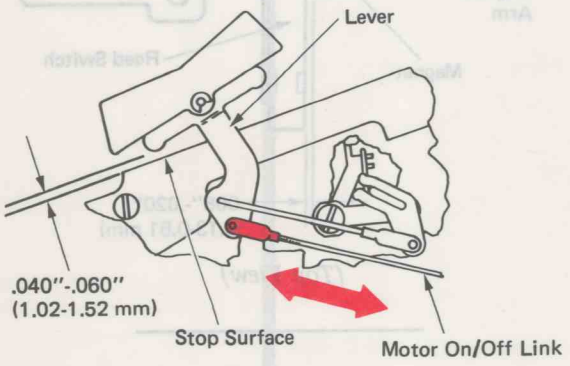


(Level 1)



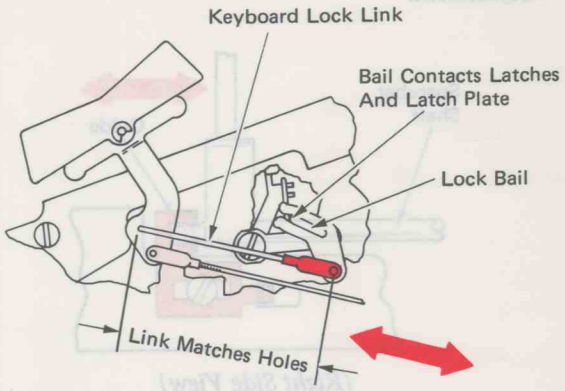
(Level 2)

25. *Motor On/Off Lever* – Adjust the motor On/Off link for a clearance of .040"-.060" (1.02-1.52 mm) between the lever and the stop surface, with the motor switch in the off position.



(Right Side View)

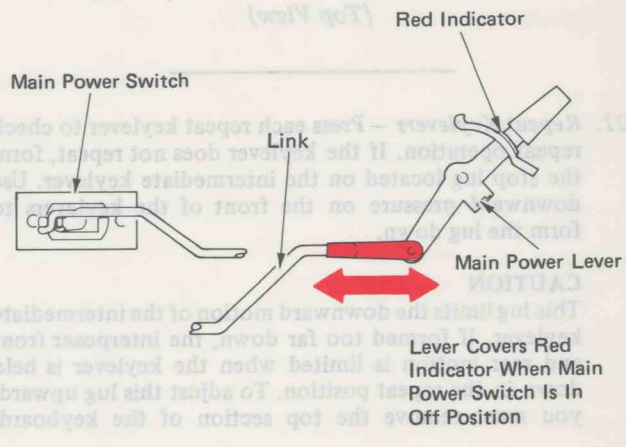
26. *Keyboard Lock Link* – Adjust the length of the keyboard lock link to match the distance between the motor On/Off lever and the lock bail. Make this adjustment with the On/Off lever in the off position and the bail in the forward rest position, against the interposer latches and the latch plate.



(Right Side View)

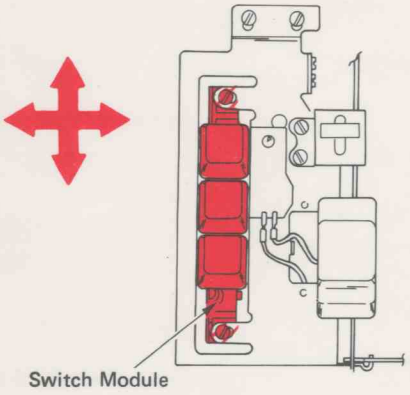
27. *Main Power Lever* – Adjust the link so that the lever fully covers the red indicator when the main power switch is in the off position.

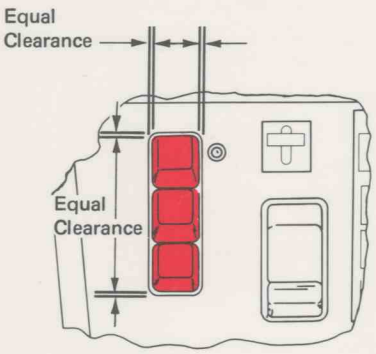
NOTE: This adjustment may require revision to match the machine cover opening.



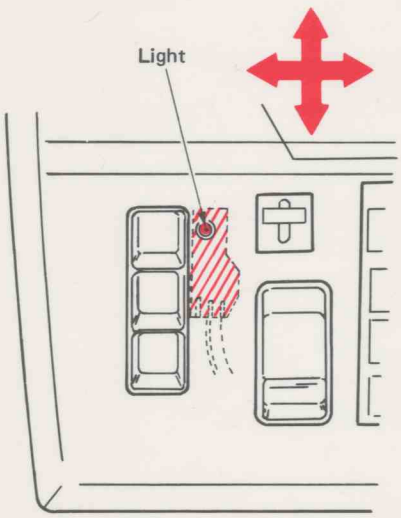
(Left Side View)

28. *Switch Position, Model 60* – Adjust the switch module so the switch buttons are located in the center of the cover opening. Make sure the machine is located correctly in the covers before checking this adjustment.

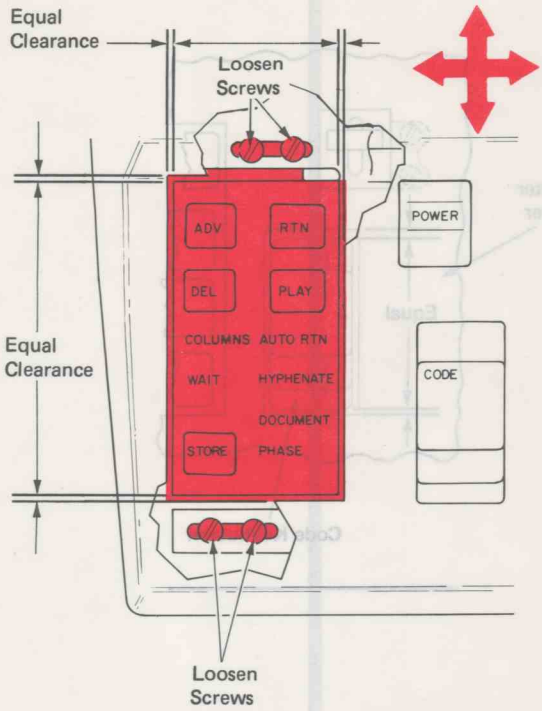




29. *Indicator Light, Model 60* – Adjust the indicator light so it is centered in the opening in the cover. Make sure the machine is located correctly in the covers before making this adjustment.

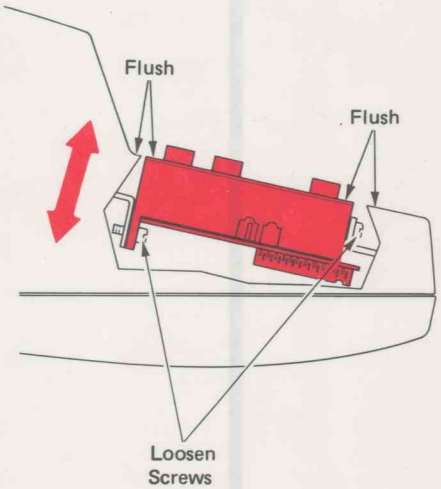


30. *Panel Position* – Adjust the panel left to right and front to rear so it is centered in the cover opening. Make sure the machine is located correctly in the covers before checking this adjustment.



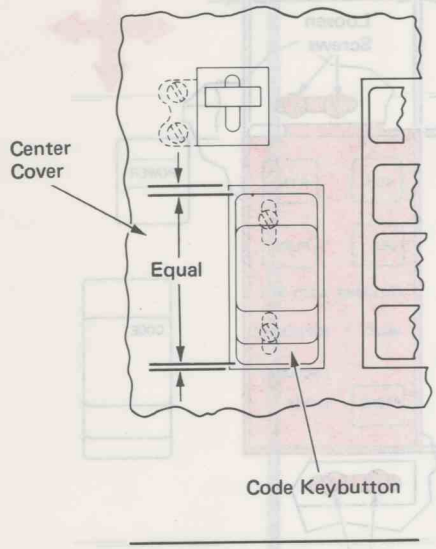
(Top View)

31. *Panel Height* – Adjust the panel up and down to be flush with the center cover. Make sure the machine is located correctly in the covers before checking this adjustment.



(Left View)

32. *Code Switch* – Adjust the code switch front or rear for equal clearance between the keybutton and the center cover. Make sure the machine is located correctly in the covers before checking this adjustment.



MOTOR AND DRIVE OPERATIONAL THEORY

The motor and drive mechanism uses a drive belt to drive the power module (Figure 1). The power module supplies drive to all of the machine operations. These operations include driving the filter bail, rotating the leadscrew, rotating the index cam, and rotating the print shaft.

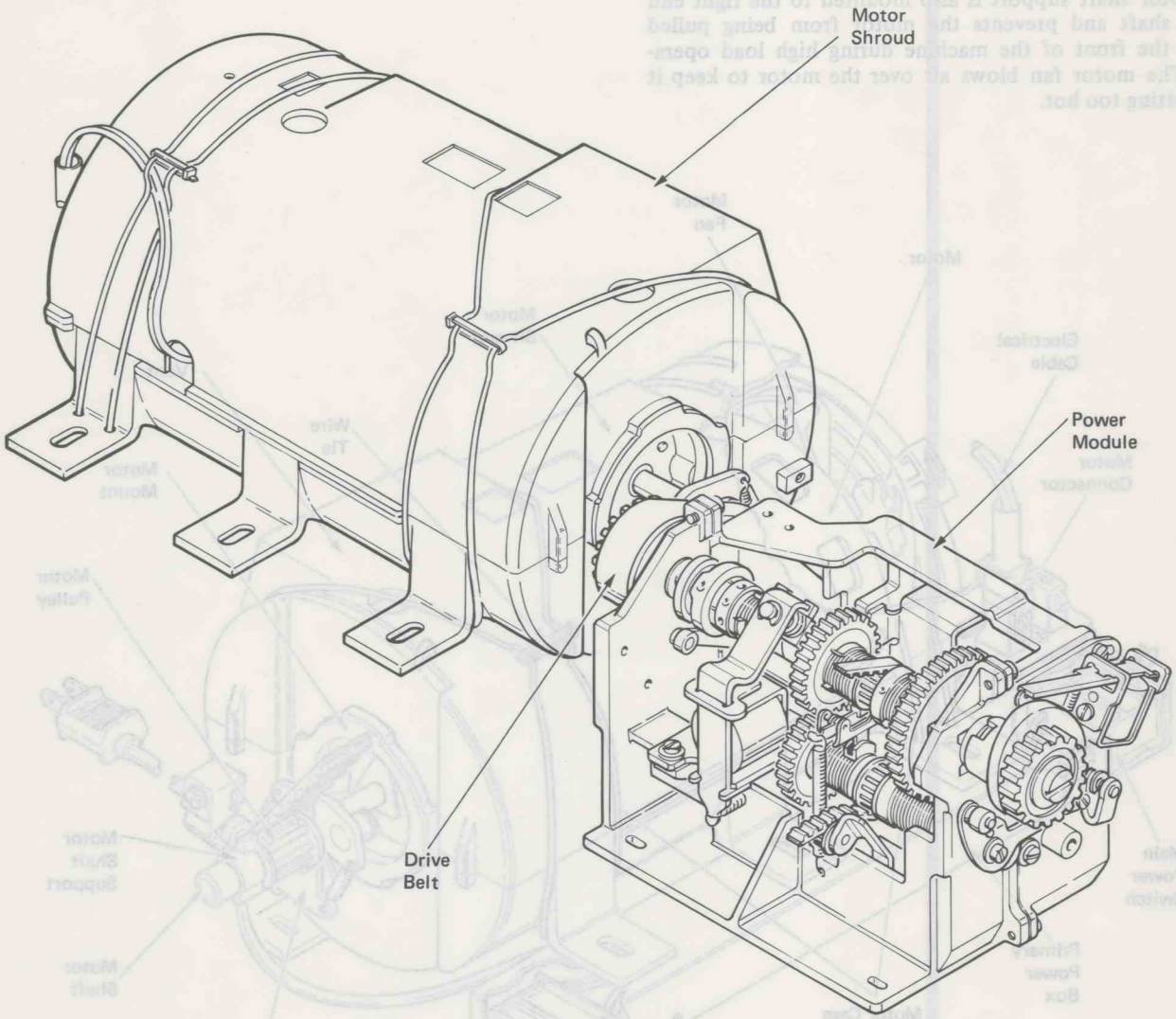


Figure 1 – Motor And Drive

MOTOR

The motor is enclosed in a case mounted to the main frame (Figure 2). The motor is supported in the motor case with motor mounts to absorb motor vibration. The motor mounts also provide a layer of insulation. (See the Electrical Insulation part of this section.)

The motor receives power from the primary power box through an electrical cable. Both the motor switch and the main power switch must be in the on position for the motor to receive voltage. Wire ties prevent the motor case retainers from vibrating.

The motor shaft extends from both ends of the motor. The motor pulley and clutch are located on the right end of the shaft and transfer motion from the motor to the drive belt. The motor shaft support is also mounted to the right end of the shaft and prevents the motor from being pulled toward the front of the machine during high load operations. The motor fan blows air over the motor to keep it from getting too hot.

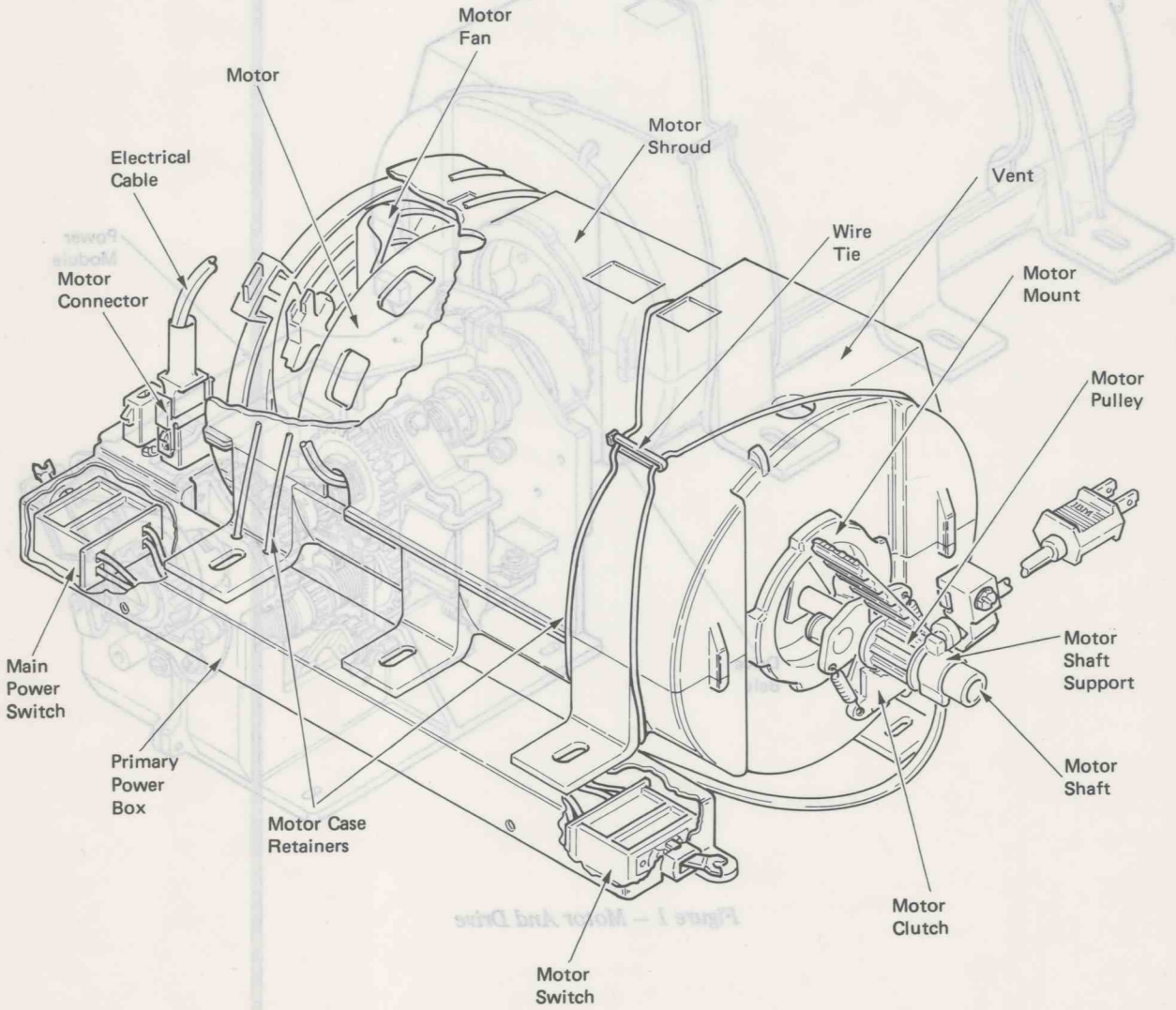


Figure 2 – Motor

CAUTION
If the motor vent is blocked, the heat generated by the motor can heat metal parts which produces a hazard for the customer or causes component failure (Figure 3). The vent must be clear and the machine must have proper space for air flow.

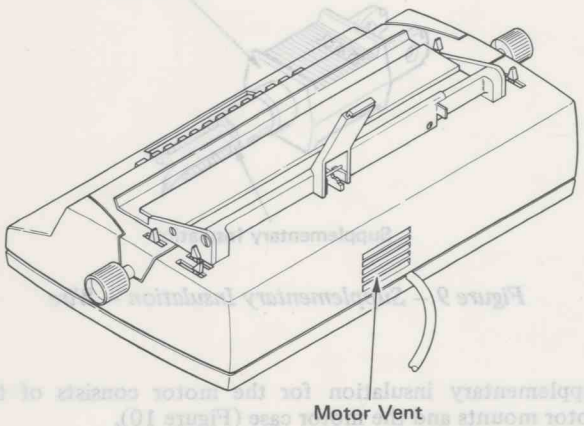


Figure 3 – Motor Vent

MOTOR CLUTCH

A motor clutch is necessary because the motor has low starting torque. The motor clutch allows the motor to start and almost reach operating speed before it engages the motor pulley.

Two clutch pawls pivot on the clutch hub (Figure 4). The clutch hub is mounted to the motor shaft. When the motor is off, the clutch pawls are held against the stop lugs by the clutch springs.

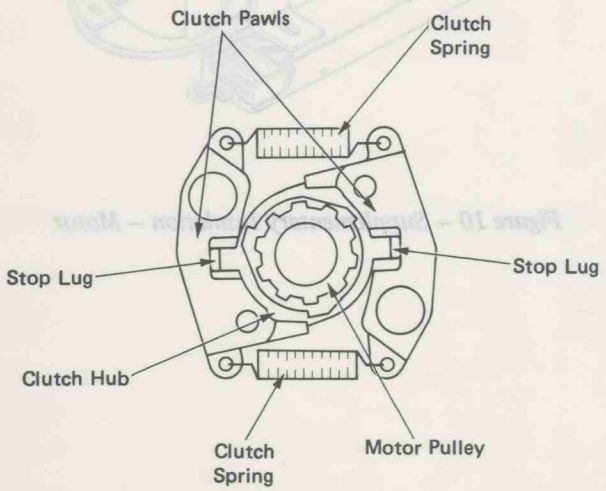


Figure 4 – Motor Clutch Disengaged

When the motor is turned on, the clutch springs hold the clutch pawls against the stop lugs. However, just before the motor reaches operating speed, the clutch pawls pivot away from the stop lugs, and engage the motor pulley teeth (Figure 5). The motor pulley then rotates with the motor clutch and shaft, and drives the drive belt and power module.

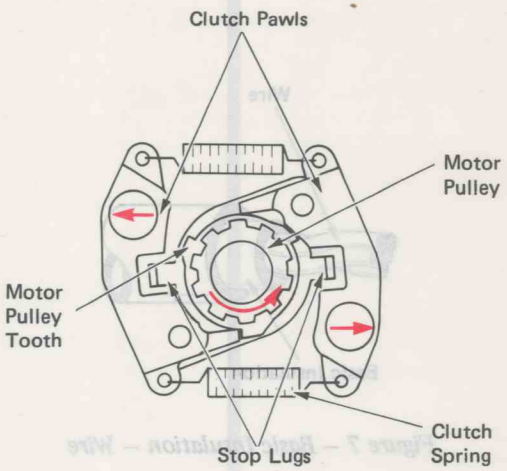
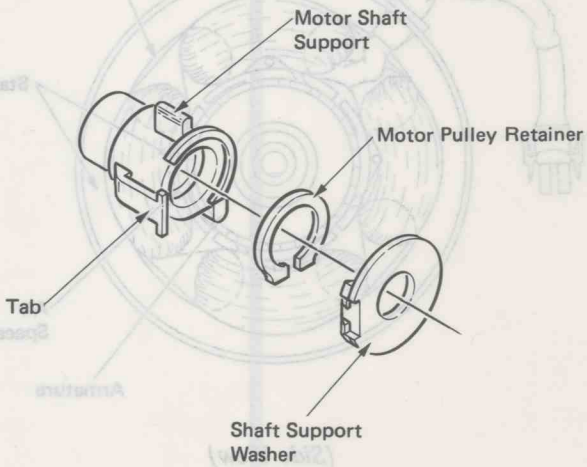


Figure 5 – Motor Clutch Engaged

The motor shaft support consists of the shaft support, the motor pulley retainer, and the shaft support washer. The shaft support is connected to the washer by a tab on the shaft support (Figure 6). The motor pulley retainer positions the support washer on the motor shaft to maintain a clearance between the washer and the motor pulley.



(Right Rear View)

Figure 6 – Motor Shaft Support

ELECTRICAL INSULATION

The electrical insulation consists of three types: basic insulation, supplementary insulation, and reinforced insulation.

Basic insulation prevents short circuiting by keeping the wires from touching (Figure 7). Basic insulation also provides primary protection against electrical shock for the user. Basic insulation on a wire is the first layer of insulation.

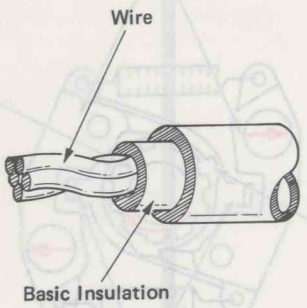
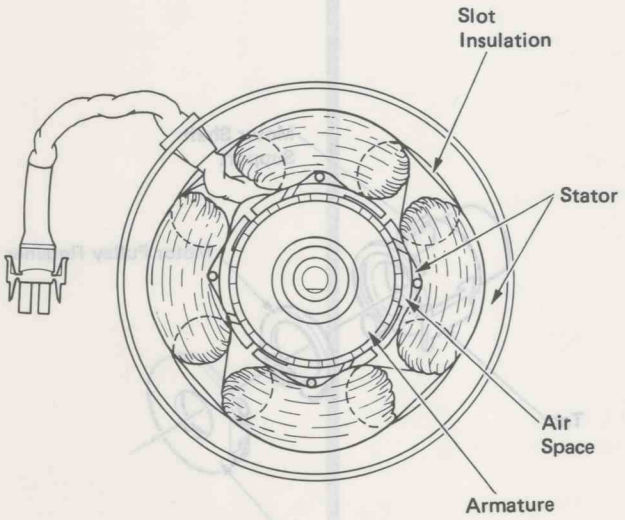


Figure 7 – Basic Insulation – Wire

Basic insulation in the motor consists of the slot insulation and the air space between the stator and the armature (Figure 8).



(Side View)

Figure 8 – Basic Insulation – Motor

Supplementary insulation is an additional layer of insulation over the basic insulation (Figure 9). It protects the user from electrical shock if the basic insulation fails. Supplementary insulation on the line cord is the layer around the wires in the linecord.

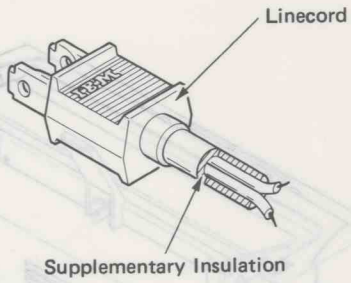


Figure 9 – Supplementary Insulation – Wire

Supplementary insulation for the motor consists of the motor mounts and the motor case (Figure 10).

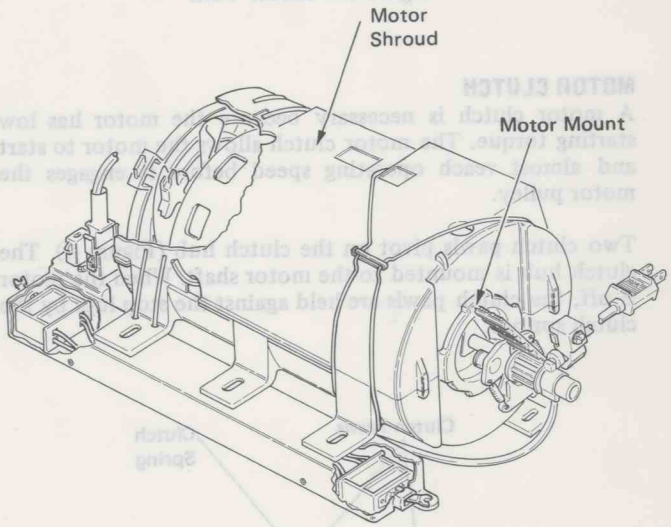


Figure 10 – Supplementary Insulation – Motor

Reinforced insulation is an improved insulation having the same qualities of basic and supplementary insulation (Figure 11). The motor switch, the main power switch and the linecord plug use reinforced insulation.

DOUBLE INSULATION

Double insulation uses both basic and supplementary insulation to provide two layers of protection against electrical shock (Figure 12). The motor has only basic insulation. The supplementary insulation consists of the motor mounts, air space between the motor and the motor case, and the motor case.

DANGER

You could receive a shock if you touch the motor shell or shaft when there is an insulation failure in the motor. Turn off the motor switch before you touch the motor or motor shaft. Do not hold motors in your hand when you test them. To check for an insulation failure in the motor, check the resistance between the motor and the motor leads, at the electrical connection plug pins. A reading of less than infinity indicates the motor is shorted to an electrical part.

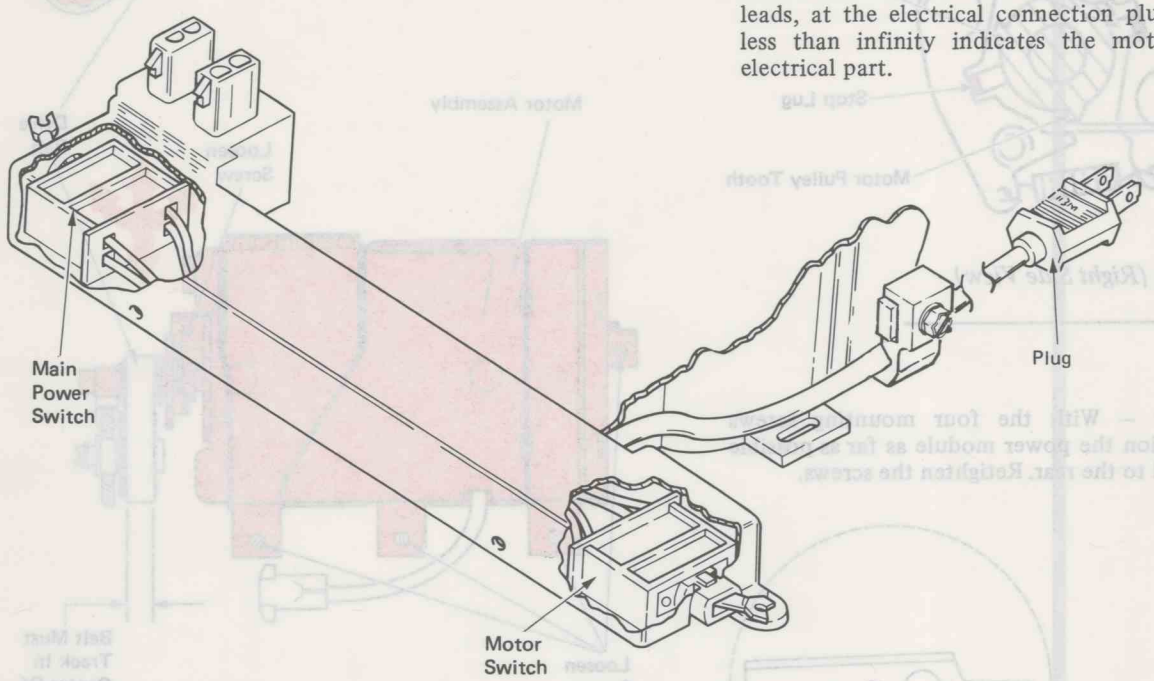


Figure 11 – Reinforced Insulation

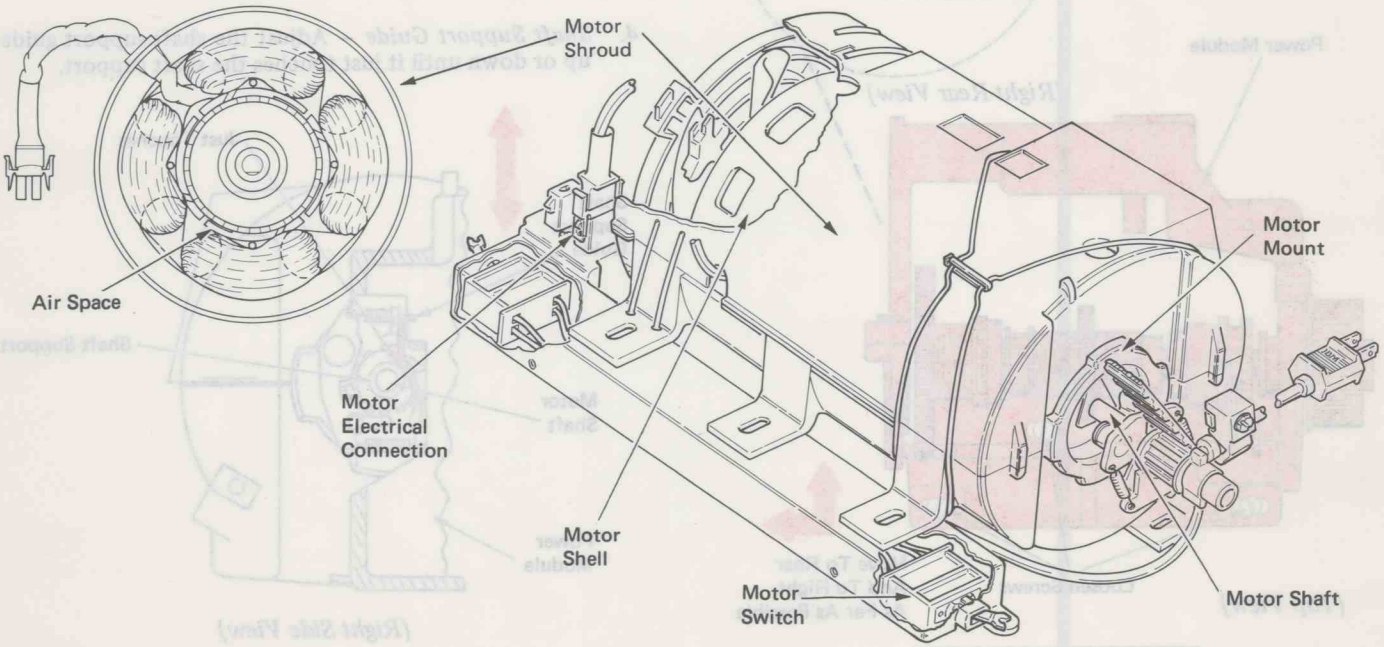
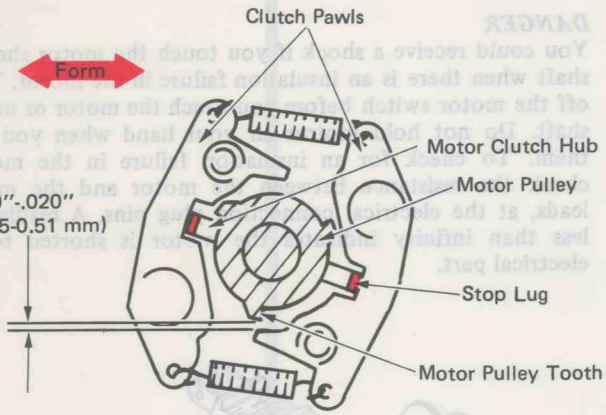


Figure 12 – Double Insulation

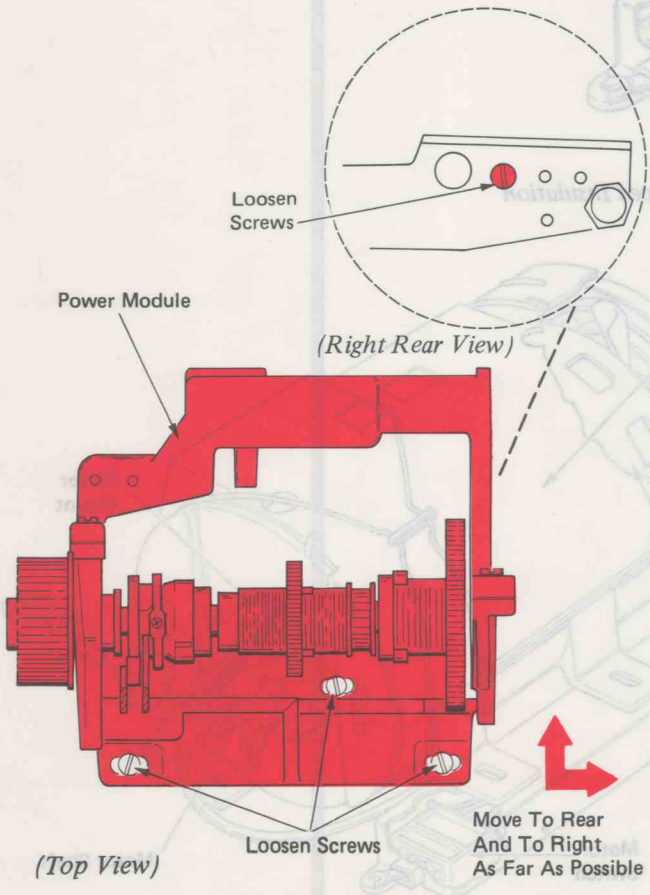
MOTOR AND DRIVE ADJUSTMENTS

1. *Motor Clutch Pawls* – Form the stop lugs for a clearance of .010"-.020" (0.25-0.51 mm) between the clutch pawls and the motor pulley teeth.



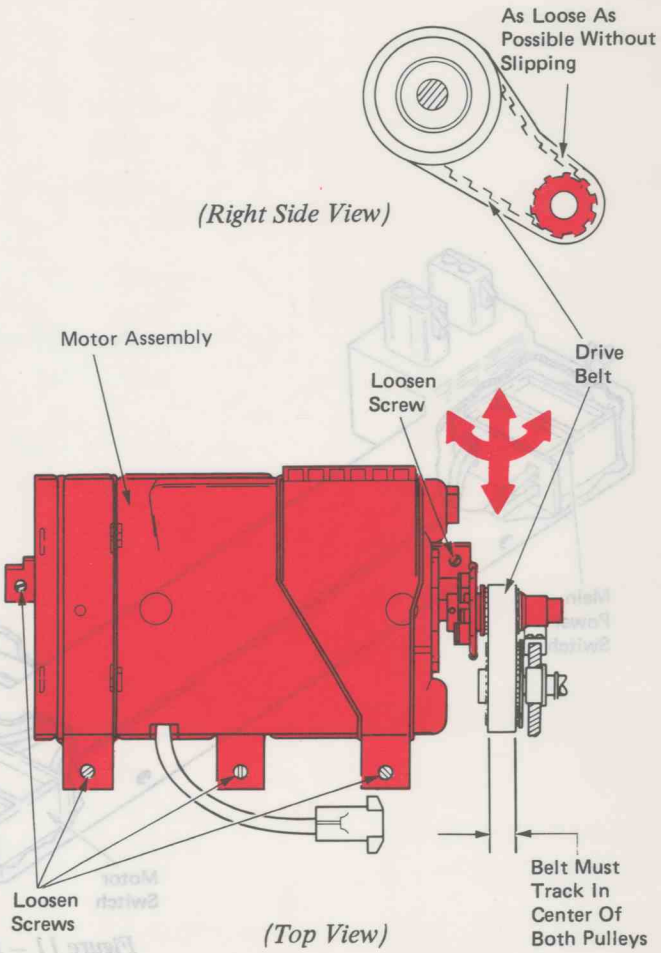
(Right Side View)

2. *Power Module* – With the four mounting screws loosened, position the power module as far as possible to the right and to the rear. Retighten the screws.

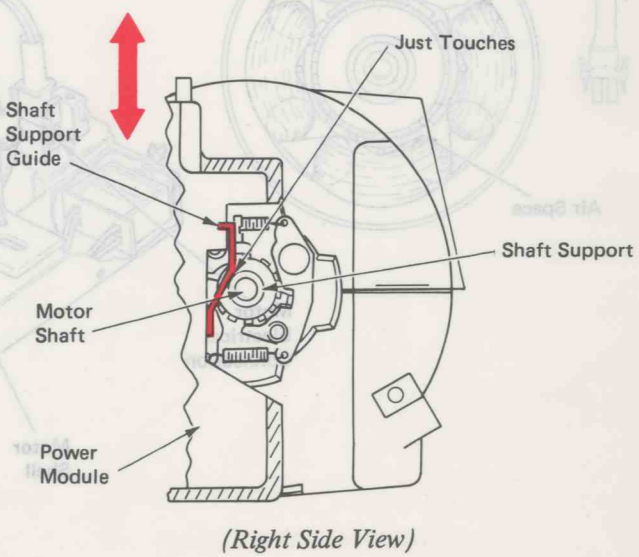


3. *Motor Position* – Adjust the position of the motor so the drive belt is as loose as possible, without slipping, and the belt tracks in the center of both pulleys.

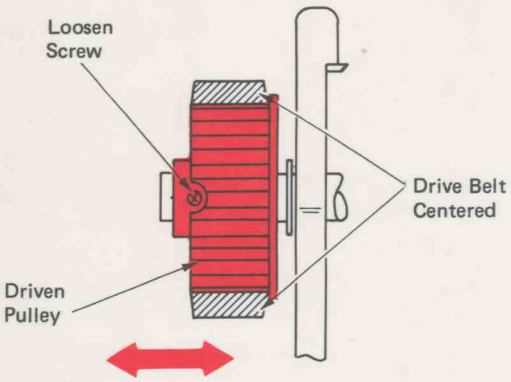
NOTE: Adjustment 2 (power module) must be made before making this adjustment.



4. *Shaft Support Guide* – Adjust the shaft support guide up or down until it just touches the shaft support.



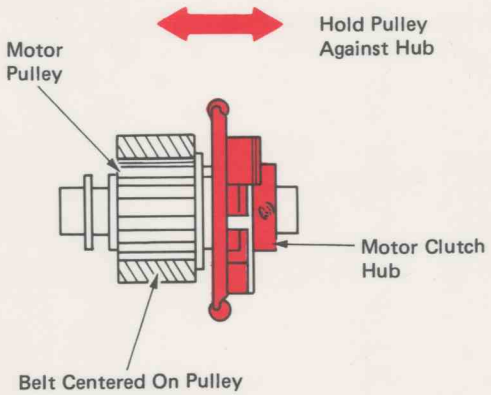
5. *Driven Pulley* – Adjust the driven pulley left or right so the drive belt is centered on the driven pulley.



Tighten Pulley On Flats

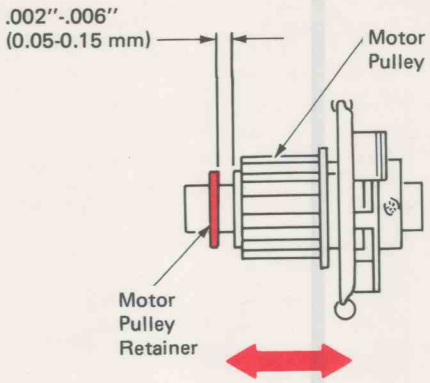
(Rear View)

6. *Motor Pulley* – Adjust the motor clutch hub assembly left or right so the belt is centered on the motor pulley.

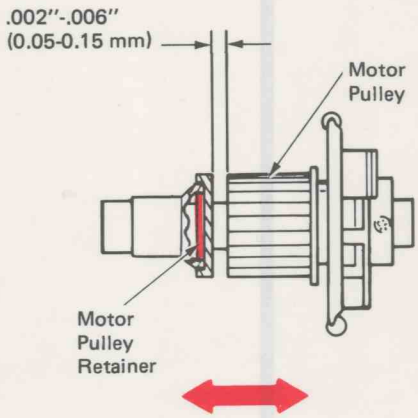


(Rear View)

7. *Motor Pulley Retainer* – Adjust the motor pulley retainer left or right for .002"-.006" (0.05-0.15 mm) clearance between the motor pulley retainer and the motor pulley.

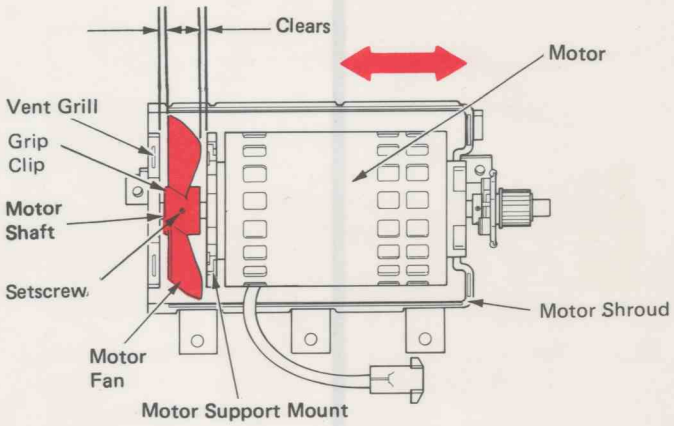


(Level 1 – Rear View)



(Level 2 – Rear View)

8. *Motor Fan* – Position the fan left or right on the motor shaft so the fan clears both the vent grill and motor support mount, with the motor mounted in the motor case. Loosen setscrew or move grip clip to position the fan.



(Top View)

PRINT SHAFT CYCLE CLUTCH OPERATIONAL THEORY

The print shaft cycle clutch drives the print shaft (Figure 1). The print shaft drive belt transfers motion to the print shaft. The print shaft drives the print mechanism, the index mechanism, the print feedback mechanism, and the escapement release mechanism.

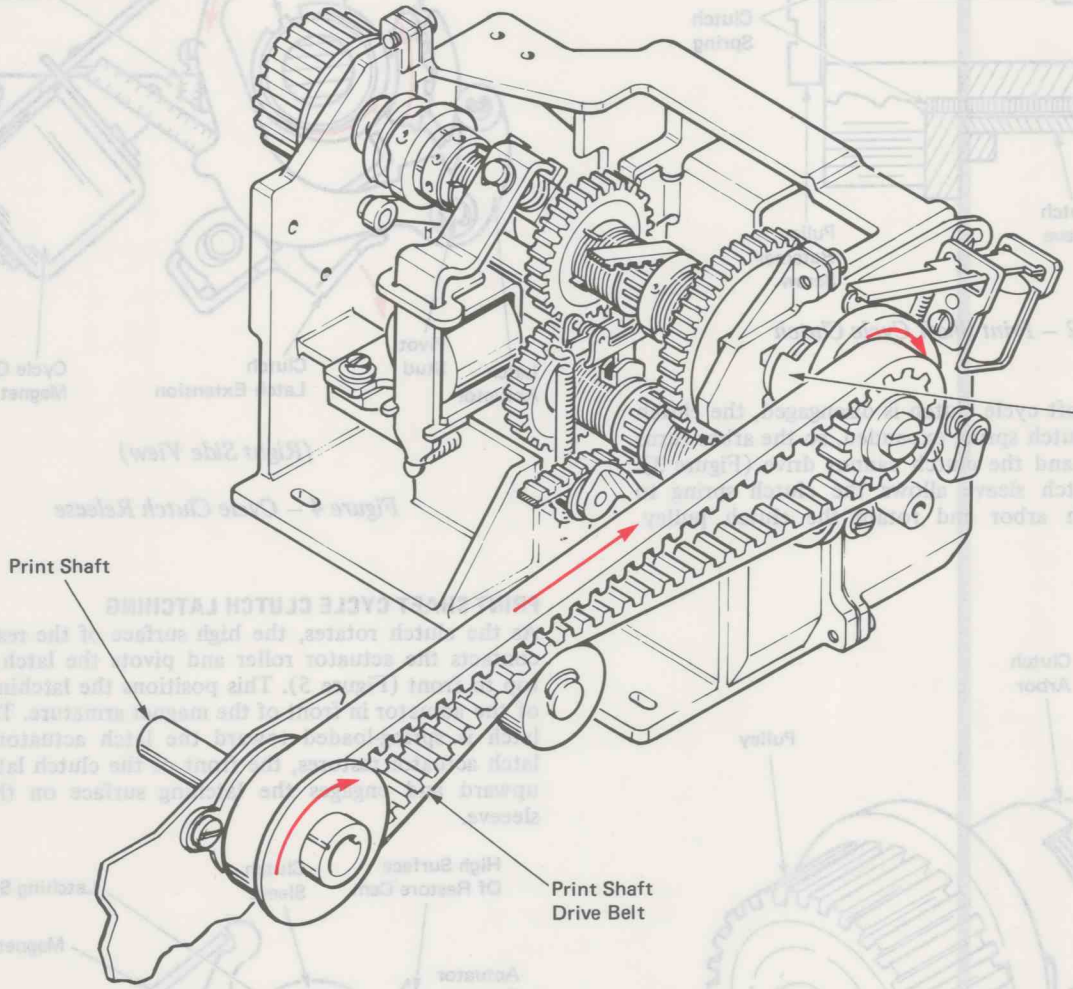


Figure 1 – Print Shaft Drive

The print shaft cycle clutch is a spring clutch. A setscrew holds the clutch arbor on the upper shaft of the power module (Figure 2). The left end of the clutch spring fits over, but does not attach to, the clutch arbor. A setscrew and wedge secure the right end of the clutch spring to the pulley. The pulley retainer screw holds the clutch pulley in position.

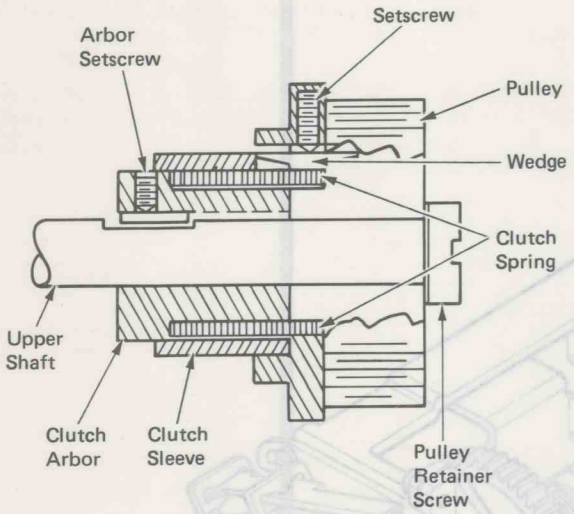


Figure 2 – Print Shaft Cycle Clutch

When the print shaft cycle clutch is disengaged, the clutch sleeve holds the clutch spring expanded, so the arbor turns within the spring and the clutch cannot drive (Figure 3). Releasing the clutch sleeve allows the clutch spring to engage the clutch arbor and rotate the clutch pulley.

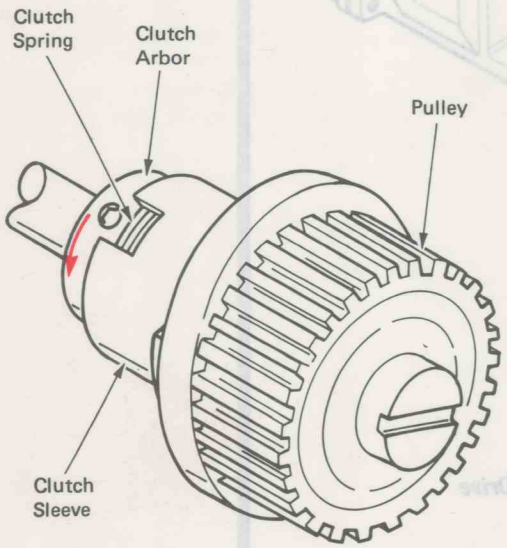
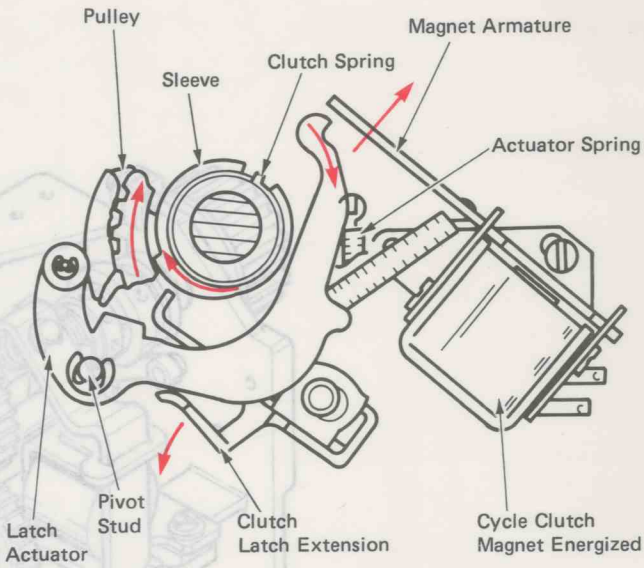


Figure 3 – Print Shaft Cycle Clutch

PRINT SHAFT CYCLE CLUTCH RELEASE

At rest, the latch actuator latches against the magnet armature. When a print shaft cycle is required, the clutch magnet energizes. When the cycle clutch magnet energizes, the latch actuator pivots top to rear under spring tension (Figure 4). The latch actuator contacts the clutch latch extension and pivots the clutch latch down. This action releases the clutch sleeve and allows the clutch spring to drive the pulley.

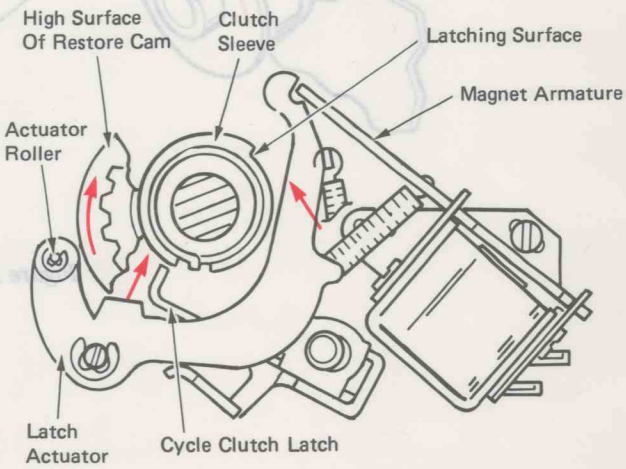


(Right Side View)

Figure 4 – Cycle Clutch Release

PRINT SHAFT CYCLE CLUTCH LATCHING

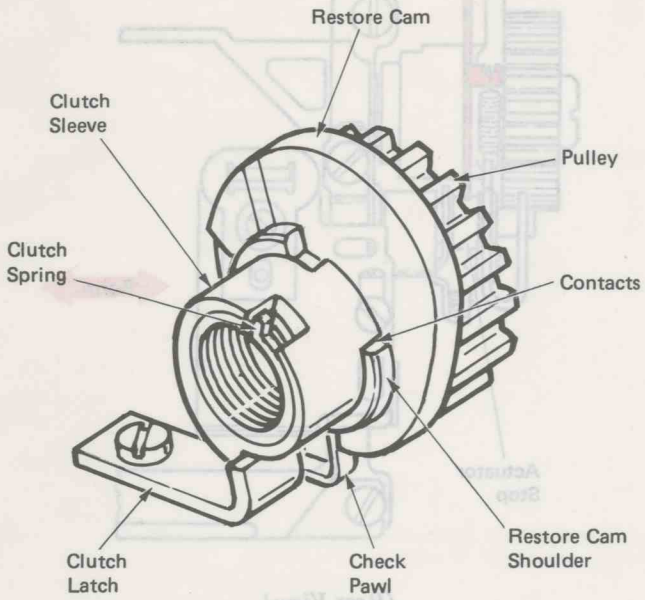
As the clutch rotates, the high surface of the restore cam contacts the actuator roller and pivots the latch actuator top to front (Figure 5). This positions the latching surface of the actuator in front of the magnet armature. The clutch latch is spring-loaded toward the latch actuator. As the latch actuator restores, the front of the clutch latch pivots upward and engages the latching surface on the clutch sleeeve.



(Right Side View)

Figure 5 – Clutch Latching

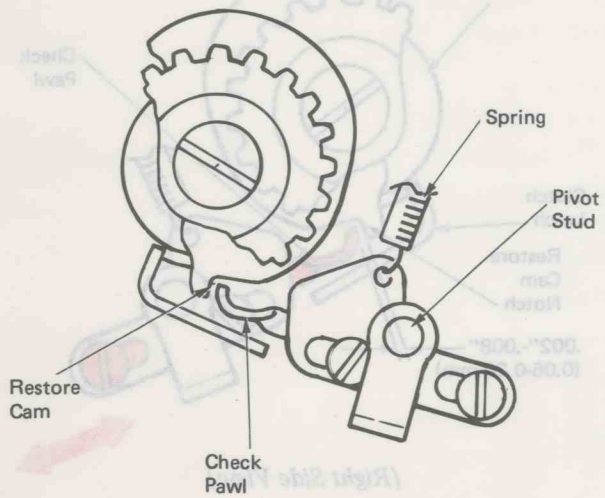
When the clutch latch stops the clutch sleeve, the pulley continues to rotate. The pulley rotates until the restore cam shoulder contacts the clutch sleeve. The additional rotation of the pulley expands the clutch spring enough to disengage it from the arbor. The check pawl holds the clutch spring in the expanded position.



(Left Front View)

Figure 6 – Clutch Disengaged

The check pawl pivots on a stud and a spring holds it upward at the front (Figure 7). The check pawl engages the restore cam. The pulley cannot rotate backwards with the check pawl engaged.



(Right Side View)

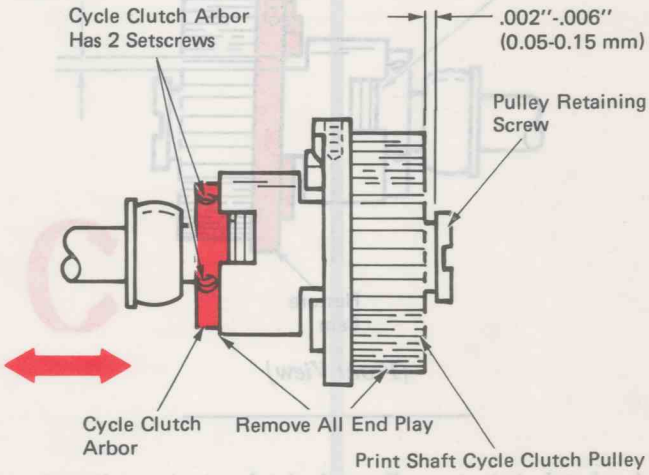
Figure 7 – Cycle Clutch Check Pawl

PRINT SHAFT CYCLE CLUTCH ADJUSTMENTS

1. *Cycle Clutch Arbor* – Adjust the arbor for a clearance of .002"-.006" (0.05-0.15 mm) between the arbor and the pulley.

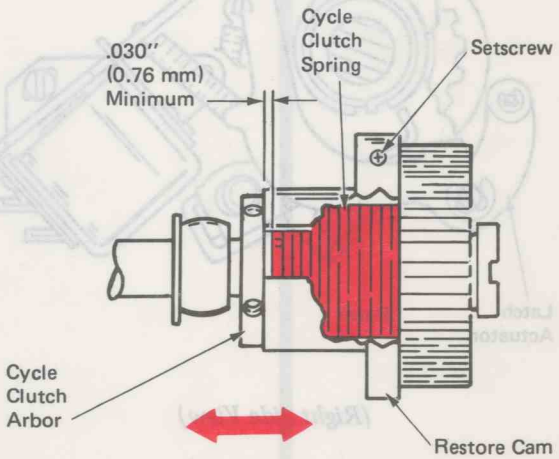
   This clearance may be checked between the pulley and the head of the pulley retaining screw. Ensure that the left-to-right position of the restore cam does not affect this adjustment.

   NOTE: One of the two arbor setscrews tightens down on a split key. Make sure all end play is removed between the cycle clutch arbor and cycle clutch pulley when making this adjustment.



2. *Print Shaft Cycle Clutch Spring* – Position the spring left or right under the restore cam so the left end of spring clears the cycle clutch arbor by a minimum of .030" (0.76 mm).

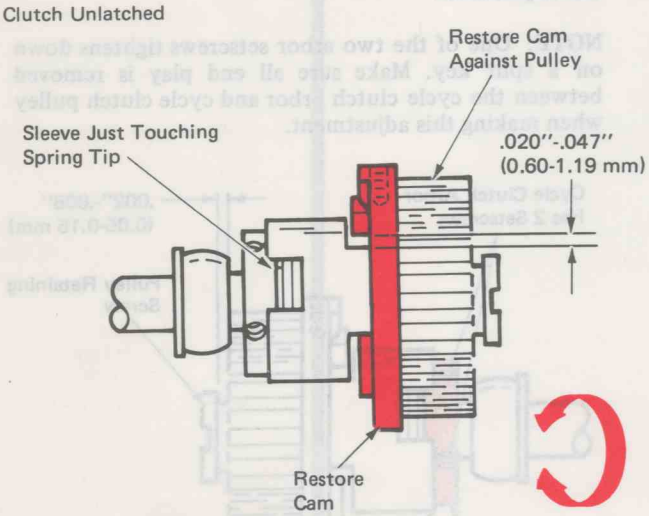
   To make this adjustment, loosen the setscrew in the restore cam. Postion the spring left or right, then retighten the setscrew.



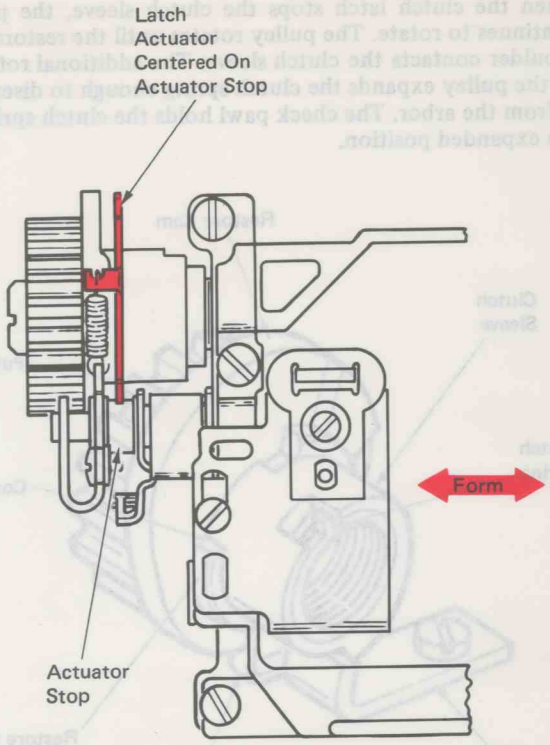
(Front View)

3. *Restore Cam* – Adjust the restore cam rotationally for a clearance of .020"-.047" (0.60-1.19 mm) between the sleeve and the restore cam shoulder, with the cycle clutch unlatched.

NOTE: Loosen the setscrew in the restore cam to make this adjustment. When tightening the setscrew, ensure that the restore cam is against the pulley.

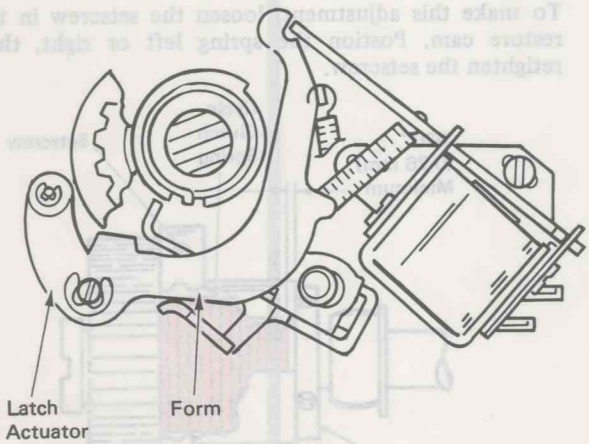


(Front View)



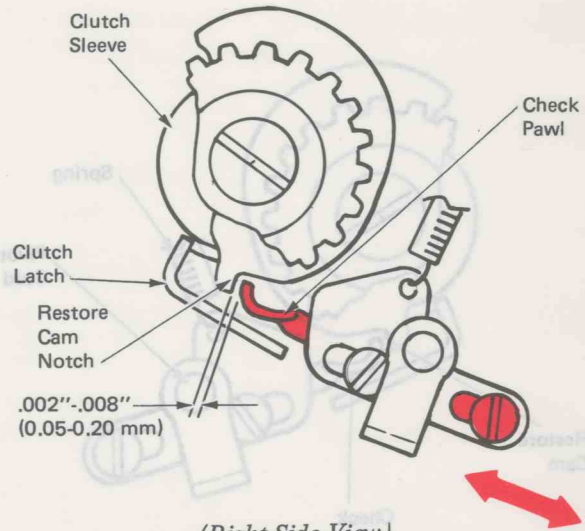
(Rear View)

4. *Latch Actuator* – Form the latch actuator so it centers on the actuator stop when it releases.



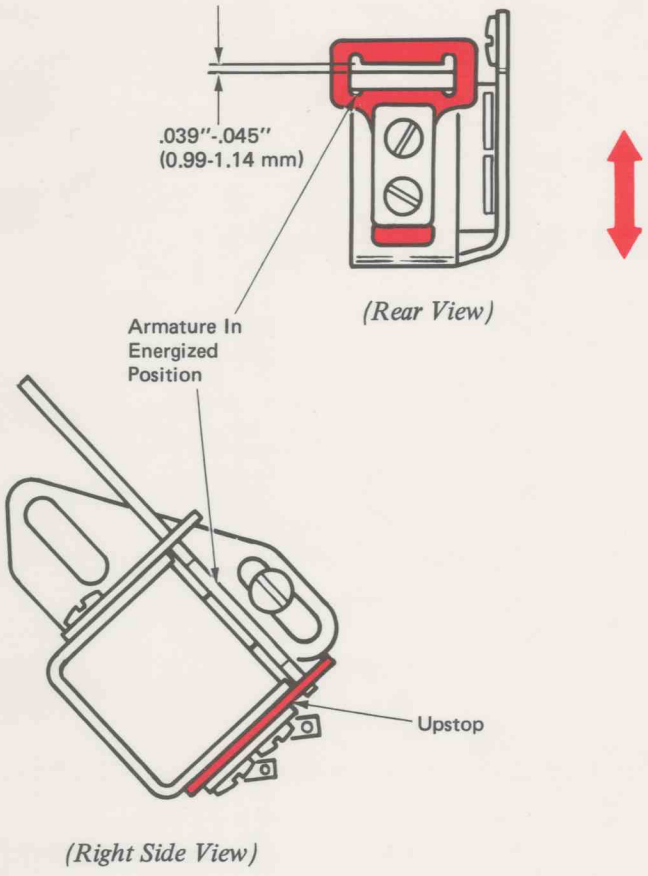
(Right Side View)

5. *Check Pawl* – Adjust the check pawl for .002"-.008" (0.05-0.20 mm) motion of the restore cam, with the clutch sleeve engaged with the clutch latch and the check pawl latched against the restore cam.



(Right Side View)

6. *Cycle Clutch Magnet Armature Upstop* – Adjust the armature upstop up or down for a clearance of .039"-.045" (0.99-1.14 mm) between the top of the armature and the upstop. The armature is in the energized position for this adjustment.

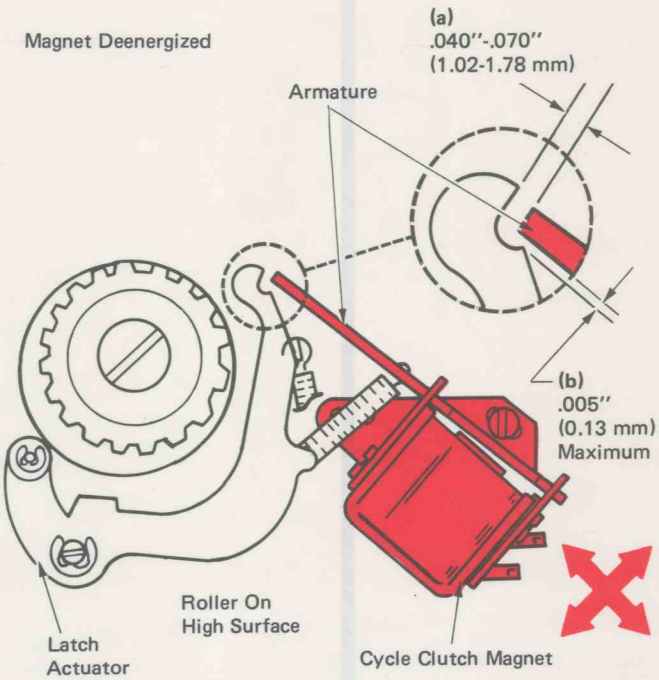


7. *Cycle Clutch Magnet Position* – Adjust the position of the cycle clutch magnet for two conditions:

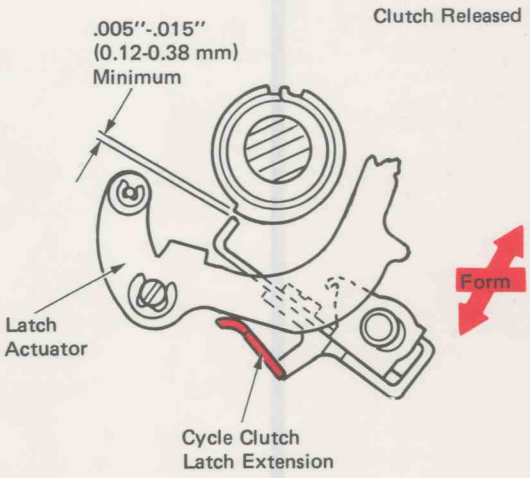
   a. An overthrow of .040"-.070" (1.02-1.78 mm) between the latch actuator and the armature.

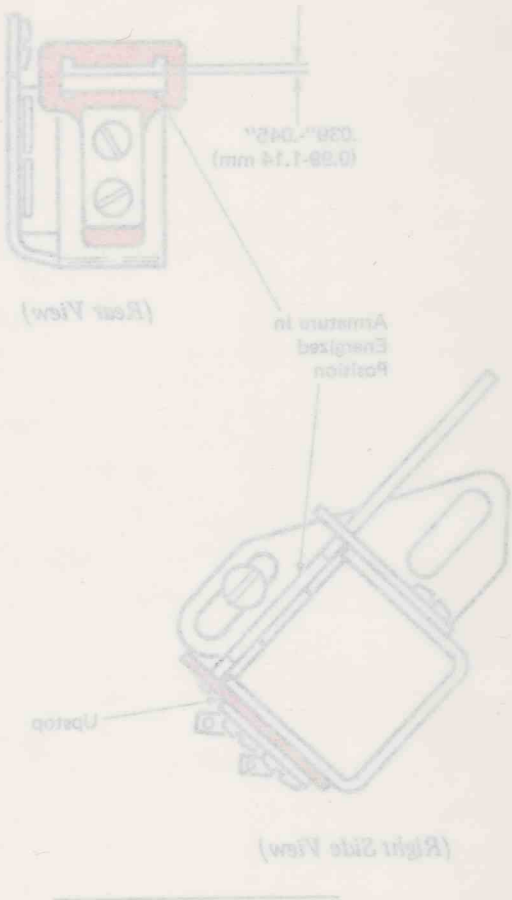
   b. A maximum clearance of .005" (0.12 mm) between the bottom surface of the armature and the latch actuator.

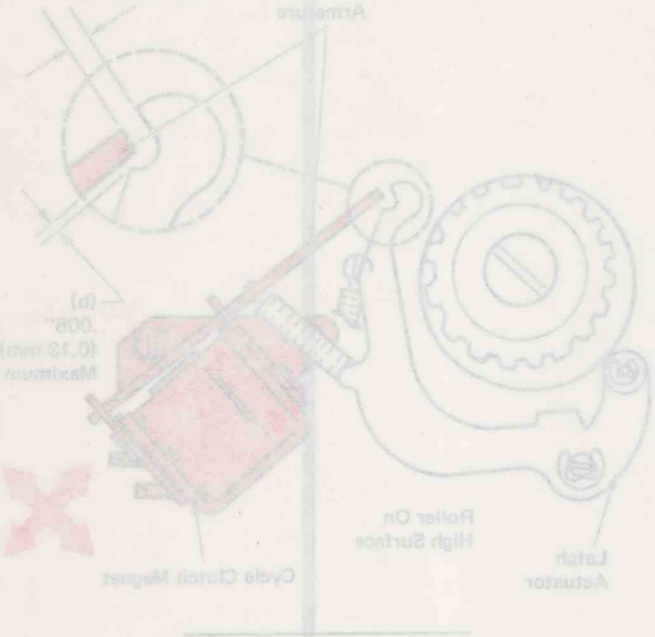
   NOTE: Both of these clearances must be checked with the magnet deenergized and the actuator roller on the high surface of the restore cam.



8. *Cycle Clutch Latch Extension* – Form the extension up or down so the clutch latch clears the latching surface of the clutch sleeve by a minimum of .005"-.015" (0.12-0.38 mm) with the latch actuator released.







PRINT FEEDBACK OPERATIONAL THEORY

The print feedback mechanism indicates the position of the print shaft to the electronics. The electronics then energizes or deenergizes magnets and solenoids at the proper time in the print shaft cycle. This timing is discussed in the Electronics and Function Chart sections.

The print feedback switch is a reed switch (Figure 1). The print feedback magnet operates the print feedback switch. The print feedback magnet rotates with the print shaft.

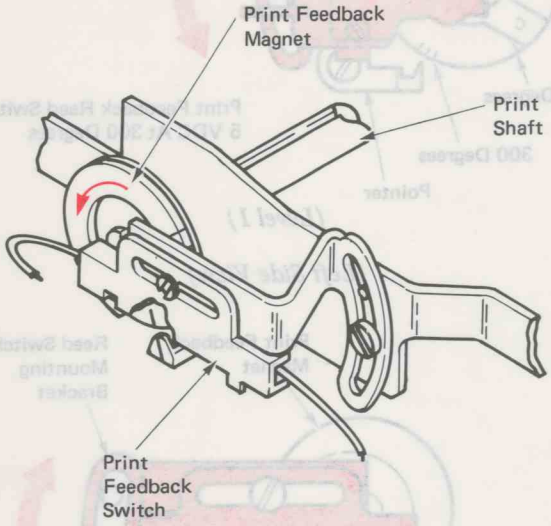


Figure 1 – Print Feedback Mechanism

With the print shaft at rest, the print feedback switch is open (Figure 2). As the print shaft rotates, the print feedback magnet causes the print feedback switch to close at 85 degrees of print shaft rotation. The switch opens when the shaft rotates 300 degrees.

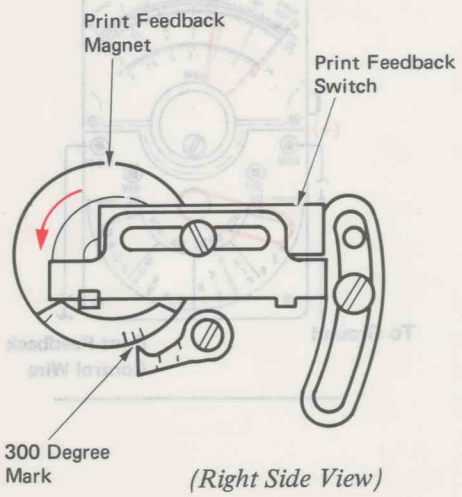
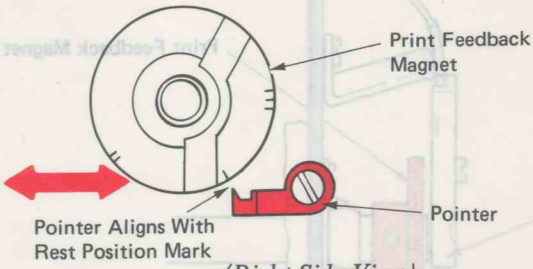


Figure 2 – Print Feedback Magnet

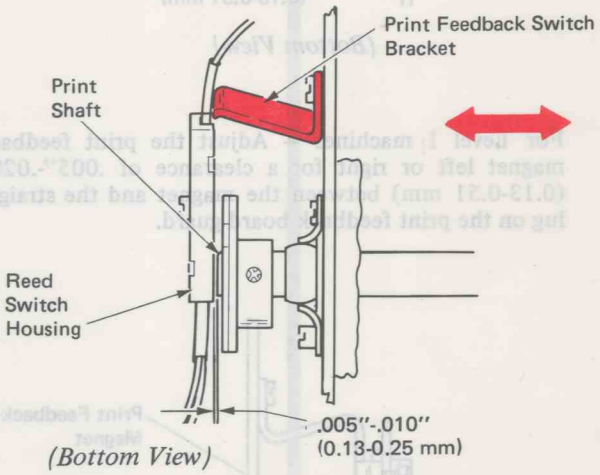
PRINT FEEDBACK ADJUSTMENTS

1. *Print Feedback Pointer* – With the print shaft in the rest position, align the pointer with the rest position mark on the print feedback magnet.

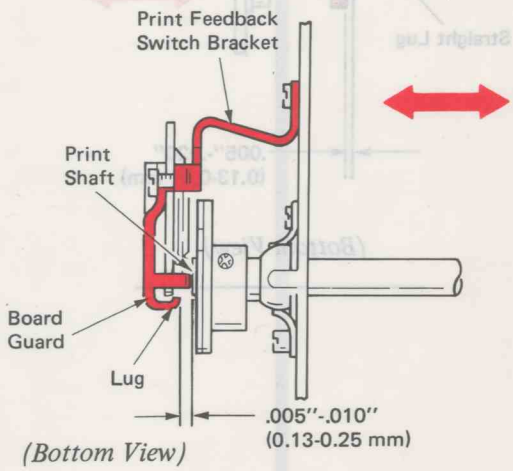
Print Shaft In Rear Position



2. *Print Feedback Switch Bracket* – Adjust the print feedback switch bracket left or right for .005"-.010" (0.13-0.25 mm) clearance between the print shaft and the reed switch housing.

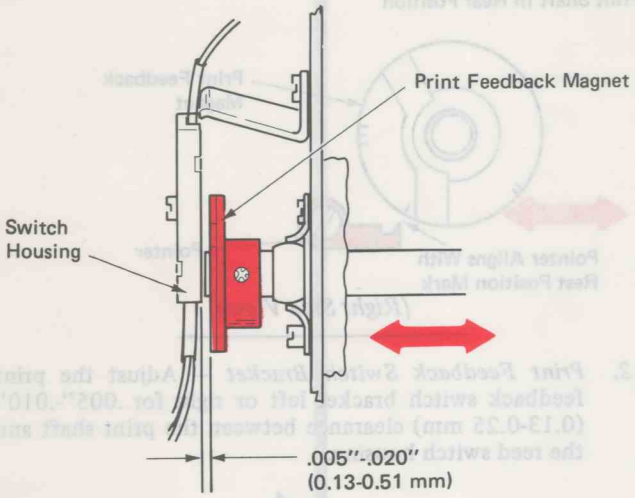


For Level 1 machines – Adjust the print feedback switch bracket left or right for .005"-.010" (0.13-0.25 mm) clearance between the print shaft and the curved lug on the print feedback board guard.



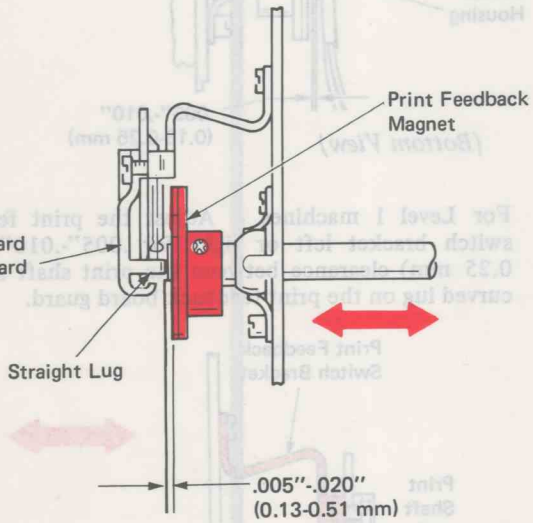
NOTE: For this adjustment, you may have to move the print feedback magnet.

3. *Print Feedback Magnet* – Adjust the print feedback magnet left or right for a clearance of .005"-.020" (0.13-0.51 mm) between the magnet and the switch housing.



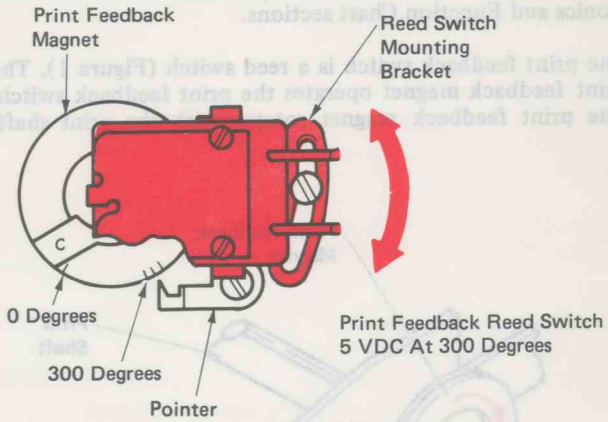
(Bottom View)

For Level 1 machines – Adjust the print feedback magnet left or right for a clearance of .005"-.020" (0.13-0.51 mm) between the magnet and the straight lug on the print feedback board guard.



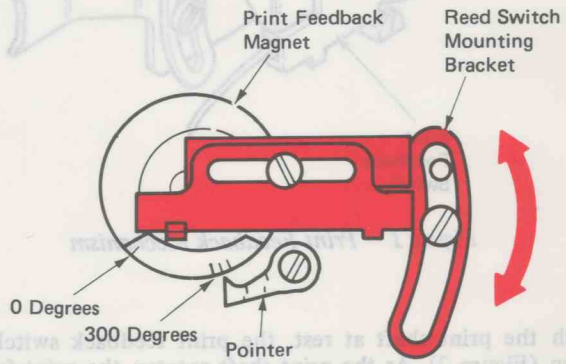
(Bottom View)

4. *Print Feedback Timing* – Adjust the reed switch mounting bracket so the switch opens when the center 300 degree mark on the magnet aligns with the pointer. Use a VOM to see if the switch is open or closed. Rotate the print shaft manually and observe the VOM as the timing mark passes the pointer.



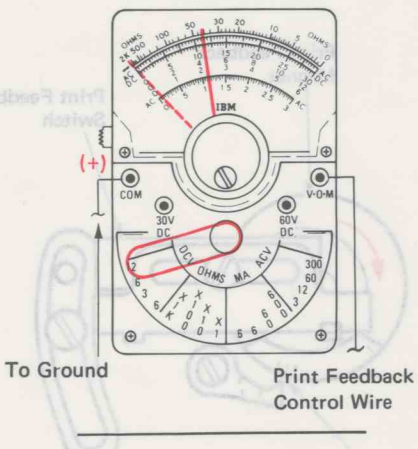
(Level 1)

(Left Side View)



(Level 2)

(Left Side View)



CHARACTER SELECTION OPERATIONAL THEORY

The character selection mechanism tilts and rotates the typehead into position for printing the desired character. The main components of the selection mechanism are the pin block assembly, the rotate rack transfer assembly, and the selection cams (Figure 1).

When a positive character is selected, the selection mechanism rotates the typehead counterclockwise. When a negative character is selected, the selection mechanism rotates the typehead clockwise. The selection mechanism has six negative rotate positions, six positive rotate positions and one zero rotate, or home, position. The sixth positive rotate position shifts the typehead between uppercase and lowercase. Its operation is discussed in the shift section.

The selection mechanism has four tilt positions. One of these is the zero tilt, or home position.

The typehead has ninety-six characters: forty-eight uppercase characters and forty-eight lowercase characters.

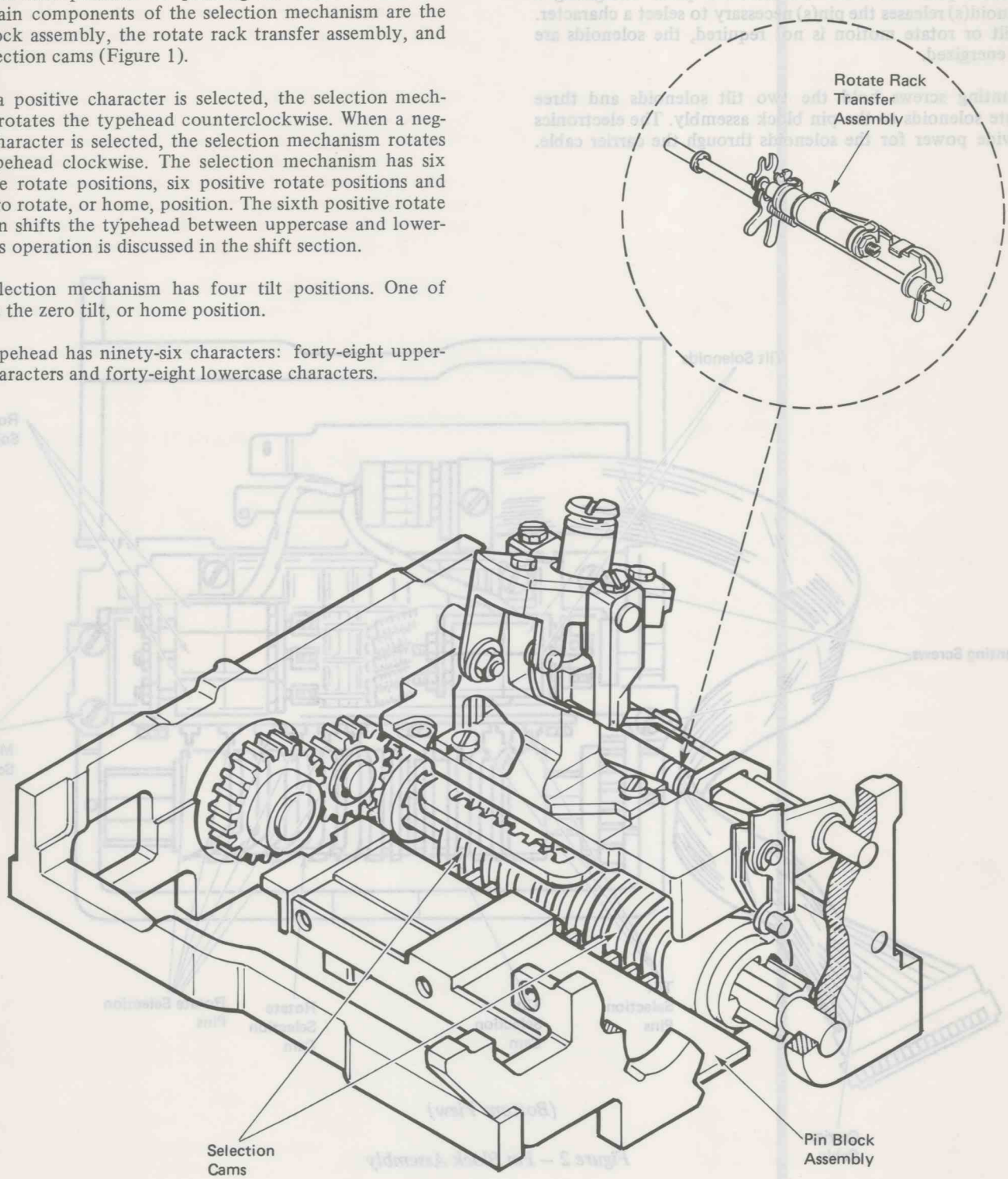
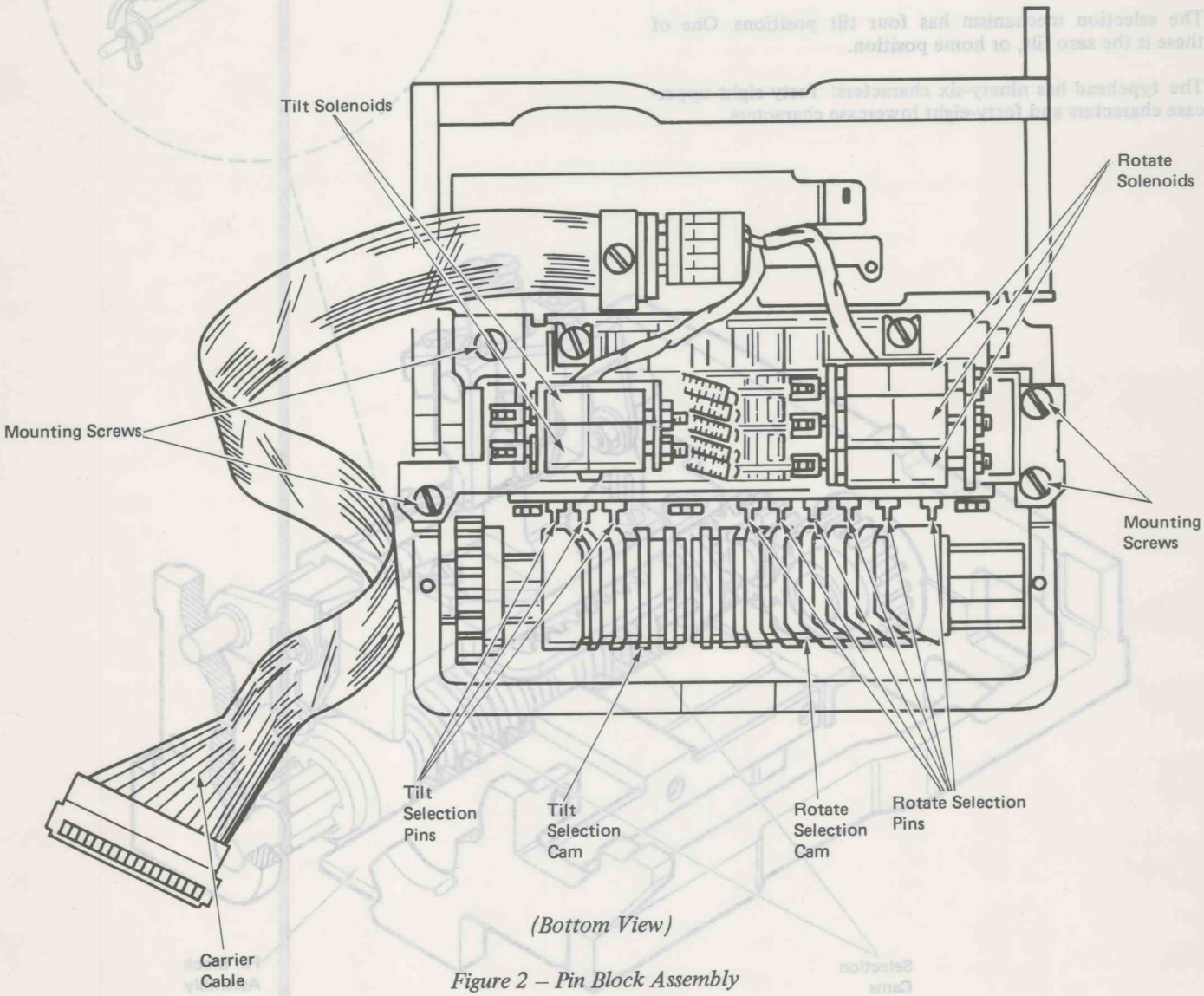


Figure 1 – Character Selection Mechanism

PIN BLOCK OPERATIONS

The pin block assembly controls tilt and rotate motion by releasing selection pins into the tilt and rotate selection cams (Figure 2). The pin block assembly contains six rotate selection pins and three tilt selection pins. Energizing a solenoid(s) releases the pin(s) necessary to select a character. If tilt or rotate motion is not required, the solenoids are not energized.

Mounting screws hold the two tilt solenoids and three rotate solenoids to the pin block assembly. The electronics provide power for the solenoids through the carrier cable.



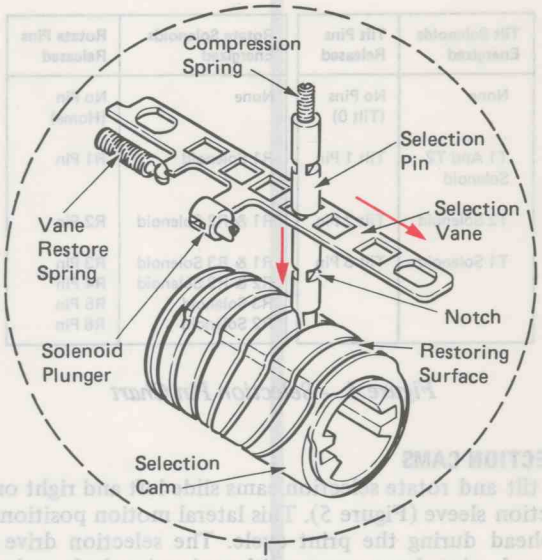
(Bottom View)

Figure 2 – Pin Block Assembly

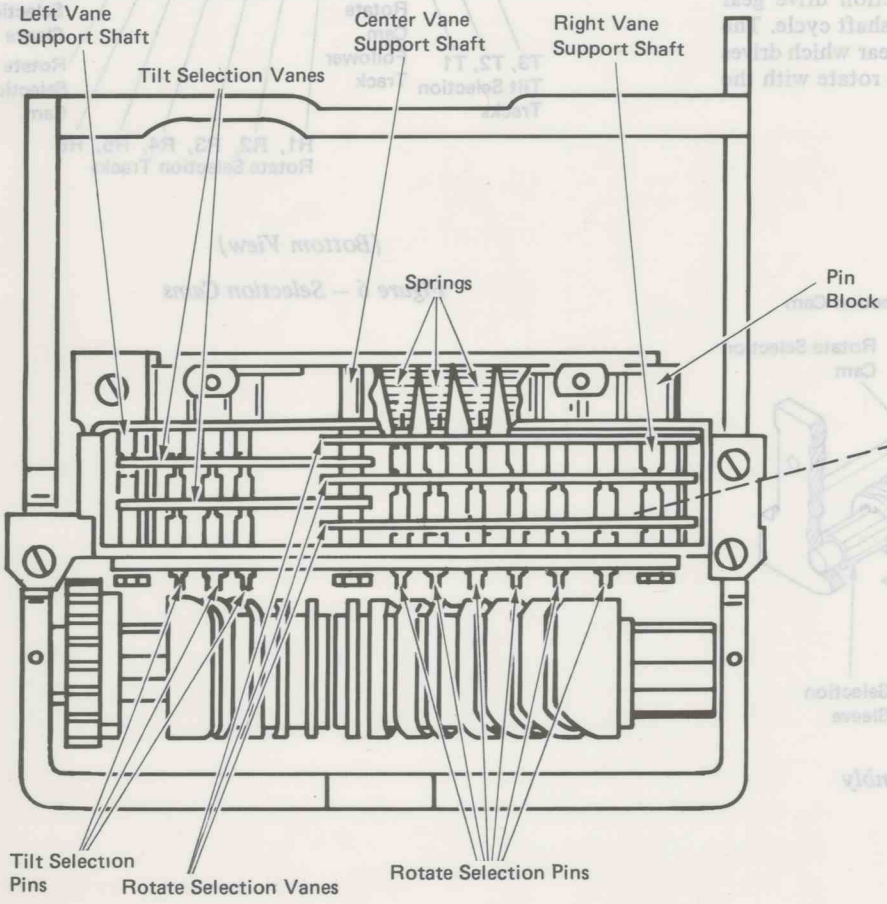
The selection pins are latched in the pin block by the selection vanes (Figure 3). The vane restore springs hold the vanes to the left. A compression spring holds each selection pin toward the selection cams. The windows in the vanes latch the notches in the pins. When the pins are latched, they cannot enter a cam track. The notches engage one or more selection vanes. Tilt pins have two notches and rotate pins have three notches.

The two tilt selection vanes are mounted between the left and center vane support shafts in the pin block. The three rotate vanes are mounted between the center and right vane support shafts. Each solenoid plunger engages a slot in a selection vane. Energizing a selection solenoid pulls a selection vane to the right to unlatch a selection pin. When more than one solenoid is energized, the selection vane windows release only one tilt and one rotate pin at a time.

A restoring surface on the selection cams returns the selection pins to the rest position. The vane restoring spring then pulls the vane to the left to latch the pin. The selection pins must be on the restoring surface of the selection cams before the solenoids can operate. The selection pins move off the vane to relieve the pressure of the compression springs, allowing the solenoid to pull the vane to the right.



(Bottom Right View)



(Bottom View)

Figure 3 – Pin Block Assembly

The selection pin chart shows which combinations of solenoids release which tilt and rotate pins (Figure 4).

CAUTION
If the solenoids are energized or manually activated when the pin block has been removed from the carrier, pins can be ejected at high velocity and cause injury.

Tilt Solenoids Energized	Tilt Pins Released	Rotate Solenoids Energized	Rotate Pins Released
None	No Pins (Tilt 0)	None	No Pin (Home)
T1 And T2 Solenoid	Tilt 1 Pin	R1 Solenoid	R1 Pin
T2 Solenoid	Tilt 2 Pin	R1 & R2 Solenoid	R2 Pin
T1 Solenoid	Tilt 3 Pin	R1 & R3 Solenoid R2 & R3 Solenoid R3 Solenoid R2 Solenoid	R3 Pin R4 Pin R5 Pin R6 Pin

Figure 4 – Selection Pin Chart

SELECTION CAMS

The tilt and rotate selection cams slide left and right on the selection sleeve (Figure 5). This lateral motion positions the typehead during the print cycle. The selection drive gear and and print sleeve rotate with each print shaft cycle. The selection drive gear drives the intermediate gear which drives the selection sleeve gear. The selection cams rotate with the selection sleeve.

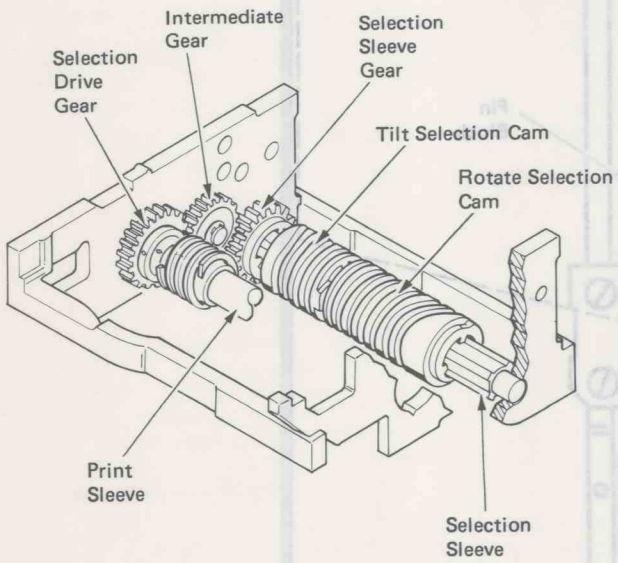
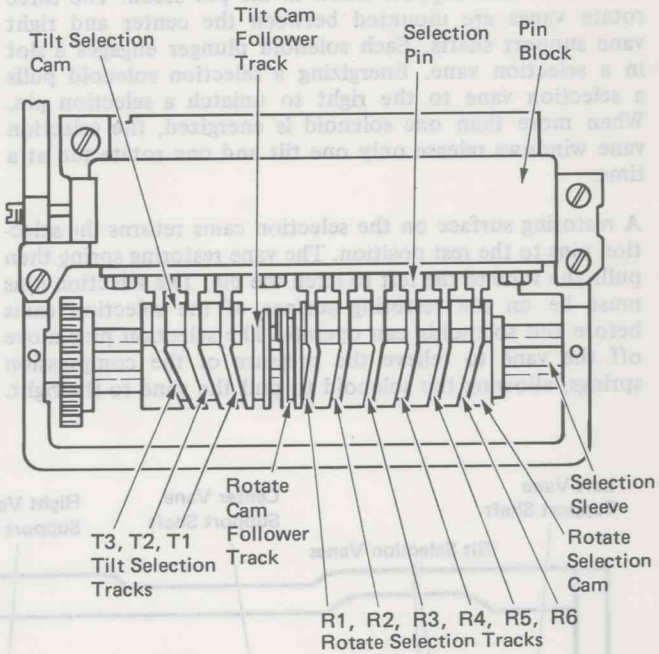


Figure 5 – Selection Cam Assembly

The selection cams have selection tracks and cam follower tracks (Figure 6). In the rest position, the selection tracks line up with the selection pins in the pin block. When a pin is selected, it is held in place by the selection cam. As the cam rotates, the pin enters the selection track. As the cam continues to rotate, the selection pin causes the selection cam to move laterally on the selection sleeve. Each track provides a different amout of lateral motion for the selection cams. This lateral motion positions the typehead for printing.



(Bottom View)

Figure 6 – Selection Cams

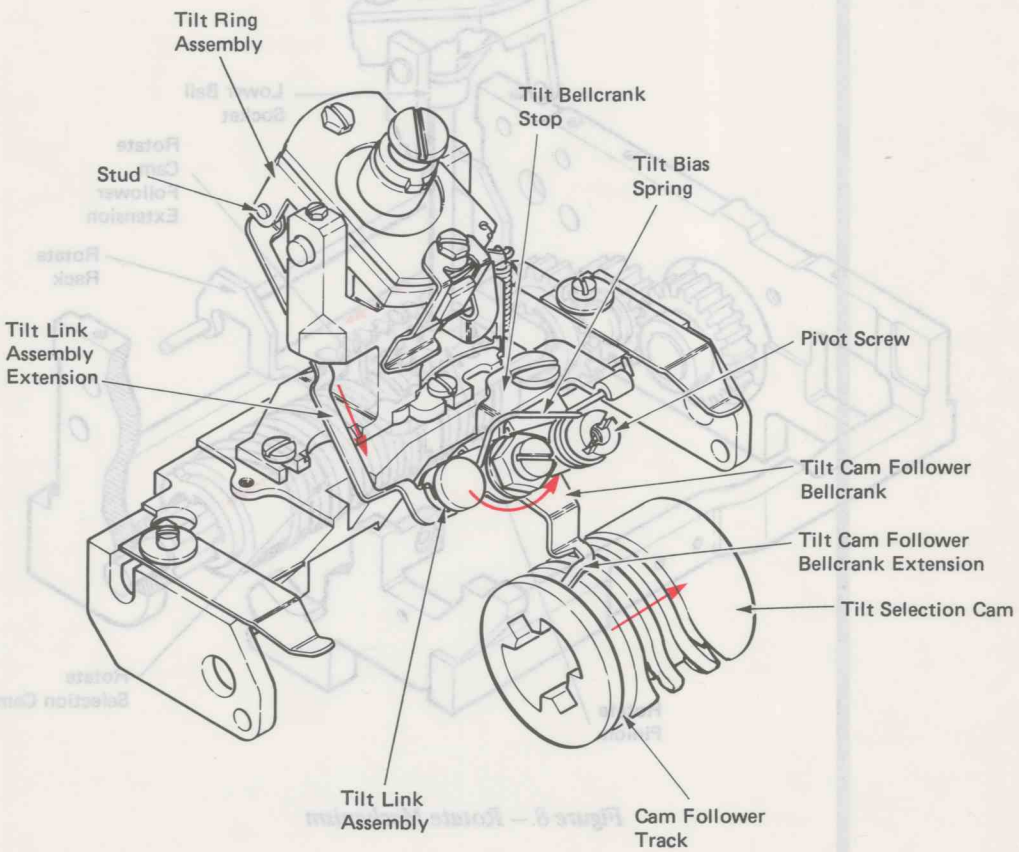
TILT OPERATION

The tilt selection cam causes the tilt mechanism to tilt the typehead (Figure 7). An extension on the tilt cam follower bellcrank engages the cam follower track in the tilt selection cam. As the tilt selection cam moves left or right, it pivots the bellcrank on the pivot screw. The tilt link assembly is mounted to the tilt cam follower bellcrank. As the bellcrank pivots, the tilt link assembly extension moves front to rear. As the front end of the extension on the tilt link assembly moves front to rear, it pivots the tilt ring assembly.

NOTE: The tilt ring is discussed in the Fine Alignment section.

The tilt bellcrank and tilt selection cam are held in the rest position by the tilt bias spring. If no tilt selection pins are selected during a print shaft cycle, the cam and bellcrank extension are held to the right by the spring. The tilt bellcrank stop determines the rest position of the mechanism.

During the first half of the print shaft cycle, the selection pin moves the cam to the left. This rotates the tilt cam follower bellcrank counterclockwise to position the typehead for printing. Printing occurs when the print shaft has rotated approximately 230 degrees. During the last half of the print shaft cycle, the tilt cam and follower bellcrank move to the rest position.



(Left Rear View)

Figure 7 – Tilt Mechanism

ROTATE OPERATION

The cam follower extension of the rotate rack engages the cam follower track of the rotate cam (Figure 8). As the rotate selection cam moves left or right, the rotate rack moves with it. As the rack moves, the rotate pinion, the lower ball socket, the ball joint, and the upper ball socket, rotate. The typehead is keyed to the upper ball socket and also rotates when the rotate cam moves laterally.

During the first half of the print shaft cycle, the selection pin moves the rotate cam and rack plate to the right. This rotates the typehead to the selected rotate position for printing. Printing occurs when the print shaft rotates approximately 230 degrees. During the last half of the print shaft cycle, the cam and typehead move to the rest position.

If no rotate selection pins are selected during a print shaft cycle, the cam and rack plate do not move laterally.

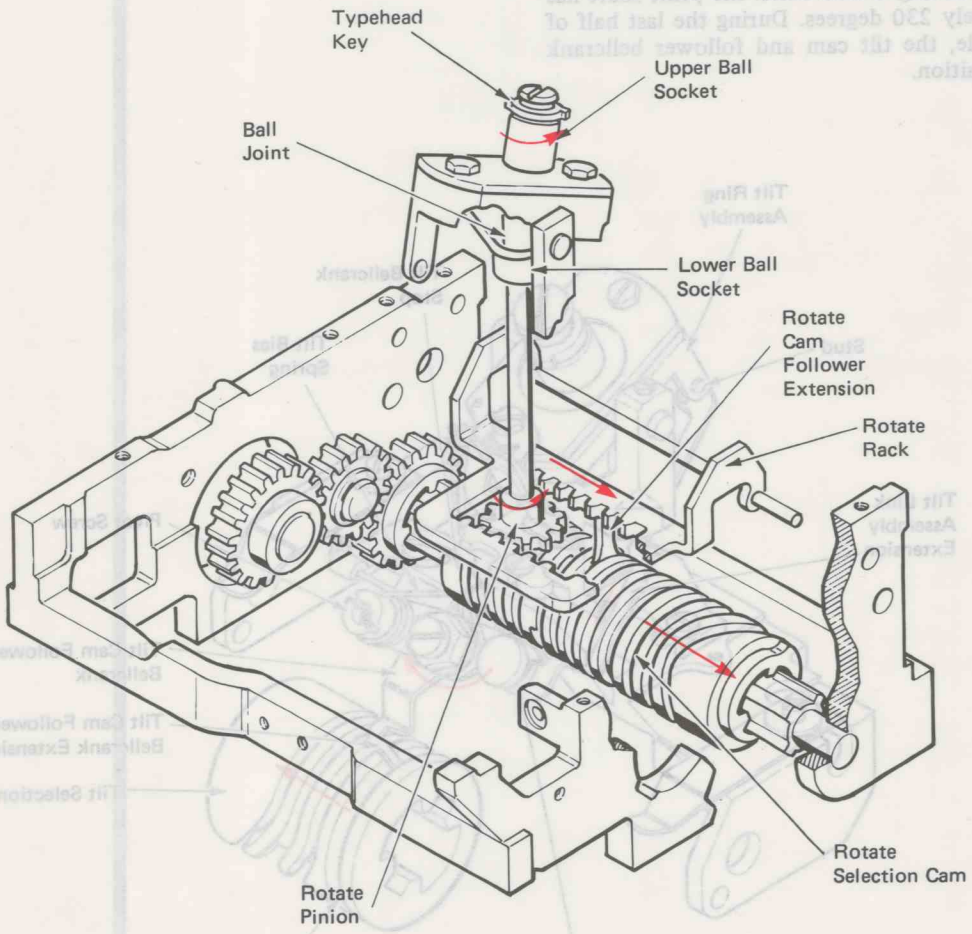
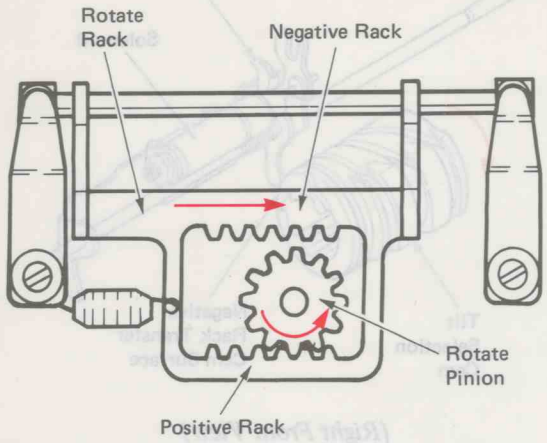


Figure 8 – Rotate Mechanism

ROTATE RACK

The rotate rack has a negative rack (rear row of teeth) and a positive rack (front row of teeth). When the rack is to the rear, the positive rack teeth engage the rotate pinion (Figure 9). During the first half of the print shaft cycle, the rotate cam and the rotate rack move to the right. As the rotate rack moves to the right, it rotates the pinion counterclockwise. When the pinion rotates counterclockwise, it positions a positive character for printing.

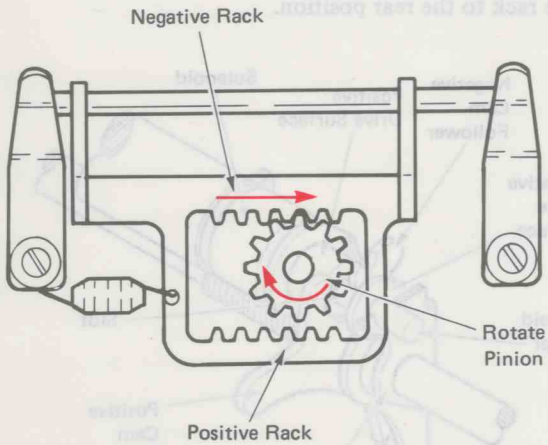


(Top View)

Figure 9 – Rotate Rack In Rear Position

When the rotate rack is to the front, the negative rack teeth engage the rotate pinion (Figure 10). During the first half of the print shaft cycle, the rotate cam and rotate rack move to the right. As the rotate rack moves to the right, it rotates the pinion clockwise. When the pinion rotates clockwise, it positions a negative character for printing.

The method for transferring the rotate rack front to rear is discussed later in this section.



(Top View)

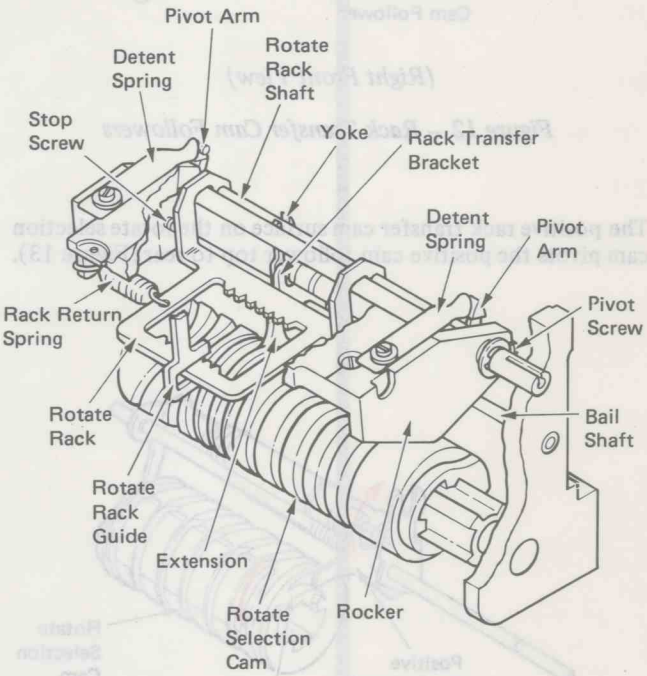
Figure 10 – Rotate Rack In Front Position

ROTATE RACK TRANSFER OPERATION

The rack transfer mechanism moves the rotate rack into the front or rear position. The rotate rack slides left or right on the rotate rack shaft. The rotate rack guide supports the front of the rotate rack. The rack transfer bracket pivots on the bail shaft (Figure 11). A yoke on top of the bracket engages the rotate rack shaft. As the bracket pivots, the yoke moves the rotate rack to the front or to the rear.

The rotate rack shaft is attached to the left and right pivot arms. The pivot arms are mounted to the rocker by pivot screws. A detent spring above each pivot arm holds the rotate rack in either the front or rear position.

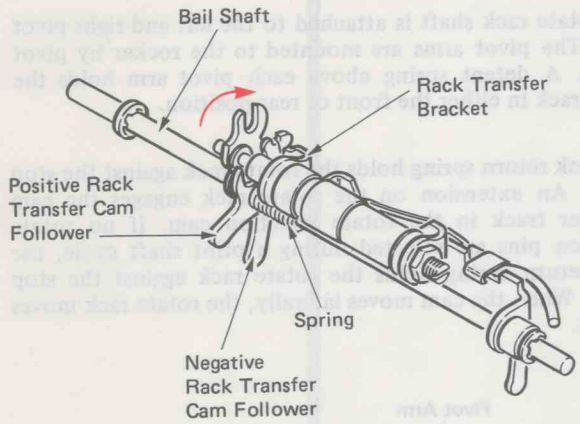
The rack return spring holds the rotate rack against the stop screw. An extension on the rotate rack engages the cam follower track in the rotate selection cam. If no rotate selection pins are selected during a print shaft cycle, the rack return spring holds the rotate rack against the stop screw. When the cam moves laterally, the rotate rack moves with it.



(Right Front View)

Figure 11 – Rotate Rack Transfer Mechanism

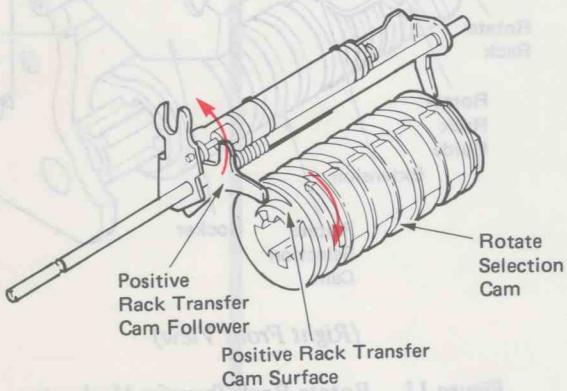
The negative rack transfer cam follower and the positive rack transfer cam follower pivot on the bail shaft (Figure 12). These followers position the rack transfer bracket to the front or rear. A spring holds the negative cam follower against the rack transfer bracket. The same spring holds the positive cam follower against the bracket.



(Right Front View)

Figure 12 – Rack Transfer Cam Followers

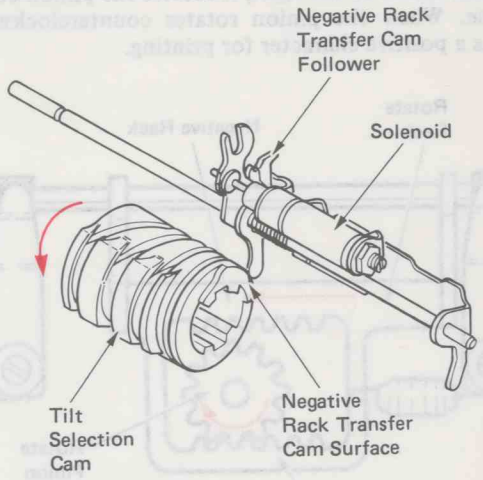
The positive rack transfer cam surface on the rotate selection cam pivots the positive cam follower top to rear (Figure 13).



(Left Front View)

Figure 13 – Positive Cam Follower Operation

The negative rack transfer cam surface on the tilt selection cam drives the negative cam follower top to front (Figure 14). Both followers pivot at the beginning of each print shaft cycle before the selection cams move laterally. However, only one follower is being used during a cycle. The solenoid determines which follower drives the bracket.

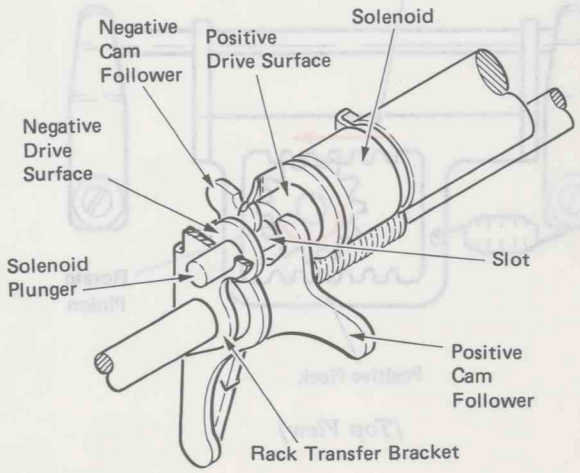


(Right Front View)

Figure 14 – Negative Cam Follower Operation

The rack transfer solenoid assembly is mounted to the rack transfer bracket. The solenoid plunger is between the two drive surfaces of the cam followers (Figure 15). The solenoid plunger has a slot between the positive drive surface and the negative drive surface.

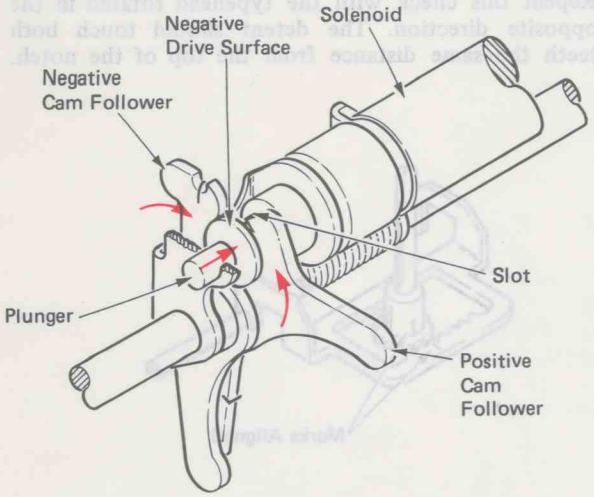
With the solenoid plunger deenergized, the rotate cam pivots the positive cam follower against the positive drive surface of the plunger. The negative cam follower pivots into the slot in the plunger without affecting the rack transfer operation. As the cam continues to rotate, the follower pivots the rack transfer bracket top to rear. This moves the rotate rack to the rear position.



(Left Front View)

Figure 15 – Rack Transfer Solenoid – Deenergized Position

When the solenoid is energized, it pulls the plunger to the right (Figure 16). In this position, the tilt cam pivots the negative cam follower against the negative drive surface of the plunger. The positive cam follower pivots into the plunger slot without affecting the rack transfer operation. As the cam continues to rotate, the follower pivots the rack transfer bracket top to front. This moves the rotate rack to the front.



(Left Front View)

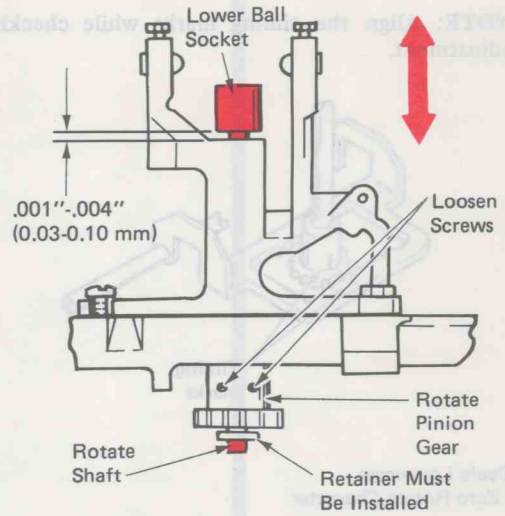
Figure 16 – Rack Transfer Solenoid – Energized Position

When a positive character is selected, the rack transfer mechanism moves the rack to the rear. The typehead then rotates counterclockwise for printing. When a negative character is selected, the rack transfer mechanism moves the rack to the front. The typehead then rotates clockwise for printing.

Unless a negative character is selected, the rack moves to the rear at the beginning of the print shaft cycle. If the rack is already to the rear at the beginning of a cycle, it will not transfer if a positive character is selected.

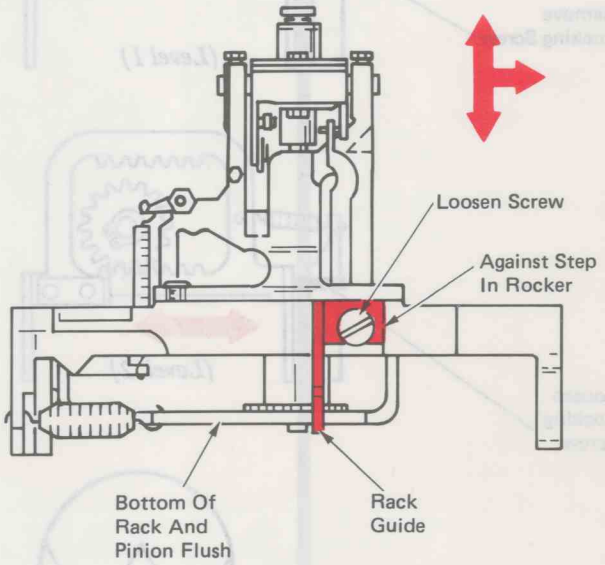
CHARACTER SELECTION ADJUSTMENTS

1. *Rotate Shaft End Play* – Adjust the rotate pinion gear up or down for .001"-.004" (0.03-0.10 mm) end clearance of the lower ball socket. The retainer must be installed.



(Rear View)

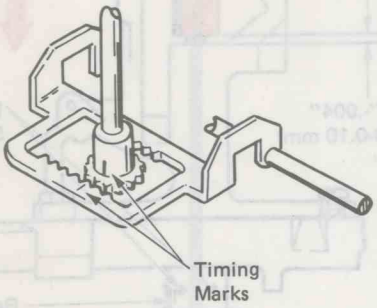
2. *Rack Guide* – Adjust the rack guide up or down until the rack is flush with the bottom of the pinion. To keep the rack guide vertical, adjust it to the right against the step in the rocker.



(Front View)

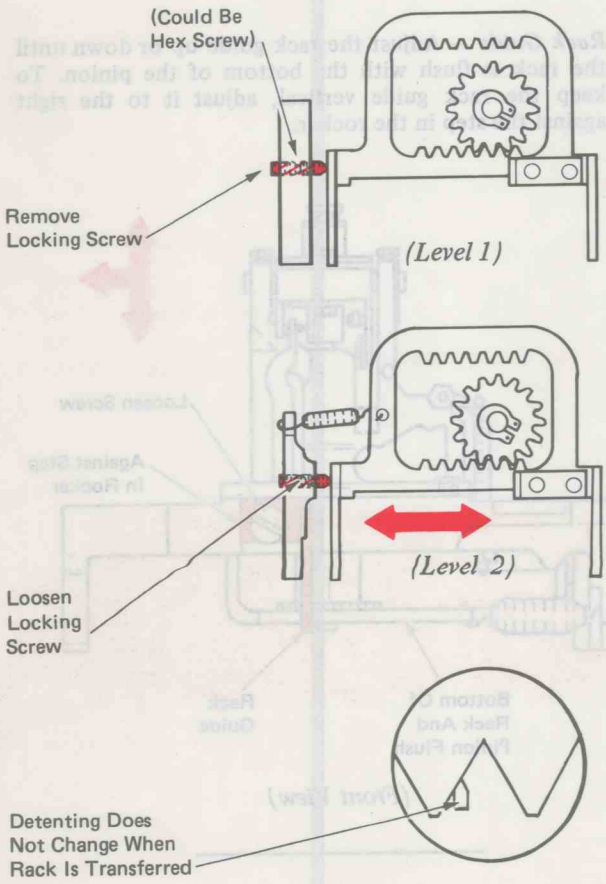
3. *Rotate Rack Home Position* – Adjust the rotate rack stop screw so the rotate pinion gear does not move when the rotate rack is transferred front and rear manually. Rotate detenting should remain the same in both front and rear positions. When checking this adjustment, hold the rotate rack against the stop screw by half cycling a zero-rotate character.

NOTE: Align the timing marks while checking this adjustment.



Half Cycle Lowercase
Tilt 2 Zero Rotate Character

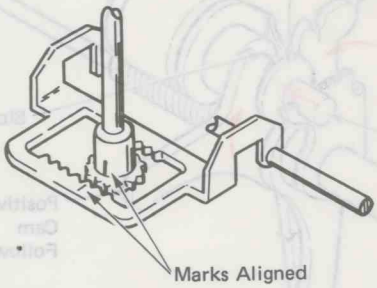
Rotate Pinion Must Not Rotate
When Rack Is Transferred

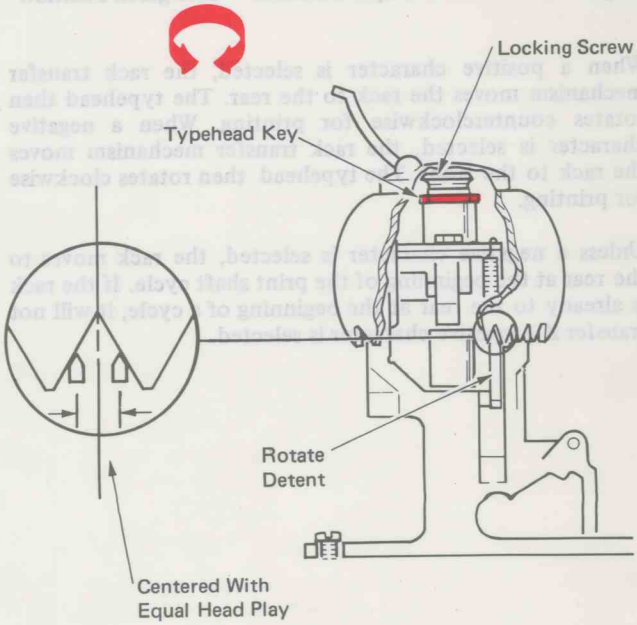


(Bottom View)

4. *Typehead Homing* – Align the timing marks on the rotate pinion and the rotate rack, unlatch the typehead, and loosen the locking screw. Then adjust the typehead key so the rotate detent is centered in the zero rotate typehead notch.

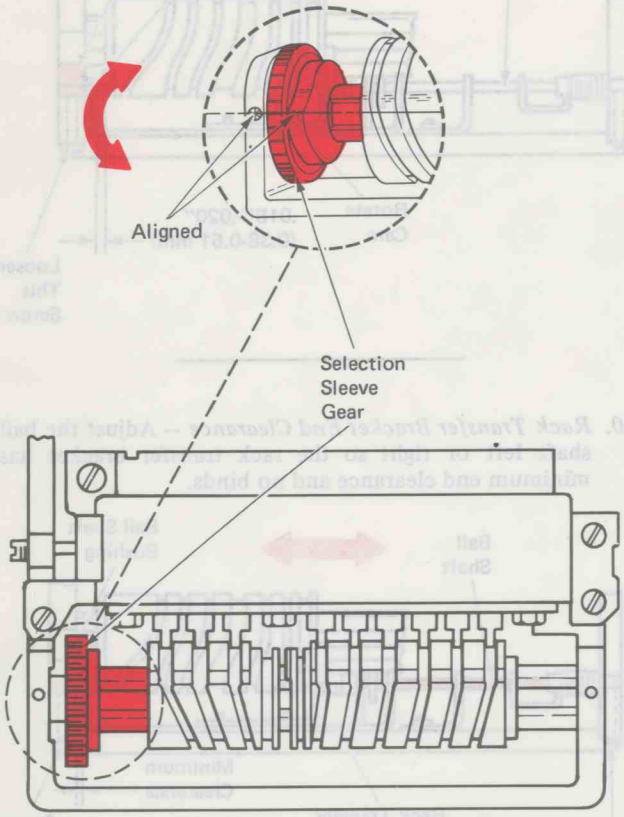
To check the adjustment, half cycle an *r* then manually remove the rotate detent and rotate the typehead until the play is removed. Slowly release the rotate detent until it just touches the side of the typehead tooth. Repeat this check with the typehead rotated in the opposite direction. The detent should touch both teeth the same distance from the top of the notch.





5. *Selection Cam Timing (Preliminary)* – With the print shaft in the home position, the beginning of the high point of the leadscrew lock cam should align with the setscrew.

To make this adjustment, loosen the selection sleeve and reengage the intermediate and selection sleeve gears.



(Bottom View)

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6. *Pin Block* – Adjust the pin block for two conditions:

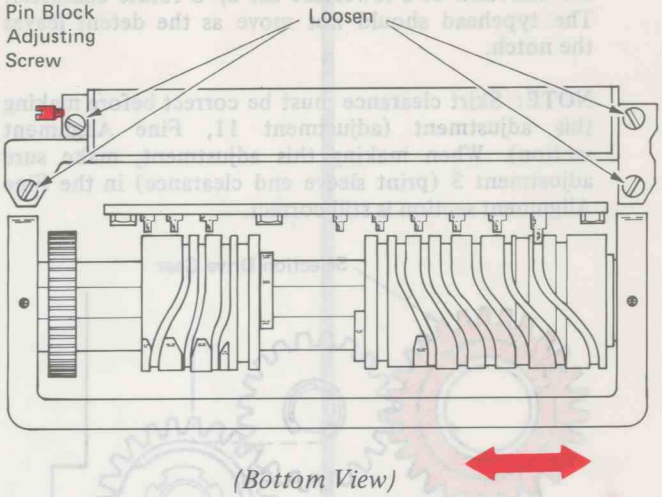
a. Left or Right – Adjust the pin block left or right for a 25% to 75% split of headplay with a shift operation half cycled (25% with headplay removed in the clockwise direction and 75% with headplay removed in the counterclockwise direction).

To adjust the pin block left or right:

1) Loosen the four pin block mounting screws (leave friction tight).
2) Turn the adjusting screw until the selection pins are evenly centered over their tracks.
3) Depress the R-2 solenoid plunger.
4) Half cycle the print shaft until the rack JUST transfers.
5) Turn the adjusting screw to obtain the 25% to 75% detenting condition.

Turning the adjusting screw out decreases the 25% and increases the 75% detenting.

1. Shift Operation
2. Print Shaft Half Cycled
3. Rack Just Transfers

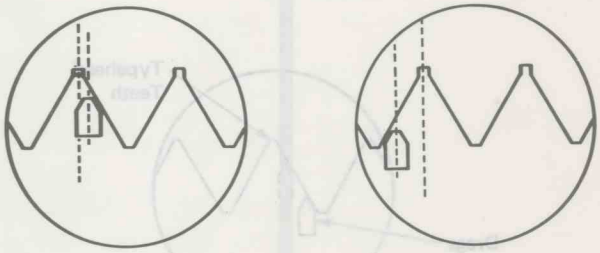


(Bottom View)

Adjust The Pin Block
For 25%-75% Split

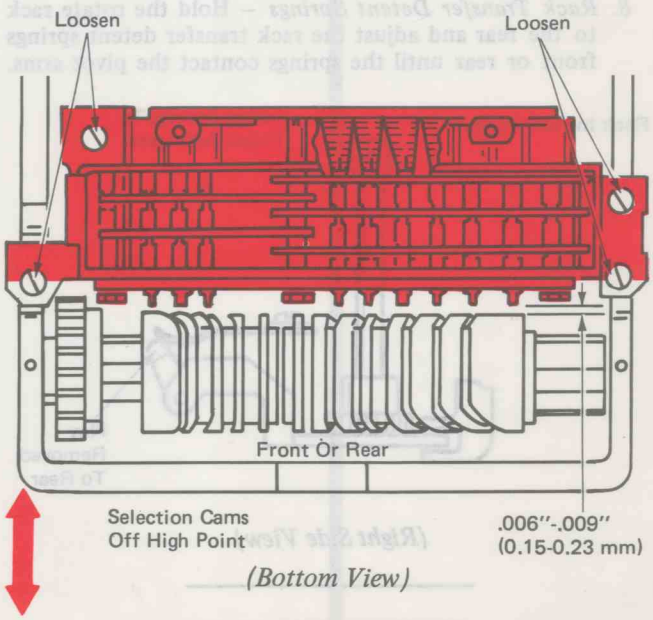
25% Head Play Removed
In The Clockwise Direction

75% Head Play Removed
In Counterclockwise Direction



(Rear View)

b. Front or Rear – Move the pin block front or rear for a clearance of .006"-.009" (0.15-0.23 mm) between the selection pins and the selection cams with the machine half cycled. (Maintain parallel.)



(Bottom View)

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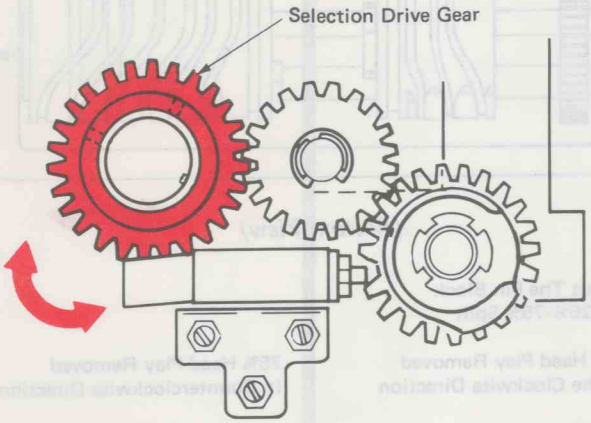
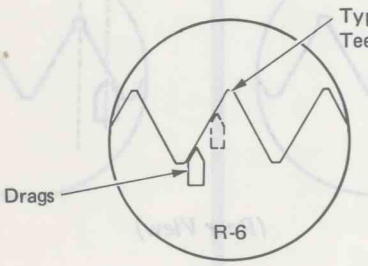
7. *Selection Cams (Fine Timing)* – Adjust the selection cam timing so the rotate detent lightly drags on the typehead tooth as the detent leaves the notch during the selection of a lowercase tilt 2, -6 rotate character. The typehead should not move as the detent leaves the notch.

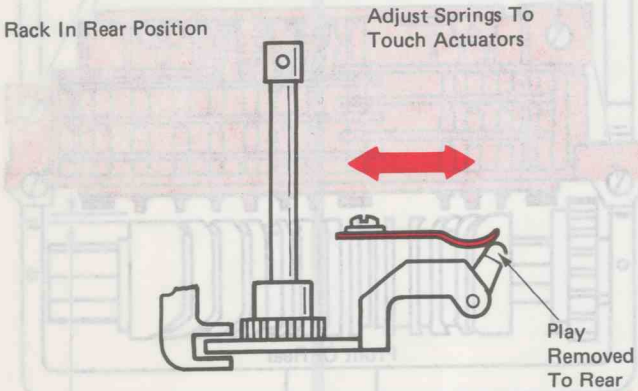
NOTE: Skirt clearance must be correct before making this adjustment (adjustment 11, Fine Alignment section). When making this adjustment, make sure adjustment 3 (print sleeve end clearance) in the Fine Alignment section is still correct.





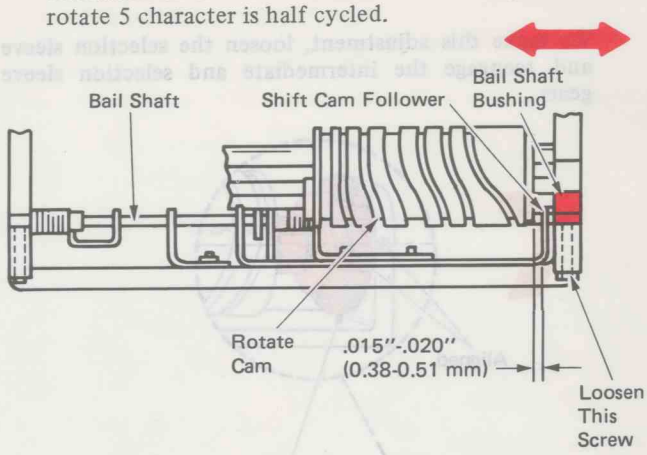
(Rear View)

8. *Rack Transfer Detent Springs* – Hold the rotate rack to the rear and adjust the rack transfer detent springs front or rear until the springs contact the pivot arms.

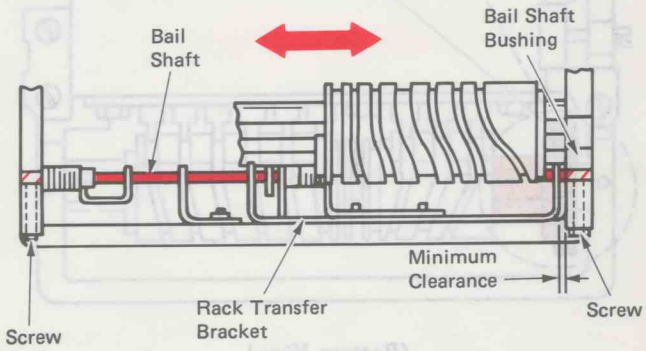


(Right Side View)

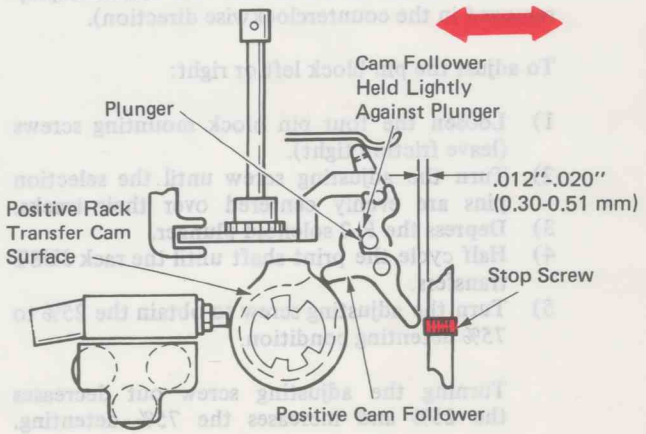
9. *Bail Shaft Bushing* – Adjust the bail shaft bushing left or right for a clearance of .015"-.020" (0.38-0.51 mm) between the rotate cam and the shift cam follower extension of the rack transfer bracket. Adjust when a rotate 5 character is half cycled.



10. *Rack Transfer Bracket End Clearance* – Adjust the bail shaft left or right so the rack transfer bracket has minimum end clearance and no binds.

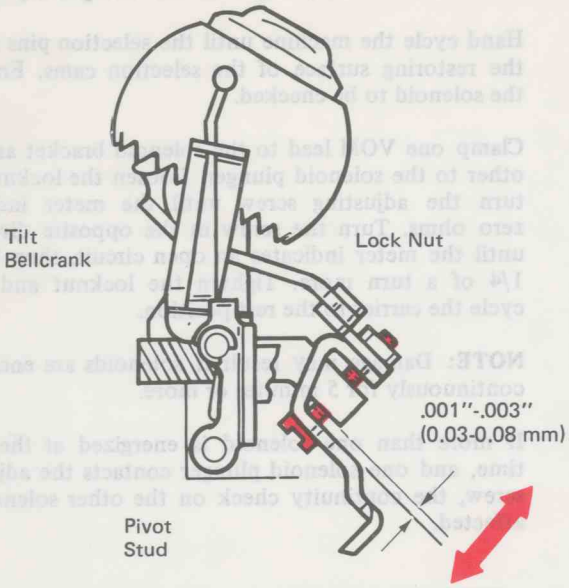


11. *Positive Cam Follower (Level 1 Rack Transfer Bracket Only)* – With the print shaft at rest, adjust the positive cam follower stop screw for a clearance of .012"-.020" (0.30-0.51 mm) between the screw and the cam follower. Make sure the cam follower is held lightly against the solenoid plunger and the rack plate is to the front.



(Right Side View)

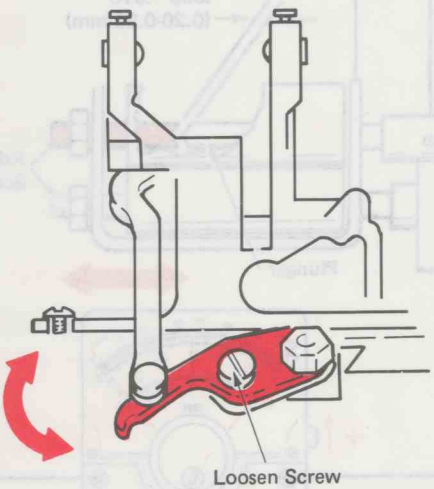
12. *Tilt Bellcrank* – Adjust the pivot stud for .001"-.003" (0.03-0.08 mm) clearance between the tilt bellcrank and rocker.



(Right Side View)

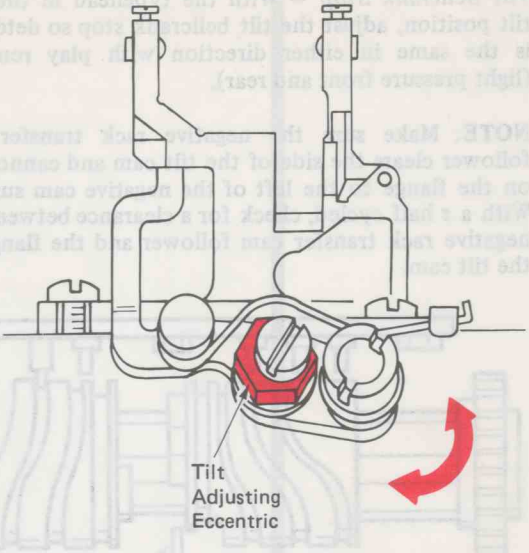
13. *Tilt Ring Position* – With the typehead in the tilt 2 position, loosen the screw or rotate the eccentric to adjust the tilt cam follower bellcrank. Adjust so detenting is the same in either direction with play removed (light pressure front or rear).

NOTE: Do not loosen the eccentric mounting screw to make this adjustment.



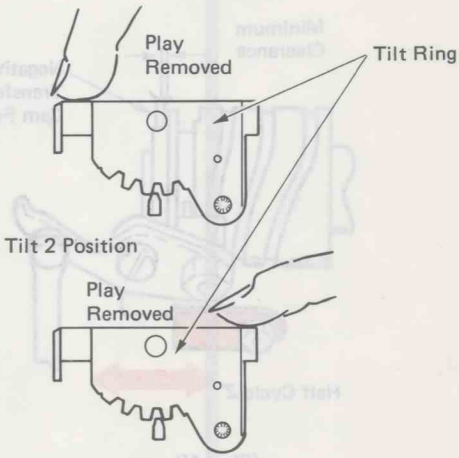
(Level 1)

(Rear View)



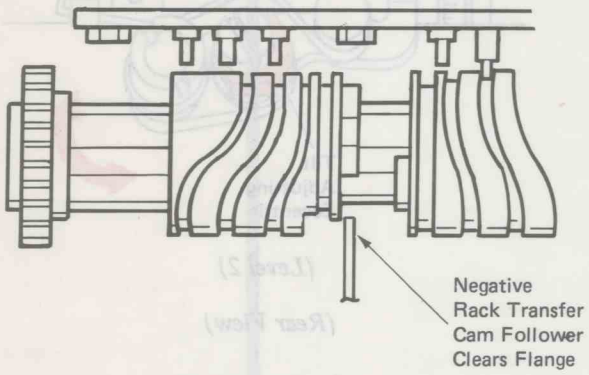
(Level 2)

(Rear View)

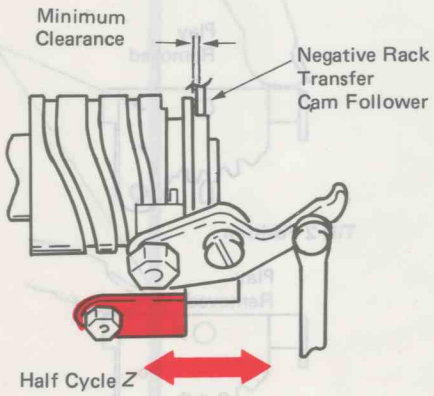


14. *Tilt Bellcrank Stop* – With the typehead in the zero tilt position, adjust the tilt bellcrank stop so detenting is the same in either direction with play removed (light pressure front and rear).

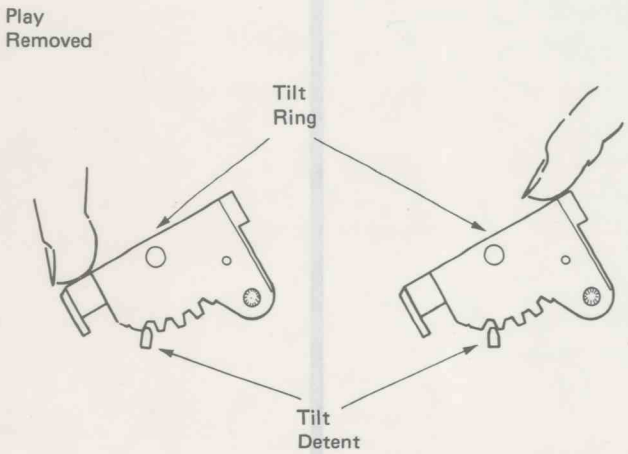
NOTE: Make sure the negative rack transfer cam follower clears the side of the tilt cam and cannot rest on the flange to the left of the negative cam surface. With a *z* half cycled, check for a clearance between the negative rack transfer cam follower and the flange on the tilt cam.



(Bottom View)



(Top View)



15. *Selection Solenoid Airgap* – Adjust each selection solenoid adjusting screw for a clearance of .008"-.010" (0.20-0.25 mm) between the adjustment screw and the selection solenoid plunger in the energized position.

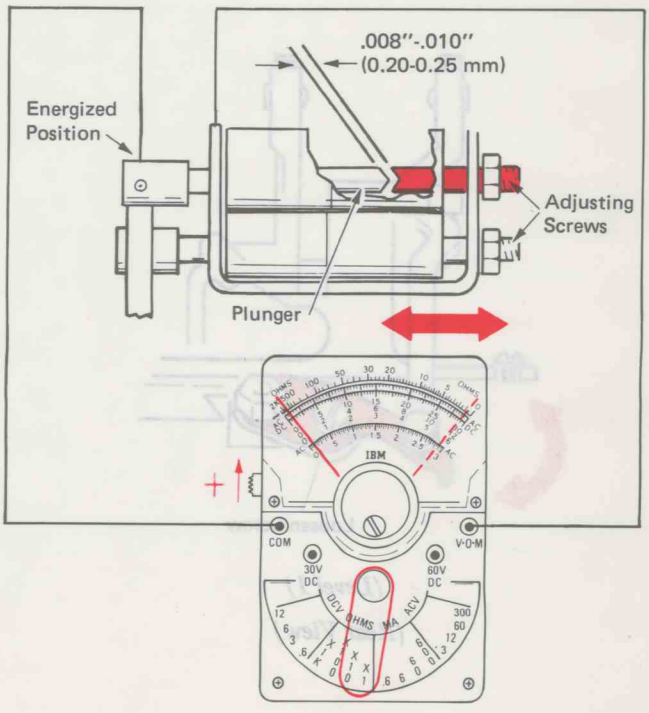
Hand cycle the machine until the selection pins are on the restoring surface of the selection cams. Energize the solenoid to be checked.

Clamp one VOM lead to the solenoid bracket and the other to the solenoid plunger. Loosen the locknut and turn the adjusting screw until the meter indicates zero ohms. Turn the screw in the opposite direction until the meter indicates an open circuit, then 1/8 to 1/4 of a turn more. Tighten the locknut and hand cycle the carrier to the rest position.

NOTE: Damage may result if solenoids are energized continuously for 5 minutes or more.

If more than one solenoid is energized at the same time, and one solenoid plunger contacts the adjusting screw, the continuity check on the other solenoids is affected.

CHARACTERS USING ONE SOLENOID	
Character	Solenoid
2	R1
/	R2
z	R3
p	T1
r	T2

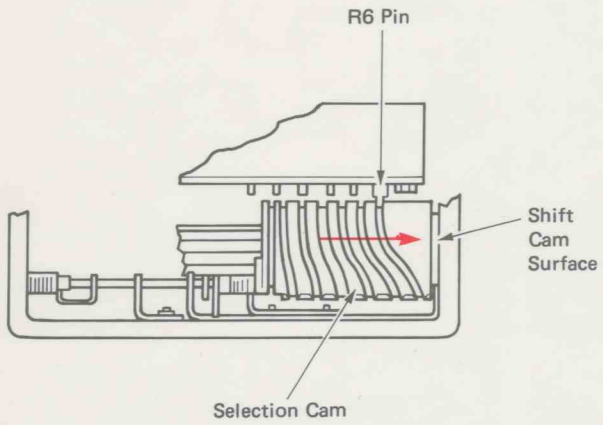


SHIFT OPERATIONAL THEORY

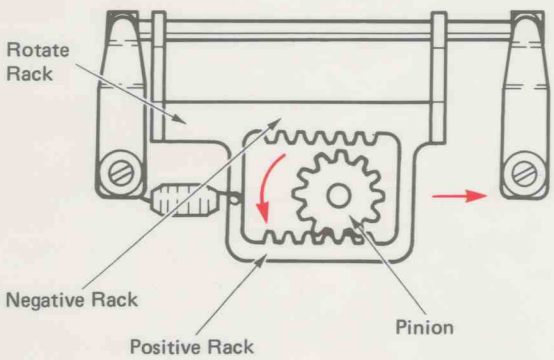
The shift mechansim rotates the typehead 180 degrees between lowercase and uppercase.

The typehead always rotates counterclockwise during a shift operation. The rotate rack must be to the rear (rotate pinion engages positive rack teeth) during the first half of a shift cycle. If the rotate rack is to the front (negative) position, it moves to the rear at the beginning of the shift operation. Rotate rack transfer is discussed in the Character Selection section.

A shift operation is a no-print operation. At the beginning of the shift cycle, the R2 selection solenoid energizes and releases the R6 pin. As the selection cams rotate, the R6 pin moves the rotate selection cam and rotate rack to the right (Figure 1). The pinion engages the positive rack teeth. Therefore, as the rotate rack moves to the right, the pinion and typehead rotate counterclockwise. When the rotate selection cam reaches the rotate 6 position, the typehead has rotated 90 degrees counterclockwise. The print shaft has now rotated approximately 180 degrees.



(Bottom View)



(Bottom View)

Figure 1 – R6 Operation

When the R6 pin moves the rotate selection cam to the right, the shift cam surface aligns with the shift cam follower (Figure 2).

The shift cam surface drives the shift cam follower to the rear. As the cam follower moves to the rear, the rack transfer bracket pivots top to front. This transfers the rotate rack plate from the rear to the front. The detent springs then hold the rack plate to the front and the pinion engages the negative rack teeth. As the rotate selection cam moves to the left during the second half of the print shaft cycle, the typehead rotates 90 degrees counterclockwise to complete the shift operation. The sequence is the same for shifting to uppercase or shifting to lowercase.

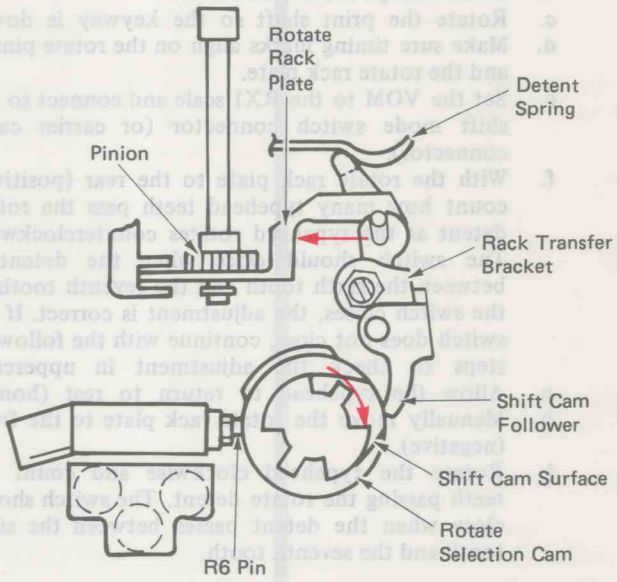
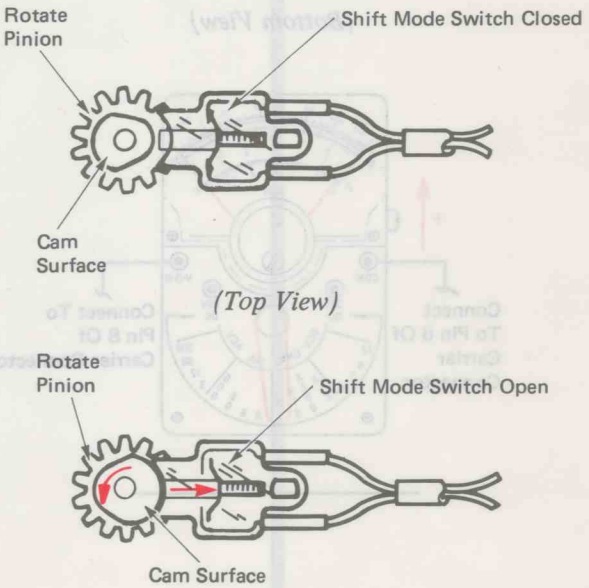


Figure 2 – Shift Cam Follower

The shift mode switch indicates to the electronics whether the typehead is in uppercase or lowercase (Figure 3). When the typehead is in lowercase, the cam surface on the rotate pinion holds the shift mode switch open. As the typehead and pinion rotate to uppercase, the switch closes.



(Top View)

(Top View)

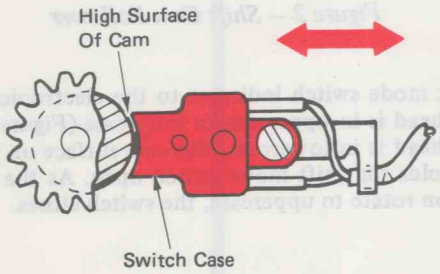
Figure 3 – Shift Mode Switch Operation

SHIFT ADJUSTMENTS

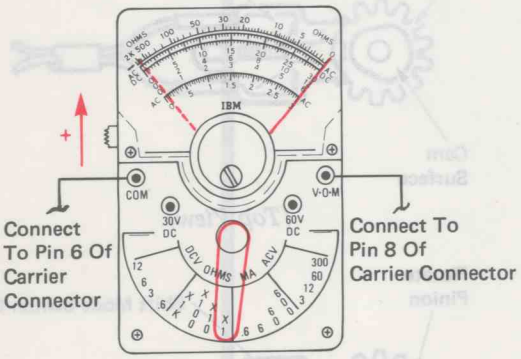
1. *Shift Mode Switch* – Position the switch as close as possible to the high surface of the cam, so there are no binds between the switch case and the cam.

   To check the shift mode switch:

   a. Shift to lowercase.
   b. Switch the power switch to off.
   c. Rotate the print shaft so the keyway is down.
   d. Make sure timing marks align on the rotate pinion and the rotate rack plate.
   e. Set the VOM to the RX1 scale and connect to the shift mode switch connector (or carrier cable connector).
   f. With the rotate rack plate to the rear (positive), count how many typehead teeth pass the rotate detent as the typehead rotates counterclockwise. The switch should close when the detent is between the sixth tooth and the seventh tooth. If the switch closes, the adjustment is correct. If the switch does not close, continue with the following steps to check the adjustment in uppercase.
   g. Allow the typehead to return to rest (home).
   h. Manually move the rotate rack plate to the front (negative).
   i. Rotate the typehead clockwise and count the teeth passing the rotate detent. The switch should close when the detent passes between the sixth tooth and the seventh tooth.



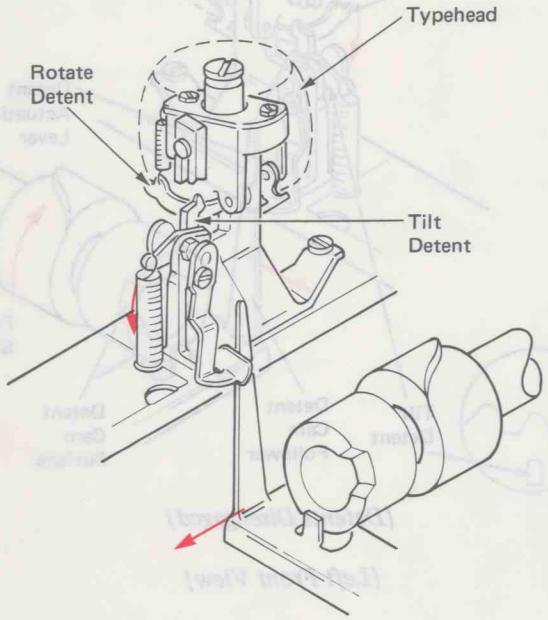
(Bottom View)



FINE ALIGNMENT OPERATIONAL THEORY

The selection mechanism moves the typehead and the fine alignment mechanism locks the typehead in position during the print operation. This allows each character to print clearly and to align with the other characters.

The tilt and rotate detents lock the typehead in position just before the character prints (Figure 1). After the print operation, the tilt and rotate detents disengage, allowing the character selection mechanism to return the typehead to the rest position.



(Left Front View)

Figure 1 – Fine Alignment Mechanism

ROCKER

The rocker and yoke support the tilt ring (Figure 2). The rocker pivots on the rocker pivot shaft. The yoke is mounted to the rocker. The tilt ring pivots on pins mounted in the yoke.

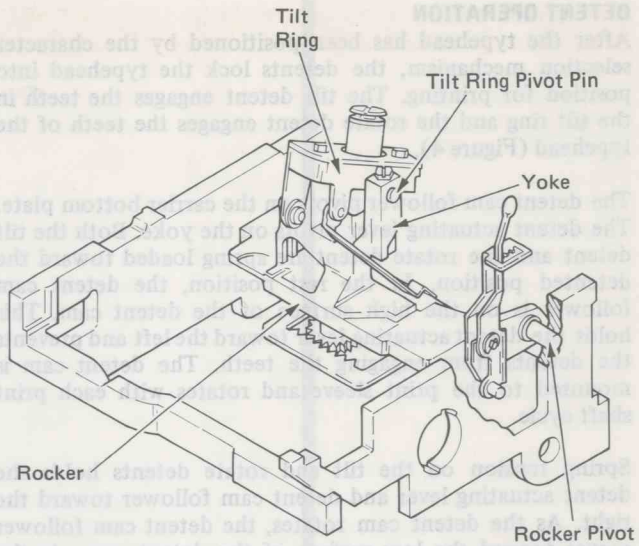


Figure 2 – Rocker

TYPEHEAD SUPPORT

The upper ball socket is mounted on the tilt ring (Figure 3). Shims give minimum clearance between the tilt ring spacer and the upper ball socket flange. The tilt ring spring holds the upper ball socket and typehead toward the front of the machine. This action biases the typehead against the tilt ring backup shoe to support the typehead during impact. Three lugs on the typehead key position the typehead on the upper ball socket. A locking screw locks the key to the upper ball socket.

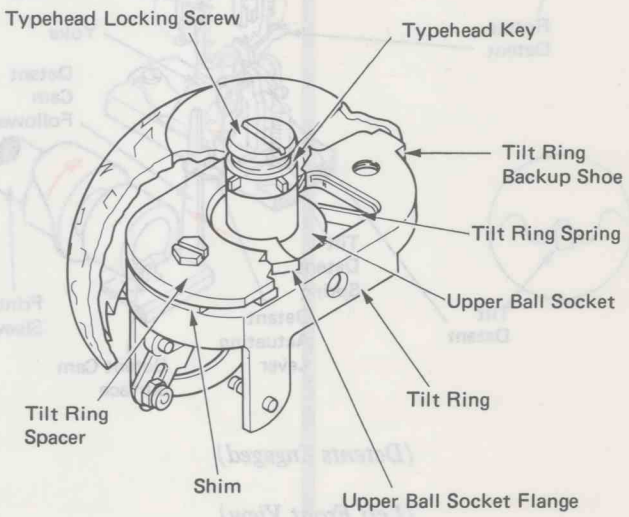


Figure 3 – Typehead Support

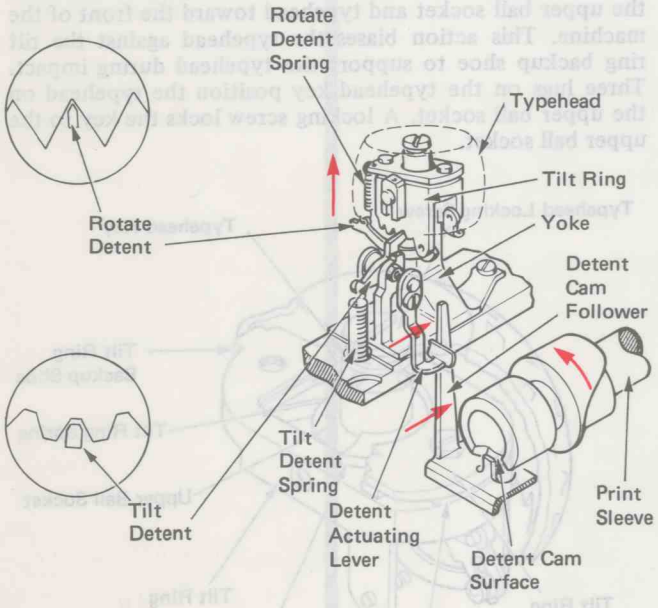
DETENT OPERATION

After the typehead has been positioned by the character selection mechanism, the detents lock the typehead into position for printing. The tilt detent engages the teeth in the tilt ring and the rotate detent engages the teeth of the typehead (Figure 4).

The detent cam follower pivots on the carrier bottom plate. The detent actuating lever pivots on the yoke. Both the tilt detent and the rotate detent are spring loaded toward the detented position. In the rest position, the detent cam follower is on the high surface of the detent cam. This holds the detent actuating lever toward the left and prevents the detents from engaging the teeth. The detent cam is mounted to the print sleeve and rotates with each print shaft cycle.

Spring tension on the tilt and rotate detents holds the detent actuating lever and detent cam follower toward the right. As the detent cam rotates, the detent cam follower moves toward the low surface of the detent cam. As the detent actuating lever moves to the right, the tilt detent spring pivots the tilt detent into a notch in the tilt ring.

The tilt detent holds the rotate detent out of the typehead as it moves into the print position. As the tilt detent engages the tilt ring, the rotate detent spring moves the rotate detent into the typehead notch. This holds the typehead securely during the print operation.

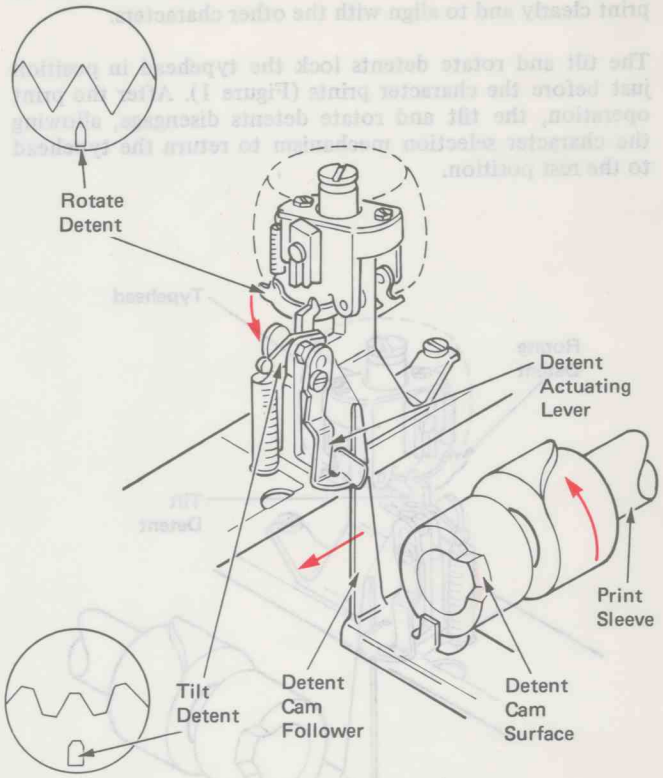


(Detents Engaged)

(Left Front View)

Figure 4 – Detent Operation

After the character prints, the cam continues to rotate and the detent cam follower moves to the high surface of the detent cam (Figure 5). The detent cam follower and detent actuating lever move to the left and disengage the detents.

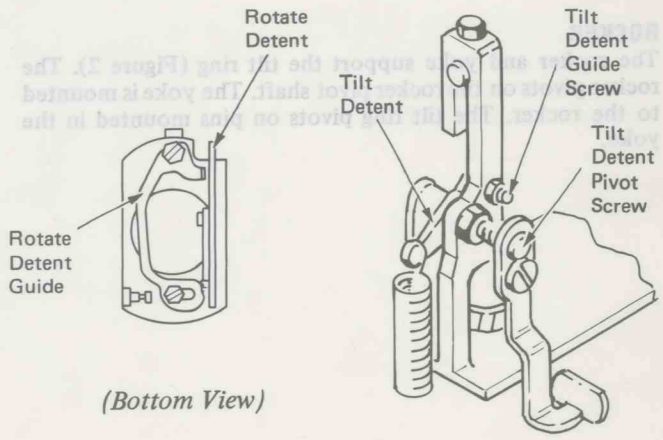


(Detents Disengaged)

(Left Front View)

Figure 5 – Detent Operation

The rotate detent guide minimizes play in the rotate detent (Figure 6). The guide screw and pivot screw minimize play in the tilt detent.



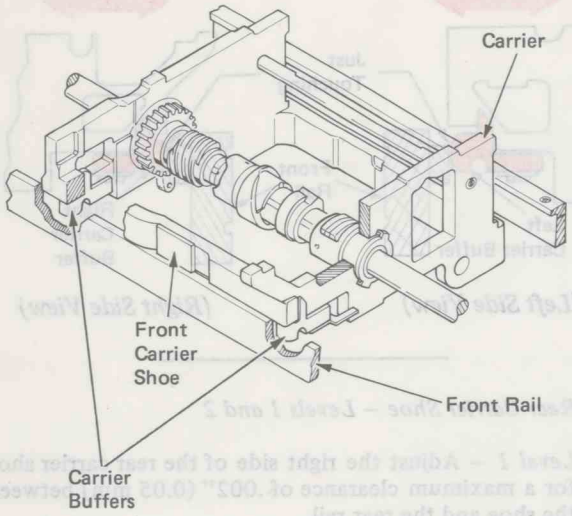
(Bottom View)

(Left Front View)

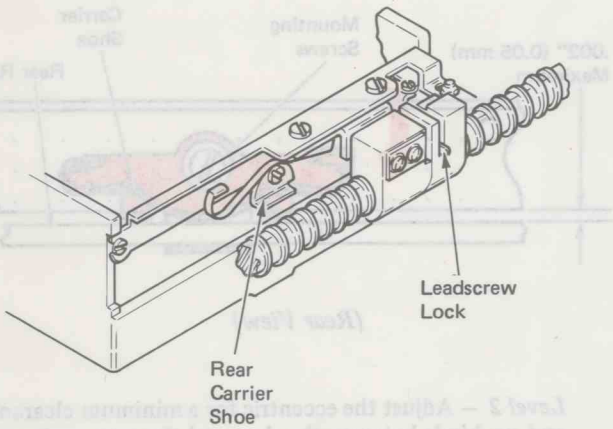
Figure 6 – Detent Control

CARRIER SUPPORT

During printing, the carrier assembly is held in place by the carrier buffers, the front and rear carrier shoes, and the leadscrew lock (Figure 7). The buffers and front and rear shoes provide minimum clearance between the carrier and front and rear rails. The leadscrew lock prevents the left-to-right movement of the carrier assembly during printing.



(Right Front View)

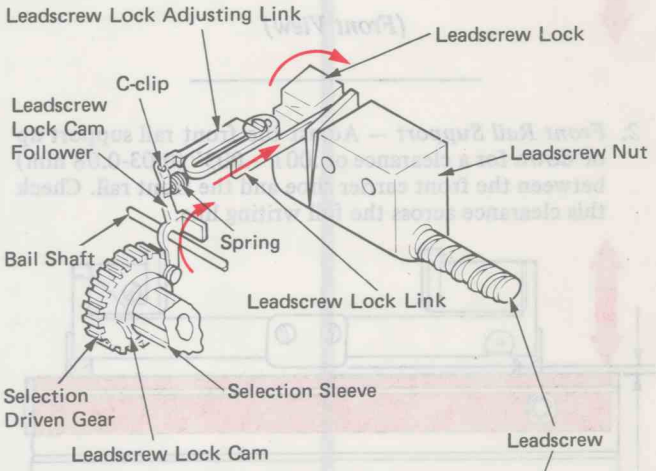


(Right Rear View)

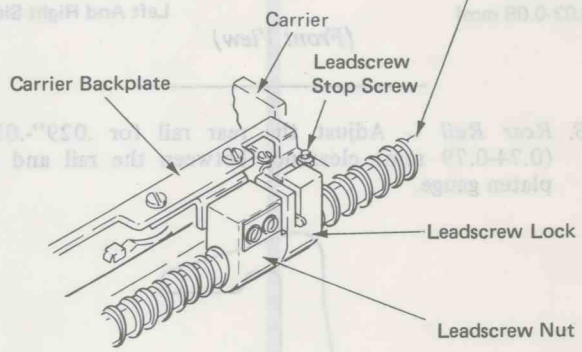
Figure 7 – Carrier Support

At rest, a slight clearance between the leadscrew lock and leadscrew nut allows the carrier to move freely left or right on the leadscrew (Figure 8). When the leadscrew lock rotates top to rear, it contacts the leadscrew nut. Further top-to-rear motion creates a bind between the leadscrew lock, leadscrew nut and leadscrew threads. This bind locks the carrier assembly to the leadscrew and prevents it from moving left or right during printing.

The leadscrew lock cam provides motion for the leadscrew lock. During a print shaft cycle, the leadscrew lock spring moves the cam follower toward the low surface of the lock cam. The cam follower pivots top to rear, and moves the adjusting link to the rear. This pivots the leadscrew lock top to rear. The leadscrew lock tightens against the leadscrew nut and locks the leadscrew nut to the leadscrew. The carrier is now held firmly in place for the print operation. After printing, the cam follower returns the leadscrew lock to the rest position.



(Right Front View)

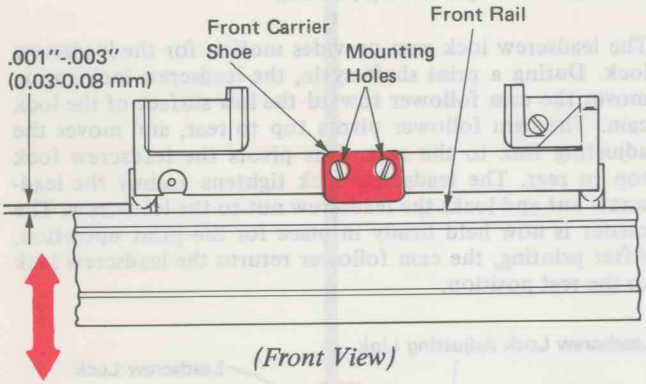


(Right Rear View)

Figure 8 – Leadscrew Lock Operation

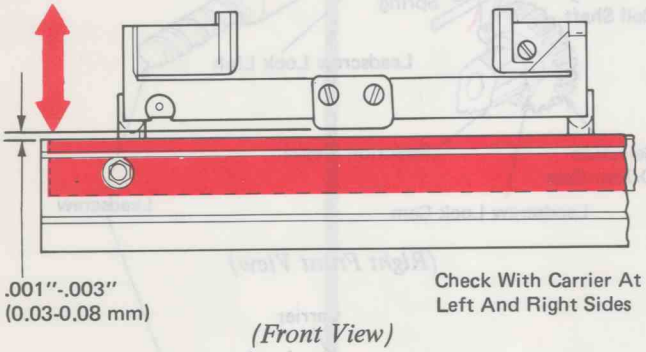
FINE ALIGNMENT ADJUSTMENTS

1. *Front Carrier Shoe* – Adjust the front carrier shoe up or down for a clearance of .001"-.003" (0.03-0.08 mm) between the shoe and the front rail. Check this clearance across the full writing line.



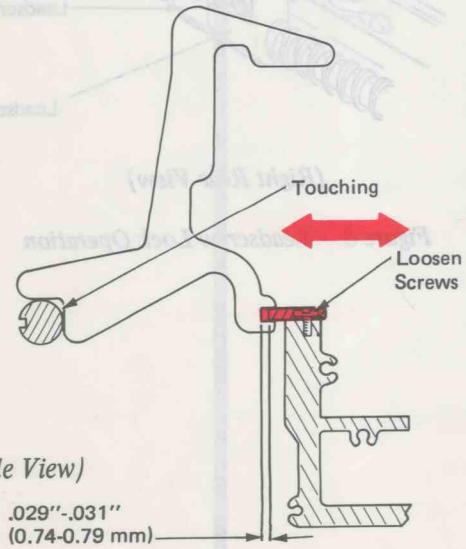
(Front View)

2. *Front Rail Support* – Adjust the front rail support up or down for a clearance of .001"-.003" (0.03-0.08 mm) between the front carrier shoe and the front rail. Check this clearance across the full writing line.



(Front View)

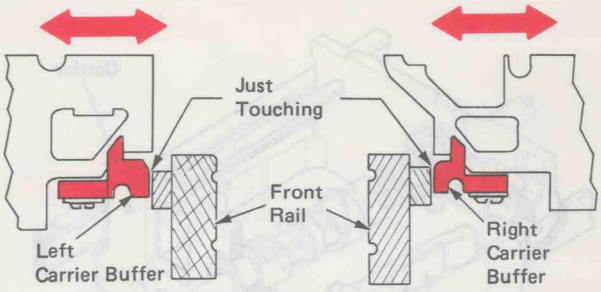
3. *Rear Rail* – Adjust the rear rail for .029"-.031" (0.74-0.79 mm) clearance between the rail and the platen gauge.



(Right Side View)

4. *Carrier Buffers* – Adjust both the carrier buffers front to rear until they just touch the rear of the front rail.

Make sure the carrier moves across the full writing line without binding.

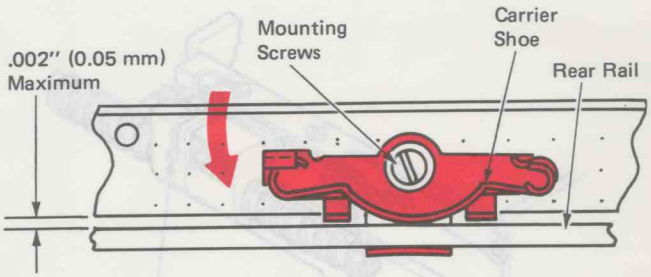


(Left Side View) *(Right Side View)*

5. *Rear Carrier Shoe – Levels 1 and 2*

Level 1 – Adjust the right side of the rear carrier shoe for a maximum clearance of .002" (0.05 mm) between the shoe and the rear rail.

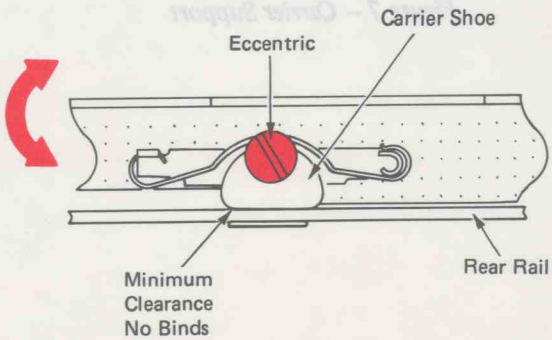
Loosen the screw and rotate the shoe counterclockwise (viewed from the rear).



(Rear View)

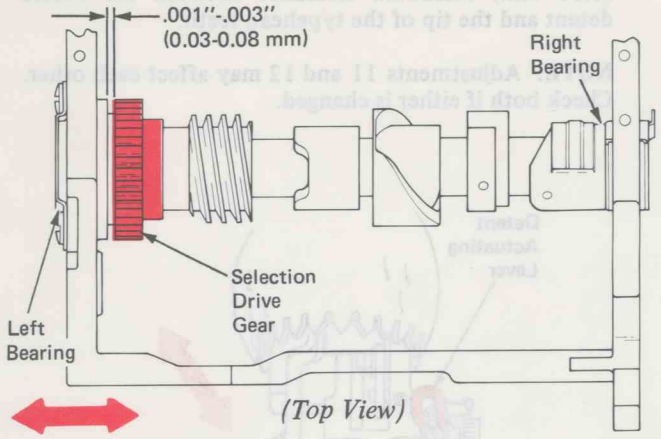
Level 2 – Adjust the eccentric for a minimum clearance and no binds between the shoe and the rear carrier rail.

NOTE: Keep the high surface of the eccentric to the left.



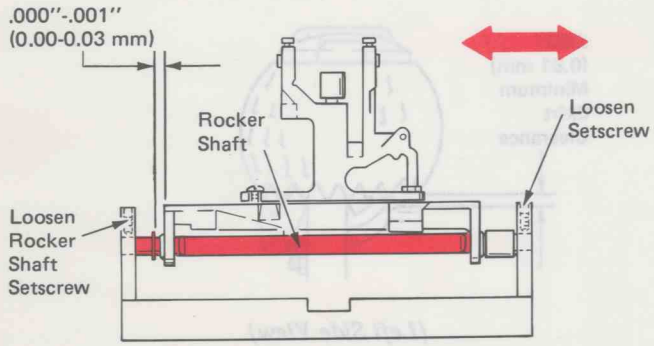
(Rear View)

6. *Print Sleeve End Play* – Adjust the selection drive gear left or right for .001"-.003" (0.03-0.08 mm) print sleeve end play.



(Top View)

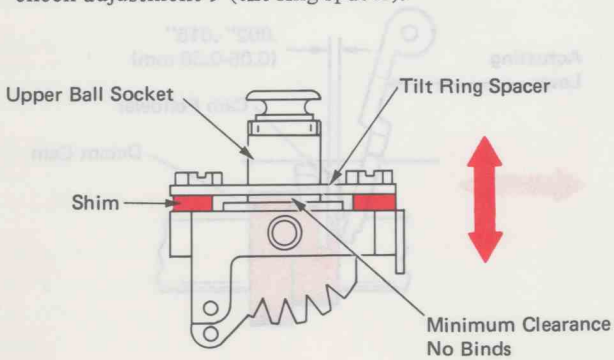
7. *Rocker End Play* – Adjust the rocker shaft left or right for .000"-.001" (0.00-0.03 mm) side play in the rocker. Loosen the setscrews at the left and right end of the rocker shaft in the carrier casting to make this adjustment.



(Rear View)

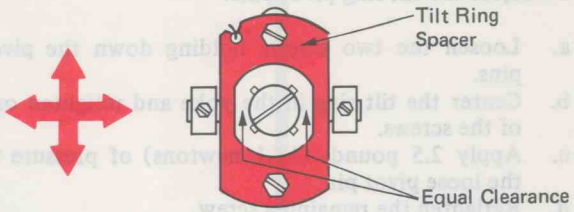
8. *Upper Ball Socket* – Adjust the upper ball socket clearance for minimum vertical end play and no binds. Insert shims under the tilt ring spacer if needed.

NOTE: If the tilt ring spacer screws are loosened, check adjustment 9 (tilt ring spacer).



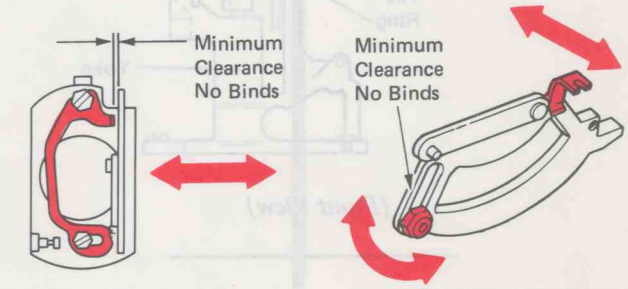
(Right Side View)

9. *Tilt Ring Spacer* – Position the tilt ring spacer front to rear and left to right for equal clearance between the upper ball socket and the opening in the tilt ring spacer.



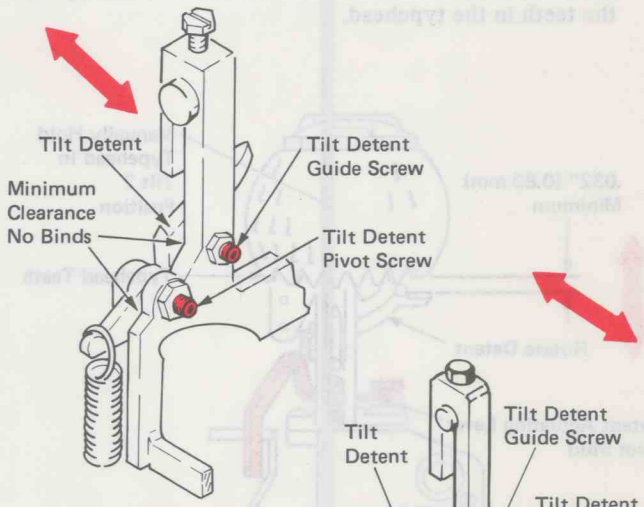
(Top View)

10. *Rotate Detent Side Play* – Adjust the rotate detent guide and rotate detent nut for minimum clearance and no binds between the guide and the detent.



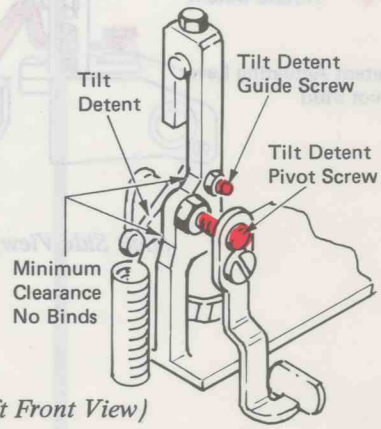
(Bottom View) *(Right Front View)*

11. *Tilt Detent Side Play (Levels 1 and 2)* – Adjust the tilt detent guide screw and the tilt detent pivot screw for minimum clearance without binds.



(Left Front View)

(Level 1)



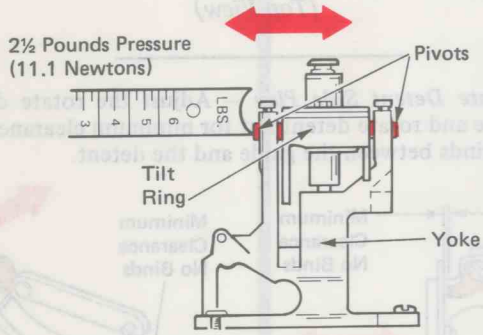
(Left Front View)

(Level 2)

12. *Tilt Ring Pivot Pins* – Adjust the pivot pins so they apply 2.5 pounds (11.1 newtons) of pressure on the tilt ring and keep the tilt ring centered in the yoke.

To adjust the tilt ring pivot pins:

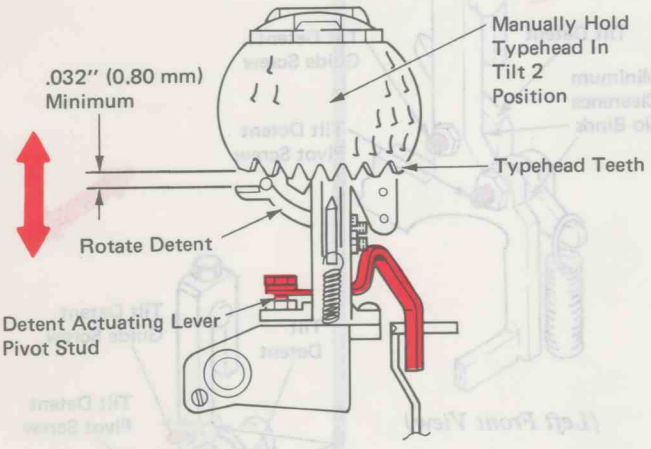
a. Loosen the two screws holding down the pivot pins.
b. Center the tilt ring in the yoke and retighten one of the screws.
c. Apply 2.5 pounds (11.1 newtons) of pressure to the loose pivot pin.
d. Retighten the remaining screw.



(Front View)

13. *Typehead Skirt Clearance (Levels 1 and 2)* –

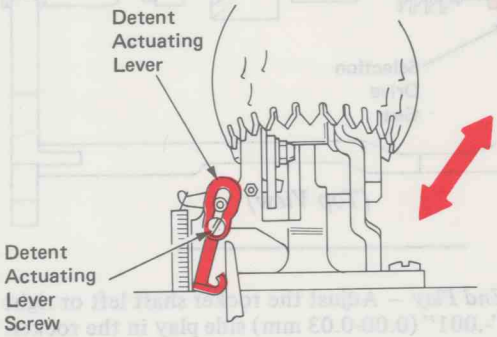
Level 1 – Manually hold the typehead in the tilt 2 position, and adjust the detent actuating lever pivot stud up or down for a minimum clearance of .032" (0.80 mm) between the rotate detent and the tip of the teeth in the typehead.



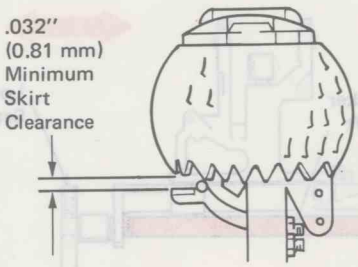
(Left Side View)

Level 2 – Manually hold the typehead in the tilt 2 position, and loosen the detent actuating lever screw. Adjust the detent actuating lever up or down for .032" (0.81 mm) minimum clearance between the rotate detent and the tip of the typehead teeth.

NOTE: Adjustments 11 and 12 may affect each other. Check both if either is changed.

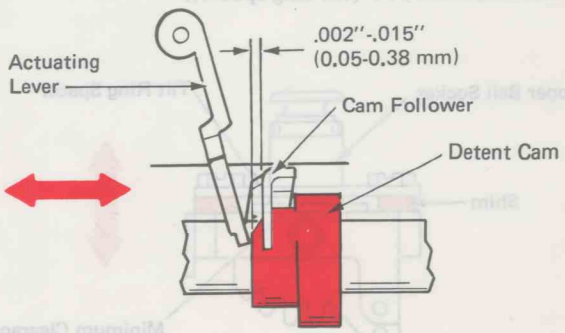


(Front View)



(Left Side View)

14. *Detent Cam* – Half cycle the print shaft and move the detent cam left or right for a clearance of .002"-.015" (0.05-0.38 mm) between the detent cam follower and the detent actuating lever. The tilt and rotate detents must be engaged in the teeth. Check this adjustment in all tilt positions and with the velocity cam follower on the high surface of the high velocity cam.



(Top View)

15. *Leadscrew Nut* – The leadscrew nut can bind on the leadscrew if not aligned correctly. You must make this adjustment; it cannot be checked. Make the adjustment with the leadscrew lock link loose.

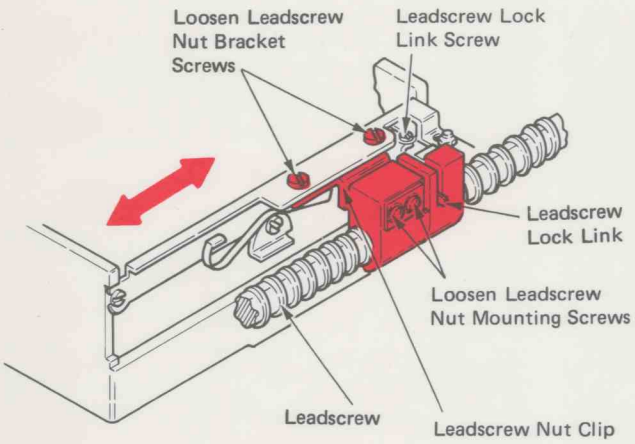
To adjust the leadscrew nut:

a. Loosen the leadscrew nut mounting screws (2), the leadscrew nut bracket screws (2), and the leadscrew lock link screw (1).
b. Tighten the leadscrew nut bracket screws (2) friction tight.
c. Push leadscrew lock top to rear so lock is locked against the leadscrew nut.
d. For machines without leadscrew nut clip – Center the nut mounting screws (2) left to right and tighten.

   For machines with leadscrew nut clip – Press the leadscrew nut down. Then slightly pull up on the leadscrew to center the leadscrew in the nut. Center the nut mounting screws (2) left to right in their mounting holes and then tighten the screws.

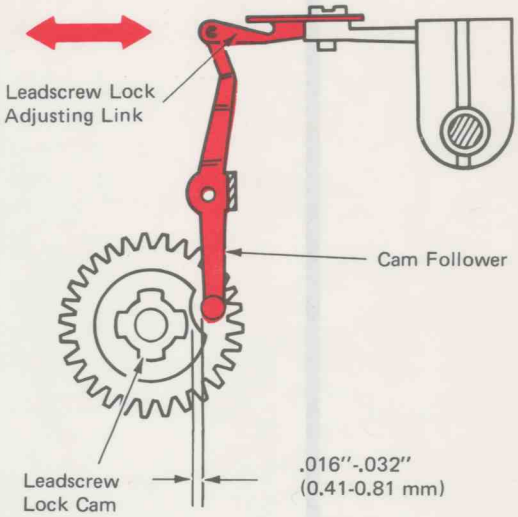
e. Loosen the leadscrew nut bracket screws (2) and center the screws left to right in their mounting holes and then tighten the screws.
f. Half cycle the print shaft. Then continue to cycle the print shaft while watching the lock link move. When the lock link has moved .015"-.030" (0.38-0.76 mm) towards the front of the machine, stop cycling the print shaft and tighten the lock link screw (1).

After the adjustment is complete, there should be a slight amount of carrier side to side movement with the print shaft at rest. With the print shaft cycled, there should be no carrier side to side movement.



(Rear View)

16. *Leadscrew Lock* – With the locknut in the locked position, adjust the leadscrew lock adjusting link for a clearance of .016"-.032" (0.41-0.81 mm) between the cam follower and the low surface of the cam.

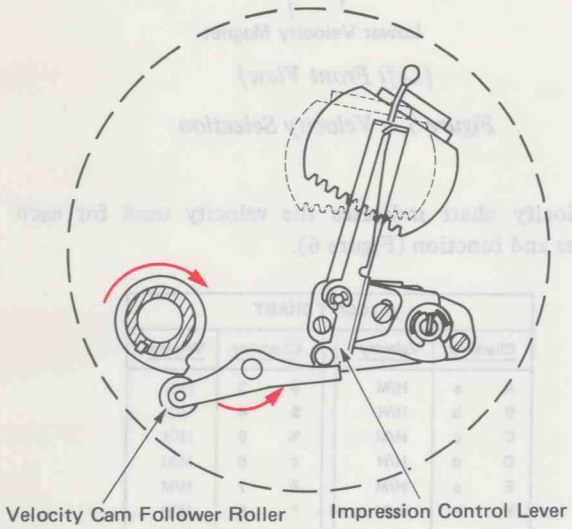


(Right Side View)

PRINT OPERATIONAL THEORY

The print mechanism pivots the rocker assembly to drive the typehead toward the platen (Figure 1). The rocker moves at high, medium, or low velocity to ensure the typehead impacts on the paper properly.

The velocity cams, mounted to the print sleeve, rotate with each print shaft cycle. During a print operation, the velocity cam follower roller tracks one of the three cam surfaces of the velocity cams. As the cams rotate, the front of the cam follower pivots down and the rear of the cam follower pivots up. The rear of the cam follower drives the impression control lever on the rocker. The rocker then pivots top to rear. After printing, the velocity cam follower moves off the high surface of the velocity cam. The rocker return spring returns the rocker and velocity cam follower to the rest position.



(Right Side View)

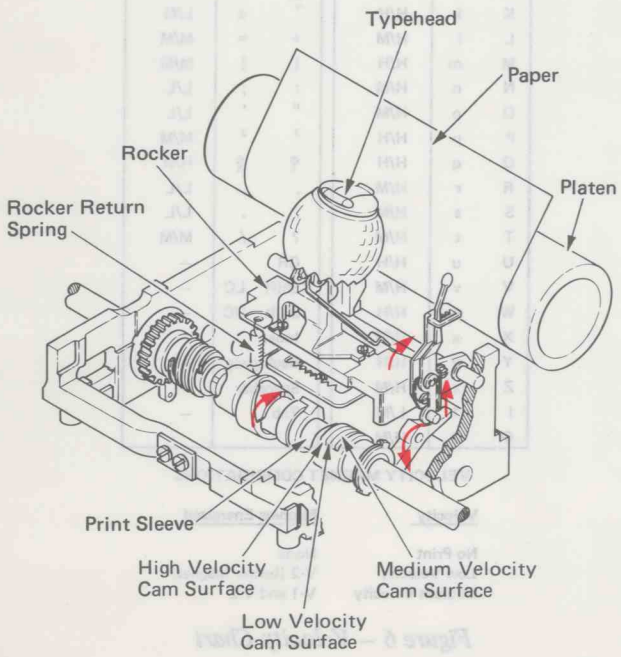
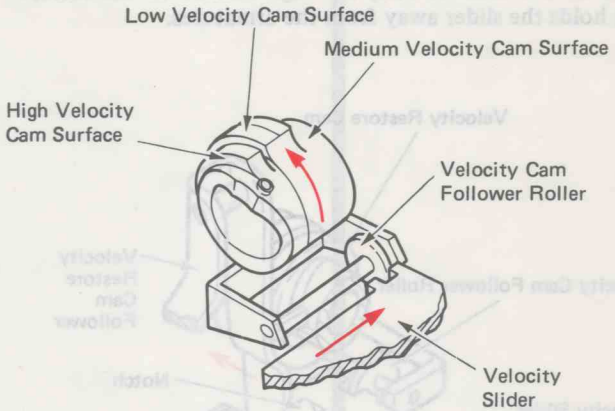


Figure 1 – Print Operation

PRINT OPERATION

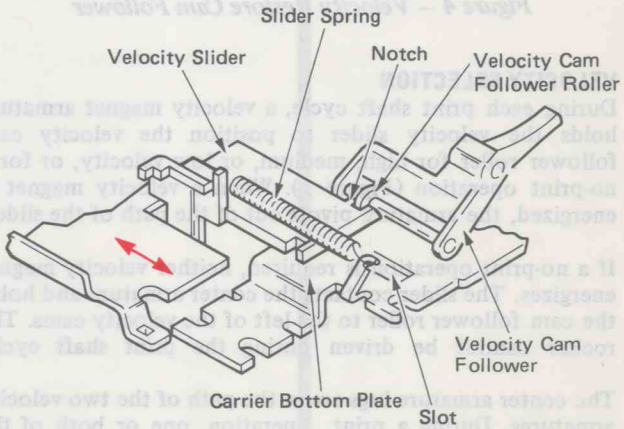
The typehead's impact is determined by the position of the cam follower roller. The velocity slider moves the velocity cam follower roller under a velocity cam surface (Figure 2). The three roller positions provide low, medium, or high velocity. For a no-print operation, the roller is held to the left of the cams.



(Left Front View)

Figure 2 – Velocity Control

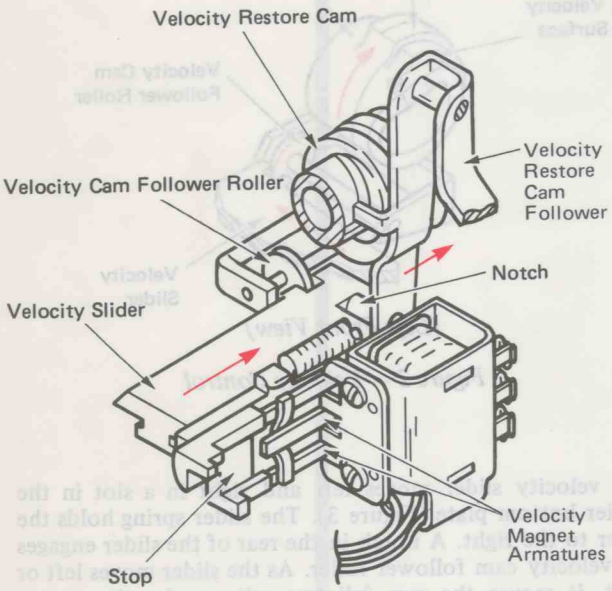
The velocity slider moves left and right in a slot in the carrier bottom plate (Figure 3). The slider spring holds the slider to the right. A notch in the rear of the slider engages the velocity cam follower roller. As the slider moves left or right, it moves the cam follower roller under the proper cam surface.



(Right Front View)

Figure 3 – Velocity Slider

The velocity restore cam follower engages a notch in the velocity slider. During a print operation, the lug of the velocity restore cam follower moves to the low surface of the velocity restore cam. The slider then moves to the right until a stop contacts a velocity magnet armature (Figure 4). The velocity cam follower roller moves under the desired cam surface. Near the end of the cycle, the restoring cam drives the restoring cam follower and the slider to the left. At rest, the high surface of the restore cam holds the slider away from the armatures.



(Left Front View)

Figure 4 – Velocity Restore Cam Follower

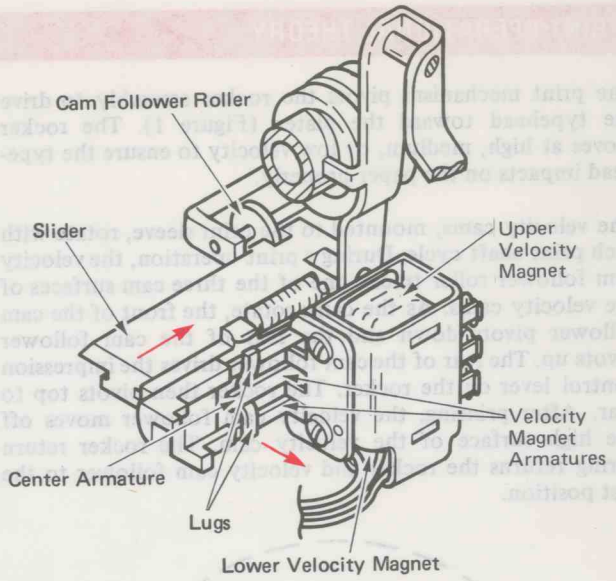
VELOCITY SELECTION

During each print shaft cycle, a velocity magnet armature holds the velocity slider to position the velocity cam follower roller for high, medium, or low velocity, or for a no-print operation (Figure 5). When a velocity magnet is energized, the armature pivots out of the path of the slider.

If a no-print operation is required, neither velocity magnet energizes. The slider contacts the center armature and holds the cam follower roller to the left of the velocity cams. The rocker cannot be driven during the print shaft cycle.

The center armature lugs are in the path of the two velocity armatures. During a print operation, one or both of the velocity magnets are energized. As either velocity armature pivots out of the path of the slider, it also pivots the center armature out of the path of the slider. This allows the slider to move to the right.

The upper magnet is energized for high velocity and the lower magnet is energized for low velocity. Both magnets are energized for medium velocity.



(Left Front View)

Figure 5 – Velocity Selection

The velocity chart indicates the velocity used for each character and function (Figure 6).

VELOCITY CHART

Character		Velocity	Character		Velocity
A	a	H/M	#	3	H/H
B	b	H/H	$	4	H/H
C	c	H/M	%	5	H/H
D	d	H/H	¢	6	M/H
E	e	H/M	&	7	H/M
F	f	H/M	*	8	M/H
G	g	H/H	(	9	M/H
H	h	H/H	)	0	M/H
I	i	M/M	¼	½	H/H
J	j	M/M	¯	-	L/L
K	k	H/H	°	±	L/M
L	l	H/M	+	=	M/M
M	m	H/H	[	]	M/M
N	n	H/M	:	;	L/L
O	o	H/M	"	'	L/L
P	p	H/H	³	²	M/M
Q	q	H/H	¶	§	H/H
R	r	H/M	,	,	L/L
S	s	H/M	.	.	L/L
T	t	H/M	?	/	M/M
U	u	H/H	CR		–
V	v	H/M	Shift	LC	–
W	w	H/H	Shift	UC	–
X	x	H/M	Index		–
Y	y	H/H	Backspace		–
Z	z	H/M	Spacebar		–
!	1	L/M	Tab		–
@	2	H/M			

VELOCITY MAGNET COMBINATIONS

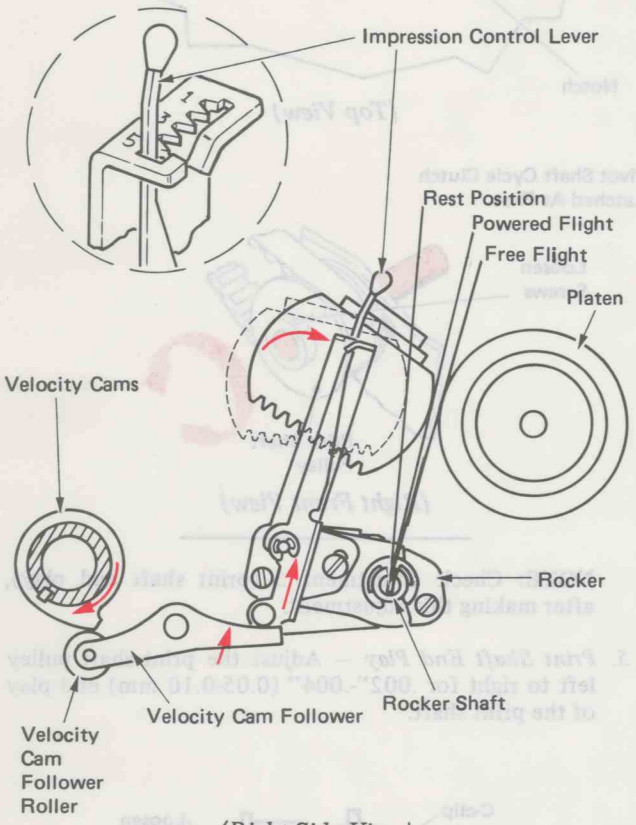
Velocity	Magnets Energized
No Print	None
Low Velocity	V-2 (Lower Magnet)
Medium Velocity	V-1 and V-2

Figure 6 – Velocity Chart

IMPRESSION CONTROL LEVER

Moving the impression control lever changes the typehead impact. The impression control lever has five impression positions (Figure 7). Moving the impression control lever changes the point where the control lever contacts the velocity cam follower. The position of the control lever determines the amount of motion the rocker receives from the velocity cam follower.

Powered flight is the distance the rocker and typehead move under power of the velocity cams. Free flight is the remaining distance the typehead moves. Free flight is necessary to produce a clear printed character.

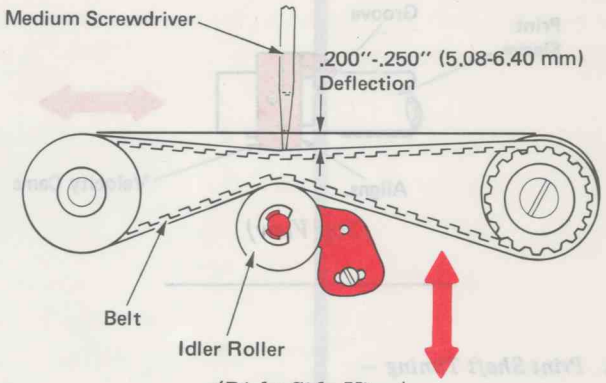


(Right Side View)

Figure 7 – Impression Control

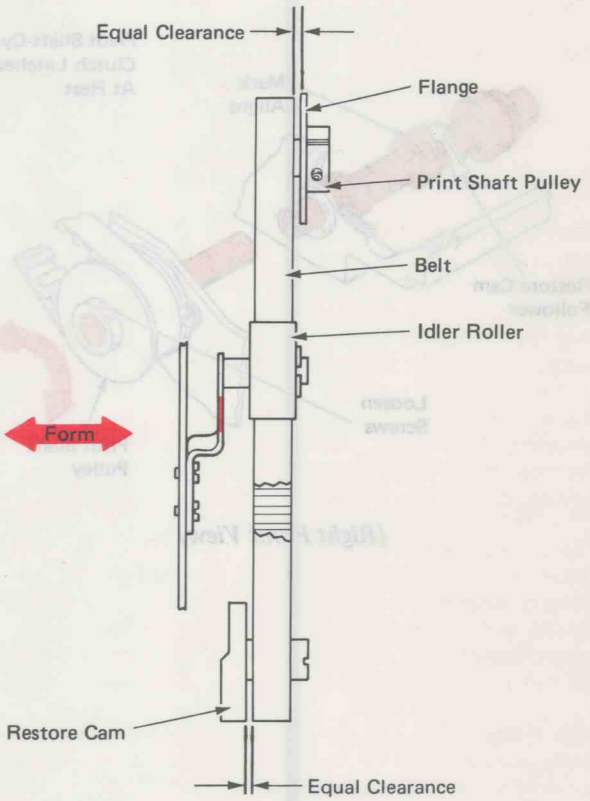
PRINT ADJUSTMENTS

1. *Print Shaft Belt Tension* – Adjust the idler roller for a belt deflection of .200"-.250" (5.08-6.40 mm) when one pound of pressure is placed on top of the belt.



(Right Side View)

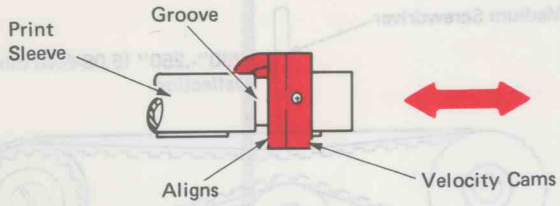
2. *Print Shaft Belt Tracking* – Form the idler roller left or right for equal clearance between the belt and the flange of the print shaft pulley, and between the belt and the restore cam.



(Bottom View)

3. *Velocity Cams* – Adjust the velocity cams left or right so the low surface of the velocity slider restore cam aligns with the edge of the groove around the print sleeve.

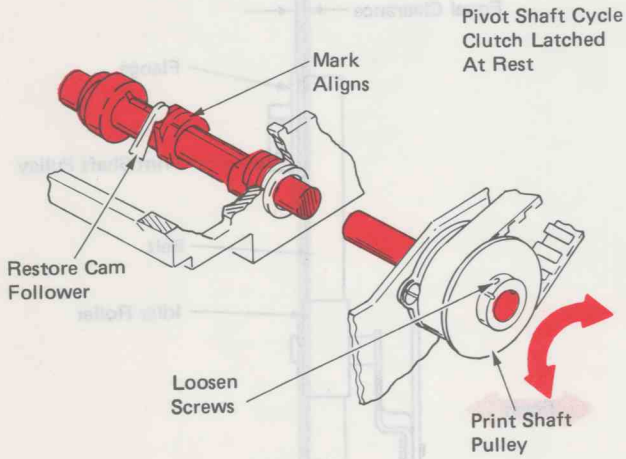
NOTE: Print sleeve end play and the position of all cams on the print sleeve may be affected when this adjustment is changed.



(Top View)

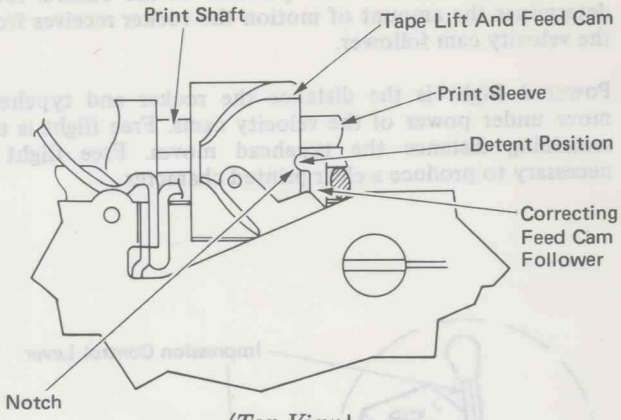
4. *Print Shaft Timing* –

a. *Selective Ribbon* – With the print shaft cycle clutch latched, loosen the print shaft pulley. Rotate the print shaft until the correcting restore cam follower detents in the notch of the restore cam.

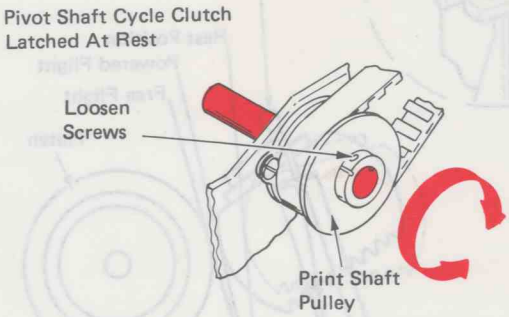


(Right Front View)

b. *Ribbon Cassette System* – With the print shaft cycle clutch latched, loosen the print shaft pulley. Rotate the print shaft until the correction feed cam follower is detented in the notch on the tape lift and feed cam.



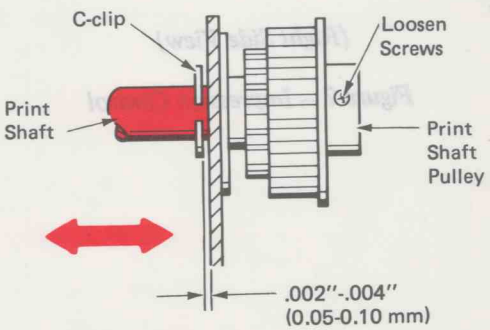
(Top View)



(Right Front View)

NOTE: Check adjustment 5 (print shaft end play), after making this adjustment.

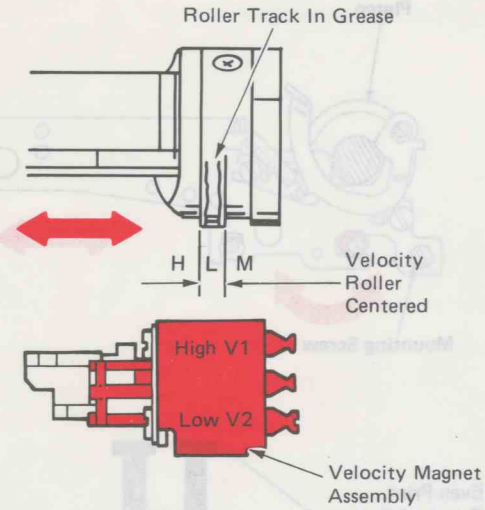
5. *Print Shaft End Play* – Adjust the print shaft pulley left to right for .002"-.004" (0.05-0.10 mm) end play of the print shaft.



(Front View)

6. *Velocity Magnet Assembly (Left To Right)* – Adjust the velocity magnet assembly left to right to align the cam follower roller with the center of the low velocity print cam surface when a low-velocity character is selected.

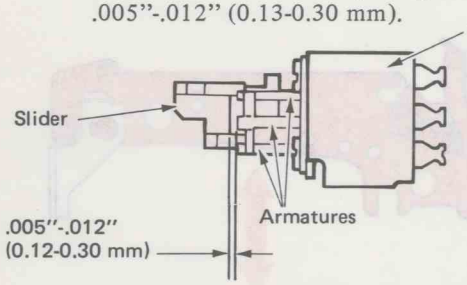
To check this adjustment, put No. 23 grease on the cam surface and observe the tracks left by the cam follower roller.



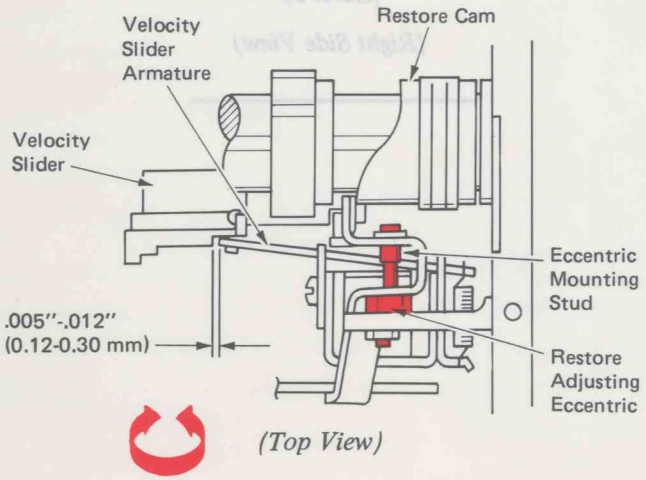
(Front View)

7. *Velocity Slider Restore* –

a. *Ribbon Cassette System* – Adjust the velocity restore adjusting eccentric so the velocity slider overthrows the velocity magnet armatures by .005"-.012" (0.13-0.30 mm).

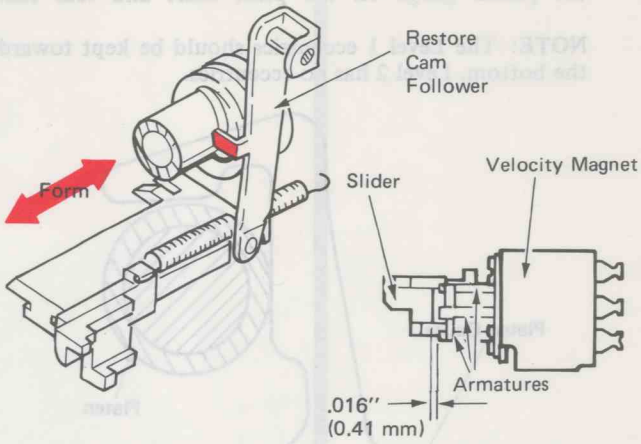


(Front View)



(Top View)

b. *Selective Ribbon* – Form the lug on the restore cam follower so the velocity slider overthrows the velocity magnet armatures by .016" (0.41 mm).

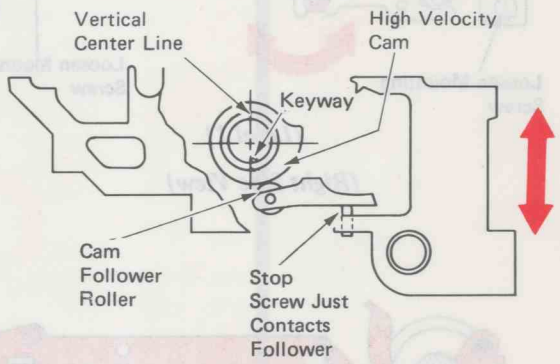


(Front View)

(Right Side View)

8. *Velocity Cam Follower* – Adjust the cam follower stop screw so the cam follower roller first contacts the high-velocity cam when the front edge of the print shaft keyway aligns with a vertical centerline through the print shaft.

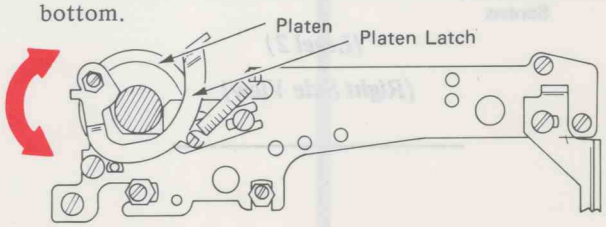
To make this adjustment, cycle a high-velocity character until the front edge of the keyway aligns with the vertical centerline. Adjust the stop screw until it just contacts the follower.



(Right Side View)

9. *Platen Latches* – Adjust the platen latch eccentrics so the platen is held firmly in position vertically and horizontally. The latches should latch and unlatch freely with the feed rolls released.

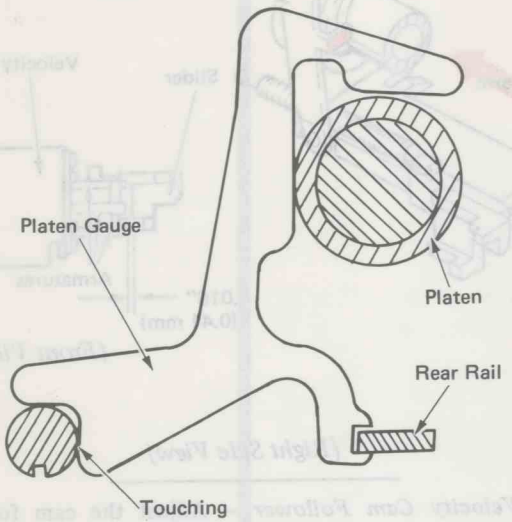
NOTE: The eccentrics should be kept toward the bottom.



(Right Side View)

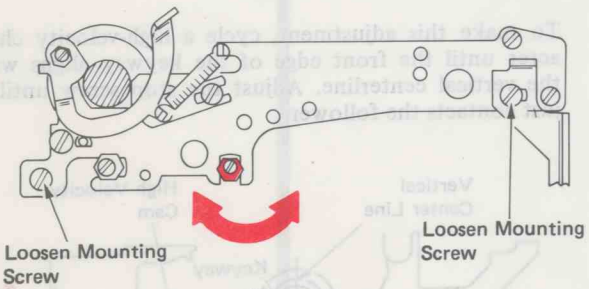
10. *Platen Position (Front To Rear)* – Loosen the four mounting screws and adjust the paper feed assembly front to rear until the platen just touches the platen gauge. Adjust with the print shaft keyway down and the platen gauge on the print shaft and rear rail.

NOTE: The Level 1 eccentrics should be kept toward the bottom. Level 2 has no eccentrics.



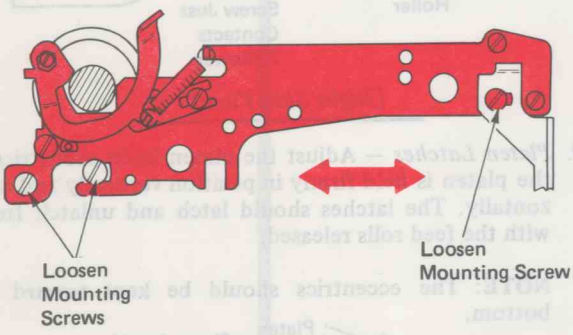
(Level 1)

(Right Side View)



(Level 1)

(Right Side View)

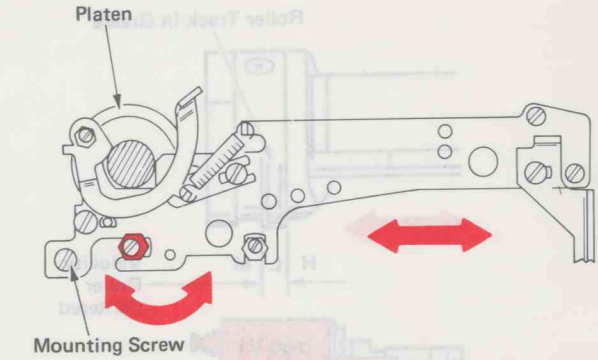


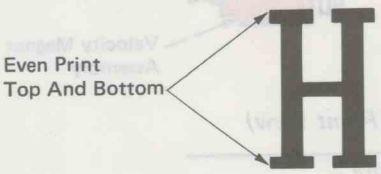
(Level 2)

(Right Side View)

11. *Platen Height* – Loosen the four mounting screws and adjust the platen height eccentrics for even top and bottom printing of all characters.

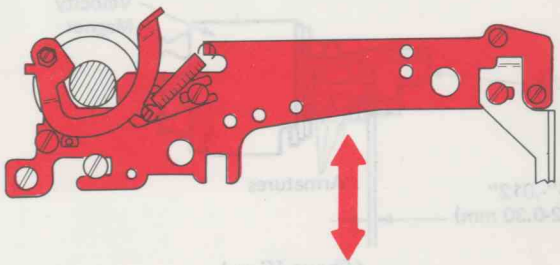
NOTE: Level 1 – The eccentric on the right side of the machine should be toward the rear and the one on the left should be toward the front. Level 2 has no eccentrics.





(Level 1)

(Right Side View)



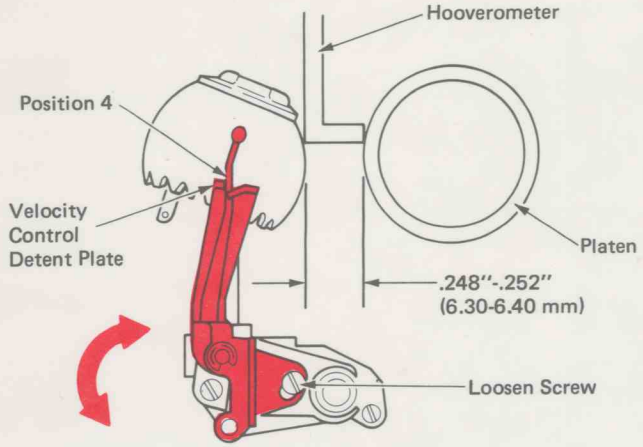
(Level 2)

(Right Side View)

12. *Powered Flight And Free Flight* –

a. *Powered Flight* – With the typehead at rest, adjust the velocity control detent plate for .248"-.252" (6.30-6.40 mm) between the center of the home character (zero) and the platen. Move the impression control lever to position 4.

The base of the Hooverometer is .25" (6.35 mm) and may be used to set this clearance.

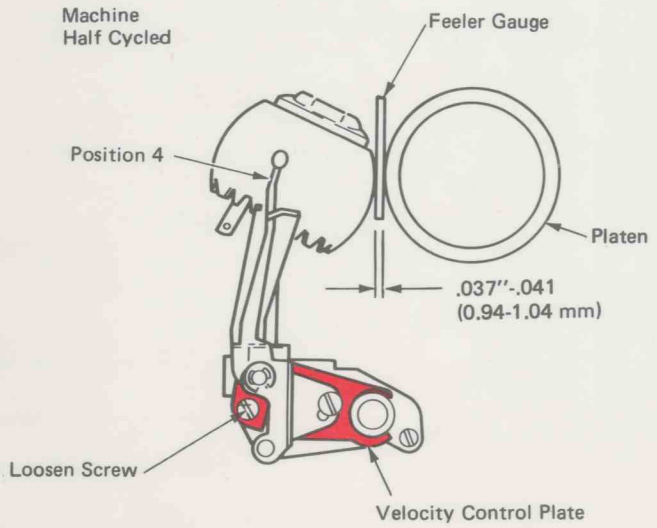


(Right Side View)

b. *Free Flight (Selective Ribbon)* – Adjust the velocity control plate for a clearance of .037"-.041" (0.94-1.04 mm) between the home character (zero) and the platen. Move the impression control lever to position 4. Check this adjustment with the machine half cycled and the velocity cam follower on the high surface of the medium velocity cam.

NOTE: Print adjustments 8, 9, and 10 must be correct before making this adjustment.

Powered flight and free flight affect each other and must be revised until both are correct.

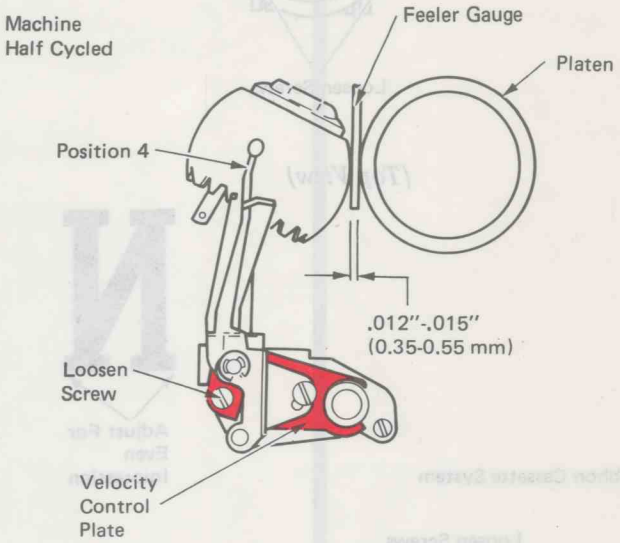


(Right Side View)

c. *Free Flight (Ribbon Cassette System)* – Adjust the velocity control plate for a clearance of .012"-.015" (0.35-0.55 mm) between the home character (zero) and the platen with the impression control lever at position 4. Check this adjustment with the machine half cycled and the velocity cam follower on the high surface of the medium velocity cam.

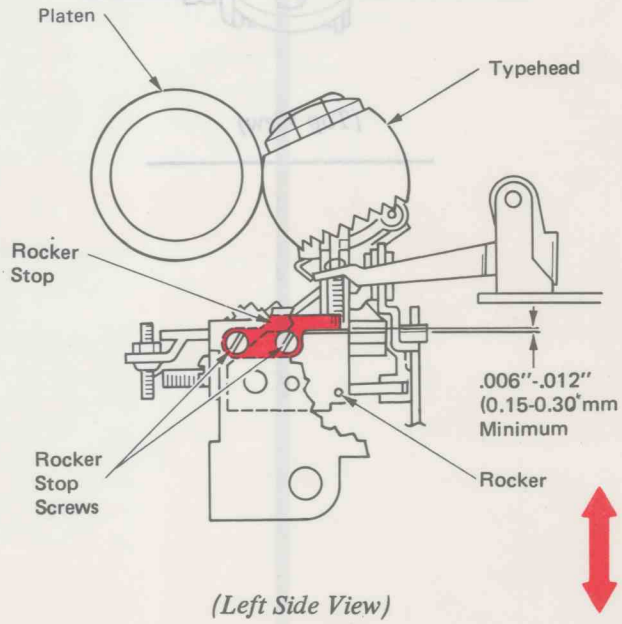
NOTE: Print adjustments 8, 9, and 10 must be correct before making this adjustment.

Powered flight and free flight affect each other and must be revised until both are correct.



(Right Side View)

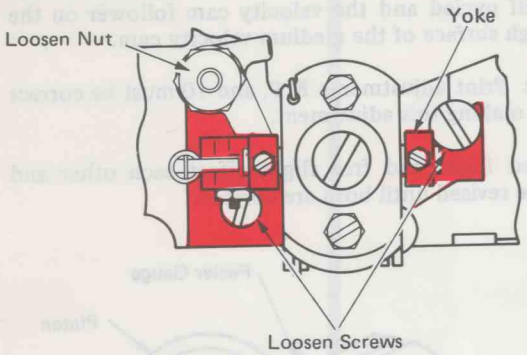
13. *Rocker Stop* – With the typehead held against the platen, adjust the rocker stop up or down for a clearance of .006"-.012" (0.15-0.30 mm) between the rocker and the rocker stop.



(Left Side View)

14. Yoke – Adjust the yoke rotationally so an uppercase *N* prints evenly on both the right and left sides.

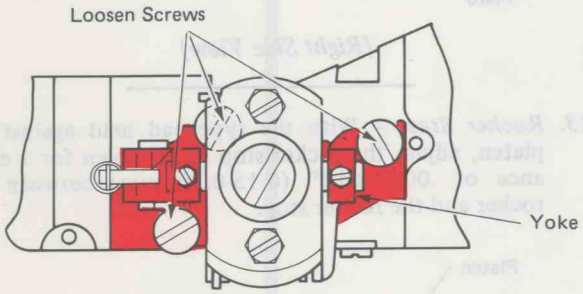
Selective Ribbon



(Top View)

Adjust For Even Impression

Ribbon Cassette System



(Top View)

SELECTIVE RIBBON OPERATIONAL THEORY

The selective ribbon system lifts and feeds the ribbon. The Electronic Typewriter may use the film ribbon, correctable film ribbon or IBM Tech III ribbon. All three ribbons are contained in cartridges. The cartridges for the three types of ribbon are identified by different colored take-up knobs. The ribbon is fed from the left side of the cartridge (Figure 1). The used ribbon winds around the take-up core in the right side of the cartridge. The film ribbons feed so characters do not overlap. The IBM Tech III ribbon feeds in smaller amounts and the characters overlap on the ribbon.

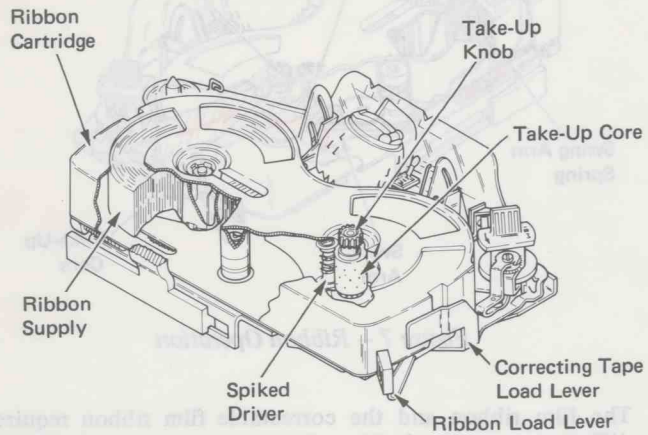
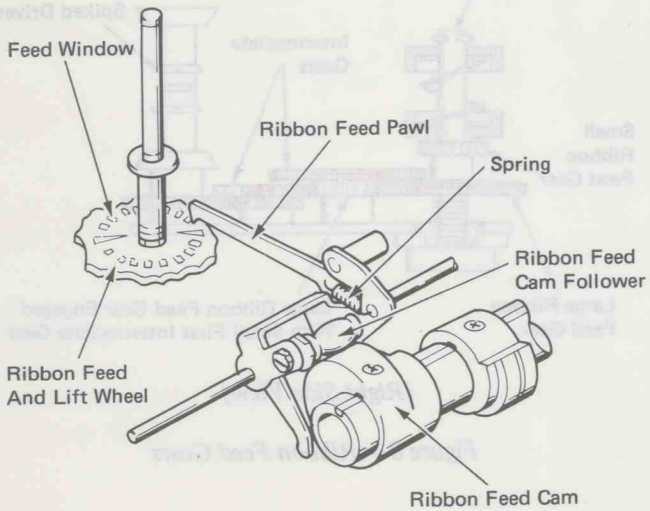


Figure 1 – Selective Ribbon

RIBBON FEED

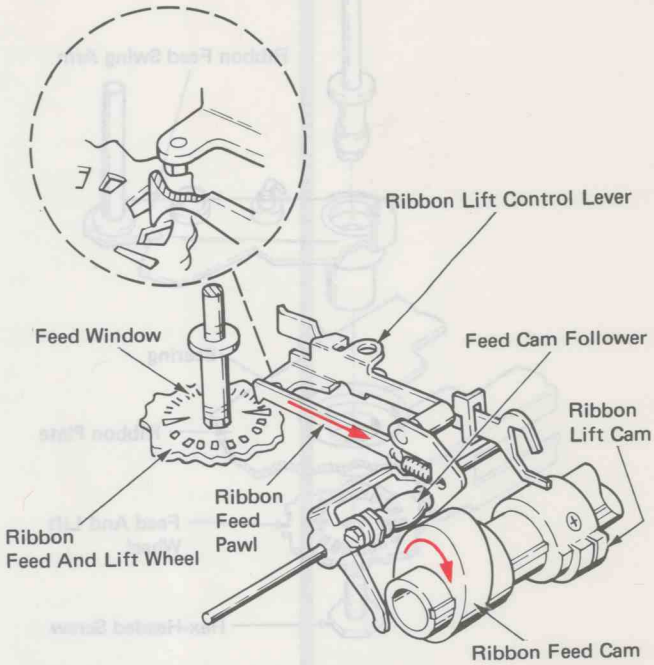
The ribbon mechanism feeds ribbon by rotating the ribbon feed and lift wheel with the ribbon feed pawl. The ribbon feed cam drives the ribbon feed pawl. At rest, a spring holds the ribbon feed cam follower against the high surface of the ribbon feed cam (Figure 2). The ribbon feed pawl engages one of the 18 feed windows in the ribbon feed and lift wheel.



(Right Rear View)

Figure 2 – Ribbon Feed At Rest

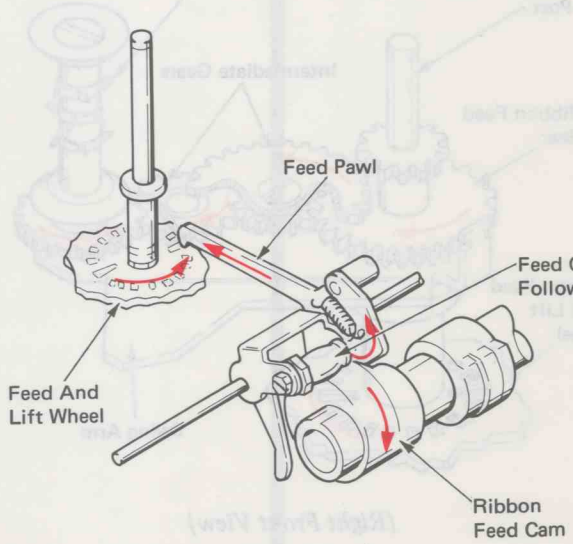
At the beginning of a print cycle, the cam follower moves toward the low surface of the ribbon feed cam (Figure 3). This causes the ribbon feed pawl to come out of the window in the ribbon feed and lift wheel. As the cam follower moves near the low surface of the cam, the feed pawl enters the next window. The ribbon lift control lever holds the ribbon feed and lift wheel to prevent clockwise movement.



(Right Rear View)

Figure 3 – Ribbon Feed Cycle

Near the end of the print cycle, the cam follower moves toward the high surface of the cam, and moves the pawl toward the front of the machine. As the pawl moves, it rotates the ribbon feed and lift wheel 1/18 of a revolution in a counterclockwise direction (Figure 4). At the completion of the print cycle, the feed cam follower again rests on the high surface of the ribbon feed cam.



(Rear View)

Figure 4 – Ribbon Feed Operating

The ribbon feed and lift wheel is mounted to the ribbon feed post with a hex-headed screw. The feed post rotates within the ribbon feed swing arm. The ribbon feed swing arm pivots within a bearing in the ribbon plate (Figure 5).

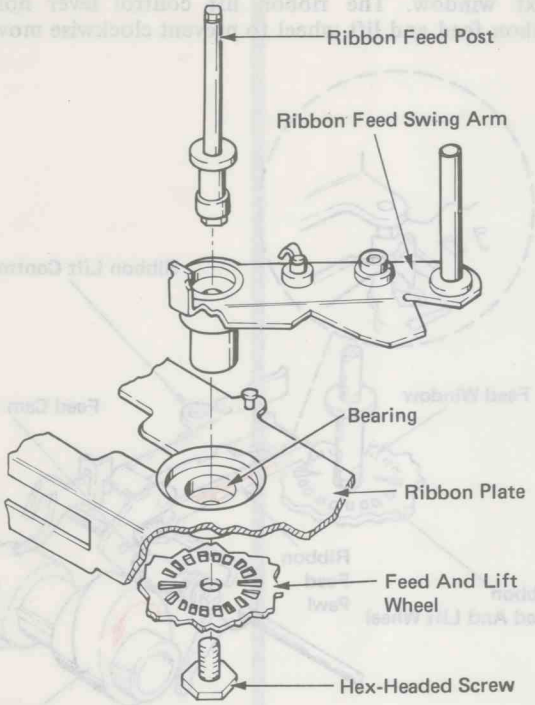
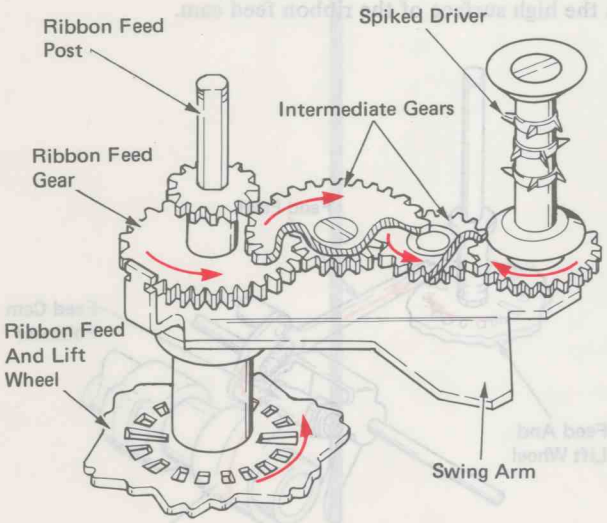


Figure 5 – Ribbon Feed Post

The ribbon feed and lift wheel rotates the ribbon feed post. The ribbon feed gear, mounted on a flat surface of the feed post, rotates two intermediate gears mounted on the swing arm. This transfers the feed gear rotation to the spiked driver (Figure 6).



(Right Front View)

Figure 6 – Swing Arm

The swing arm spring holds the rear end of the swing arm toward the ribbon take-up post (Figure 7). This causes the spiked driver to engage the used ribbon. When the spiked driver rotates, it drives the take-up core on the take-up post, to pull new ribbon into the print position and wind the used ribbon. The amount of spiked driver rotation during each print cycle controls the amount of ribbon feed.

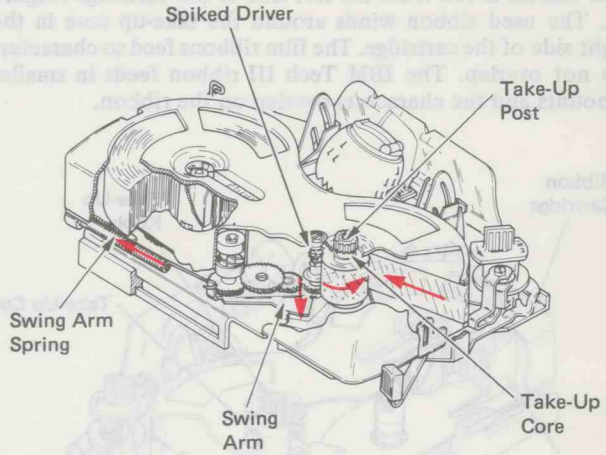
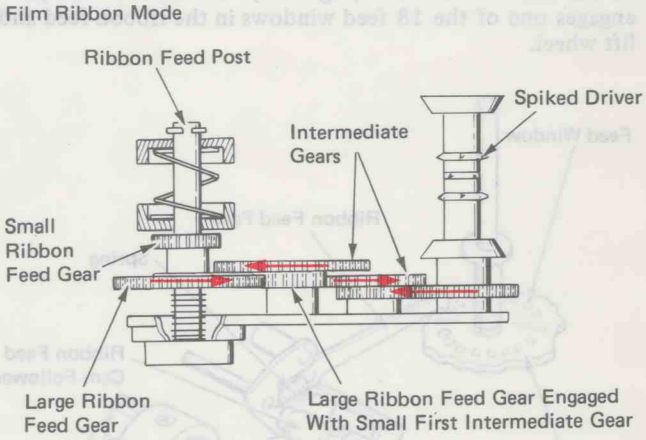


Figure 7 – Ribbon Operation

The film ribbon and the correctable film ribbon require different amounts of ribbon feed than the Tech III ribbon. Therefore, the selective ribbon mechanism has two feed modes.

The ribbon feed gears slide up and down on the ribbon feed post. In the film ribbon mode, the large ribbon feed gear engages the small intermediate gear. This causes the spiked driver to feed enough film ribbon so the characters do not overlap (Figure 8).



(Right Side View)

Figure 8 – Ribbon Feed Gears

With the IBM Tech III ribbon installed, an extension within the cartridge depresses the ribbon mode button and holds down the ribbon feed gear. This positions the small ribbon feed gear so it engages the large intermediate gear. This causes the spiked driver to rotate approximately 1/6 as far as in the film ribbon mode (Figure 9).

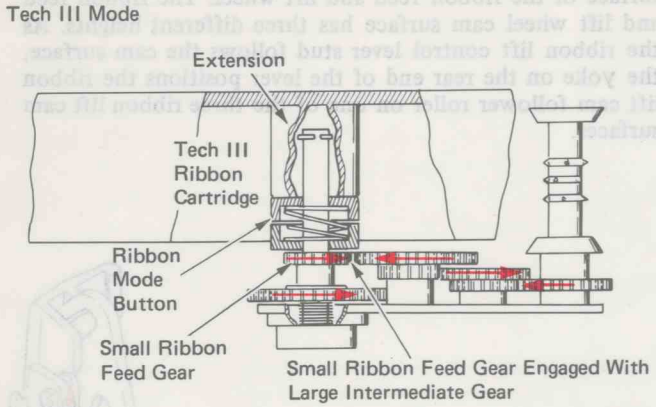
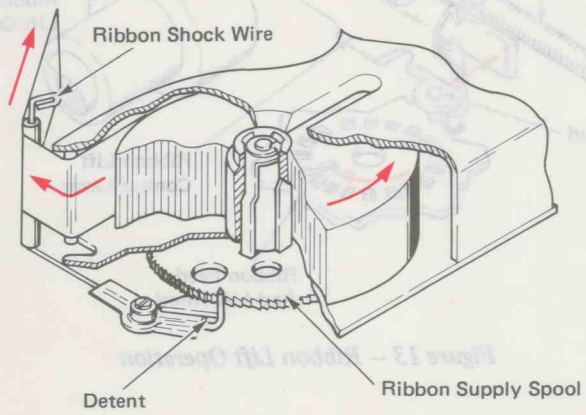


Figure 9 – Ribbon Feed Gears

A detent against the supply spool provides tension on the ribbon as it passes through the ribbon path so it will feed and track properly. The detent keeps the ribbon supply spool from rotating until the ribbon applies enough tension on the shock wire to release the detent. As more ribbon is supplied, some tension is released from the shock wire, allowing the detent to relocate in the teeth of the supply spool (Figure 10).



(Left Front View)

Figure 10 – Ribbon Tension

RIBBON LIFT

The mechanism uses three different ribbon lift positions. The ribbon lift mechanism includes a ribbon lift cam, lift cam follower assembly, ribbon lift control lever, lift arm and lift guide assemblies (Figure 11). The lift cam follower assembly pivots above the lift cam. A lug on the adjusting plate contacts the head of the height adjusting screw in the lift arm. As the lift cam pivots the cam follower, this screw transfers vertical motion to the lift arm. The lift arm spring restores the lift arm and lift guides to rest.

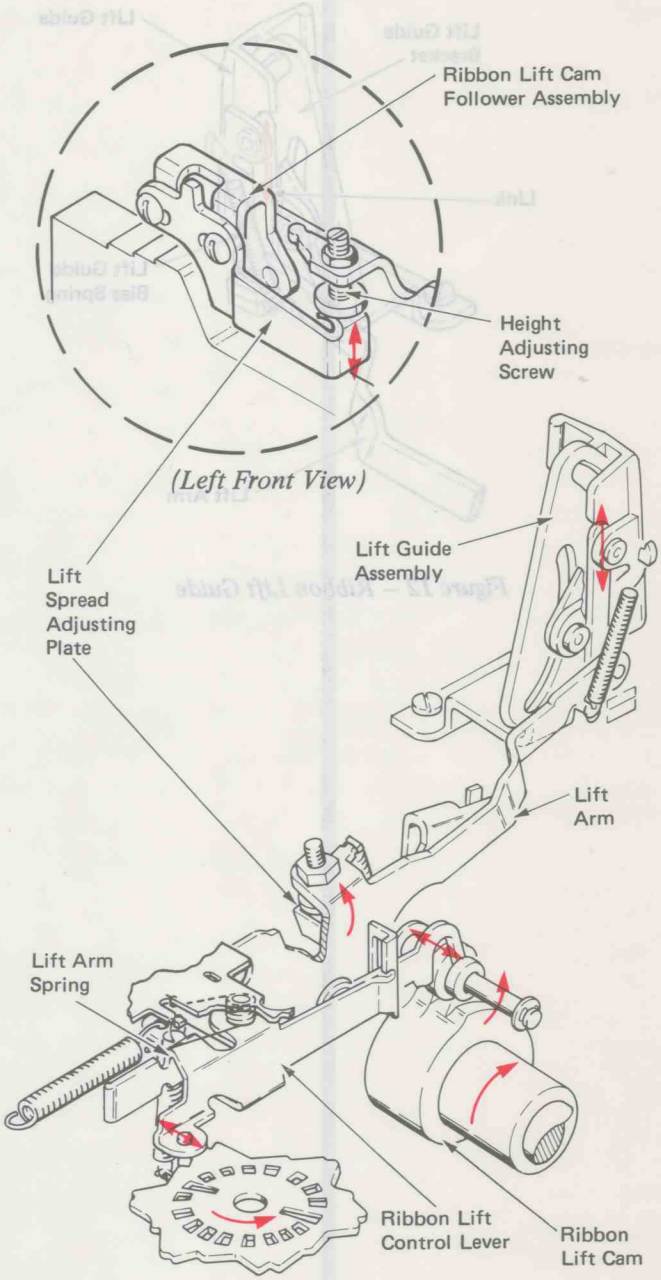


Figure 11 – Ribbon Lift

The ribbon passes through the ribbon lift guides which move vertically in curved slots in the lift guide brackets. Links connect the lift guides to the lift arms. The lift guide bias springs ensure consistent ribbon lift (Figure 12).

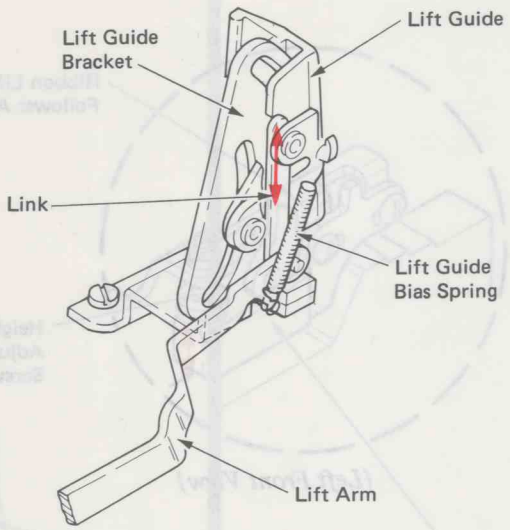


Figure 12 – Ribbon Lift Guide

The ribbon lift cam has three surfaces which provide the motion for three lift positions. The amount the lift cam follower moves is determined by the cam surface it tracks (Figure 13). The cam follower roller slides on the roller shaft. A yoke on the ribbon lift control lever engages the roller. The lift arm control spring holds the stud on the forward end of the ribbon lift control lever against the cam surface of the ribbon feed and lift wheel. The ribbon feed and lift wheel cam surface has three different heights. As the ribbon lift control lever stud follows the cam surface, the yoke on the rear end of the lever positions the ribbon lift cam follower roller on one of the three ribbon lift cam surfaces.

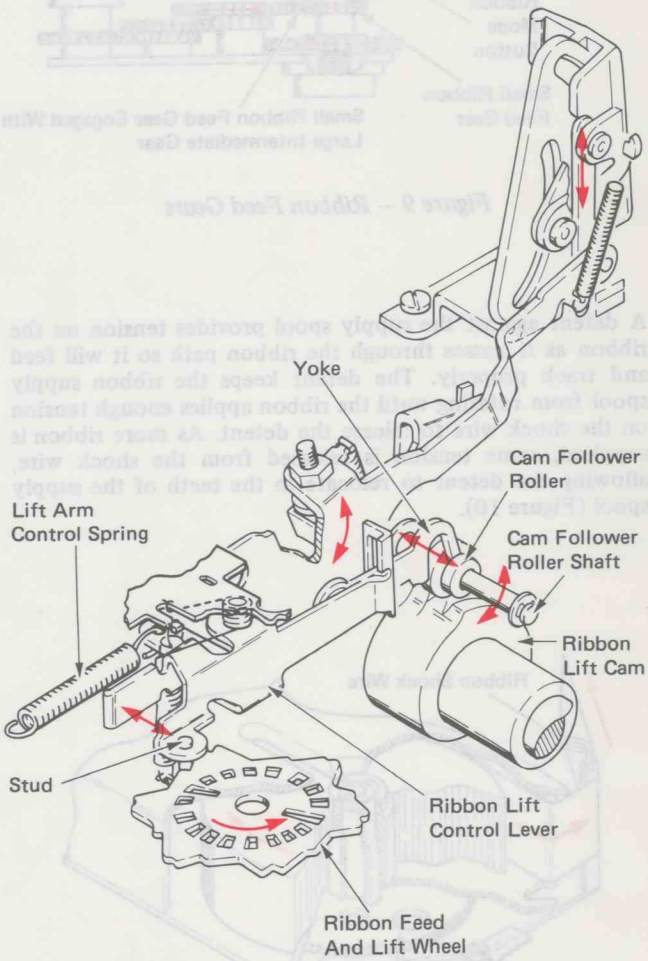


Figure 13 – Ribbon Lift Operation

When the mechanism is in the IBM Tech III ribbon mode, the wobbler cam, the wobbler bellcrank and the wobbler eccentric change the ribbon lift position slightly (Figure 14). The left pivot point of the ribbon lift arm assembly is the wobbler eccentric. The wobbler eccentric has a vertical lug that extends above the surface of the ribbon plate. Moving this lug front to rear rotates the wobbler eccentric and changes the left lift arm pivot point. The wobbler bellcrank, operated by the wobbler cam, pivots on a stud on the ribbon plate. The left extension of the wobbler bellcrank rests in a notch in the vertical lug of the wobbler eccentric. A spring loads both the wobbler eccentric and the wobbler bellcrank extension toward the front.

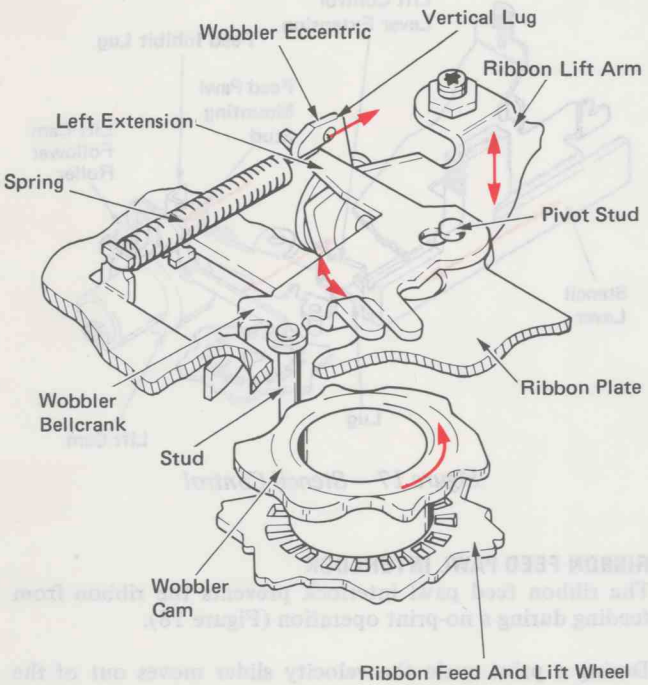
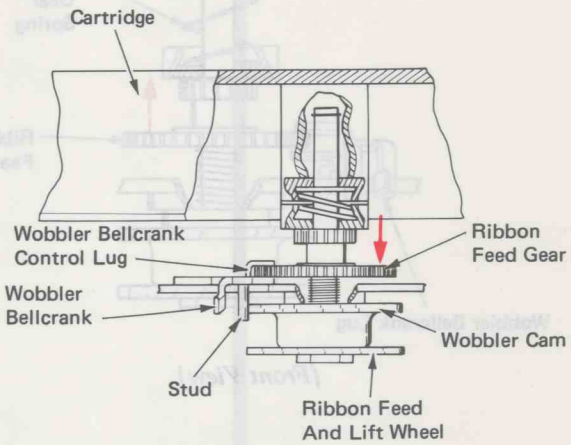
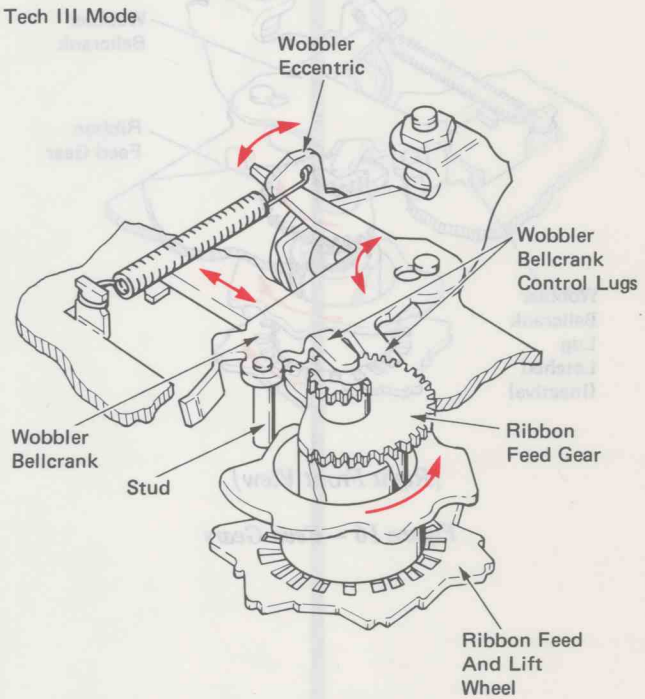


Figure 14 – Wobbler Operation

The two lugs contacting the ribbon feed gear control the vertical position of the wobbler bellcrank (Figure 15). When the feed gear is pressed down into the IBM Tech III ribbon mode by the cartridge, it also moves the wobbler bellcrank down into the operated position. The wobbler cam rotates with the ribbon feed and lift wheel. A stud on the forward end of the wobbler bellcrank follows the wobbler cam. The wobbler cam rotates the wobbler bellcrank which operates the wobbler eccentric and causes the ribbon to lift the correct amount.



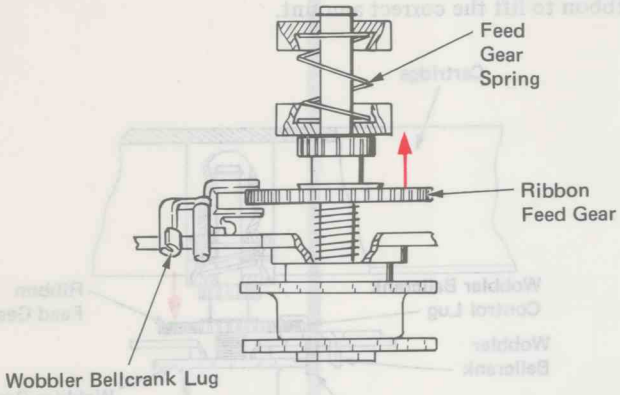
(Front View)



(Right Front View)

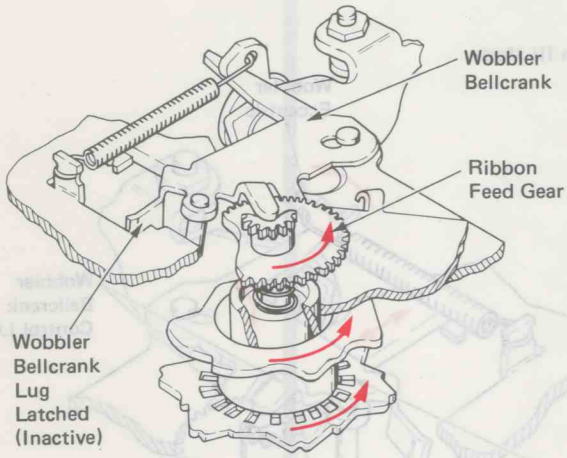
Figure 15 – Feed Gears

When the mechanism is in the film ribbon mode, the feed gear spring moves the feed gear to the upward position (Figure 16). This allows a lug on the wobbler bellcrank to stop against the ribbon plate, and deactivate the bellcrank.



(Front View)

Film Ribbon Mode



(Right Front View)

Figure 16 – Feed Gears

STENCIL MODE

When typing stencils, the ribbon feed and lift operations must be inhibited (Figure 17). A lug on the stencil lever contacts an extension on the front of the lift control lever, and moves the rear of the lift control lever to the right. This moves the lift cam follower roller off the lift cam.

When the lift control lever is in the stencil position, the feed inhibit lug moves behind the feed pawl mounting stud and prevents the feed cam follower from moving toward the low surface of the ribbon feed cam.

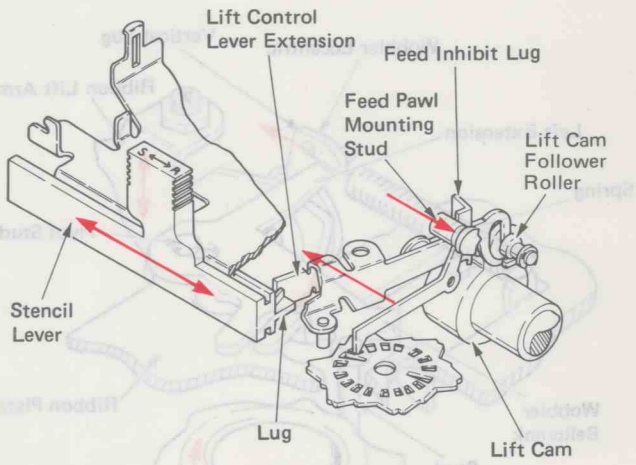
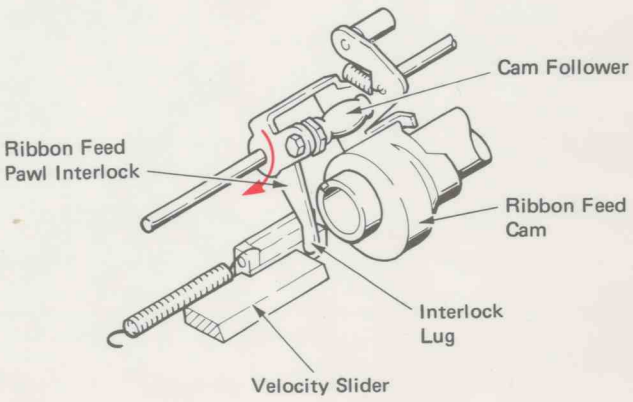


Figure 17 – Stencil Control

RIBBON FEED PAWL INTERLOCK

The ribbon feed pawl interlock prevents the ribbon from feeding during a no-print operation (Figure 18).

During a print cycle the velocity slider moves out of the path of the interlock lug allowing the cam follower to follow the ribbon feed cam. During a no-print operation, the slider does not move and the interlock contacts the velocity slider. This prevents the cam follower from moving to the low surface of the ribbon feed cam and inhibits ribbon feed.

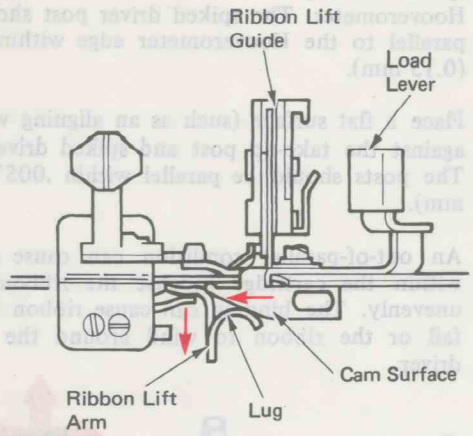


(Right Rear View)

Figure 18 – Ribbon Feed Pawl Interlock

RIBBON LOAD

To change the ribbon, move the load lever left to the load position. A cam surface on the load lever contacts a lug on the right front of the ribbon lift arm assembly (Figure 19). As the load lever moves to the left, it pushes the front of the lift arm down and moves the lift guides up.



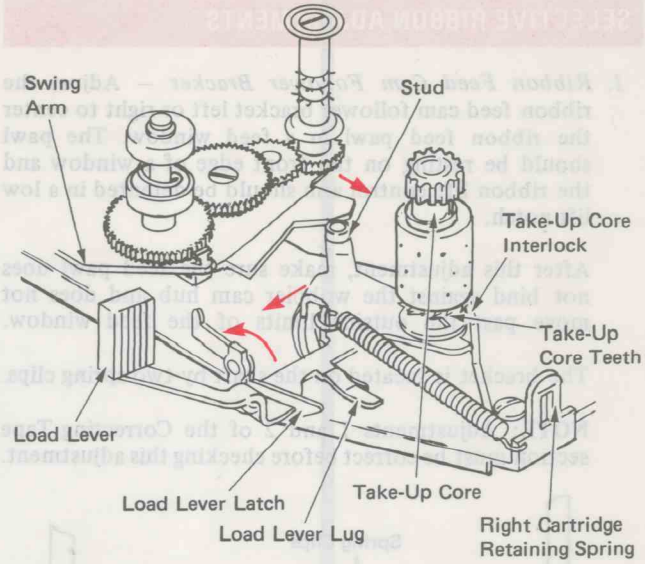
(Front View)

Figure 19 – Ribbon Load Lever

The take-up core interlock extends to the left from the right cartridge retaining spring (Figure 20). In the load position, the take-up core interlock engages the teeth on the take-up core and prevents the core from rotating clockwise. In the normal operating position, the load lever lug holds the take-up core interlock away from the take-up core.

The load lever latch prevents the load lever from restoring to the operating position until a cartridge is installed. An installed cartridge depresses the latch and allows the load lever to be restored to the operating position.

A stud on the left side of the load lever contacts the right side of the swing arm. As the load lever is rotated, it pivots the swing arm to the load position.

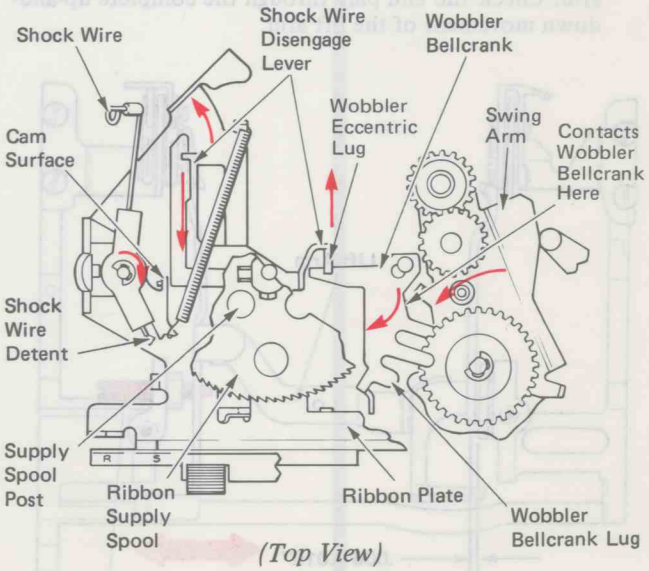


(Left Front View)

Figure 20 – Ribbon Load

As the swing arm moves to the load position, it contacts the wobbler bellcrank, rotating it clockwise. The wobbler bellcrank lug can now clear the ribbon plate. This allows the lug to latch against the ribbon plate if in the film ribbon mode, or to move down into the operated position if in the IBM Tech III ribbon mode (Figure 21).

As the wobbler bellcrank rotates, it moves the vertical lug of the wobbler eccentric to the rear. The wobbler eccentric lug contacts the right arm of the shock wire disengage lever which pivots on the supply spool post. The left arm of the shock wire disengage lever pushes against the cam surface of the shock wire. As the left arm of the disengage lever moves to the front, it releases the shock wire detent from the ribbon supply spool. This allows the operator to easily wind the leader on the take-up core when installing a ribbon.



(Top View)

Figure 21 – Shock Wire (Load Position)

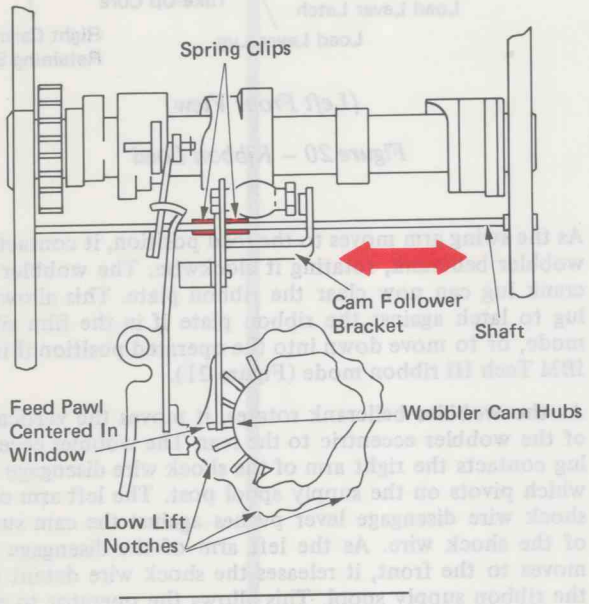
SELECTIVE RIBBON ADJUSTMENTS

1. *Ribbon Feed Cam Follower Bracket* – Adjust the ribbon feed cam follower bracket left or right to center the ribbon feed pawl in a feed window. The pawl should be resting on the front edge of a window and the ribbon lift control arm should be detented in a low lift notch.

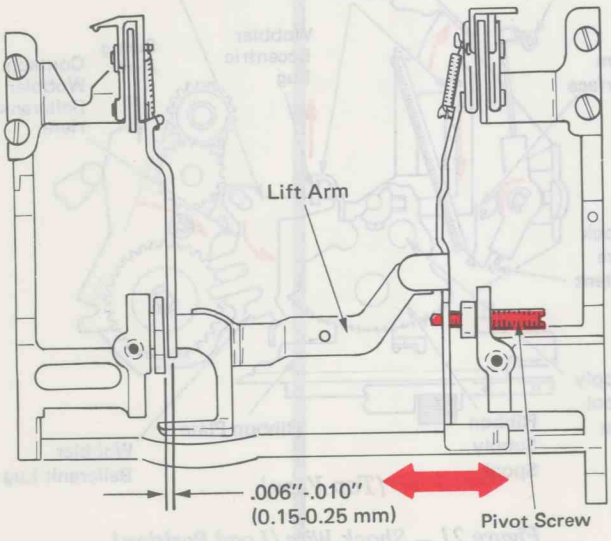
   After this adjustment, make sure the feed pawl does not bind against the wobbler cam hub and does not move past the outside limits of the feed window.

   The bracket is located on the shaft by two spring clips.

   NOTE: Adjustments 1 and 2 of the Correcting Tape section must be correct before checking this adjustment.



2. *Ribbon Lift Arm* – Adjust the right lift arm pivot screw for .006"-.010" (0.15-0.25 mm) end play of the lift arm. Check the end play through the complete up-and-down movement of the lift arm.

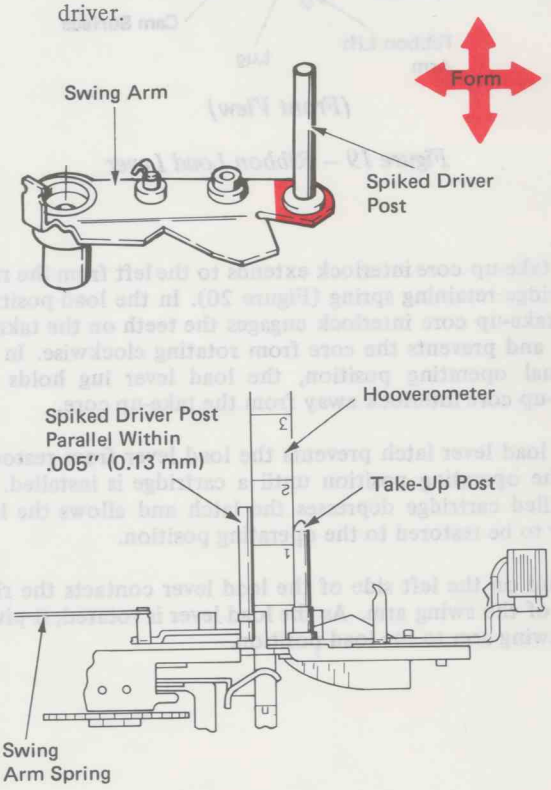


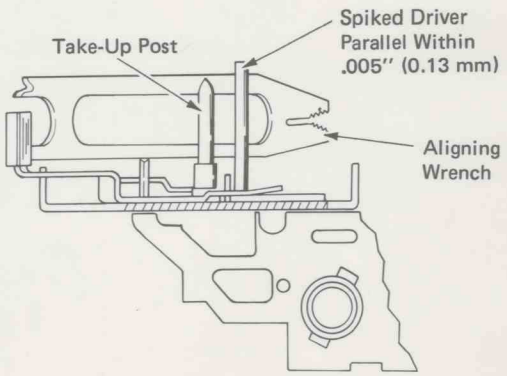
3. *Spiked Driver Post* – Form the free end of the swing arm so the spiked driver post is parallel to the take-up post. This must be checked in two directions with the swing arm spring connected.

   a. Hold the Hooverometer edge flat against the take-up post. Allow the swing arm to close until the spiked driver post contacts the other edge of the Hooverometer. The spiked driver post should be parallel to the Hooverometer edge within .005" (0.13 mm).

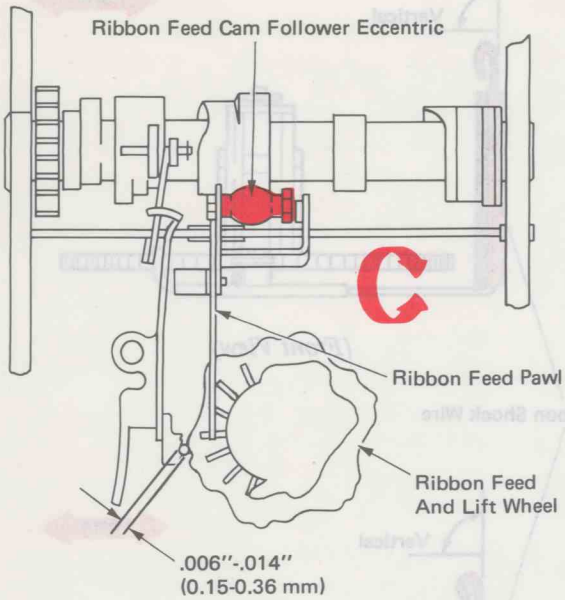
   b. Place a flat surface (such as an aligning wrench) against the take-up post and spiked driver post. The posts should be parallel within .005" (0.13 mm).

      An out-of-parallel condition can cause a bind within the cartridge because the ribbon winds unevenly. The binding can cause ribbon feed to fail or the ribbon to wind around the spiked driver.





4. *Ribbon Feed Cam Follower Eccentric* – Adjust the ribbon feed cam follower eccentric. The ribbon feed pawl should drive the ribbon feed and lift wheel .006"-.014" (0.15-0.36 mm) past the detent point of the ribbon feed and lift wheel cam surface. The eccentric should be kept low and to the front.

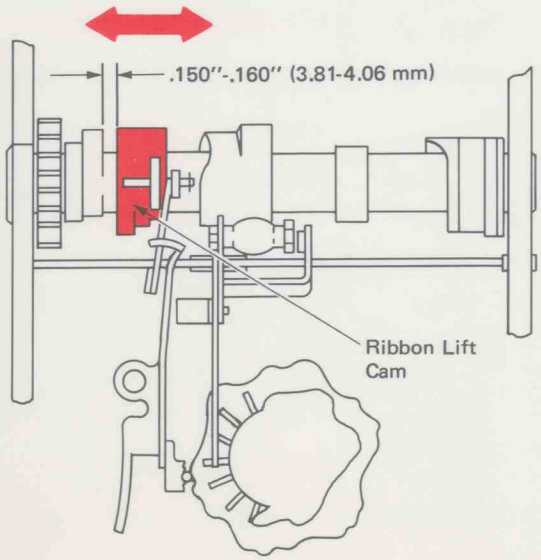


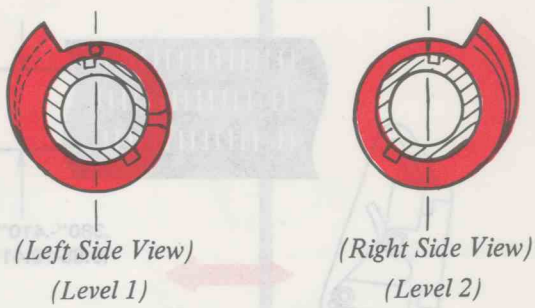
5. *Ribbon Lift Cam* – Adjust the ribbon lift cam as follows:

   a. Left or right so it clears the tape lift cam by .150"-.160" (3.81-4.06 mm).

   b. Top to rear so the center line of the round timing mark on the cam aligns with the front edge of the keyway in the print sleeve.

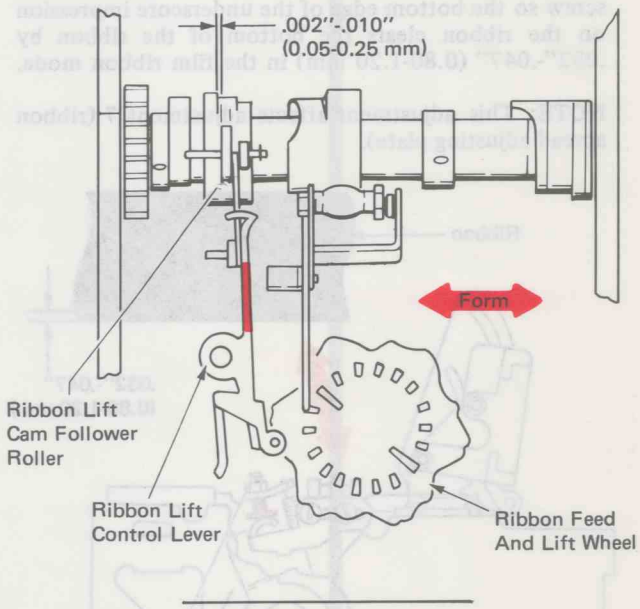
NOTE: The setscrew in the cam may not align with the center of the flat surface on the print sleeve when this adjustment is correct.



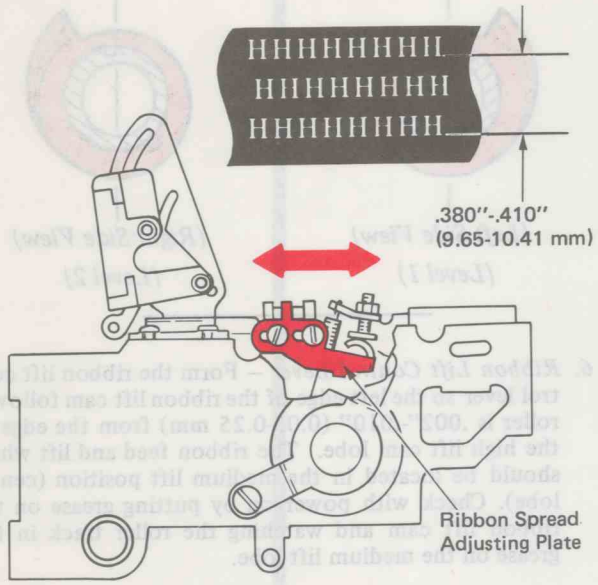


6. *Ribbon Lift Control Lever* – Form the ribbon lift control lever so the left edge of the ribbon lift cam follower roller is .002"-.010" (0.05-0.25 mm) from the edge of the high lift cam lobe. The ribbon feed and lift wheel should be located in the medium lift position (center lobe). Check with power on by putting grease on the ribbon lift cam and watching the roller track in the grease on the medium lift lobe.

NOTE: If this adjustment requires more than .040" (1.02 mm) change, the ribbon lift cam should be adjusted.



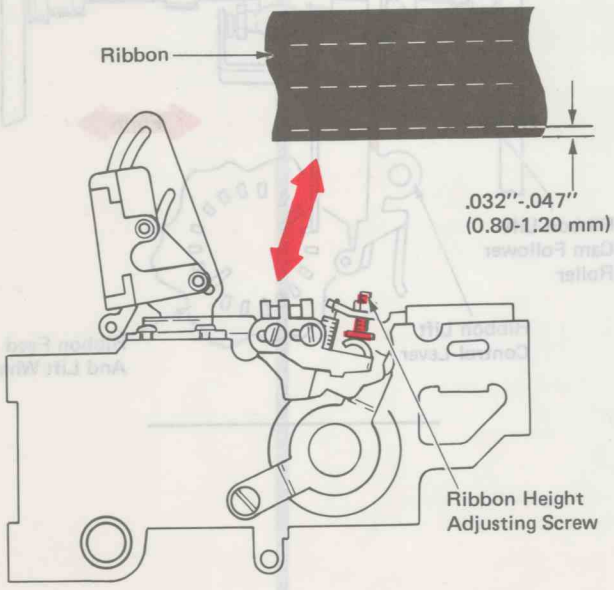
7. *Ribbon Spread Adjusting Plate* – Adjust the ribbon spread adjusting plate front to rear to get .380"-.410" (9.65-10.41 mm) between the bottom of the high lift characters and the bottom of the low lift characters in the film ribbon mode. This may be measured with the six-inch steel rule or the Hooverometer, which is .375" (9.52 mm) wide. Ribbon height must be checked after making this adjustment.



(Left Side View)

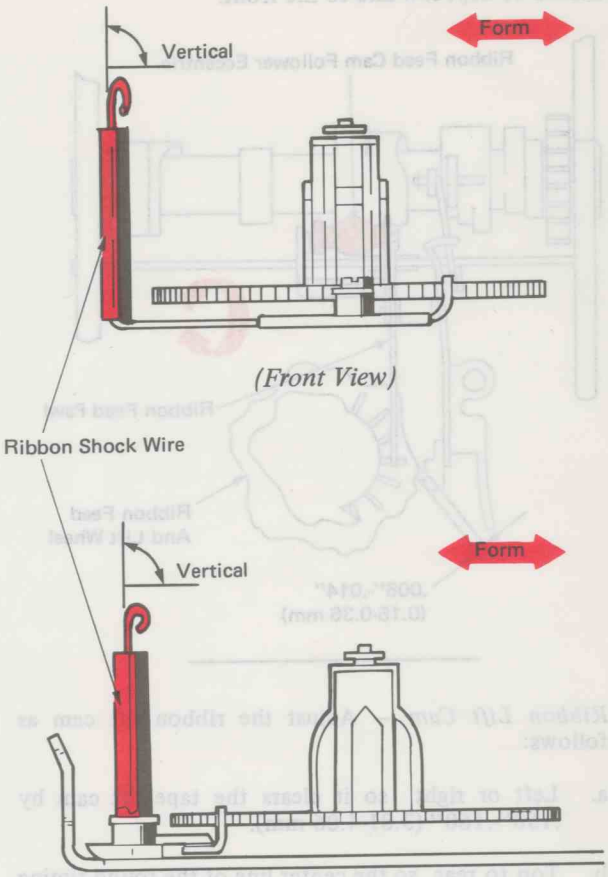
8. *Ribbon Height* – Adjust the ribbon height adjusting screw so the bottom edge of the underscore impression on the ribbon clears the bottom of the ribbon by .032"-.047" (0.80-1.20 mm) in the film ribbon mode.

NOTE: This adjustment affects adjustment 7 (ribbon spread adjusting plate).



(Left Side View)

9. *Ribbon Shock Wire* – Form the shock wire for vertical alignment front to rear and left to right. This adjustment may need to be varied for proper tracking through the left ribbon lift guide.

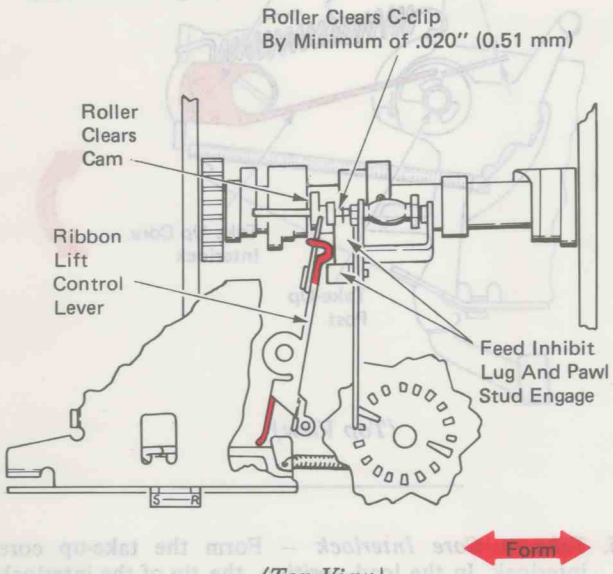


10. *Stencil Adjustment* – Form the stencil lug on the ribbon lift control lever to meet two conditions when the stencil lever is latched in the stencil position:

a. So the ribbon feed lockout lug engages the ribbon feed pawl mounting stud by approximately the thickness of the lockout lug.

b. So the ribbon lift cam follower roller moves to the right completely off the ribbon lift cam. Make sure there is a minimum of .020" (0.51 mm) clearance between the roller and the C-clip at the end of the shaft.

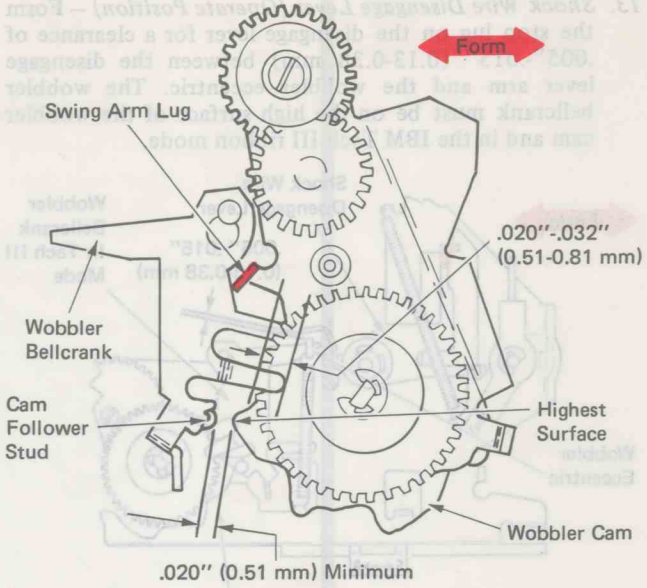
NOTE: During normal typing in the low lift ribbon position, the ribbon feed inhibit lug on the ribbon lift control lever must clear the ribbon feed pawl mounting stud. If necessary, form the ribbon feed inhibit lug to get this condition. If the lug is formed, recheck the stencil adjustments.



(Top View)

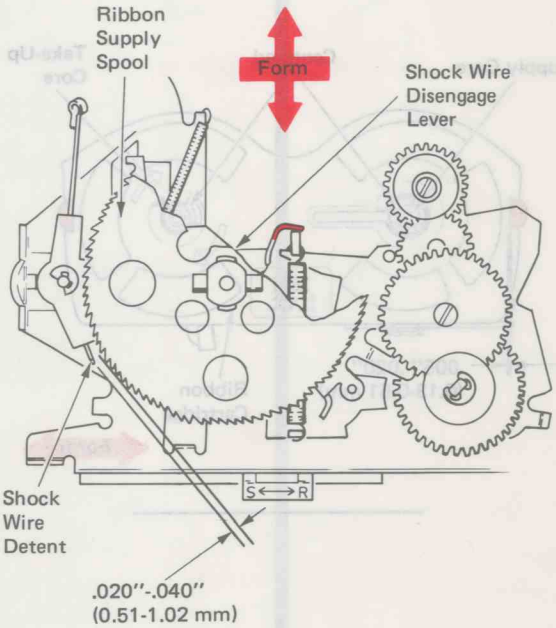
11. *Swing Arm Lug* – Form the lug on the swing arm that contacts the wobbler bellcrank. The cam follower stud should clear the highest surface of the wobbler cam by .020"-.032" (0.51-0.81 mm) when the load lever is latched in the load position.

NOTE: The top wobbler bellcrank lug should overlap the ribbon drive gear by a minimum of .020" (0.51 mm).



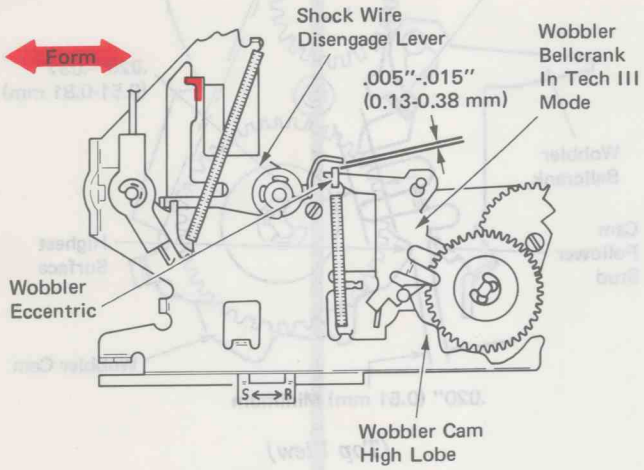
(Top View)

12. *Shock Wire Disengage Lever (Load Position)* – Form the right arm on the shock wire disengage lever. The shock wire detent should clear the ribbon supply spool by .020"-.040" (0.51-1.02 mm) with the load lever in the load position. If necessary, form the arm down so the wobbler eccentric cannot get under the arm.



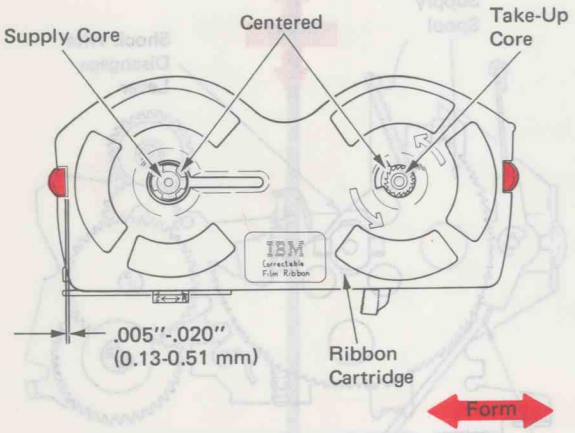
(Top View)

13. *Shock Wire Disengage Lever (Operate Position)* – Form the stop lug on the disengage lever for a clearance of .005"-.015" (0.13-0.38 mm) between the disengage lever arm and the wobbler eccentric. The wobbler bellcrank must be on the high surface of the wobbler cam and in the IBM Tech III ribbon mode.

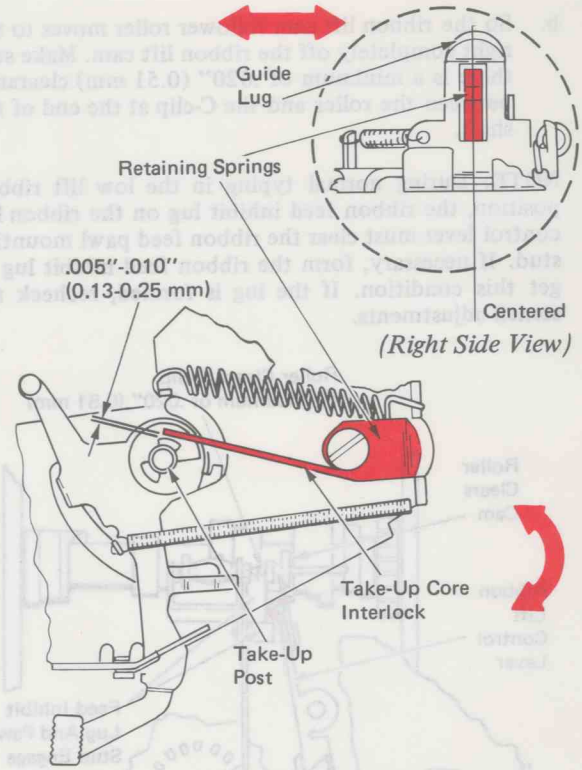


(Top View)

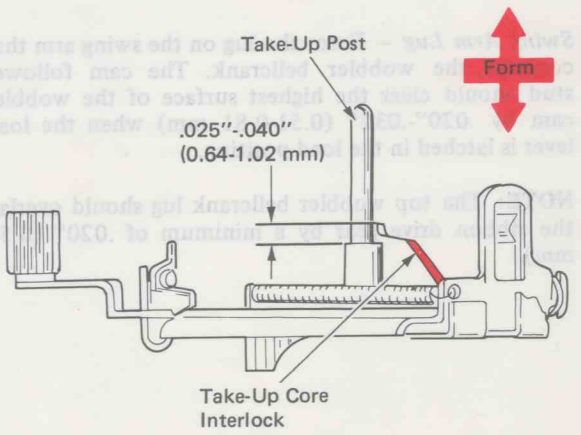
14. *Cartridge Guides* – Form the cartridge guides to center the ribbon take-up and supply cores within the holes in the top of the cartridge. Maintain .005"-.020" (0.13-0.51 mm) end play of the cartridge.



15. *Cartridge Retaining Springs* – Center the cartridge retaining springs in the holes in the cartridge guide lugs. Adjust the springs left to right so they hold down the IBM Tech III ribbon cartridge tight against the ribbon feed plate. The take-up core interlock must clear the center surface of the take-up post by .005".010" (0.13-0.25 mm).



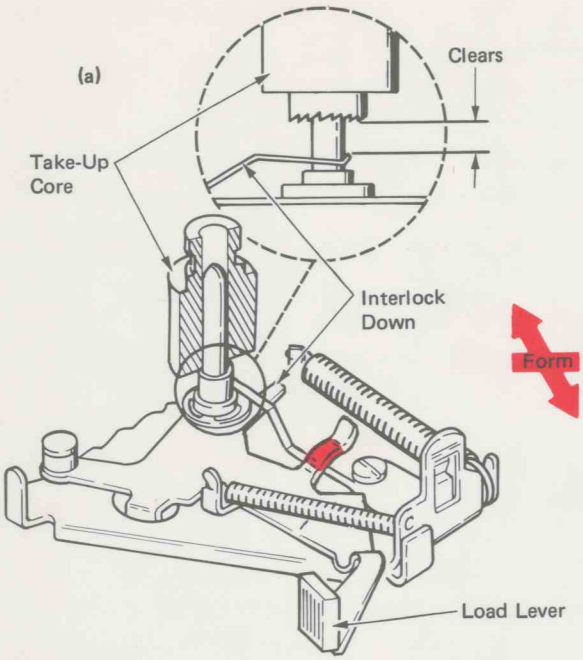
16. *Take-up Core Interlock* – Form the take-up core interlock. In the load position, the tip of the interlock must be .025"-.040" (0.64-1.02 mm) above the top edge of the center surface on the take-up post.



(Right Front View)

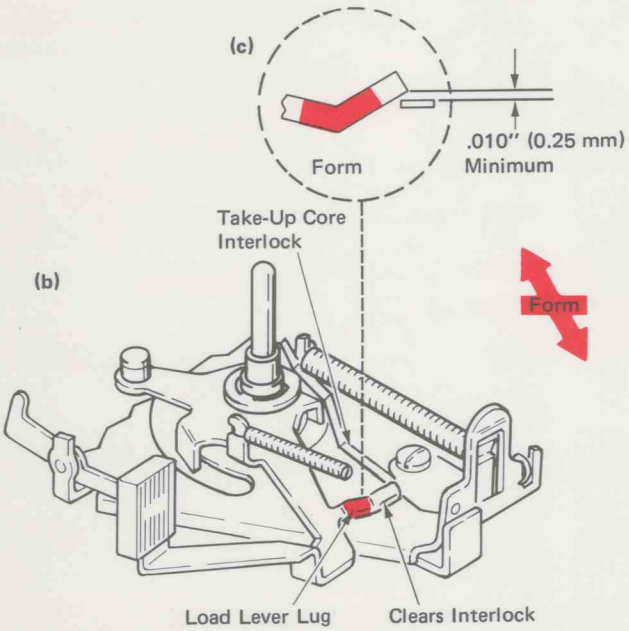
17. *Load Lever* – Form the take-up core interlock lug on the load lever to meet two conditions:

a. In the operate position, it must hold the take-up core interlock down and completely disengaged from the take-up core.



(Right Front View)

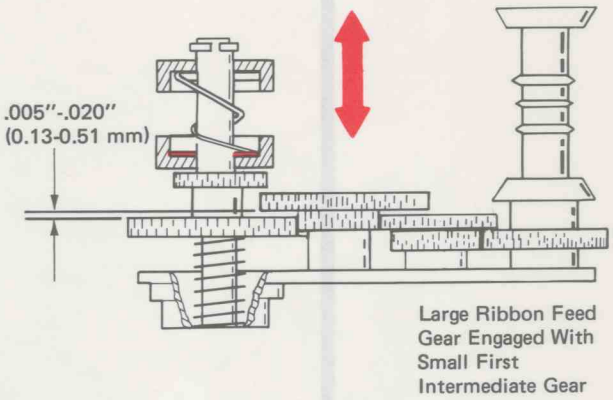
b. When the load lever is moved from load to operate, the tip of the lug must clear the top surface of the take-up core interlock by a minimum of .010" (0.25 mm).



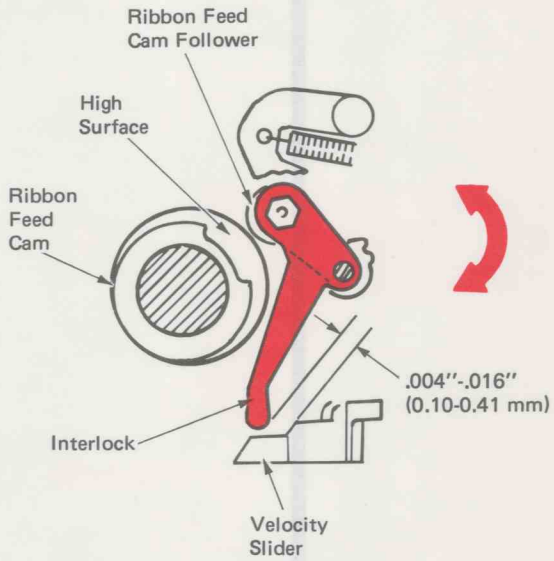
(Right Front View)

18. *Mode Button Grip Clip Position* – With the mode button in the film ribbon mode, adjust the grip clip up or down for a clearance of .005"-.020" (0.13-0.51 mm) between the ribbon feed gear and the first intermediate gear.

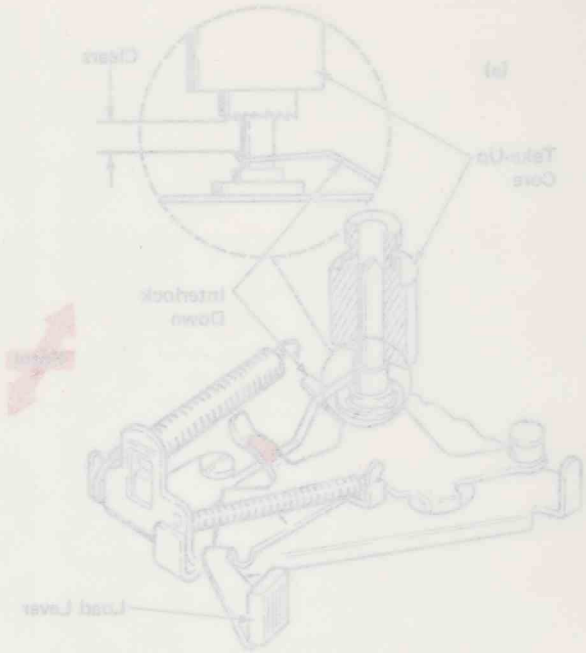
Film Ribbon Mode

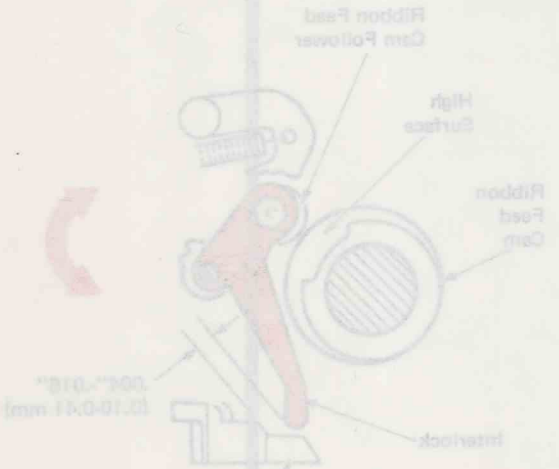


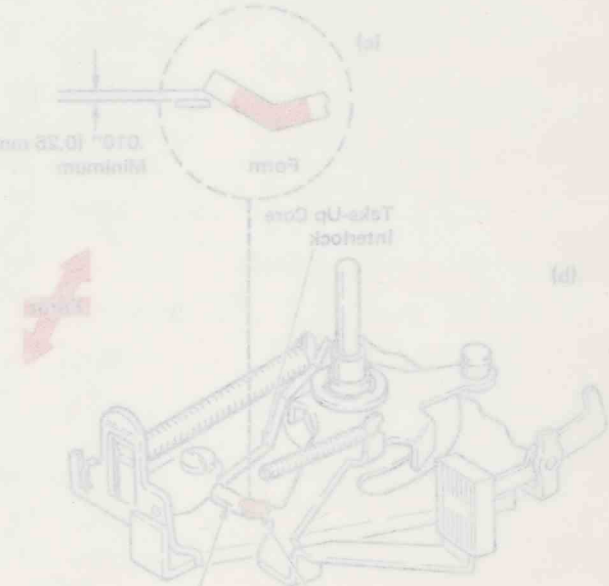
19. *Ribbon Feed Pawl Interlock* – Adjust the interlock so it clears the velocity slider by .004"-.016" (0.10-0.41 mm) with the ribbon feed cam follower on the high surface of the ribbon feed cam.



(Left Side View)







RIBBON CASSETTE SYSTEM OPERATIONAL THEORY

The ribbon cassette system lifts and feeds the ribbon and correcting tape. The ribbon cassette system (RCS) uses a ribbon cassette and a correcting tape cassette which are connected together (Figure 1). The ribbon cassette can contain the IBM Correctable Ribbon or the T-III Ribbon. The correcting tape can be the IBM Lift-Off or IBM Cover-Up. The cassette spools are color-coded for identification. The color of the ribbon spool must match the color of the correcting tape spool in order to fit together correctly.

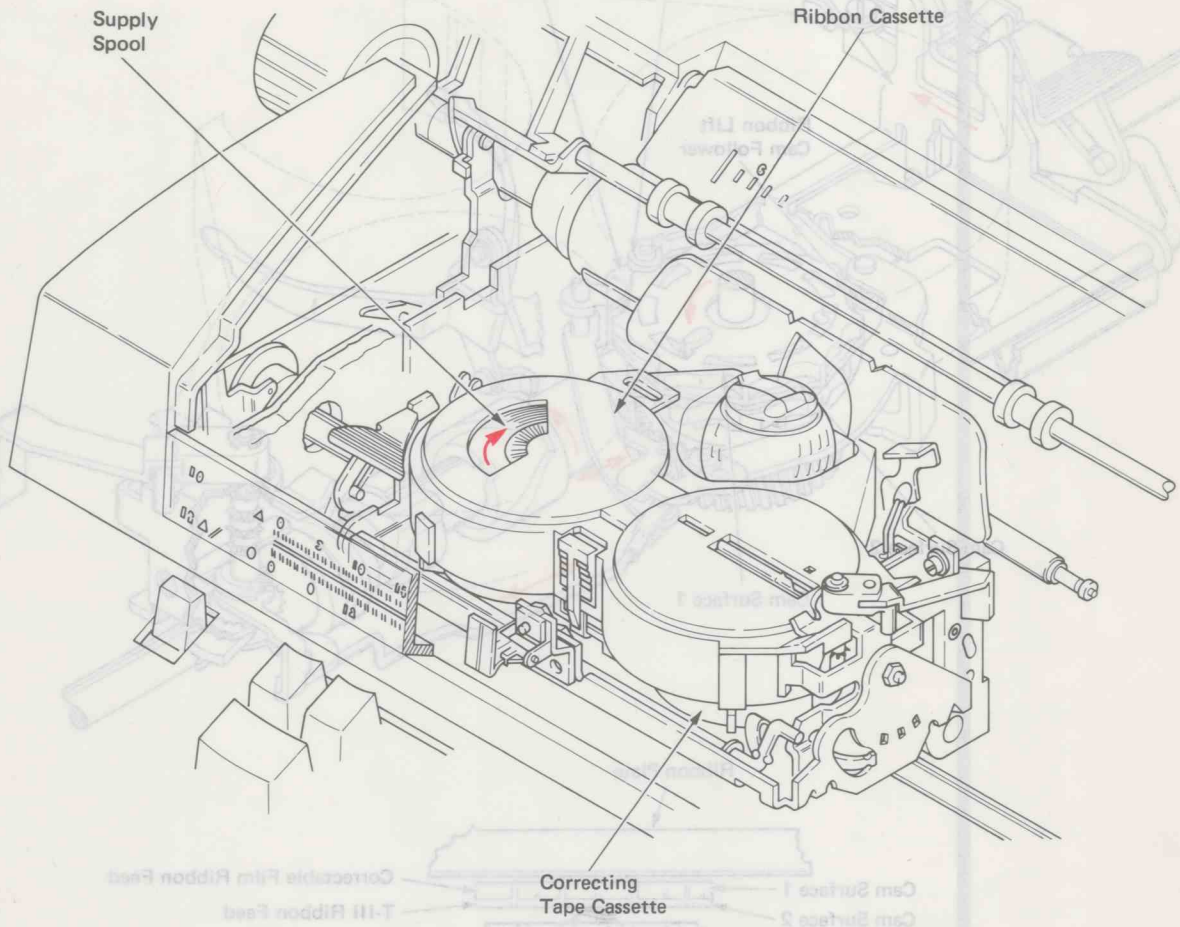


Figure 1 – Ribbon Cassette System

RIBBON MODE SELECTION

The extension on the left side of the ribbon cassette pivots the ribbon mode selector lever and controls the amount of lift and feed (Figure 2). The T-III cassette pivots the mode selector lever top to rear. The correcting film ribbon cassette pivots the selector lever top to front. The mode selector lever pivots and aligns the ribbon feed and lift cam followers with the ribbon lift and feed cam surfaces. When the selector lever pivots top to front, the ribbon feed and lift cam followers follow the correctable film cam surfaces 1 and 4. When the selector lever pivots top to rear, the ribbon feed and lift cam followers follow the T-III ribbon cam surfaces 2 and 3.

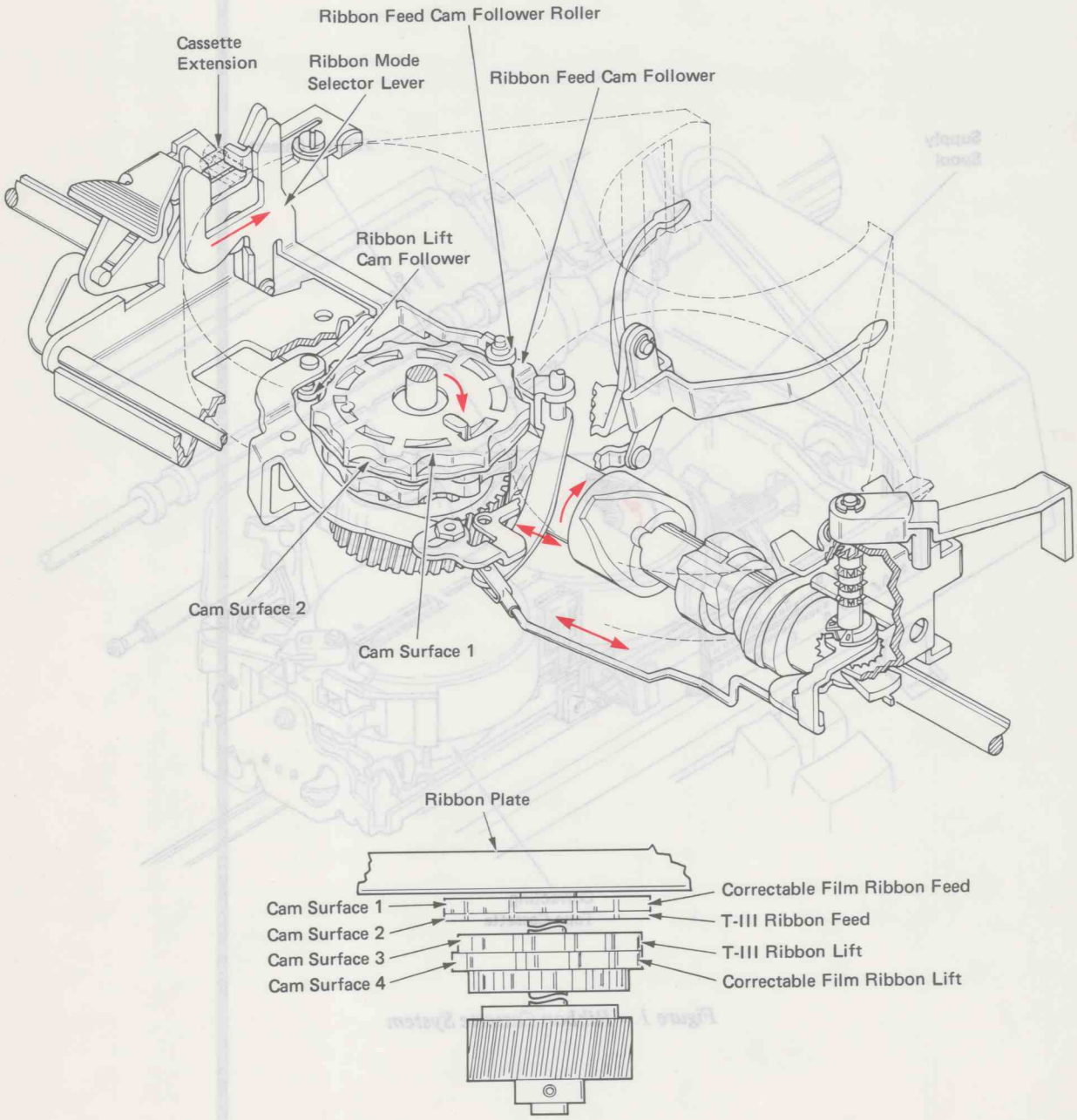


Figure 2 – Ribbon Lift And Feed Cam Surfaces

RIBBON FEED

The ribbon drive gear provides motion for ribbon feed (Figure 3). The print sleeve rotates the ribbon drive gear top to rear. During a print operation, the ribbon drive gear rotates the ribbon driven gear. The detent ball transfers motion from the driven gear to the ribbon lift and feed cams and drives the cams clockwise. The ribbon feed follower roller is spring-loaded against the ribbon feed cam. As the ribbon feed cam rotates, the ribbon feed cam follower roller moves from the high to the low surface of the cam and the ribbon feed link moves to the right. As the link moves to the right, the ribbon feed pawl moves counter-clockwise to engage the next window in the bottom of the spiked driver. Near the end of the print cycle, the cam follower rises toward the high surface of the ribbon feed cam, moving the ribbon feed pawl toward the front of the machine. The pawl operates against the front surface of the window and rotates the spiked driver clockwise.

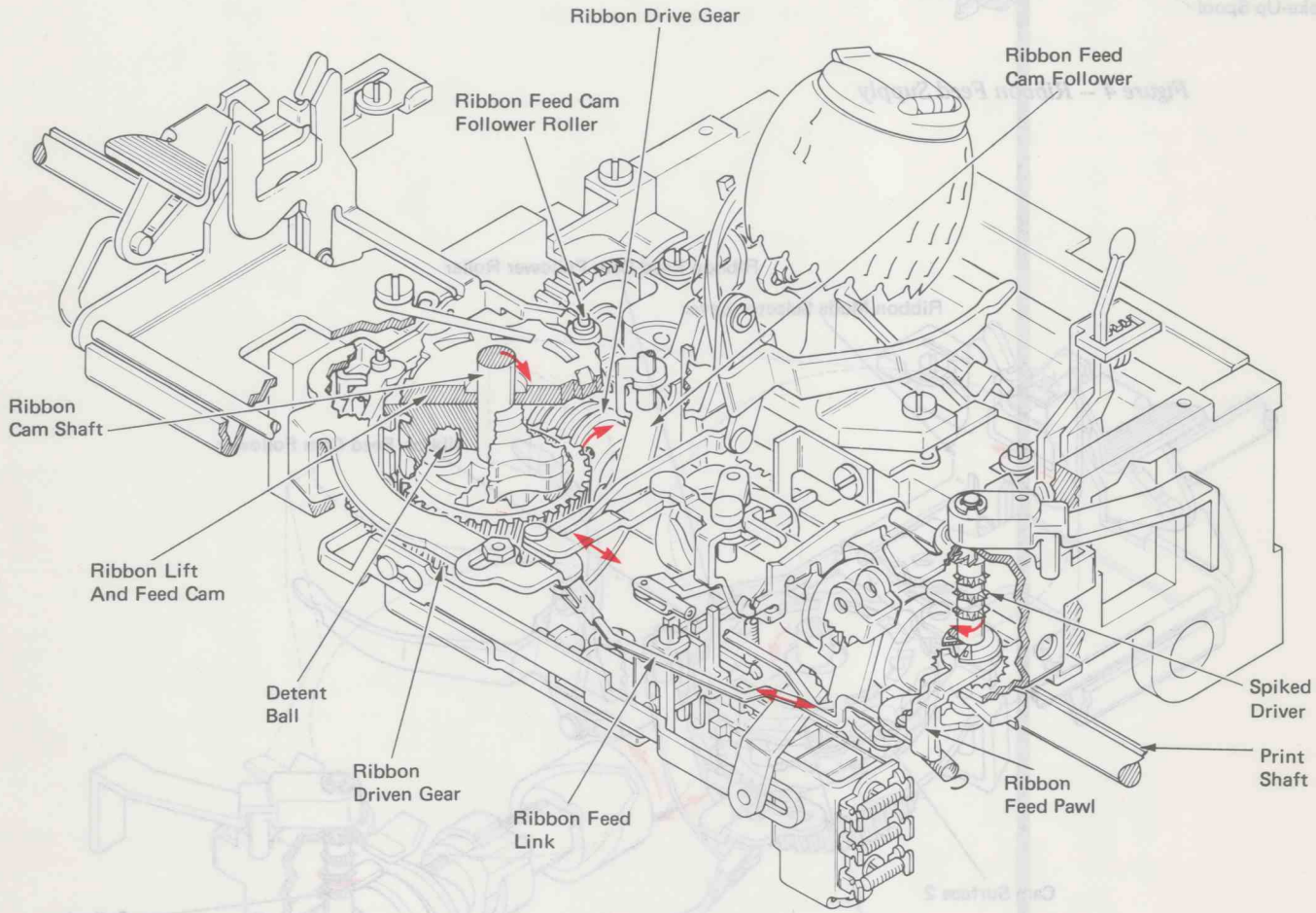


Figure 3 – Ribbon Feed Operation

The amount of ribbon feed is controlled by the rotation of the spiked driver during each print cycle. The ribbon cassette take-up spool is spring loaded to the right against the spiked driver. This causes the spiked driver to engage the used ribbon (Figure 4). As the spiked driver rotates, it drives the take-up spool and pulls new ribbon into the print position as it winds the used ribbon.

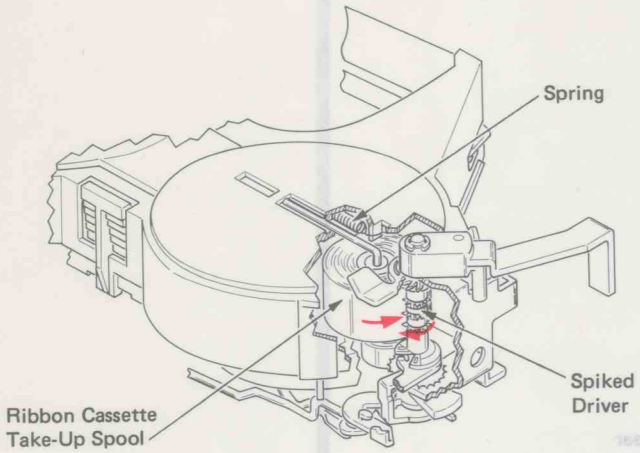


Figure 4 – Ribbon Feed Supply

The ribbon feed cam controls the amount of spiked driver rotation. As the ribbon feed cam follower follows the ribbon feed cam surfaces, it rotates the spiked driver (Figure 5). Cam surface 1 causes the spiked driver to advance the ribbon so the characters do not overlap. Cam surface 2 lets the characters overlap by advancing the ribbon 1/9 as far as when in the correctable ribbon cassette mode.

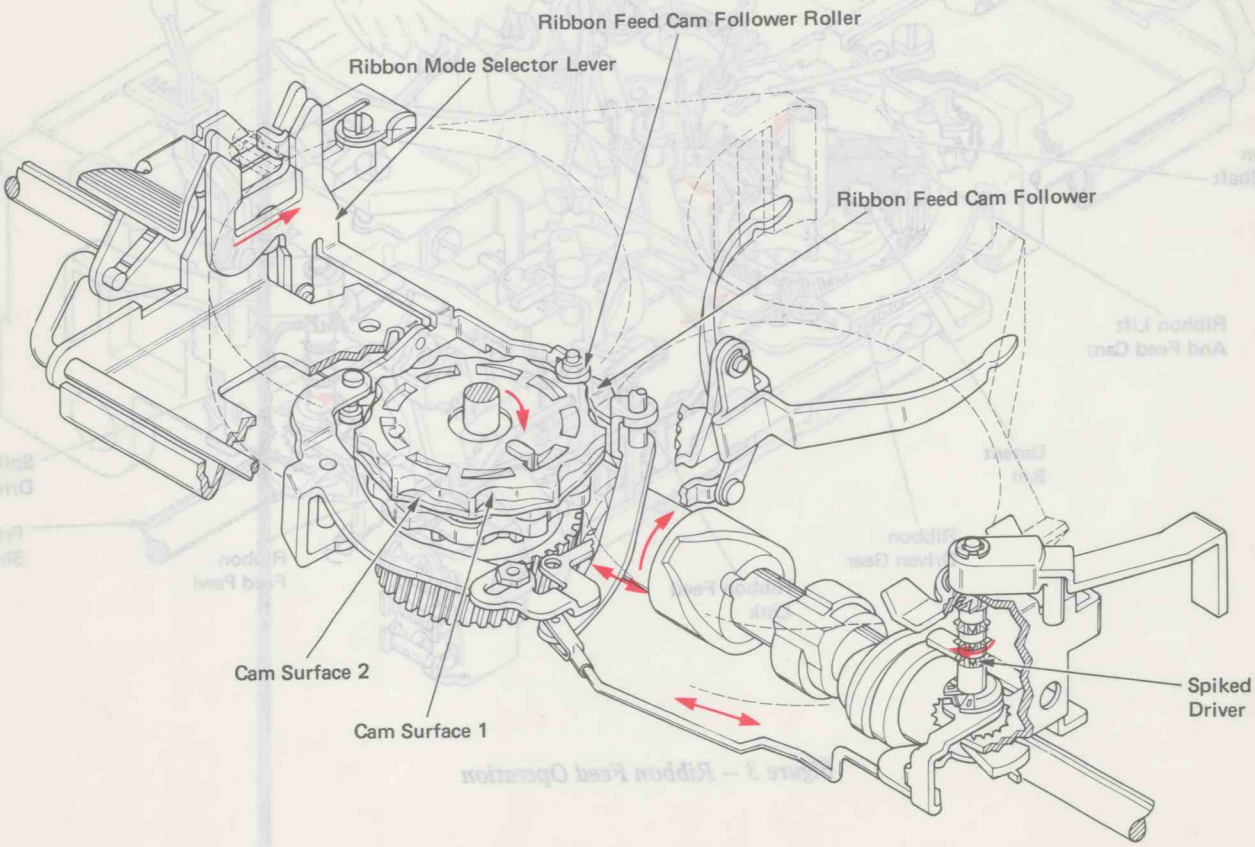


Figure 5 – Ribbon Feed And Cam Surfaces

RIBBON LIFT

The ribbon lift mechanism has three lift positions for the correctable film ribbon and nine lift positions for the T-III ribbon. As the ribbon lift follower arm is moved by the ribbon lift cam, it pivots the ribbon lift fork assembly to a lift position (Figure 6).

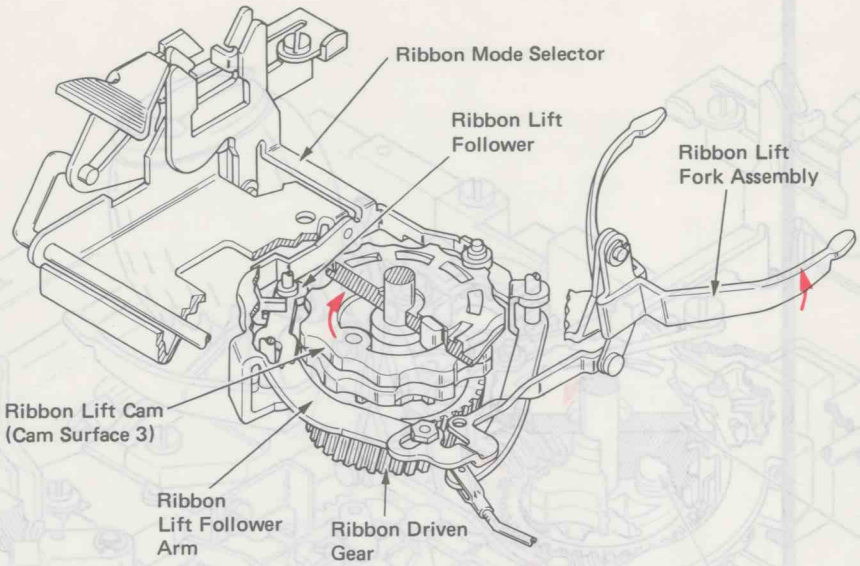
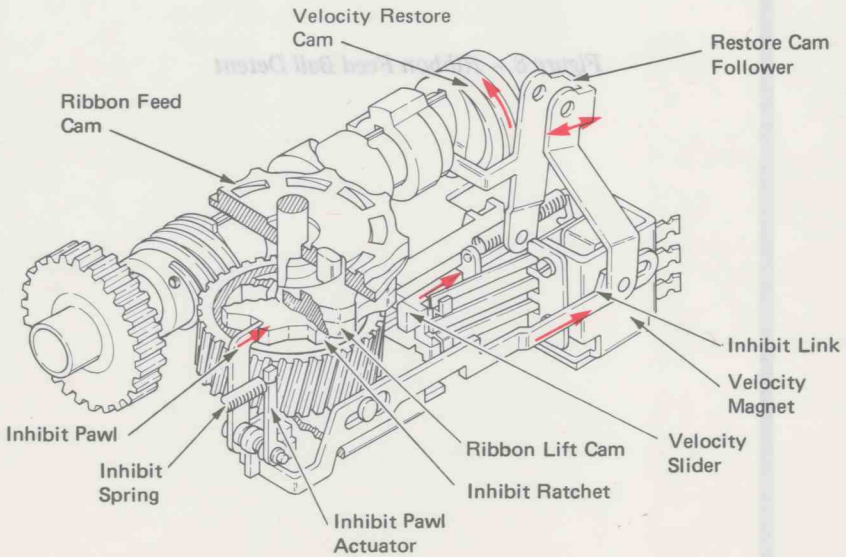


Figure 6 – Ribbon Lift

RIBBON FEED AND LIFT INHIBIT

The ribbon feed and lift operations are inhibited during a no-print cycle. At rest, the inhibit pawl is engaged with the inhibit ratchet by the inhibit link (Figure 7). When the velocity magnet energizes, the velocity slider moves to the right as the print shaft rotates. As the velocity slider moves to the right, it rotates the restore cam follower counter-clockwise. As the restore cam follower rotates, the inhibit link moves to the right and allows the inhibit spring to disengage the inhibit pawl from the inhibit ratchet.

During a no-print cycle (no velocity magnets energized), the velocity slider rests against the center armature of the velocity magnet assembly. This prevents the velocity slider from moving the restore cam follower. With no restore cam follower movement, the inhibit pawl remains engaged with the inhibit ratchet. This prevents the ribbon feed and lift cam from rotating.



(Left Front View)

Figure 7 – Ribbon Feed Inhibit

The driven gear and the ribbon feed and lift cams are connected by the ball detent (Figure 8). The ball detent acts like a clutch and allows the driven gear to rotate while the feed and lift cams are inhibited. During an inhibit operation, the detent ball rotates to the next hole in the ribbon lift cam.

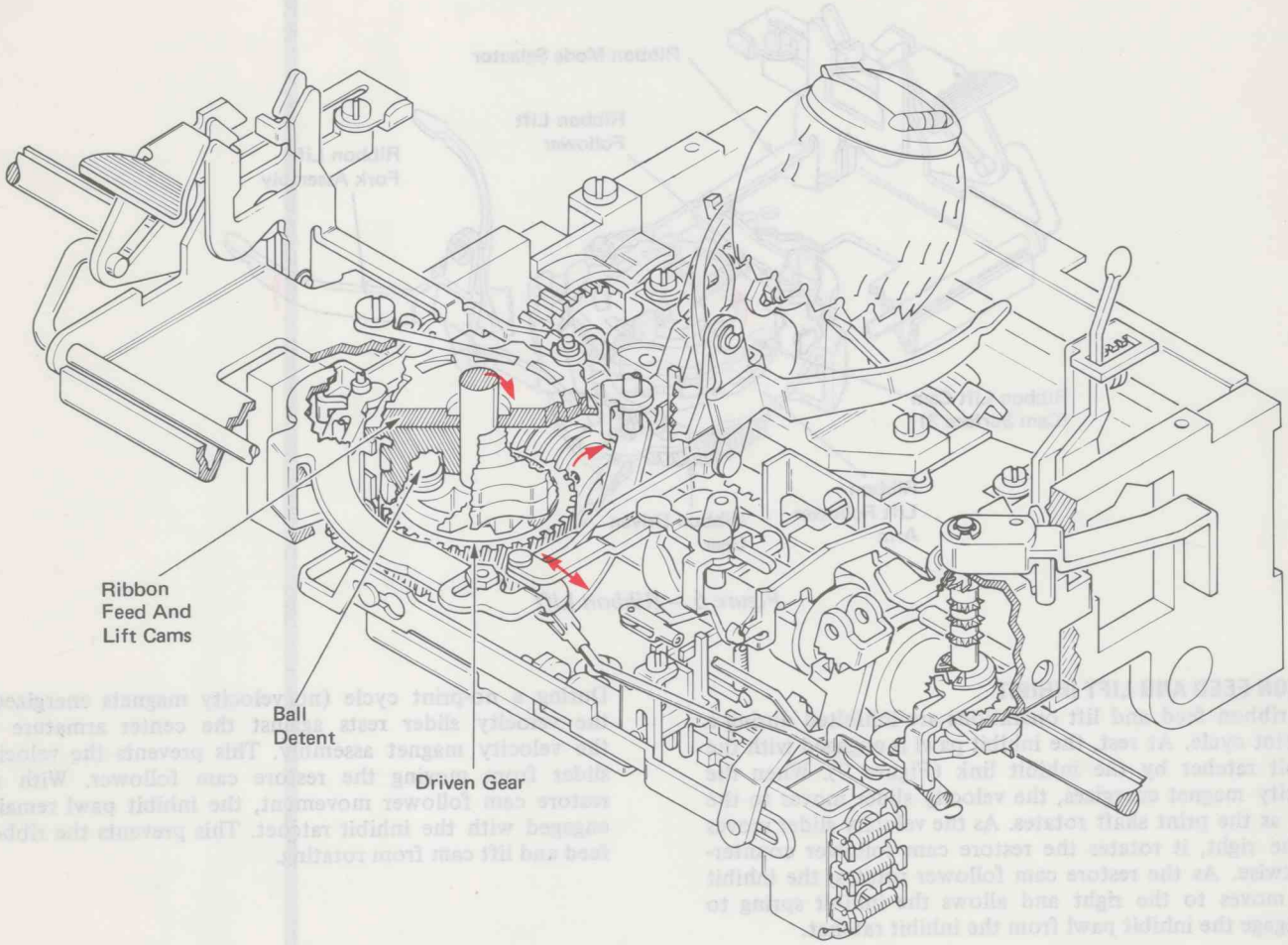


Figure 8 – Ribbon Feed Ball Detent

CORRECTING RELEASE AND RESTORE

The correcting control arm latch holds the correcting mechanism at rest during typing (Figure 9). When the correcting solenoid energizes, it pivots the correcting control arm latch top to right. The correcting control arm spring moves the control arm against the low surface of the correcting restore cam. The lift and feed cam followers can now follow their cam surfaces to provide motion for tape lift and feed.

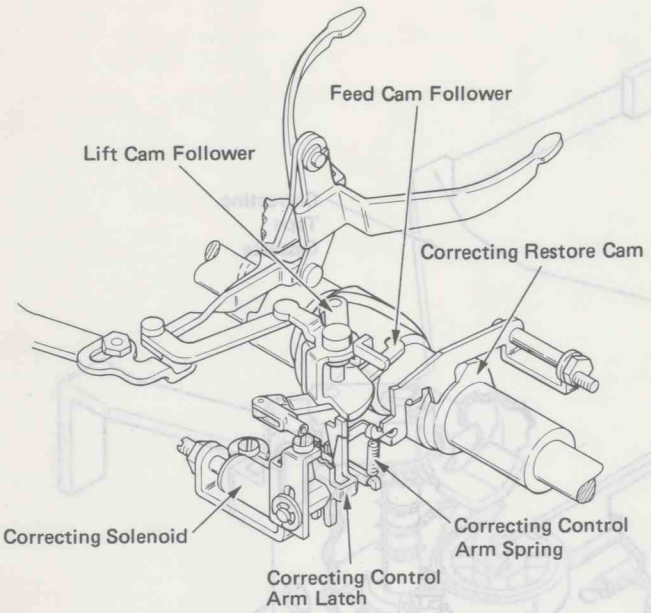


Figure 9 – Correcting Release

Near the end of a correcting cycle, the restore cam surface pivots the front of the control arm up (Figure 10). The correcting control arm latch spring pivots the correcting control arm latch under the control arm to hold the mechanism at rest.

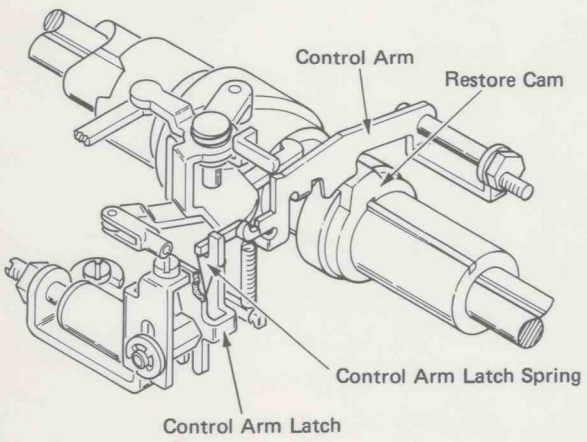


Figure 10 – Correcting Restore

CORRECTING TAPE LIFT

The tape lift mechanism consists of the tape lift and feed cam and the lift fork assembly (Figure 11). An extension on the correcting control arm holds the tape lift cam follower at rest. When the control arm releases and moves down, a compression spring moves the tape lift cam follower down into the path of the tape lift cam surface.

As the print shaft rotates, the tape lift cam pivots the tape lift cam follower clockwise. The left extension of the follower pulls the links to the rear. This pivots the lift fork up and moves the correction tape between the typehead and the platen. As the print shaft continues to rotate, the tape lift cam follower moves toward the low surface of the lift cam and the lift fork returns to rest.

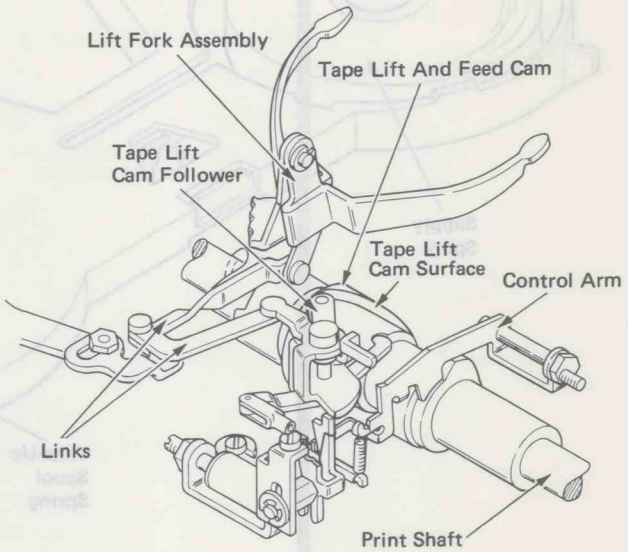


Figure 11 – Correcting Tape Lift

CORRECTING TAPE FEED

The correcting take-up spool in the correcting tape cassette is held against a spiked wheel. As the spiked wheel rotates, it pulls tape from the supply spool (Figure 12). It also winds the used tape onto the take-up spool. A shock wire on the supply spool keeps tension on the tape between the two spools.

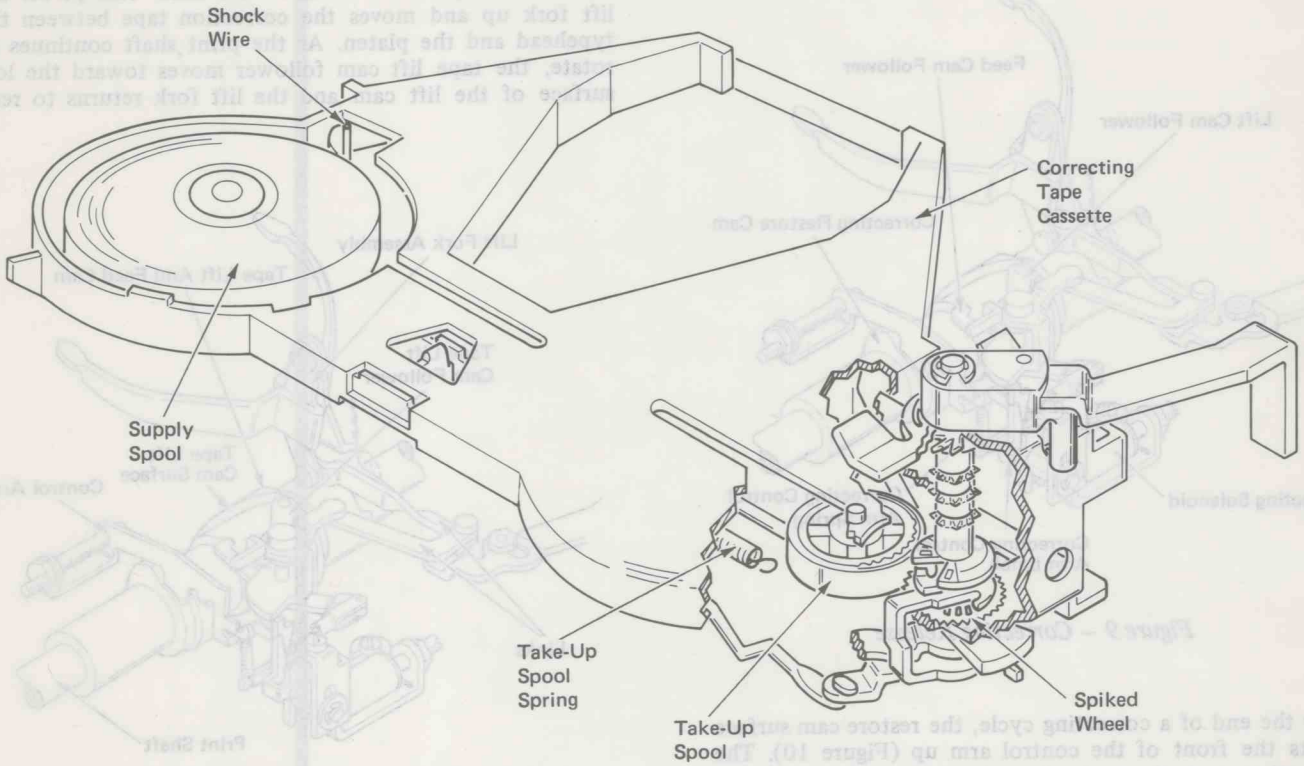


Figure 12 – Correcting Tape Feed

The tape feed link connects the tape feed cam follower to the tape feed pawl (Figure 13). The tape feed pawl engages one of the windows in the spike wheel. The tape feed pawl pivots clockwise to engage the next window.

The tape lift and feed cam rotates with each print shaft cycle. The tape feed spring holds the tape feed cam follower against the feed cam surface of the tape lift and feed cam. An extension on the tape feed cam follower contacts the control arm and prevents the cam follower from pivoting against the cam.

When the tape lift and feed cam rotates, the tape feed spring pivots the tape feed cam follower counterclockwise. The tape feed spring also pivots the tape feed pawl counterclockwise to engage the next window in the spiked wheel.

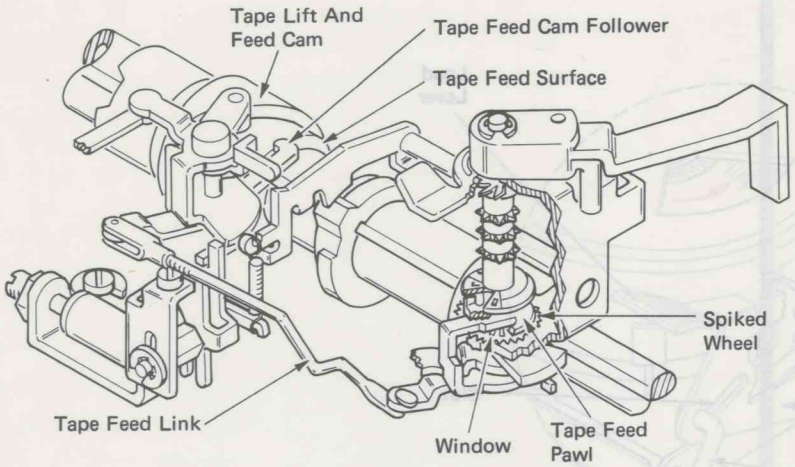


Figure 13 – Correcting Tape Feed

As the cam rotates further, it pivots the tape feed cam follower clockwise. The cam follower pivots the pawl clockwise to rotate the spiked wheel. One-half of the tape feed occurs before the typehead contacts the correcting tape. This holds the tape tight as the character is corrected. After printing, the second half of tape feed occurs. This prevents the tape from sticking to the paper. The tape feed cam follower moves to the high surface of the feed cam to complete the feed operation and restore the feed mechanism to rest.

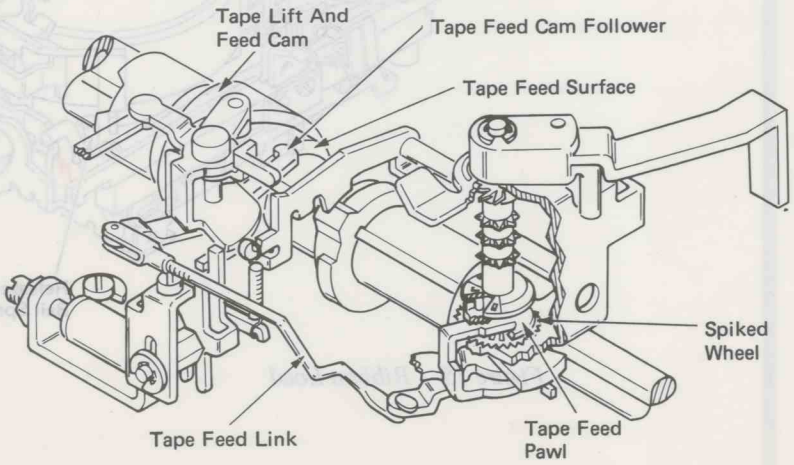


Figure 14 – Correcting Tape Feed

RIBBON LOAD

As the load lever is depressed and latched, a slot in the load lever rotates the release bail top to rear, pivoting the spiked driver assembly top to front (Figure 15). As the ribbon cassette is installed, an extension on the left side of the cassette pushes the load lever latch down, releasing the load lever. As the load lever clears the load lever latch, the release bail spring pivots the release bail top to front. The spiked driver assembly is then spring loaded to the rest position. At the same time, the load lever pivots top to rear over the ribbon cassette extension to hold the cassette in place. The release bail spring holds the load lever in place during a ribbon lift operation. The ribbon advance lever is used to take up the slack in the ribbon.

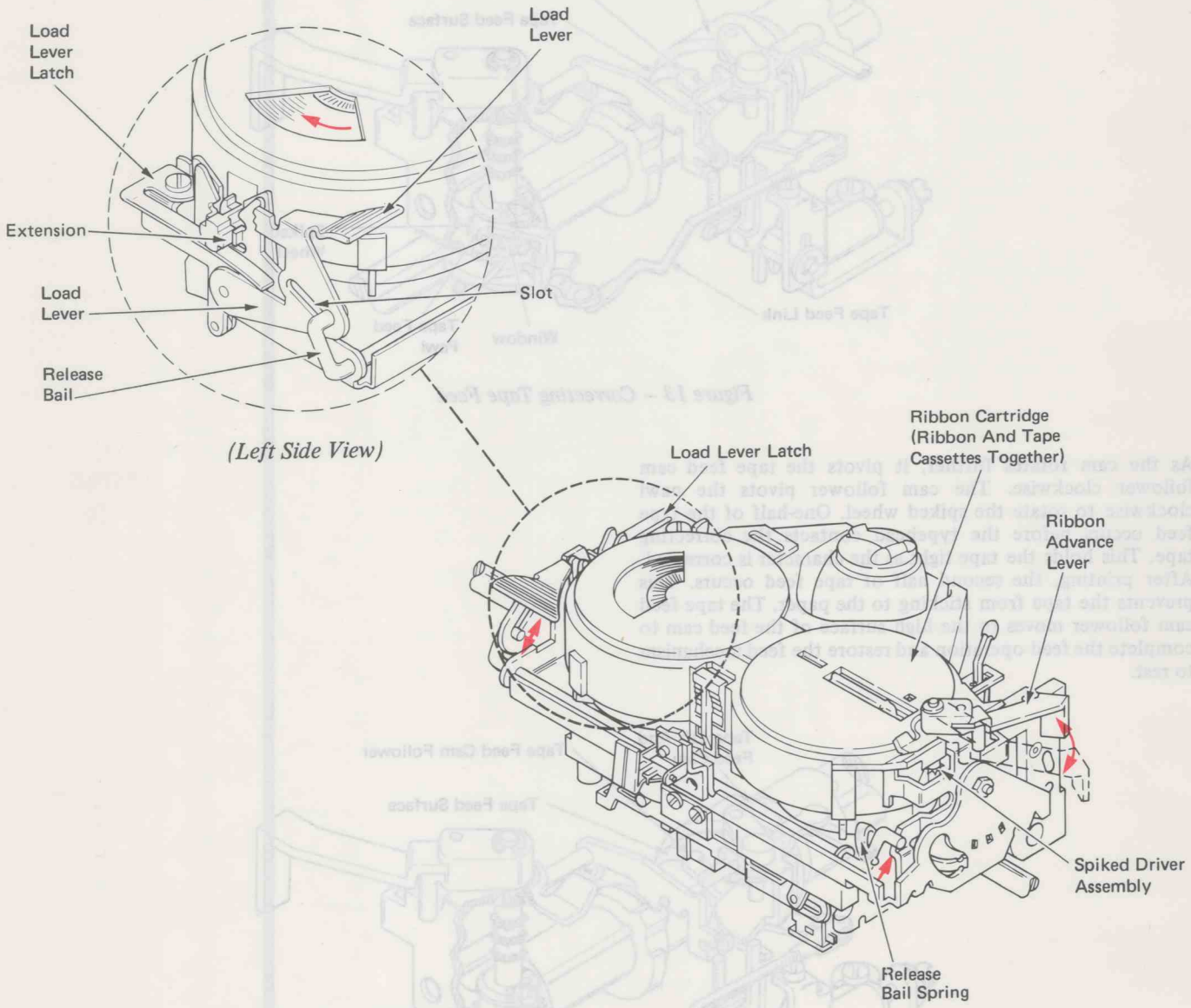
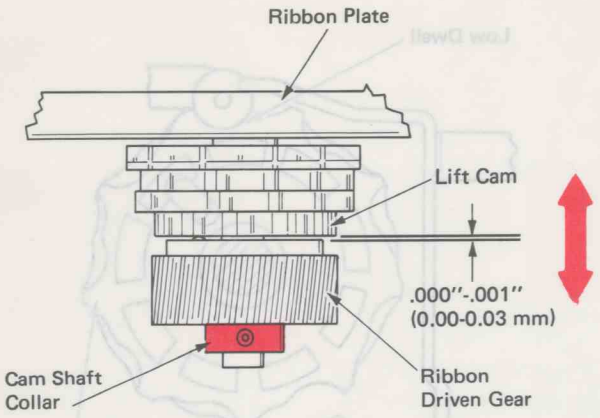


Figure 15 – Ribbon Load

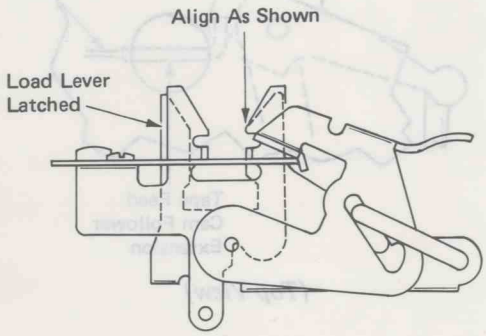
RIBBON CASSETTE SYSTEM ADJUSTMENTS

1. *Ribbon Driven Gear End Clearance* – Ajust the cam shaft collar for .000"-.001" (0.00-0.03 mm) clearance between the ribbon driven gear and the lift cam.

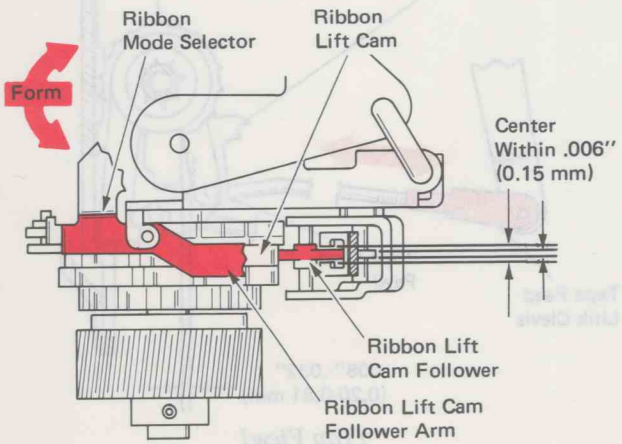


(Right Side View)

2. *Ribbon Lift Cam Follower* – Align the front edge of the ribbon mode selector with the front edge of the slot in the ribbon plate. Form the horizontal part of the ribbon mode selector so it centers the ribbon lift cam follower on cam surface 3 of the ribbon lift cam within .006" (0.15 mm).

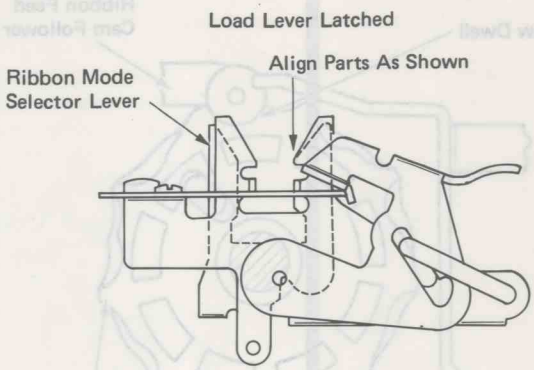


(Left Side View)

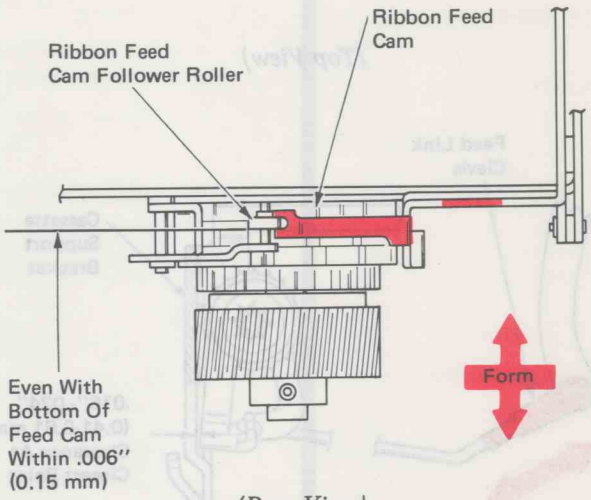


(Left Side View)

3. *Ribbon Feed Cam Follower* – Align the front edge of the ribbon mode selector with the front edge of the slot in the ribbon plate. Form the ribbon mode selector lever arm to position the bottom of the ribbon feed cam follower roller even with cam surface 2 on the ribbon feed cam within .006" (0.15 mm).

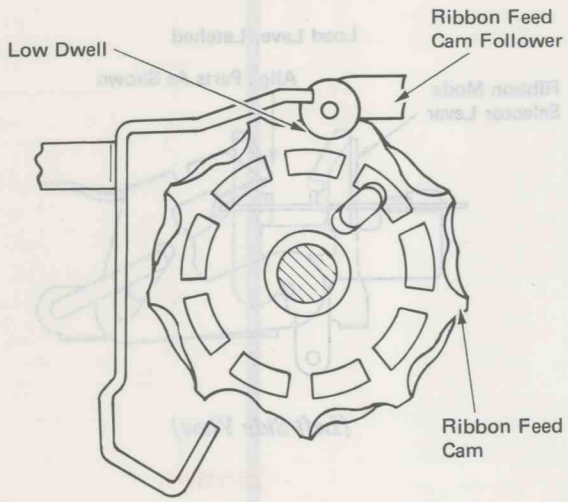


(Left Side View)

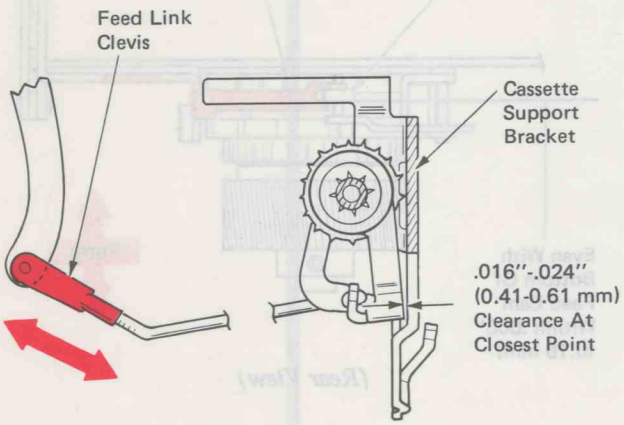


(Rear View)

4. *Ribbon Feed Link* – With the ribbon feed cam follower on the low dwell of cam surface 1 on the ribbon feed cam and the load lever latched, adjust the feed link clevis for .016"-.024" (0.41-0.61 mm) between the ribbon feed pawl and the cassette support bracket.



(Top View)

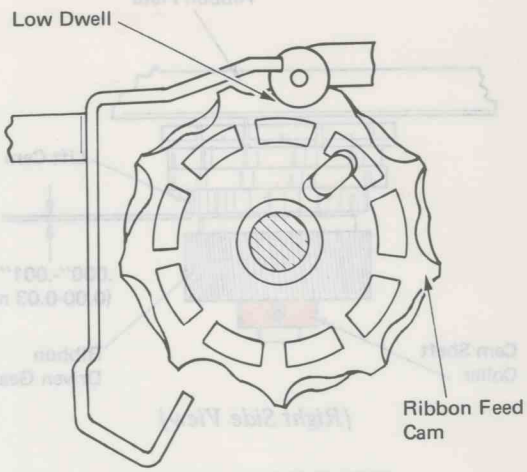


(Top View)

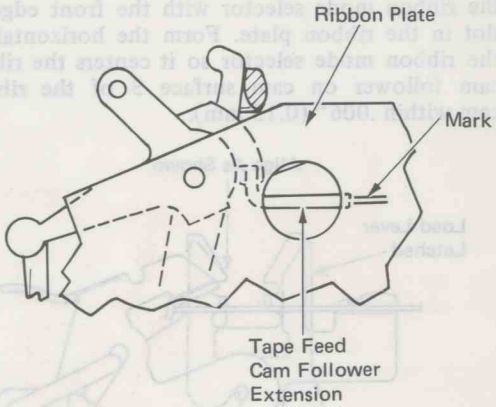
5. *Tape Feed Link* –

NOTE: Before removing the ribbon plate, note the position of the tape feed cam follower extension and mark its position on the ribbon plate. The ribbon plate must be removed from the machine before making this adjustment.

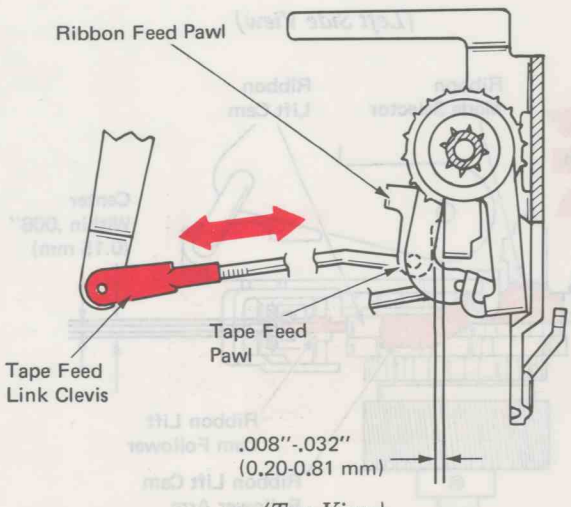
With the ribbon feed cam follower on the low dwell of cam surface 1 of the ribbon feed cam, the load lever in the latched position, and the tape feed cam follower extension aligned with your mark, adjust the tape feed link clevis for .008"-.032" (0.20-0.81 mm) between the tape feed pawl and the ribbon feed pawl.



(Top View)

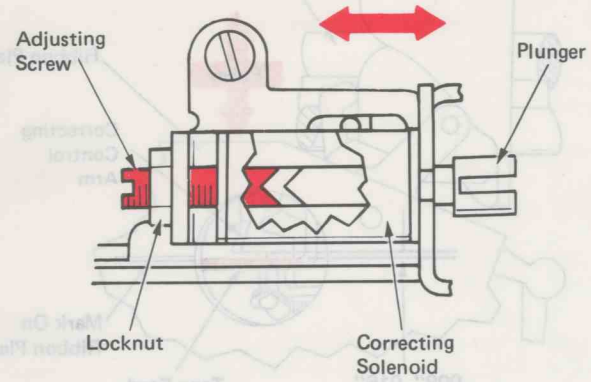


(Top View)



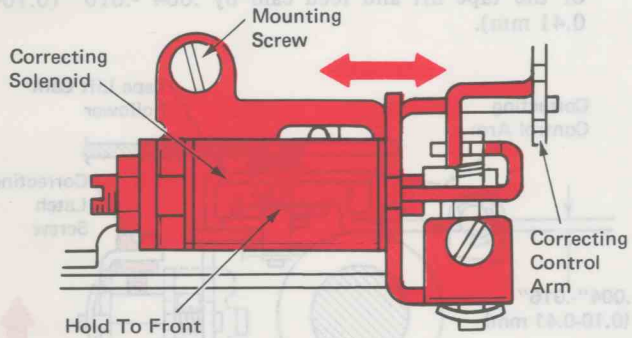
(Top View)

6. *Correcting Solenoid Airgap* – Loosen locknut. Manually hold the correcting solenoid plunger in the energized position. Turn the adjusting screw clockwise until it contacts the plunger. Back the adjusting screw out and counterclockwise 1/4 of a turn, then retighten the locknut.

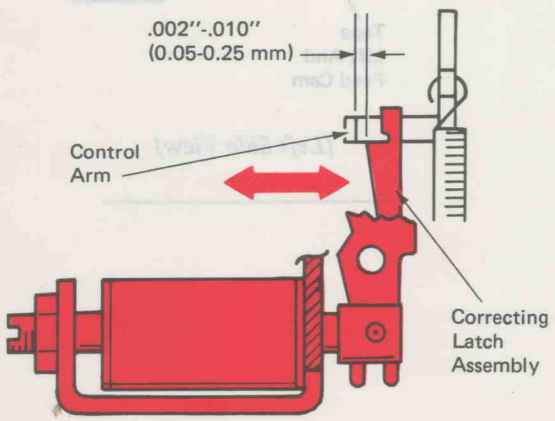


(Top View)

7. *Correcting Latch Assembly* – Loosen the correcting solenoid bracket mounting screw. Hold the correcting solenoid plunger in the energized position. Adjust the solenoid bracket right or left until the correcting control arm clears the latch assembly by .002"-.010" (0.05-0.25 mm).

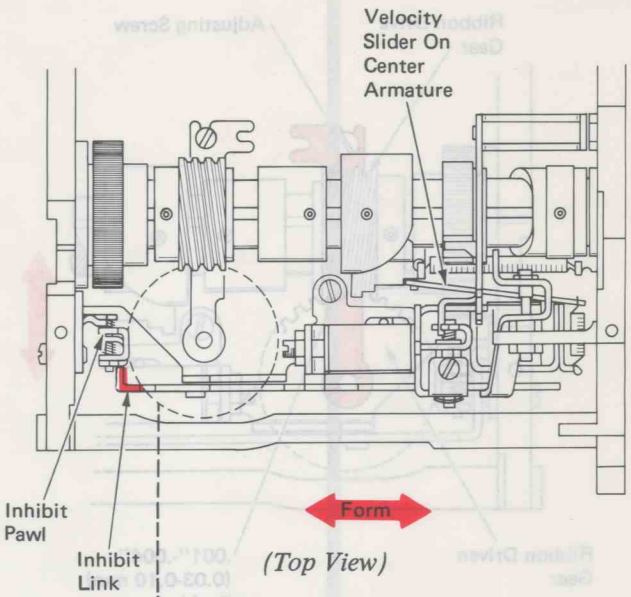


(Top View)

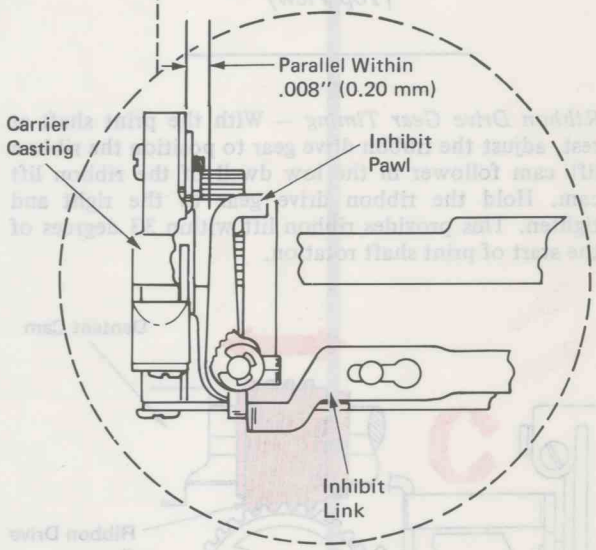


(Front View)

8. *Ribbon Inhibit (Lateral)* – With the velocity slider resting on the center armature of the velocity magnet assembly, form the extension of the inhibit link until the inhibit pawl is parallel with the carrier casting within .008" (0.20 mm).

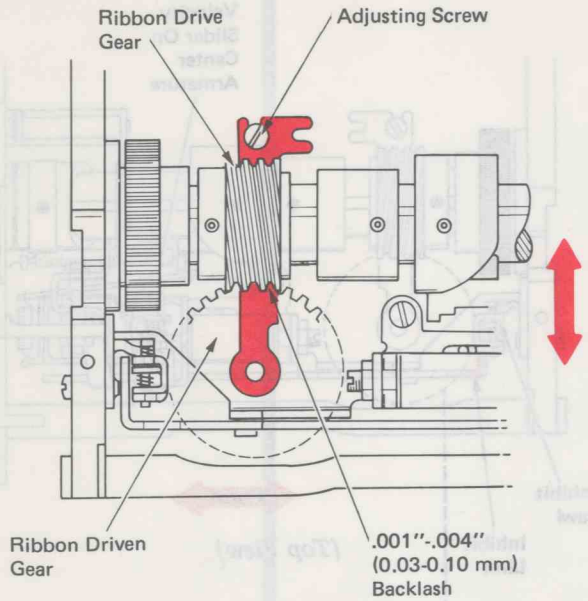


(Top View)



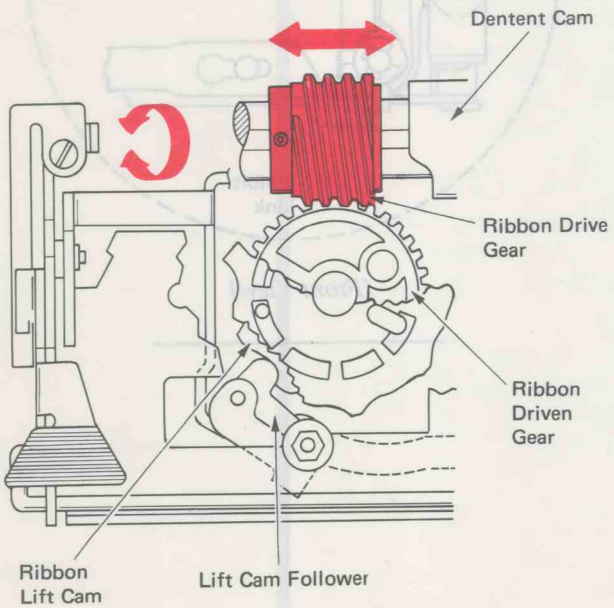
(Front View)

9. *Cam Shaft Locator* – Loosen the left ribbon plate mounting screw and adjust the bottom cam shaft locator front to rear for .001"-.004" (0.03-0.10 mm) backlash between the ribbon driven gear and the ribbon drive gear.



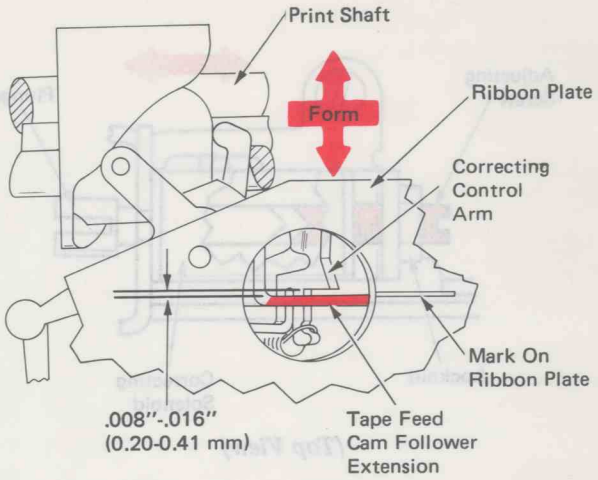
(Top View)

10. *Ribbon Drive Gear Timing* – With the print shaft at rest, adjust the ribbon drive gear to position the ribbon lift cam follower in the low dwell of the ribbon lift cam. Hold the ribbon drive gear to the right and tighten. This provides ribbon lift within 33 degrees of the start of print shaft rotation.



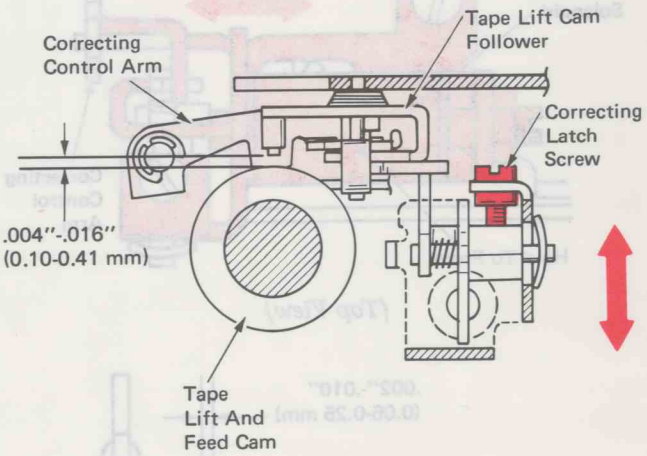
(Top View)

11. *Tape Feed Cam Follower* – With the tape feed cam follower on the high surface of the tape feed cam, form the tape feed cam follower extension for a clearance of .008"-.016" (0.20-0.41 mm) between the cam follower extension and the control arm latch surface.



(Top View)

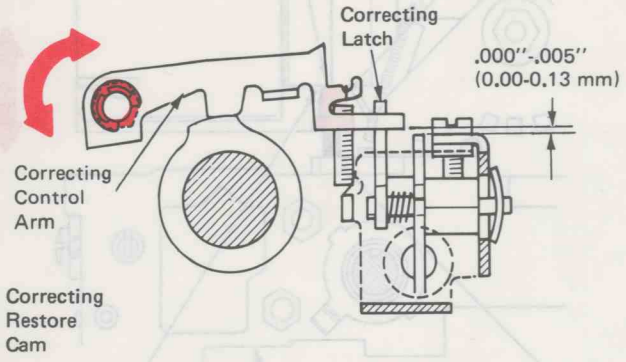
12. *Correcting Latch Height* – With the correcting control arm resting on the correcting latch, adjust the correcting latch screw so the tape lift cam follower clears the top of the tape lift and feed cam by .004"-.016" (0.10-0.41 mm).



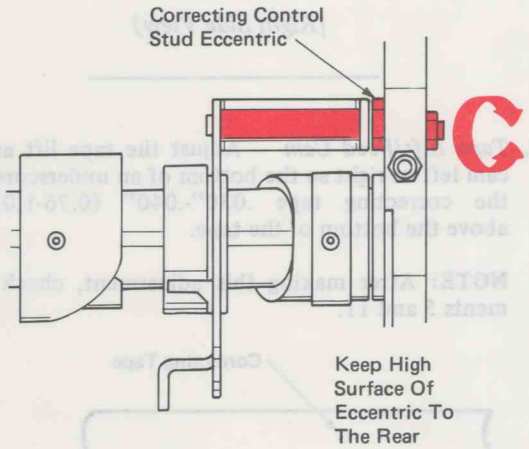
(Left Side View)

13. *Correcting Control Arm* – With the correcting control arm on the high point of the correcting restore cam, adjust the correcting control eccentric stud so the latch surface on the correcting control arm latches with .000"-.005" (0.00-0.13 mm) overthrow.

NOTE: This adjustment should be checked with the ribbon plate installed. Keep the high surface of the eccentric to the rear.



(Left Side View)

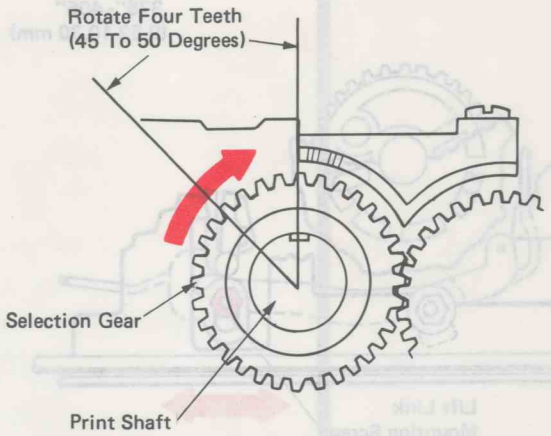


(Top View)

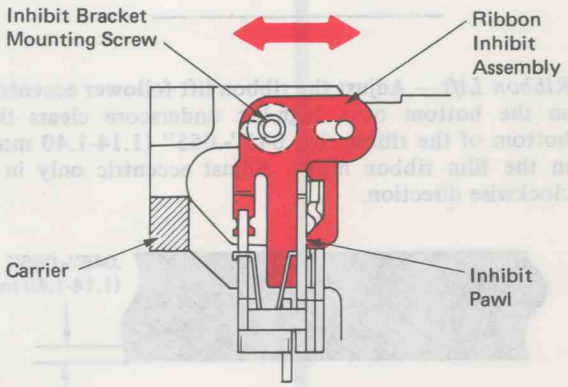
14. *Ribbon Drive Inhibitor* – Adjust the ribbon inhibit assembly so the inhibit pawl contacts an inhibit ratchet tooth when the print shaft is rotated 45-50 degrees (four teeth) from the rest position during a no-print cycle.

To make this adjustment:

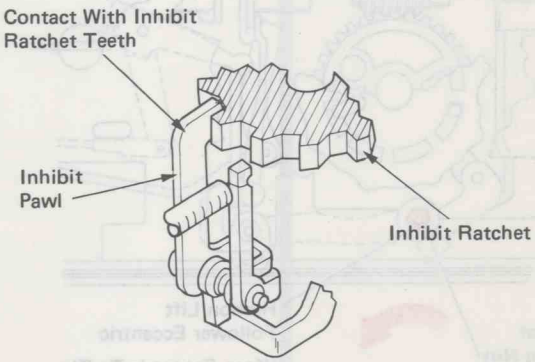
a. Loosen inhibit bracket mounting screw.
b. Move inhibit bracket to rear.
c. Tighten mounting screws friction tight.
d. Rotate print shaft four teeth.
e. Slide inhibit assembly toward front until it stops.
f. Tighten mounting screw.
g. Recheck.



(Right Side View)

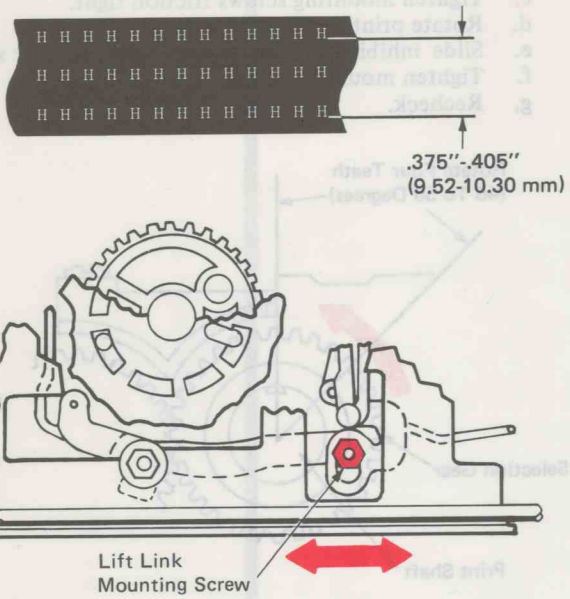


(Right Side View)



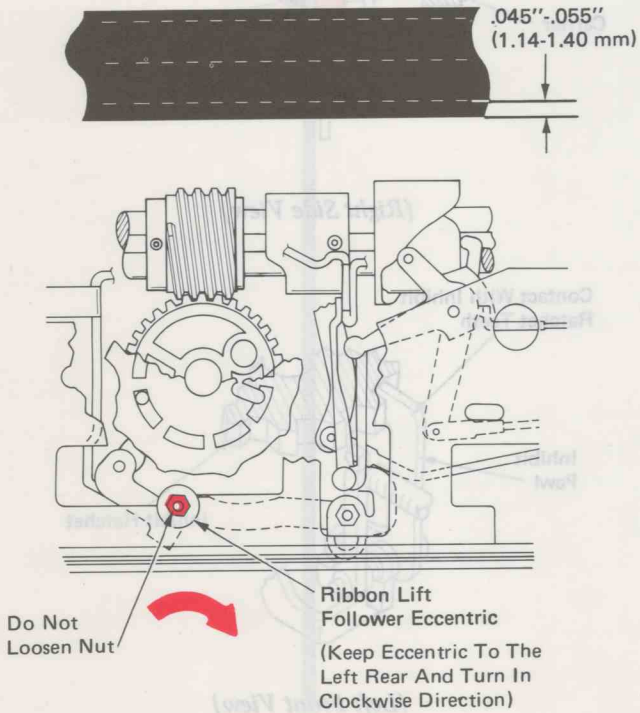
(Left Front View)

15. *Ribbon Spread* – Adjust the lift link mounting screw left or right for .375"-.405" (9.52-10.30 mm) between the bottom of the high-lift characters and the bottom of the low-lift characters in the film ribbon mode.



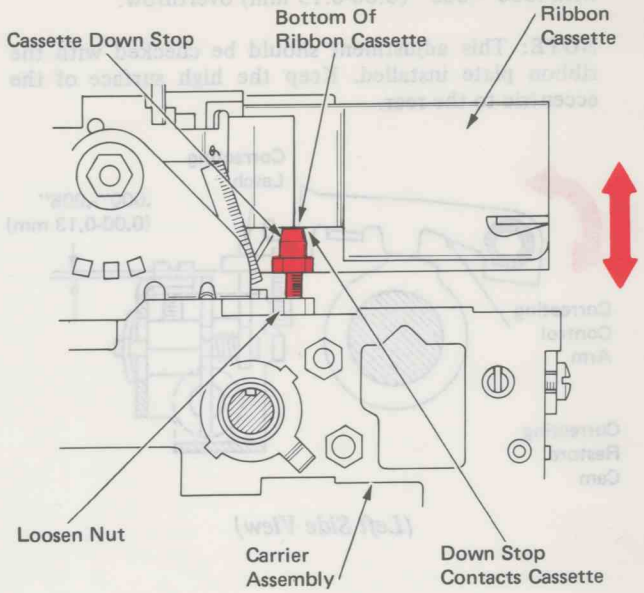
(Top View)

16. *Ribbon Lift* – Adjust the ribbon lift follower eccentric so the bottom of a high-lift underscore clears the bottom of the ribbon by .045"-.055" (1.14-1.40 mm) in the film ribbon mode. Adjust eccentric only in a clockwise direction.



(Top View)

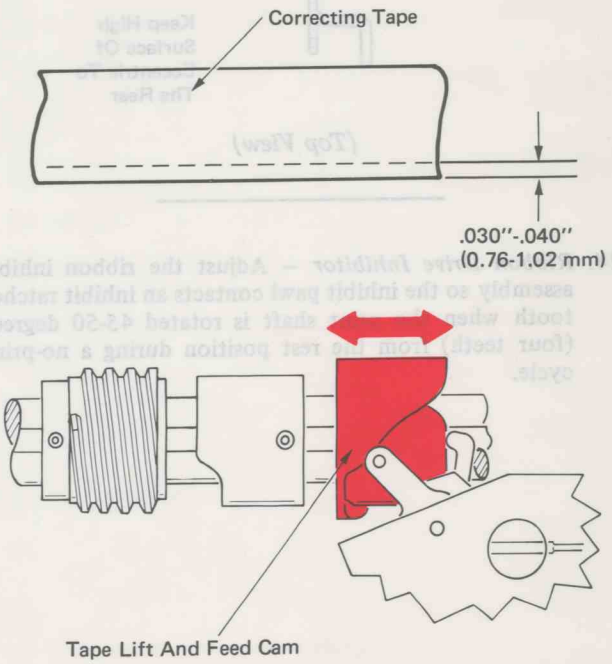
17. *Ribbon Cassette Down Stop* – With the print shaft at rest, adjust the cassette down stop upward until it contacts the bottom of the ribbon cassette.



(Right Side View)

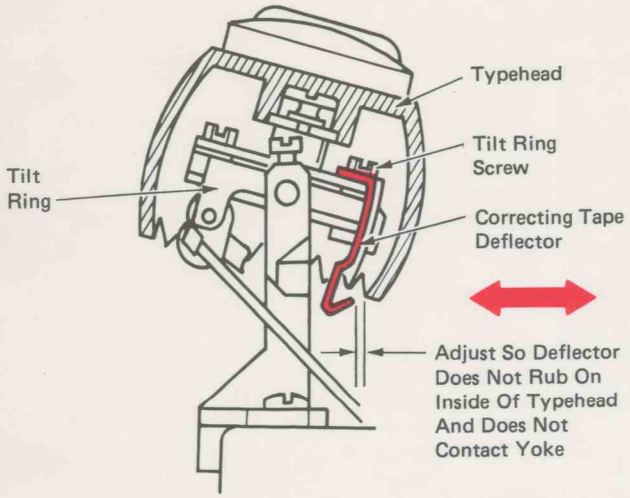
18. *Tape Lift/Feed Cam* – Adjust the tape lift and feed cam left or right so the bottom of an underscore strikes the correcting tape .030"-.040" (0.76-1.02 mm) above the bottom of the tape.

NOTE: After making this adjustment, check adjustments 5 and 11.



(Top View)

19. *Correcting Tape Deflector* – Loosen the tilt ring screw and adjust the correcting tape deflector so it does not contact the inside of the typehead (deflector should be flush with tilt ring). After making this adjustment, tighten the tilt ring screw.

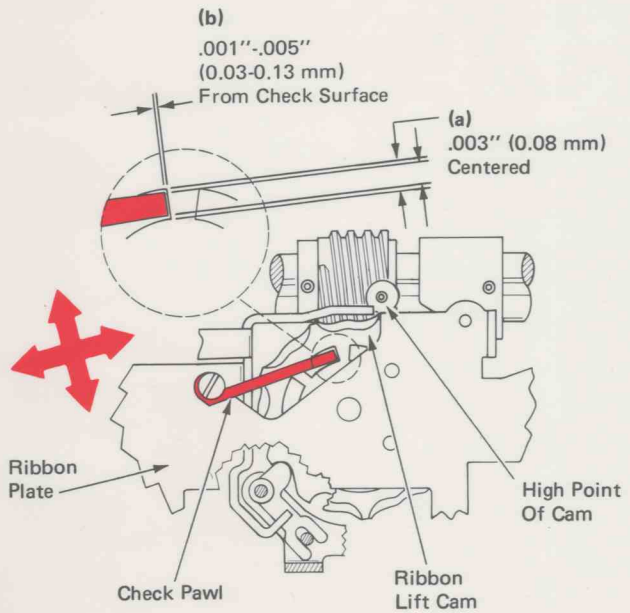


(Right Side View)

20. *Check Pawl* – With the print shaft at rest, adjust the check pawl to meet two conditions:

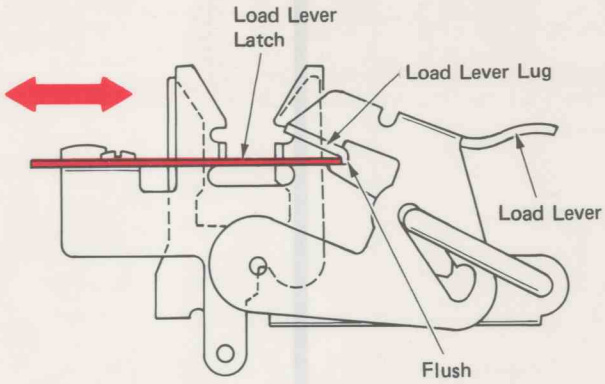
a. The check pawl must be centered within the detents in the cam by .003" (0.08 mm).

b. The end of the check pawl must be .001"-.005" (0.03-0.13 mm) from the check surface of the cam.



(Top View)

21. *Load Lever Latch* – With the load lever in the load position, adjust the load lever latch front to rear so the latch is flush with the bottom of the load lever lug.



CORRECTING TAPE OPERATIONAL THEORY

NOTE: See the Ribbon Cassette System section for the operational theory of ribbon cassette system correcting tape.

The purpose of the correcting tape mechanism is to lift and feed the correcting tape (Figure 1). Pressing the backspace keybutton starts the correcting operation. The correcting operation consists of two print shaft cycles, one for backspace and one for correction. During the correction, the correcting solenoid and the selection solenoids energize to correct the typed character. The character is retyped with the correcting tape lifted between the ribbon and the paper. No escapement takes place during the correcting cycle. After the correction is made, the operator may then type the correct character or keep the backspace key depressed to remove the next character.

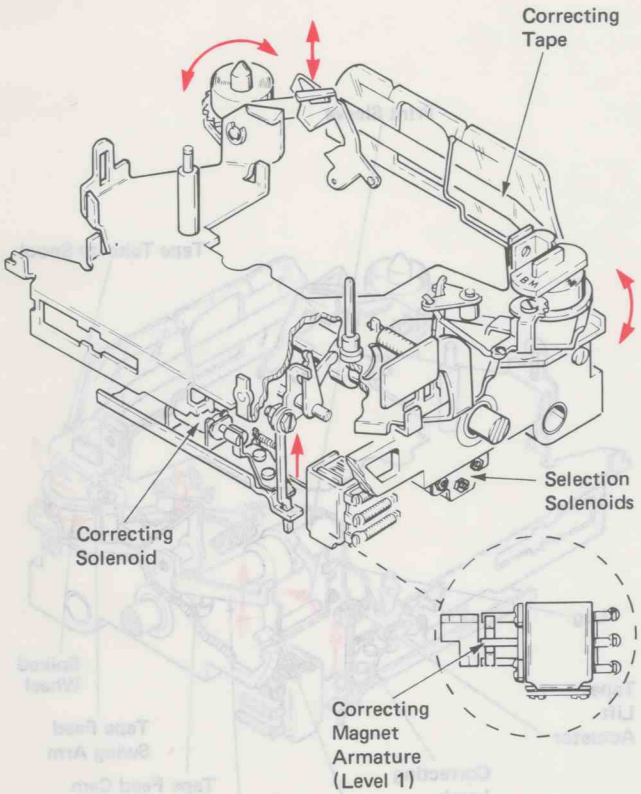
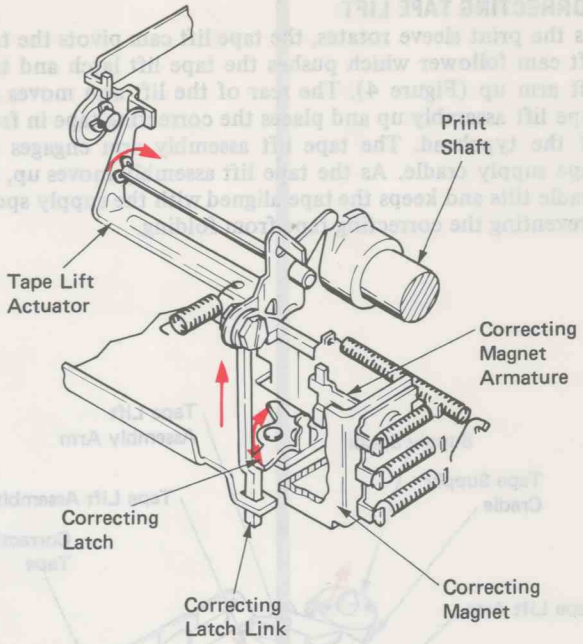


Figure 1 – Correcting Tape Mechanism

CORRECTING LATCH RELEASE (Level 1)

NOTE: The Level 1 correcting mechanism uses a correcting magnet instead of a correcting solenoid.

When the correcting magnet is energized, the armature pivots the correcting latch out of the path of the correcting latch link (Figure 2). As the print shaft rotates, the correcting latch link moves up and the tape lift actuator pivots top to rear.



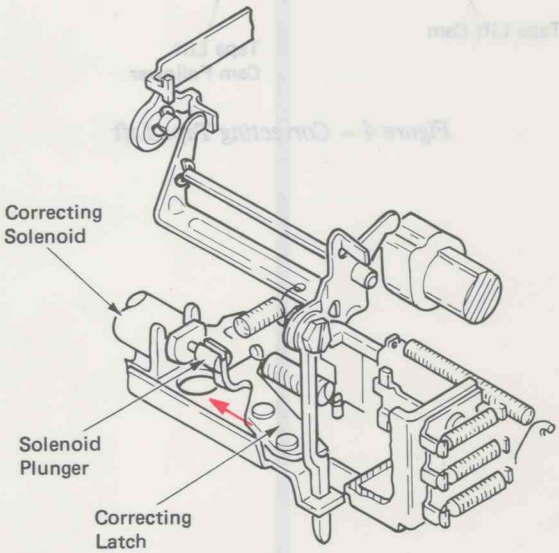
(Level 1)

Figure 2 – Correcting Latch Operation

CORRECTING LATCH RELEASE (Level 2)

When the correcting solenoid is energized, the solenoid plunger pulls the correcting latch to the left (Figure 3). The rest of the correcting latch operation is the same as Level 1.

As the tape lift actuator pivots, it activates both the tape lift mechanism and the tape feed mechanism. The tape lift and feed mechanisms operate as the print shaft rotates.



(Level 2)

Figure 3 – Correcting Latch Operation

CORRECTING TAPE LIFT

As the print sleeve rotates, the tape lift cam pivots the tape lift cam follower which pushes the tape lift latch and tape lift arm up (Figure 4). The rear of the lift arm moves the tape lift assembly up and places the correcting tape in front of the typehead. The tape lift assembly arm engages the tape supply cradle. As the tape lift assembly moves up, the cradle tilts and keeps the tape aligned with the supply spool, preventing the correcting tape from folding.

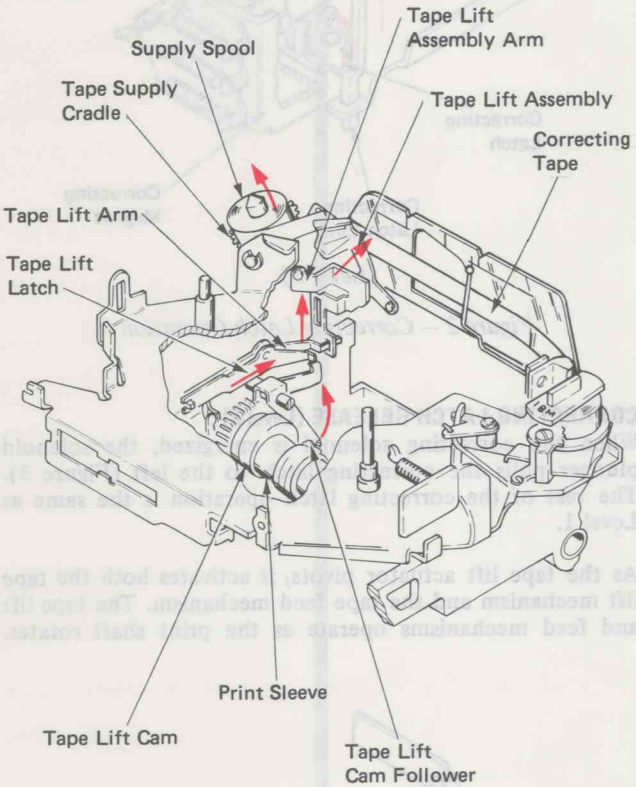


Figure 4 – Correcting Tape Lift

CORRECTING TAPE FEED

The tape feed cam on the print sleeve provides motion for tape feed. When the correcting latch releases and the tape lift actuator pivots top to rear, a lug on the right end of the actuator rotates the tape feed latch (Figure 5). The latch surface rotates out of the path of the tape feed cam follower, allowing it to follow the tape feed cam. The tape feed cam follower provides motion to the spiked wheel.

The spiked wheel is mounted on the tape feed swing arm and is spring loaded toward the take-up spool. This causes the spikes on the wheel to push into the used tape. As the spiked wheel rotates, it pulls new tape into the correcting position and winds the used tape onto the take-up spool.

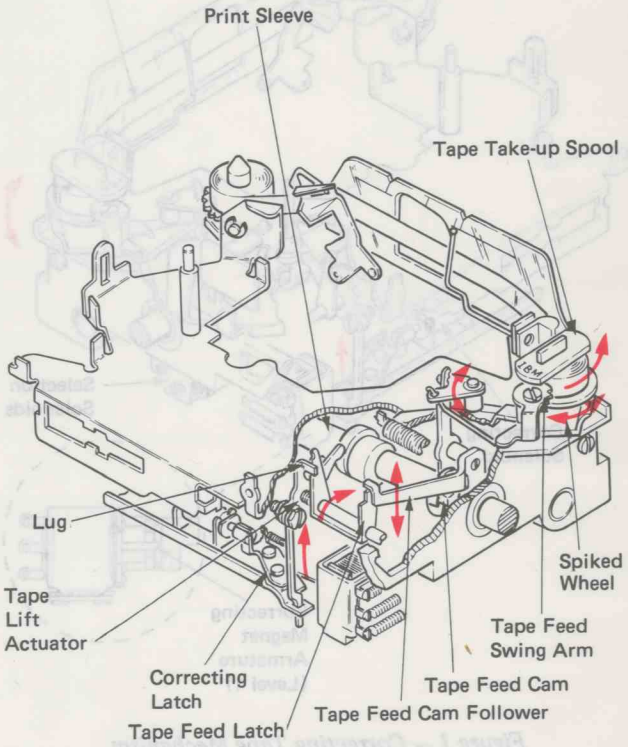
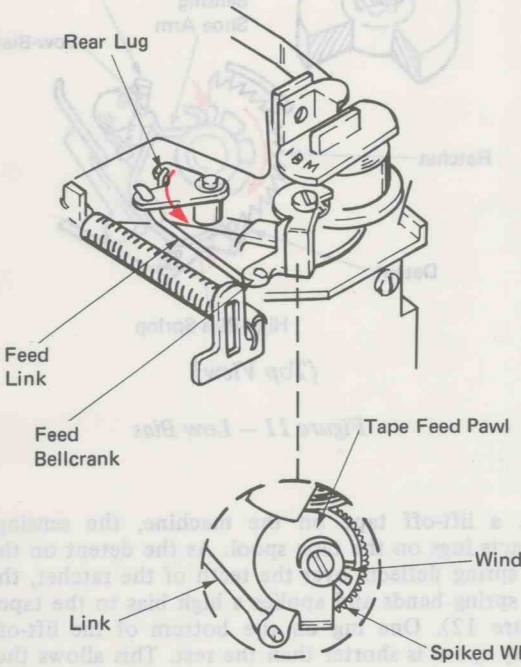


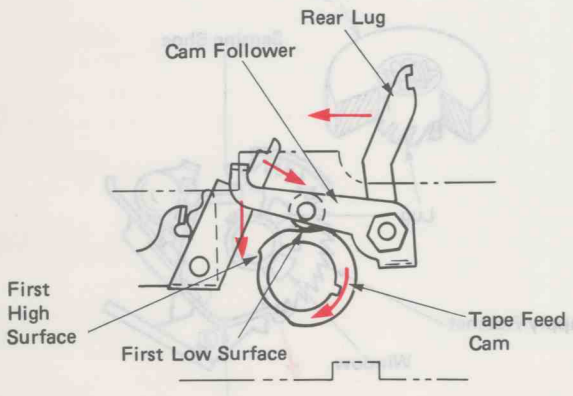
Figure 5 – Correcting Tape Feed

The tape feed cam has two high surfaces and two low surfaces. The first high surface provides one-third of the feed motion and the second high surface provides the remaining two-thirds motion (Figure 6).

As the tape feed cam follower moves to the first low surface of the tape feed cam, the rear lug on the follower moves forward. This motion allows the feed bellcrank and link to rotate the tape feed pawl counterclockwise and engage a window in the spiked wheel.



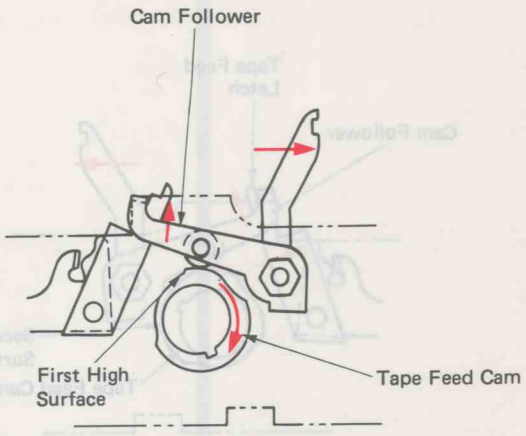
(Top View)



(Right Side View)

Figure 6 – Tape Feed

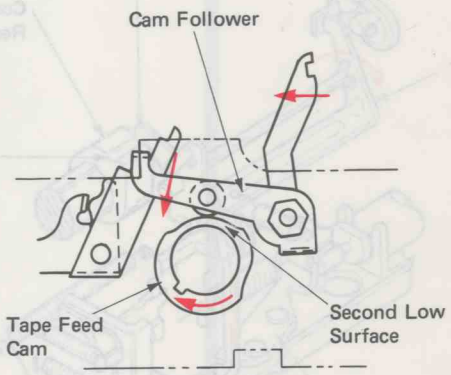
The tape feed cam then rotates to the first high surface (Figure 7). The cam follower pivots to move the tape feed pawl and spiked wheel clockwise for the first one-third of the tape feed. This motion tightens the correcting tape before the typehead prints.



(Right Side View)

Figure 7 – Tape Feed Motion

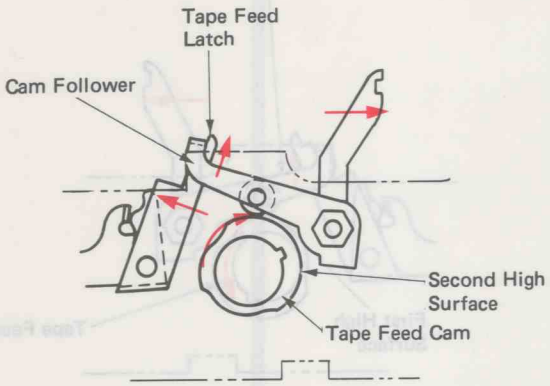
The feed cam then rotates to the second low surface (Figure 8).



(Right Side View)

Figure 8 – Tape Feed Motion

The second high surface then drives the cam follower, and the correcting tape advances the remaining two-thirds of tape feed (Figure 9). While the cam follower is on the second high surface of the tape feed cam, the tape feed latch moves under the cam follower. In this position, the tape feed latch prevents the follower from following the cam until the next correction cycle.



(Right Side View)

Figure 9 – Tape Feed Motion

As the print cycle completes, the correcting restore cam pivots the tape lift actuator top to front (Figure 10). The actuator moves the correcting latch link down to the latched position. At the end of the print cycle the cam follower on the tape lift actuator rests in a groove in the correcting restore cam.

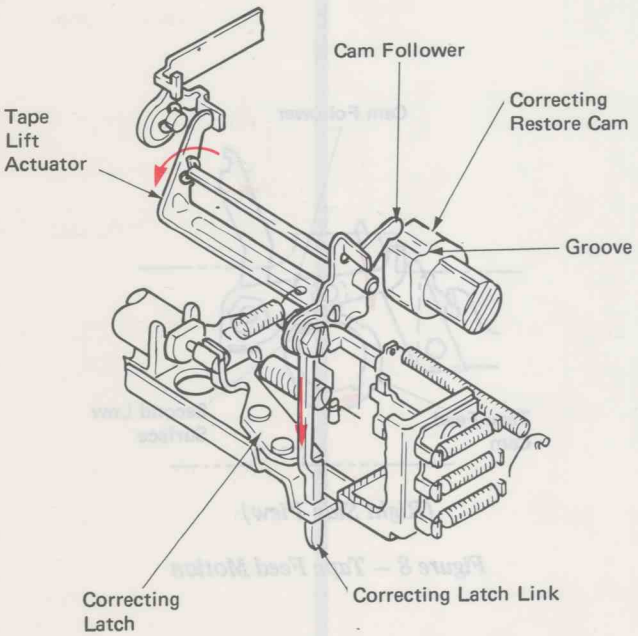
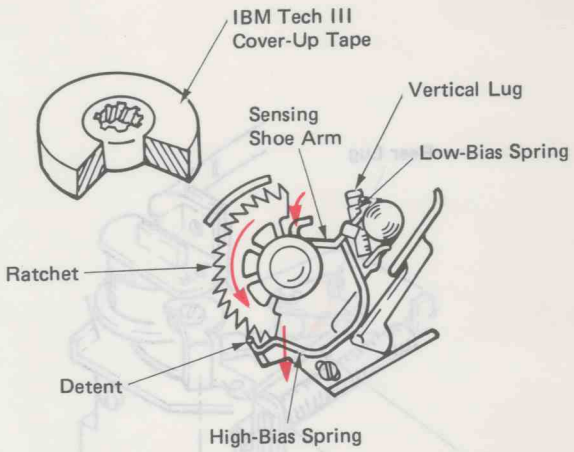


Figure 10 – Correcting Restore

TAPE BIAS SYSTEM

The correcting tape supply cradle assembly contains a bias system that supplies a low bias for the Tech III cover-up tape and a high bias for the lift-off tape.

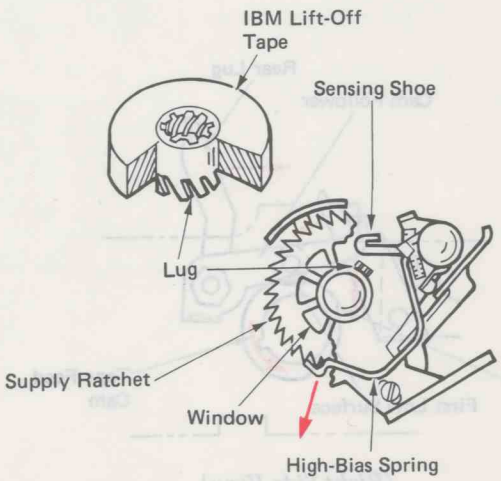
As cover-up tape is being pulled off the supply spool and the tape supply spool ratchet turns counterclockwise, the teeth on the ratchet deflect the detent on the high-bias spring (Figure 11). The low-bias spring is connected to the vertical lug on the sensing shoe arm and extends to produce the low bias on the ratchet.



(Top View)

Figure 11 – Low Bias

With a lift-off tape on the machine, the sensing shoe contacts lugs on the tape spool. As the detent on the high bias spring deflects over the teeth of the ratchet, the high bias spring bends and applies a high bias to the tape spool (Figure 12). One lug on the bottom of the lift-off tape supply spool is shorter than the rest. This allows the spool to engage completely with the supply spool ratchet if the sensing shoe is under a window in the ratchet when the operator loads the tape.

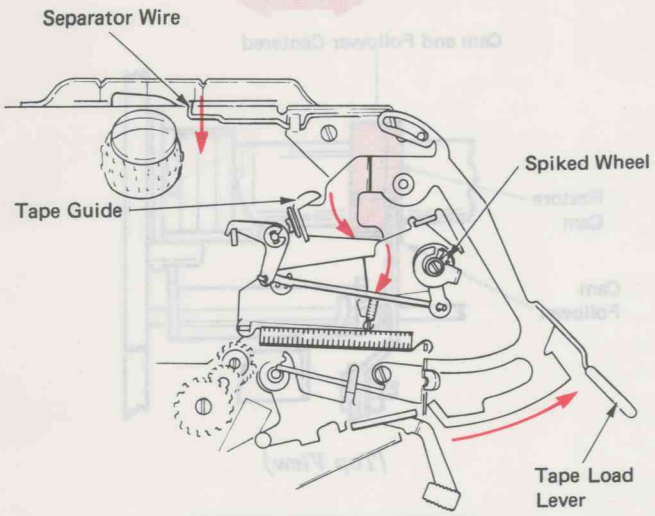


(Top View)

Figure 12 – High Bias

CORRECTING TAPE LOADING

To change the correcting tape, move the tape load lever to the load position (Figure 13). The load lever pivots the tape guide forward, the separator wire to the front, and the spiked wheel forward.

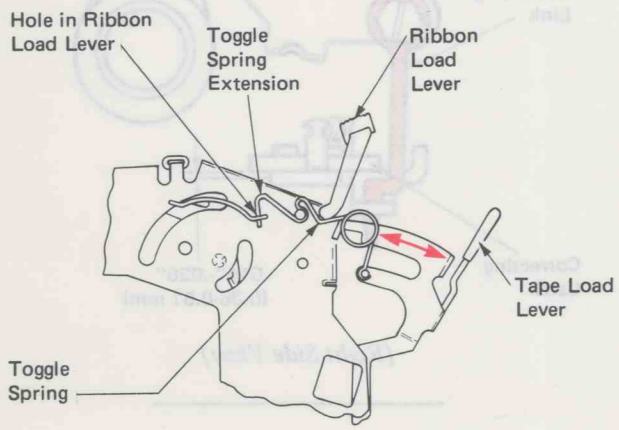


(Top View)

Figure 13 – Correcting Tape Loading

LOAD LEVER INTERLOCKS

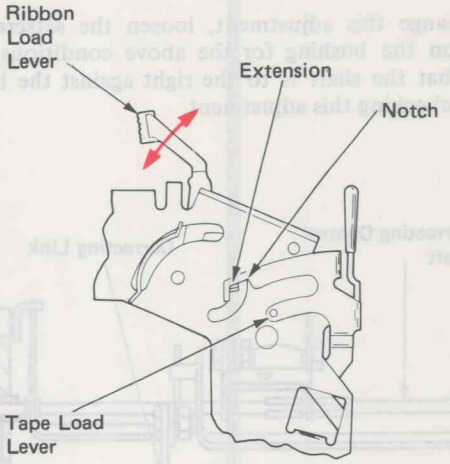
A toggle spring holds the tape load lever in either the load or type position (Figure 14). An extension on the spring engages a hole in the ribbon load lever. This extension prevents the ribbon load lever from moving while the tape lever is in the load position.



(Bottom View)

Figure 14 – Ribbon Load Lever Interlock

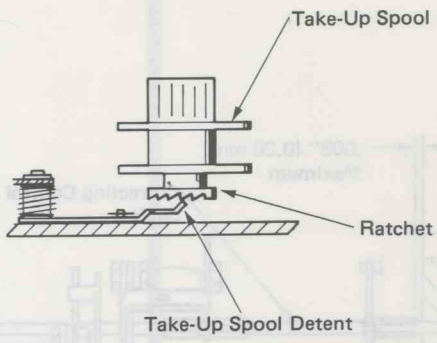
When the ribbon load lever is moved to the load position, an extension on the lever enters a notch in the tape load lever (Figure 15). This prevents the tape load lever from moving to the right.



(Bottom View)

Figure 15 – Tape Load Lever Interlocked

To prevent the operator from turning the take-up spool in the wrong direction, a take-up spool detent engages a ratchet on the bottom of the take-up spool (Figure 16).



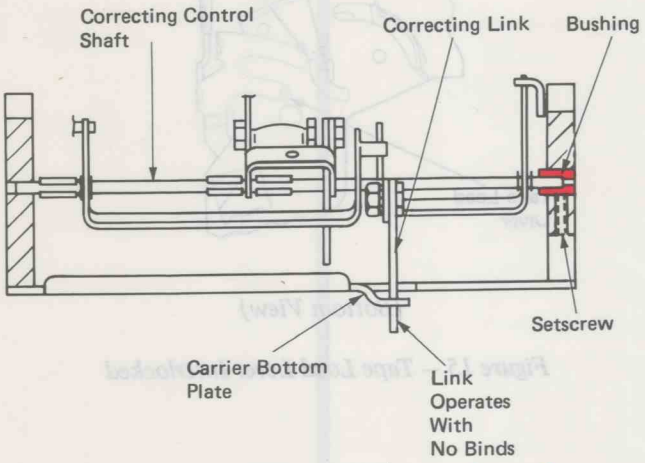
(Front View)

Figure 16 – Take-Up Spool Detent

CORRECTING TAPE ADJUSTMENTS

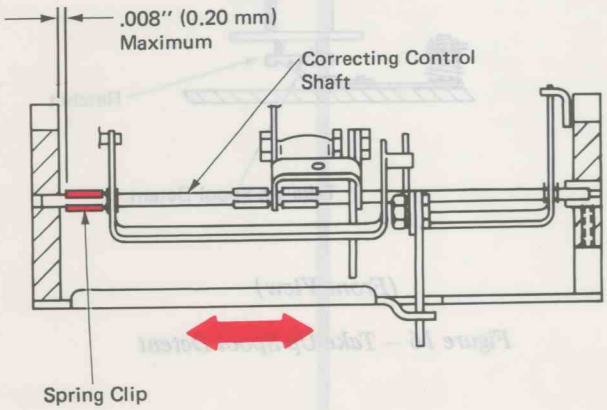
1. *Correcting Control Shaft* – Adjust the correcting control shaft left or right so the correcting link is vertical and operates without binding in the carrier bottom plate.

   To change this adjustment, loosen the setscrew and position the bushing for the above conditions. Make sure that the shaft is to the right against the bushing when checking this adjustment.



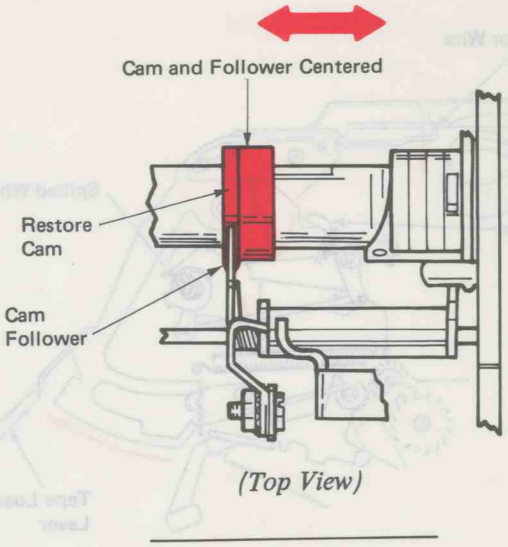
(Front View)

2. *Correcting Control Shaft End Clearance* – Adjust the spring clip on the correcting control shaft left or right for a maximum end clearance of .008" (0.20 mm).



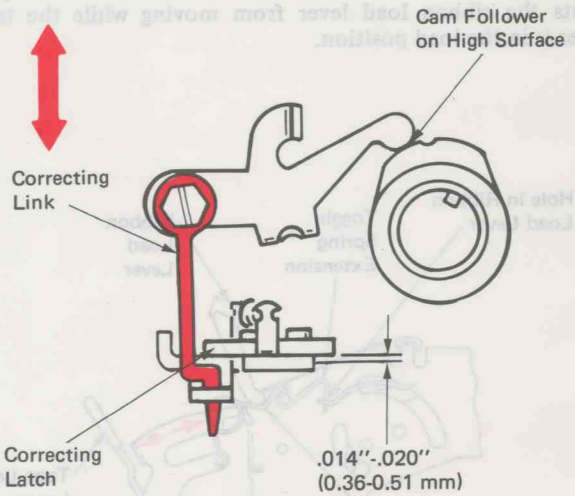
(Front View)

3. *Correcting Restore Cam* – Position the correcting restore cam left or right so the cam follower on the tape lift actuator is centered on the cam.



(Top View)

4. *Correcting Link* – Adjust the correcting link up or down so the link clears the correcting latch by .014"-.020" (0.36-0.51 mm) with the tape lift actuator on the high surface of the restore cam.

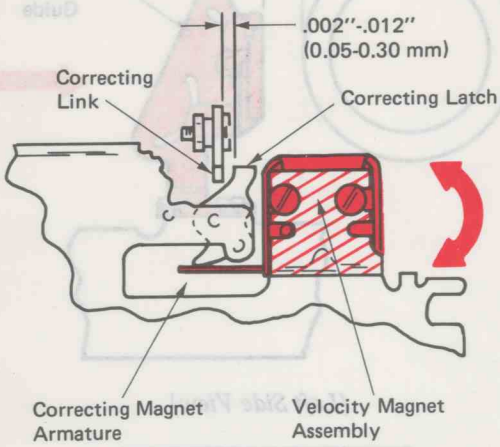


(Right Side View)

5. *Correcting Latch* – Adjust the velocity magnet assembly rotationally so the correcting latch clears the correcting link by .002"-.012" (0.05-0.30 mm) when the correcting and low-velocity magnets are energized.

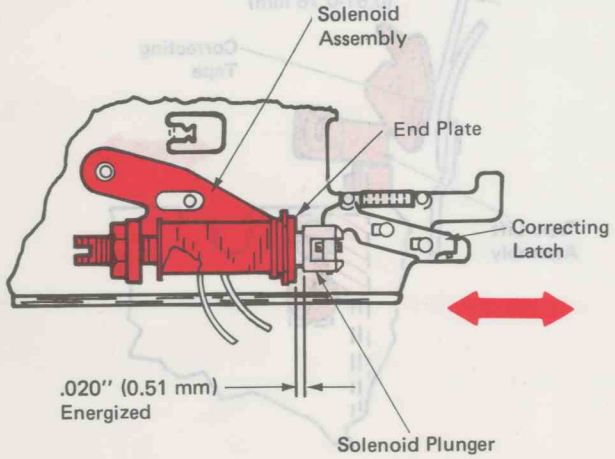
The machine should be hand cycled in a low velocity correcting mode until the velocity slider just contacts the armature of the high velocity magnet. The clearance may then be observed from the bottom with the machine in the service position and the carrier at the right.

This adjustment affects adjustment No. 5 (velocity magnet assembly) in the Print section.



(Bottom View)

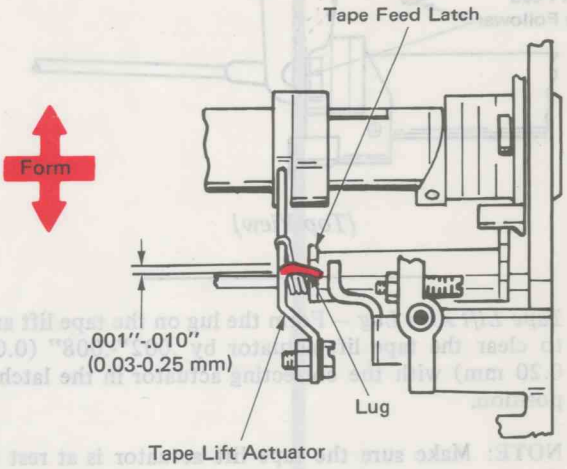
6. *Correcting Solenoid* – With the solenoid plunger in the energized position, move the solenoid assembly to the left or right until there is .020" (0.51 mm) clearance between the solenoid assembly end plate and the step on the solenoid plunger with the correcting latch held to the left. This sets the plunger air gap.



(Top View)

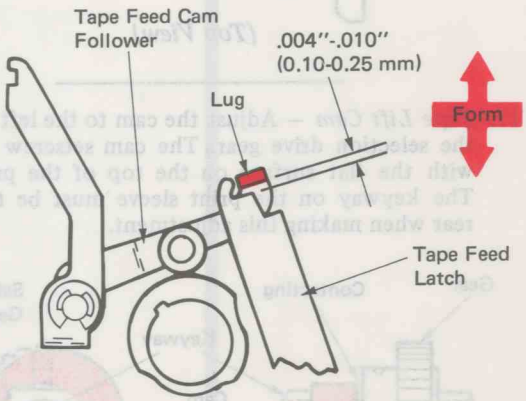
7. *Tape Feed Latch* – Form the right-hand lug of the tape lift actuator so it clears the tape feed latch by .001"-.010" (0.03-0.25 mm) with the actuator in the latched position.

NOTE: Make sure the tape lift actuator is at rest on the correcting latch and not on the high surface of the restore cam when checking this adjustment.



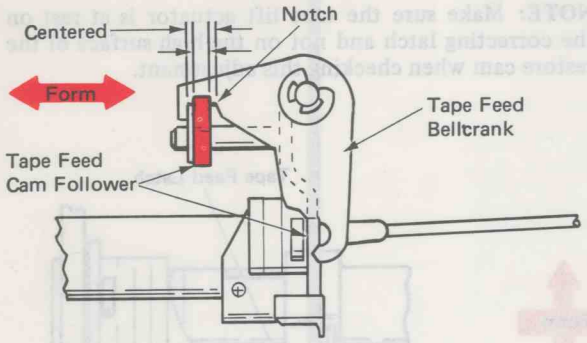
(Top View)

8. *Tape Feed Cam Follower* – Form the horizontal lug on the tape feed cam follower up or down to clear the stop on the tape feed latch by .004"-.010" (0.10-0.25 mm) with the print shaft in the rest position.



(Left Side View)

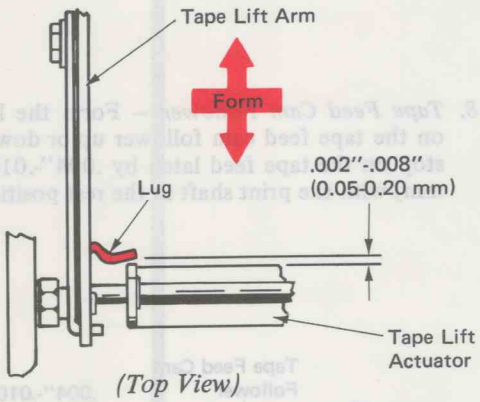
9. *Tape Feed Cam Follower Vertical Arm* – Form the vertical arm on the tape feed cam follower left or right to align with the center of the notch in the tape feed bellcrank.



(Top View)

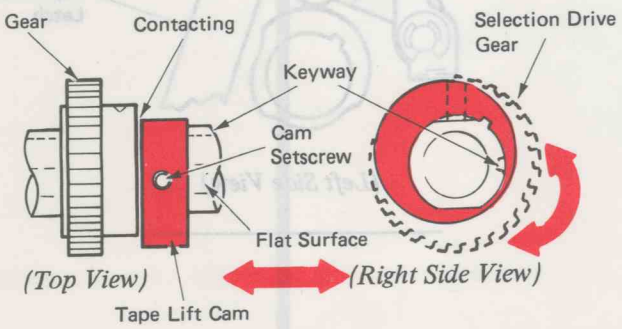
10. *Tape Lift Arm Lug* – Form the lug on the tape lift arm to clear the tape lift actuator by .002"-.008" (0.05-0.20 mm) with the correcting actuator in the latched position.

NOTE: Make sure the tape lift actuator is at rest on the correcting latch and not on the high surface of the restore cam when checking this clearance.



(Top View)

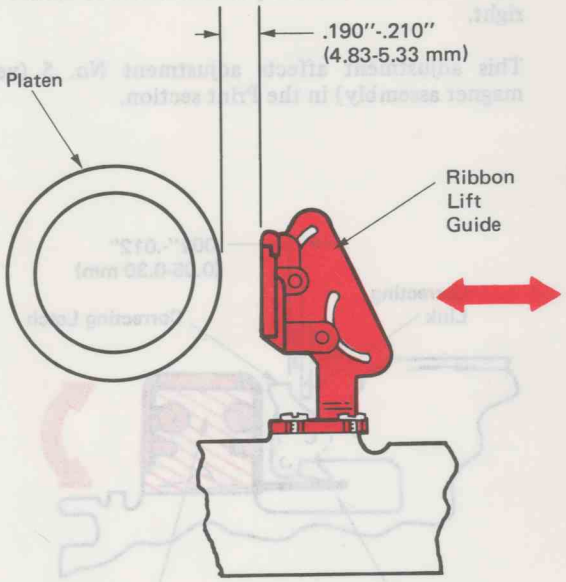
11. *Tape Lift Cam* – Adjust the cam to the left to contact the selection drive gear. The cam setscrew must align with the flat surface on the top of the print sleeve. The keyway on the print sleeve must be toward the rear when making this adjustment.



(Top View) *(Right Side View)*

12. *Left Ribbon Lift Guide* – With the machine half cycled and the left ribbon lift guide in the medium lift position, adjust the lift guide front or rear for a clearance of .190"-.210" (4.83-5.33 mm) between the lift guide and the platen.

NOTE: Level 1 lift guide is not adjustable.

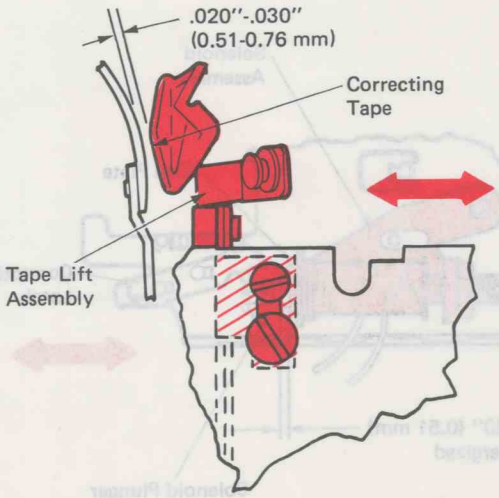


(Left Side View)

NOTE: The cardholder must be adjusted properly before the following adjustments are made.

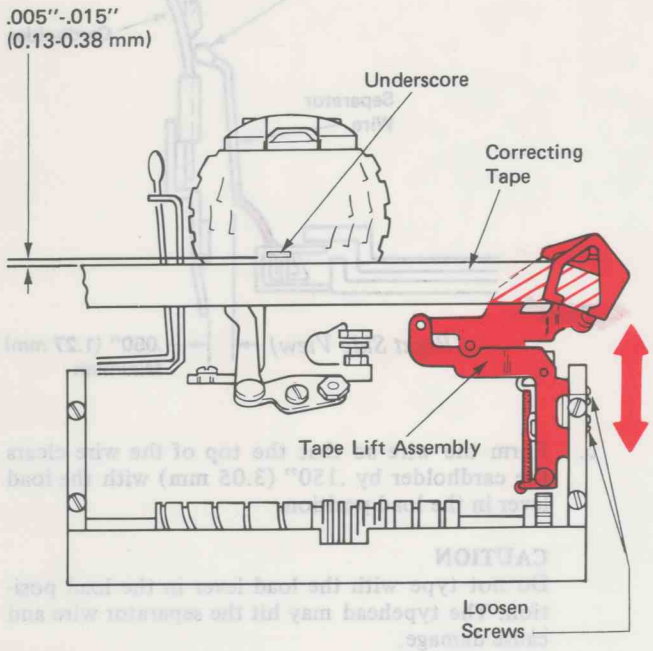
13. *Tape Lift Assembly* – Adjust the tape lift assembly as follows:

a. Front to rear so the tape clears the front of the cardholder by .020"-.030" (0.51-0.76 mm). The tape supply cradle fork must be loose while making this adjustment.



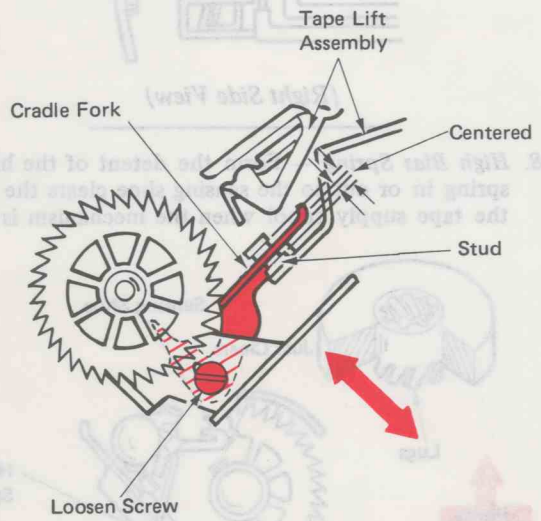
(Left Side View)

b. Vertically so the bottom of the underscore clears the top of the tape by .005"-.015" (0.13-0.38 mm) during a print operation.



(Rear View)

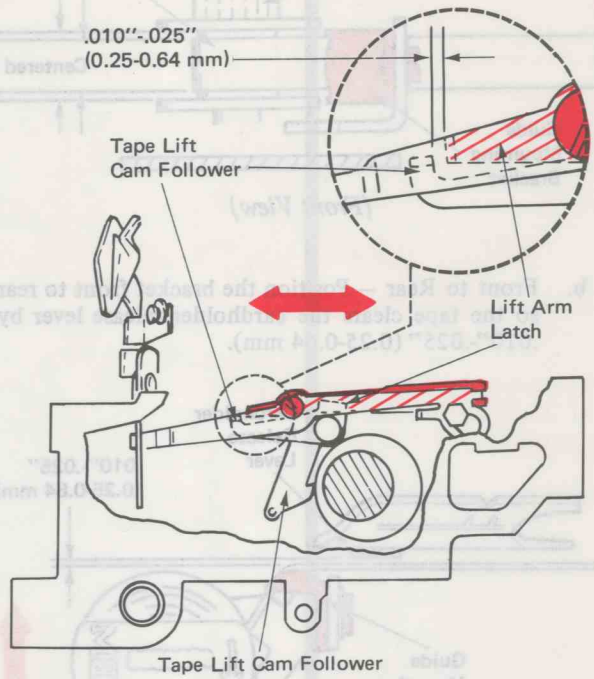
14. *Tape Supply Cardle Fork* – Position the cradle fork so it centers on the stud of the tape lift assembly.



(Top View)

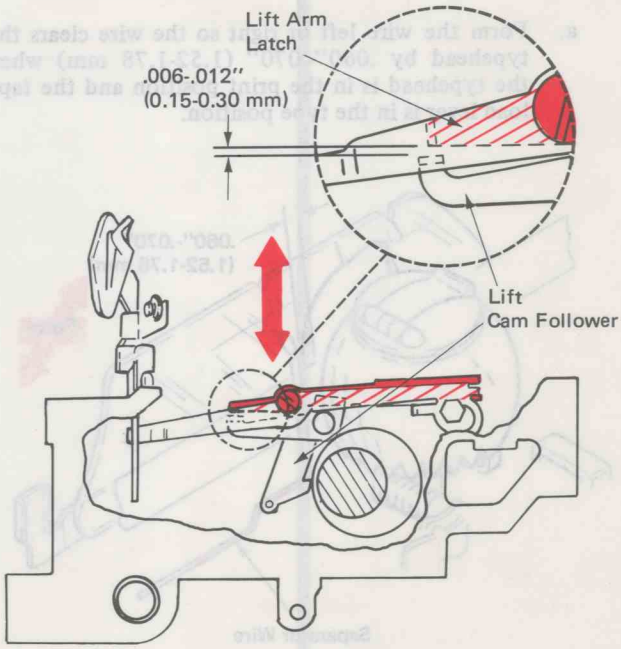
15. *Lift Arm Latch* – Adjust the lift arm latch as follows:

a. Position the lift arm latch front or rear for a clearance of .010"-.025" (0.25-0.64 mm) to the tape lift cam follower, with the tape lift actuator latched and the restore cam follower away from the high surface.



(Left Side View)

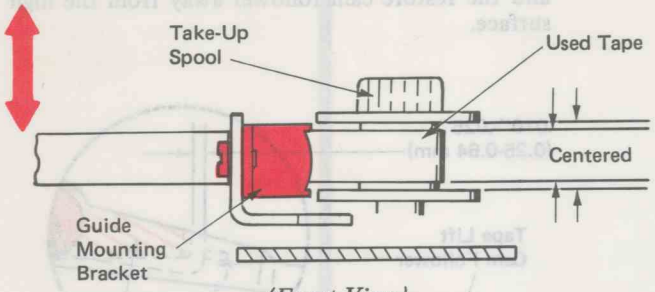
b. Position the lift arm latch vertically so the bottom of the latch clears the lift cam follower by .006"-.012" (0.15-0.30 mm) with the tape lift actuator cam follower on the low surface of the restore cam.



(Left Side View)

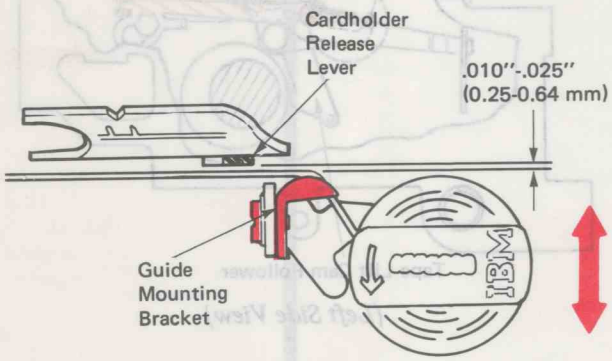
16. *Tape Guide* – Adjust the guide mounting bracket as follows:

a. Vertical – Position the bracket up or down so the used tape is centered on the take-up spool.



(Front View)

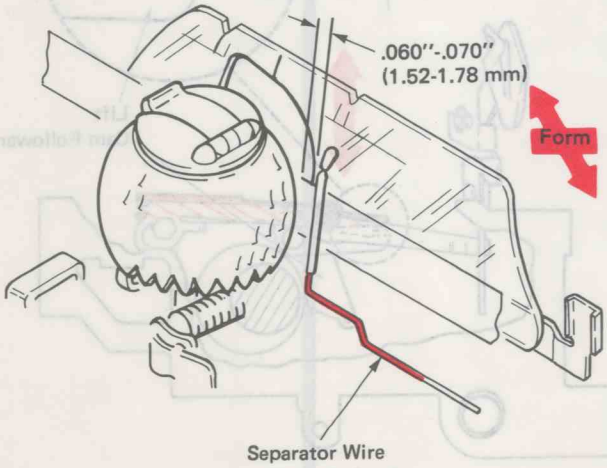
b. Front to Rear – Position the bracket front to rear so the tape clears the cardholder release lever by .010"-.025" (0.25-0.64 mm).



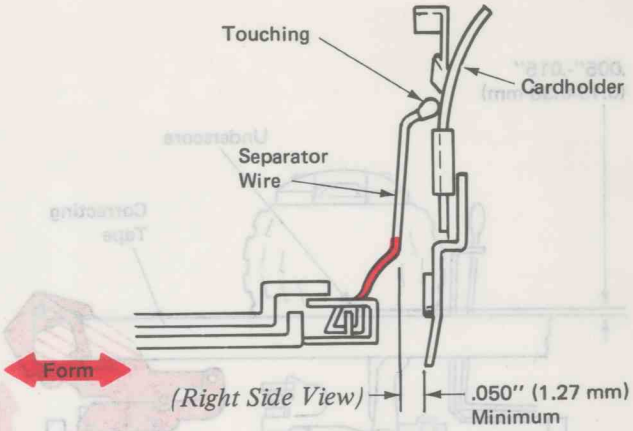
(Top View)

17. *Separator Wire* – Adjust the separator as follows:

a. Form the wire left or right so the wire clears the typehead by .060"-.070" (1.52-1.78 mm) when the typehead is in the print position and the tape load lever is in the type position.



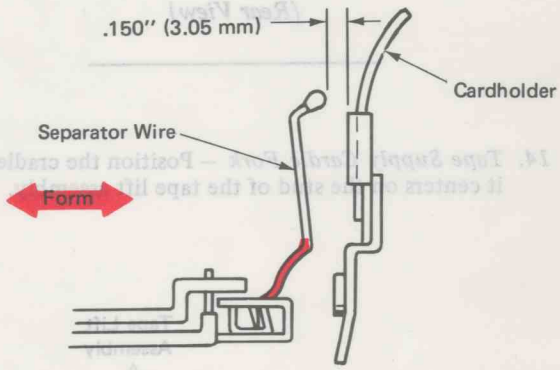
b. Form the wire so the top of the separator wire just touches the cardholder while maintaining a minimum of .050" (1.27 mm) clearance at the bottom of the vertical part of the separator wire with the tape load lever in the type position.



(Right Side View)

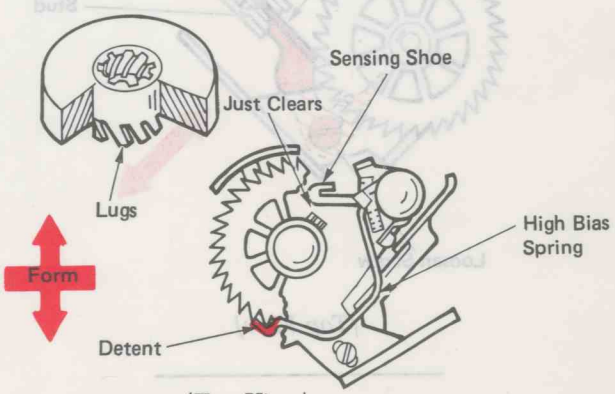
c. Form the wire so that the top of the wire clears the cardholder by .150" (3.05 mm) with the load lever in the load position.

CAUTION
Do not type with the load lever in the load position. The typehead may hit the separator wire and cause damage.



(Right Side View)

18. *High Bias Spring* – Form the detent of the high bias spring in or out so the sensing shoe clears the lugs on the tape supply spool when the mechanism is at rest.



(Top View)

CARDHOLDER OPERATIONAL THEORY

The cardholder guides the paper around the platen as it is fed into the machine. The operator also uses the cardholder to align the paper and position the carrier on the writing line.

The cardholder bracket is mounted to the carrier by the cardholder mounting brackets (Figure 1). A pin on the cardholder bracket and a pin on the cardholder load lever engage slots in the cardholder to hold it in place. The load lever spring biases the load lever and the cardholder to the left.

The cardholder is removed by pressing the cardholder load lever. As the lever is pressed, the pin on the load lever pulls the cardholder to the right. The cardholder may then be lifted from the machine.

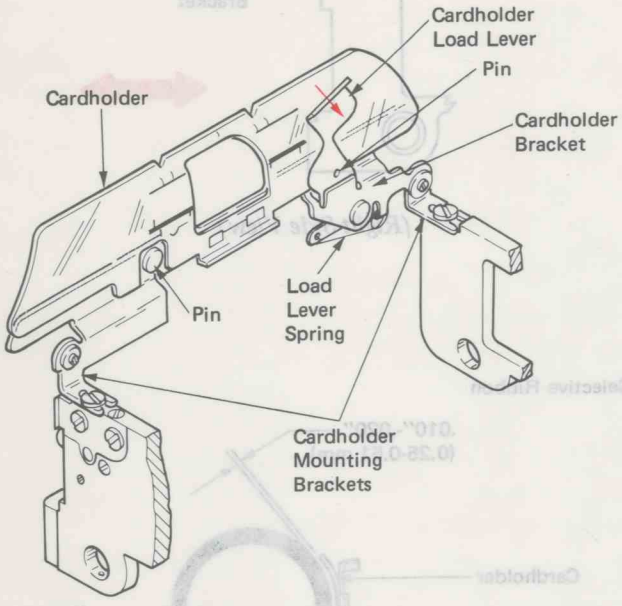
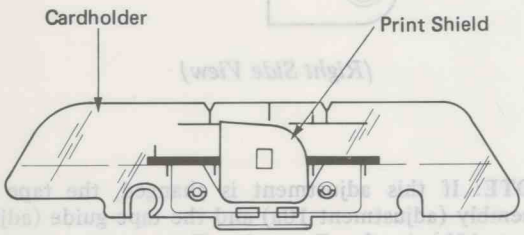


Figure 1 – Cardholder

A cardholder with a print shield may be installed. The print shield covers most of the opening in the center of the cardholder. A small hole in the shield allows the selected character on the typehead to strike the paper (Figure 2).



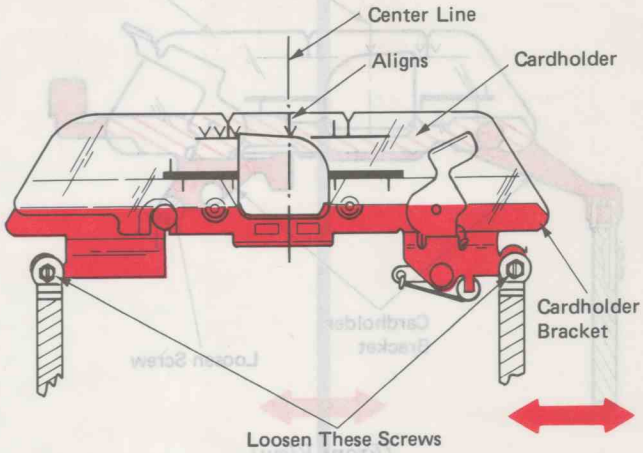
(Front View)

Figure 2 – Print Shield

CARDHOLDER ADJUSTMENTS

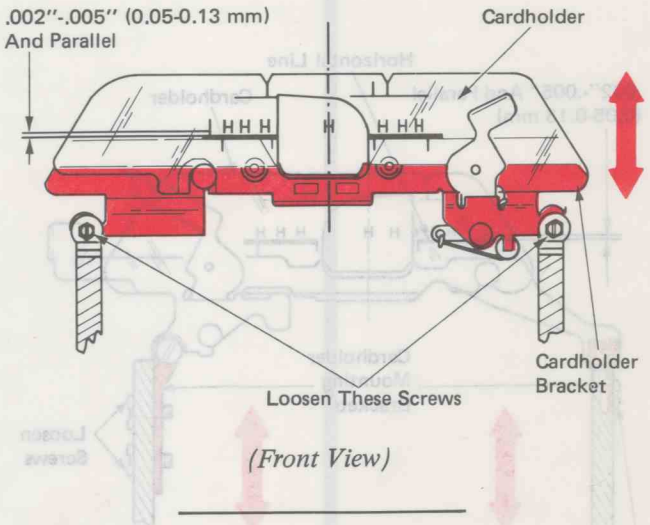
1. *Cardholder (Ribbon Cassette System)* – Adjust the cardholder bracket left or right and up or down for the following conditions:

   a. Left to right so the center line on the cardholder aligns with the point of the character *V* in 10 and 12 pitch.



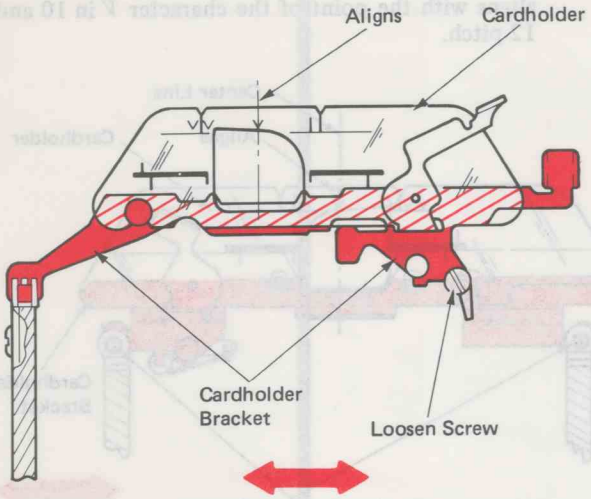
(Front View)

   b. Up or down for a clearance of .002"-.005" (0.05-0.13 mm) between the horizontal line and the bottom of typed uppercase letters. The line should be parallel to the bottom edge of the characters.



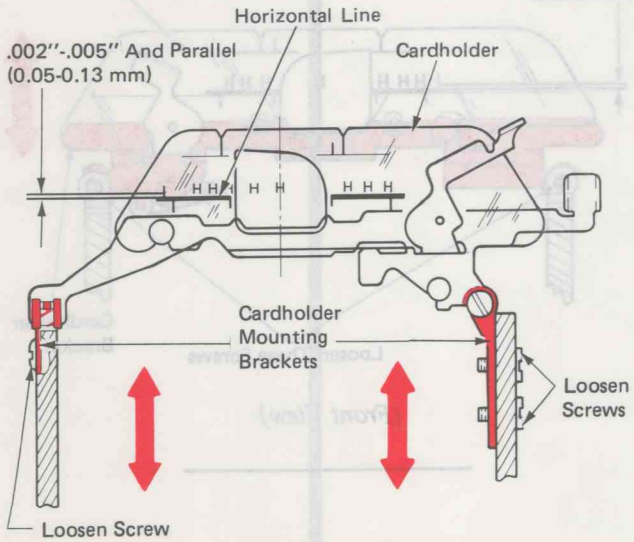
(Front View)

2. *Cardholder (Left-To-Right) (Selective Ribbon)* – Adjust the cardholder bracket so the center line on the cardholder aligns with the point of the character *V* in 10 and 12 pitch.



(Front View)

3. *Cardholder Height (Selective Ribbon)* – Adjust the cardholder mounting brackets for a clearance of .002"-.005" (0.05-0.13 mm) between the horizontal line and the bottom of typed uppercase letters. The line should be parallel to the bottom edge of the characters.

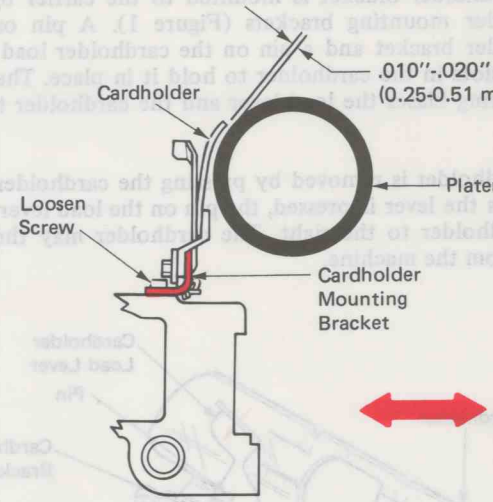


(Front View)

4. *Cardholder Clearance* – Adjust the cardholder mounting brackets front to rear for a clearance of .010"-0.20" (0.25-0.51 mm) between the cardholder and the platen.

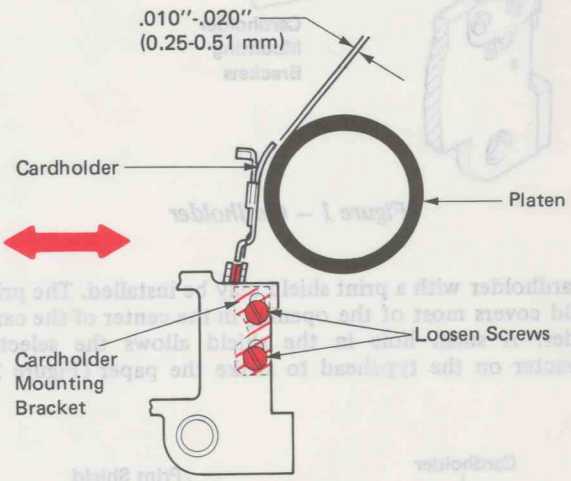
This clearance is measured at the closest point on each side of the cardholder.

Ribbon Cassette System



(Right Side View)

Selective Ribbon



(Right Side View)

NOTE: If this adjustment is changed, the tape lift assembly (adjustment 10a) and the tape guide (adjustment 13b) in the Correcting Tape section must be checked.

ESCAPEMENT OPERATIONAL THEORY

As the leadscrew rotates, it moves the carrier left or right. The leadscrew drive mechanism rotates the leadscrew Figure 1). The escapement control mechanism releases the leadscrew. The leadscrew rotates the proper amount and stops when the carrier reaches the desired position.

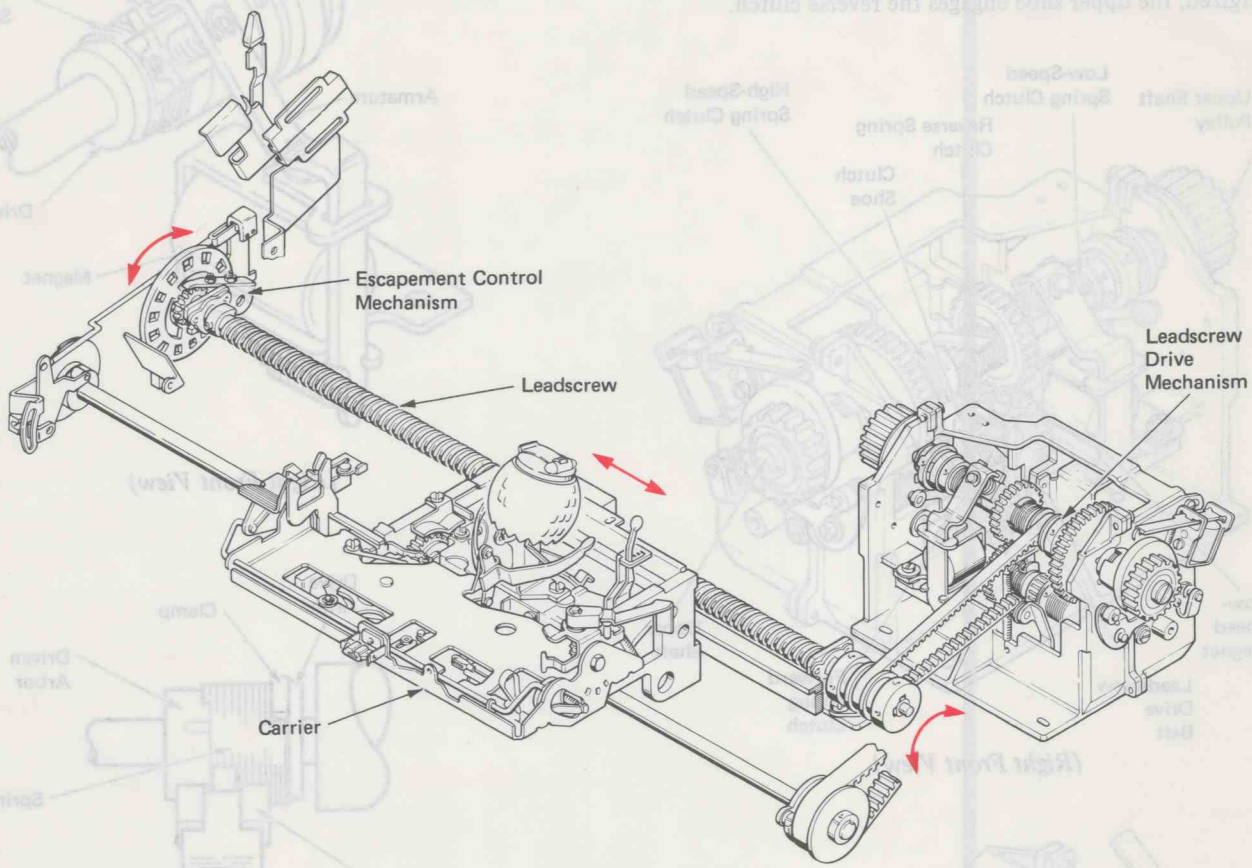
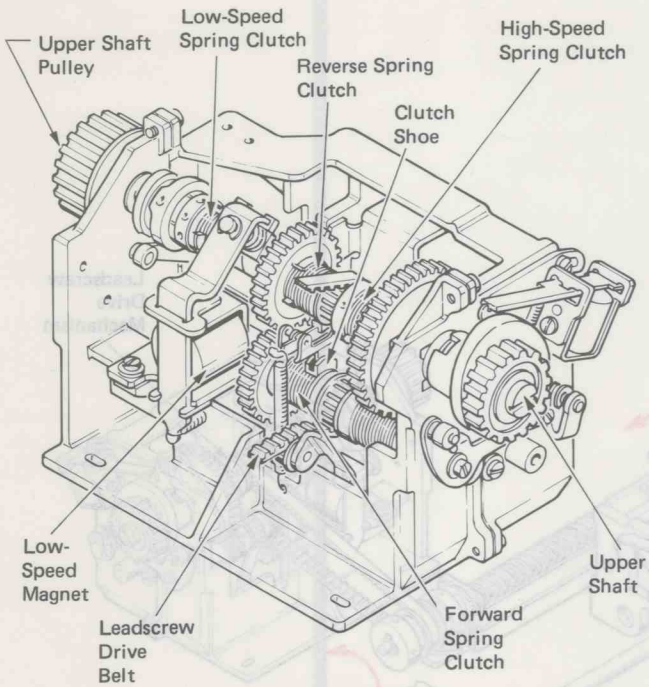


Figure 1 – Leadscrew Escapement

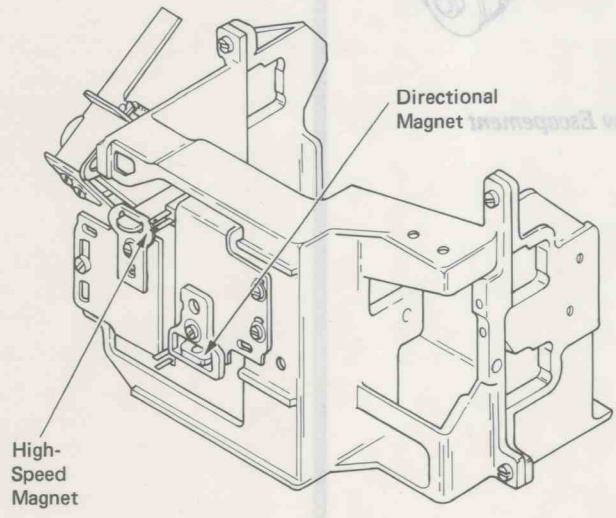
LEADSCREW DRIVE OPERATION

The leadscrew has four modes: low-speed forward, low-speed reverse, high-speed forward, and high-speed reverse. Four spring clutches (low speed, high speed, forward, and reverse) drive the leadscrew drive belt (Figure 2). Drive shoes engage the springs to drive the spring clutches.

When the motor is on, the upper shaft pulley rotates the power module upper shaft. When escapement is required, two spring clutches rotate the leadscrew drive belt top to rear or top to front at low or high speed. The low-speed and high-speed magnets determine the speed of leadscrew rotation. The directional magnet directs the leadscrew to rotate top to front or top to rear. When the directional magnet is in the rest position, a spring holds the lower shoe engaged with the forward clutch. When the magnet is energized, the upper shoe engages the reverse clutch.



(Right Front View)

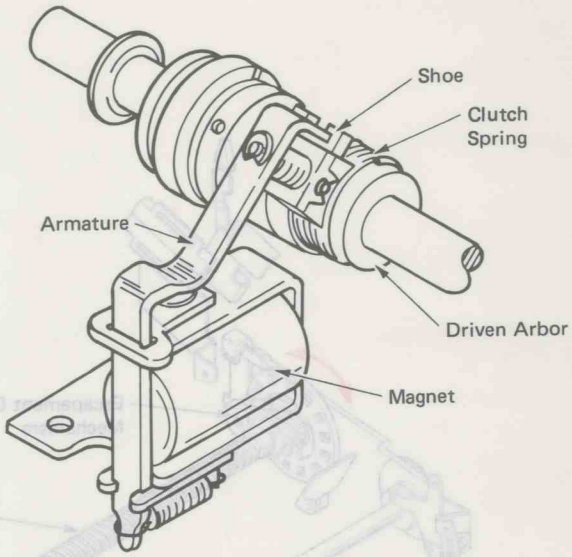


(Right Rear View)

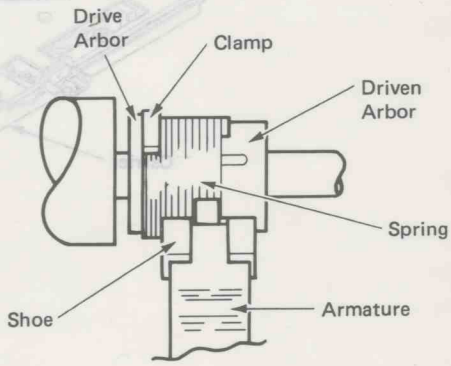
Figure 2 – Leadscrew Drive

SPRING CLUTCH OPERATION

Each spring clutch consists of a drive arbor, spring, and driven arbor (Figure 3). The spring is clamped to the drive arbor and rotates with it. The driven arbor is inside the spring and rotates freely in either direction until the clutch is engaged. To engage the clutch, a shoe on the magnet armature holds the clutch spring against the driven arbor. This transfers motion from the rotating drive arbor to the driven arbor.



(Right Front View)



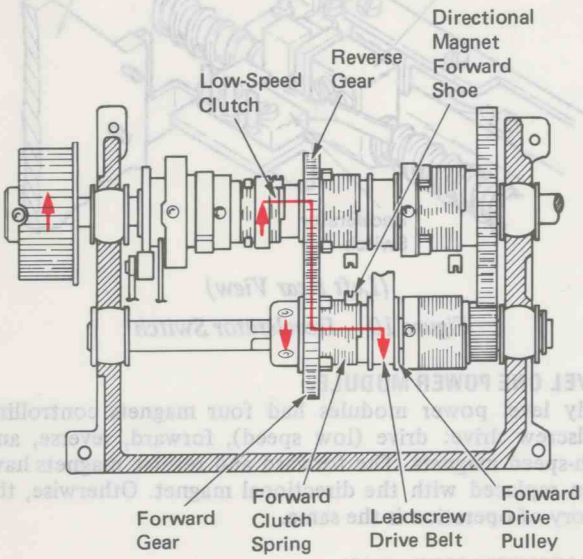
(Top View)

Figure 3 – Spring Clutch Operation

LOW-SPEED DRIVE

For low-speed drive, the low-speed magnet is energized and the low-speed clutch drives the reverse gear top to rear (Figure 4). The reverse gear drives the forward gear top to front. At this time the forward clutch spring, clamped to the forward gear, and the reverse clutch spring, clamped to the reverse gear, rotate.

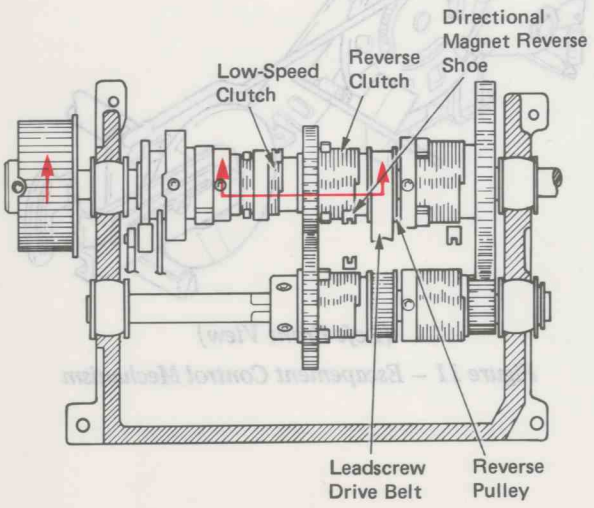
The position of the directional magnet armature determines which spring clutch (forward or reverse) engages to drive the leadscrew drive belt. With the directional magnet deenergized, the forward clutch engages and drives the forward pulley. The forward pulley drives the leadscrew drive belt top to front.



(Front View)

Figure 4 – Low-Speed Forward Drive

With the directional magnet energized, the reverse clutch engages and drives the reverse pulley (Figure 5). The reverse pulley drives the leadscrew drive belt top to rear.



(Front View)

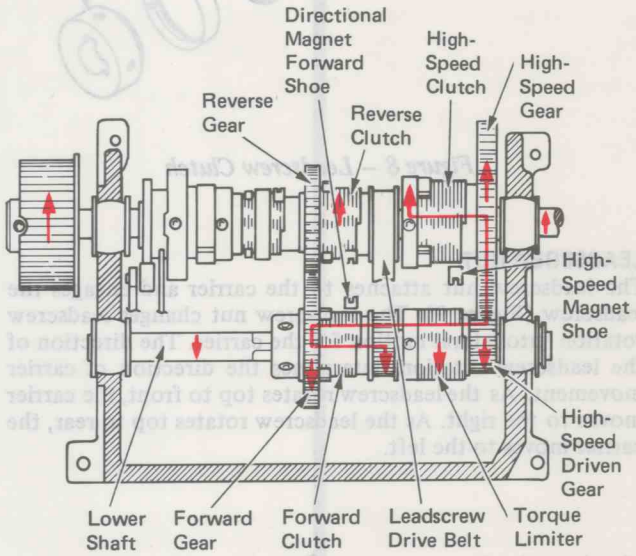
Figure 5 – Low-Speed Reverse Drive

HIGH-SPEED DRIVE

The leadscrew rotates at high speed when more than 1½ inches of carrier movement are required. For high speed, the high-speed magnet is energized and the high-speed clutch drives the high-speed gear top to rear (Figure 6). This rotates the high-speed driven gear top to front. The high-speed driven gear rotates the torque limiter and the lower shaft. The torque limiter prevents sudden changes in the speed of the leadscrew when changing from high speed to low speed, or from low speed to high speed.

As the lower shaft rotates, the forward gear rotates top to front at high speed. The forward gear drives the reverse gear at high speed. At this time, the forward clutch spring and the reverse clutch spring are rotating. The position of the directional magnet armature determines which spring clutch (forward or reverse) engages to drive the leadscrew drive belt.

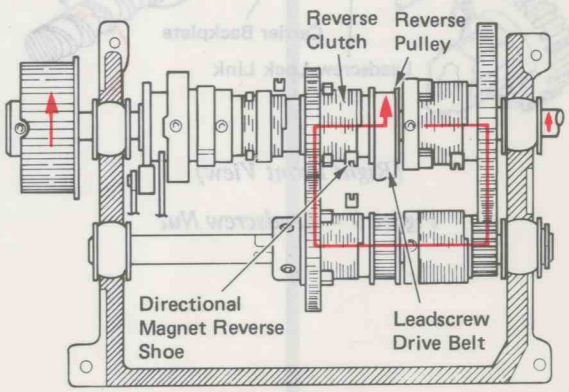
With the directional magnet deenergized, the forward clutch engages and drives the forward pulley. The forward pulley drives the leadscrew drive belt top to front at high speed.



(Front View)

Figure 6 – High-Speed Forward Drive

With the directional magnet energized, the reverse clutch engages and drives the reverse pulley (Figure 7). The reverse pulley drives the leadscrew drive belt top to rear at high speed.



(Front View)

Figure 7 – High-Speed Reverse Drive

LEADSCREW CLUTCH

The leadscrew clutch is a slip clutch and consists of a drive pulley, two clutch springs and two driven arbors (Figure 8). The leadscrew drive belt rotates and drives the leadscrew clutch drive pulley. When carrier movement is inhibited, the leadscrew clutch allows the leadscrew drive pulley to rotate while the escapement control mechanism holds the leadscrew. When the leadscrew is released, the leadscrew clutch rotates the leadscrew. The position of the right driven arbor determines the driving torque of the leadscrew clutch.

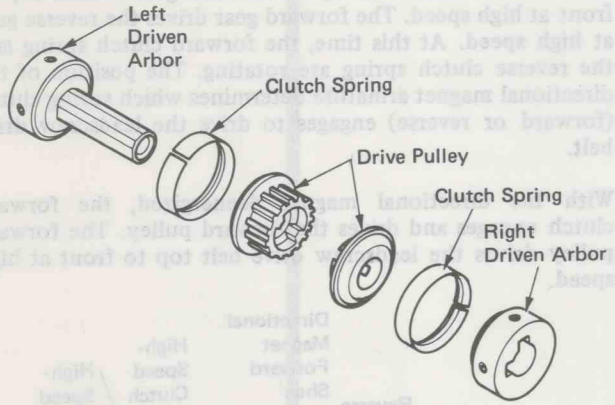
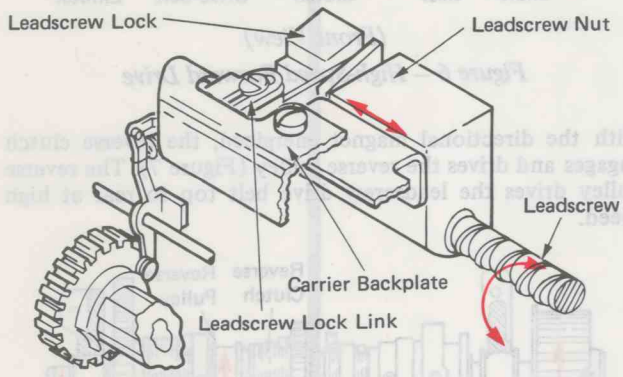


Figure 8 – Leadscrew Clutch

LEADSCREW NUT

The leadscrew nut attaches to the carrier and engages the leadscrew (Figure 9). The leadscrew nut changes leadscrew rotation into lateral motion for the carrier. The direction of the leadscrew rotation determines the direction of carrier movement. As the leadscrew rotates top to front, the carrier moves to the right. As the leadscrew rotates top to rear, the carrier moves to the left.

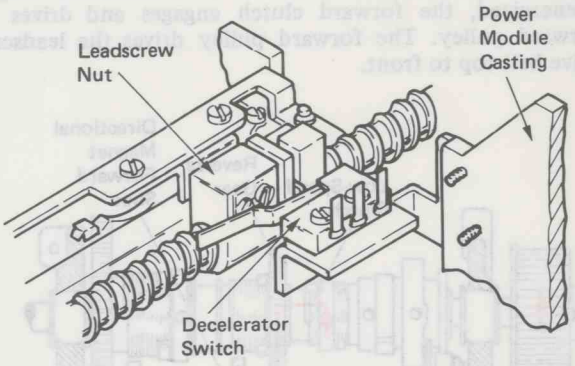


(Right Front View)

Figure 9 – Leadscrew Nut

DECELERATOR SWITCH

A decelerator switch was used on some early model 75 machines. It is mounted on the power module casting and is operated by the leadscrew nut (Figure 10). When the carrier moves at high speed, the switch deenergizes the high-speed magnet and energizes the low-speed magnet when the carrier is within 1½ inches of the right side frame. This changes the leadscrew drive from high speed to low speed to ensure that the carrier moves at low speed when within 1½ inches of the right side frame.



(Left Rear View)

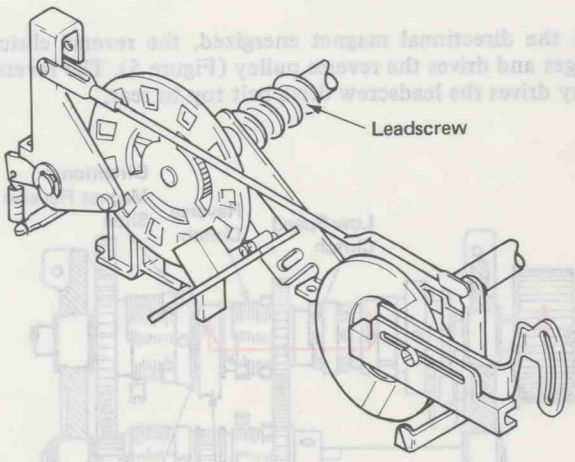
Figure 10 – Decelerator Switch

LEVEL ONE POWER MODULE

Early level power modules had four magnets controlling leadscrew drive: drive (low speed), forward, reverse, and high-speed magnets. The forward and reverse magnets have been replaced with the directional magnet. Otherwise, the theory of operation is the same.

ESCAPEMENT OPERATION

The escapement control mechanism keeps the leadscrew from moving, releases the leadscrew to move the carrier, controls the leadscrew rotation, then stops the leadscrew (Figure 11).

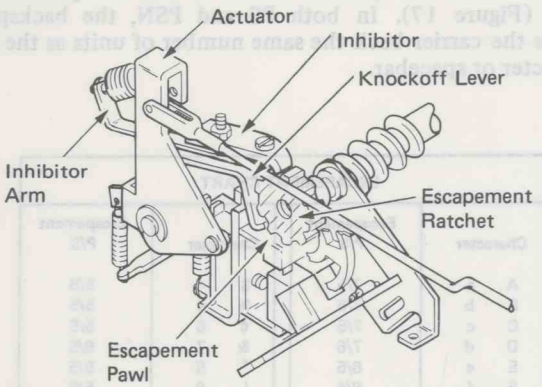


(Left Front View)

Figure 11 – Escapement Control Mechanism

ESCAPEMENT RELEASE

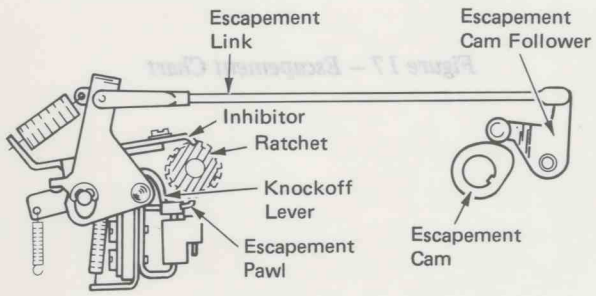
The escapement release assembly consists of the actuator, knockoff lever, and inhibitor arm (Figure 12). Escapement release pivots the inhibitor into the escapement ratchet, drives the escapement pawl out of the ratchet, and removes the inhibitor from the ratchet so the leadscrew can rotate.



(Left Front View)

Figure 12 – Escapement Release Assembly

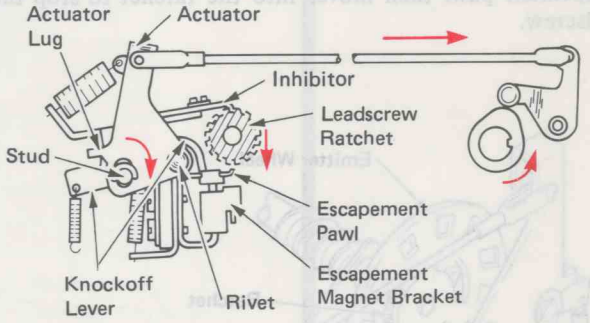
The print shaft moves the escapement release assembly. When a machine operation requires carrier movement, the escapement cam on the print feedback magnet wheel pivots the escapement cam follower top to front (Figure 13). This pulls the escapement link to the front and pivots the escapement release assembly top to front. As the release assembly pivots, the inhibitor enters a notch in the escapement ratchet. As the inhibitor bottoms in the notch, the knockoff lever contacts the escapement pawl. Further motion of the escapement link causes the knockoff lever to drive the escapement pawl out of the ratchet and against the escapement magnet bracket.



(Left Side View)

Figure 13 – Escapement Release Operation

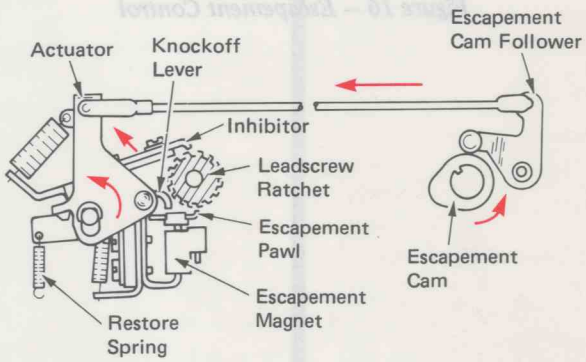
With the escapement pawl against the magnet bracket, additional link motion causes the actuator to pivot on the rivet instead of the stud (Figure 14). This pivots the actuator lug away from the knockoff lever so the knockoff lever can drive the escapement pawl firmly against the magnet bracket. The leadscrew drive mechanism drives the leadscrew clutch top to front. This biases the leadscrew ratchet against the inhibitor to remove the play between the inhibitor and ratchet in the same direction during each print operation. During a print operation, printing occurs at this time.



(Left Side View)

Figure 14 – Escapement Release Operation

As the escapement cam continues to rotate, the cam follower moves toward the low surface, allowing the restore spring to pivot the release assembly top to rear (Figure 15). The inhibitor pivots out of the ratchet. Now the escapement magnet holds the escapement pawl out of the ratchet and the leadscrew is free to rotate.

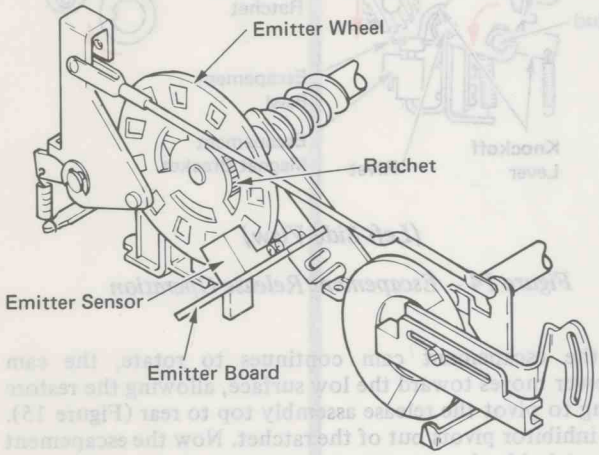


(Left Side View)

Figure 15 – Escapement Release Operation

ESCAPEMENT CONTROL

The electronics uses signals from the emitter assembly to control the amount of leadscrew rotation (Figure 16). The emitter assembly consists of an emitter wheel and an emitter sensor. The emitter wheel rotates with the leadscrew. As the leadscrew rotates, the windows in the emitter wheel pass through the the emitter sensor, generating electrical pulses to the electronics. The emitter wheel has one window for each leadscrew ratchet tooth. One pulse is generated for each window and the electronics counts the pulses. When the electronics receives the correct number of pulses for escapement, the magnet is deenergized. The escapement pawl then moves into the ratchet to stop the leadscrew.



(Left Front View)

Figure 16 – Escapement Control

The carrier moves one escapement unit for each emitter pulse. In 12 pitch, the carrier moves five units for each character, each backspace and each spacebar operation. In 10 pitch, the carrier moves six units for each character, each backspace and each spacebar operation.

The escapement chart shows the units of escapement for each character and spacebar in the PS and PSN pitch selections (Figure 17). In both PS and PSN, the backspace moves the carrier back the same number of units as the last character or spacebar.

ESCAPEMENT CHART

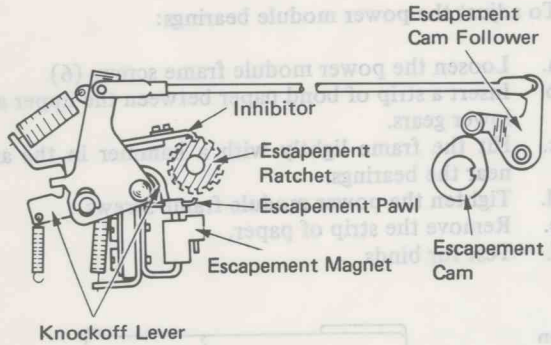
Character	Escapement P/S	Character	Escapement P/S
A a	7/5	$ 4	5/5
B b	7/6	% 5	5/5
C c	7/5	¢ 6	5/5
D d	7/6	& 7	6/5
E e	6/5	* 8	5/5
F f	6/4	(9	5/5
G g	7/6	) 0	5/5
H h	7/6	¼ ½	5/5
I i	4/3	_ -	5/5
J j	5/3	° ±	5/5
K k	7/6	+ =	5/5
L l	6/3	[ ]	5/5
M m	7/7	; ;	5/5
N n	7/6	¨ ¡	5/3
O o	7/5	³ ²	5/5
P p	6/6	¶ §	5/5
Q q	7/6	' '	5/5
R r	7/5	. .	5/5
S s	6/5	? /	5/5
T t	7/4		
U u	7/6		
V v	7/6		
W w	7/7		
X x	7/6		
Y y	7/6		
Z z	6/5		
! 1	5/5		
@ 2	5/5		
# 3	5/5		

Backspace Value of Last Character		
Spacebar	P/S	4/5
Spacebar	PSN	4/5
Spacebar	10P	6/6
Spacebar	12P	5/5
Each 10P Character		6/6
Each 12P Character		5/5

Figure 17 – Escapement Chart

NO-ESCAPE CYCLE

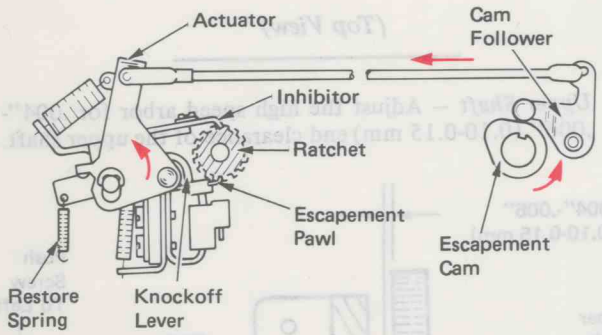
During a no-escape cycle, the escapement magnet is not energized and cannot hold the escapement pawl after it is driven out of the ratchet. With the escapement cam follower on the high surface of the escapement cam, the inhibitor engages the escapement ratchet (Figure 18). The knockoff lever holds the escapement pawl against the escapement magnet bracket.



(Left Side View)

Figure 18 – No-Escape Cycle

As the cam follower moves toward the low surface of the cam, the actuator pivots top to rear (Figure 19). This allows the escapement pawl to reenter the ratchet. By its position, the inhibitor ensures the escapement pawl enters the same notch it was in at the beginning of the cycle. As the actuator continues to pivot top to rear, the restore spring removes the inhibitor from the ratchet.



(Left Side View)

Figure 19 – No-Escape Cycle

PITCH SELECTION

The pitch selection mechanism consists of the pitch selector lever, a magnet mounted to the selector lever and two reed switches (Figure 20). The top reed switch is the P2 switch. The bottom reed switch is the P1 switch. The pitch selector lever detents into one of four positions to determine which reed switches are open or closed.

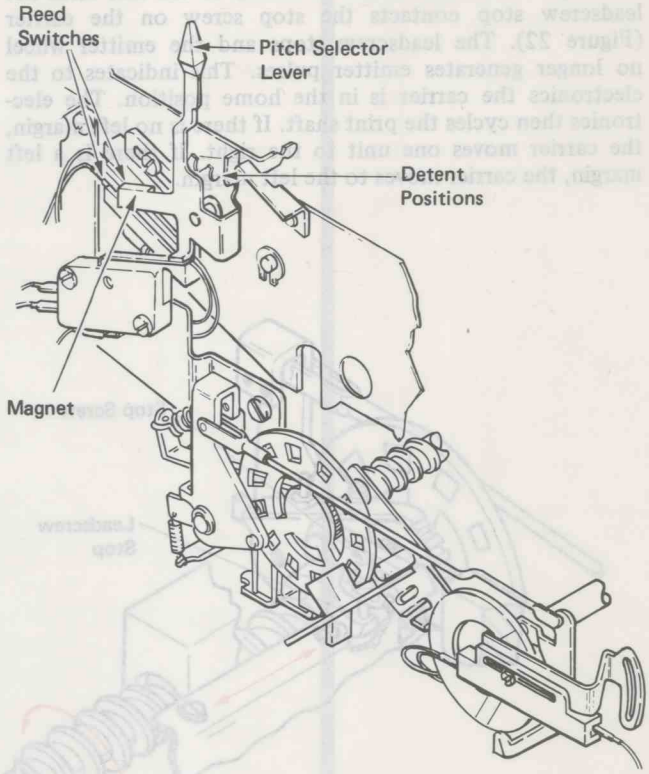


Figure 20 – Pitch Selection Mechanism

The pitch selection chart shows which reed switches are open or closed for each lever position (Figure 21).

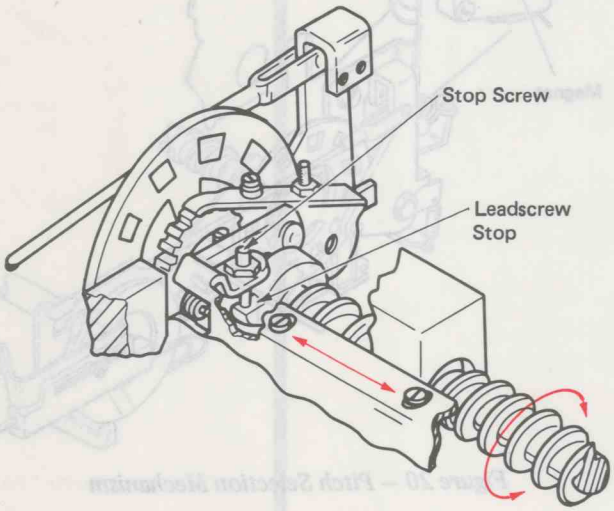
50	60	75	P1	P2
10	10A	10A	CLOSED	OPEN
12	10B	10B	CLOSED	CLOSED
PS	12A	12A	OPEN	CLOSED
PSN	12B	12B	OPEN	OPEN

Figure 21 – Pitch Selection Chart

LEADSCREW HOMING

The leadscrew homes each time the machine is turned on. For models 50 and 60, the leadscrew also homes when the pitch selector lever is moved from one pitch to another except when moving between PS and PSN.

All carrier movement is measured by the electronics from the home position. During a homing operation, the print shaft cycles and the carrier is driven to the left until the leadscrew stop contacts the stop screw on the carrier (Figure 22). The leadscrew stops and the emitter wheel no longer generates emitter pulses. This indicates to the electronics the carrier is in the home position. The electronics then cycles the print shaft. If there is no left margin, the carrier moves one unit to the right. If there is a left margin, the carrier moves to the left margin.



(Right Front View)

Figure 22 – Leadscrew Homing

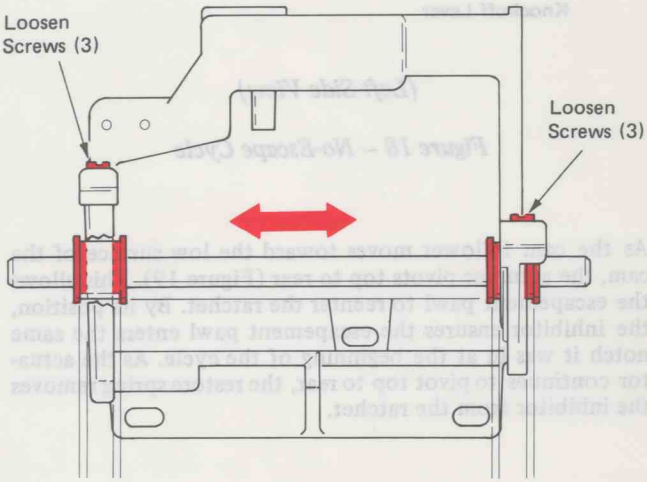
ESCAPEMENT ADJUSTMENTS

NOTE: Adjustments 1 through 18 are for leadscrew drive.

1. *Power Module Bearings* – Adjust the bearings so the upper and lower shafts rotate freely with no binds, and left or right so no parts contact the power module casting.

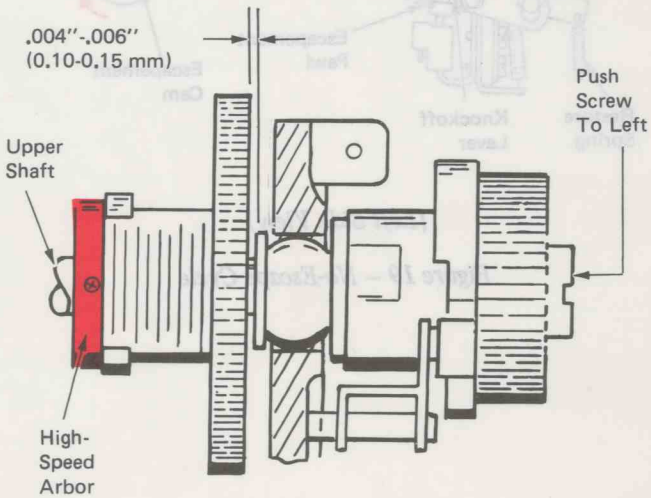
   To adjust the power module bearings:

   a. Loosen the power module frame screws (6).
   b. Insert a strip of bond paper between the upper and lower gears.
   c. Hit the frame lightly with a hammer in the area near the bearings.
   d. Tighten the power module frame screws.
   e. Remove the strip of paper.
   f. Test for binds.



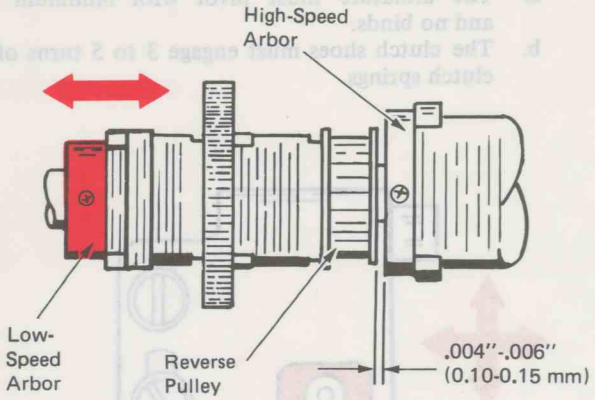
(Top View)

2. *Upper Shaft* – Adjust the high speed arbor for .004"-.006" (0.10-0.15 mm) end clearance of the upper shaft.



(Front View)

3. *Low-Speed Arbor (Upper Shaft)* – Adjust the low-speed arbor for .004"-.006" (0.10-0.15 mm) clearance between the reverse pulley and the high-speed arbor.



(Front View)

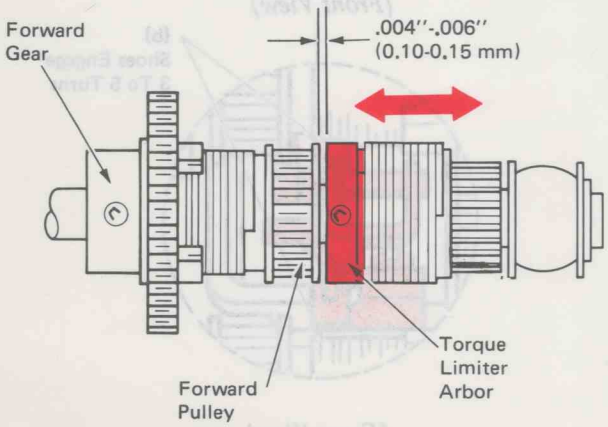
4. *Lower Shaft End Clearance* – Adjust the torque limiter arbor left or right for .004"-.006" (0.10-0.15 mm) end clearance between the high-speed gear and the C-clip.

To make this adjustment:

a. Loosen the screws (2) in the high-speed torque limiter arbor and the screws (2) in the forward gear.
b. Insert a .010" (0.25 mm) feeler gauge between the forward pulley and the high-speed torque limiter arbor.
c. Push the forward gear to the right and tighten the screws (2).

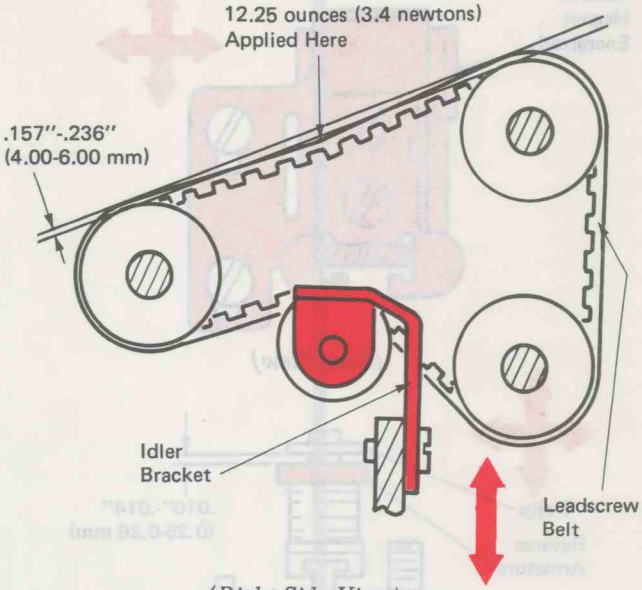
NOTE: In the Level 1 power module, push the lower shaft to the left before tightening the screws.

d. Remove the .010" (0.25 mm) feeler gauge and insert a .004" (0.10 mm) feeler gauge in its place. Push the high-speed torque limiter arbor to the left and tighten the screws (2).



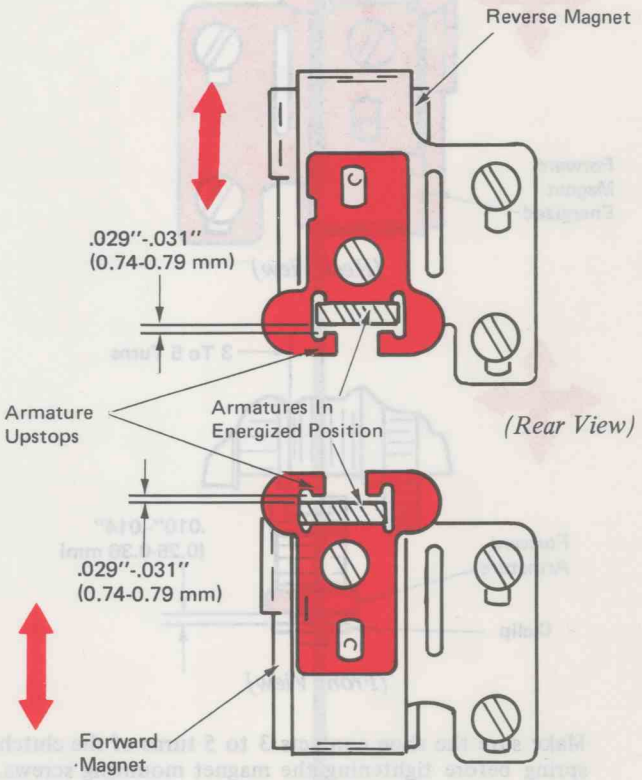
(Front View)

5. *Leadscrew Belt Tension* – Adjust the belt idler bracket up or down for a deflection of .157"-.236" (4.00-6.00 mm) when 12.25 ounces (3.4 newtons) are applied to the belt.



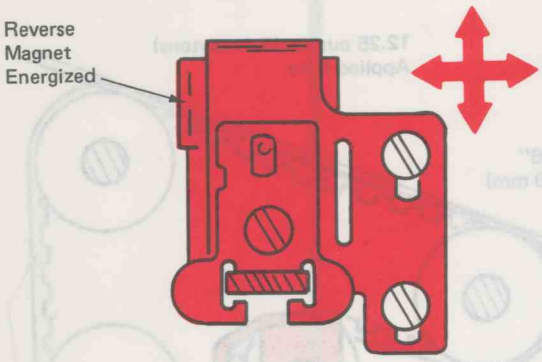
(Right Side View)

6. *Reverse and Forward Magnet Armature Upstops (Four-Magnet Power Module Only)* – Adjust the armature upstops up or down for .029"-.031" (0.74-0.79 mm) clearance between the armature and the upstop, with the armature energized.

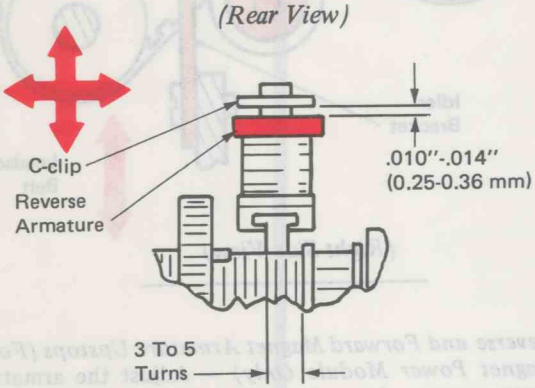


(Rear View)

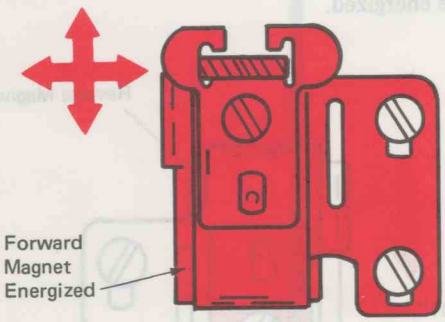
7. *Reverse and Forward Magnet Position (Four-Magnet Power Module Only)* – Adjust the magnets up or down for .010"-.014" (0.25-0.36 mm) clearance between the C-clip and the armature, with the armature energized.



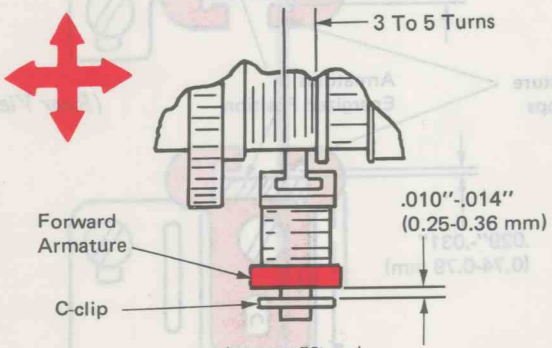
(Rear View)



(Front View)



(Rear View)

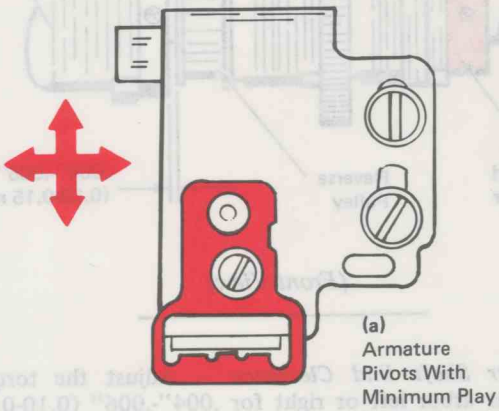


(Front View)

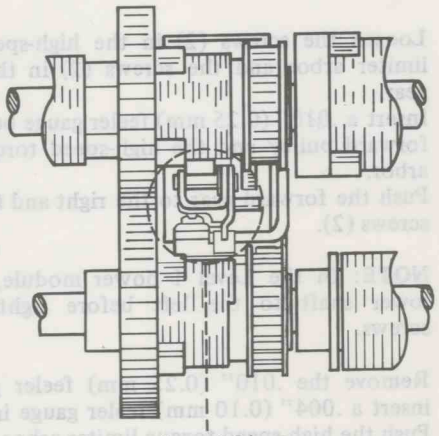
Make sure the shoe contacts 3 to 5 turns of the clutch spring before tightening the magnet mounting screws.

8. *Direction Magnet Pivot Plate (Three-Magnet Power Module Only)* – Adjust the pivot plate for the following conditions:

a. The armature must pivot with minimum play and no binds.
b. The clutch shoes must engage 3 to 5 turns of the clutch springs.

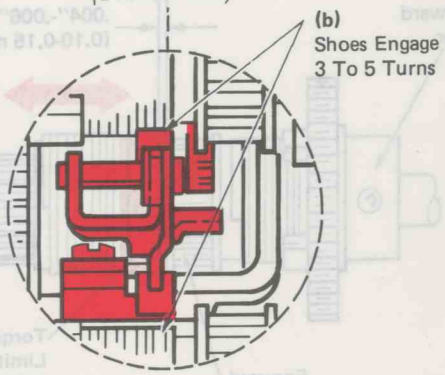


(Rear View)



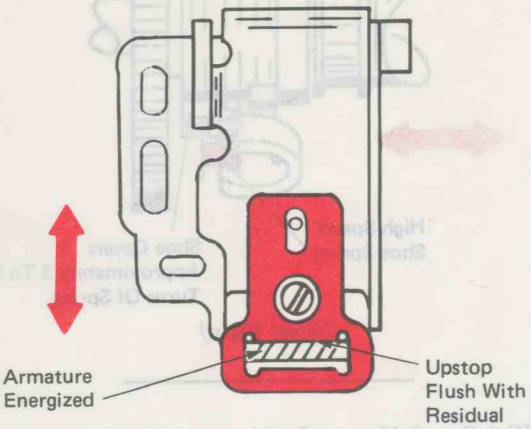
(Level 2)

(Front View)



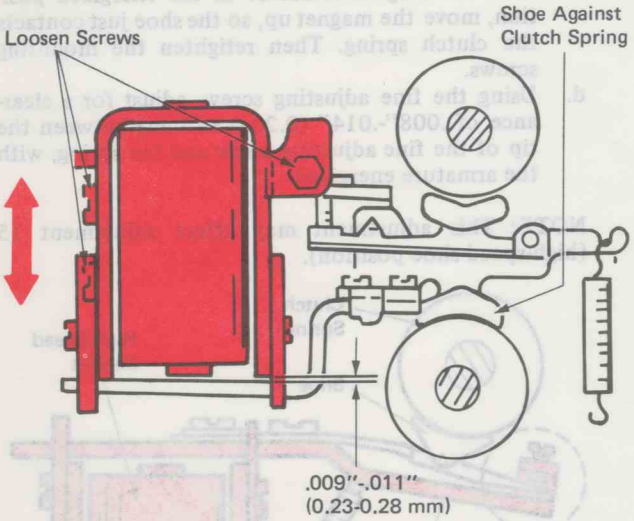
(Front View)

9. *Direction Magnet Armature Upstop (Three-Magnet Power Module, Level 1 Only, Level 2 Nonadjustable)* – With the armature energized, adjust the armature upstop so it is flush with the residual.



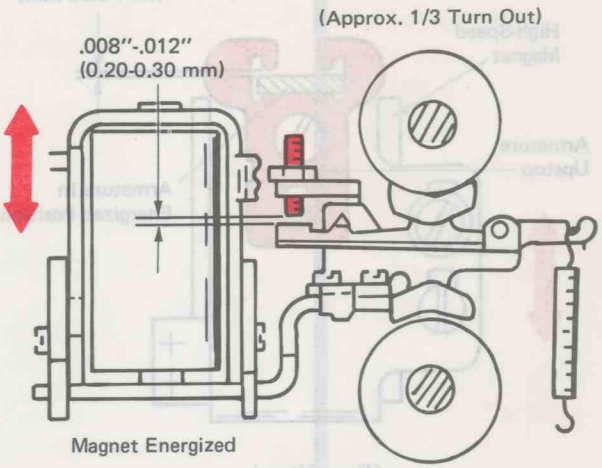
(Front View)

10. *Direction Magnet Position (Three-Magnet Power Module Only)* – With the armature spring disconnected, move the magnet up or down for .009"-.011" (0.23-0.28 mm) clearance between the magnet upstop and the magnet armature.



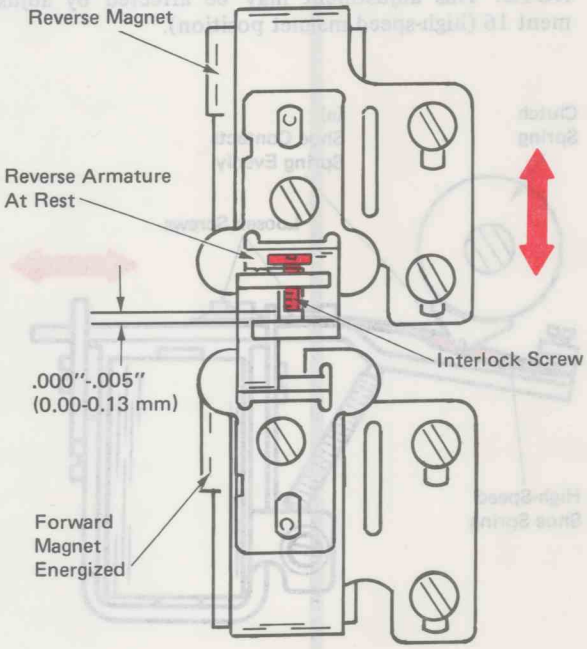
(Left Side View)

11. *Reverse Shoe Stop Lever (Three-Magnet Power Module Only)* – Turn the adjusting screw in or out for a clearance of .008"-.012" (0.20-0.30 mm) between the shoe stop lever and the adjusting screw, with the armature energized.



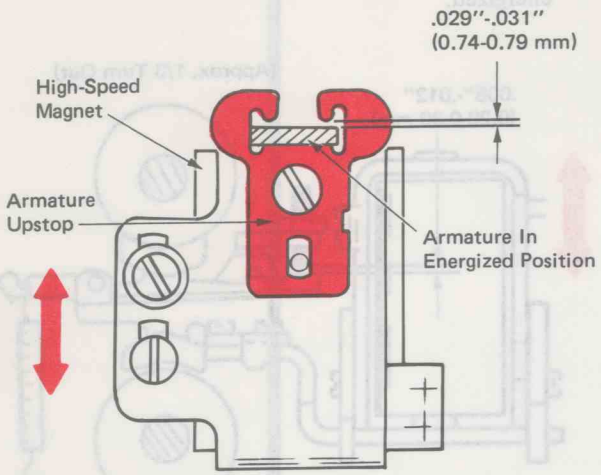
(Left Side View)

12. *Magnet Interlock (Four-Magnet Power Module Only)* – Adjust the interlock screw up or down for a clearance of .000"-.005" (0.00-0.13 mm) between the interlock screw and the reverse armature. Energize the forward magnet armature when checking this clearance.



(Rear View)

13. *High-Speed Magnet Upstop* – Adjust the armature upstop up or down for a clearance of .029"-.031" (0.74-0.79 mm) between the armature and the upstop, with the armature energized.

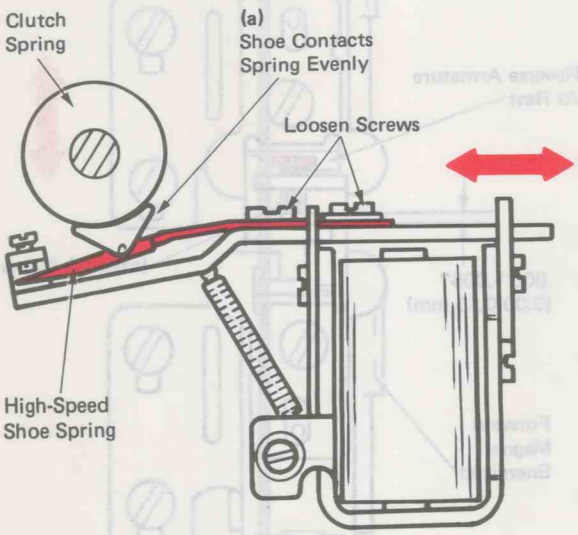


(Rear View)

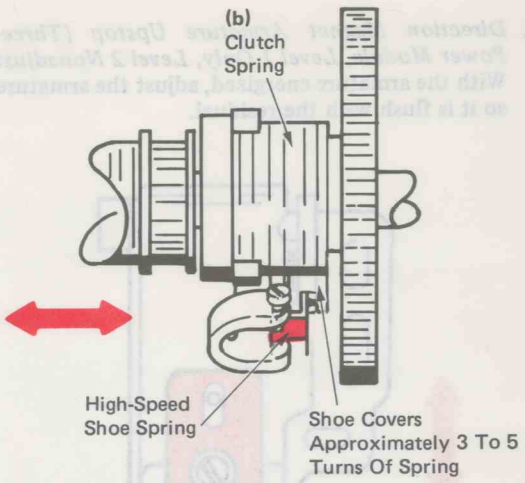
14. *High-Speed Shoe Position* – Adjust the shoe spring for two conditions:

a. Front or rear, so the shoe contacts the spring evenly.
b. Left or right, so the shoe contacts 3 to 5 turns of the spring.

NOTE: This adjustment may be affected by adjustment 16 (high-speed magnet position).



(Right Side View)



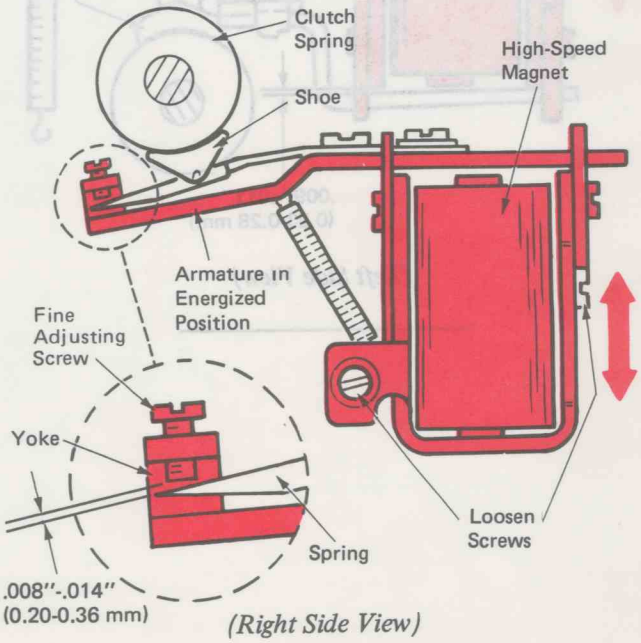
(Front View)

15. *High-Speed Magnet Position* – Adjust the magnet up or down for a clearance of .008"-.014" (0.20-0.36 mm) between the tip of the fine adjusting screw and the spring. The armature must be energized to check this adjustment.

Adjustment Procedure:

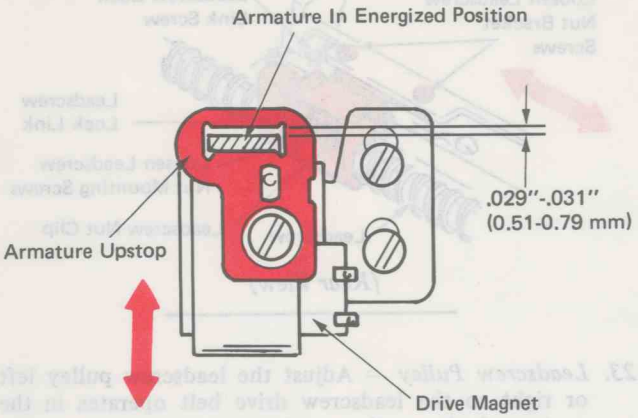
a. Loosen the magnet mounting screws (2).
b. Center the spring in the yoke using the fine adjusting screw.
c. With the magnet armature in the energized position, move the magnet up, so the shoe just contacts the clutch spring. Then retighten the mounting screws.
d. Using the fine adjusting screw, adjust for a clearance of .008"-.014" (0.20-0.36 mm) between the tip of the fine adjusting screw and the spring, with the armature energized.

NOTE: This adjustment may affect adjustment 15 (high-speed shoe position).



(Right Side View)

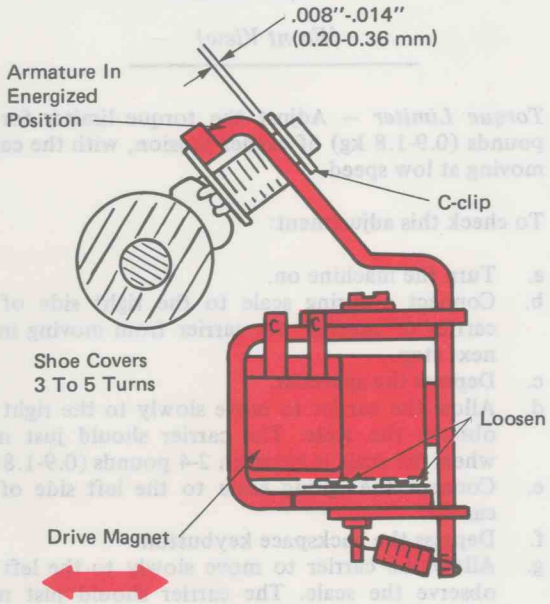
16. *Low-Speed Magnet Armature Upstop* – With the low-speed magnet armature energized, adjust the armature upstop front to rear for .029"-.031" (0.51-0.79 mm) clearance between the armature and the upstop.



(Top View)

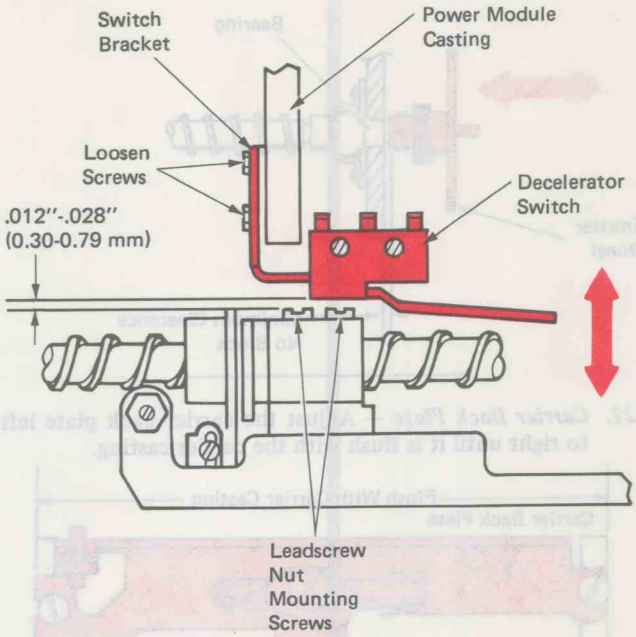
17. *Low-Speed Magnet Position* – Adjust the magnet for the following conditions:

a. Left to right so the clutch shoe contacts 3 to 5 turns of the spring.
b. Front to rear for .008"-.014" (0.20-0.36 mm) clearance between the C-clip and the armature, with the armature in the energized position.



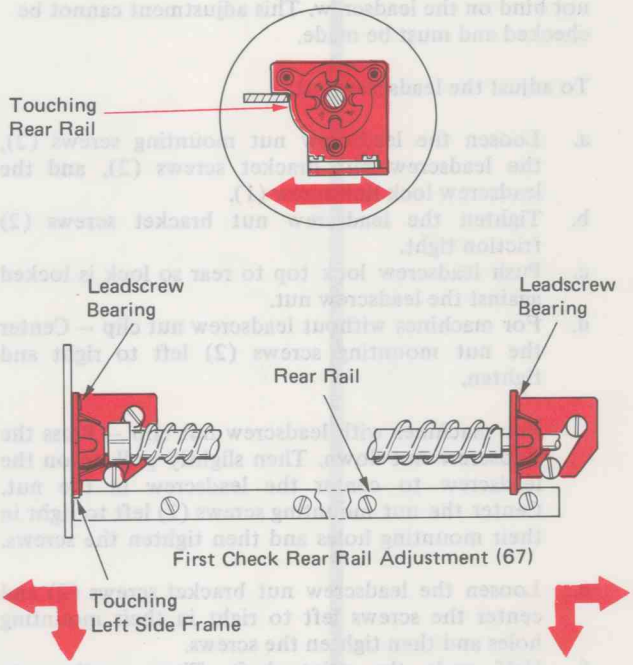
(Left Side View)

18. *Decelerator Switch* – Adjust the switch mounting bracket front to rear so that the switch clears the lead-screw nut mounting screws by .012"-.028" (0.30-0.79 mm).

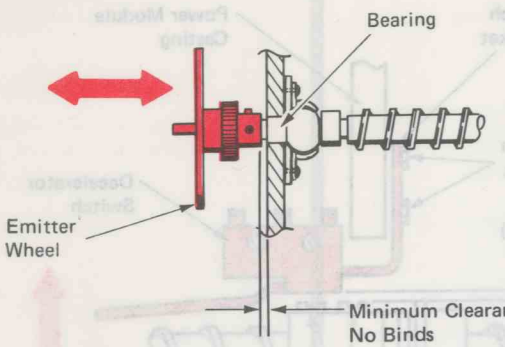


19. *Leadscrew Bearings* – Move both leadscrew bearings forward, so they contact the rear rail. Next, move the left bearing to the left until it touches the left side frame and bias the right bearing to the right.

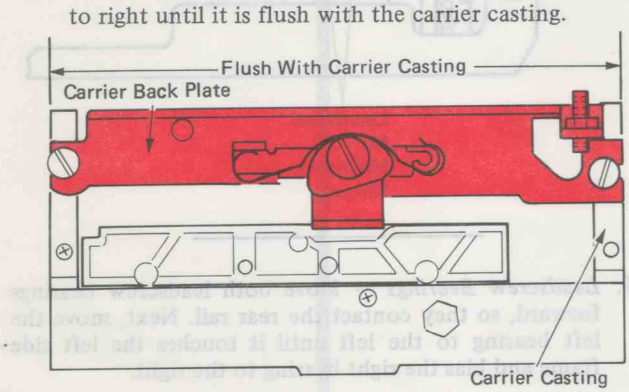
NOTE: The LED adjusting bracket must be loosened to move the left bearing front or rear.



20. *Leadscrew End Clearance* – Adjust the emitter wheel left or right for minimum end clearance with no binds of the leadscrew. Maximum end play should not exceed .002" (0.05 mm).



21. *Carrier Back Plate* – Adjust the carrier back plate left to right until it is flush with the carrier casting.



(Rear View)

22. *Leadscrew Nut* – Adjust the leadscrew nut so it does not bind on the leadscrew. This adjustment cannot be checked and must be made.

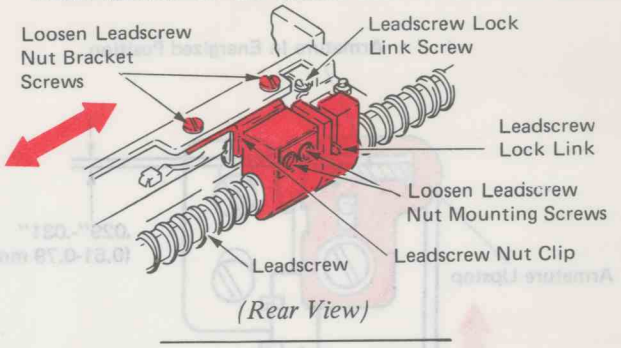
To adjust the leadscrew nut:

a. Loosen the leadscrew nut mounting screws (2), the leadscrew nut bracket screws (2), and the leadscrew lock link screw (1).
b. Tighten the leadscrew nut bracket screws (2) friction tight.
c. Push leadscrew lock top to rear so lock is locked against the leadscrew nut.
d. For machines without leadscrew nut clip – Center the nut mounting screws (2) left to right and tighten.

For machines with leadscrew nut clip – Press the leadscrew nut down. Then slightly pull up on the leadscrew to center the leadscrew in the nut. Center the nut mounting screws (2) left to right in their mounting holes and then tighten the screws.

e. Loosen the leadscrew nut bracket screws (2) and center the screws left to right in their mounting holes and then tighten the screws.
f. Half cycle the print shaft. Then continue to cycle the print shaft while watching the lock link move. When the lock link has moved .015"-.030" (0.38-0.76 mm) towards the front of the machine, stop cycling the print shaft and tighten the lock link screw (1).

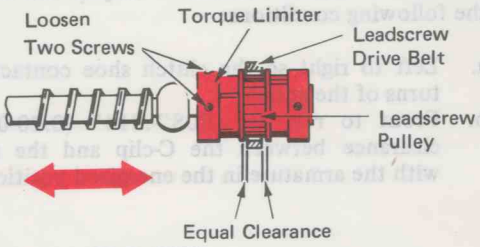
After the adjustment is complete, there should be a slight amount of carrier side to side movement with the print shaft at rest. With the print shaft cycled, there should be no carrier side to side movement.



(Rear View)

23. *Leadscrew Pulley* – Adjust the leadscrew pulley left or right so the leadscrew drive belt operates in the center of the pulley without touching the pulley flanges.

NOTE: Loosen only the setscrews in the left side of the torque limiter when making this adjustment.



(Front View)

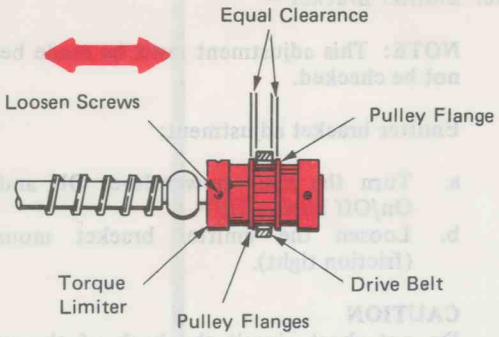
24. *Torque Limiter* – Adjust the torque limiter for 2-4 pounds (0.9-1.8 kg) of carrier tension, with the carrier moving at low speed.

To check this adjustment:

a. Turn the machine on.
b. Connect a spring scale to the right side of the carrier to prevent the carrier from moving in the next step.
c. Depress the spacebar.
d. Allow the carrier to move slowly to the right and observe the scale. The carrier should just move when the scale is between 2-4 pounds (0.9-1.8 kg).
e. Connect the spring scale to the left side of the carrier.
f. Depress the backspace keybutton.
g. Allow the carrier to move slowly to the left and observe the scale. The carrier should just move when the scale is between 2-4 pounds (0.9-1.8 kg).
h. Turn the motor switch off and back on to allow the machine to reset the carrier position.

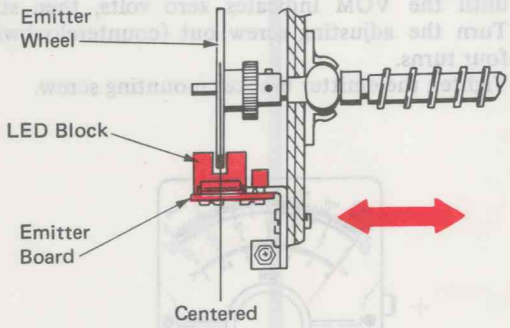
To adjust the torque clutch:

a. Loosen the setscrews (2) on the right end of the torque limiter.
b. Move the right end of the torque limiter to the left for more torque or to the right for less torque.
c. Recheck the adjustment.



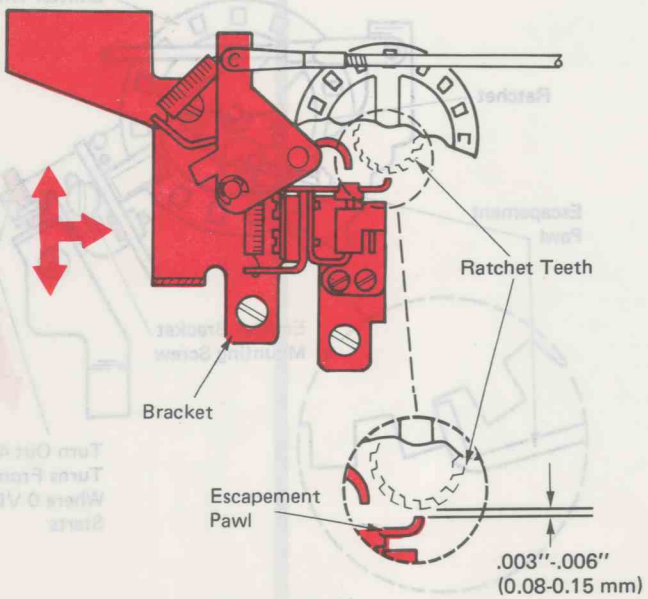
(Front View)

25. *Emitter Board* – Adjust the emitter board left or right so that the emitter wheel is centered in the LED block.



(Front View)

26. *Escapement Pawl Clearance* – Adjust the escapement magnet bracket up or down for a clearance of .003"-.006" (0.08-0.15 mm) between the escapement pawl and the ratchet teeth with the escapement pawl held in the energized position.



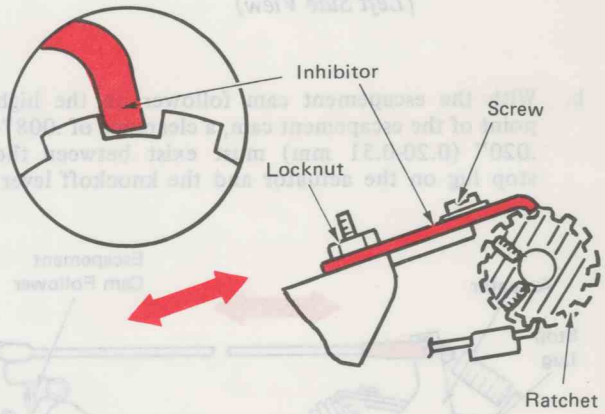
(Left Side View)

27. *Escapement Inhibitor* – Adjust the escapement inhibitor front or rear to meet the following two conditions:

a. With the emitter wheel biased top to rear, manually press the inhibitor into the emitter ratchet. The inhibitor should slightly rotate the emitter ratchet.
b. With the emitter wheel biased top to front, manually press the inhibitor into the emitter ratchet. The inhibitor should rotate the emitter ratchet the same amount as in step a, only in the opposite direction.

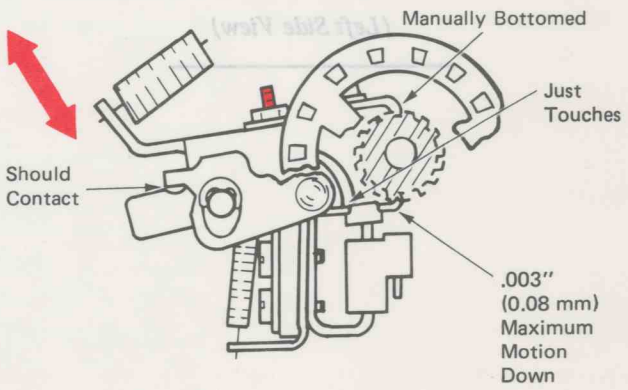
Check this adjustment with the ratchet setscrews positioned toward the rear and then toward the front.

To change this adjustment, loosen the locknut and the screw holding the inhibitor.



(Left Side View)

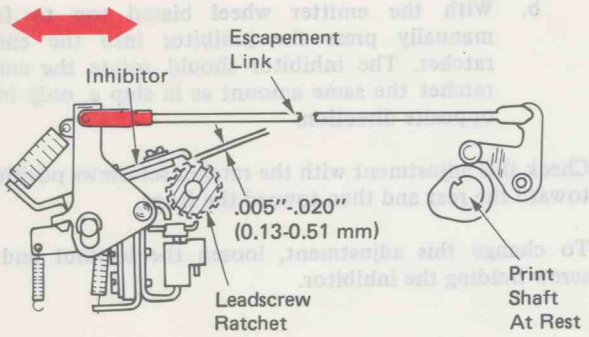
28. *Inhibitor Stop Screw* – With the inhibitor held into an emitter ratchet notch, the knockoff lever should just contact the top of the escapement pawl.



(Left Side View)

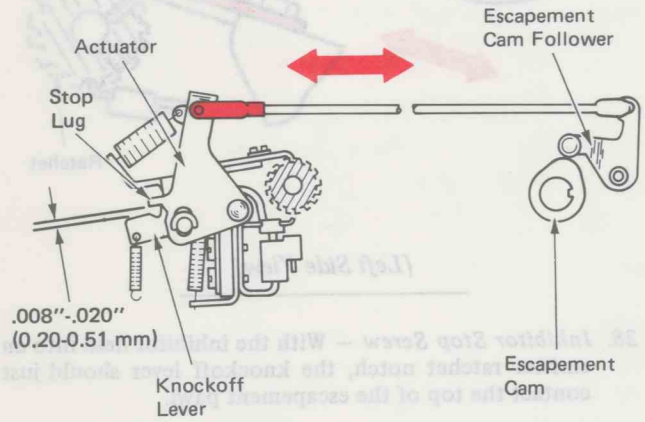
29. *Escapement Link* – Adjust the escapement link clevis for the following two conditions:

a. With the print shaft in the rest position, the inhibitor must clear the leadscrew ratchet by .005"-.020" (0.13-0.51 mm).



(Left Side View)

b. With the escapement cam follower on the high point of the escapement cam, a clearance of .008"-.020" (0.20-0.51 mm) must exist between the stop lug on the actuator and the knockoff lever.



(Left Side View)

30. *Emitter Bracket* –

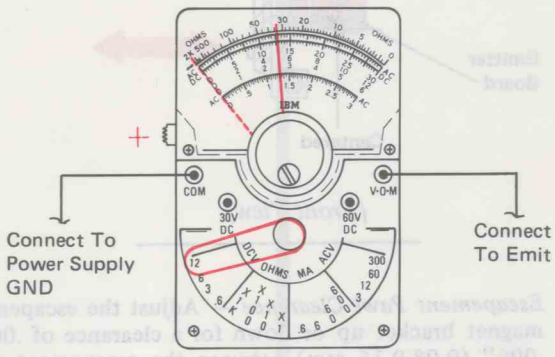
NOTE: This adjustment must be made because it cannot be checked.

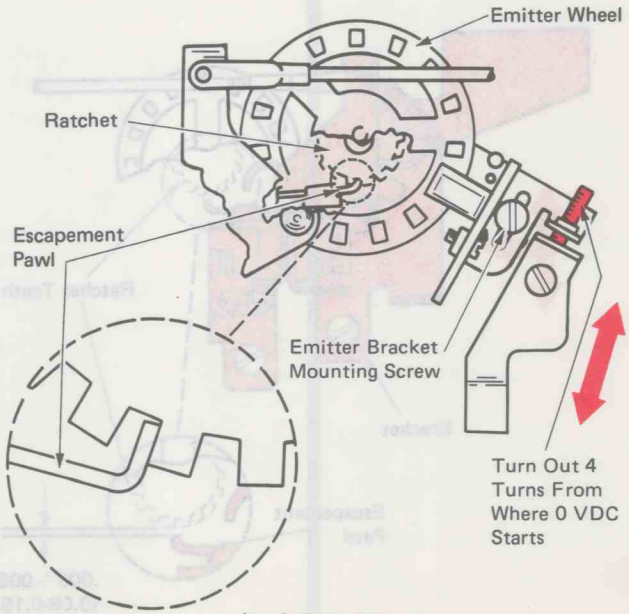
Emitter bracket adjustment:

a. Turn the main power lever ON and the motor On/Off button OFF.
b. Loosen the emitter bracket mounting screw (friction tight).

CAUTION
Do not short circuit the back of the emitter board with the screwdriver.

c. Set the meter on the 12 VDC scale and connect it to the emitter board connectors (COM to GND, VOM to EMIT).
d. Hold the emitter wheel top to front so a ratchet tooth contacts the front of the escapement pawl.
e. Turn the adjusting screw in (clockwise) slowly until the VOM indicates zero volts, then stop.
f. Turn the adjusting screw out (counterclockwise) four turns.
g. Tighten the emitter bracket mounting screw.



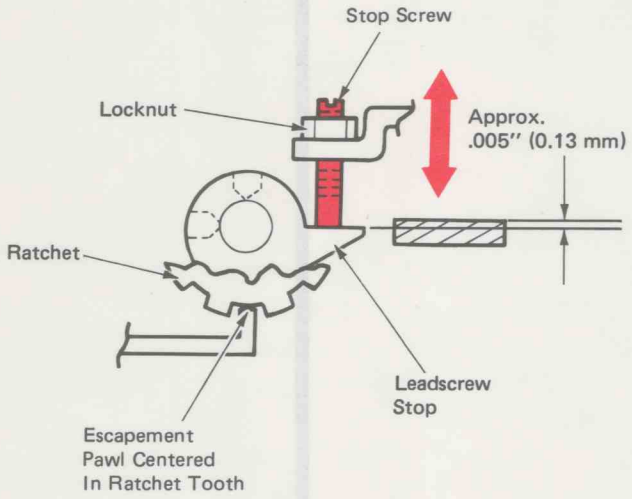


(Left Side View)

31. *Leadscrew Homing* – Adjust the leadscrew stop and stop screw so the escapement pawl reliably enters a ratchet notch during a homing operation.

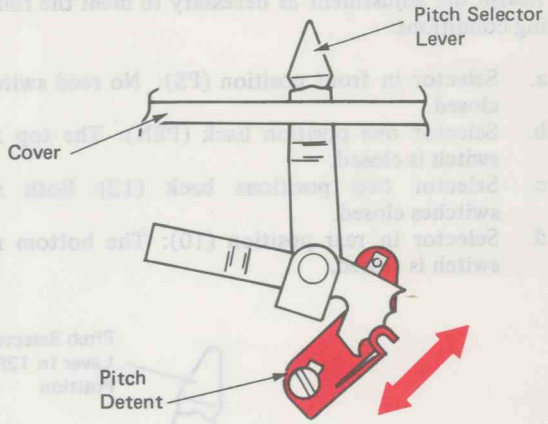
To make this adjustment:

a. Position the carrier approximately 6 inches from the left side frame.
b. Loosen the setscrews in the leadscrew stop.
c. Loosen the leadscrew stop screw locknut and turn the screw until the bottom of the screw is even with the top of the rear rail.
d. Operate a POR with no left margin set. This positions the carrier one unit from the left side frame.
e. Manually release the escapement pawl and rotate the ratchet top to front one unit, then release the escapement pawl.
f. Bias the ratchet top to rear and adjust the leadscrew stop so the top surface contacts the stop screw.
g. Tighten the leadscrew stop setscrews.
h. Turn the leadscrew stop screw down one-half a turn and tighten the locknut.



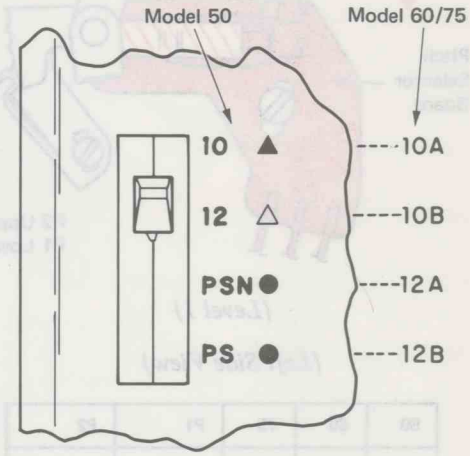
(Left Side View)

32. *Pitch Detent* – Adjust the pitch detent so the pitch selector lever aligns with the second indicator from the rear on the cover (12P on Model 50, 10B on Models 60, 75).

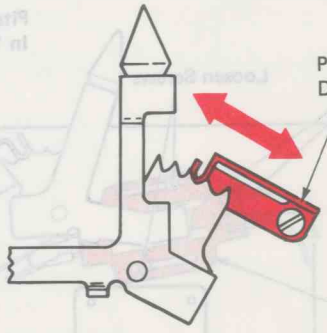


(Level 1)

(Left Side View)



(Top View)



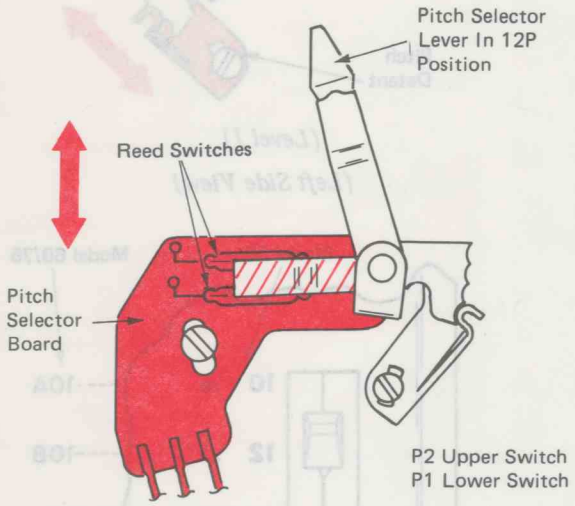
(Level 2)

(Left Side View)

33. *Pitch Selection Switches* – With the pitch selector lever in the 10B position on Models 60 and 75 (12P position for Model 50), adjust the pitch selection switches so they align with the pitch selector magnet.

Revise the adjustment as necessary to meet the following conditions:

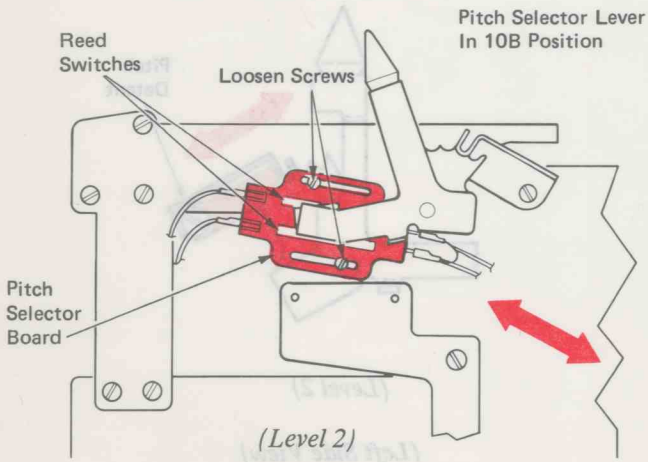
a. Selector in front position (PS): No reed switches closed.
b. Selector one position back (PSN): The top reed switch is closed.
c. Selector two positions back (12): Both reed switches closed.
d. Selector in rear position (10): The bottom reed switch is closed.



(Level 1)

(Left Side View)

50	60	75	P1	P2
10	10A	10A	CLOSED	OPEN
12	10B	10B	CLOSED	CLOSED
PS	12A	12A	OPEN	CLOSED
PSN	12B	12B	OPEN	OPEN



(Level 2)

(Left Side View)

PAPER FEED AND INDEX OPERATIONAL THEORY

The paper feed and index mechanism holds the paper against the platen and moves the paper vertically as the platen indexes.

The front and rear feed rolls and the paper bail rolls hold the paper against the platen (Figure 1). The leaf springs bias the feed rolls toward the platen.

The index mechanism controls the spacing between typed lines and is operated by the index or carrier return buttons. The operator moves the paper bail to use the Semi-Automatic Paper Insertion mechanism.

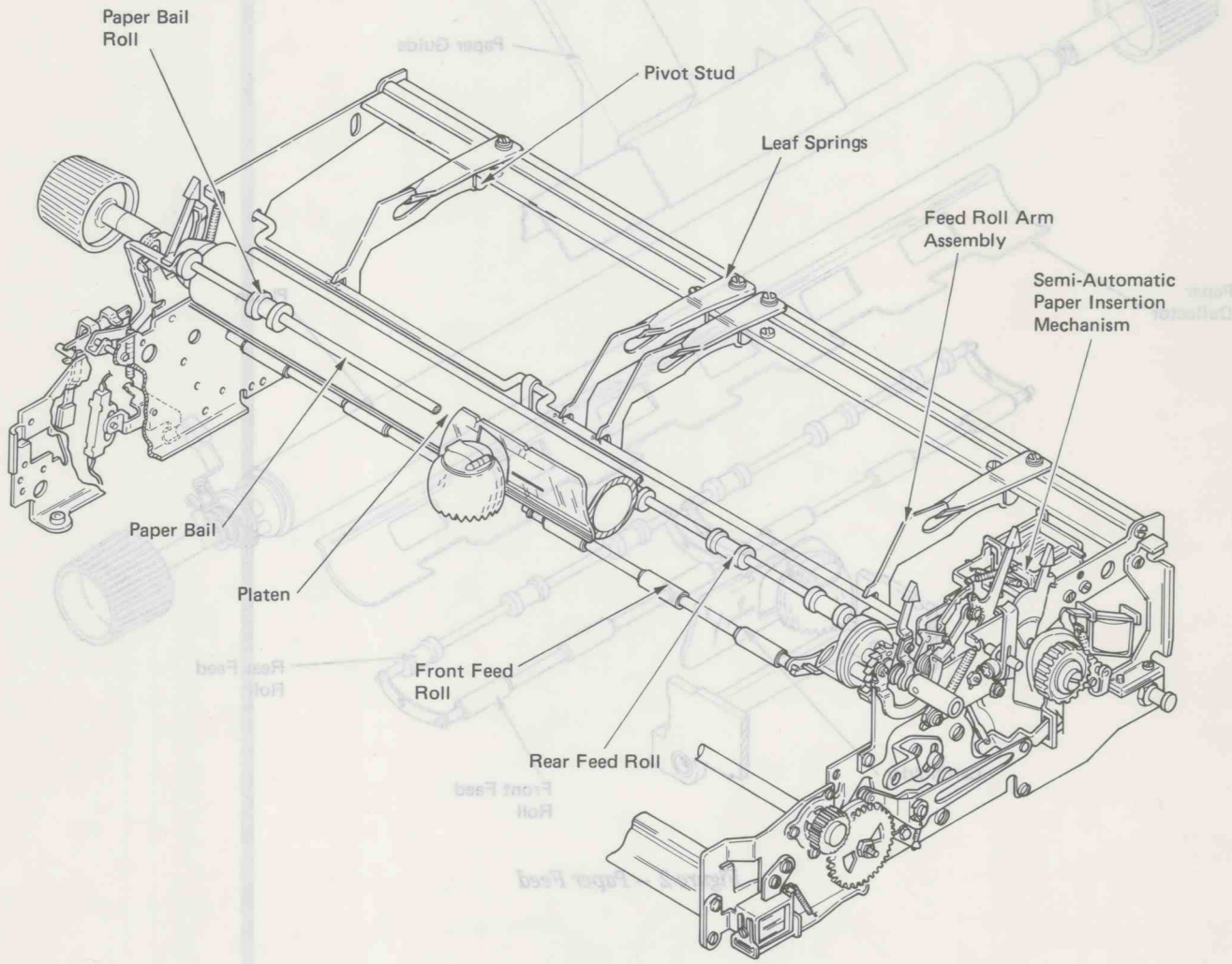


Figure 1 – Paper Feed And Index

PAPER FEED

The paper guide positions the left edge of the paper as it is inserted (Figure 2). The paper guide may be positioned left or right on the paper support bar. The paper deflector guides the paper between the feed rolls and the platen. As the platen turns, pressure between the feed rolls and the platen moves the paper around the platen. The cardholder guides the front edge of the paper up.

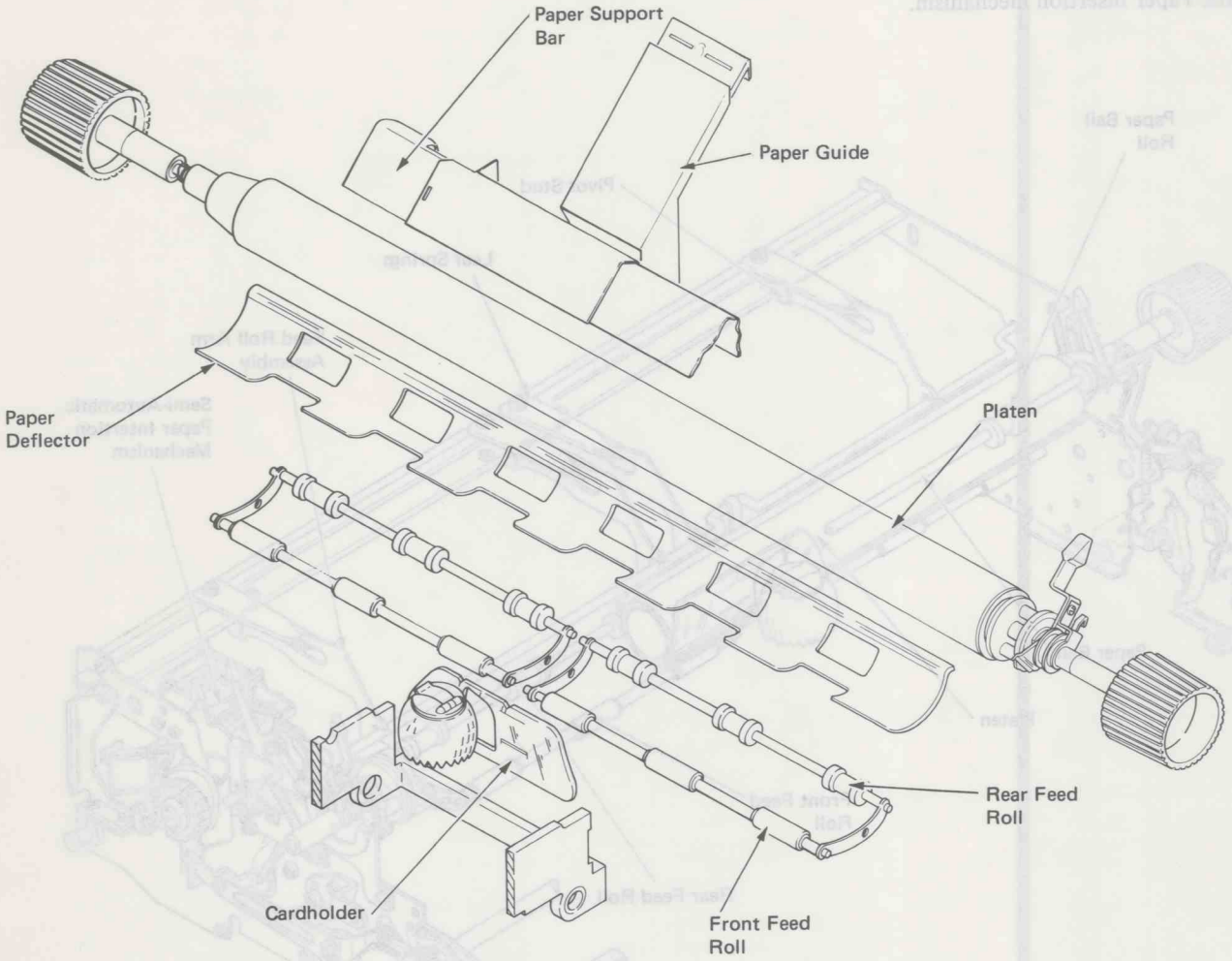


Figure 2 – Paper Feed

The paper bail rollers hold the paper against the platen (Figure 3). Two levers support the paper bail as it pivots front to rear. Toggle springs attached to each bail lever either hold the bail rollers to the rear against the platen or forward in the released position.

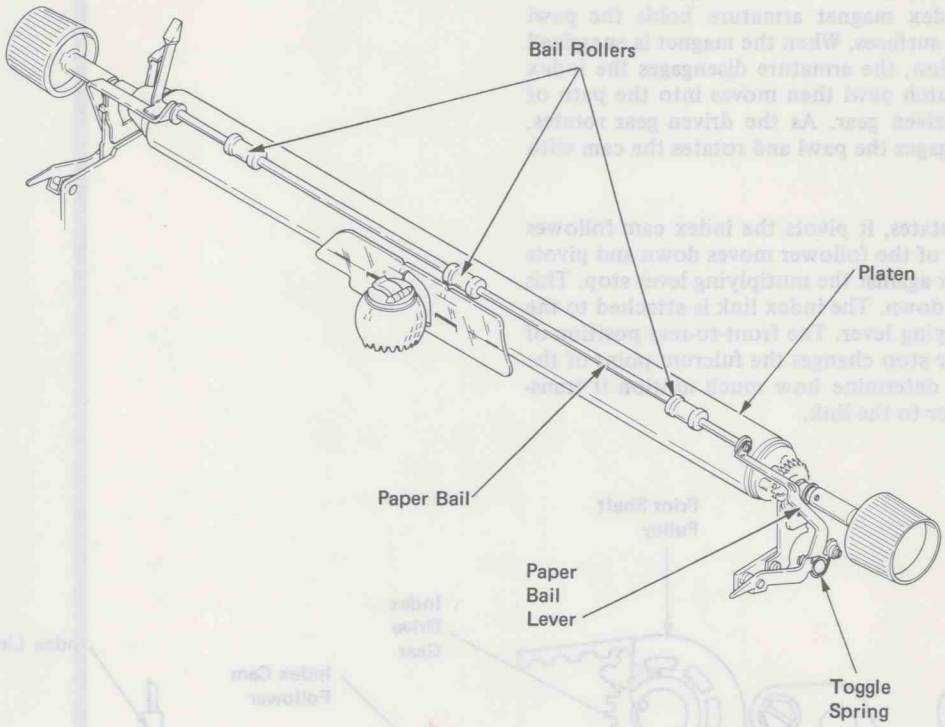


Figure 3 – Paper Bail

PAPER RELEASE

The paper release mechanism releases the feed rolls from the platen. The operator uses the paper release to insert, remove, or reposition the paper (Figure 4). The paper release lever pivots the feed roll release bellcrank top to front to rotate the feed roll release shaft. The feed roll release shaft then pushes the feed roll arms down to move the feed rolls away from the platen.

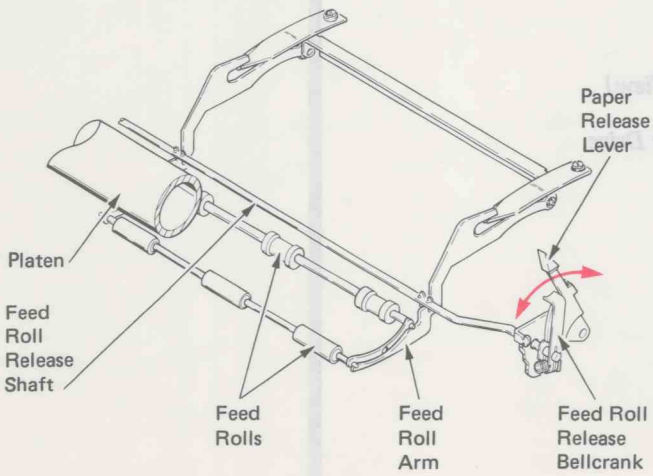


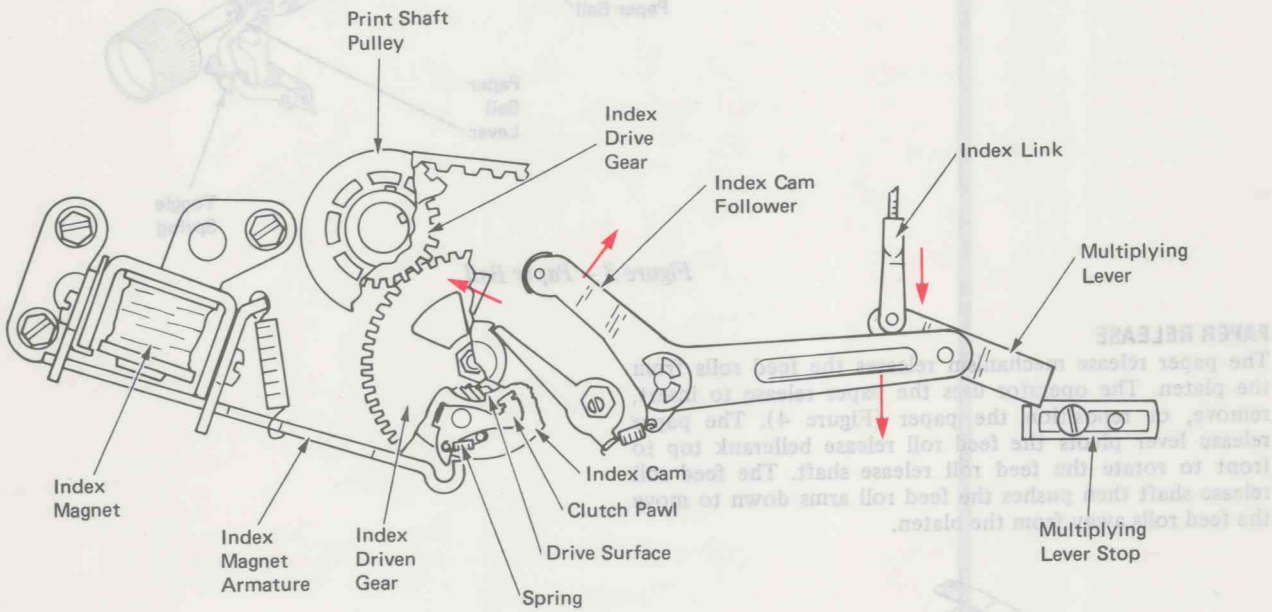
Figure 4 – Paper Release

INDEX DRIVE

The index drive gear engages the index driven gear and both gears rotate during a print shaft cycle (Figure 5). The print shaft cycles twice for an index operation. The index clutch transfers motion from the driven gear to the index cam for an index operation. The index clutch consists of the index driven gear, the clutch pawl, and the index cam.

The index clutch pawl attaches to a stud on the index cam and is spring loaded toward the drive surfaces on the index driven gear. The index magnet armature holds the pawl away from the drive surfaces. When the magnet is energized for an index operation, the armature disengages the index clutch pawl. The clutch pawl then moves into the path of a drive surface or driven gear. As the driven gear rotates, the drive surface engages the pawl and rotates the cam with the driven gear.

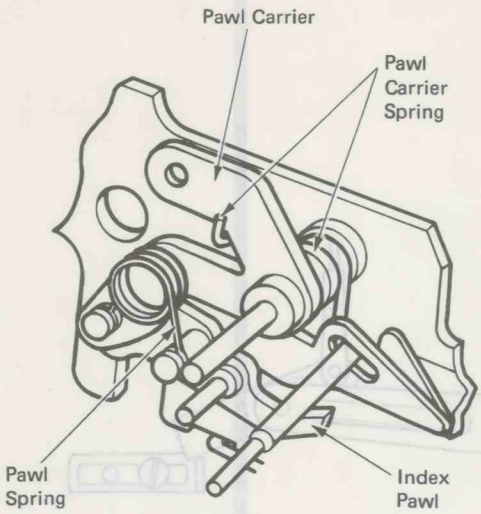
As the index cam rotates, it pivots the index cam follower top to rear. The rear of the follower moves down and pivots the multiplying lever against the mutiplying lever stop. This pulls the index link down. The index link is attached to the front of the multiplying lever. The front-to-rear position of the multiplying lever stop changes the fulcrum point of the mutiplying lever to determine how much motion it transfers from the follower to the link.



(Right Side View)

Figure 5 – Index Drive

The index pawl mounts to the pawl carrier and a pawl spring holds the pawl toward the ratchet (Figure 6).



(Left Side View)

Figure 6 – Index Pawl

As the index link moves down, it pivots the pawl carrier top to rear (Figure 7). As the pawl carrier pivots, the pawl guide allows the pawl to enter the ratchet. Further motion of the link drives the pawl to rotate the ratchet and platen. The pawl keeps moving until it contacts the overthrow stop. The cam follower is now on the high surface of the index cam.

The platen detent roller holds the ratchet and platen in position. As the cam follower moves toward the low surface of the index cam, the pawl carrier spring biases the pawl away from the ratchet. The pawl carrier spring also biases the cam follower against the index cam.

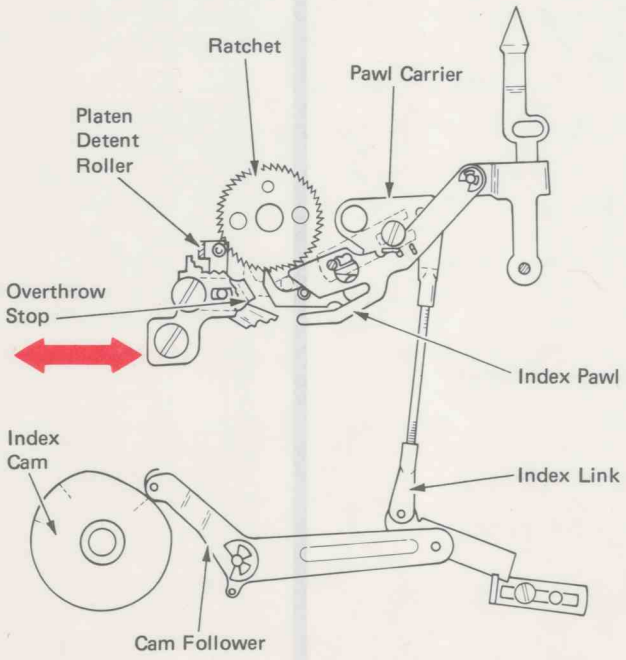


Figure 7 – Index Operation

Near the end of the index cycle, the index clutch pawl contacts the index magnet armature (Figure 8). As the index cam rotates, the armature pivots the pawl away from the drive surface of the driven gear and disengages the driven gear from the index cam. At rest, the check pawl engages the index cam to hold the clutch pawl away from the drive surface of the driven gear. The clutch pawl reaches the rest position at the end of the index cycle or at the beginning of the next print shaft cycle.

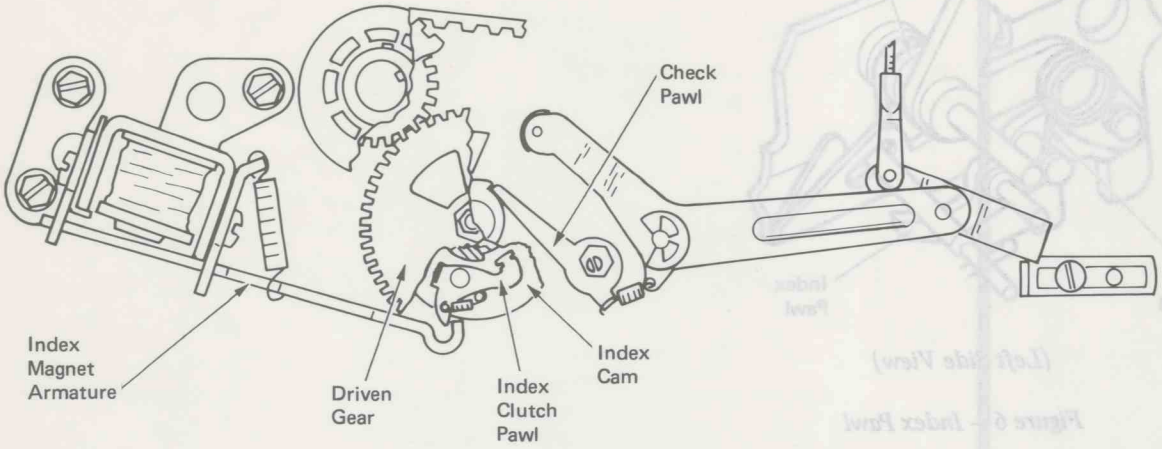
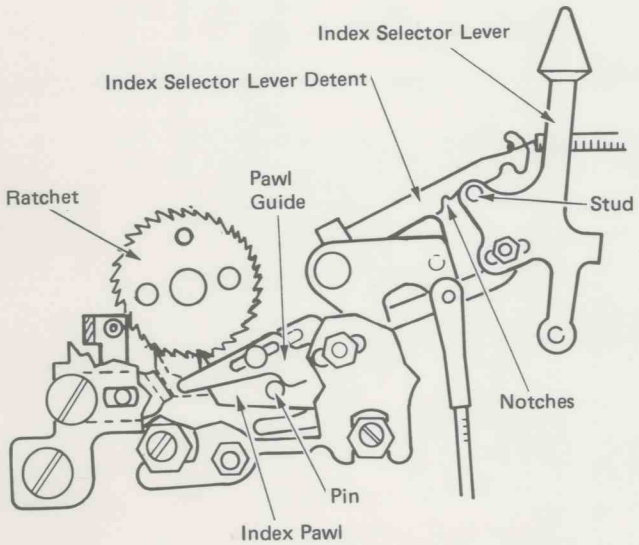


Figure 8 – Index Operation

INDEX SELECTION

The index selection mechanism provides single, one and one-half, double, and triple linespacing (Figure 9). The ratchet advances two teeth for each linespace. The index pawl moves the same amount for each index operation. As the index pawl moves forward, the pin on the left side of the pawl follows the surface of the pawl guide to enter the proper ratchet tooth. The front-to-rear position of the pawl guide determines which ratchet tooth the pawl enters. The index selector lever controls the position of the index pawl guide.

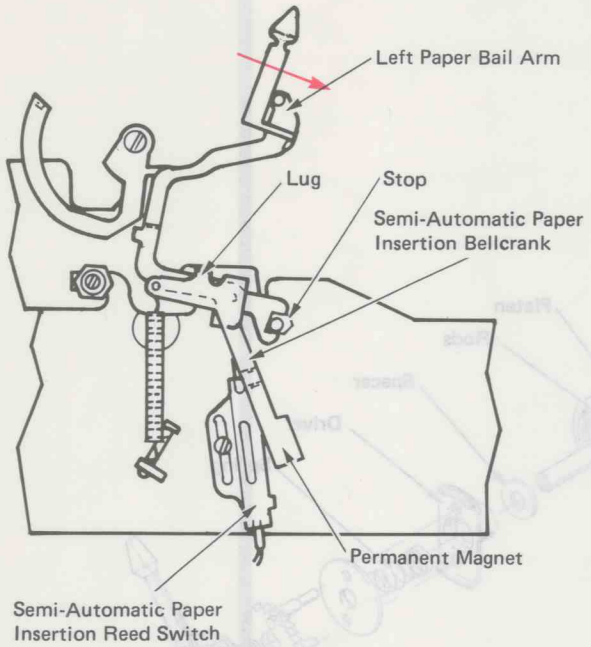


(Right Side View)

Figure 9 – Index Selection

SEMI-AUTOMATIC PAPER INSERTION

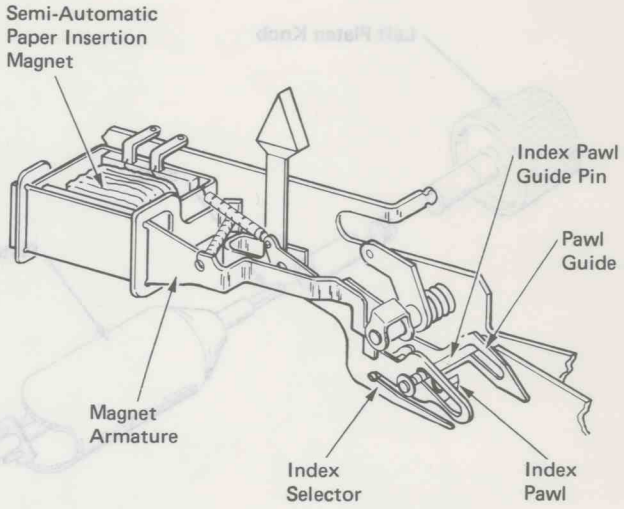
The semi-automatic paper insertion mechanism inserts paper to a preset writing line. When the operator pulls the paper bail to the detented position, the left paper bail arm contacts a lug on the semi-automatic paper insertion bellcrank (Figure 10). The bail arm then pivots the semi-automatic paper insertion bellcrank. A magnet on the bellcrank closes the semi-automatic paper insertion reed switch. The switch signals the electronics to begin a semi-automatic paper insertion operation.



(Left Side View)

Figure 10 – Semi-Automatic Paper Insertion

The electronics energize the semi-automatic paper insertion magnet (Figure 11). The magnet armature moves the pawl guide away from the pin on the left side of the index pawl. The pin on the right side of the index pawl follows the surface of the triple index pawl guide. The guide allows the pawl to enter the platen ratchet for triple linespacing with the index selector lever in any position. The machine then indexes twice (four print shaft cycles) to feed the paper six linespaces.



(Left Front View)

Figure 11 – Semi-Automatic Paper Insertion

As the paper bail arm releases, the semi-automatic paper insertion reed switch opens. This signals the electronics to complete the operation. To complete the operation, the carrier moves three inches to the right of the left margin. This prevents the cardholder from catching the corner of the paper being inserted. Then the paper indexes to the preset writing line. The carrier returns to the same position as before the semi-automatic paper insertion.

To change the amount of paper insertion, refer to the operating instructions.

PLATEN VARIABLE

The platen variable allows the platen to rotate while the platen ratchet is detented. As you push the left platen knob to the right, two rods inside the platen contact a spacer that pushes the platen driver to the right (Figure 12). This disengages the driver teeth from the platen. When you release the platen knob, the spring moves the driver to engage the platen.

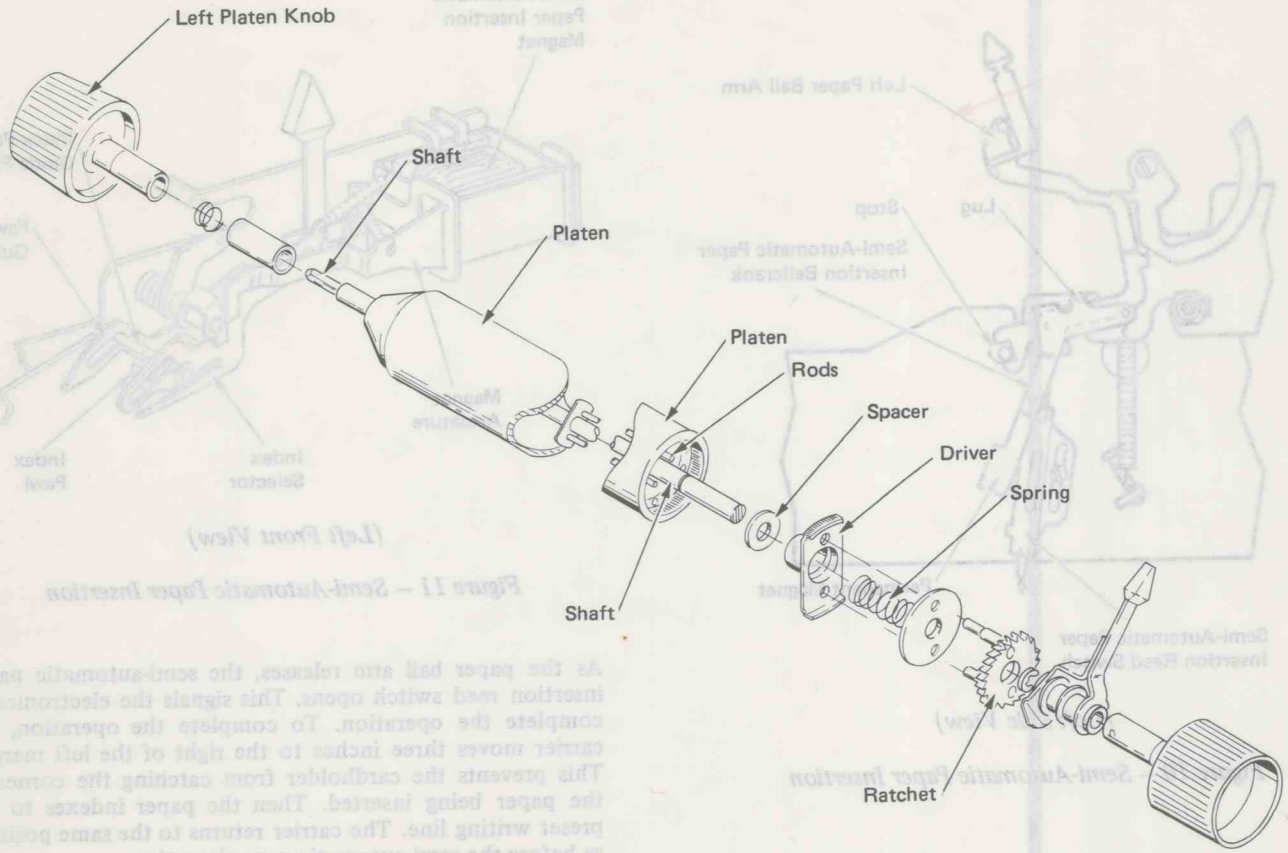
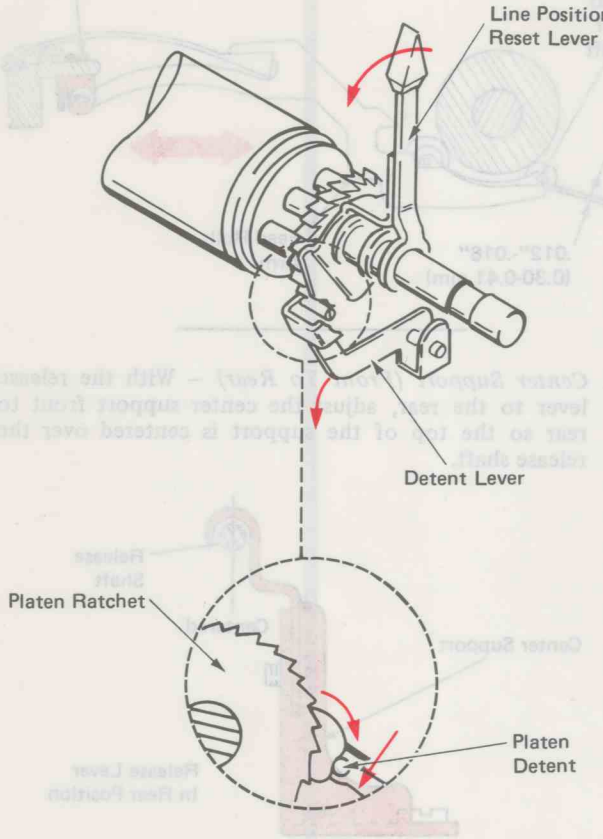


Figure 12 – Platen Variable

LINE POSITION RESET LEVER

With the line position reset lever, the operator can roll the paper away from a typed line and then return to it. As you move the lever forward, it disengages the platen detent from the platen ratchet. The platen can then rotate without being detented (Figure 13).



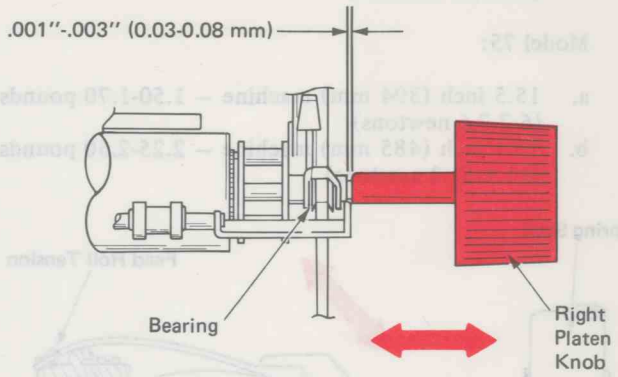
(Left Side View)

Figure 13 – Line Position Reset

PAPER FEED AND INDEX ADJUSTMENTS

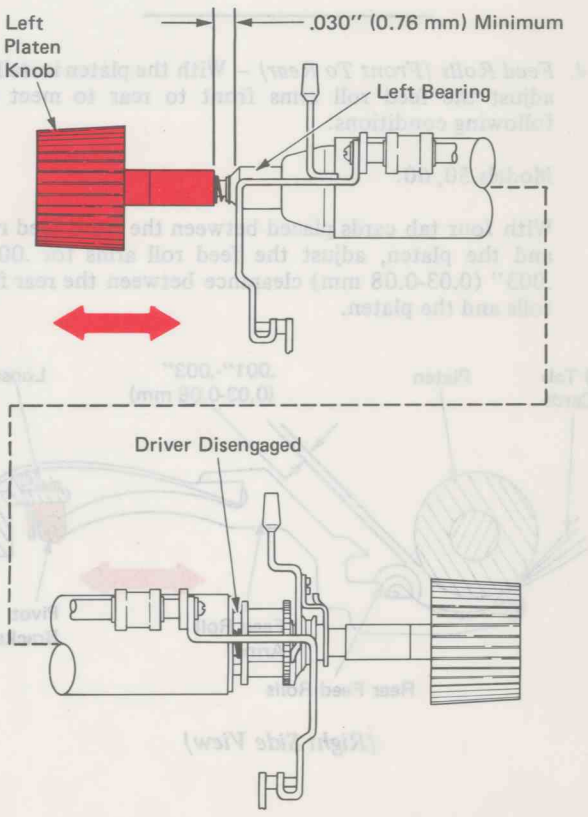
NOTE: See the Print Adjustment section for platen latches, platen position, and platen height adjustments.

1. *Platen End Clearance* – Position the right platen knob for .001"-.003" (0.03-0.08 mm) end clearance at the bearing.



(Front View)

2. *Platen Variable* – Adjust the left platen knob for a clearance of .030" (0.76 mm) from the left bearing. Hold the knob to the right so the platen driver disengages the platen.



(Front View)

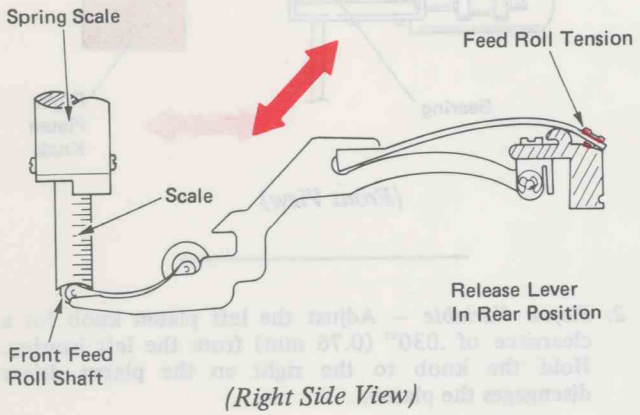
3. *Feed Roll Tension* – Adjust the feed roll tension screw so the feed rolls apply the following pressures, (as measured at the left and right ends of each front feed roll shaft):

Models 50, 60:

a. 15.5 inch (394 mm) machine – 2.00-2.25 pounds (8.9-10 newtons)
b. 19.1 inch (485 mm) machine – 2.25-2.50 pounds (10-11.1 newtons)

Model 75:

a. 15.5 inch (394 mm) machine – 1.50-1.70 pounds (6.7-7.6 newtons)
b. 19.1 inch (485 mm) machine – 2.25-2.50 pounds (11.1-12.2 newtons)

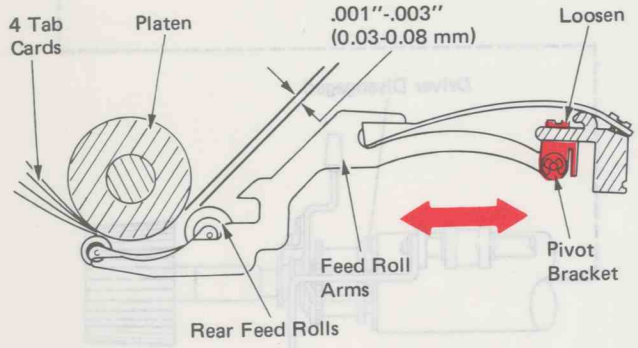


(Right Side View)

4. *Feed Rolls (Front To Rear)* – With the platen installed, adjust the feed roll arms front to rear to meet the following conditions:

Models 50, 60:

With four tab cards placed between the front feed rolls and the platen, adjust the feed roll arms for .001"-.003" (0.03-0.08 mm) clearance between the rear feed rolls and the platen.

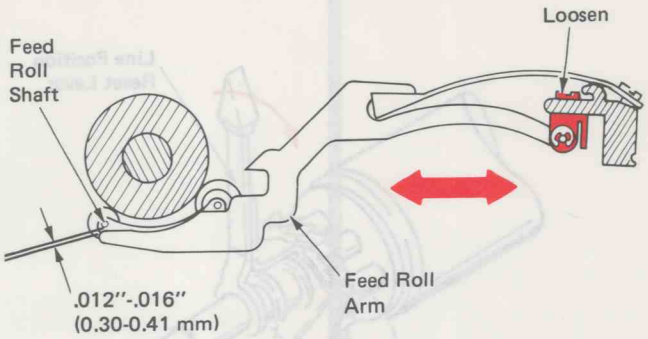


(Right Side View)

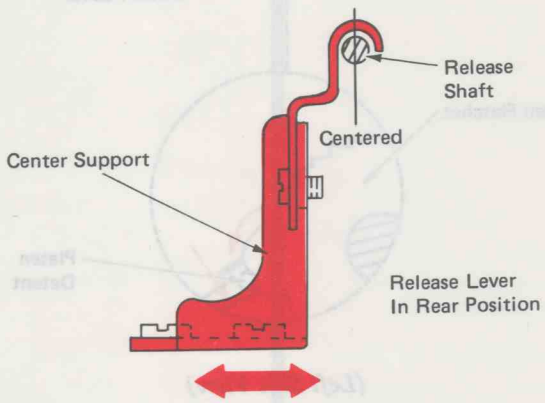
Model 75:

Adjust the feed roll arms for a clearance of .012"-.016" (0.30-0.41 mm) between the front feed roll shafts and their feed roll arms.

NOTE: Make sure the cardholder clearance is correct after making this adjustment.

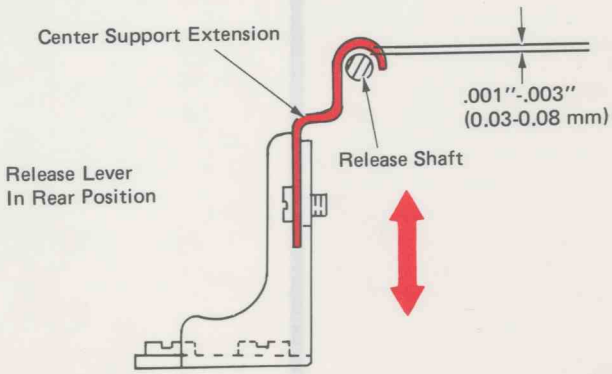


5. *Center Support (Front To Rear)* – With the release lever to the rear, adjust the center support front to rear so the top of the support is centered over the release shaft.



(Right Side View)

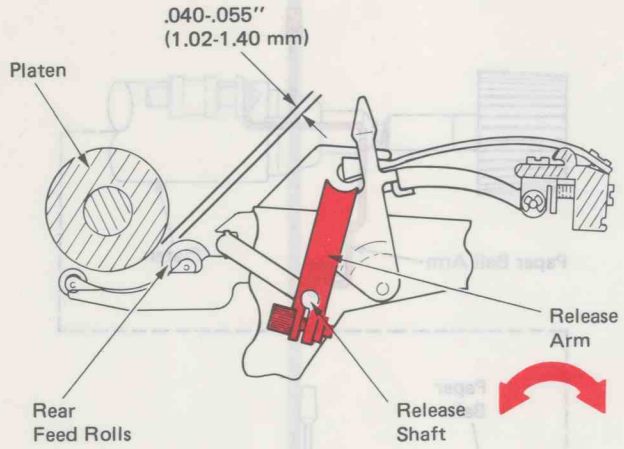
6. *Center Support Extension* – With the platen installed and the release lever in the rear position, adjust the center support extension for .001"-.003" (0.03-0.08 mm) clearance between the support and the release shaft.



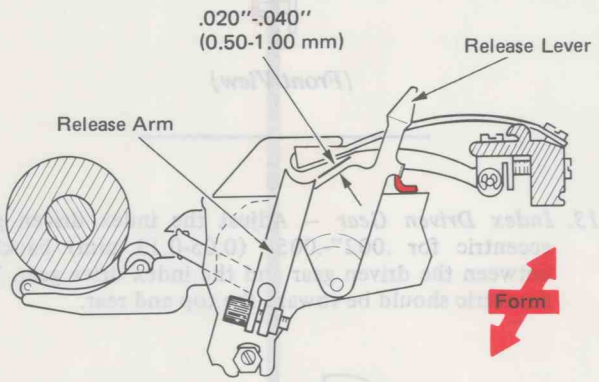
(Right Side View)

7. *Paper Release* – Adjust the release arm front to rear on the release shaft so the rear feed rolls clear the platen by .040"-.055" (1.02-1.40 mm) with the release lever in the forward position. Loosen the binding screw to change this adjustment.

NOTE: The release shaft should have .002"-.010" (0.05-0.25 mm) end clearance.



8. *Release Lever* – Form the tab on the release lever to get a clearance of .020"-.040" (0.50-1.00 mm) between the release arm and the release lever, with the platen installed and the paper release lever to the rear.

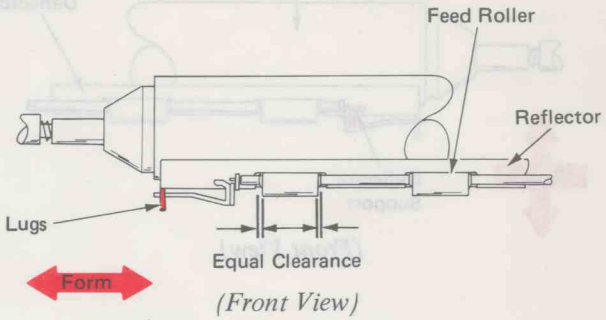


(Right Side View)

9. *Deflector* – Adjust the deflector left to right as follows:

Models 50, 60:

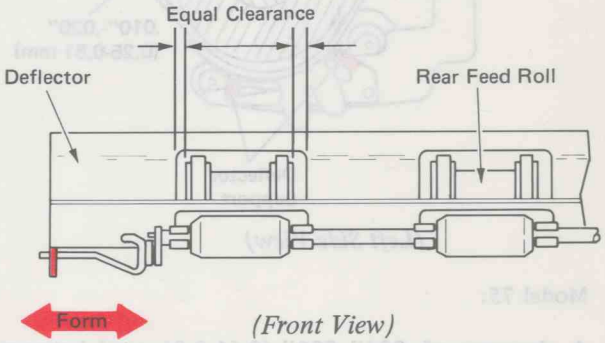
Form the left deflector lugs so the deflector holes have equal clearance on the left and right ends of the feed rollers.



(Front View)

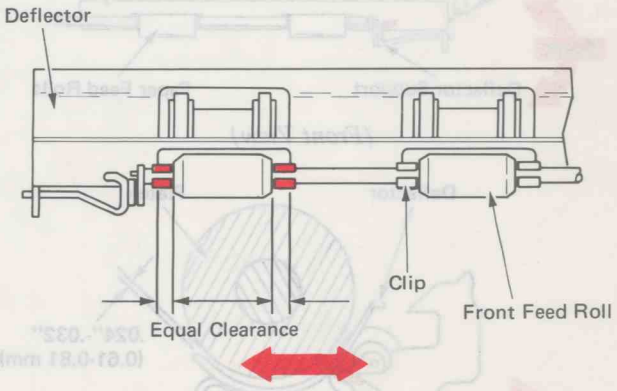
Model 75:

With the platen removed, form the left deflector lugs so the deflector holes have equal clearance on the left and right ends of the rear feed rolls.



(Front View)

10. *Front Feed Rolls (Left To Right) – Model 75 Only* – Position the front feed roll clips to center each feed roll within the deflector opening with minimum end clearance and no binds.

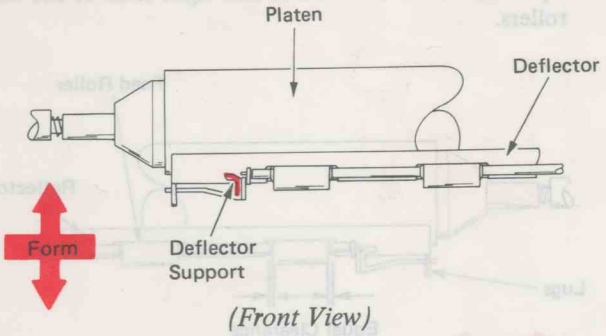


(Front View)

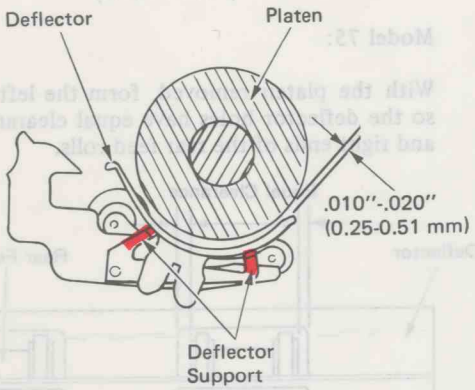
11. *Deflector Height* – Adjust the deflector support for:

Models 50, 60:

A clearance of .010"-.020" (0.25-0.51 mm) between the deflector and the platen.



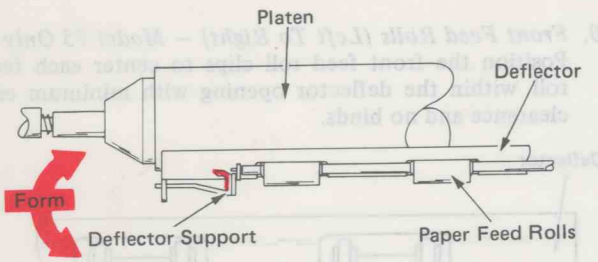
(Front View)



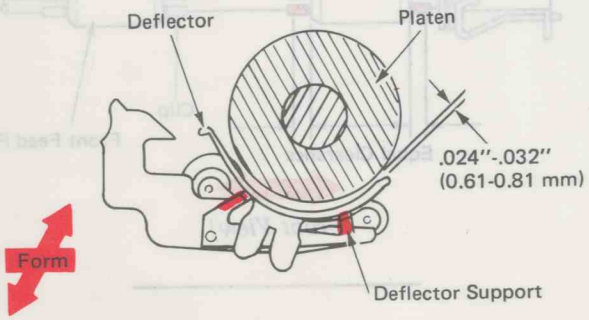
(Left Side View)

Model 75:

A clearance of .024"-.032" (0.61-0.81 mm) between the deflector and the platen.



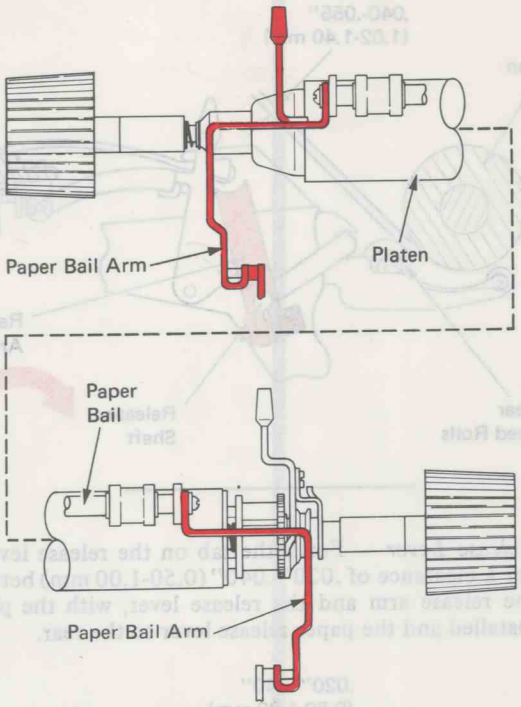
(Front View)



(Left Side View)

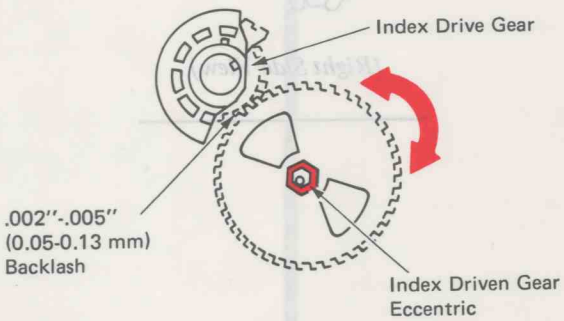
NOTE: The deflector must not contact the feed rolls when the platen and deflector are in position and the platen is rotated. The paper release lever should be to the rear when checking this adjustment.

12. *Paper Bail Arms* – Form the paper bail arms so the paper bail is parallel with the platen.



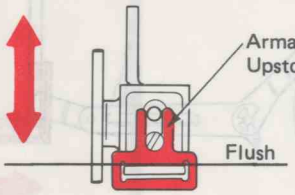
(Front View)

13. *Index Driven Gear* – Adjust the index driven gear eccentric for .002"-.005" (0.05-0.13 mm) backlash between the driven gear and the index drive gear. The eccentric should be toward the top and rear.

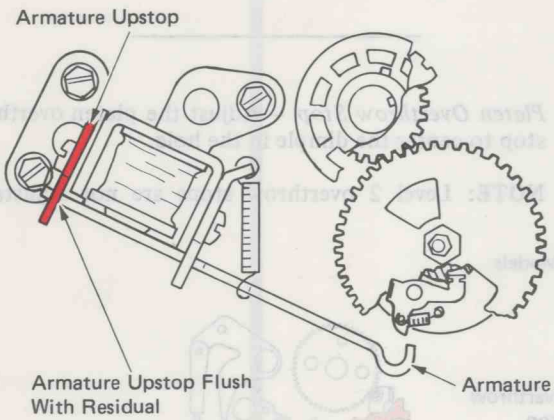


(Right Side View)

14. *Index Magnet Upstop* – Adjust the index magnet armature upstop up or down so the top of the slot is flush with the magnet residual, with the magnet held in the energized position.

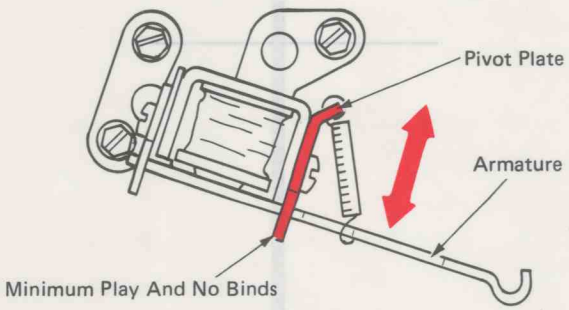


(Front View)



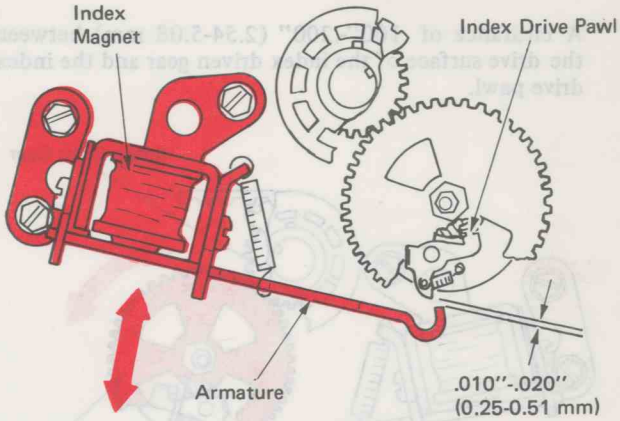
(Right Side View)

15. *Index Magnet Pivot Plate* – Adjust the plate up or down so the armature pivots with minimum play and no binds.



(Right Side View)

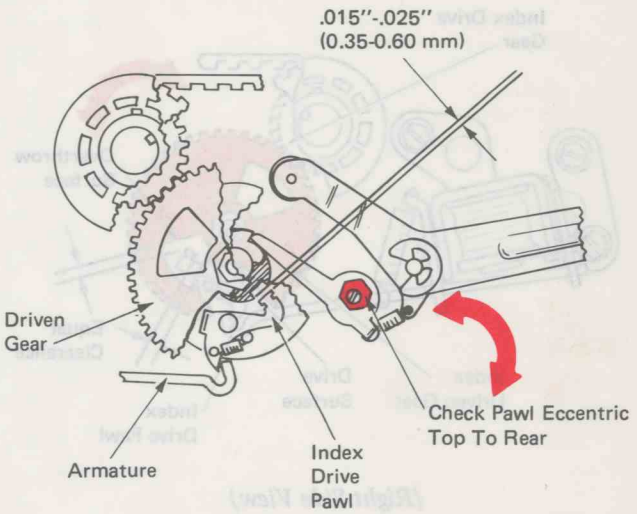
16. *Index Magnet Position* – With the index magnet armature in the energized position, adjust the magnet for .010"-.020" (0.25-0.51 mm) clearance between the tip of the index drive pawl and the latching surface of the armature.



(Right Side View)

17. *Index Cam Check Pawl* – Adjust the check pawl eccentric for .015"-.025" (0.35-0.60 mm) clearance between the index drive pawl and the drive surface of the driven gear.

With the index magnet armature engaged with the index drive pawl, hand cycle the print shaft until the drive surface aligns with the index drive pawl, then check this adjustment.

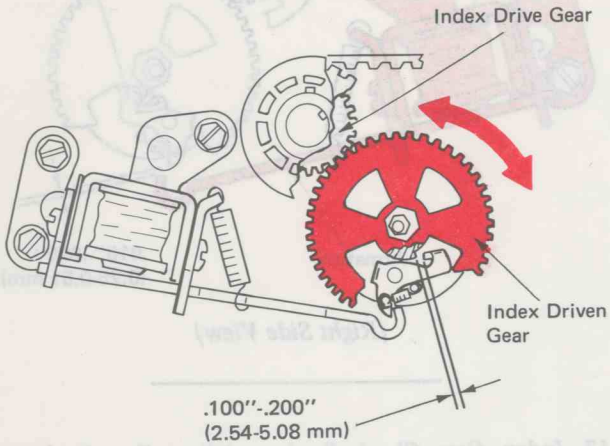


(Right Side View)

18. *Index Timing* – With the print shaft cycle clutch latched and the check pawl engaging the index cam, engage the index driven gear with the index drive gear to meet the following conditions:

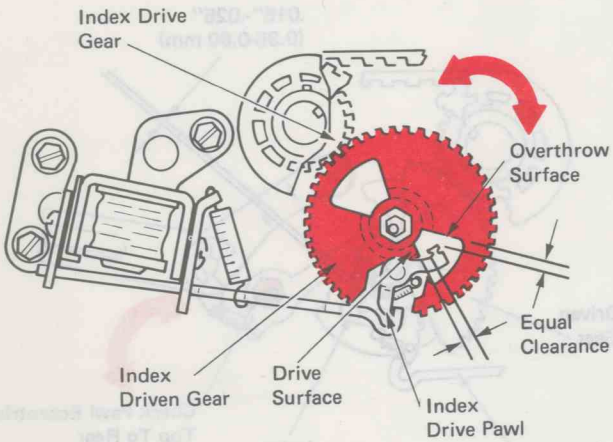
Models 50, 60:

A clearance of .100"-.200" (2.54-5.08 mm) between the drive surface of the index driven gear and the index drive pawl.



Model 75:

The index drive pawl must be centered between the drive surface and the overthrow surface of the index driven gear.

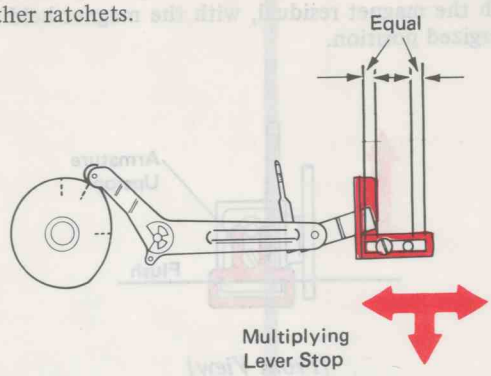


(Right Side View)

To make this adjustment, remove the print shaft C-clip and move the print shaft to the right to disengage the index drive gear.

NOTE: The print shaft timing should be checked before this adjustment is changed.

19. *Multiplying Lever Stop* – Adjust the stop to the center position (54 tooth). Adjust all the way forward for all other ratchets.

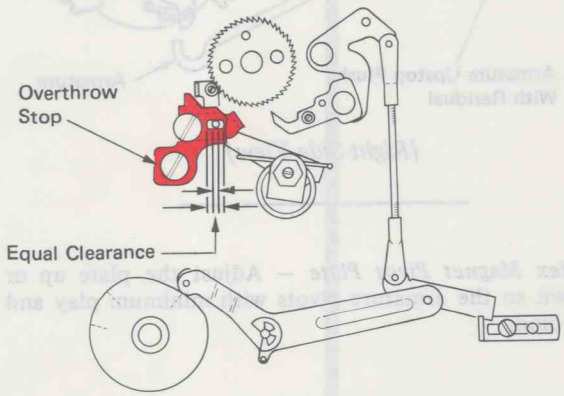


(Right Side View)

20. *Platen Overthrow Stop* – Adjust the platen overthrow stop to center the dimple in the hole.

NOTE: Level 2 overthrow stops are not adjustable.

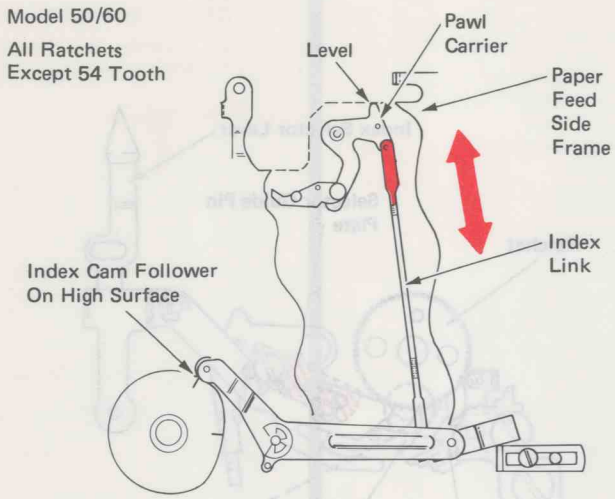
All Models



21. Index Link – Adjust the index link for the following conditions:

Models 50, 60 – All ratchets, except 54 tooth:

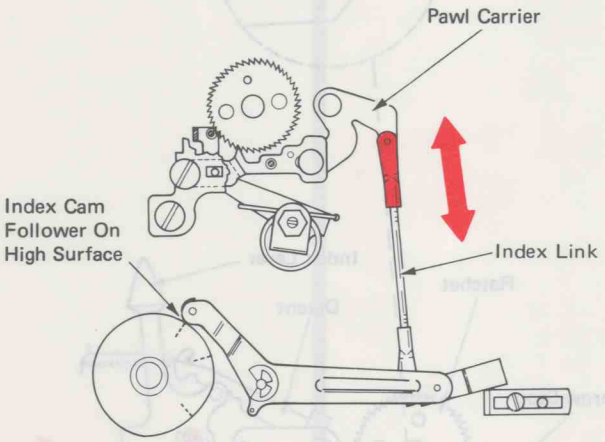
With the index cam follower on the high point of the index cam, adjust the index link so the pawl carrier is level with the top of the paper feed side frame.



Level 2 Cam Will Have An Adjusting Scribe Mark

Models 50, 60 – 54 tooth ratchets (No adjusting scribe mark on the index cam):

With the index cam follower on the high point of the cam and the pawl held against the overthrow stop, adjust the index link to match the hole in the pawl carrier, then shorten the link one turn.



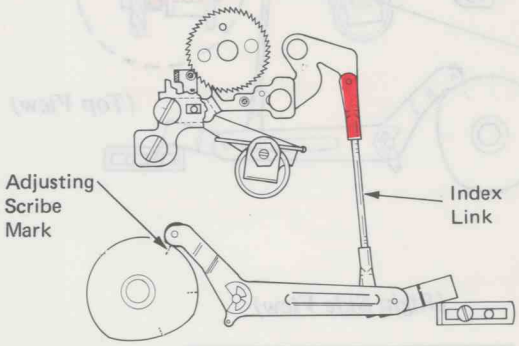
Adjust Link To Match Hole; Shorten One Turn

Models 50, 60, 75 – All Model 75s, and Models 50, 60 with a 54 tooth ratchet and the adjustment scribe mark on the index cam:

Adjust the index link so the index pawl contacts the overthrow stop when the index cam follower is aligned with the adjustment scribe mark on the index cam.

To make this adjustment, cycle the index cam so the cam follower aligns with the adjustment mark. With the platen installed, push the index pawl carrier down until the pawl fully contacts the stop, then adjust the link to match the hole in the pawl carrier.

NOTE: The adjusting scribe mark may be on the outside or inside surface of the index cam.



Scribe Mark On
Inside Of Cam

(Right Side View)

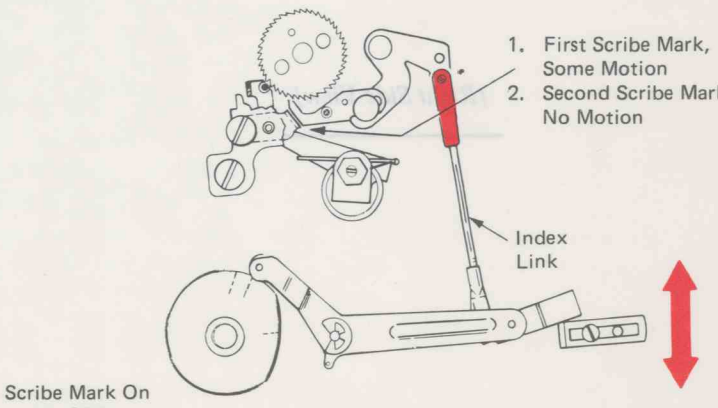
Models 50, 60, 75 – All ratchets (late level cams). These cams have two adjusting scribe marks on the inside of the cam. The scribe marks can be seen through the access hole in the right side frame.

NOTE: Some early level cams had punch marks instead of scribe marks.

Adjust the index link for two conditions:

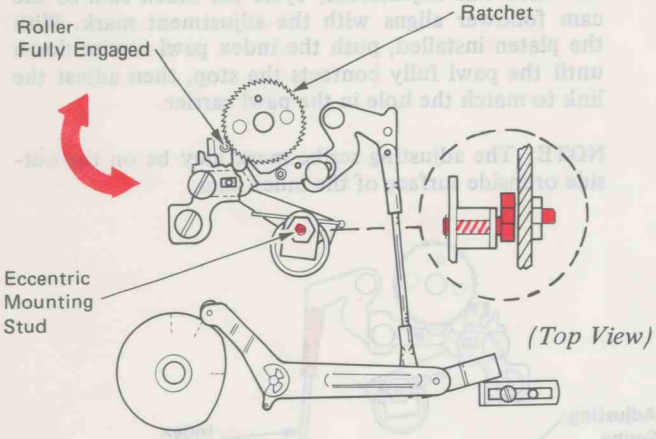
a. With the index cam follower on the first scribe mark (preliminary mark), there should be some motion between the index pawl and the overthrow stop.

b. With the index cam follower on the next scribe mark (adjusting mark), there should be no motion between the index pawl and the overthrow stop.



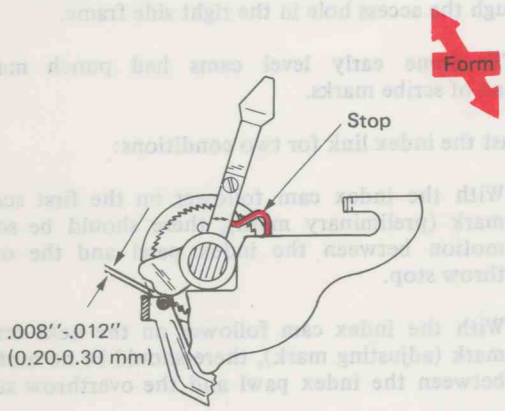
22. *Platen Detent* – With the index cam follower on the high surface of the index cam, adjust the eccentric mounting stud so the detent roller fully engages the ratchet teeth.

The eccentric should be toward the lower front quarter.



(Right Side View)

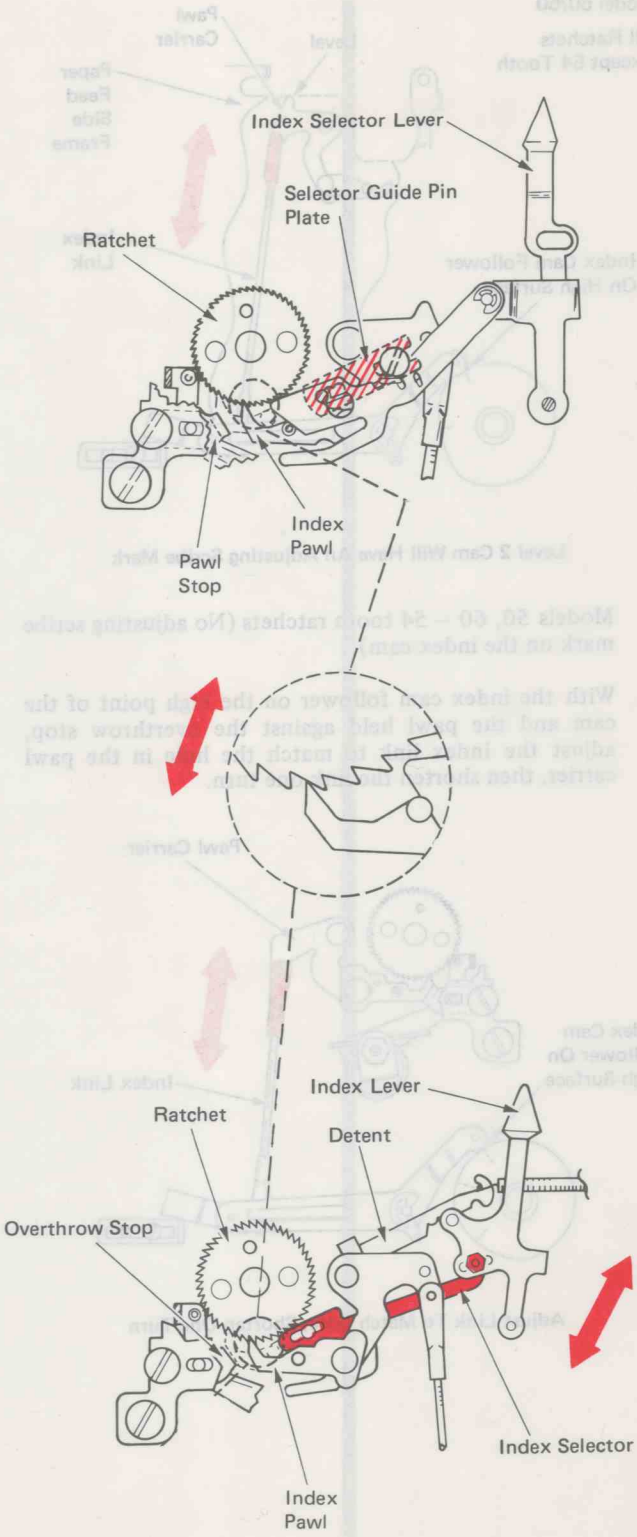
23. *Platen Detent Release Lever* – Adjust the detent release lever stop for a clearance of .008"-.012" (0.20-0.30 mm) between the cam surface and the detent roller when the detent roller fully engages with the ratchet.



(Right Side View)

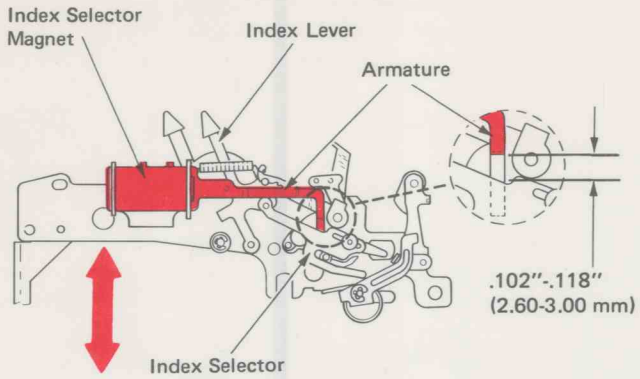
24. *Index Selector* – With the linespace lever to the rear, adjust the pawl guide support so the index pawl contacts the ratchet approximately halfway down the surface of a tooth.

After making this adjustment, check pawl entry in the other lever positions similar to the way you checked the rear position. Readjust if necessary.



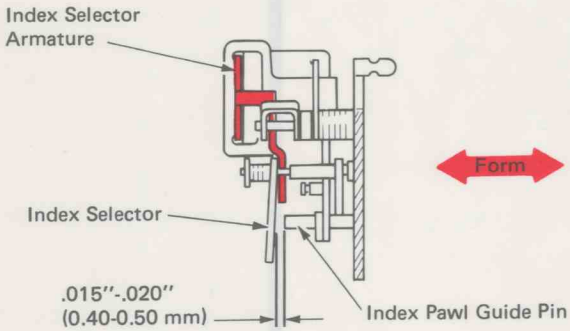
(Right Side View)

25. *Index Selector Magnet* – With the linespace lever in triple space and the magnet armature held in the energized position, adjust the magnet assembly for .102"-.118" (2.60-3.00 mm) clearance between the armature and the index selector.



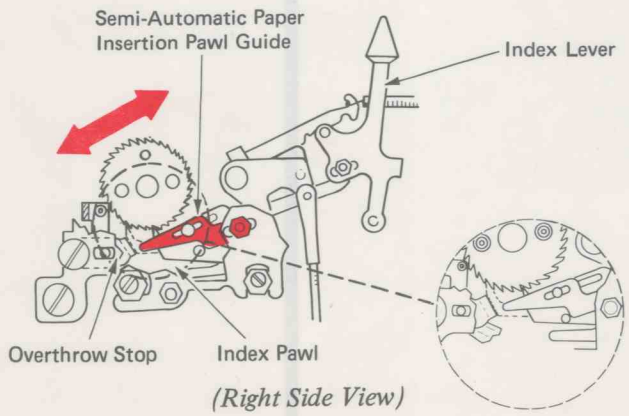
(Left Side View)

26. *Index Selector Armature* – With the linespace lever in the single-space position and the magnet armature held in the energized position, form the armature so the selector clears the index pawl guide pin by .015"-.020" (0.40-0.50 mm).



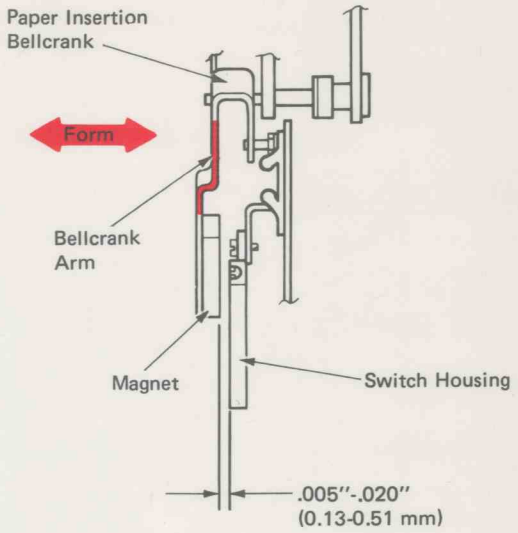
(Front View)

27. *Triple Index Pawl Guide* – Adjust the guide front to rear so the index pawl entry matches the triple index pawl entry.



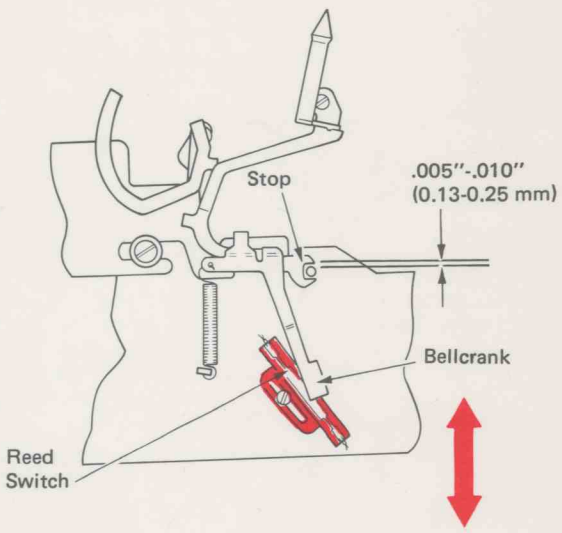
(Right Side View)

28. *Paper Insertion Bellcrank* – Form the bellcrank arm so the magnet is .005"-.020" (0.13-0.51 mm) from the switch housing.



(Top View)

29. *Paper Insertion Reed Switch* – Adjust the reed switch so it closes when the semi-automatic paper insertion bellcrank is .005"-.010" (0.13-0.25 mm) from the top of the stop.



(Left Side View)

MARGIN AND BELL OPERATIONAL THEORY

The margin positions are stored in the electronics and may be set or changed as described in the operating instructions. The electronics monitor the position of the carrier by counting emitter pulses as the carrier moves. Emitter pulses are discussed in the Escapement section of this manual. The carrier position on the writing line is indicated on the margin scale with a pointer.

When the carrier is five character spaces from the right margin, the electronics energize the bell magnet. During a carrier return the electronics count the emitter pulses and stop the carrier when it reaches the left margin position.

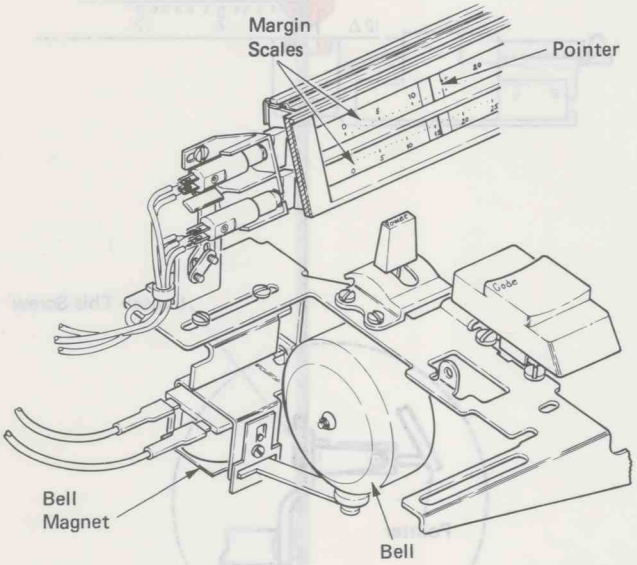


Figure 1 – Margin And Bell

MARGIN BELL

The margin bell assembly consists of the bell magnet, magnet armature, bell clapper, and bell (Figure 2). The clapper fits into a hole in the end of the magnet armature. When the magnet is energized, the armature moves toward the bell. The armature stops against the magnet upstop and the clapper continues upward to strike the bell.

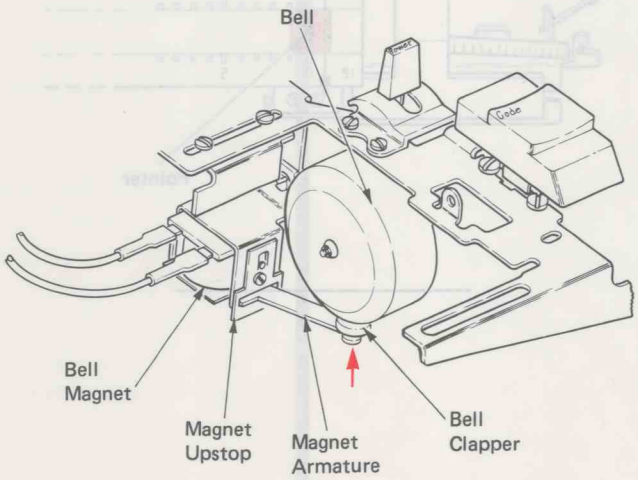


Figure 2 – Margin Bell

LIGHTED MARGINS (MODEL 75 ONLY)

The margin scales are lighted by lamps at the left end of the scales (Figure 3). Power (2.4 VAC) is provided to the lamps by the transformer. The 10-pitch lamp lights the 10-pitch scale. The 12-pitch lamp lights the 12-pitch scale. When the machine is operating, one of the lamps will be on.

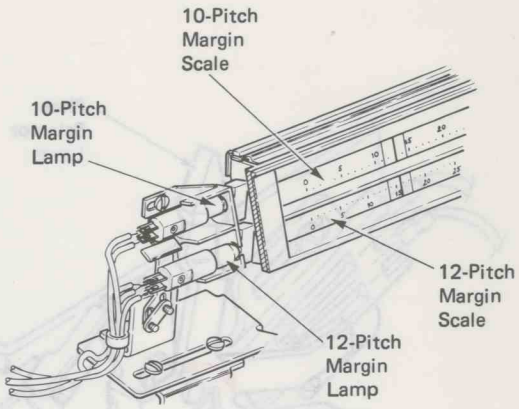


Figure 3 – Lighted Margins

The lamp On/Off switch is on the POR switch pivot bracket and is operated by the switch actuator (Figure 4). The actuator is spring loaded to the rear by a spring inside the lamp On/Off switch. As the motor keybutton is moved to the on position, the On/Off switch link pivots the switch operating bail top to front. This pivots the switch actuator toward the front to close the lamp On/Off switch. When the switch is closed, the selected margin lamp turns on.

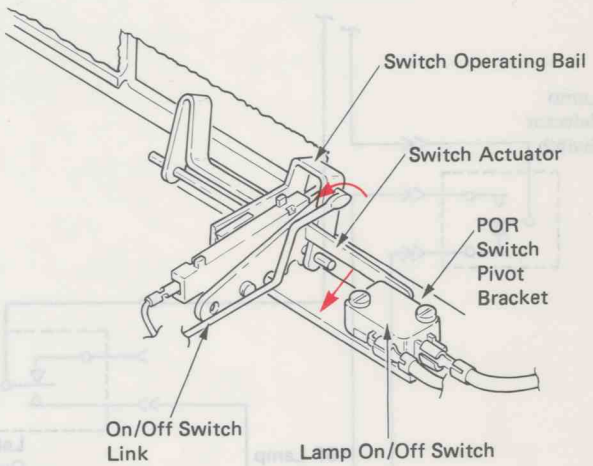


Figure 4 – Lamp On/Off Switch

The lamp selector switch selects the proper margin lamp (Figure 5). The switch is operated by the switch actuator. The actuator is spring loaded up by a spring inside the lamp selector switch and is operated by a lug on the pitch selector lever. When the pitch selector lever is in the 12A or 12B position, the normally closed contact is closed. This lights the 12 pitch margin lamp. When the pitch selector lever is in the 10A or 10B position, the normally open contact is closed. This lights the 10 pitch margin lamp.

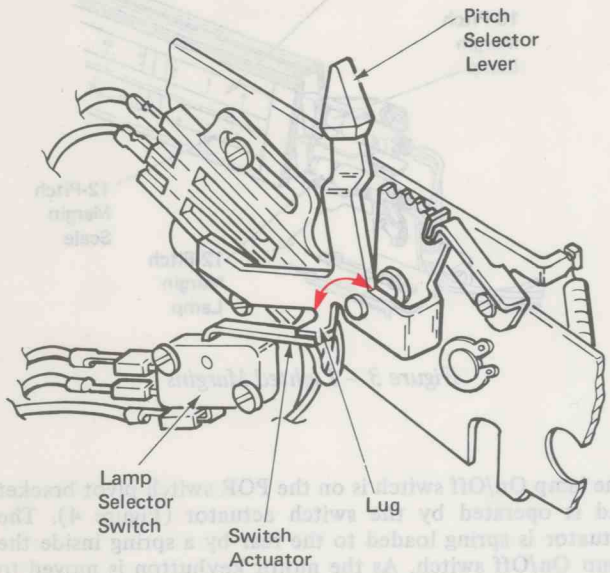


Figure 5 – Lamp Selector Switch

The margin lamp circuit diagram shows how the machine is wired to light the selected margin lamp (Figure 6).

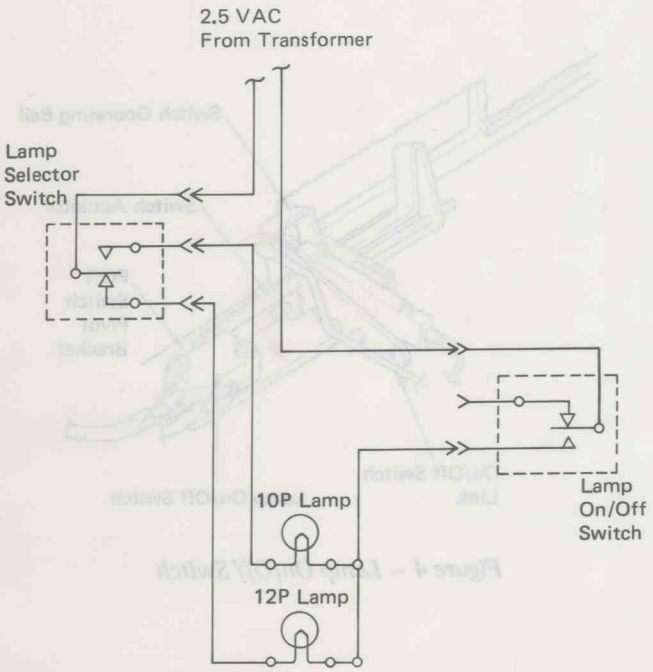
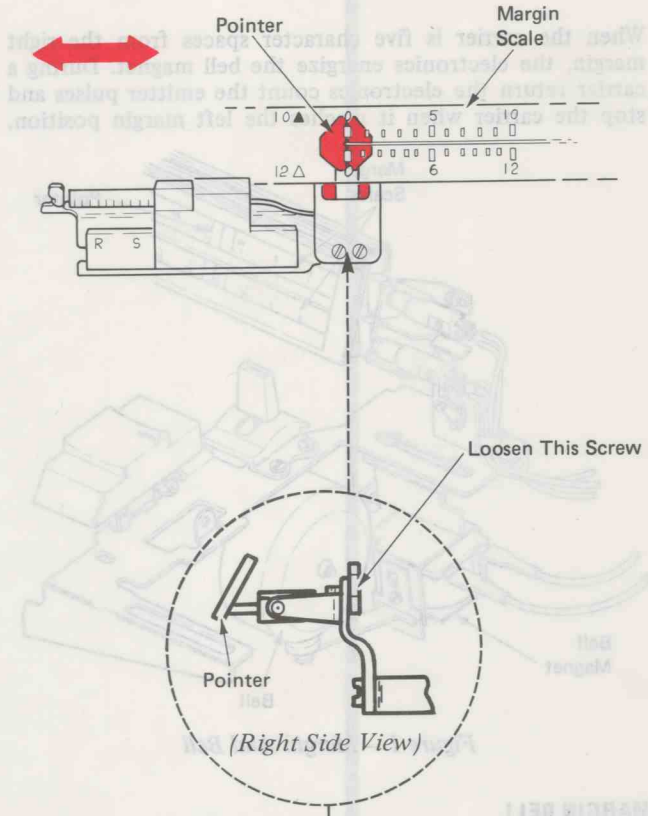


Figure 6 – Margin Lamp Circuit

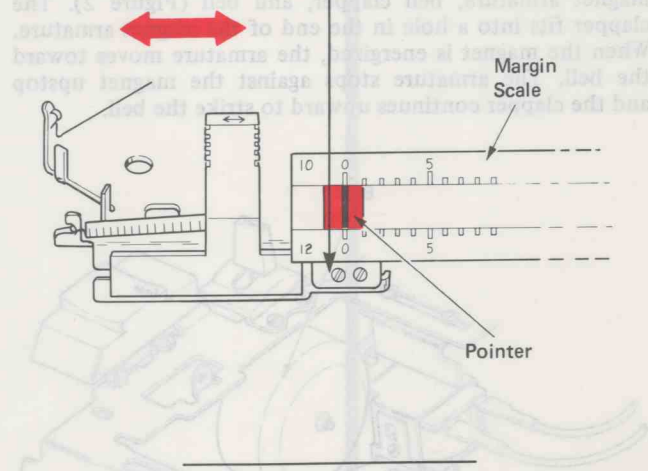
MARGIN AND BELL ADJUSTMENTS

1. *Carrier Pointer (Left-to-Right)* – With the leadscrew in the home position, adjust the carrier pointer left to right so the vertical line on the pointer aligns with the zero on the margin scale.

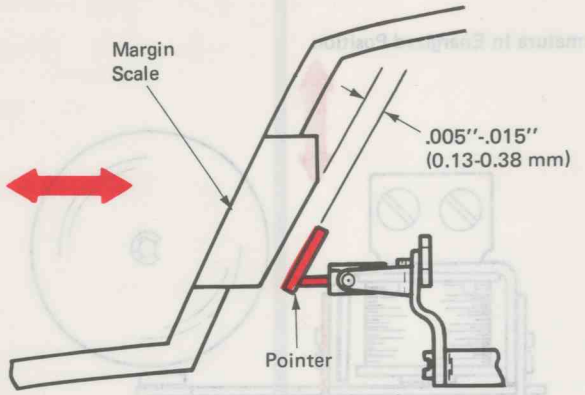
Carrier At Left Frame, Model 50/60



Carrier At Left Frame, Model 75

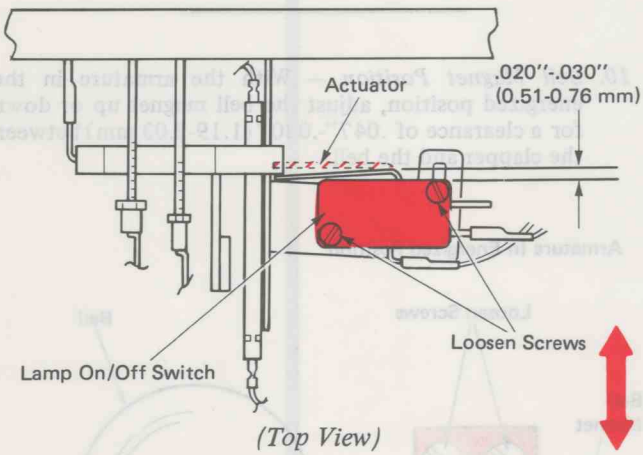


2. *Carrier Pointer (Front-to-Rear) (Model 75 RCS Only)* – Adjust the pointer front to rear for .005"-.015" (0.13-0.38 mm) clearance between the pointer and the margin scale.



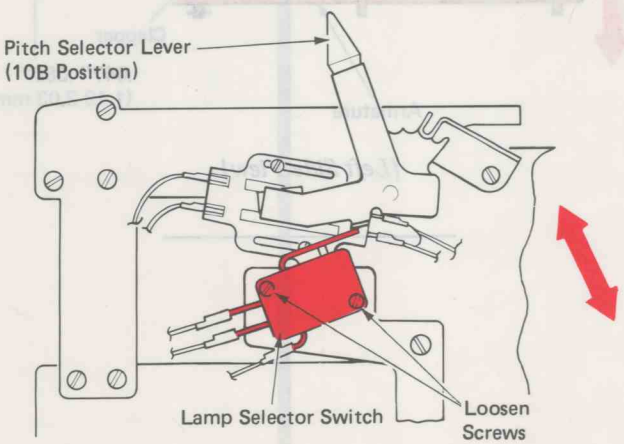
(Right Side View)

3. *Lamp On/Off Switch* – Adjust the switch front to rear for .020"-.030" (0.51-0.76 mm) overthrow of the actuator. Make this adjustment after the switch closes and as the motor On/Off button is moved to On.



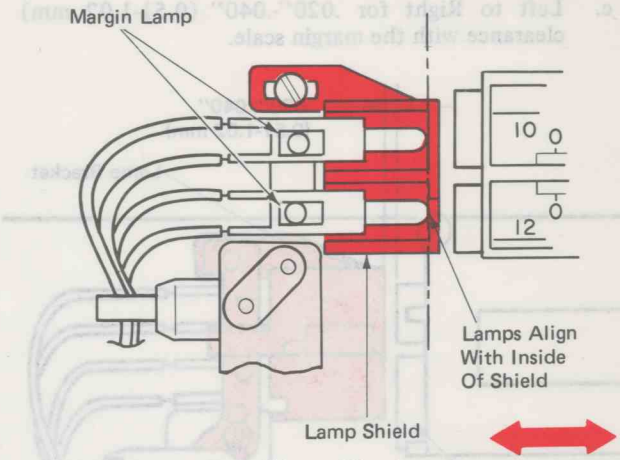
(Top View)

4. *Lamp Selector Switch* – Adjust the switch up or down so that it just closes (10 pitch lamp on) as the pitch selector lever detents into the 10B position from the 12A position. Check the lamps with the lever in all positions.



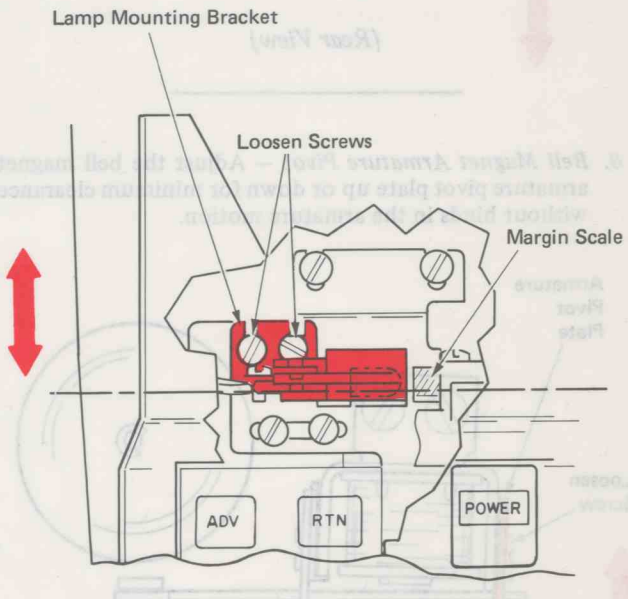
(Left Side View)

5. *Lamp Shield* – Adjust the lamp shield left or right so the right ends of the lamps align with the inside surface of the shield.



(Front View)

6. *Lamp Mounting Bracket (Front-to-Rear)* – Adjust the lamp mounting bracket front or rear so the lamps align with the center of the margin scales. Ensure that the lamps are parallel to the margin scales.



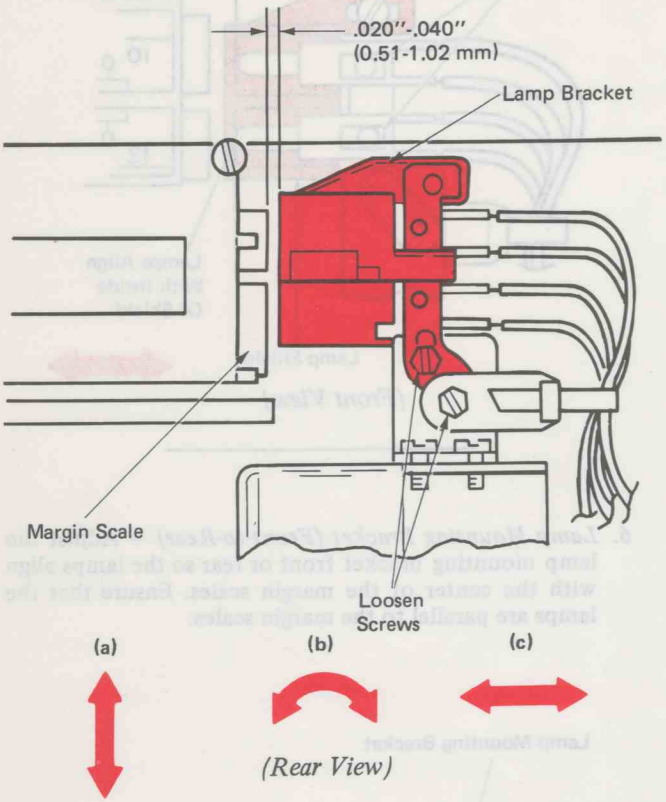
(Top View)

7. *Lamp Alignment* – Adjust the lamp bracket for three conditions:

   a. Up or down for maximum brightness at the right side of the scale.

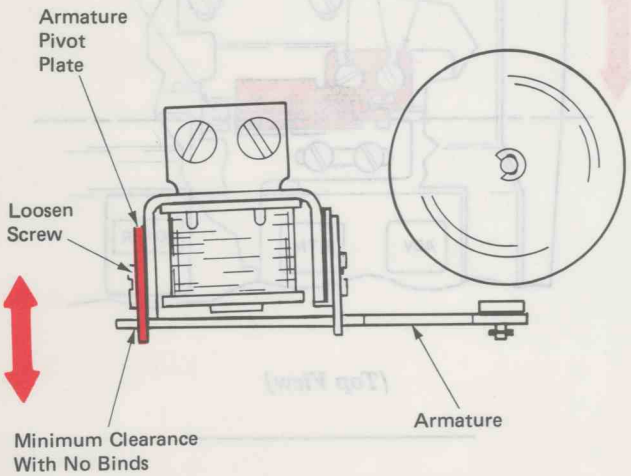
   b. Rotationally for even brightness across the scale.

   c. Left to Right for .020"-.040" (0.51-1.02 mm) clearance with the margin scale.



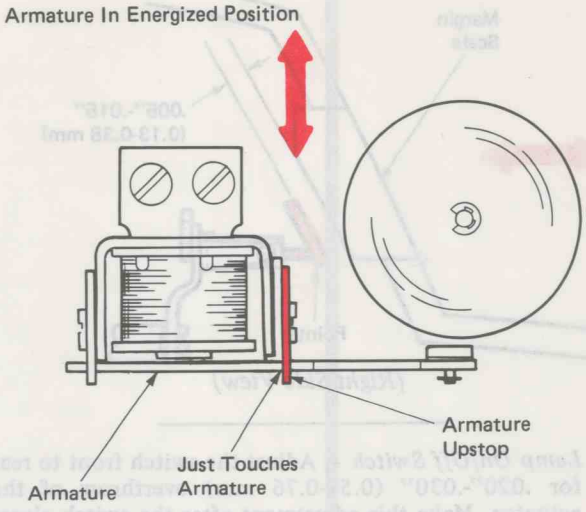
(Rear View)

8. *Bell Magnet Armature Pivot* – Adjust the bell magnet armature pivot plate up or down for minimum clearance without binds in the armature motion.



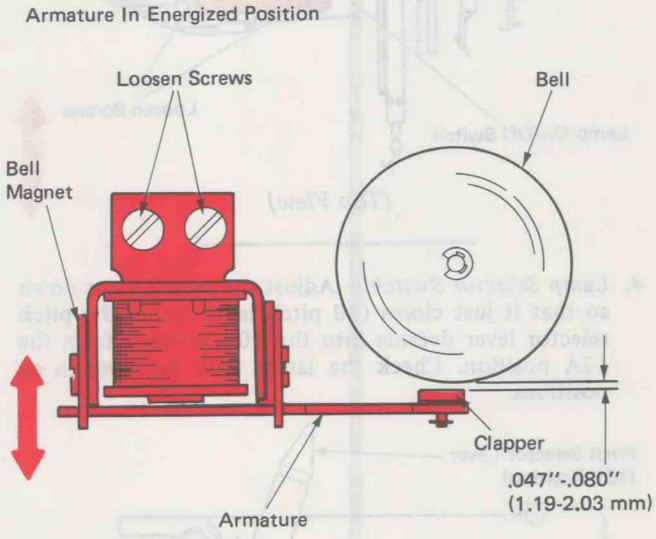
(Left Side View)

9. *Bell Magnet Armature Upstop* – With the armature in the energized position, adjust the upstop up or down to just contact the top of the armature.



(Left Side View)

10. *Bell Magnet Position* – With the armature in the energized position, adjust the bell magnet up or down for a clearance of .047"-.080" (1.19-2.03 mm) between the clapper and the bell.



(Left Side View)

COVERS OPERATIONAL THEORY

The cover assembly has three main sections: top cover, center cover, and bottom cover.

The covers include an acoustical filter hood to reduce the amount of noise from the typewriter. The hood mounts to the center support bar on the center cover and covers the opening between the top and center covers (Figure 1).

The page-end indicator and paper guide are mounted on the center support bar. When raised, the indicator supports the paper.

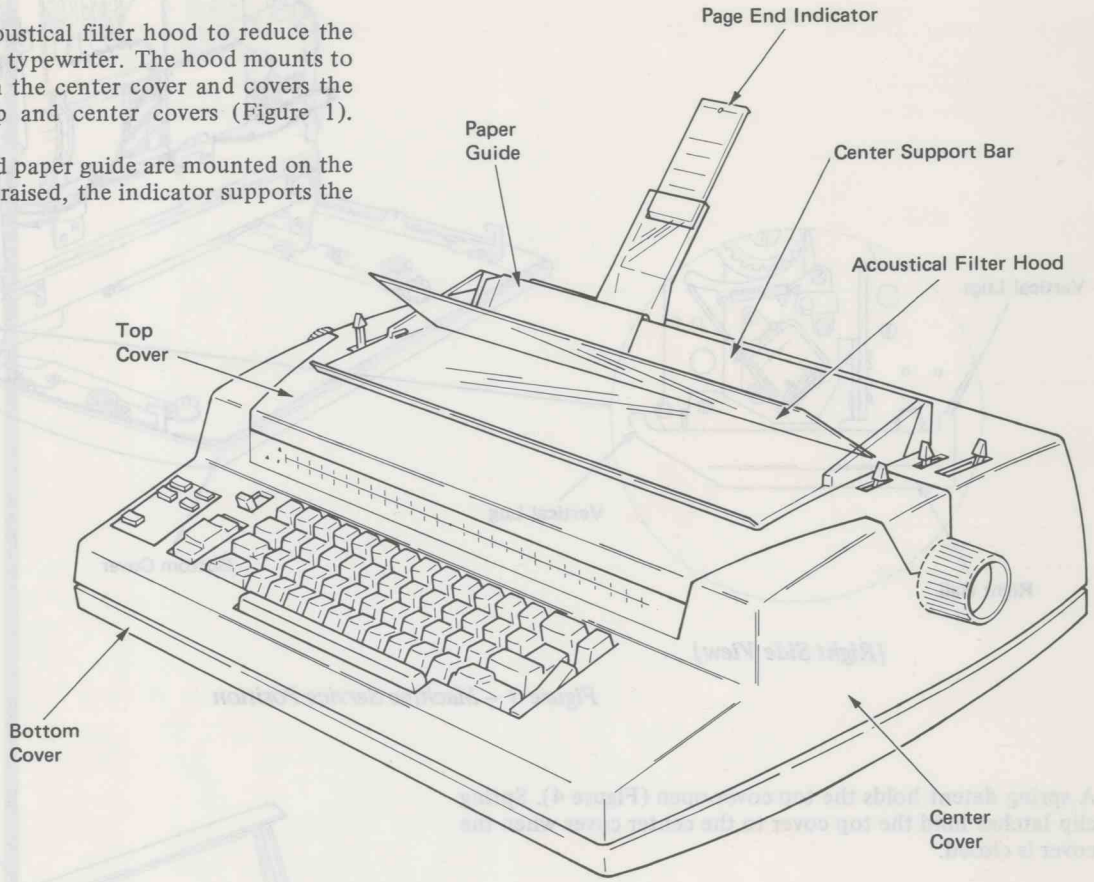


Figure 1 – Covers

Sliding latches on each side hold the bottom cover and center cover together (Figure 2). The latches slide to the rear to latch the covers.

Rubber shock mounts support the machine in the bottom cover.

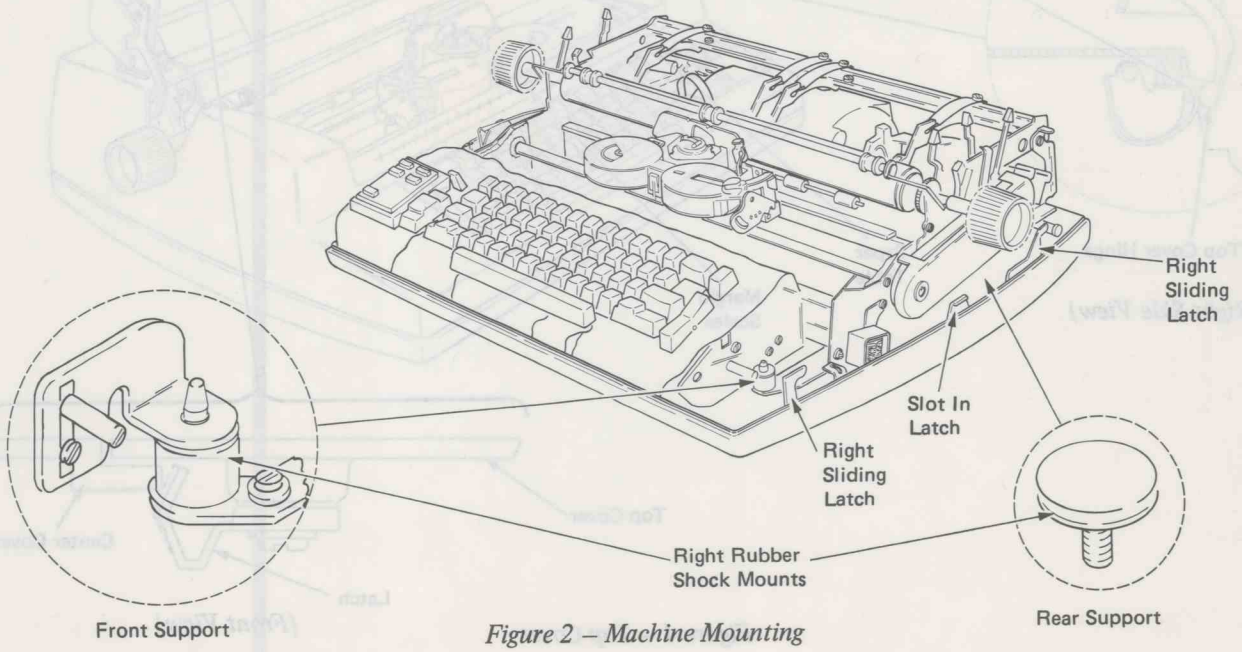


Figure 2 – Machine Mounting

To service, tilt the machine up as shown in Figure 3. In the service position, the machine is supported on rails in the bottom cover. Vertical lugs on the rails help control front and rear movement of the machine as it is being tilted up or down.

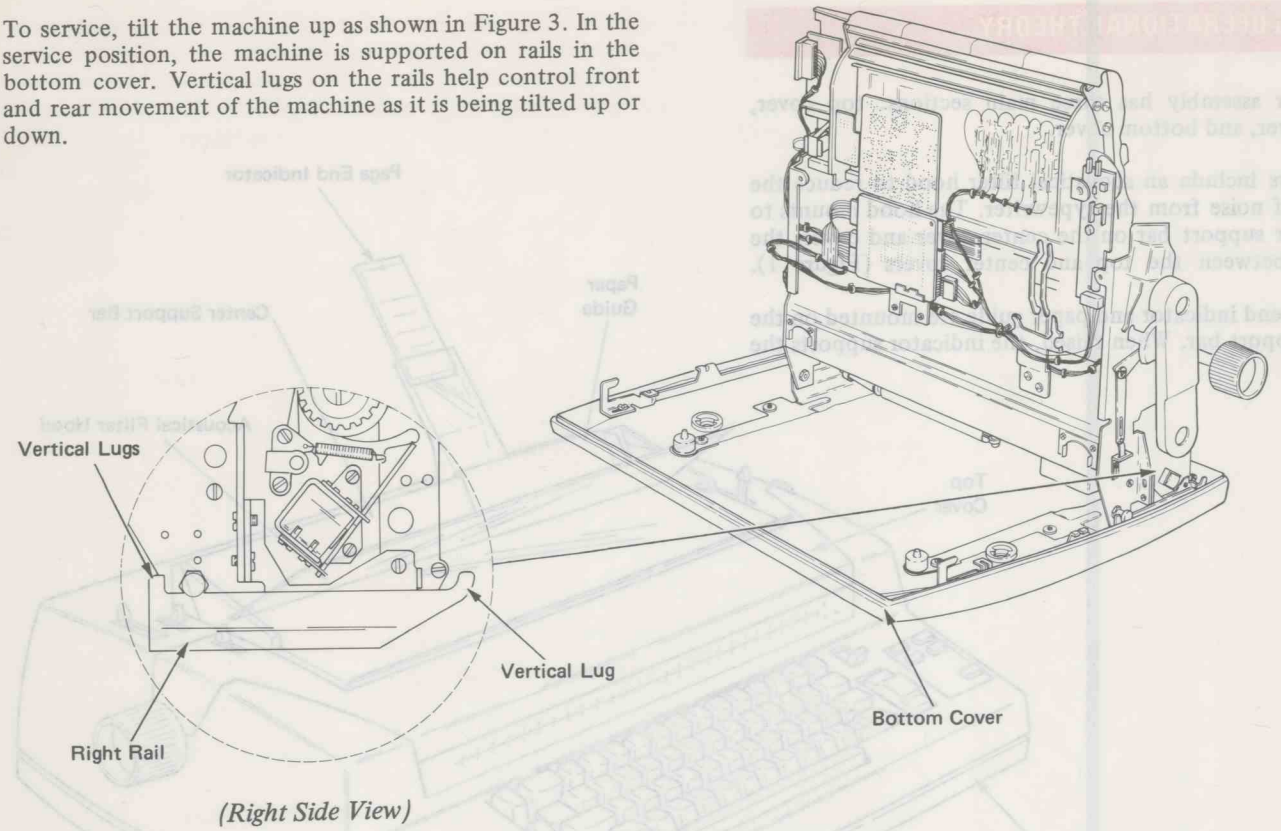


Figure 3 – Machine Service Position

A spring detent holds the top cover open (Figure 4). Spring clip latches hold the top cover to the center cover when the cover is closed.

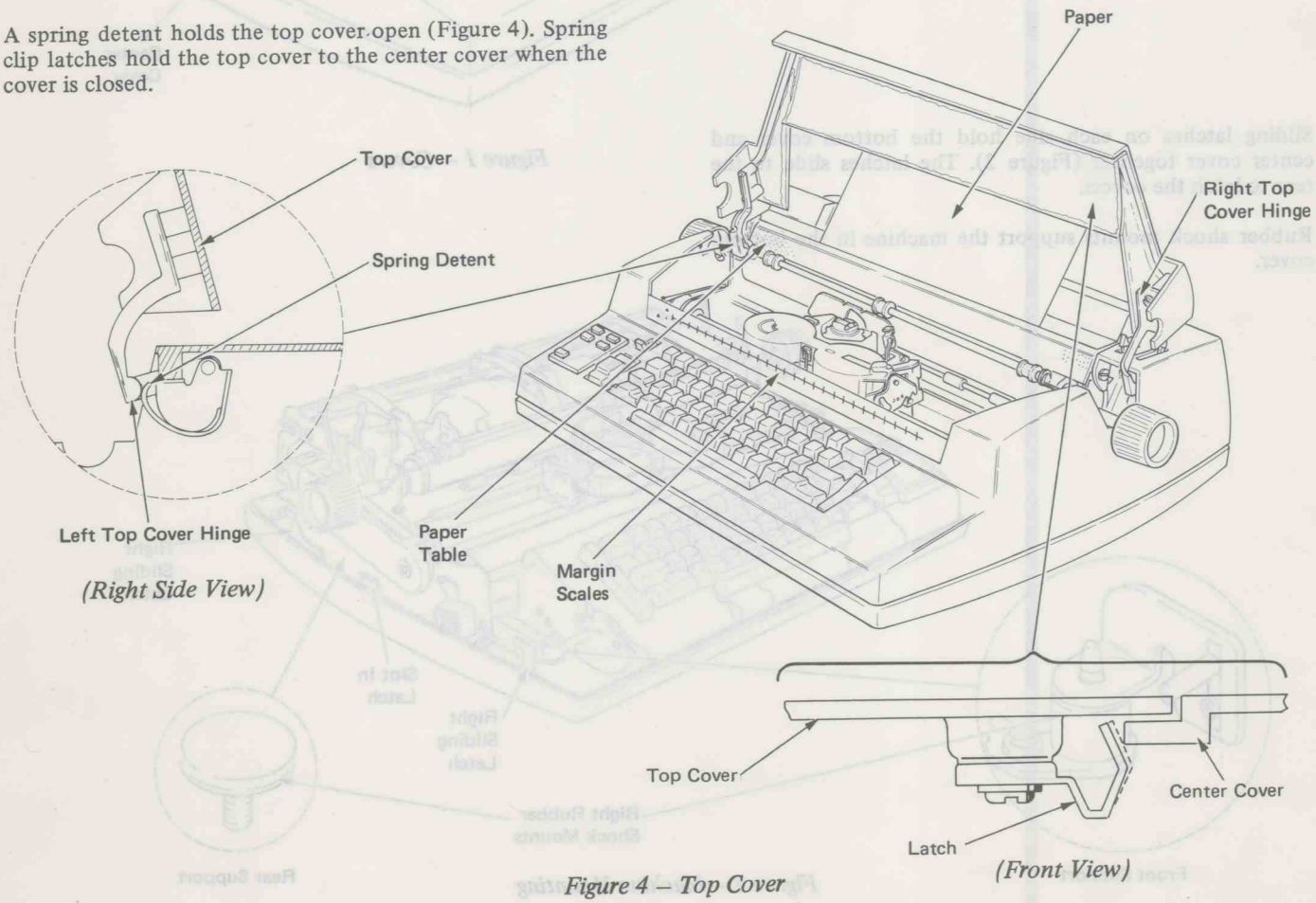


Figure 4 – Top Cover

The paper table is mounted by two brackets attached to the center cover (Figure 5). The front of the paper table can be pivoted up to remove the platen. Springs hold the table against the platen. A scale on the paper table is for positioning the paper left or right.

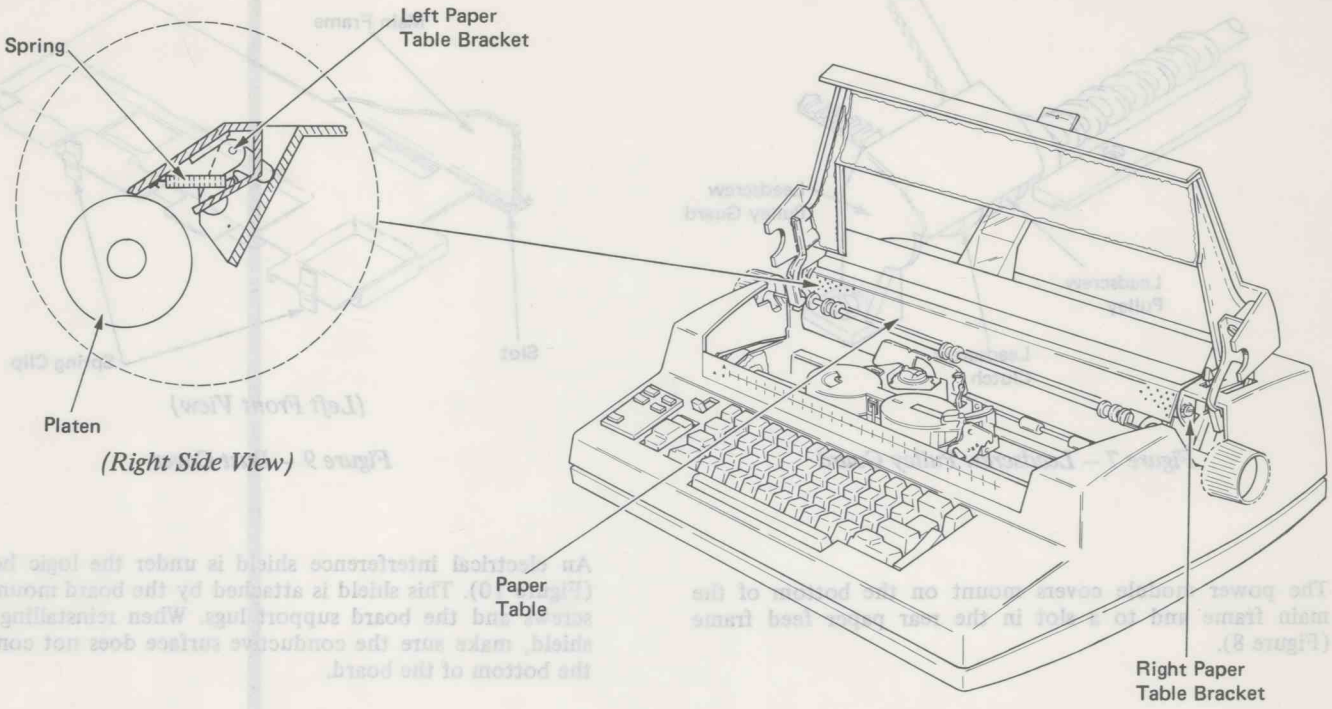


Figure 5 – Paper Table

SAFETY SHIELDS

Safety shields protect the operator from moving parts. If you remove the shields for servicing the machine, you must reinstall them.

The belt guard covers the print shaft drive belt and pulley (Figure 6).

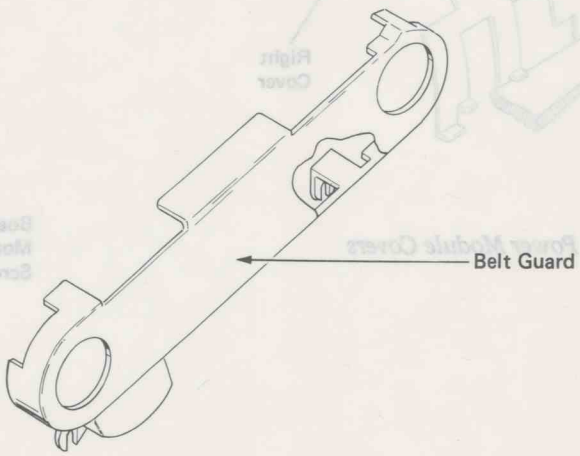


Figure 6 – Belt Guard

The leadscrew pulley guard covers the leadscrew pulley and leadscrew clutch (Figure 7).

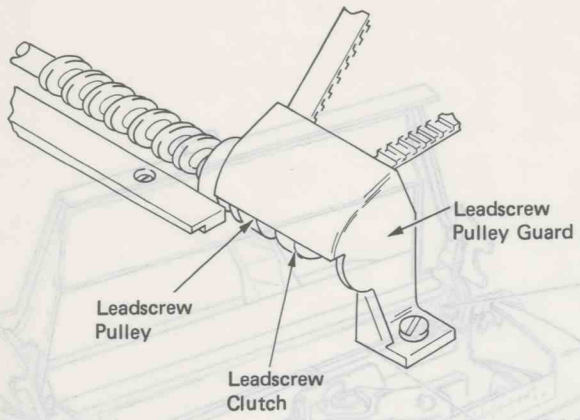


Figure 7 – Leadscrew Pulley Guard

The power module covers mount on the bottom of the main frame and to a slot in the rear paper feed frame (Figure 8).

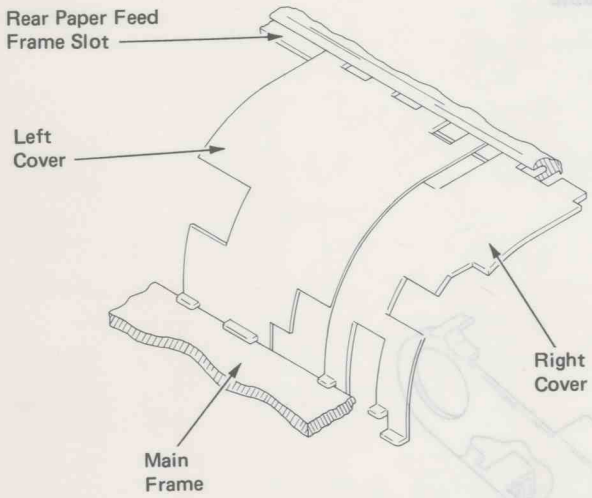
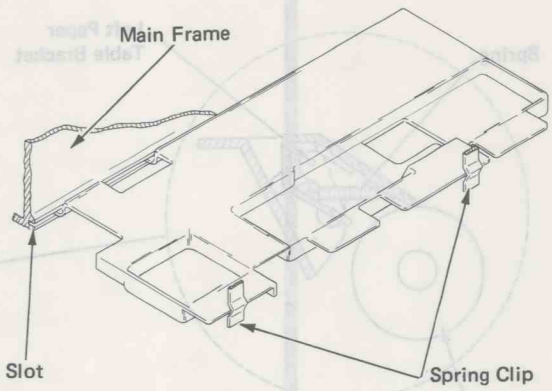


Figure 8 – Power Module Covers

ELECTRONIC SHIELDS

The electronic boards are protected by a dust cover (Figure 9). The cover is mounted by two spring clips at the front and a slot in the frame at the rear.



(Left Front View)

Figure 9 – Dust Cover

An electrical interference shield is under the logic board (Figure 10). This shield is attached by the board mounting screws and the board support lugs. When reinstalling the shield, make sure the conductive surface does not contact the bottom of the board.

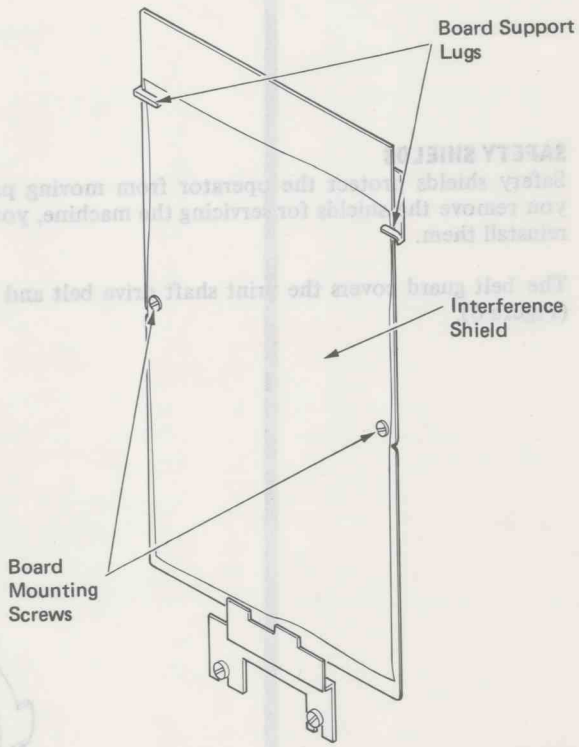
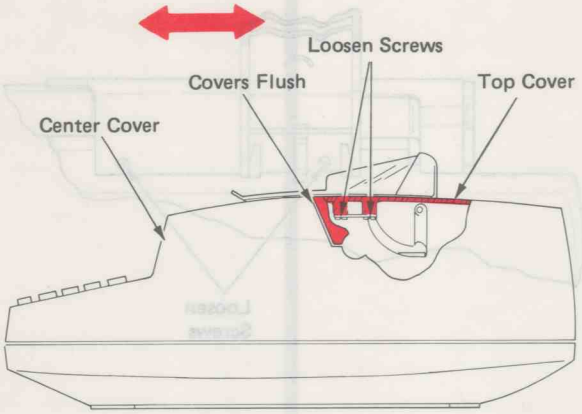


Figure 10 – Interference Shield

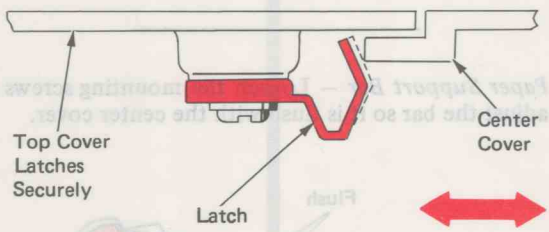
COVERS ADJUSTMENTS

1. *Top Cover* – Adjust the top cover front to rear on the hinges to fit flush with the center cover.



(Right Side View)

2. *Top Cover Latches* – Adjust the top cover latches left or right so the top cover latches securely when closed.



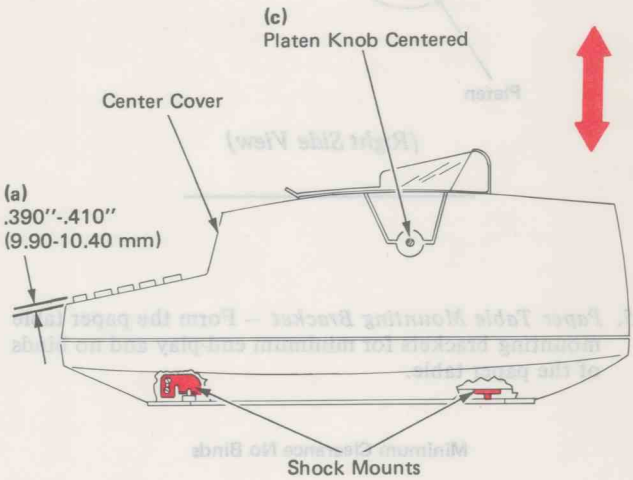
(Front View)

3. *Shock Mounts* – Adjust the shock mounts for the following conditions:

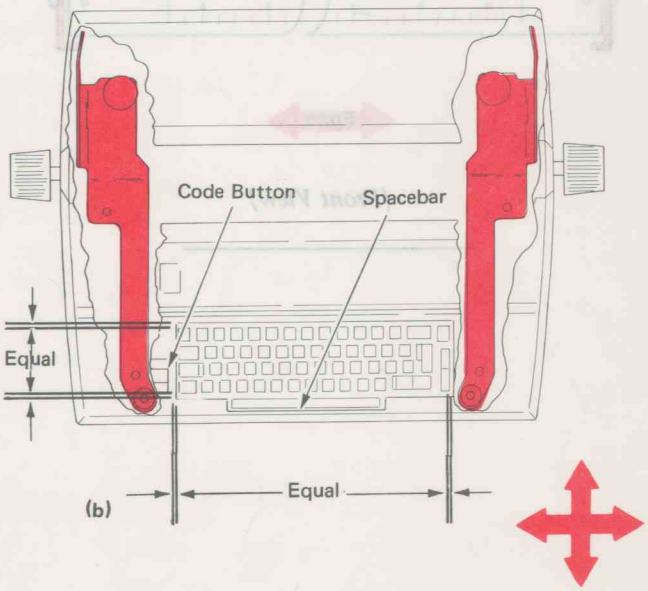
   a. The spacebar should be .390"-.410" (9.90-10.40 mm) above the surface of the cover.
   b. All openings for keybuttons should have equal front-to-rear and left-to-right clearance.

   NOTE: The spacebar and code buttons may be adjusted separately.

   c. The platen knobs should be centered front to rear and top to bottom in the cover openings.

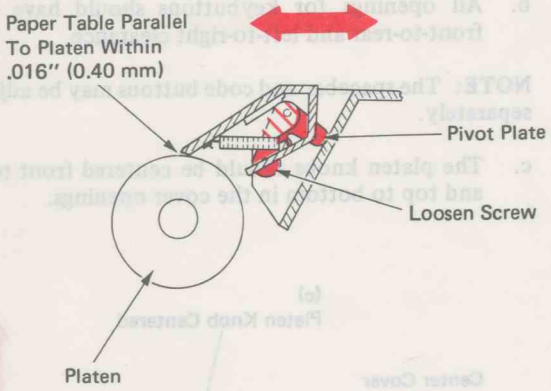


(Right Side View)



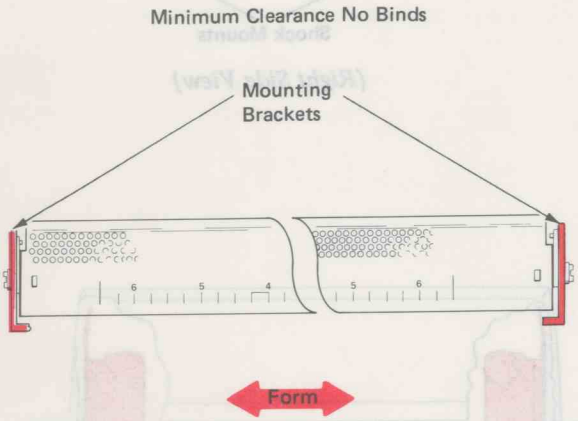
(Top View)

4. *Paper Table* – Adjust the pivot plates so the front edge of the paper table is parallel with the platen within .016" (0.40 mm).



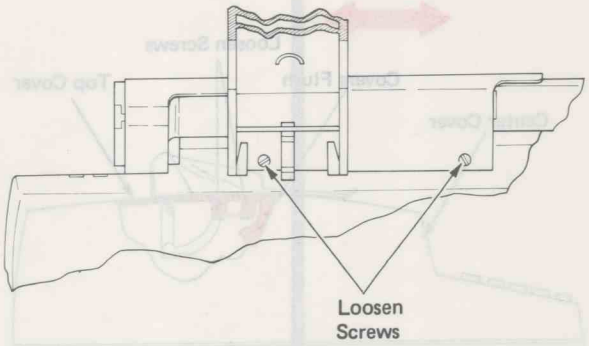
(Right Side View)

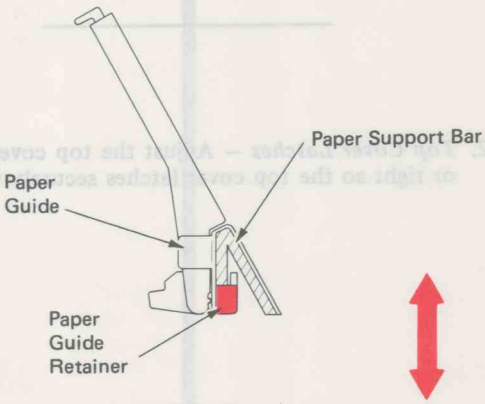
5. *Paper Table Mounting Bracket* – Form the paper table mounting brackets for minimum end play and no binds of the paper table.



(Front View)

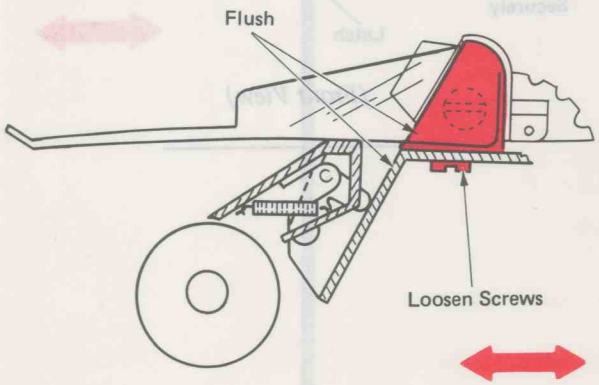
6. *Paper Guide Retainer* – Loosen the screws and adjust the paper guide retainer up or down to provide friction between the paper guide and paper support bar.





(Left Side View)

7. *Paper Support Bar* – Loosen the mounting screws and adjust the bar so it is flush with the center cover.



(Right Side View)

PIN FEED PLATEN OPERATIONAL THEORY

The pin feed platen is used with continuous feed forms. The pins feed the forms by engaging the holes in the paper (Figure 1).

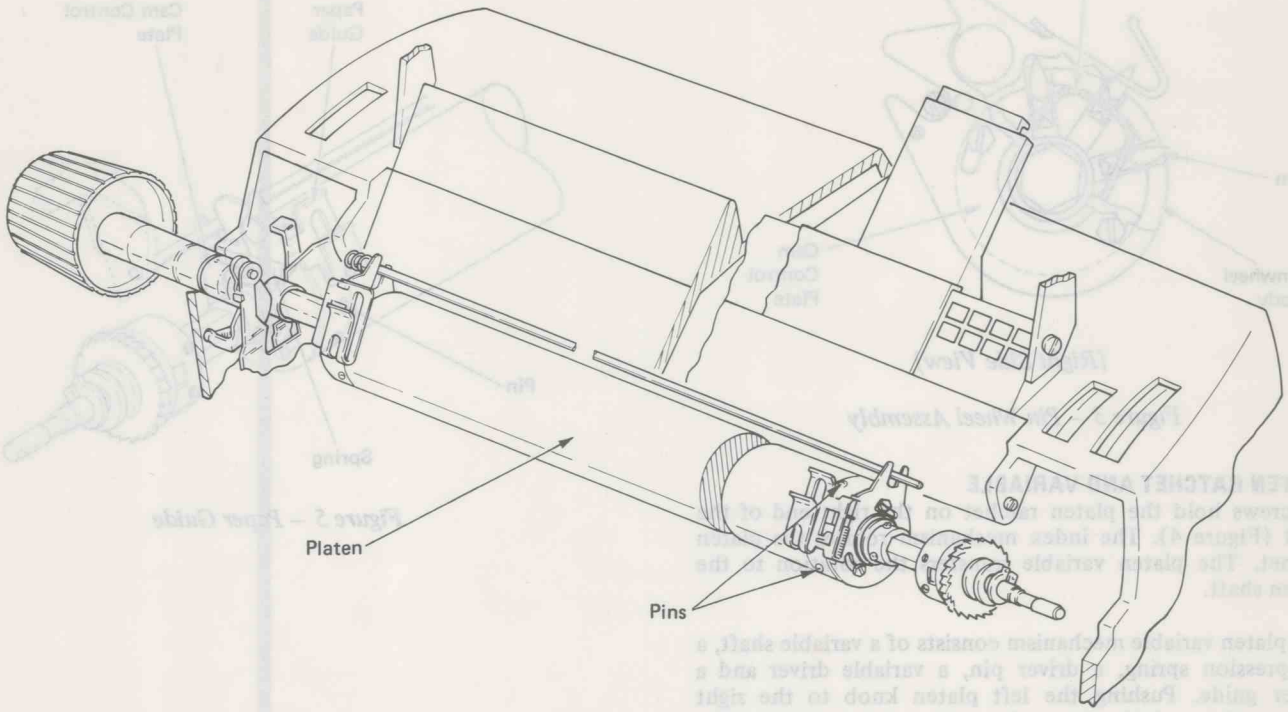


Figure 1 – Pin Feed Platen

The platen core is keyed to the right pin wheel body (Figure 2). The pin wheel body is attached to and rotates with the platen shaft. Each pin wheel body contains nine pins. The cam fits into a guide slot in each pin. The control plate is mounted to the cam. The control plate engages the anchor rod to prevent the control plate and cam from rotating with the platen.

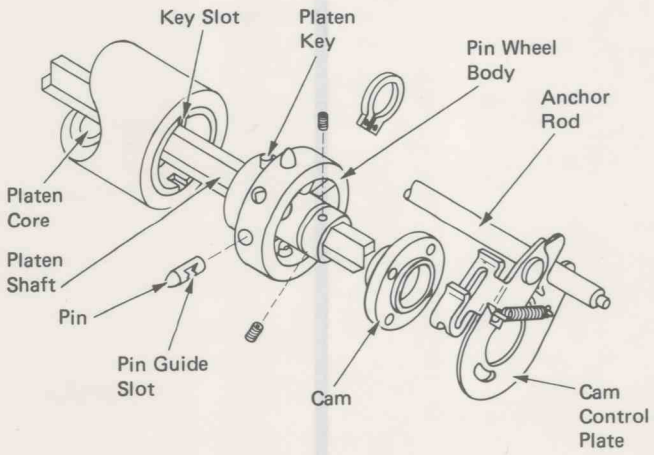
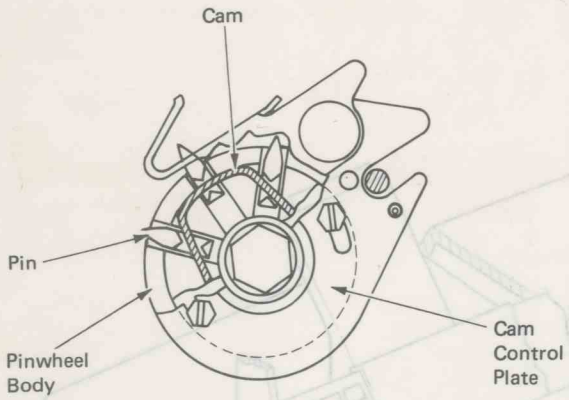


Figure 2 – Pin Feed Platen

PIN WHEEL OPERATION

As the pin wheel body rotates, the pins move in and out of their holes (Figure 3). Because the cam is stationary, the pins exit and enter the pin wheel body at a fixed position. This fixed position is determined by the cam control plate.



(Right Side View)

Figure 3 – Pin Wheel Assembly

PLATEN RATCHET AND VARIABLE

Setscrews hold the platen ratchet on the right end of the shaft (Figure 4). The index mechanism rotates the platen ratchet. The platen variable transfers the rotation to the platen shaft.

The platen variable mechanism consists of a variable shaft, a compression spring, a driver pin, a variable driver and a driver guide. Pushing the left platen knob to the right releases the variable driver from the platen ratchet. The operator can then rotate the platen without moving the platen ratchet.

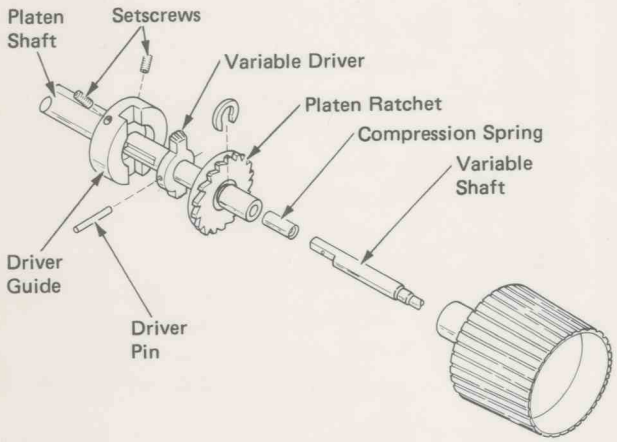


Figure 4 – Platen Ratchet And Variable

PAPER GUIDE

The paper guides are attached to the right and left cam control plates and are positioned in front of the extended pins to guide the paper (Figure 5). Move the paper guides up to position the form paper around the platen and over the extended pins.

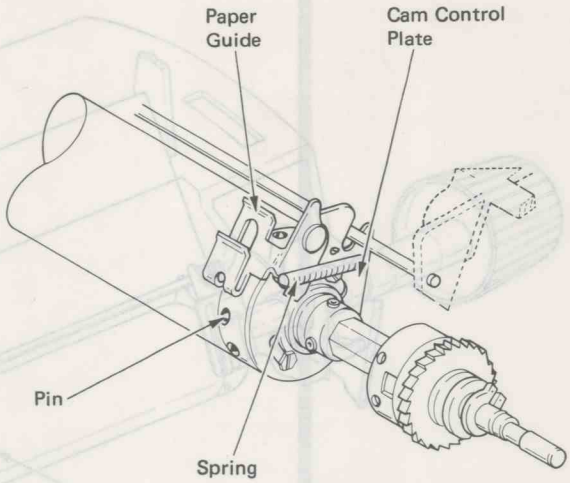
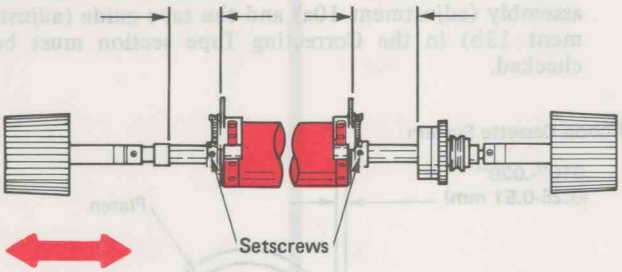


Figure 5 – Paper Guide

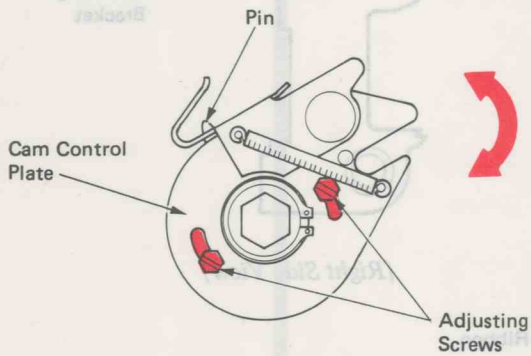
PIN FEED PLATEN ADJUSTMENTS

1. *Platen Core Lateral Position* – Loosen the setscrews in the pin wheel bodies, center the core, and slide the pin wheel assemblies against each end. Tighten the setscrews.



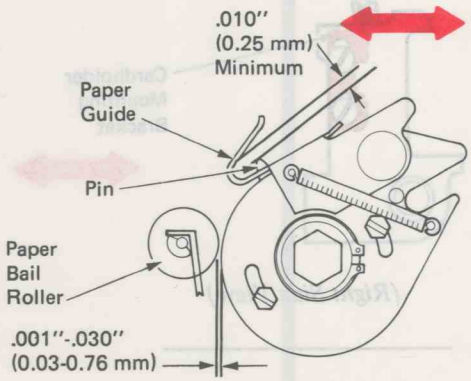
(Front View)

2. *Pin Wheel Assembly* – Adjust the cam on the control plate to allow the pins to fully extend immediately after they pass into the slot of the paper guide.



(Right Side View)

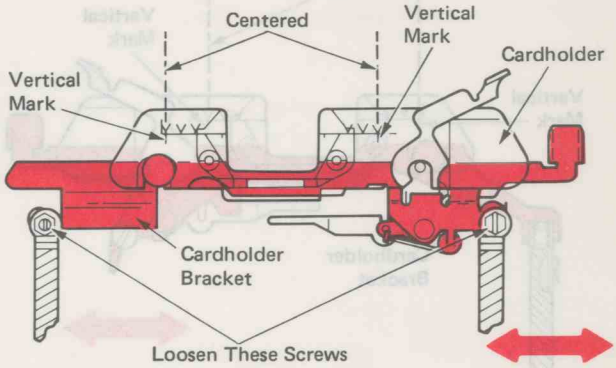
3. *Paper Guide* – Form the front extension of the paper guides front or rear. The paper bail rollers should clear the platen by .001"-.030" (0.03-0.76 mm). Maintain a minimum clearance of .010" (0.25 mm) between the guide and a fully extended pin as it passes under the guide.



(Right Side View)

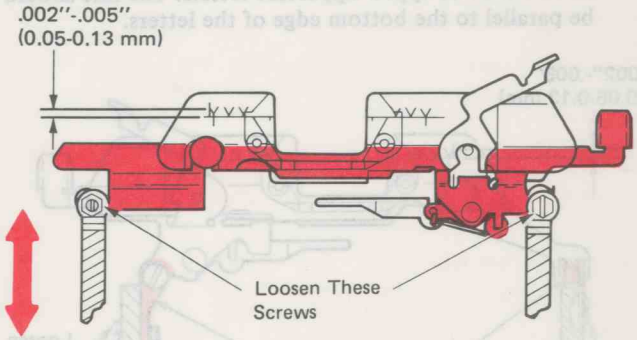
4. *Cardholder (Ribbon Cassette System)* – Adjust the cardholder bracket as follows:

   a. Left or right to center the bottom of a typed *V* on the vertical marks on the cardholder.



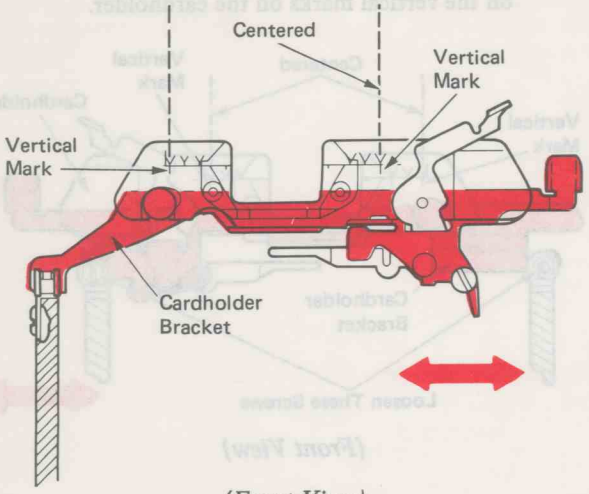
(Front View)

   b. Up or down for a clearance of .002"-005" (0.05-0.13 mm) between the horizontal line and the bottom of typed uppercase letters. The line should be parallel to the bottom edge of the letters.



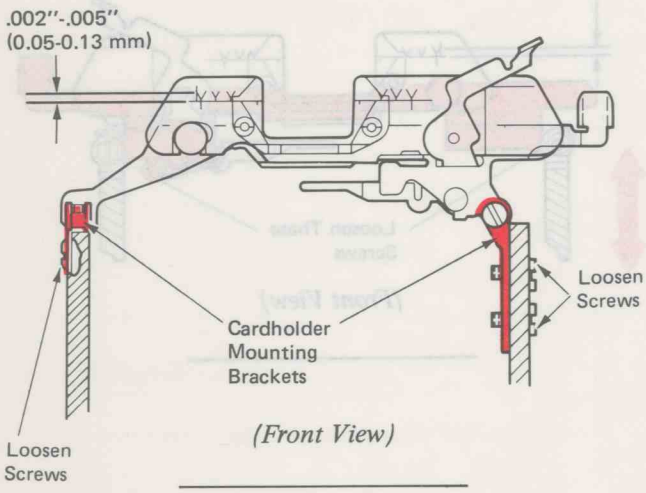
(Front View)

5. *Cardholder Left To Right (Selective Ribbon)* – Adjust the cardholder bracket left or right to center the bottom of a typed *V* on the vertical marks on the cardholder.



(Front View)

6. *Cardholder Height (Selective Ribbon)* – Adjust the cardholder mounting brackets for a clearance of .002"-.005" (0.05-0.13 mm) between the horizontal line and the bottom of typed uppercase letters. The line should be parallel to the bottom edge of the letters.



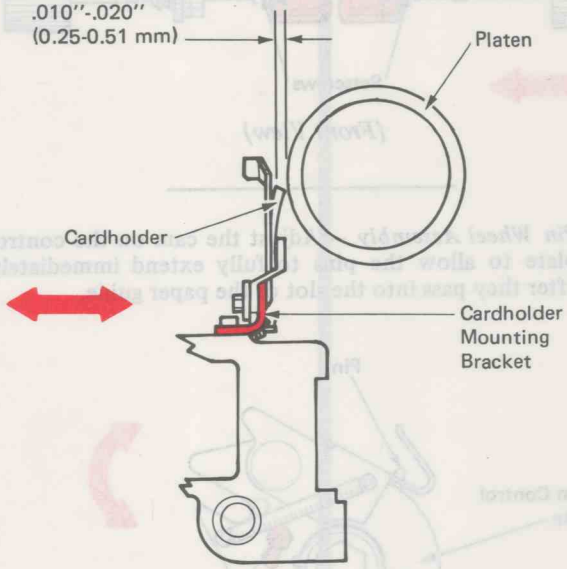
(Front View)

7. *Cardholder Clearance* – Adjust the cardholder mounting brackets front to rear for a clearance of .010"-.020" (0.25-0.51 mm) between the cardholder and the platen.

Measure the clearance at the closest point on each side of the cardholder.

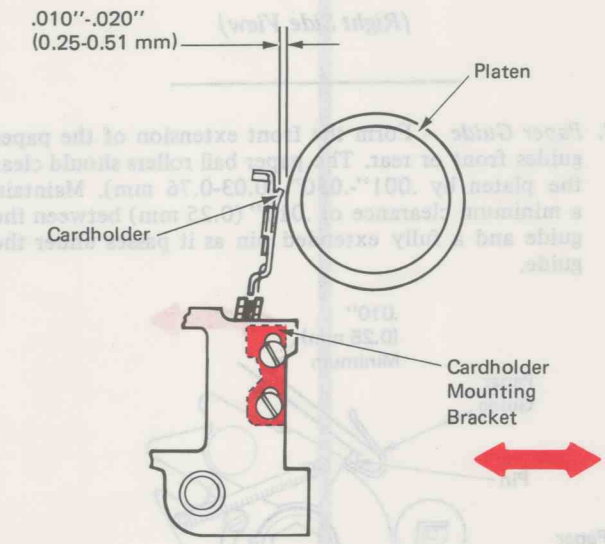
NOTE: If this adjustment is changed, the tape lift assembly (adjustment 10a) and the tape guide (adjustment 13b) in the Correcting Tape section must be checked.

Ribbon Cassette System



(Right Side View)

Selective Ribbon

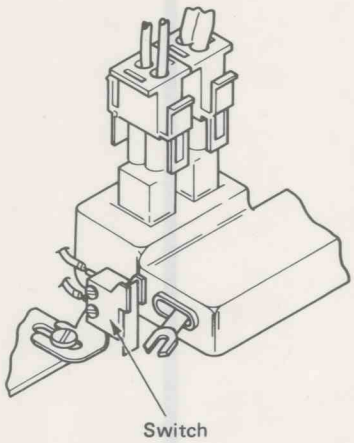


(Right Side View)

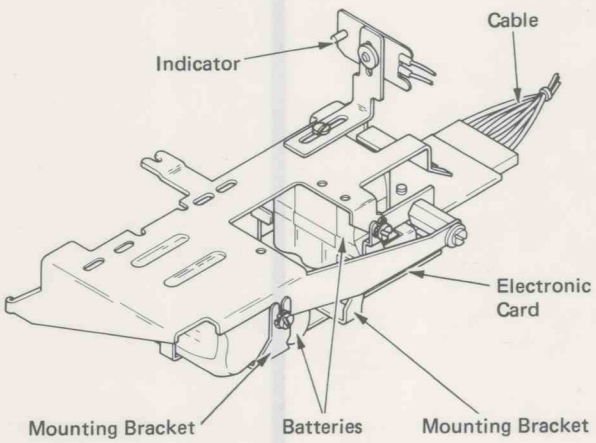
MEMORY PROTECTION OPERATIONAL THEORY (MODEL 75 ONLY)

The Memory Protection Feature (MP) for the Model 75 protects information stored in memory if power fails or if the machine is accidentally unplugged.

The Memory Protection Feature consists of rechargeable nickel cadmium batteries, an electronic card, mounting brackets, a cable, a switch, and the memory protection indicator (Figure 1). There are two packs of batteries with six batteries in each pack.



(Left Front View)

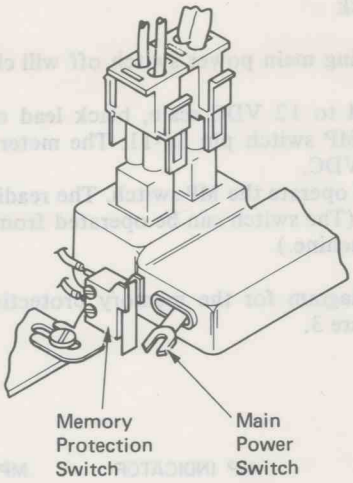


(Right Front View)

Figure 1 – Memory Protection Mechanism

MEMORY PROTECTION SWITCH

Turning the main power switch on and off also turns the memory protection switch on and off. The memory protection switch indicates to the control card whether the main power is on or off. The memory protection switch closes and memory is cleared when the main power is turned off.



(Left Front View)

Figure 2 – Memory Protection Switch

MEMORY PROTECTION OPERATION

When the main power voltage drops below approximately 90 VAC or the main power cord is unplugged, the MP control card places the typewriter in the protect mode. During the protect mode, the batteries supply the necessary voltages to the power supply to protect the memory. The MP indicator light comes on and stays on to inform the operator that the typewrier is in the protect mode. While in the protection mode, the typewriter cannot be operated. When power is restored, the machine performs a POR and the carrier moves to its last position. If the power stays off for a longer time than the batteries' capability, the MP indicator turns off when memory protection ceases. When the power is restored, the MP control card recharges the batteries.

Memory Protection Control Card Static Check

Pin No.	Name	Static	Active
11-1*	-High Voltage (-HV)	-20V to -28V	–
11-2*	+ High Voltage (+HV)	+20V to +28V	–
11-3	MP Indicator	+13V	+13V
11-4*	Power Supply +13V	+13V	–
11-5*	GND	0	0
11-6	Key	–	–
11-7*	GND	0	0
11-8*	PORIN	+5V	–
11-9*	CT 13V	+13V	–
11-10	MP Indicator	+11.8V	+11V
11-11	MP Switch	+1.3V**	0V

All voltages are DC ± unless otherwise specified. All static readings are taken with the main power and motor switch on.

*With main power on, perform the static check of the power supply voltages. These voltages are supplied from the power supply to the MP control card. If any of these voltages are incorrect, check for the proper voltages at the power supply accessory connector. If voltages are correct, replace the cable; if incorrect, remove connector No. 11 from the MP control card and check the voltages at the power supply again. If voltages are correct, replace control card; if incorrect, replace the power supply.

**Switch Check

NOTE: Turning main power switch off will clear memory.

1. Set VOM to 12 VDC scale, black lead on GND, red lead on MP switch pin 11-11. The meter should indicate 1.3 VDC.
2. Manually operate the MP switch. The reading should be 0 VDC. (The switch can be operated from the bottom of the machine.)

The wiring diagram for the memory protection feature is shown in Figure 3.

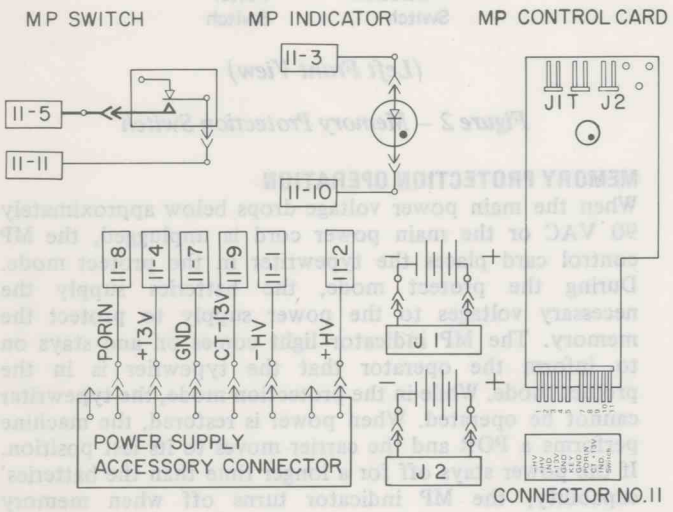
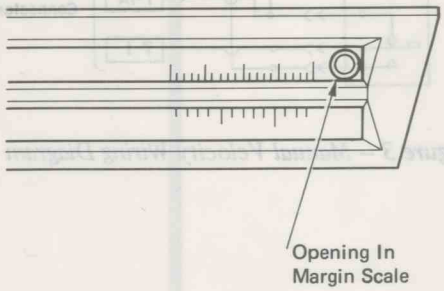


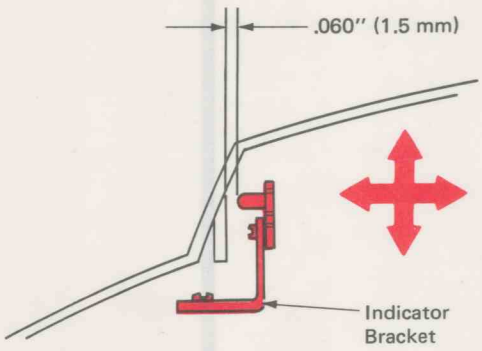
Figure 3 – Memory Protection Wiring Diagram

MEMORY PROTECTION ADJUSTMENTS

1. *Memory Protection Indicator* – Adjust the indicator bracket to show the indicator in the lower right part of the opening in the margin scale.



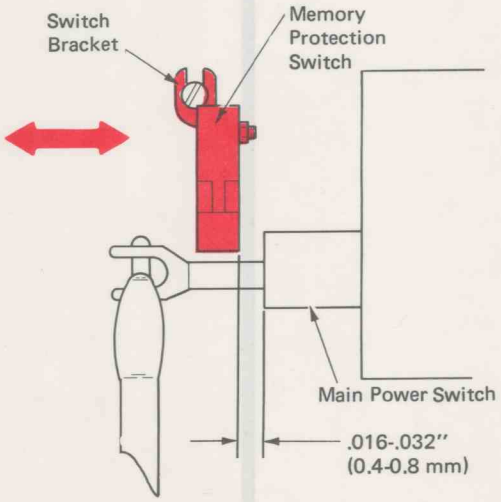
(Front View)



(Left Side View)

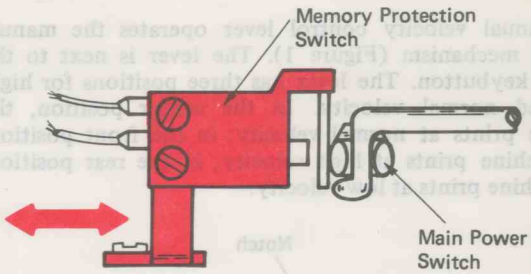
2. *Memory Protection Switch* – Adjust the switch bracket for the following conditions:

   a. Left to right for a clearance of .016"-.032" (0.4-0.8 mm) between the memory protection switch and the main power switch.



(Top View)

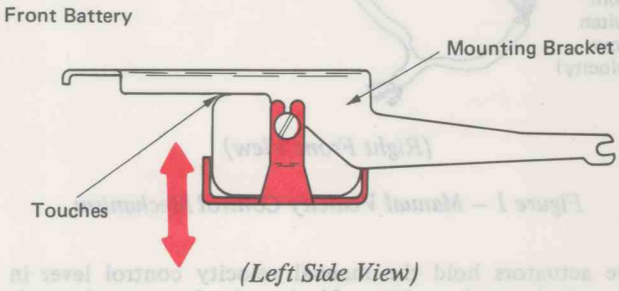
   b. Front to rear to make the switch operate reliably with the main power switch in both the on and off positions.



(Left Side View)

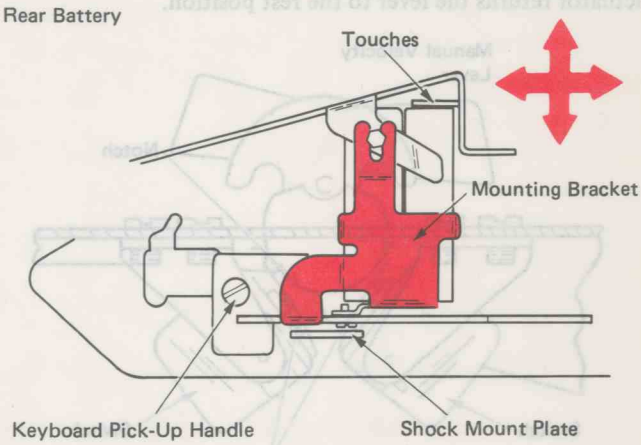
3. *Battery Mounting Brackets* – Adjust the battery mounting brackets as follows:

   a. Move the front battery bracket to touch the battery mounting bracket.



(Left Side View)

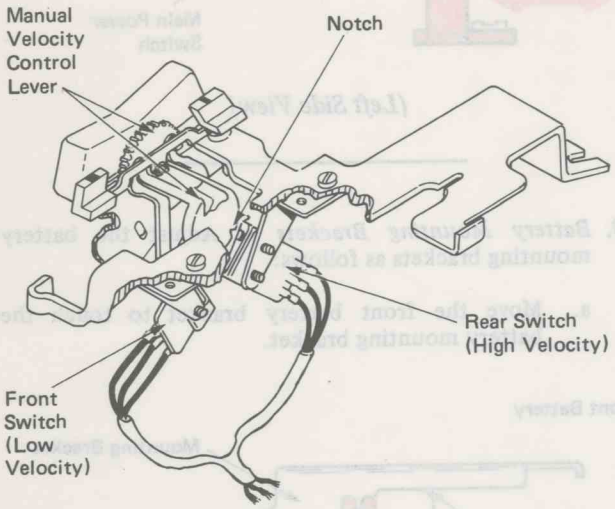
   b. Move the rear battery bracket up or down and front or rear until the control card clears the keyboard pick-up handle and shock mount plate.



(Left Side View)

MANUAL VELOCITY CONTROL OPERATIONAL THEORY

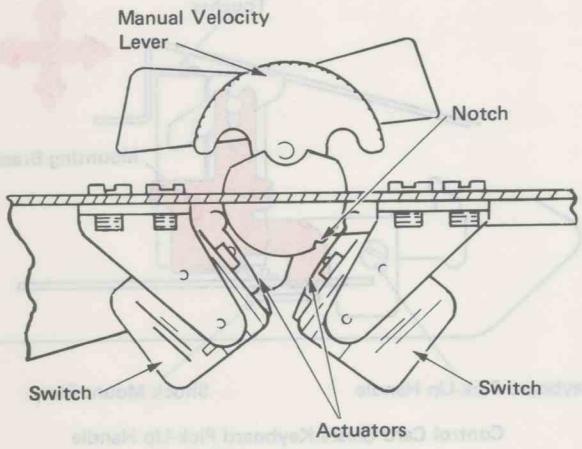
The manual velocity control lever operates the manual velocity mechanism (Figure 1). The lever is next to the On/Off keybutton. The lever has three positions for high, low, and normal velocity. In the center position, the machine prints at normal velocity; in the front position, the machine prints at high velocity; in the rear position, the machine prints at low velocity.



(Right Front View)

Figure 1 – Manual Velocity Control Mechanism

The actuators hold the manual velocity control lever in the rest (center) position. Moving the lever to the high velocity (front) position causes the rear switch actuator to move into a notch in the lever and detent the lever. The lever does not detent in the low velocity (rear) position. The lever must be held in the rear position to print in low velocity. When released, the front switch actuator returns the lever to the rest position.



(Right Side View)

Figure 2 – Manual Velocity Control Lever Detent

The wiring diagram for the manual velocity control is shown in Figure 3.

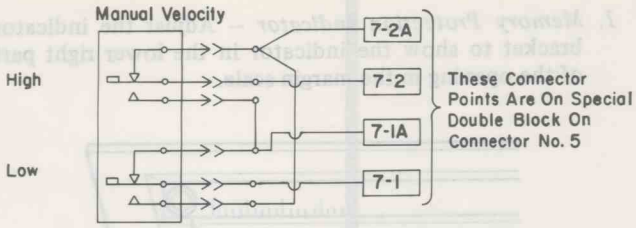


Figure 3 – Manual Velocity Wiring Diagram

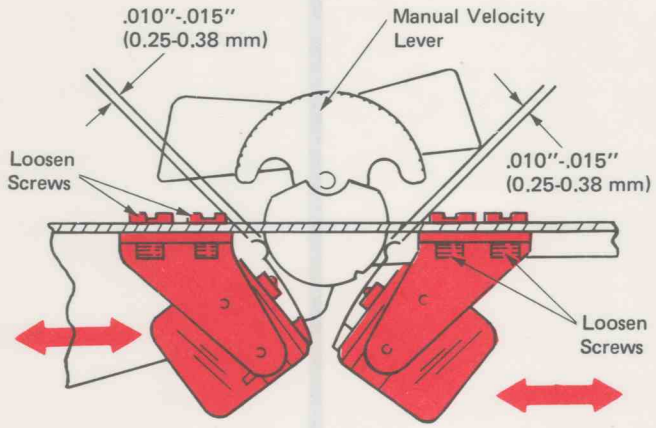
MANUAL VELOCITY CONTROL ADJUSTMENTS

1. *Manual Velocity Control Switches* – Both switches are adjusted front to rear as follows:

   a. The switch actuator should deflect .010"-.015" (0.25-0.38 mm), with the manual velocity control lever in the normal (center) position.

   b. The rear switch should close when the manual velocity control lever is detented by the rear switch actuator.

   c. The front switch should close when the manual velocity control lever is manually held in the low velocity position. The lever must restore to the rest position when it is released from the low-velocity mode.



(Right Side View)

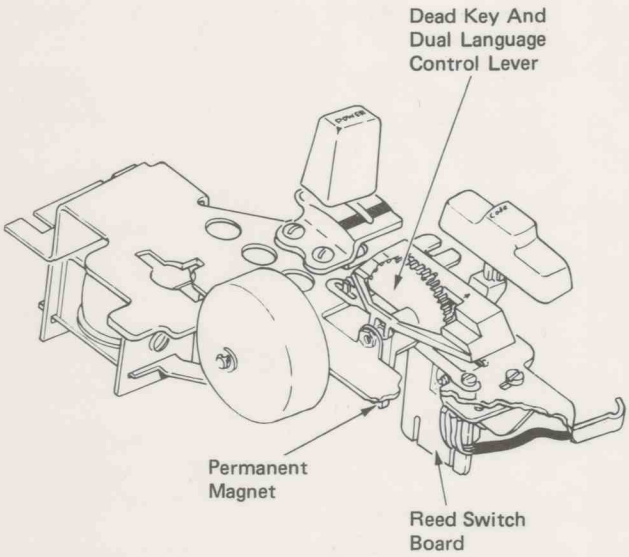
DEAD KEY DISCONNECT AND DUAL LANGUAGE CONTROL OPERATIONAL THEORY

The operator uses the dead key disconnect and dual language control to type in the primary or secondary language. The operator can also type without dead keys (Figure 1).

With the dial in the center (rest) position, the machine types in the primary language.

With the control in the rear position, a magnet on the lower end of the control lever closes the front reed switch and the machine types in the secondary language. Also, the escapement values and velocity of the characters are changed for the secondary language.

With the control in the forward position, the magnet closes the rear reed switch and the machine operates without dead keys.



(Left Front View)

Figure 1 – Dead Key Disconnect And Dual Language

The wiring diagram for dead key disconnect and dual language is shown in Figure 2.

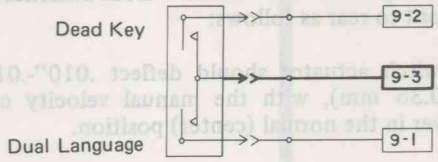
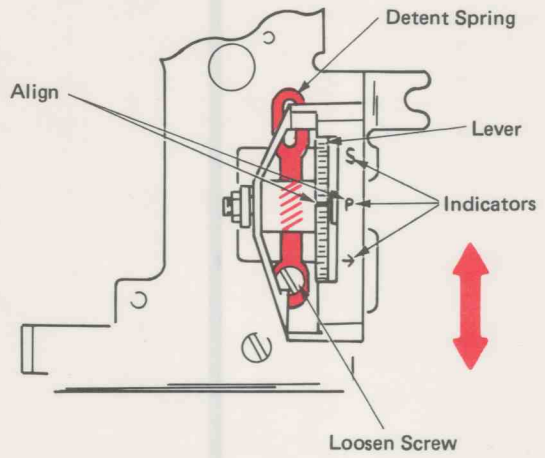


Figure 2 – Dead Key Disconnect And Dual Language Wiring Diagram

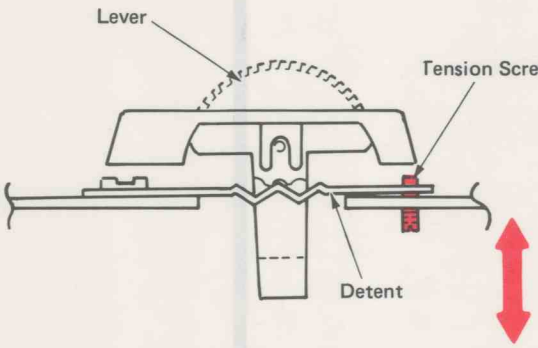
DEAD KEY DISCONNECT AND DUAL LANGUAGE CONTROL ADJUSTMENTS

1. *Detent Spring* – Adjust the detent spring front or rear to align the lever with the indicators on the guide.



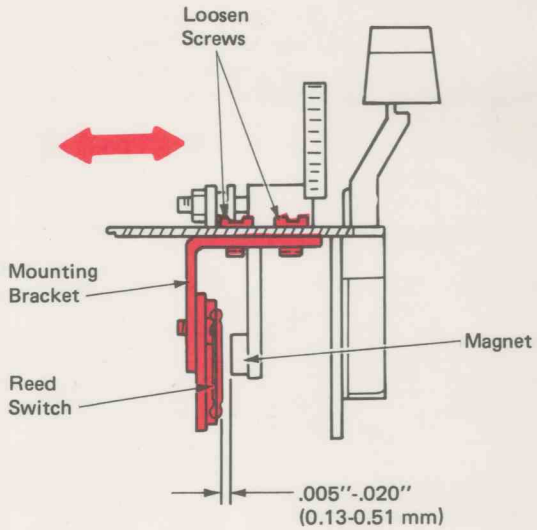
(Top View)

2. *Detent Tension* – Adjust the detent tension screw up or down to firmly hold the lever in each position.



(Right Side View)

3. *Magnet Clearance* – Loosen the reed switch board mounting bracket and position it left or right. The magnet should clear the reed switches by .005"-.020" (0.13-0.51 mm).

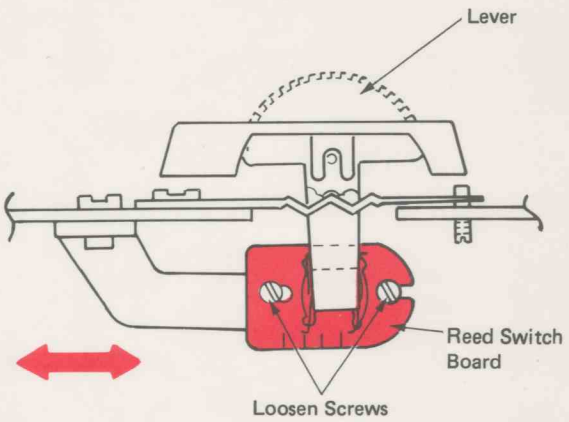


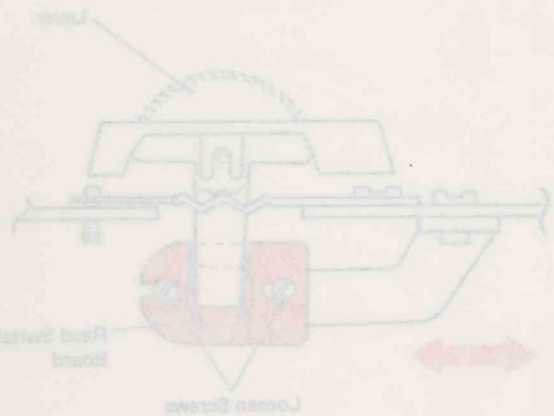
4. *Reed Switch Position* – Adjust the reed switch board front or rear to obtain the following:

   a. With the lever detented in the front position, the rear switch closes.

   b. With the lever set in the center position, both switches are open.

   c. With the lever set in the rear position, the front switch closes.

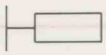
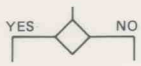




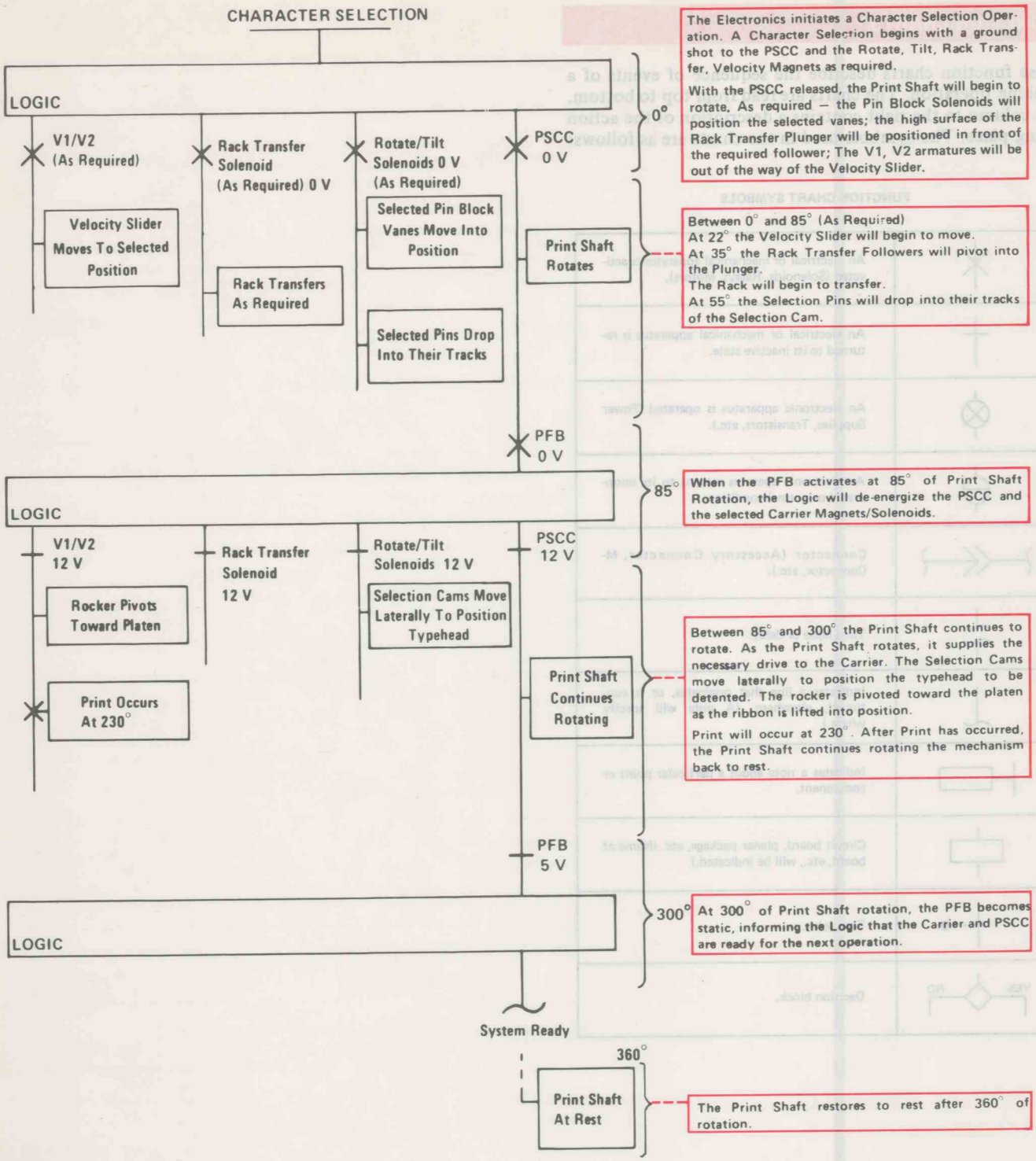
FUNCTION CHARTS

These function charts describe the sequence of events of a machine operation. The charts are read from top to bottom. The column to the right contains a description of the action taking place. The symbols used in the charts are as follows:

FUNCTION CHART SYMBOLS

	An electrical or mechanical apparatus is activated (Solenoids, Relays, Motors).
	An electrical or mechanical apparatus is returned to its inactive state.
	An electronic apparatus is operated (Power Supplies, Transistors, etc.).
	An electronic aparatus returns to its unoperated or normal condition.
	Connector (Accessory Connector, M-Connector, etc.).
	Time lapse or delay.
	Indicates a line that originates, or is continued, elsewhere. (A note will specify where.)
	Indicates a note about a particular point or component.
	Circuit board, planar package, etc. (Name of board, etc., will be indicated.)
	Test point.
	Decision block.

CHARACTER SELECTION



The Electronics initiates a Character Selection Operation. A Character Selection begins with a ground shot to the PSCC and the Rotate, Tilt, Rack Transfer, Velocity Magnets as required.

With the PSCC released, the Print Shaft will begin to rotate. As required – the Pin Block Solenoids will position the selected vanes; the high surface of the Rack Transfer Plunger will be positioned in front of the required follower; The V1, V2 armatures will be out of the way of the Velocity Slider.

Between 0° and 85° (As Required)
At 22° the Velocity Slider will begin to move.
At 35° the Rack Transfer Followers will pivot into the Plunger.
The Rack will begin to transfer.
At 55° the Selection Pins will drop into their tracks of the Selection Cam.

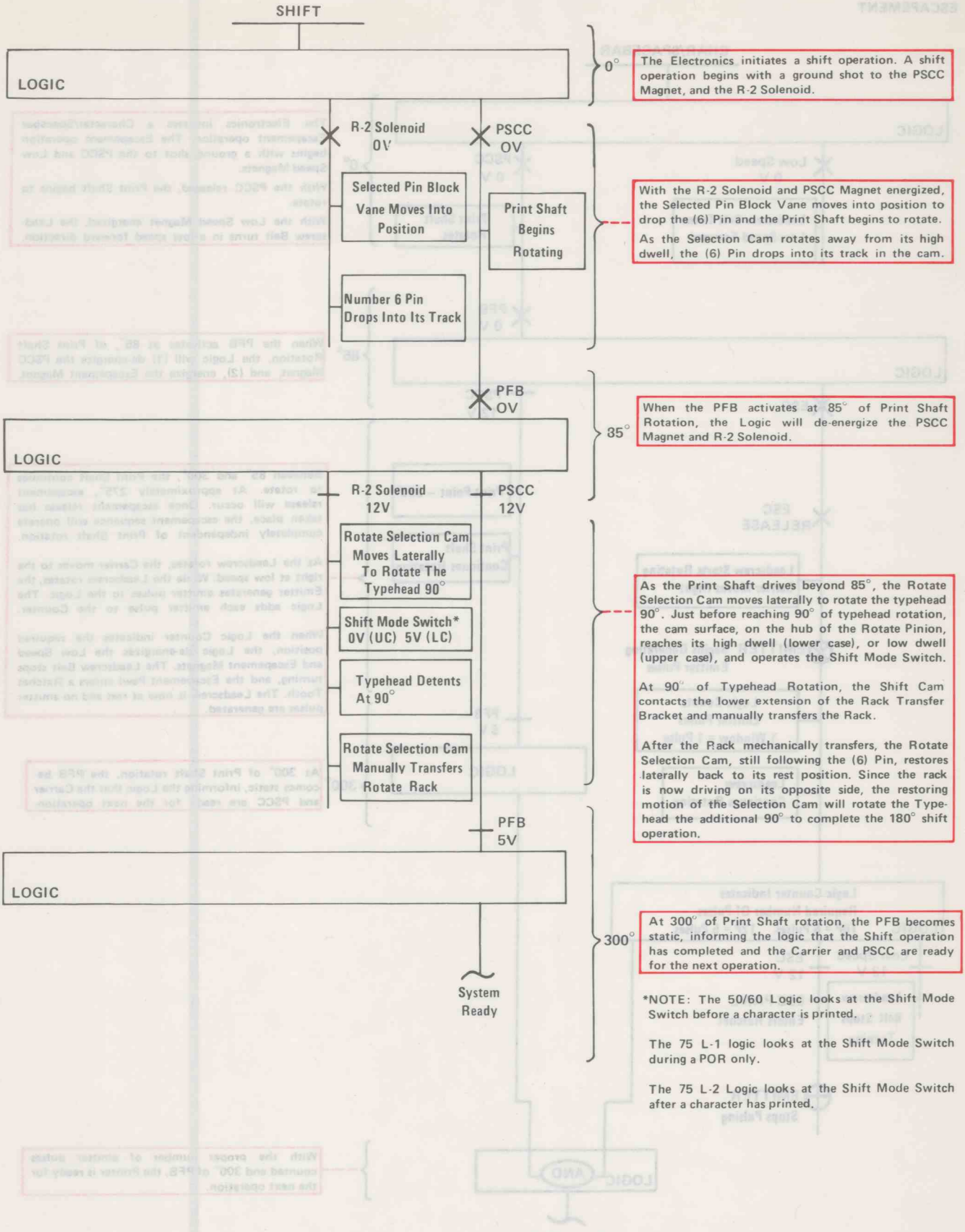
When the PFB activates at 85° of Print Shaft Rotation, the Logic will de-energize the PSCC and the selected Carrier Magnets/Solenoids.

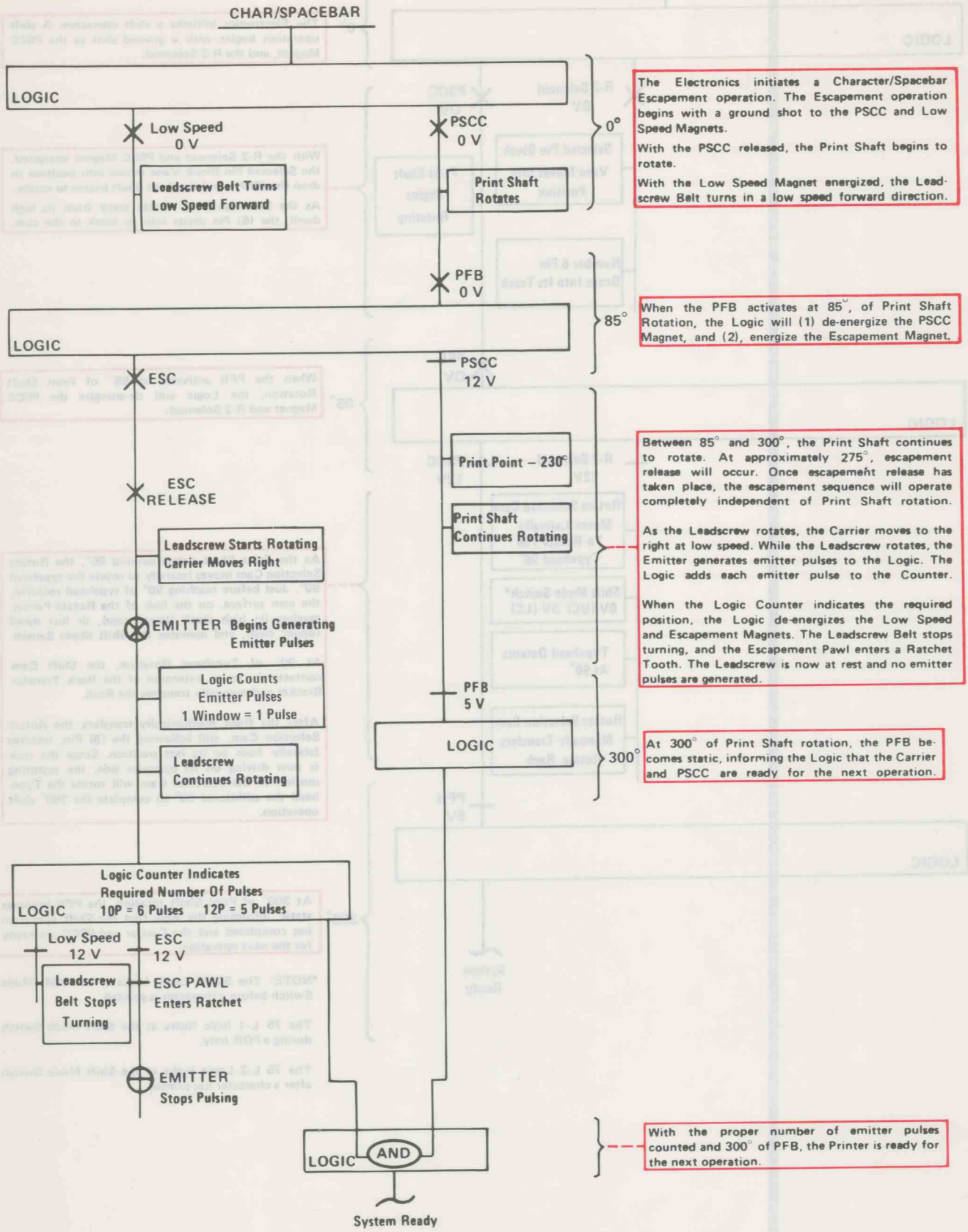
Between 85° and 300° the Print Shaft continues to rotate. As the Print Shaft rotates, it supplies the necessary drive to the Carrier. The Selection Cams move laterally to position the typehead to be detented. The rocker is pivoted toward the platen as the ribbon is lifted into position.

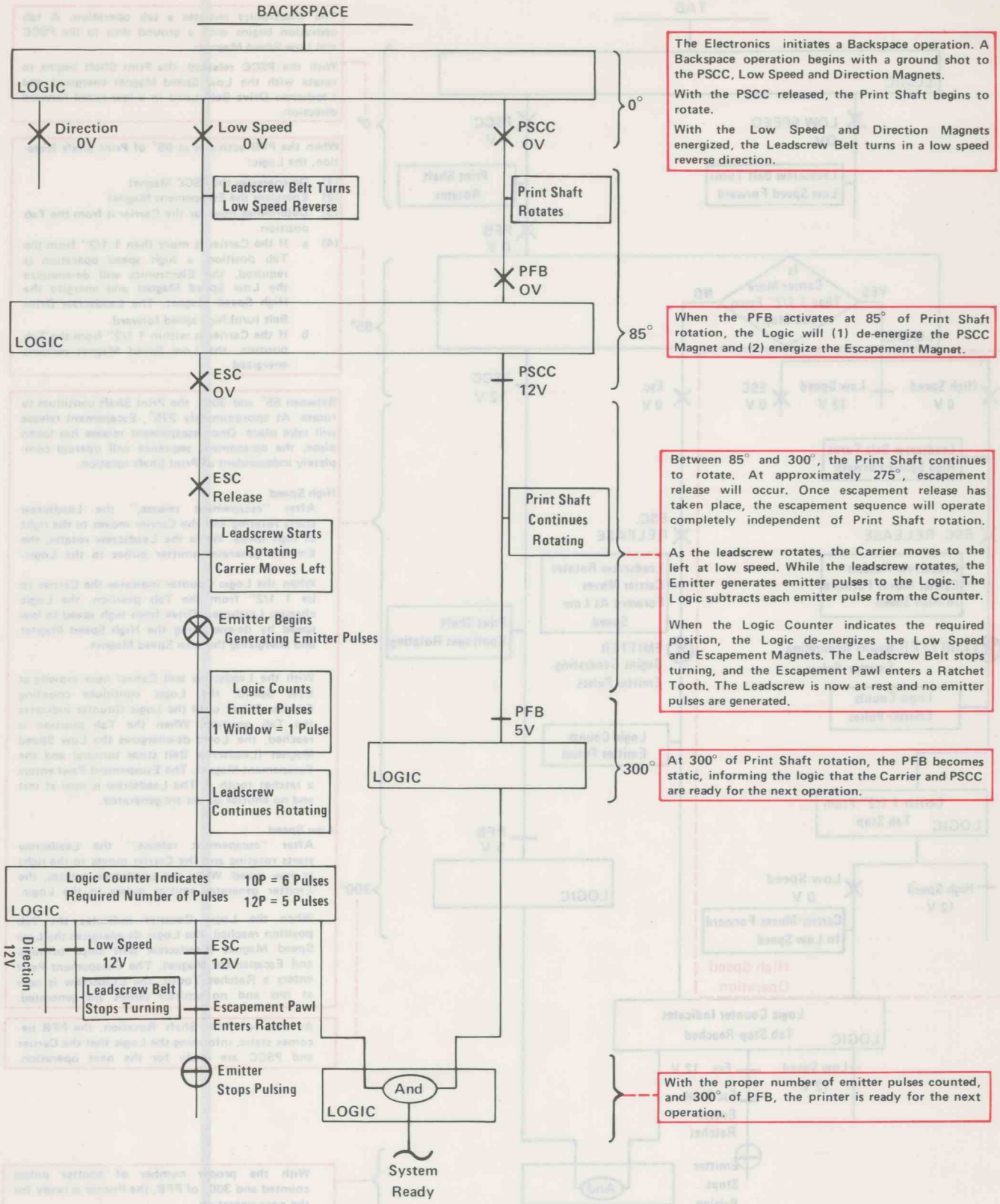
Print will occur at 230°. After Print has occurred, the Print Shaft continues rotating the mechanism back to rest.

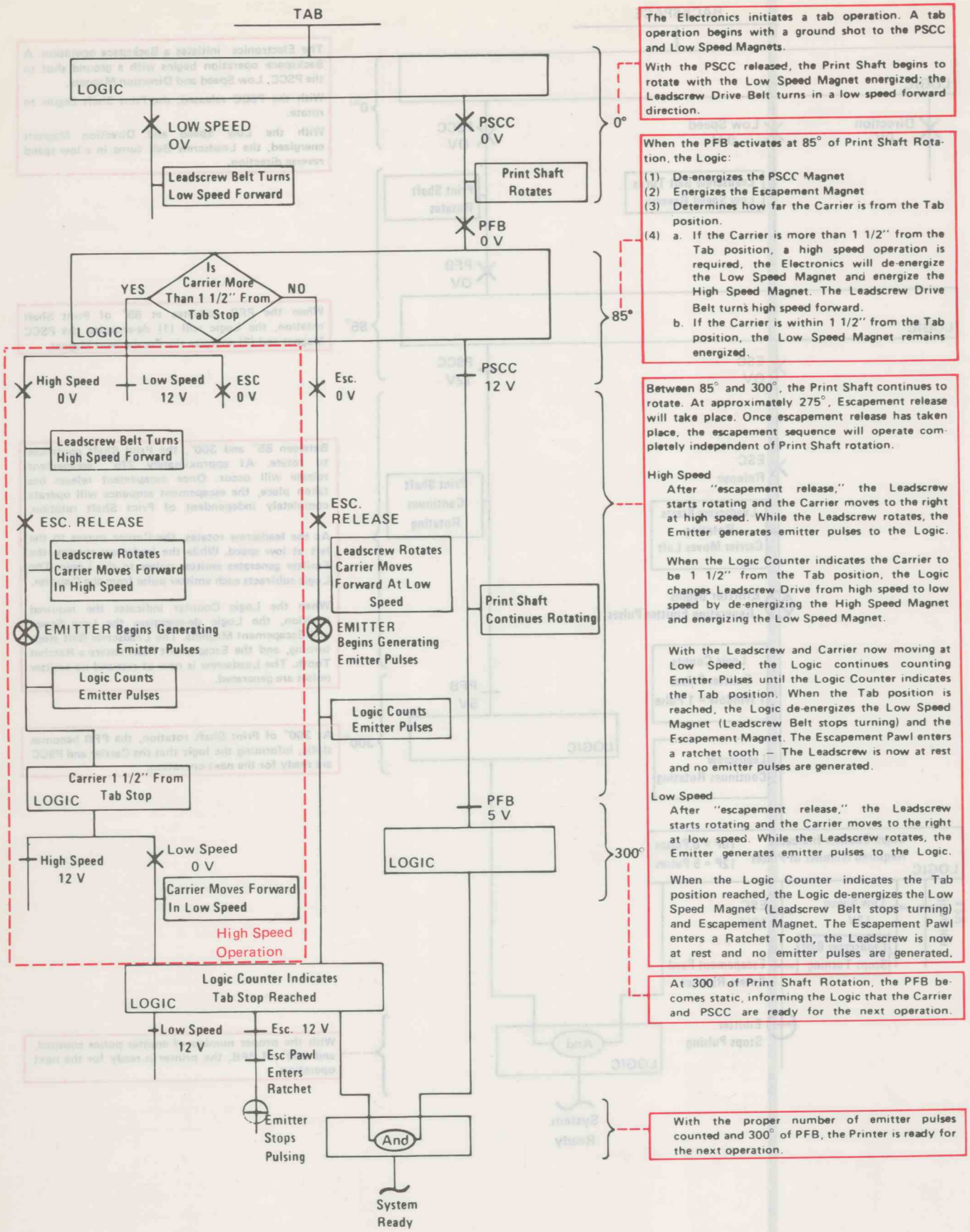
At 300° of Print Shaft rotation, the PFB becomes static, informing the Logic that the Carrier and PSCC are ready for the next operation.

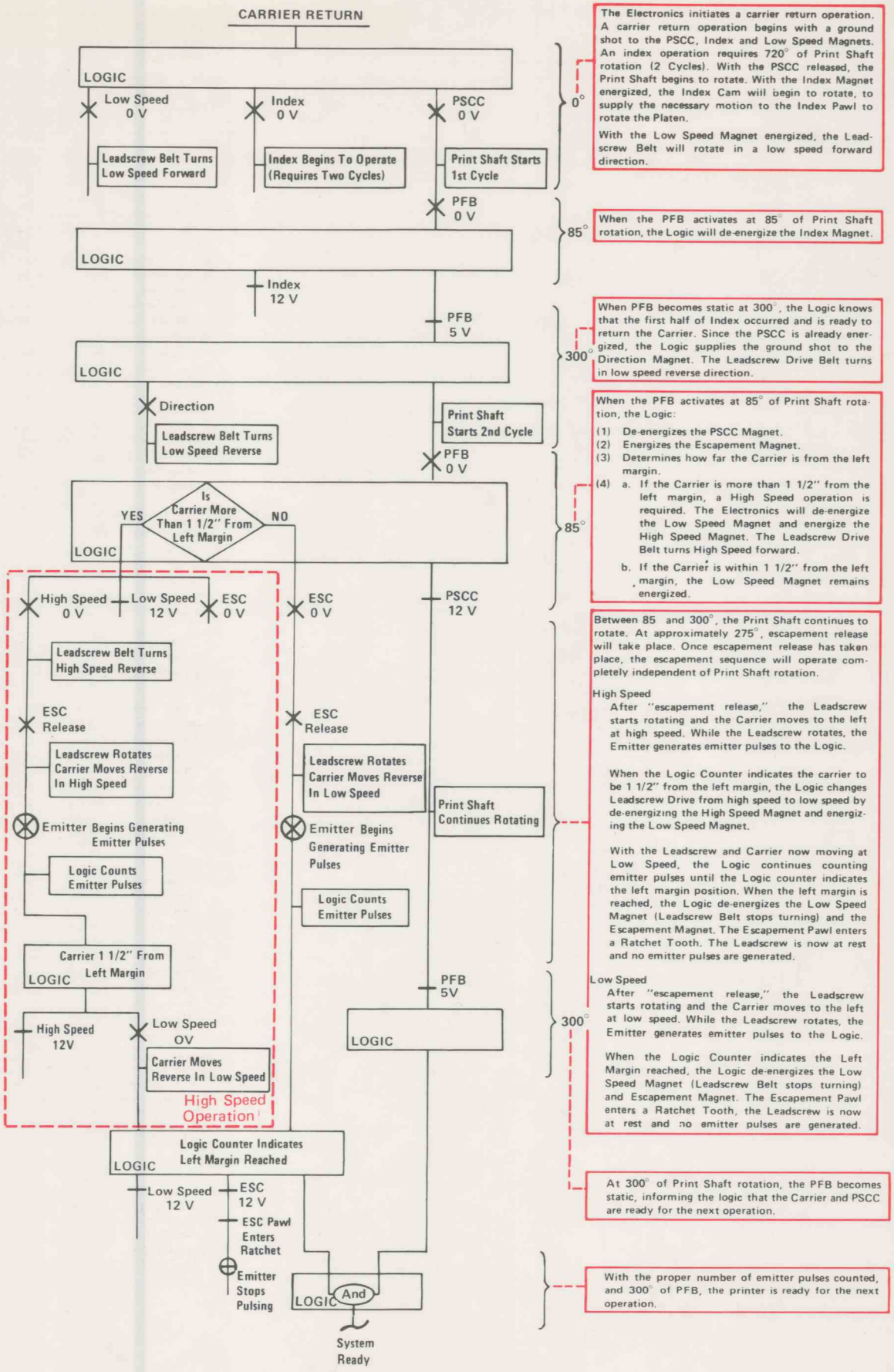
The Print Shaft restores to rest after 360° of rotation.

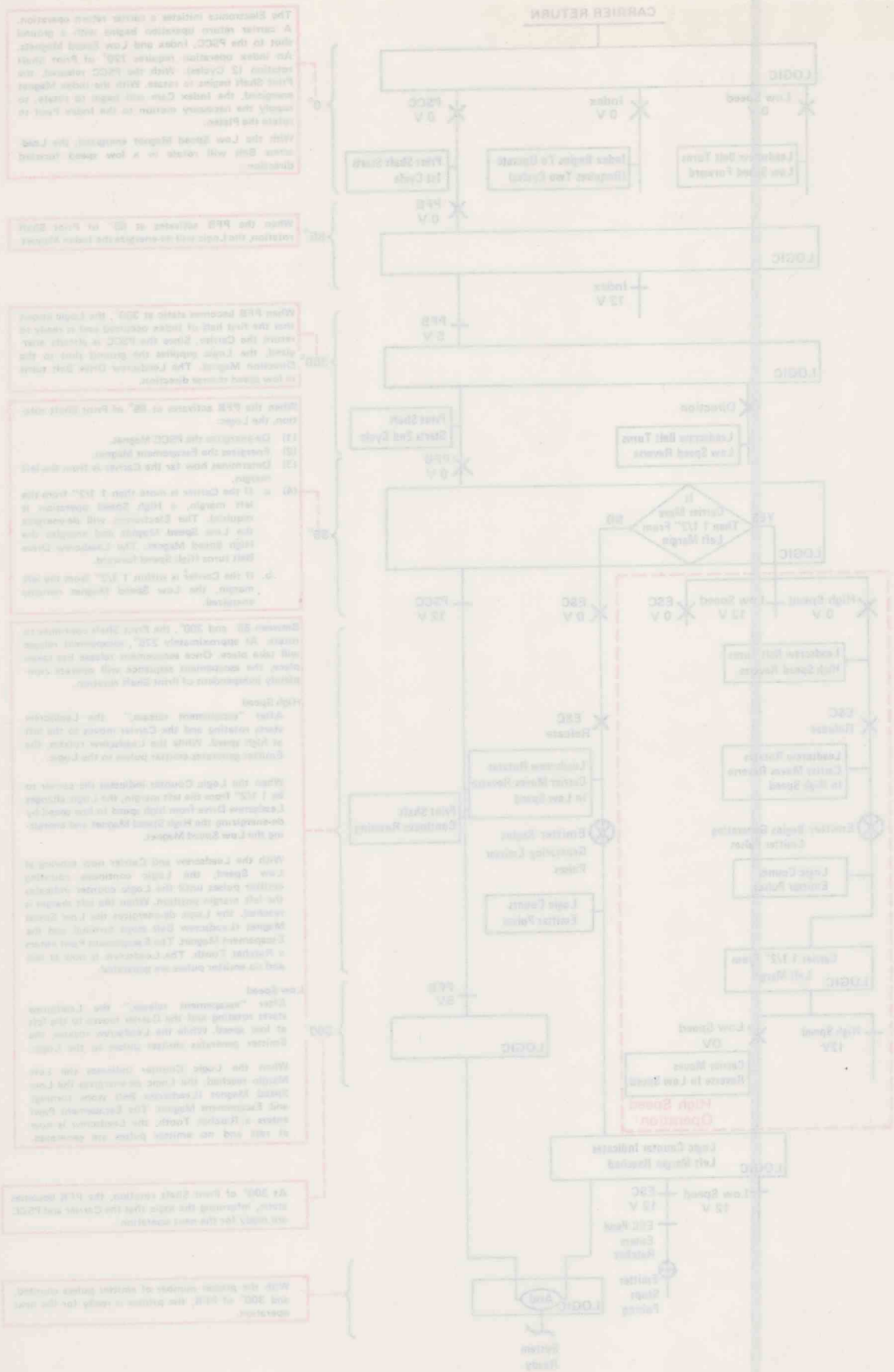





BACKSPACE
LOGIC
Direction 0V
Low Speed 0 V
PSCC OV
0°
Leadscrew Belt Turns Low Speed Reverse
Print Shaft Rotates
PFB OV
LOGIC
85°
ESC OV
PSCC 12V
ESC Release
Print Shaft Continues Rotating
Leadscrew Starts Rotating Carrier Moves Left
Emitter Begins Generating Emitter Pulses
Logic Counts Emitter Pulses 1 Window = 1 Pulse
PFB 5V
LOGIC
300°
Leadscrew Continues Rotating
Logic Counter Indicates Required Number of Pulses
10P = 6 Pulses
12P = 5 Pulses
LOGIC
Direction 12V
Low Speed 12V
ESC 12V
Leadscrew Belt Stops Turning
Escapement Pawl Enters Ratchet
Emitter Stops Pulsing
And
LOGIC
System Ready
The Electronics initiates a Backspace operation. A Backspace operation begins with a ground shot to the PSCC, Low Speed and Direction Magnets.
With the PSCC released, the Print Shaft begins to rotate.
With the Low Speed and Direction Magnets energized, the Leadscrew Belt turns in a low speed reverse direction.
When the PFB activates at 85° of Print Shaft rotation, the Logic will (1) de-energize the PSCC Magnet and (2) energize the Escapement Magnet.
Between 85° and 300°, the Print Shaft continues to rotate. At approximately 275°, escapement release will occur. Once escapement release has taken place, the escapement sequence will operate completely independent of Print Shaft rotation.
As the leadscrew rotates, the Carrier moves to the left at low speed. While the leadscrew rotates, the Emitter generates emitter pulses to the Logic. The Logic subtracts each emitter pulse from the Counter.
When the Logic Counter indicates the required position, the Logic de-energizes the Low Speed and Escapement Magnets. The Leadscrew Belt stops turning, and the Escapement Pawl enters a Ratchet Tooth. The Leadscrew is now at rest and no emitter pulses are generated.
At 300° of Print Shaft rotation, the PFB becomes static, informing the logic that the Carrier and PSCC are ready for the next operation.
With the proper number of emitter pulses counted, and 300° of PFB, the printer is ready for the next operation.




CARRIER RETURN
LOGIC
Low Speed 0 V
Index 0 V
PSCC 0 V
Leadscrew Belt Turns Low Speed Forward
Index Begins To Operate (Requires Two Cycles)
Print Shaft Starts 1st Cycle
PFB 0 V
LOGIC
Index 12 V
PFB 5 V
LOGIC
Direction
Leadscrew Belt Turns Low Speed Reverse
Print Shaft Starts 2nd Cycle
PFB 0 V
LOGIC
Is Carrier More Than 1 1/2" From Left Margin
YES
NO
High Speed 0 V
Low Speed 12 V
ESC 0 V
ESC 0 V
PSCC 12 V
Leadscrew Belt Turns High Speed Reverse
ESC Release
Leadscrew Rotates Carrier Moves Reverse In High Speed
Emitter Begins Generating Emitter Pulses
Logic Counts Emitter Pulses
ESC Release
Leadscrew Rotates Carrier Moves Reverse In Low Speed
Emitter Begins Generating Emitter Pulses
Logic Counts Emitter Pulses
Print Shaft Continues Rotating
Carrier 1 1/2" From Left Margin
LOGIC
High Speed 12V
Low Speed OV
Carrier Moves Reverse In Low Speed
High Speed Operation
PFB 5V
LOGIC
Logic Counter Indicates Left Margin Reached
LOGIC
Low Speed 12 V
ESC 12 V
ESC Pawl Enters Ratchet
Emitter Stops Pulsing
LOGIC
And
System Ready
0°
85°
300°
85°
300°
The Electronics initiates a carrier return operation. A carrier return operation begins with a ground shot to the PSCC, Index and Low Speed Magnets. An index operation requires 720° of Print Shaft rotation (2 Cycles). With the PSCC released, the Print Shaft begins to rotate. With the Index Magnet energized, the Index Cam will begin to rotate, to supply the necessary motion to the Index Pawl to rotate the Platen.
With the Low Speed Magnet energized, the Leadscrew Belt will rotate in a low speed forward direction.
When the PFB activates at 85° of Print Shaft rotation, the Logic will de-energize the Index Magnet.
When PFB becomes static at 300°, the Logic knows that the first half of Index occurred and is ready to return the Carrier. Since the PSCC is already energized, the Logic supplies the ground shot to the Direction Magnet. The Leadscrew Drive Belt turns in low speed reverse direction.
When the PFB activates at 85° of Print Shaft rotation, the Logic:
(1) De-energizes the PSCC Magnet.
(2) Energizes the Escapement Magnet.
(3) Determines how far the Carrier is from the left margin.
(4) a. If the Carrier is more than 1 1/2" from the left margin, a High Speed operation is required. The Electronics will de-energize the Low Speed Magnet and energize the High Speed Magnet. The Leadscrew Drive Belt turns High Speed forward.
b. If the Carrier is within 1 1/2" from the left margin, the Low Speed Magnet remains energized.
Between 85 and 300°, the Print Shaft continues to rotate. At approximately 275°, escapement release will take place. Once escapement release has taken place, the escapement sequence will operate completely independent of Print Shaft rotation.
High Speed
After "escapement release," the Leadscrew starts rotating and the Carrier moves to the left at high speed. While the Leadscrew rotates, the Emitter generates emitter pulses to the Logic.
When the Logic Counter indicates the carrier to be 1 1/2" from the left margin, the Logic changes Leadscrew Drive from high speed to low speed by de-energizing the High Speed Magnet and energizing the Low Speed Magnet.
With the Leadscrew and Carrier now moving at Low Speed, the Logic continues counting emitter pulses until the Logic counter indicates the left margin position. When the left margin is reached, the Logic de-energizes the Low Speed Magnet (Leadscrew Belt stops turning) and the Escapement Magnet. The Escapement Pawl enters a Ratchet Tooth. The Leadscrew is now at rest and no emitter pulses are generated.
Low Speed
After "escapement release," the Leadscrew starts rotating and the Carrier moves to the left at low speed. While the Leadscrew rotates, the Emitter generates emitter pulses to the Logic.
When the Logic Counter indicates the Left Margin reached, the Logic de-energizes the Low Speed Magnet (Leadscrew Belt stops turning) and Escapement Magnet. The Escapement Pawl enters a Ratchet Tooth, the Leadscrew is now at rest and no emitter pulses are generated.
At 300° of Print Shaft rotation, the PFB becomes static, informing the logic that the Carrier and PSCC are ready for the next operation.
With the proper number of emitter pulses counted, and 300° of PFB, the printer is ready for the next operation.



REMOVALS

This section contains removal procedures for main parts and assemblies. The drawings in the parts manual should be used when more removal or assembly information is required.

Parts in the drawings shown with the removal procedure are numbered with reference to the removal sequence. Some removals refer to certain steps of a previous removal procedure to prevent repeating information. (Refer to the "Contents" in the Removal section.)

The procedures in this section are suggested methods of removal or replacement and are given as an aid in servicing the Electronic Typewriter. Some persons may find another method better for them.

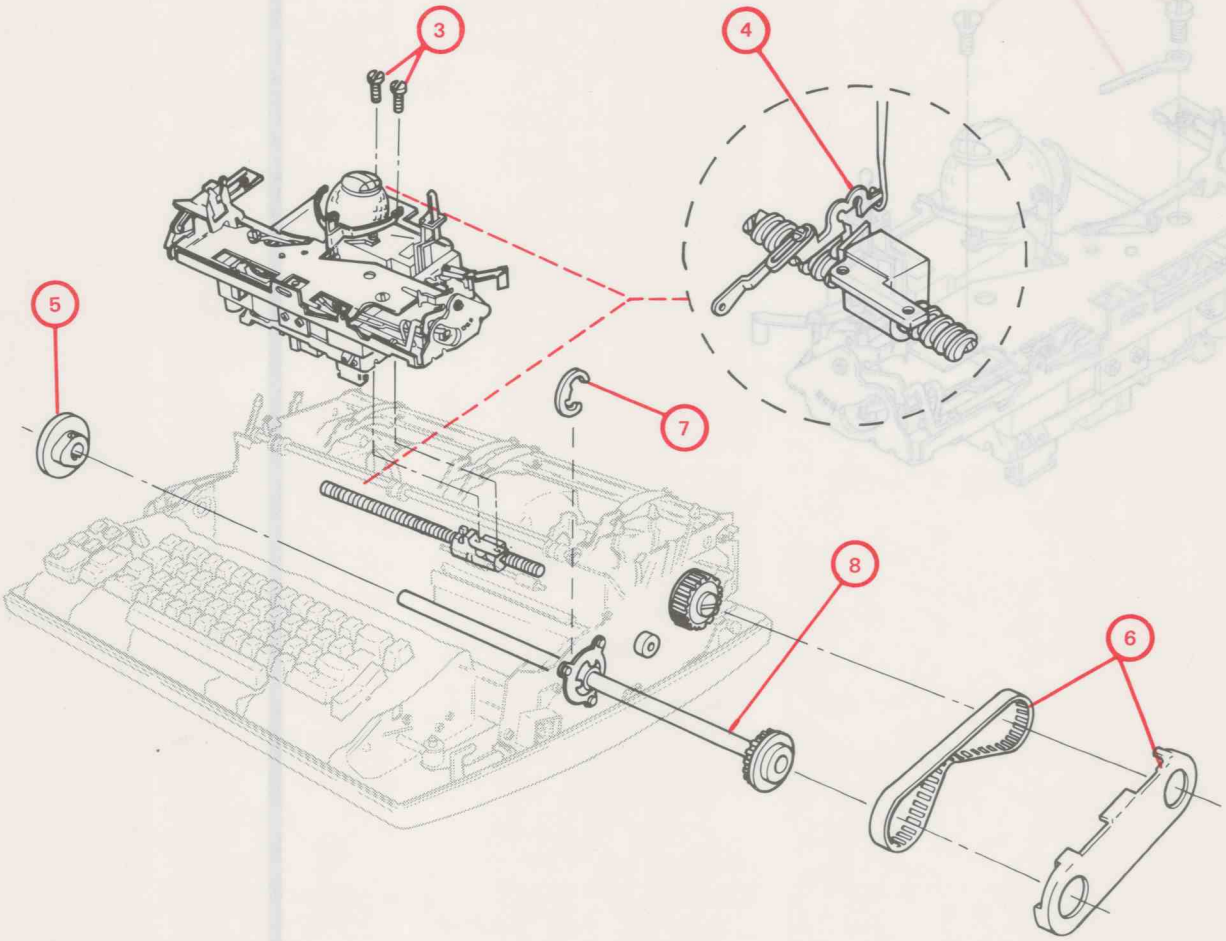
CARRIER

1. Center the carrier in front of the right feed rolls and remove the right feed rolls.
2. Disconnect the carrier cable from the logic board.
3. Remove the screws (2) from the leadscrew nut bracket.
4. Disconnect the leadscrew lock link from the locknut.

CAUTION
To reconnect the link, press the notch and not the rear of the link.

5. Loosen the setscrew in the print feedback magnet.
6. Remove the print shaft belt guard and belt.
7. Remove the clip from the right end of the print shaft.
8. Slide the print shaft to right while supporting the carrier.
9. Lift the carrier out, being careful not to damage the cable.

NOTE: Make sure the index driven gear is properly timed after the carrier has been reinstalled.

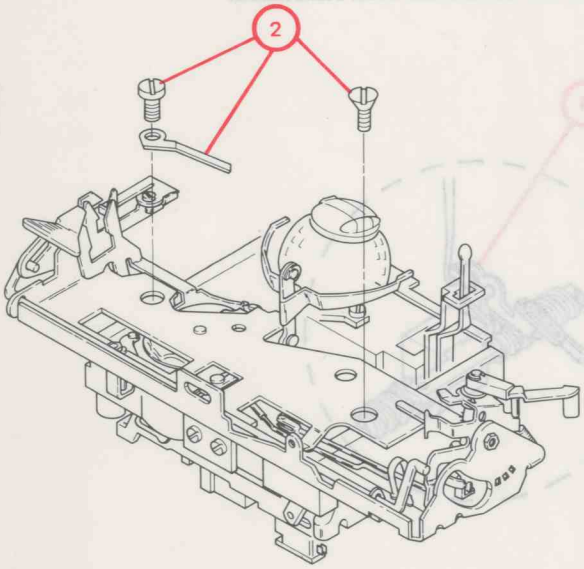


RIBBON PLATE – RIBBON CASSETTE SYSTEM

1. Remove the cassettes.
2. Remove the mounting screws (2) and the check pawl.
3. Lift the ribbon plate from the carrier.

To install:

1. Set the print shaft to the home position.
2. Unlatch the correcting control arm.
3. Align the aligning holes in the ribbon plate and ribbon feed cam. (The mounting screw can be inserted into the aligning holes to prevent the cam from rotating.)
4. Install the ribbon plate. (Rotate the ribbon plate counterclockwise before engaging the ribbon drive and driven gears.)
5. Push the tape feed cam follower to the right.
6. Install the right side mounting screw.
7. Make sure the screw is loose in the aligning holes.
8. Install the check pawl and the left side mounting screw.

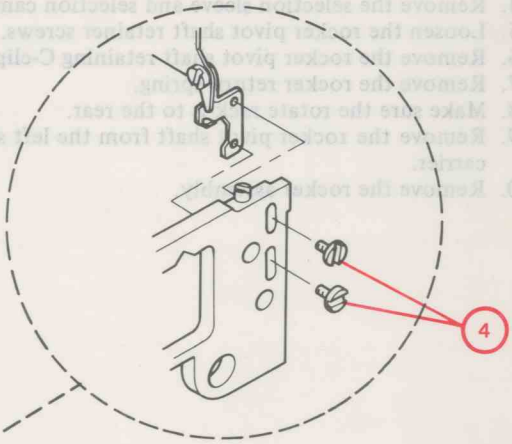


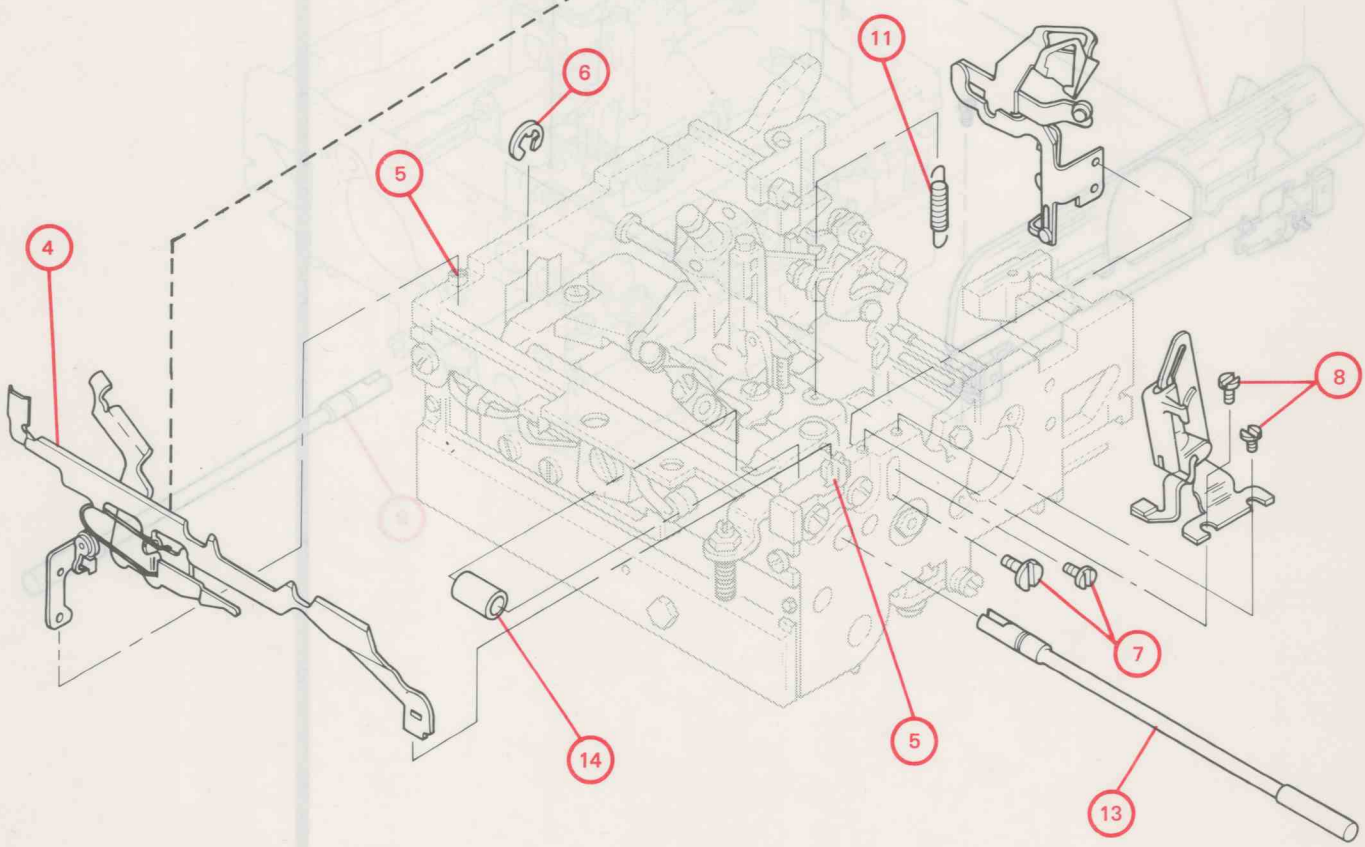
ROCKER ASSEMBLY – SELECTIVE RIBBON

1. Center the carrier in front of the right feed rolls.
2. Remove the ribbon and leave the load lever in the unload position.
3. Remove the right front feed roll.
4. Remove the cardholder bracket (2 screws).
5. Loosen the rocker pivot shaft binding screws (2).

   NOTE: The left cardholder bracket may need to be loosened to reach the left binding screw.

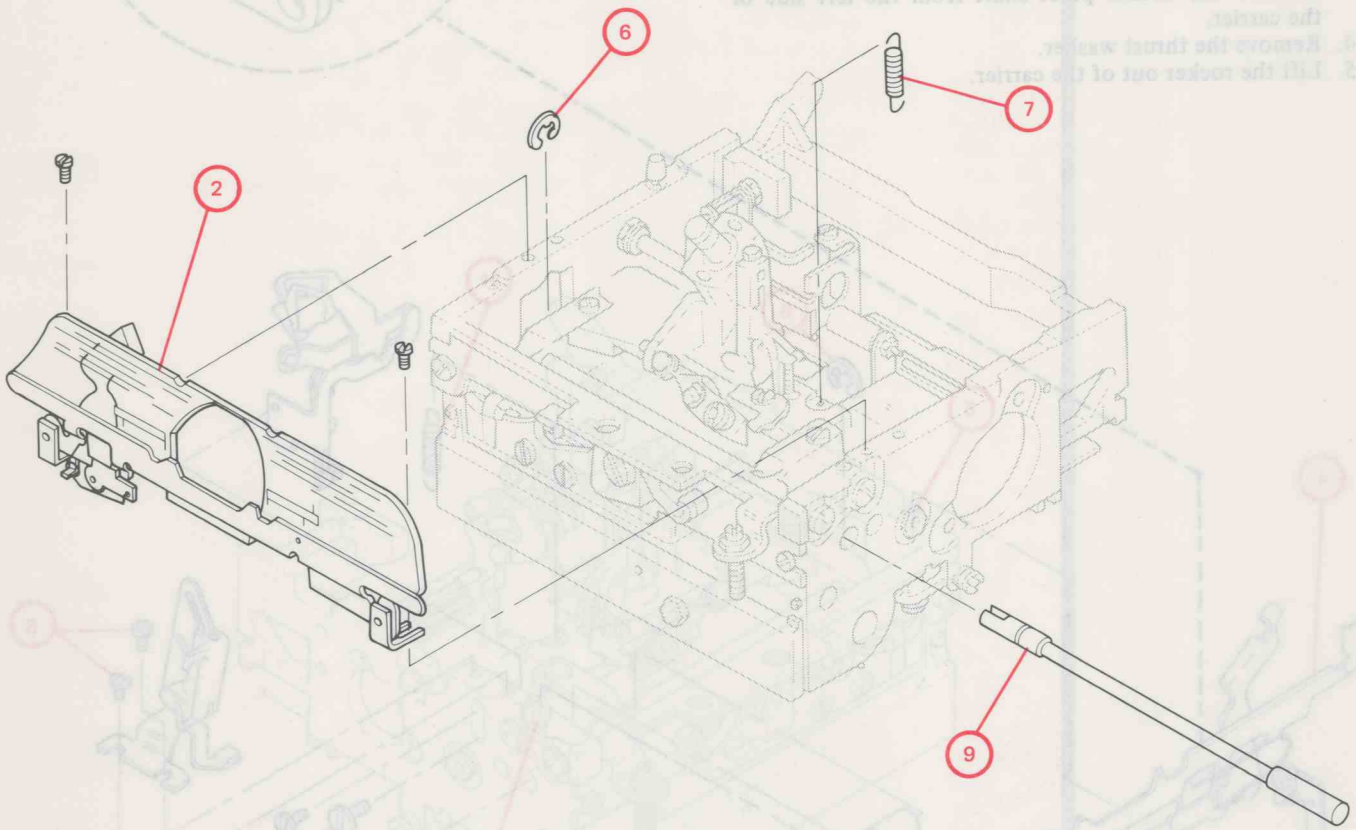
6. Remove the rocker pivot shaft C-clip.
7. Remove the tape lift guide (2 screws).
8. Remove the left ribbon lift guide (2 screws).
9. Disconnect the shift mode switch from the carrier cable.
10. Remove the selection sleeve and selection cams.
11. Disconnect the rocker return spring.
12. Make sure the rotate rack is to the rear.
13. Remove the rocker pivot shaft from the left side of the carrier.
14. Remove the thrust washer.
15. Lift the rocker out of the carrier.





ROCKER ASSEMBLY – RIBBON CASSETTE SYSTEM

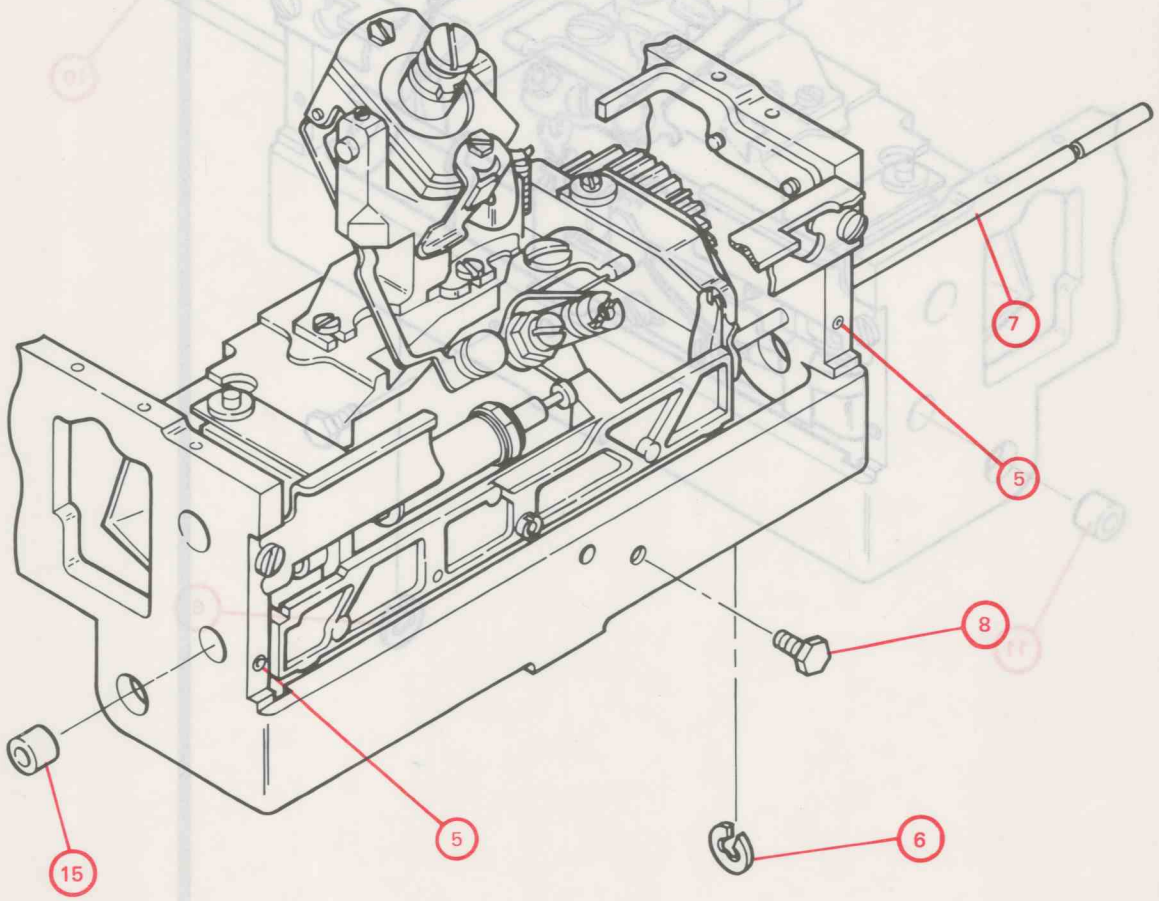
1. Center the carrier in front of the right feed rolls.
2. Remove the cardholder bracket assembly.
3. Disconnect the shift mode switch leads from the carrier connector.
4. Remove the selection sleeve and selection cams.
5. Loosen the rocker pivot shaft retainer screws.
6. Remove the rocker pivot shaft retaining C-clip.
7. Remove the rocker return spring.
8. Make sure the rotate rack is to the rear.
9. Remove the rocker pivot shaft from the left side of the carrier.
10. Remove the rocker assembly.



RACK TRANSFER BRACKET (BRASS)

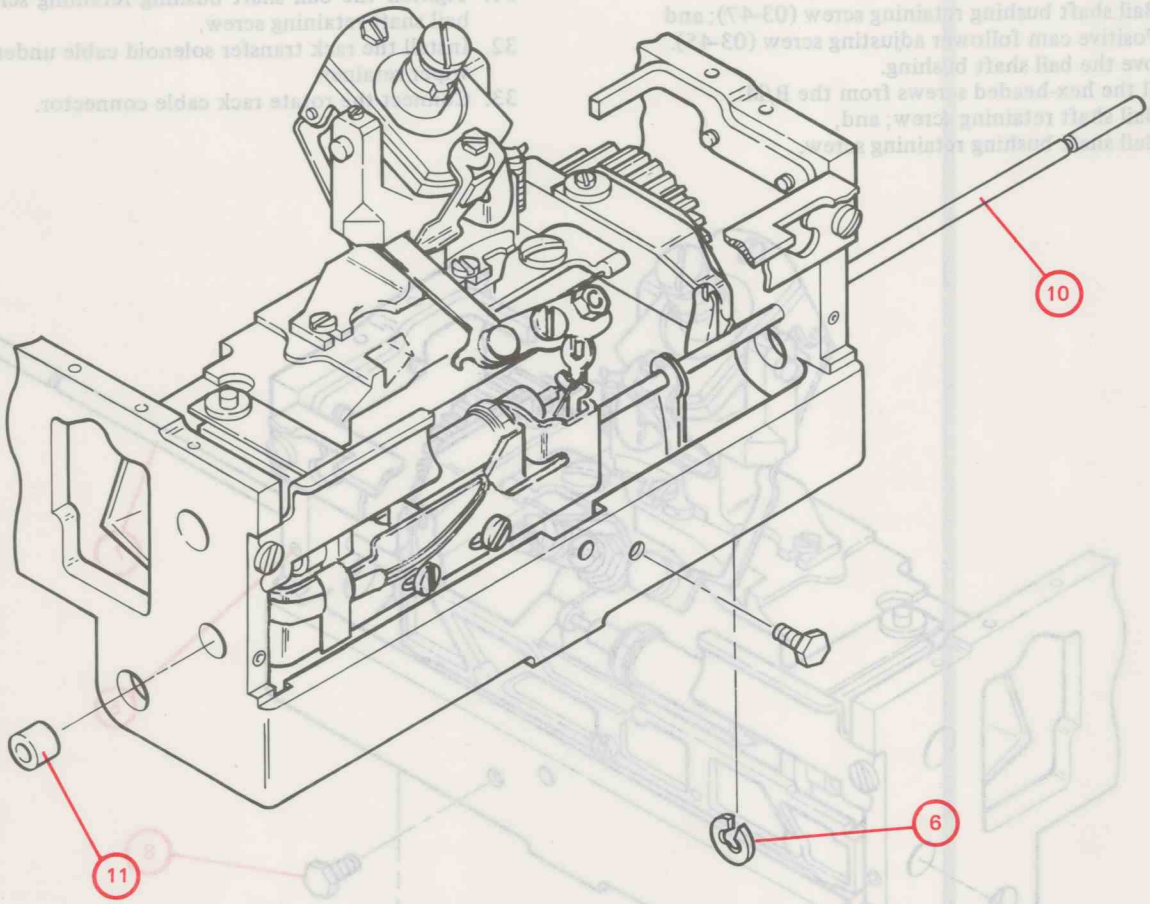
REMOVAL AND CONVERSION TO STEEL BRACKET

1. Remove the carrier. (See carrier removal.)
2. Half cycle the selection cams.
3. Retain the selection pins.
4. Remove the selection sleeve and selection cams.
5. Remove the setscrews holding the bail shaft and bail shaft bushing.
6. Remove the C-clip on the bail shaft.
7. Remove the bail shaft.
8. Remove the shaft support bracket screw.
9. Disconnect the rotate rack solenoid connector.
10. Remove the solenoid cable from under the carrier wiper retainer.
11. Manually transfer the rack plate to the front (negative rack engaged).
12. Manually position the typehead in the tilt 3 rotate 6 position.
13. Manually raise the rocker to the print position and remove the bracket assembly from the bottom of the carrier.
14. Remove and discard:
    a. Bail shaft support bracket screw (03-5);
    b. Bail shaft retaining screw (03-44);
    c. Bail shaft bushing retaining screw (03-47); and
    d. Positive cam follower adjusting screw (03-45).
15. Remove the bail shaft bushing.
16. Install the hex-headed screws from the B/M:
    a. Bail shaft retaining screw; and,
    b. Bail shaft bushing retaining screw.
17. Install the rotate rack solenoid cable from the bottom of the carrier through the carrier side frame.
18. Install the Level 2 (steel) bracket assembly so the vertical yoke engages the rotate rack plate shaft. (Make sure the short C-clip shaft area is to the right.)
19. Install the bail shaft bushing.
20. Slide the bail shaft through the bail shaft support and the leadscrew lock cam follower.
21. Install the rack transfer bracket bias spring.
22. Slide the bail shaft into the left carrier casting.
23. Install the left C-clip.
24. Bias the bail shaft to the left and install the right C-clip.
25. Install the bail shaft support bracket screw. [Install a shim (03-43) as required.]
26. Adjust the bail shaft support. (Move the bracket assembly left and right to check for binds.)
27. Reinstall the carrier.
28. Cycle the print shaft to rest.
29. Install the selection sleeve and selection cams in the preliminary timed position.
30. Half cycle a rotate 5 selection. Move the bail shaft bushing until there is .015"-.020" (0.38-0.51 mm) clearance between the right side of the rotate cam and the shift cam follower.
31. Tighten the bail shaft bushing retaining screw and the bail shaft retaining screw.
32. Install the rack transfer solenoid cable under the carrier wiper retainer.
33. Connect the rotate rack cable connector.



RACK TRANSFER BRACKET (STEEL)

1. Half cycle the selection cams.
2. Retain the pins with the type aligning tool.
3. Remove the selection sleeve and selection cams.
4. Manually transfer the rack plate to the front (negative rack).
5. Manually rotate and tilt the typehead to a T3, R6 position.
6. Remove the C-clips on the bail shaft.
7. Loosen the bail shaft retaining screw and the bail shaft bushing retaining screw.
8. Disconnect the rack transfer solenoid connector.
9. Remove the solenoid cable from under the carrier wiper retainer.
10. Use an old bail shaft or splined wrench to push the bail shaft to the right until it clears the shaft support. This keeps the bias spring and the leadscrew lock cam follower in the carrier.
11. Remove the bail shaft bushing.
12. Remove the bracket assembly from the bottom of the carrier.



TILT CAM FOLLOWER

1. Position the carrier in front of the right paper feed rolls.
2. Remove the right front paper feed roll.
3. Remove the selection cams.
4. Remove the tilt adjusting screw.
5. Remove the tilt pivot nut and screw.
6. Make sure the rack plate is in the forward position. Remove the tilt cam follower bellcrank by moving it to the right and rotating it slightly to the rear, then up and out.

To install:

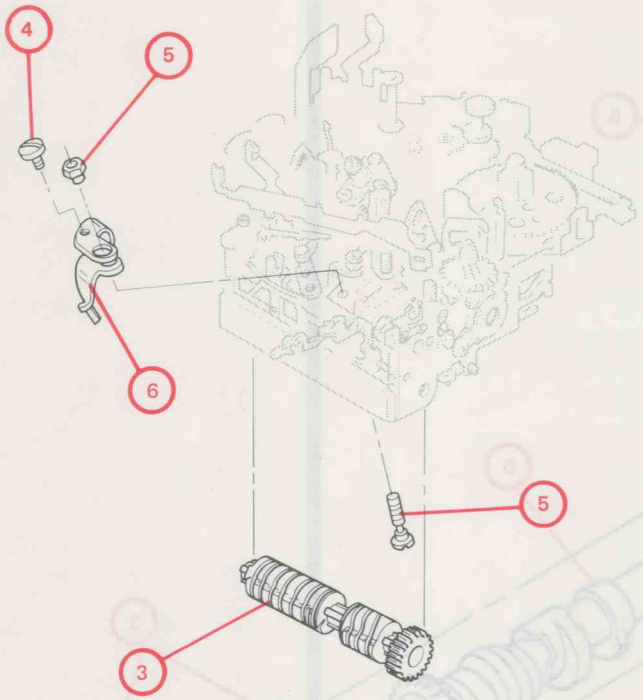
1. Insert the tilt cam follower (thin extension) between the rocker shaft and the rear of the rack plate.
2. Hold the left end of the bellcrank (the end with the two pivot holes) up in a position just above the edge of the rocker casting at the right of the tilt bellcrank stop.

   Lower the right end of the bellcrank slightly and rotate it clockwise and down. (No force is necessary.)

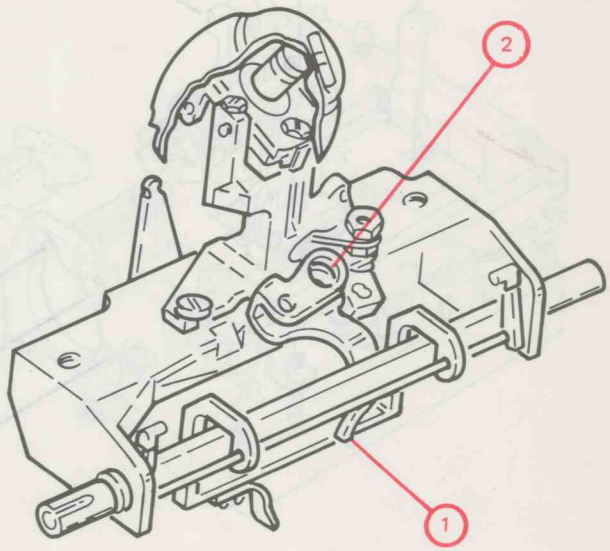
   Move the bellcrank to the left into the operating position.

3. Connect the tilt spring. Reverse removal steps 2, 3, 4, and 5.

   Make the tilt adjustments and check for the cause of the broken parts before applying power.



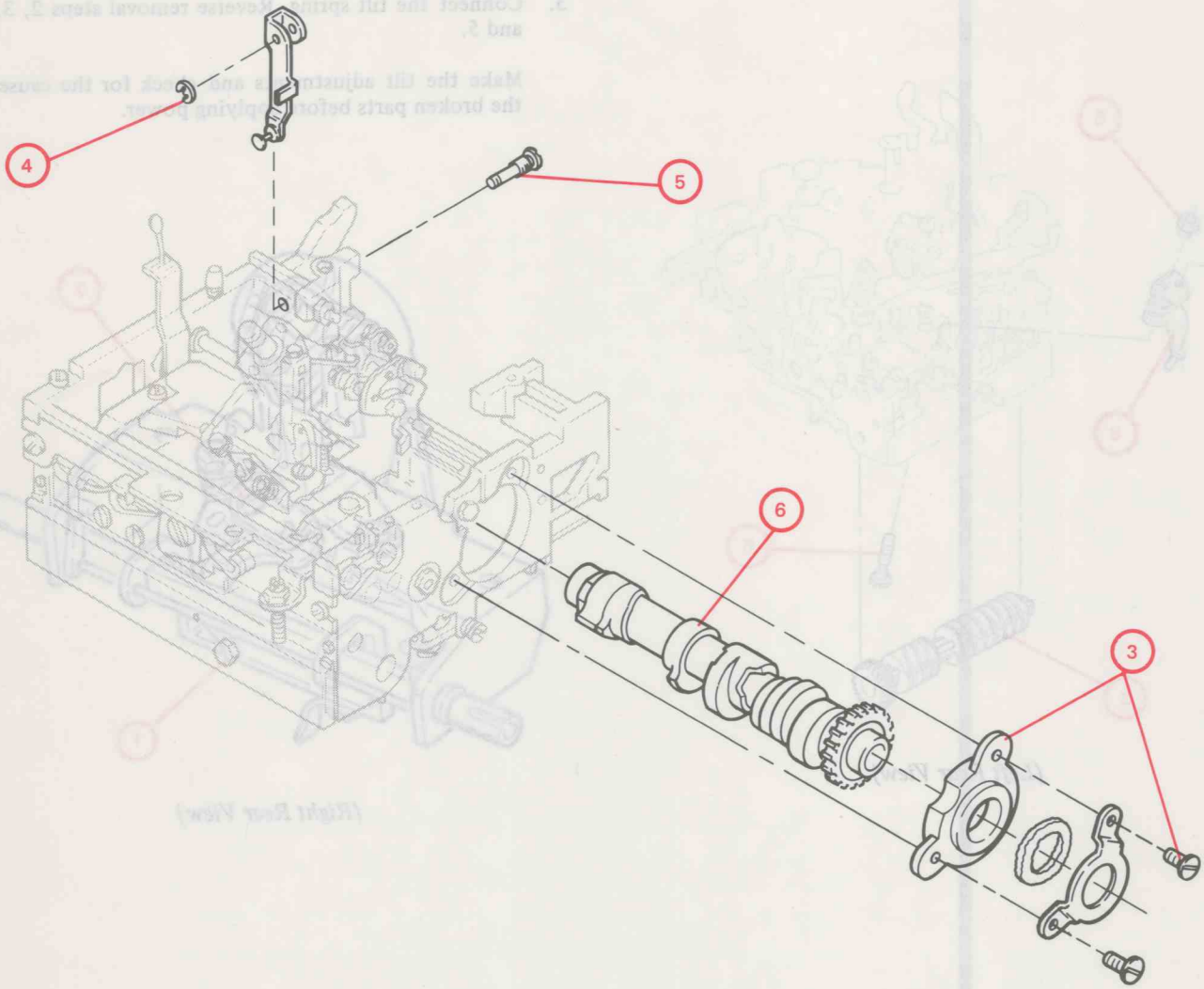
(Left Rear View)



(Right Rear View)

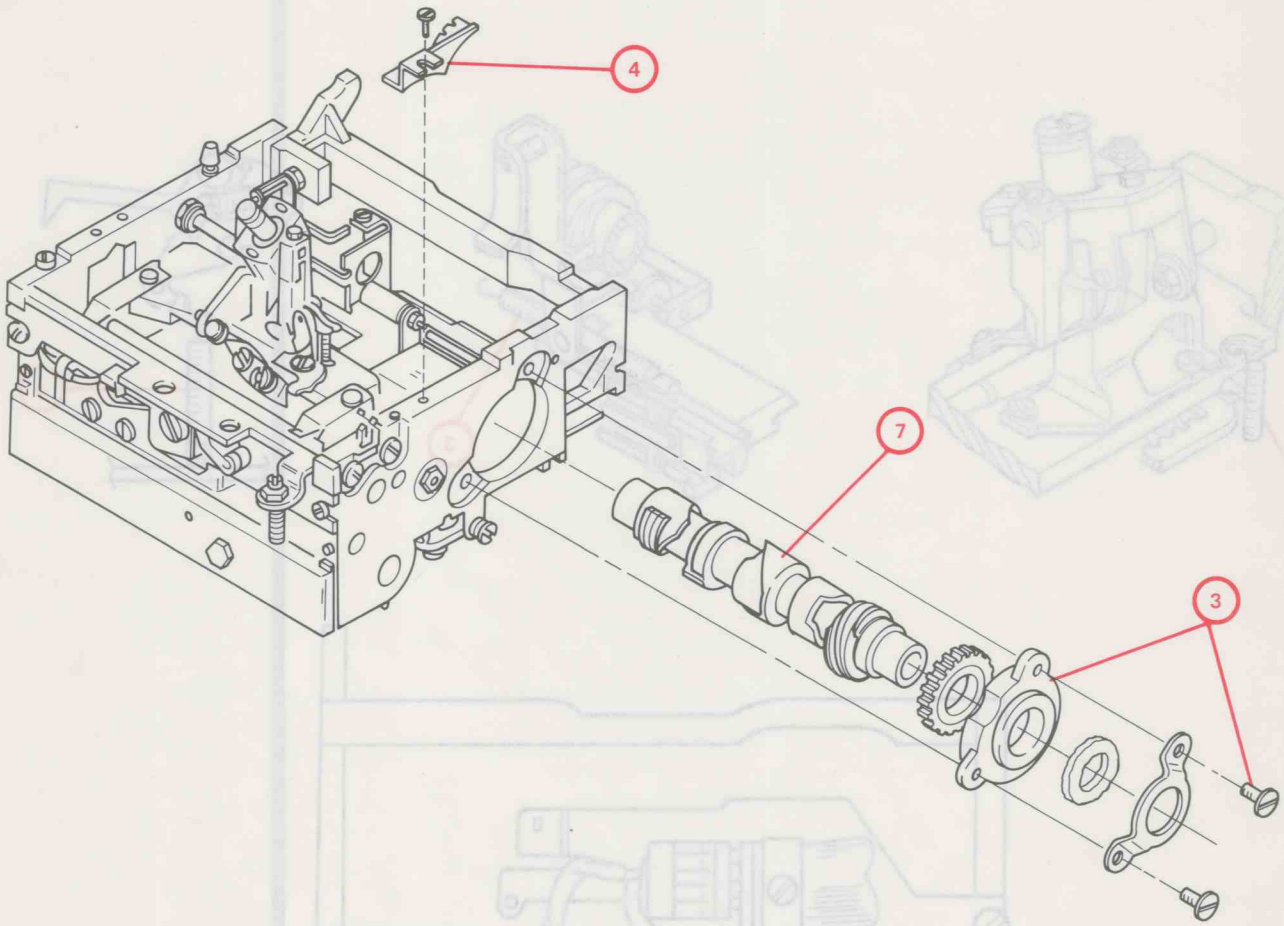
PRINT SLEEVE – SELECTIVE RIBBON

1. Remove the ribbon plate.
2. Remove the print shaft.
3. Remove the screws holding the left wiper retainer and remove the print sleeve bearing.
4. Remove the C-clip holding the velocity slider restoring cam follower.
5. Loosen the screw enough to remove the velocity cam follower.
6. Slide the print shaft sleeve assembly to the left and remove.



PRINT SLEEVE – RIBBON CASSETTE SYSTEM

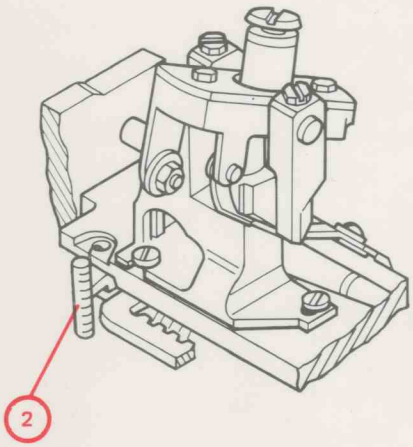
1. Remove the ribbon plate.
2. Remove the print shaft.
3. Remove the left wiper retainer and bearing (2 screws).
4. Remove the selection drive gear guard.
5. Remove the selection drive gear.
6. Remove the correcting control arm spring and pivot the arm out of the way.
7. Move the print sleeve to the left and remove it from the top.

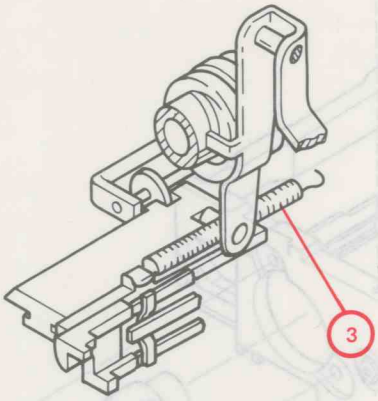


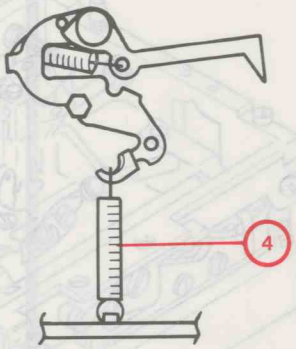
CARRIER BOTTOM PLATE – SELECTIVE RIBBON

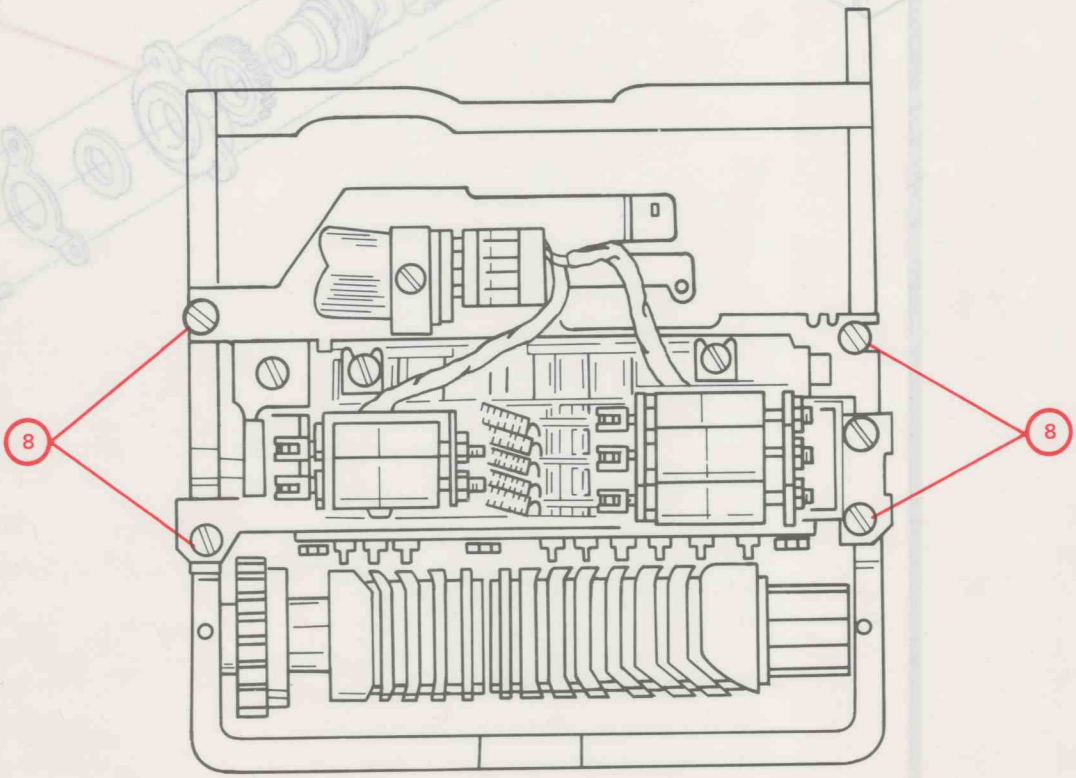
1. Remove the ribbon plate.
2. Disconnect the rocker return spring.
3. Disconnect the velocity slider restore spring.
4. Disconnect the correcting lift arm spring.
5. Disconnect the ribbon feed cam follower spring.
6. Unplug the shift mode and rack transfer connectors.
7. Unlatch the correcting latch.
8. Remove the bottom plate mounting screws.
9. Remove the bottom plate.

NOTE: When reinstalling, make sure the velocity restore arm and print cam follower engage the velocity slider and detent cam follower on the right side of the actuator arm. Also, be sure to engage the correcting latch link with the aligning hole in the plate.





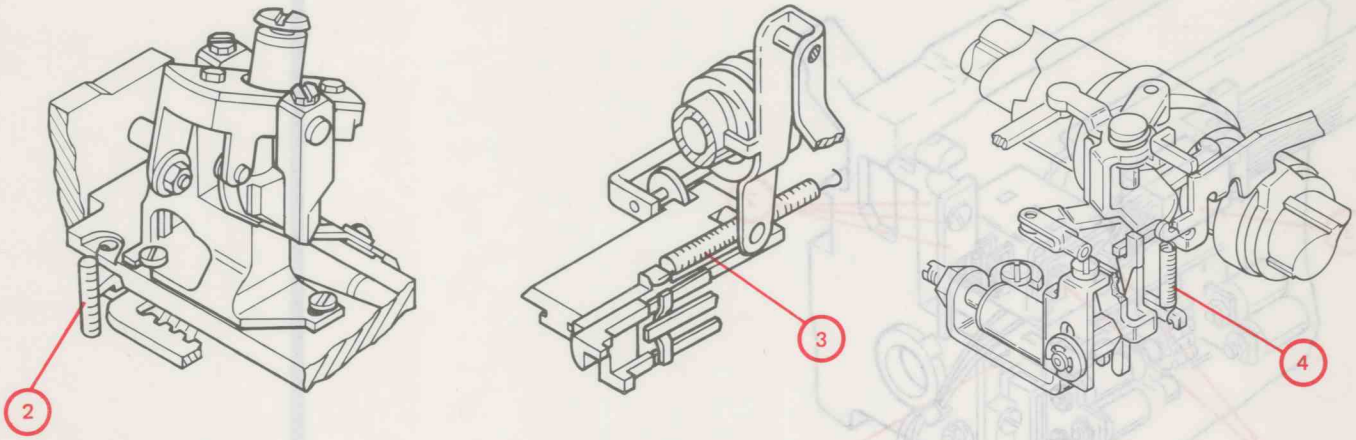


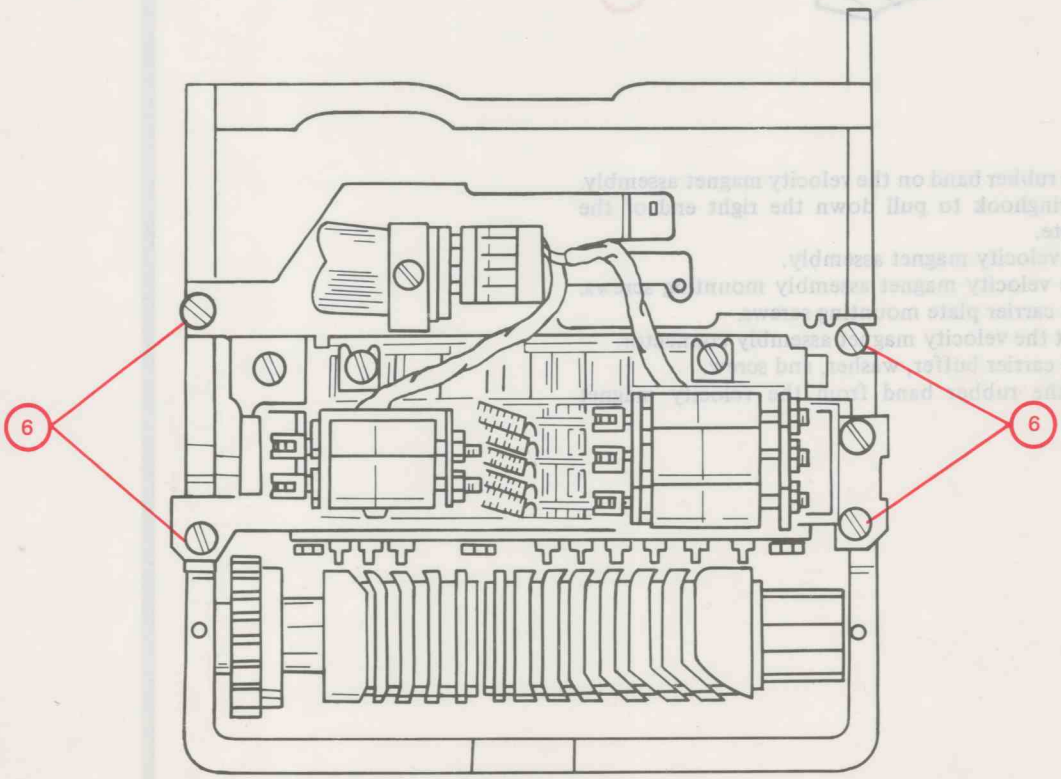


CARRIER BOTTOM PLATE – RIBBON CASSETTE SYSTEM

1. Remove the ribbon plate.
2. Disconnect the rocker return spring.
3. Disconnect the velocity slider restore spring.
4. Disconnect the correcting control arm spring.
5. Unplug the shift mode switch and rack transfer solenoid connectors.
6. Remove the bottom plate mounting screws (4).
7. Pivot the left side of the bottom plate down and disengage the inhibit link from the plate.
8. Remove the bottom plate.

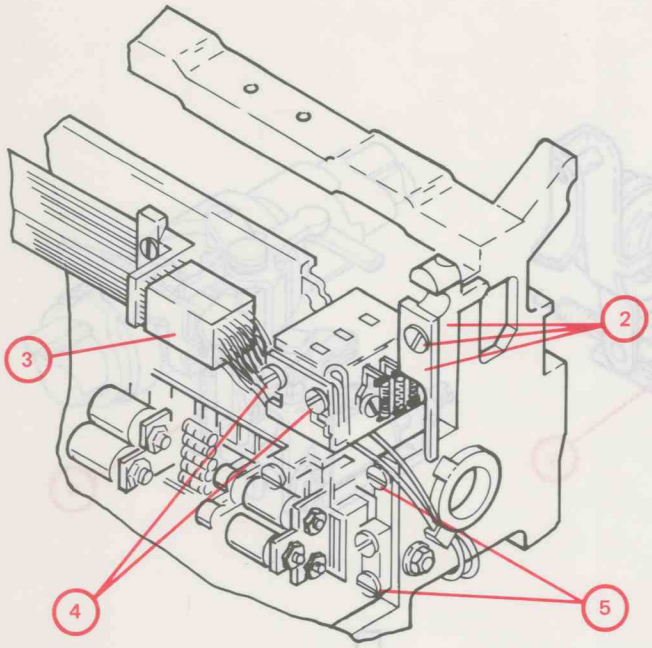
NOTE: When reinstalling, make sure the velocity restore arm and print cam follower roller engage the velocity slider and detent cam on the right side of the actuator. Also, make sure the inhibit link is positioned properly.





VELOCITY MAGNET ASSEMBLY

1. Tab the carrier to the right side of the machine, approximately 4" (101.60 mm) from the frame.
2. Remove the right carrier buffer, washer and screw.
3. Disconnect the velocity magnet assembly.
4. Remove the velocity magnet assembly mounting screws (2).
5. Loosen the right carrier plate mounting screws (2).
6. Use a springhook to slightly pull down the right end of the carrier plate that mounts the velocity magnet assembly.
7. Remove the velocity magnet pack through the right side of the carrier.



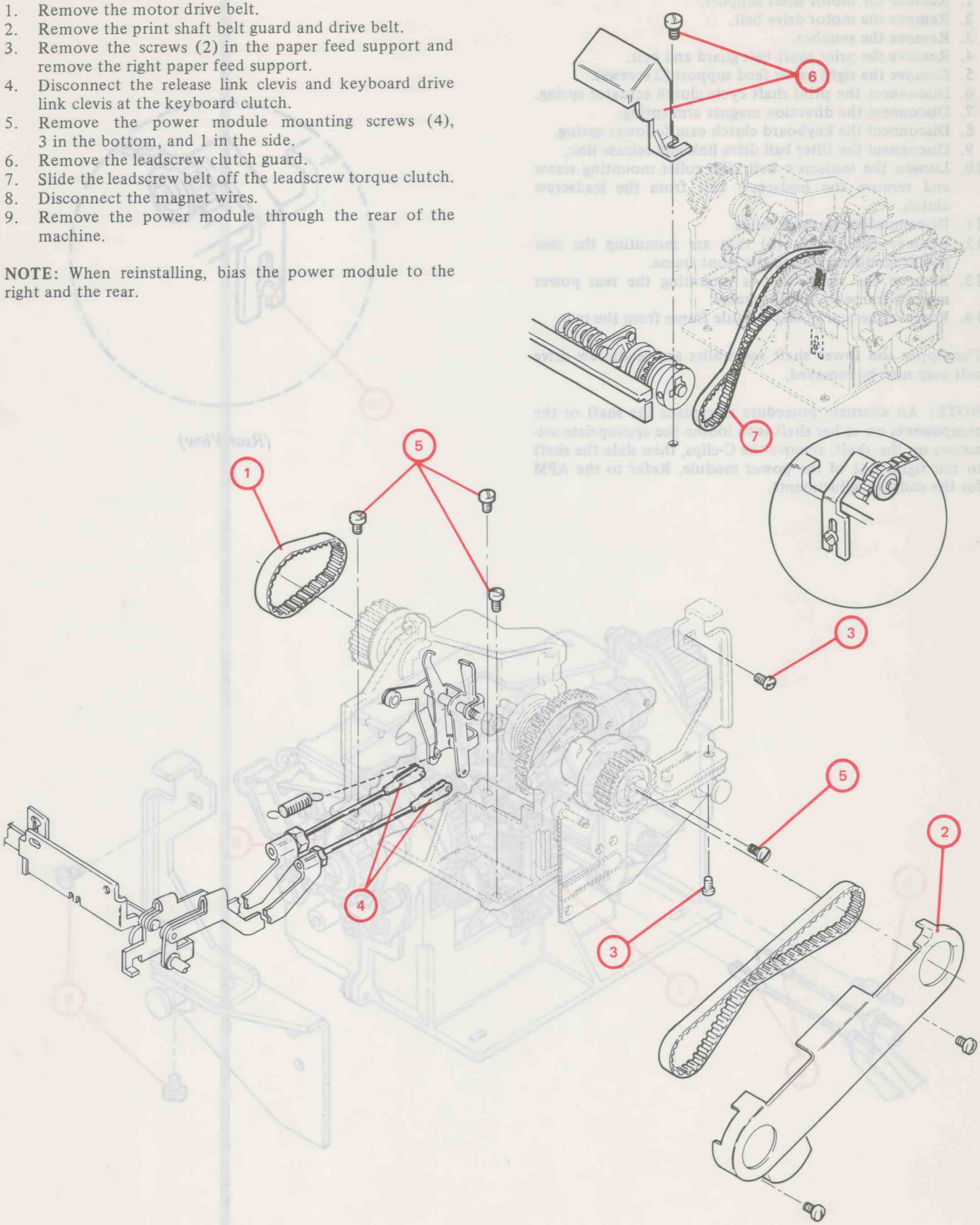
To install:

1. Install the rubber band on the velocity magnet assembly.
2. Use a springhook to pull down the right end of the carrier plate.
3. Insert the velocity magnet assembly.
4. Install the velocity magnet assembly mounting screws.
5. Install the carrier plate mounting screws.
6. Reconnect the velocity magnet assembly connector.
7. Install the carrier buffer, washer, and screw.
8. Remove the rubber band from the velocity magnet pack.

POWER MODULE

1. Remove the motor drive belt.
2. Remove the print shaft belt guard and drive belt.
3. Remove the screws (2) in the paper feed support and remove the right paper feed support.
4. Disconnect the release link clevis and keyboard drive link clevis at the keyboard clutch.
5. Remove the power module mounting screws (4), 3 in the bottom, and 1 in the side.
6. Remove the leadscrew clutch guard.
7. Slide the leadscrew belt off the leadscrew torque clutch.
8. Disconnect the magnet wires.
9. Remove the power module through the rear of the machine.

NOTE: When reinstalling, bias the power module to the right and the rear.

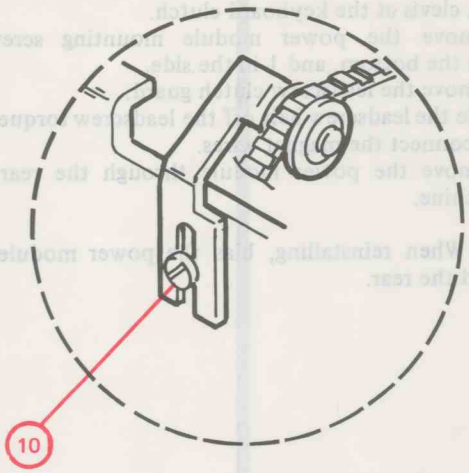


POWER MODULE UPPER AND LOWER SHAFT

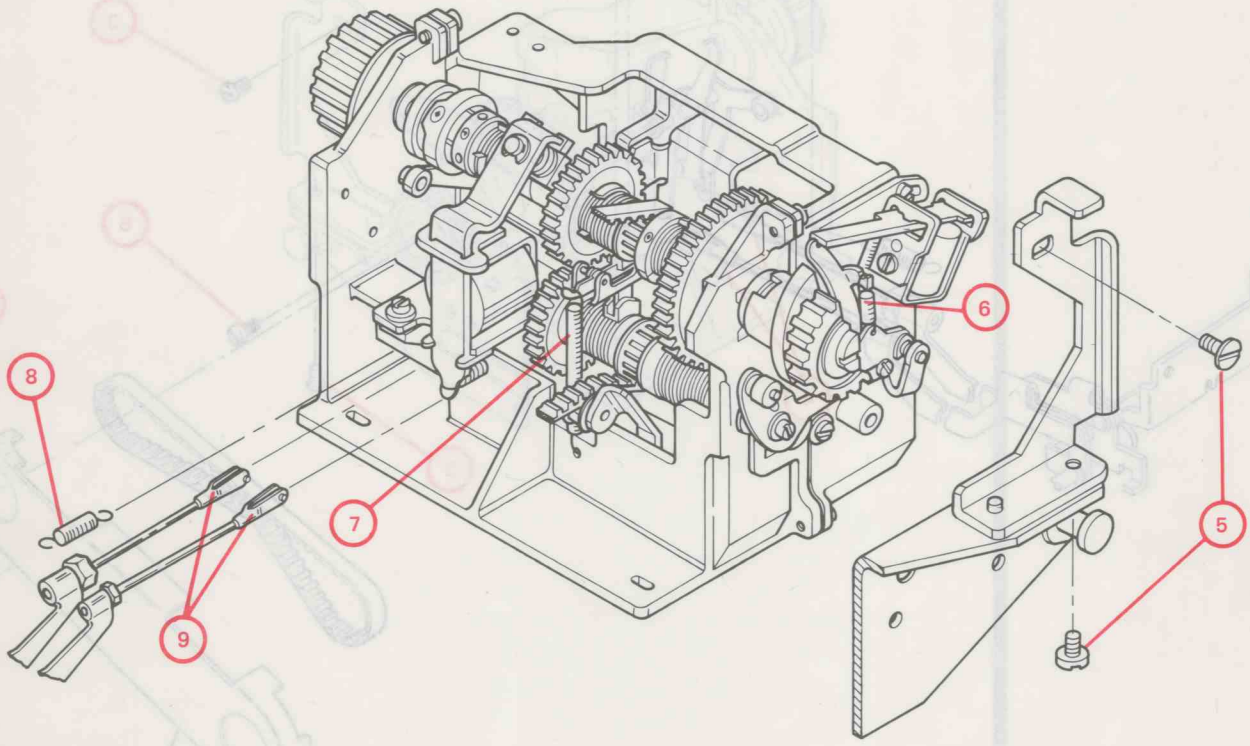
1. Remove the motor shaft support.
2. Remove the motor drive belt.
3. Remove the snubber.
4. Remove the print shaft belt guard and belt.
5. Remove the right paper feed support (2 screws).
6. Disconnect the print shaft cycle clutch actuator spring.
7. Disconnect the direction magnet arm spring.
8. Disconnect the keyboard clutch cam follower spring.
9. Disconnect the filter bail drive link and release link.
10. Loosen the leadscrew belt idler roller mounting screw and remove the leadscrew belt from the leadscrew clutch.
11. Disconnect the magnet wires.
12. Remove the screws (6) that are mounting the rear power module frame to the front frame.
13. Remove the screw that is mounting the rear power module frame to the side frame.
14. Remove the rear power module frame from the rear.

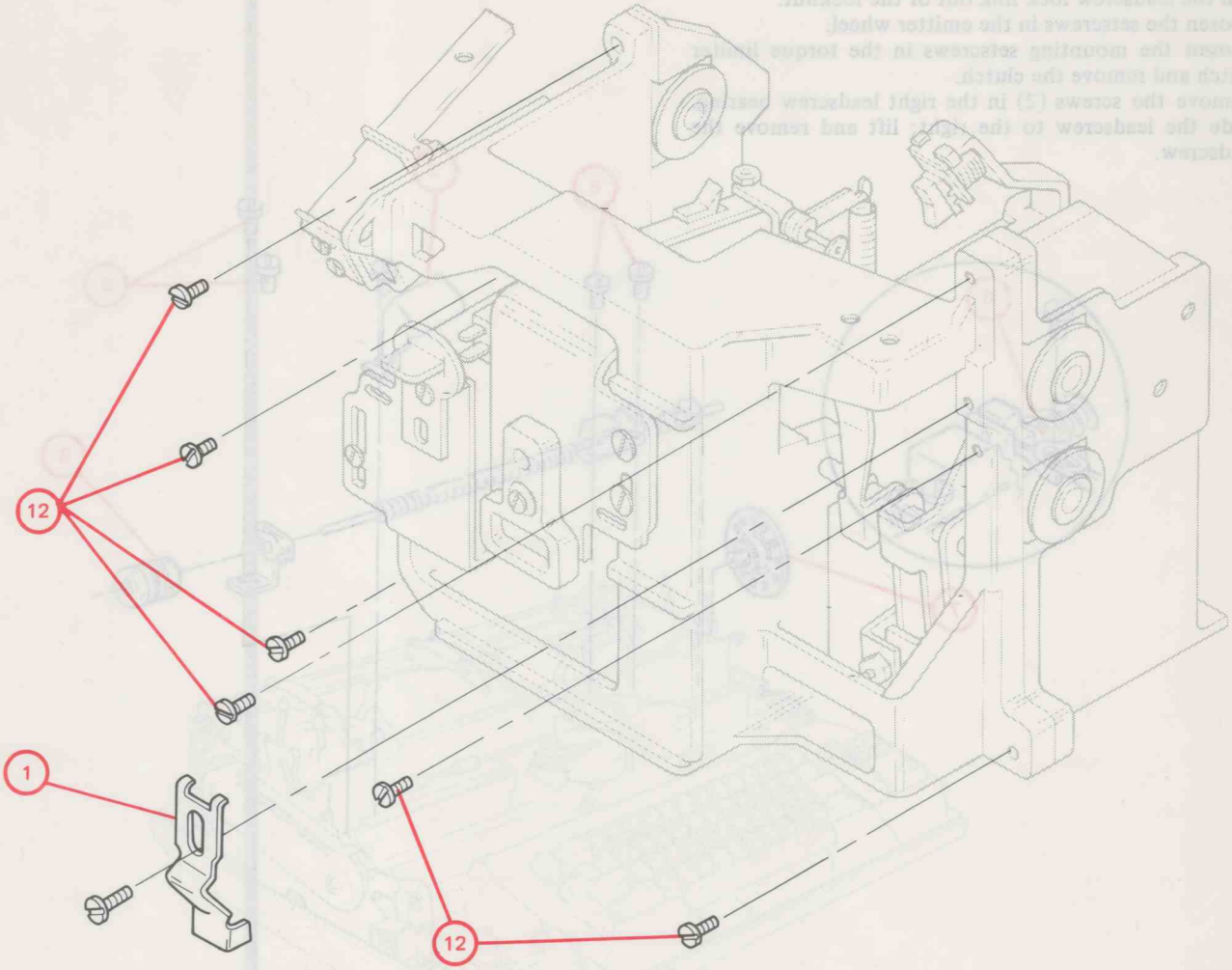
The upper and lower shaft assemblies and leadscrew drive belt may now be removed.

NOTE: An alternate procedure to replace the shaft or the components on either shaft is to loosen the appropriate set-screws on the shaft, remove the C-clips, then slide the shaft to the right, out of the power module. Refer to the APM for the endplay adjustments.



(Rear View)

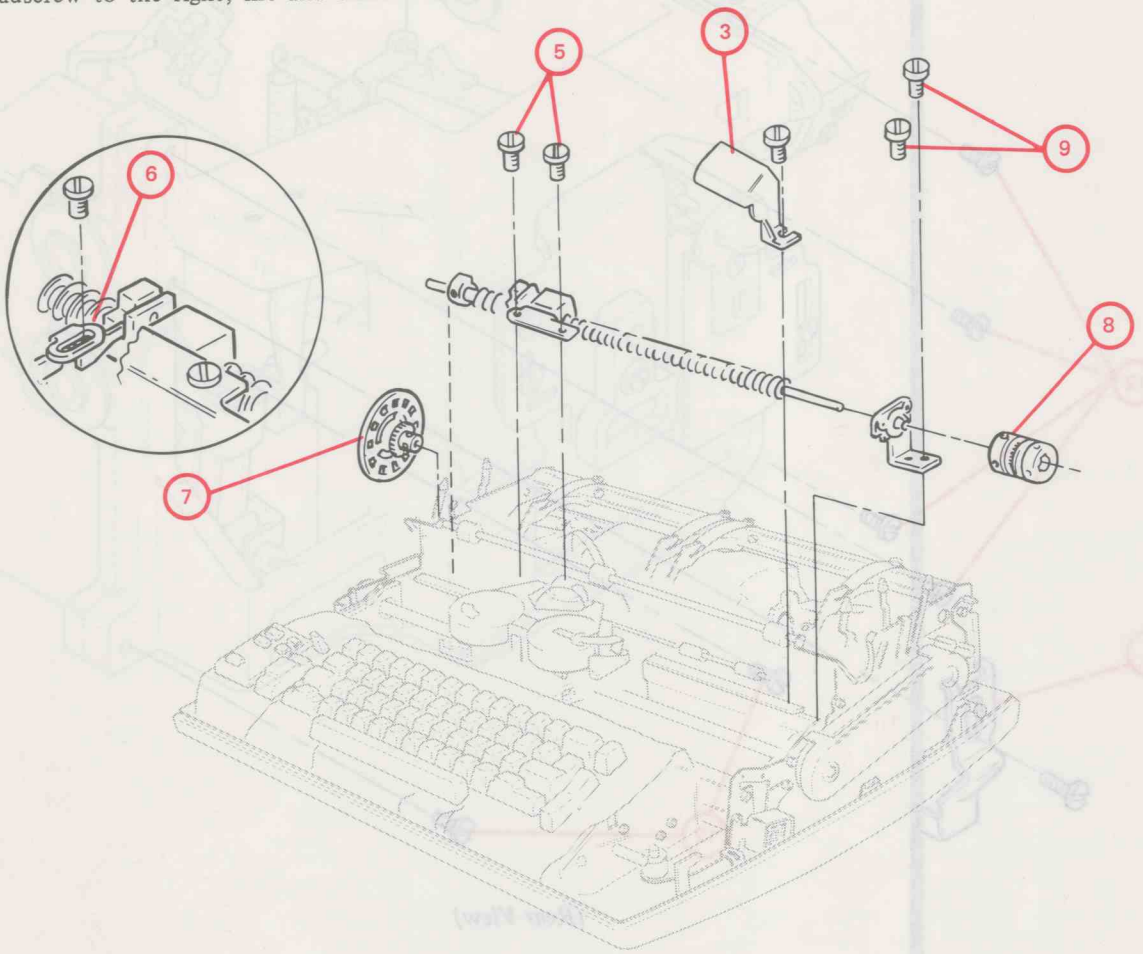


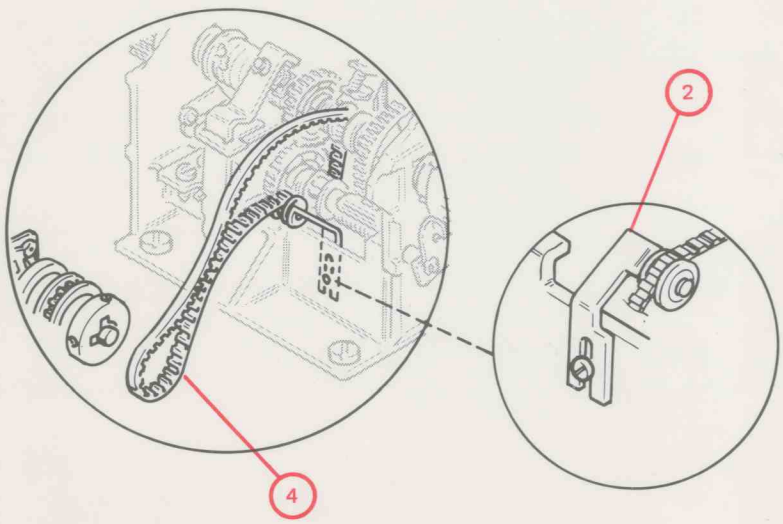


(Rear View)

LEADSCREW

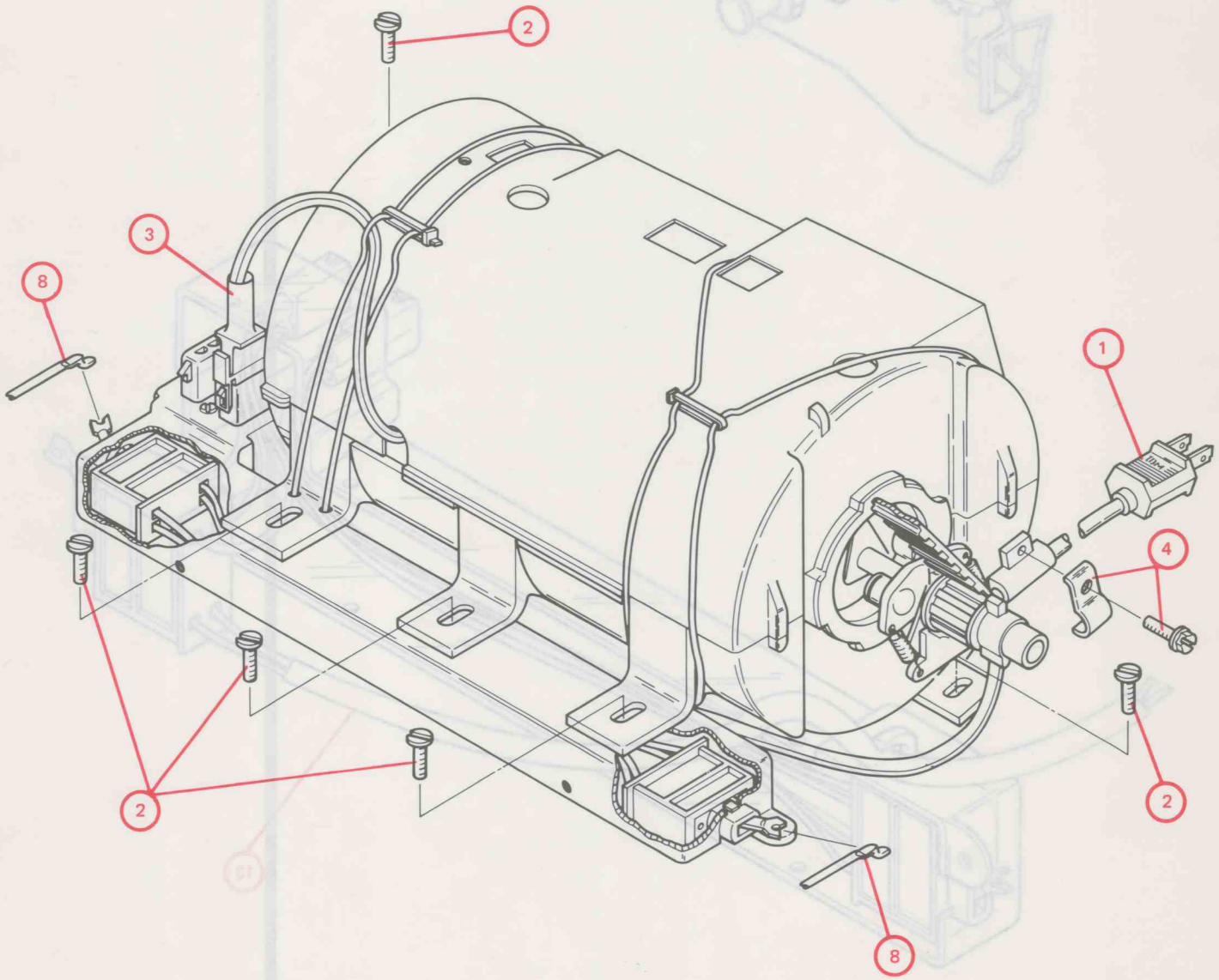
1. Center the carrier in front of the left feed rolls.
2. Loosen the leadscrew drive belt idler pulley.
3. Remove the leadscrew clutch guard.
4. Remove the leadscrew drive belt from the torque clutch.
5. Remove the screws (2) from the leadscrew nut.
6. Pull the leadscrew lock link out of the locknut.
7. Loosen the setscrews in the emitter wheel.
8. Loosen the mounting setscrews in the torque limiter clutch and remove the clutch.
9. Remove the screws (2) in the right leadscrew bearing.
10. Slide the leadscrew to the right; lift and remove the leadscrew.

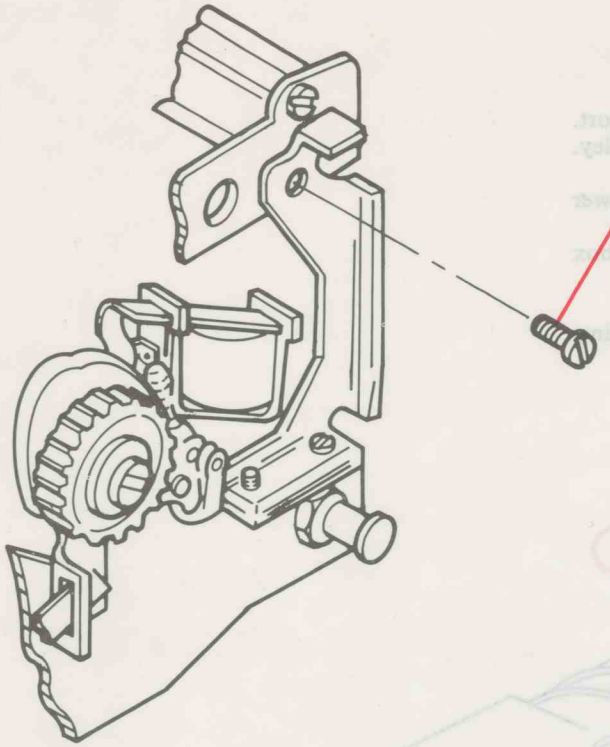


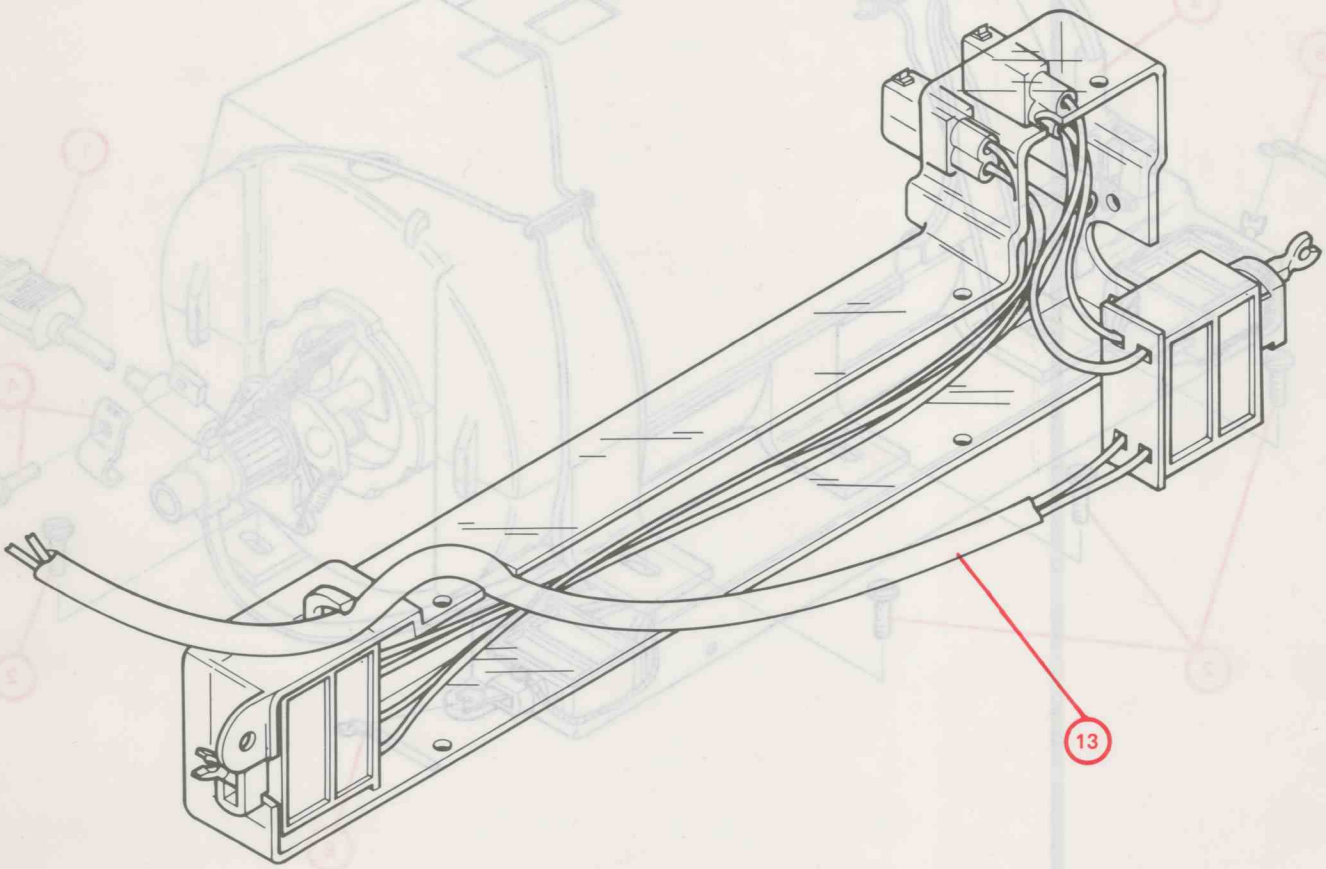


MOTOR, PRIMARY BOX, LINECORD

1. Unplug the linecord from the outlet.
2. Remove the motor mounting screws (5).
3. Unplug the motor from the primary box connector.
4. Remove the linecord cable clamp (1 screw).
5. Remove the top screw from each paper feed support.
6. Remove the motor drive belt from the driven pulley.
7. Remove the motor from the rear of the machine.
8. Disconnect the links from the motor switch and power switch.
9. Unplug the transformer from the primary box connector.
10. Remove the primary box mounting screws (2).
11. Remove the primary box from the rear of the machine.
12. Remove the bottom of the primary box.
13. Remove the linecord.

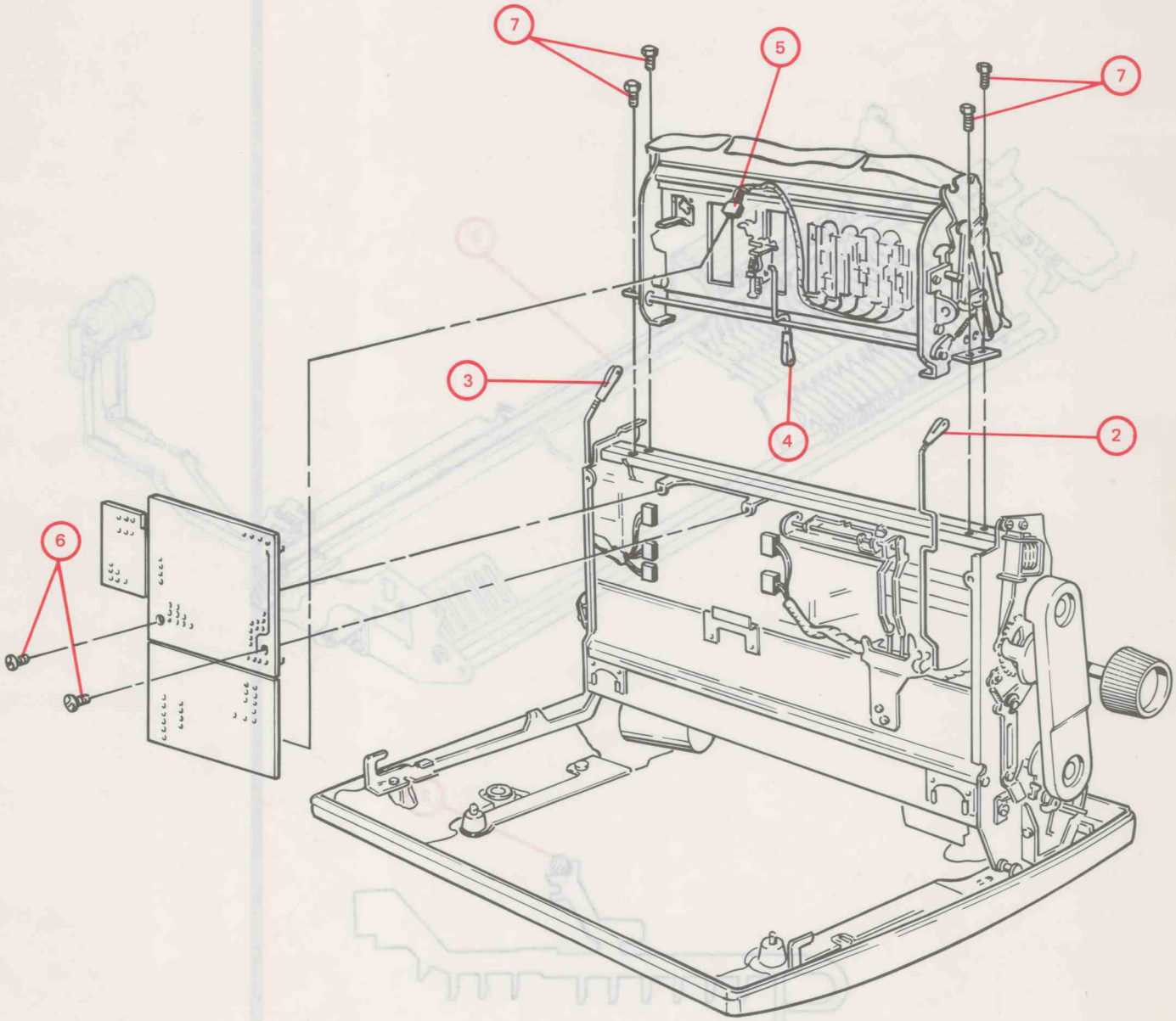






KEYBOARD

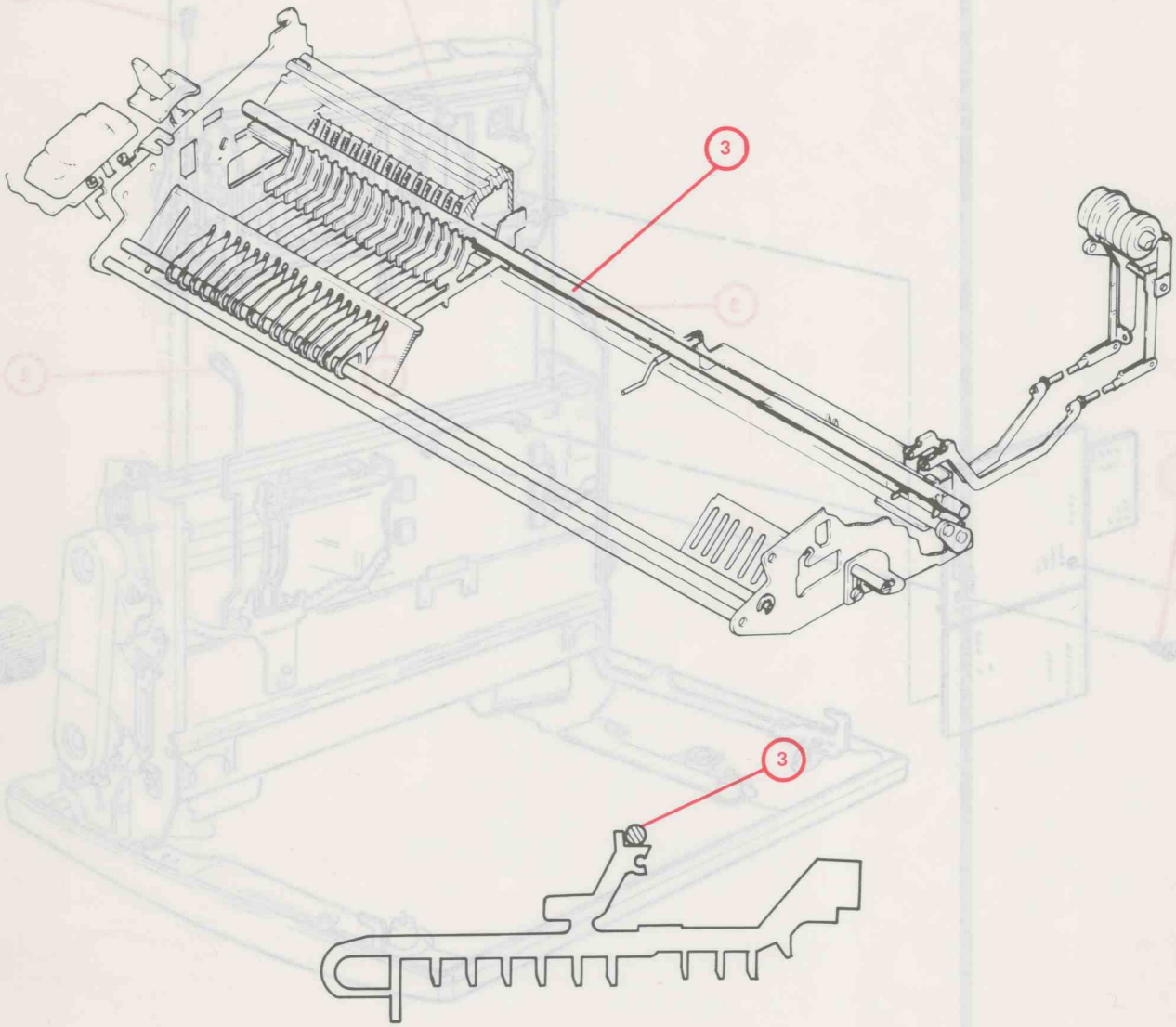
1. Remove the power switch bracket (and the right switch bracket, if used).
2. Disconnect the motor On/Off switch link.
3. Disconnect the main power lever link.
4. Disconnect the keyboard release link and filter bail drive link.
5. Remove the keyboard cable from the electronic board.
6. Remove the electronic board mounting screws.
7. Remove the mounting screws (4) from the front rail.
8. Remove the keyboard.



COMPENSATOR TUBE BALLS

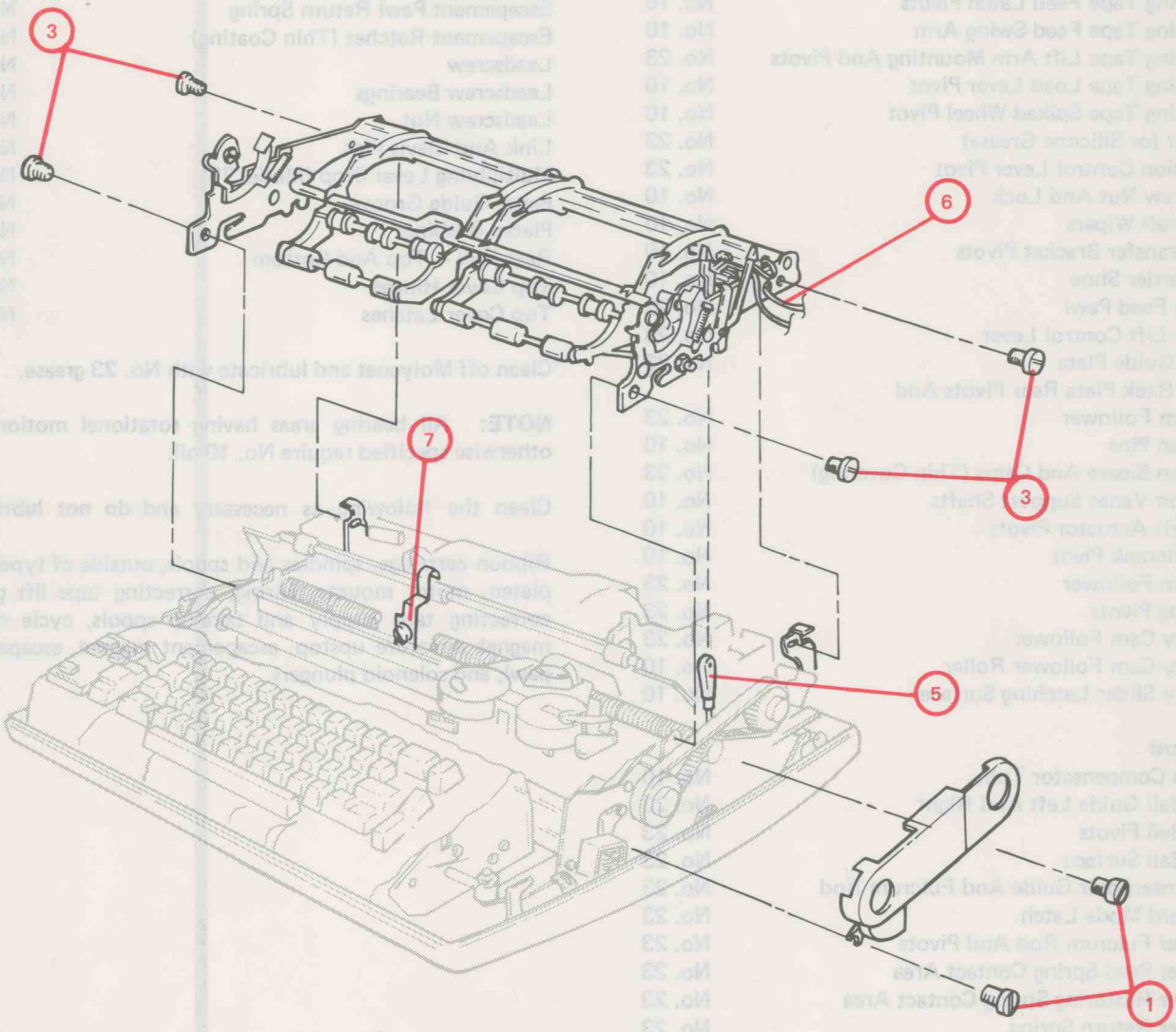
1. Remove the power bracket assembly and the top keyboard assembly.
2. Remove the right end plate from the compensator tube.
3. Use the typebar fulcrum wire, or similar object, to pull all interposers toward the front of the machine.
4. Carefully tilt the machine toward the right while holding the interposers toward the front. The balls will fall out of the compensator tube into the bottom cover.

NOTE: Sixty-five (65) balls are required.



PAPER FEED ASSEMBLY

1. Remove the print shaft belt guard (2 screws).
2. Scribe the position of the assembly.
3. Remove the screws (4).
4. If machine is straight lead pitch switch, disconnect the switches.
5. Disconnect the index link.
6. If a Model 75, disconnect the semi-automatic paper insertion magnet wires.
7. Loosen the screw on the center support. (Lift up and release it from the paper release shaft.)
8. Lift the rear of the frame and slide it toward the rear.



LUBRICATION GUIDE

CAUTION
Because oil and grease affect rubber, special care should be taken to prevent lubricants from contacting the platen, feed rolls, paper bail rolls, rubber mounts and drive belts.

Carrier

All Non-Rotating Bearing Surfaces Not Otherwise Specified	No. 23
Ball Joint	No. 23
Correcting Latch	No. 10
Correcting Tape Feed Bellcrank Pivots	No. 10
Correcting Tape Feed Cam Follower Pivots	No. 10
Correcting Tape Feed Latch Pivots	No. 10
Correcting Tape Feed Swing Arm	No. 10
Correcting Tape Lift Arm Mounting And Pivots	No. 23
Correcting Tape Load Lever Pivot	No. 10
Correcting Tape Spiked Wheel Pivot	No. 10
Element (or Silicone Grease)	No. 23
Impression Control Lever Pivot	No. 23
Leadscrew Nut And Lock	No. 10
Print Shaft Wipers	No. 10
Rack Transfer Bracket Pivots	No. 10
Rear Carrier Shoe	No. 10
Ribbon Feed Pawl	No. 23
Ribbon Lift Control Lever	No. 23
Rotate Guide Plate	No. 23
Rotate Rack Plate Rear Pivots And Cam Follower	No. 23
Selection Pins	No. 10
Selection Sleeve And Cams (Thin Covering)	No. 23
Selection Vanes Support Shafts	No. 10
Tape Lift Actuator Pivots	No. 10
Tilt Bellcrank Pivot	No. 10
Tilt Cam Follower	No. 23
Tilt Ring Pivots	No. 23
Velocity Cam Follower	No. 23
Velocity Cam Follower Roller	No. 10
Velocity Slider Latching Surface	No. 10

Keyboard

Balls In Compensator Tube	No. 10
Filter Bail Guide Left And Right	No. 23
Filter Bail Pivots	No. 23
Filter Bail Surface	No. 23
Front Interposer Guide And Fulcrum Rod	No. 23
Keyboard Mode Latch	No. 23
Keylever Fulcrum Rod And Pivots	No. 23
Keylever Pawl Spring Contact Area	No. 23
Keylever Restoring Spring Contact Area	No. 23
Keylever Return Spring	No. 23
Rear Interposer Guide Slots	No. 10
Release Latch	No. 23
Repeat Keylevers At Leaf Springs	No. 23
Selection Bail Pivots	No. 23
Shift Bail	No. 23
Spacebar Pivot Points	No. 23

Power Module And Motor

All Bearings	No. 10
All Drive Clutch Springs And Arbors	No. 10
Keyboard Clutch Spring And Arbor (Through Third Hole)	No. 23
Leadscrew Belt Idler	No. 10
Motor Pulley And Shaft	No. 23
Print Shaft Cycle Clutch Spring And Arbor (Through Screw Hole)	No. 23

Main Frame

Bottom Cover Latches	No. 23
Escapement Actuator Pivot	*No. 23
Escapement Cam Follower And Pivot	No. 23
Escapement Link Clevis (At Actuator)	No. 23
Escapement Pawl Return Spring	No. 23
Escapement Ratchet (Thin Coating)	No. 23
Leadscrew	No. 10
Leadscrew Bearings	No. 10
Leadscrew Nut	No. 10
Link And Clevis Pins	No. 10
Multiplying Lever Stop (Model 75)	No. 23
Paper Guide Groove	No. 23
Platen Bushing	No. 10
Rear Rail — Top And Bottom	No. 23
Top Cover Hinges	No. 23
Top Cover Latches	No. 23

*Clean off Molycoat and lubricate with No. 23 grease.

NOTE: All bearing areas having rotational motion not otherwise specified require No. 10 oil.

Clean the following as necessary and **do not lubricate:**

Ribbon cartridge, spindles and spools, outside of typehead, platen, motor mounts, wiring, correcting tape lift guide, correcting tape supply and take-up spools, cycle clutch magnet armature upstop, escapement magnet, escapement pawl, and solenoid plungers.

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Customer Service Division

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S544-4014-0

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