IBM Office Products Division
Customer Engineering

SERVICE MANUAL

IBM MEMORY TYPEWRITER

Form No. 241-5751-1
February - 1975

IBM MEMORY TYPEWRITER
SERVICE MANUAL CONTENTS
(ALPHABETICAL)

PREFACE

This manual is published for use by Customer Engineers and other technically oriented individuals as a reference source to aid in servicing the IBM Memory Typewriter. This manual was written with the restraint that the persons using it will have already become familiar with the machine from the operator's viewpoint. This manual is not a training course but has been designed so a technically oriented person or trained CE should be able to repair a machine that malfunctions. The technician must be able to use a multimeter and interpret the readings.

The Pictorial Reference/Adjustment Manual, Diagnostics Manual, and Parts Catalog are to be used in conjunction with this manual.

The Introduction section of this manual includes the functions and applications of the machine and unique features or functions of the machine.

The Functional Check section is outlined in a sequence so that all major functions of the machine are checked for proper performance. However, this check does not necessarily follow the sequence of operational theory adjustments within the manual. The use of the Functional Check cannot be stressed too strongly and should be used after any service has been performed on the equipment.

The mechanism sections of the manual are divided into two parts: Operational Theory and Adjustments. The Operational Theory part of a section contains the purpose of the mechanism, explanation and illustrations in detail of how that particular mechanism operates. When it is required, the view, the model of machine, level of design, and mode or condition of the equipment is noted under the illustration.

Operational Theory illustrations show the machine at rest unless otherwise noted. Red directional arrows on the operational theory illustrations indicate the movement of parts from rest to their operated position.

The view of the illustration is noted unless it is a front view, i.e., easily identified by the reader.

In the adjustment part of the sections, each adjustment is written and illustrated in the sequence that the adjustments are to be made. When an adjustment is made, all adjustments that follow in that mechanism must be checked to ensure that the adjustment did not affect an adjustment later in the sequence. The part to be adjusted, as well as the direction the part must be adjusted, are printed in red. When required, the view, and mode or condition of the equipment is noted under the illustration. There may be instances where adjustment sequences or tolerances vary from those set forth in other related publications, however, the publication bearing the latest date should normally be considered the most current.

The Removal Procedures section is a numbered sequence of instructions for part removals when a detailed part by part removal instruction is needed. Reassembly is accomplished by reversing the removal steps. (All parts contained within a removal procedure are found within the Parts Catalog mechanism code(s) listed at the beginning of the Removal Procedure.) If a detailed breakdown of an assembly is needed, the illustration in the Parts Catalog should be used.

WARNING

Keep hair, fingers and personal objects (such as bracelets, necklaces, neckties, etc.) out of the printing and ribbon area when the machine is on.

In order to prevent long hair, fingers and personal articles from getting caught on the rotating shaft in the machine, you should comply with this warning.

When servicing the machine, all safety practices should be followed. When the manual calls for a function to be operated by hand, the power should be disconnected.

INTRODUCTION

The IBM Memory Typewriter is a power typing station with revision capabilities. The machine consists of a single element printer, a 4,000 character electronic memory, and a 50 track magnetic tape loop which is capable of storing 4,000 characters or functions on each track. All components of the machine are contained in a single typewriter cover.

The machine is designed for applications where a typical project is from one to three pages in length, has a short term completion cycle, and requires light to moderate revisions.

As the text is typed on the keyboard, it prints out on paper in the conventional manner. However, at the same time that the text is entered at the keyboard, it is placed in the electronic memory. The text can be manipulated in the memory by the operator to accomplish revisions and thus ensure letter perfect text.

Once the text is letter perfect in memory, it can be played out in final format, or it can be recorded on one of the tracks of the tape loop for future use.

The IBM Memory Typewriter has the following features as standard equipment:

Acoustical Filter Hood
Automatic Centering
Automatic Word Underscore
Correcting Ribbon
Decimal Tabulation
Dual Pitch Escapement
Electronic Right Margin
Electronic Tabulation
No-Zone (Half Inch Margin Adjust)
Required Tabs (Paragraph Indent)
Selective Ribbon

These features are described on the following pages.

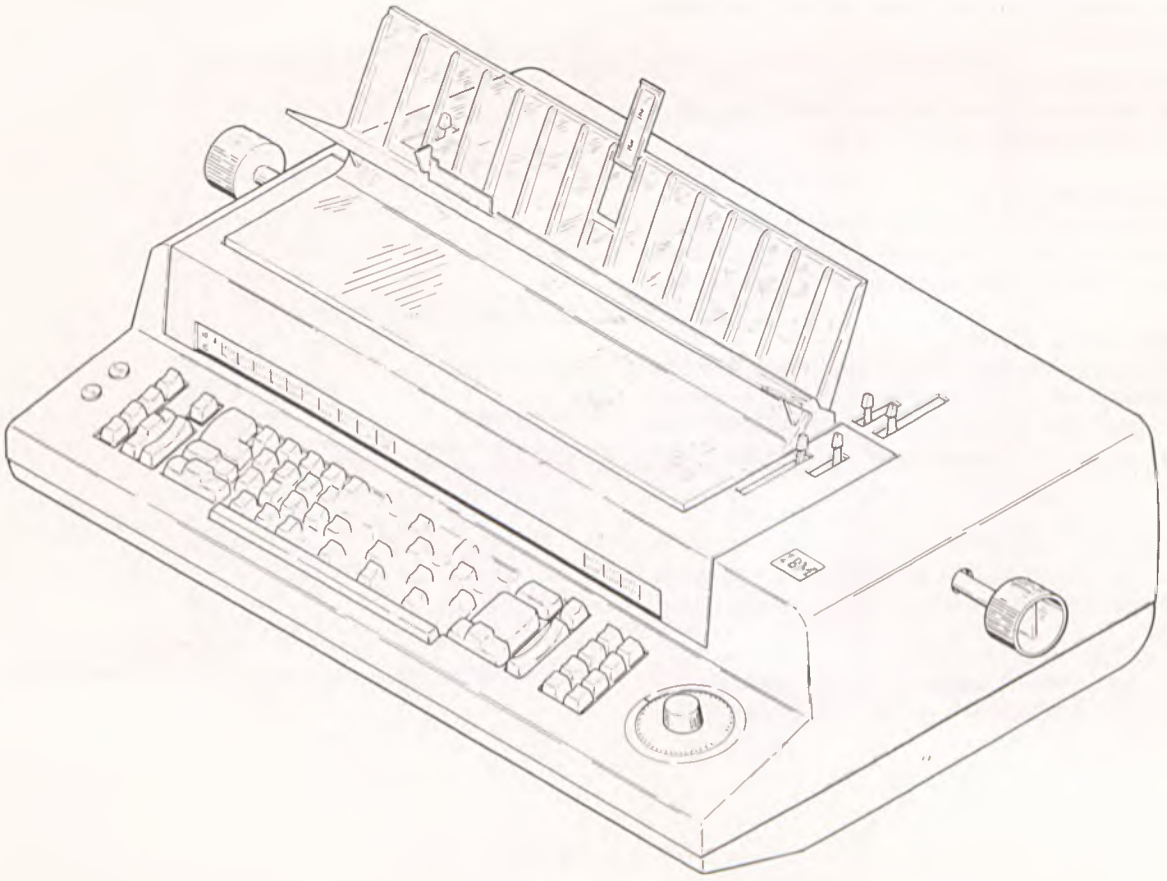


Figure 1 – IBM Memory Typewriter

SYSTEM STANDARD FEATURES

ACOUSTICAL FILTER HOOD
The acoustical filter hood reduces the noise emitted during printer operation. This feature is designed for those stations where minimum noise is a prime consideration.

AUTOMATIC CENTERING
Centering is an automatic electronic function when text is preceded by a coded "C".

AUTOMATIC WORD UNDERSCORE
A word may be underscored automatically by entering a coded "i" after the word has been keyboarded.

ELECTRONIC RIGHT MARGIN
The function of the right margin is performed by the electronic logic. The position of the right margin is termed "Line Length Setting". The line length is automatically set six inches from the left margin when power is turned on. The line length may be varied as the operator desires.

NO-ZONE (1/2" MARGIN ADJUST)
With the "No-Zone" button up, the electronics converts single carrier returns and spaces to adjust pre-recorded information to the "line length setting". The 1/2" space zone maintains a fairly uniform right margin.

CORRECTING RIBBON MECHANISM
Enables the operator to correct errors without her hands leaving the keyboard.

DECIMAL TABULATION
The decimal tab feature is designed specifically for typing columns of figures aligned to the decimal point.

DUAL PITCH ESCAPEMENT
The system may be used for any 10 or 12 pitch application. The cardholder and margin scale are calibrated for both pitch positions. The left margin is set on half inch intervals.

ELECTRONIC TABULATION
The tab function is performed by electronic logic. The tabs are automatically set every five spaces when power is turned on. These tabs are referred to as a tab grid. The operator may set and clear the tab grid and individual tabs as desired.

REQUIRED TABS (Paragraph Indent)
The required tab feature enables an operator to play back indented material adjusted to the line length setting.

SELECTIVE RIBBON MECHANISM
This feature enables the operator to use the IBM "TECH III" ribbon, "FILM RIBBON" or the "CORRECTABLE FILM RIBBON".

OPTIONAL FEATURES

REVERSE INDEX
The reverse index feature enables the typewriter to index 1/2 space in either direction. (Plant installation only)

DEAD KEY AND FOREIGN LANGUAGE
The dead key and foreign language causes certain characters or symbols to type without causing the carrier to escape to the right. Also, controls the velocity of selected characters.

PINFEED PLATEN
The pinfeed platen permits use of continuous pinfeed forms.

VELOCITY CONTROL AND DEAD KEY INHIBITOR
The velocity control and dead key inhibitor mechanism provide a means of overriding normal velocity selection and inhibiting the dead key mechanism.

KEYLOCK
Keylock is a positive security device, providing protection against unauthorized access to tape loop.

Inside the system cover is a keyboard for input, a printer for output, an electronic planar package for control and memory, a tape loop for storage and a power supply to distribute the necessary voltages.

SYSTEM I/O

The I/O consists of two major units, the keyboard and the printer (Figure 2). The keyboard (input device) is the command unit of the system. From the keyboard, the system is manipulated to perform its various functions; store, recall, keyboarding, etc. The printer (output device) is used to produce the hard copy.

Text is transmitted to the electronics in the form of a code. In the electronics, the text is simultaneously translated into a machine operation and placed into memory.

The I/O may also be used in the "Typewriter" mode without using the electronic memory. The TPWR button, located on the left side of the keyboard, controls the use of the electronic memory. With the TPWR button down, the memory is not used. With the TPWR button up, the memory is used.

PLANAR PACKAGE

The planar package (Figure 2) contains the electronic logic and memory for the system.

TAPE LOOP

The tape loop provides storage for information the operator wishes to retain for future use.

POWER SUPPLY

The power supply provides the system with the necessary voltages to perform various functions. The power supply is a single module unit and it is not field repairable.

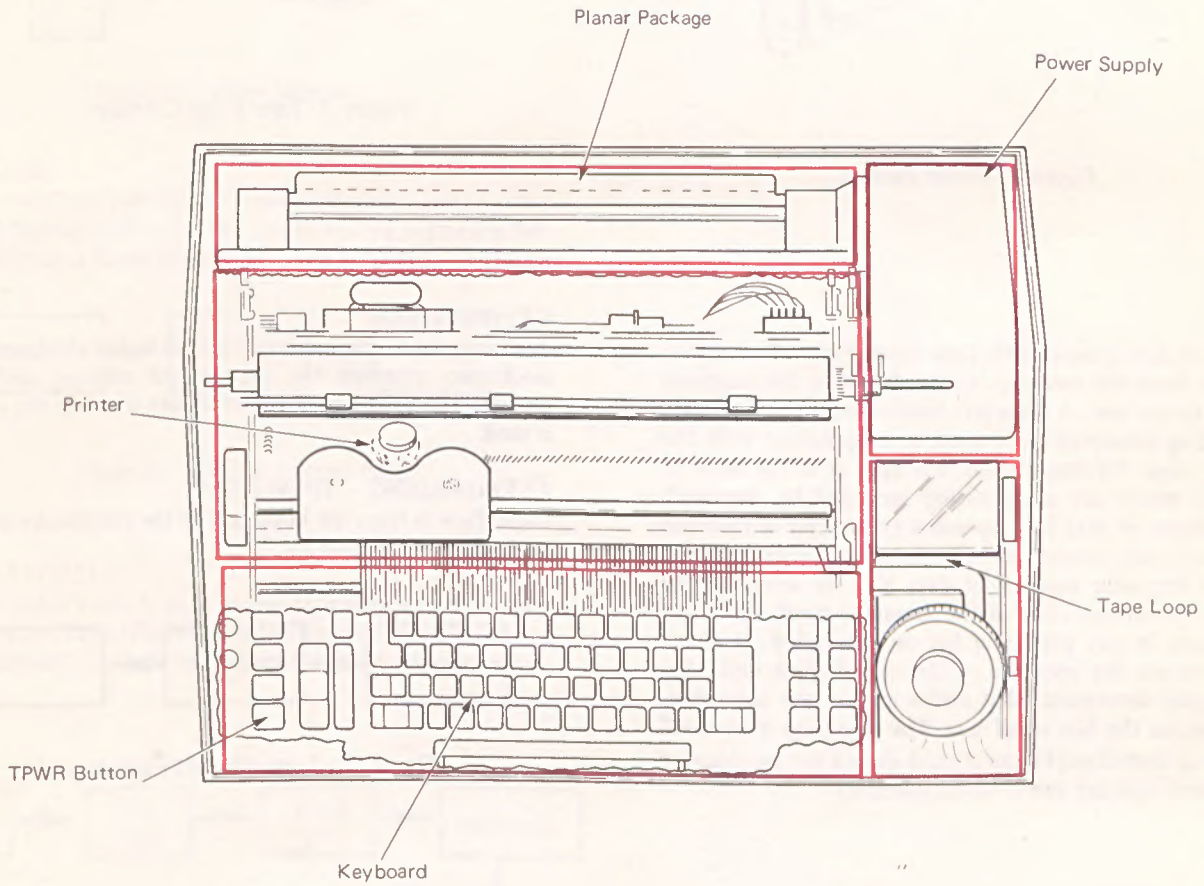


Figure 2 – IBM Memory Typewriter

The system uses an electronic memory as a working media. The memory is capable of storing 4000 functions. The main purpose of the memory is to store text for playout of revision. Text may be typed into the memory from the keyboard or read into memory from the tape loop. The electronic logic is contained in the planar package (Figure 1).

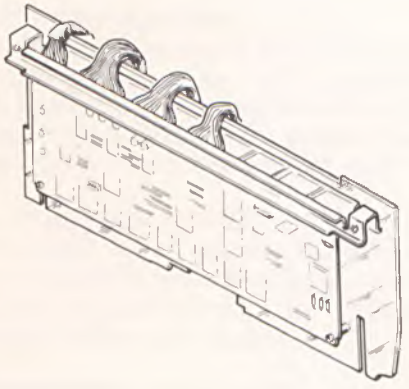


Figure 1–Planar Package

The system uses a magnaetic tape loop (Figure 2) for storage. Text from the memory is recorded onto the magnetic tape for future use. A magnetic head, capable of recording and reading information, is used in conjunction with the magnetic tape. Information on the tape is in the form of data bits, which are magnetically recorded by the head. Combinations of data bits represent a character or function code. Each code consists of eight data bits. Although each code has the same number of data bits, by changing the direction of current flow in the magnetic head, the direction of flux in any particular bit can be varied. It is not possible to see the presence or absence of these data bits, nor can you determine what codes are on the tape loop. This is due to the bits small size. The tape loop is enclosed in a plastic cartridge (Figure 2) and should not be removed from it, but replaced as a modular assembly.

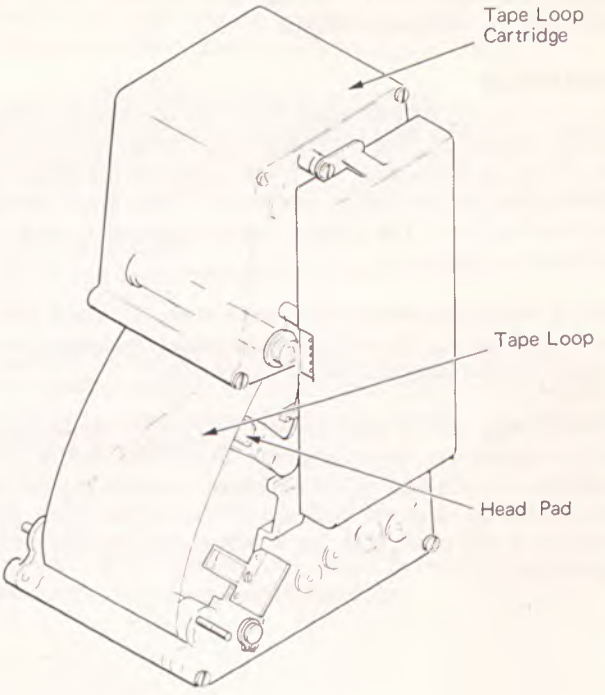


Figure 2–Tape Loop Cartridge

SYSTEM LOGIC FLOW

KEYBOARDING
Text entered at the keyboard is sent to the electronics. The electronics transfers the text to the memory and/or the printer. The TPWR button determines whether the memory is used.

KEYBOARDING – TPWR DOWN
Logic flow is from the keyboard to the electronics and then to the printer (Figure 3).

Figure 3 – Logic Flow (TPWR Down)

Keyboarding – TPWR UP
Logic flow is from the keyboard to the electronics, then to the memory and the printer (Figure 4).

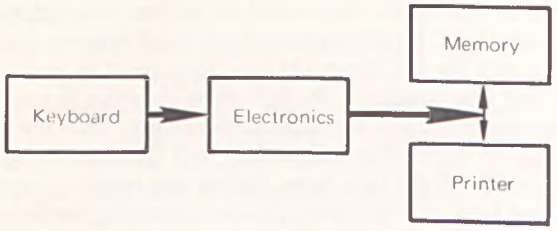


Figure 4 – Logic Flow (TPWR Up)

CLEAR MEMORY
When starting a new project always clear the memory by depressing CODE and the SIX keybutton (Figure 5).

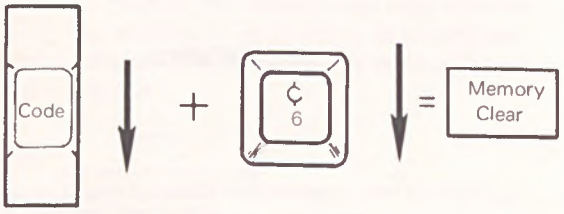


Figure 5 – Clear Memory

PLAYBACK
Text is always played out from the electronic memory. The text will be adjusted to the line length setting unless the NO ZONE button is down (Figure 6).

Figure 6 – Playback Logic Flow

READ (RECALL)
A prerecorded track is read as the tape is driven under the Read/Record head (Figure 7). Text from the head is sent to the amplifier (Board 0) and on to the electronics and memory.

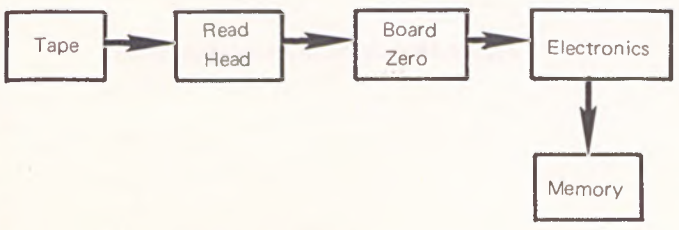


Figure 7– Read Logic Flow

RECORD (STORE)
Text is always recorded onto the tape from memory (Figure 8). Text from memory is sent to the electronics, then to the amplifier (Board 0), and then to the Read/Record head. The head records the text on the magnetic tape as the tape is driven under the head.

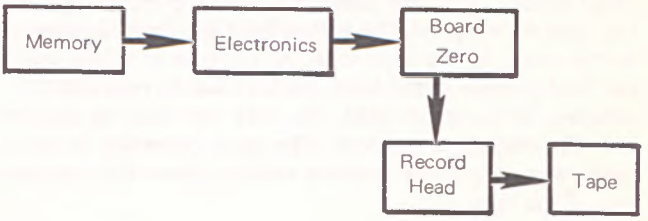


Figure 8 – Record Logic Flow

RECALL (READ) OPERATION

Memory must be cleared before text can be read from the tape loop. Depressing code and the six keybutton or turning the machine off then on will cause a memory clear operation. The tape loop selection dial should be position to the track where the desired text to be recalled is stored. The read operation (Figure 9) is initiated by depressing the recall button. This will cause the tape loop motor to drive the tape up to speed. The yellow light will flash showing an active mode of the tape loop. As the tape is driven under the read portion of the head, the text will be read and error checked. If no errors exist, the text will then be entered into the electronic memory. The recall operation is terminated when the home position emitter senses the clear section of the tape.

STORE (RECORD) OPERATION

Text can be stored on the tape loop from the electronic memory (Figure 10). Before a store operation can be initiated, certain electronic conditions must be met. The tape loop is electronically interlocked to prevent rerecording on the same track. Having depressed the track selector dial or having read the text from the tape loop prior to recording will clear this condition. By depressing the store button the electronics will cause the tape loop motor to drive the tape loop up to speed. The yellow light will flash indicating an active mode of the tape loop. During any record operation the tape loop will be driven for two complete revolutions. The first revolution will record the text on the tape. The second revolution will read and error check the recorded text. If no error exists, the electronic memory will be cleared. The home position will be sensed by the emitter assembly and the store operation will be terminated.

RECALL (READ)

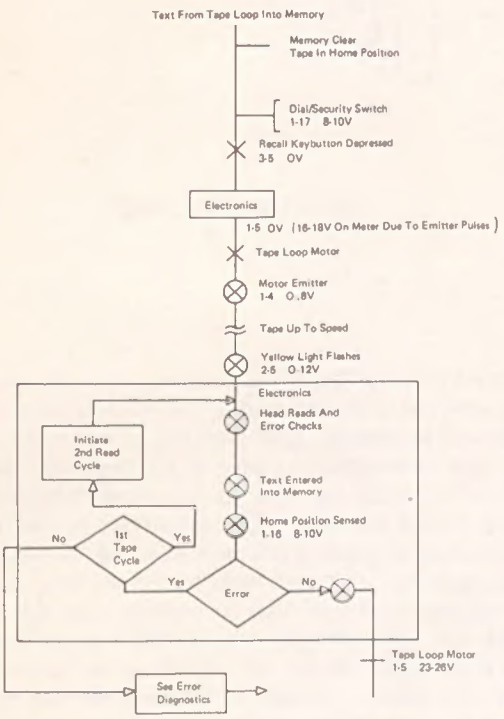


Figure 9 – Recall (Read) Operation

STORE(RECORD)

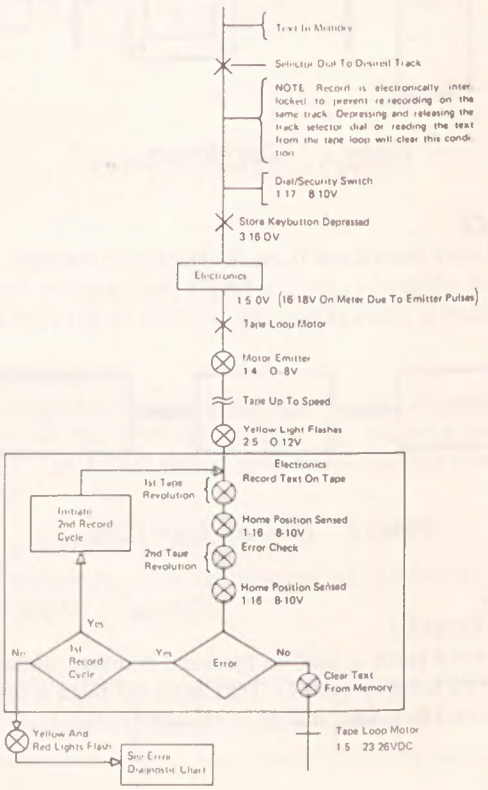


Figure 10 – Store (Record) Operation

ERRORS

The system utilizes a yellow (limit) light and a red (error) light to indicate that an error has been detected within the electronic memory.

Read Errors

During a read operation the yellow limit light will blink indicating a system busy condition. The keyboard will also be deactivated and if the track just read contained sufficient text to create a "Memory Full" condition, the yellow limit light will be turned on solid at the end of the read operation. Otherwise the blinking yellow limit light will be turned off. If the operator should move the tape loop selector dial during a read operation, the operation will be terminated. Any text read will be deleted, leaving the memory empty. The yellow limit light will be off, indicating the system ready for use. If during read an error is detected, the electronics will initiate a second read cycle. If the error is detected in the second cycle an error code will be entered into memory and the read cycle will be complete. An error read into electronic memory will be indicated only when the error code is at that position of memory to be played out. The error must be deleted to turn off the red error light and to activate the keyboard.

Record Errors

If the memory is empty upon depressing of the record button, no action will occur. If the record button depression is honored, the limit light will blink during the record and error-check operations regardless of whether the light had been on steady because of a "memory full" condition. After recording has been successfully completed the limit light will cease blinking to indicate the system is ready for operation. If error codes in memory are present upon depression of the record button the limit light will not blink. Instead, the red error light will begin blinking and the operator must locate the error codes and correct them. The record button will not be honored until this condition is relieved. If the operator should move the tape loop selector dial during record, the operation will be terminated to prevent erasure of other tracks and the red error and the yellow limit lights will both blink.

ELECTRICAL INTERFACE

The electrical interface of the system consists of magnets, solenoids, reed switches and light emitting diode phototransistor assemblies. The magnets and solenoids are used by the electronics to initiate mechanical action of the printer. Reed switches are used throughout the system as input switches and sensing switches.

The system employs the use of what is called "closed loop" operation. "Closed loop" operation means simply that the speed of the entire system is dependent on the speed of the slowest component or operation. For example, the electronics is capable of supplying information much faster than the printer is capable of producing that same information in hard copy form. With the "closed loop", the speed of the electronics is controlled by the printer.

This "closed loop" operation is obtained through the use of feedback switches which monitor mechanical action of the system. In the printer, feedback switches are made to close at the beginning of an operation. As long as a feedback switch is closed, the next operation is held up by the electronics.

REED SWITCH LOCATION AND FUNCTION (Figure 11)

A. Shift Mode – Senses the mode of the shift mechanism (upper or lower case).
B. Shift Feedback – Prevents the next operation from occurring while the typehead is shifting and is also used to drop the shift magnet.
C. Selection Contact Assembly – Codes and transmits to the electronics information that is entered at the keyboard. It consists of 6 selection contacts and a strobe contact. Strobe is the last one to close during a keyboard operation. Closing strobe signals the electronics that the keyboard is ready to transmit a code.

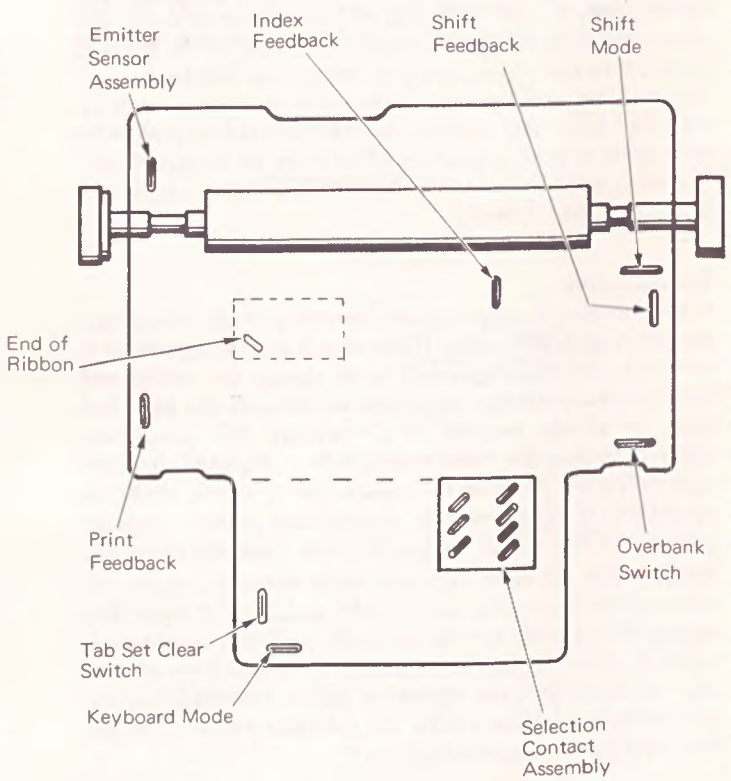


Figure 11– Reed Switch Locations In The Printer

D. Keyboard Mode – Senses the position of the shift key levers. The keyboard mode switch is only used when a character is transmitted from the keyboard.
E. Print Feedback – Prevents the next operation from occurring during a print operation.
F. Tab Set/Clear – Signals electronics to set or clear a tab stop.
G. Overbank – Signals the electronics to de-energize the carrier return solenoid, or backspace magnet
H. Index Feedback – Prevents the next operation from occurring during an index operation and causes the index magnets to drop.

The reed switch used in the system is a normally open, single pole, single throw switch. It consists of a pair of magnetically operated reeds that are enclosed in a glass envelope (Figure 12). The reeds are made of a ferrous metal which is easily magnetized but will not retain magnetic properties.

Figure 12– Reed Switch(At Rest)

A permanent magnet is used to operate the reed switch. The magnet is placed in front of the reed switch, and the reeds are made to to make and break by either moving the magnet in relation to the switch, or moving a shunt between the magnet and the switch.

In the case of moving the magnet, the magnet is placed at the junction point of the two reeds (Figure 13). The effect is to magnetize the two reeds. Since magnetic lines of force have a definite direction, a condition is developed where "like poles" are created at the junction point of the reeds. Because "like poles" repel, the switch will remain open.

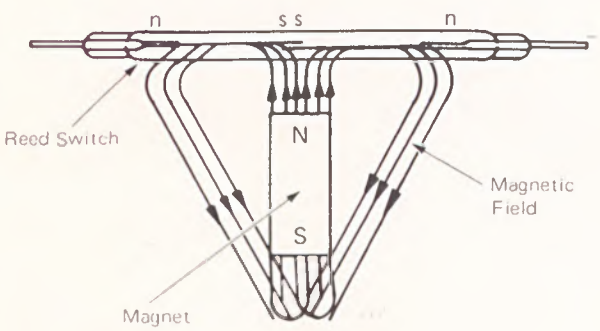


Figure 13– Reed Switch In Open Position

If the magnet is moved to the left or right, the magnetic line of force would have a different effect on the reeds (Figure 14). In this condition, "unlike poles" are created at the junction point of the two reeds. Because "unlike poles" attract, the switch will close.

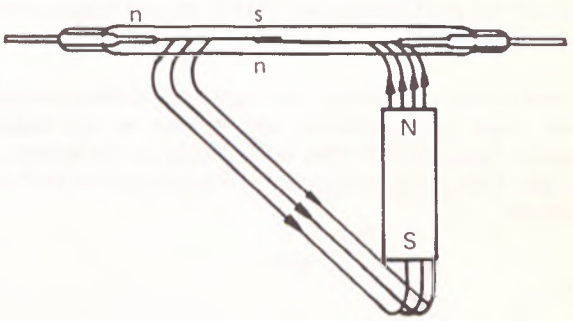


Figure 14– Reed Switch In Closed Position

The second method of operating the reed switch is through the use of a shunt (Figure 15). The shunt is a piece of low reluctance metal. When it is placed around the magnet or between the magnet and the reed switch, the magnetic lines of force will pass through the shunt, having no effect on the reeds. Since the reed switch is a normally open switch, it will remain open. If the shunt is removed, the magnet would effect the reeds as in Figure 14 causing the switch to close.

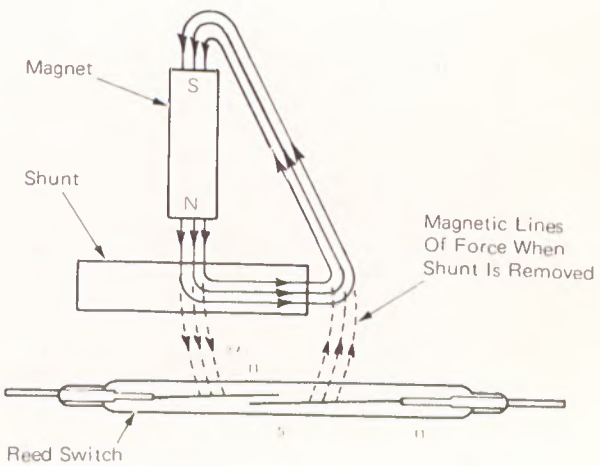


Figure 15– Shunt Operation

LIGHT EMITTING DIODE/PHOTOTRANSISTORS (EMITTER ASSEMBLIES)

These sensors (Figure 16) used in the system consist of two parts: the light source, which is a light emitting diode (LED) and the sensing device, which is a phototransistor.

The LED provides the light source for the phototransistor to conduct. If the light source is unable to reach the phototransistor, the transistor will stop conducting. The conduction of the phototransistor controls various functions of the system.

These sensors are used in the tape loop motor control circuit, tape home poistion circuit, and in the leadscrew emitter wheel. For further information on the sensors, refer to the Tape Loop section or the Escapement section of this manual.

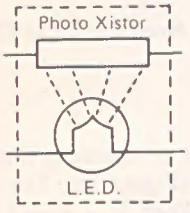


Figure 16– Light Emitting Diode/Photo Transistor

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 operators manual, if further information is needed, refer to the IBM Memory Typewriter Operating Instruction Manual.

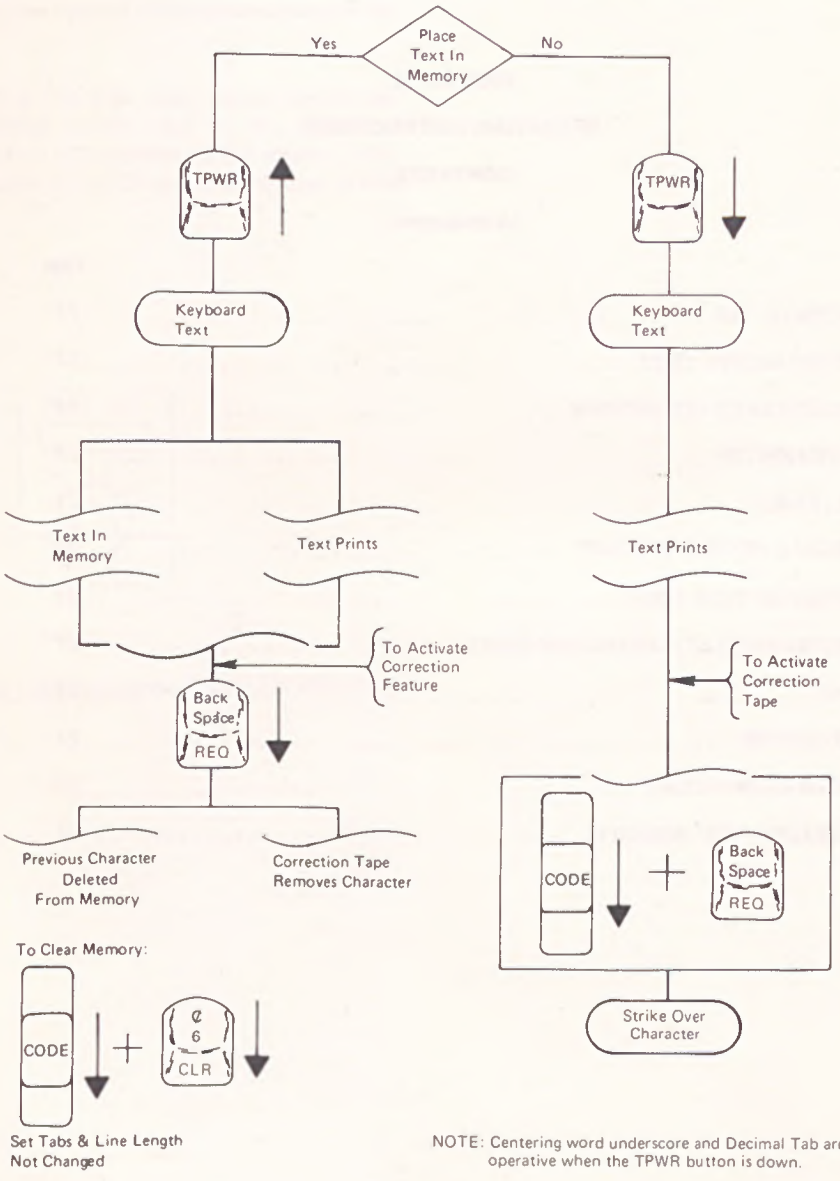
SECTION 16

OPERATING INSTRUCTIONS

CONTENTS

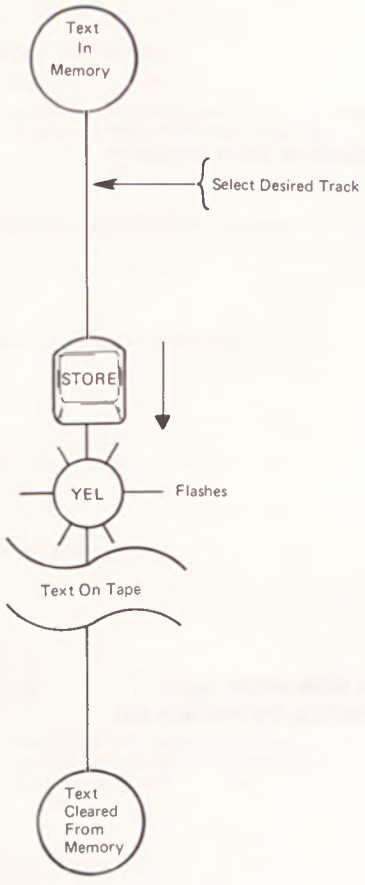
(Alphabetical)

KEYBOARDING TEXT



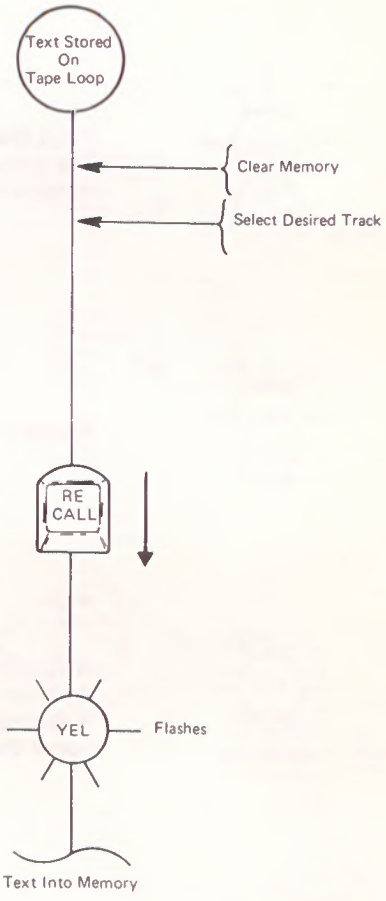
NOTE: Centering word underscore and Decimal Tab are not operative when the TPWR button is down.

STORE ON TAPE LOOP



NOTE: Tape security lever must be to rear. Store is electronically interlocked to prevent re-recording on the same track. Depressing and releasing the track selector dial will clear this condition.

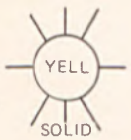
RECALL FROM TAPE LOOP



NOTE: Tape Security lever must be to rear.

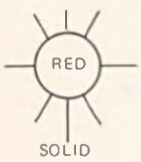
LIGHT/ERROR CONDITIONS

YELLOW LIMIT LIGHT
The yellow limit light will blink during a Recall or Store operation showing an active mode of the tape loop.



Memory is full.

RED ERROR LIGHT
An error in memory causes the red light to blink when Store is depressed. The error must be corrected before the machine will honor the Record instruction.



The solid red light indicates that the memory is positioned at an error. The error can be eliminated by depressing Code and Char/Stop. Then use Line Return and playback to identify missing text.

NOTE:

Moving the tape loop selector dial during a Store operation causes the Store operation to be terminated. This prevents erasure of other tracks and both lights will blink. By depressing Store the operation will be initiated once again.

WORKING WITH MEMORY

Backspace with TPWR deletes text.

(Function codes, with the exception of Carrier Return, Required Carrier Return, Index and Index Return can be deleted by Backspacing over the code)

No Zone — Rearranges line endings in memory during playout.

ACCESS BUTTONS

Page Start — Return to previous Record End Code in memory. If there are no Record End Codes, return to the beginning of text.

PAR ADV — Advance memory to beginning of next paragraph.

LINE ADV — Advance memory to beginning of next line.

LINE RET — Position memory to previous carrier return.

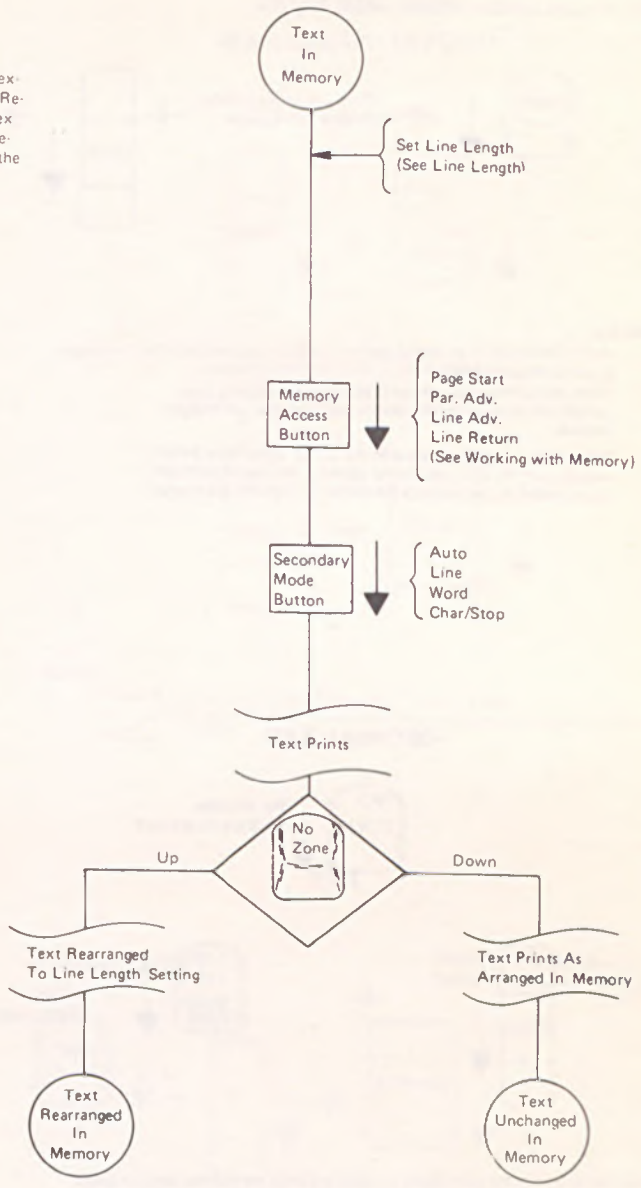
DELETE FUNCTIONS

CODE + LINE DEL — Deletes a line of text. If the memory is positioned in the middle of a line, the text remaining in that line and the carrier return will be deleted.

CODE + WORD DEL — Deletes a Word or function code. (When deleting a word, the function code following the word is also deleted.)

CODE + CHAR STOP DEL — Deletes a character or function code.

PLAYBACK



NOTE: Carrier must be at left margin when pitch lever is changed.

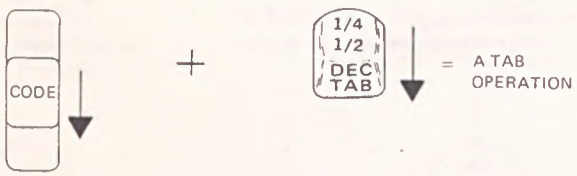
LINE LENGTH

TO SET LINE LENGTH FOR PLAYOUT

NOTES:

1. A 6" line length is set everytime the machine is turned on. This line length is set for Hyphen Scan.
2. When the Left Margin setting is changed, the existing Line Length will be maintaindd, and moved with the Left Margin Setting.
3. If the Pitch Lever is moved with the carrier away from the left margin with No Zone Up during playout, the line of print will be extended by the distance the carrier is from the left margin.

DECIMAL TAB



Carrier will B/S once for each figure keyboarded until the decimal point is typed.

Entering another Dec Tab instruction or depressing either of the following will cause the figure to print:

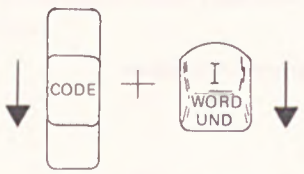
CR	Index Return
TAB	
WORD UNDERSCORE	Required CR
Required Backspace	

NOTES:

1. If an error is made while keyboarding the figures, BACKSPACE one time. The carrier will be positioned to the decimal point and the memory will be positioned back to the DEC TAB instruction in memory.
2. To correct an error after the figure prints, line delete and retype the line.
3. The machine does not interpret the upper case period as a decimal point.

WORD UNDERSCORE

Type The Word To Be Underscored



The Machine Will Backspace Until It Finds:

- A Space
- A Tab
- A Carrier Return
- Another Word Underscore Instruction
- A Required Backspace

TO UNDERSCORE SEVERAL WORDS:

Type The Text To Be Underscored, Using Required Spaces – Then Follow The Instructions For Word Underscore

TO UNDERSCORE A WORD THAT IS DIVIDED AT THE END OF A LINE:

Type The First Part Of The Word
Type A Word Underscore Instruction
Type A Hyphen & Carrier Return
Type The Rest Of The Word
Type A Word Underscore Instruction

TO UNDERSCORE A WORD CONTAINING A REQUIRED HYPHEN:

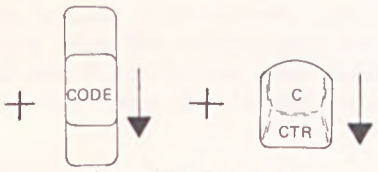
Type The First Word
Type A Word Underscore Instruction
Type The Required Hyphen
Type The Next Word
Type Another Word Underscore Instruction

WHEN PLAYBACK STOPS FOR HYPHENATION OF AN UNDERSCORED WORD:

Play By CHAR To The End OF A Syllable
Type A Word Underscore Instruction (The Machine Will Underscore The First Part Of The Word)
Type A Hyphen
Depress AUTO

TO CENTER

Tab Or Space To Point Which Text Will Be Centered Around



Keyboard Text To Be Centered

+

Depress Carrier Return, Tab, Word Underscore Instruction, Index, Index Return, Required Carrier Return or Required Backspace to print the centered text.

NOTES:

1. If you make an error while keyboarding the text to be centered, BACK-SPACE one time. This positions the carrier to the point where you began keyboarding the text to be centered and positions the memory back to the center instruction.
2. To correct an error after the centered text prints, delete the line and retype the entire line.

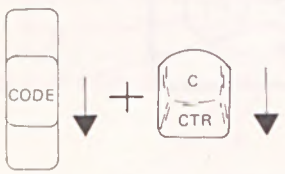
TO UNDERSCORE CENTERED TEXT

Use required spaces to type the text to be centered.

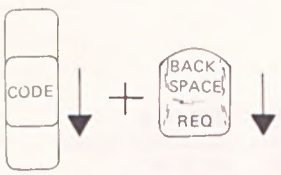
Enter the WORD UNDERSCORE instruction at the end of the last centered word.

TO UNDERSCORE INDIVIDUAL WORDS IN A CENTERED LINE

Tab or Space to the Center point



Type the Text to be centered



Type Required Backspaces to move carrier to first character in line

+

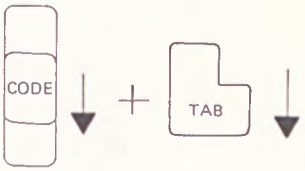
Type the Underscores

+

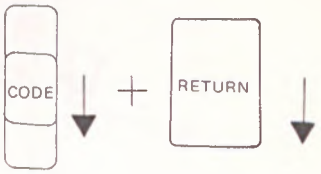
Carrier Return

REQUIRED TABS (PARAGRAPH INDENT)

(To Enter A Required Tab)



To Cancel The Required Tab Instruction:



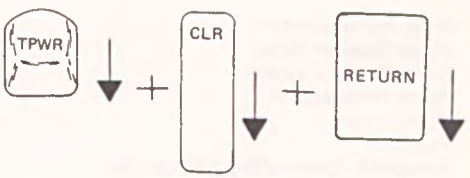
NOTES:

1. The System can accept up to 14 Required Tabs Per Line.
2. Required Tabs must be used if indented text will be played back with NO ZONE up.

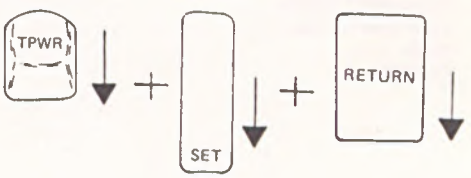
TAB

To CLR All Set Tabs*

*Clears All Set Tabs Even If Carrier Is At The Left Margin.



To Reestablish 5 Space Tabs

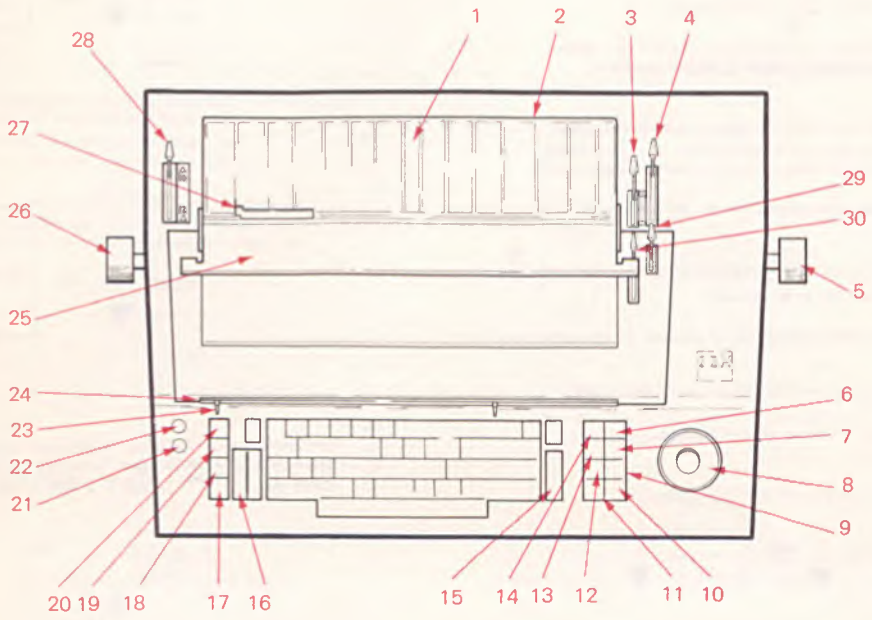


NOTES:

1. Tabs Are Automatically Set Every 5 Spaces When Power Is Turned On.
2. Individual Tab Stops Can Be Set And Cleared Just As On A "Selectric" Typewriter.

FUNCTIONAL CHECK

The chart below will serve as reference in performing the Functional Check on the following pages.



1. Page End Indicator
2. Paper Support Table
3. Index Selector Lever
4. Paper Release Lever
5. Platen Knob
6. Page Start
7. Paragraph Advance/Right Margin Set
8. Selector Dial
9. Line Advance
10. Line Return
11. Character/Stop-Character Delete
12. Word-Word Delete
13. Line-Line Delete
14. Auto
15. On/Off
16. Code Key
17. Typewriter Button
18. No Zone
19. Recall(Read)
20. Store(Record)
21. Error Light
22. Limit Light
23. Left Margin Lever
24. Margin Window
25. Acoustic Hood
26. Platen Knob & Platen Variable
27. Paper Guide
28. Pitch Selector Lever
29. Line Position Lever
30. Paper Bail Release Lever

FUNCTIONAL CHECK PROCEDURE

In order to successfully service this system, it is necessary to establish a logical problem solving approach.

This functional check is a procedure that will indicate whether or not the system has a malfunction. It includes checks of every function of the machine organized in an efficient sequence. Using this checking procedure on every service call will help locate failures. After the failure has been repaired, it will ensure that the machine is working properly.

1. *Visual Inspection* – Examine the machine for any obviously loose, damaged or missing parts. Also, look for foreign material in the machine: pencils, erasers, paper clips, etc.
2. *Paper Insertion* – Roll a single piece of paper into the machine. It should not wrinkle or tear.
3. *Paper Release* – Pull the paper bail forward. Notice that the feed rolls still hold the paper firmly. Now, pull the paper release lever forward. You should be able to easily reposition the paper left and right.
4. *Detent Release* – Rotate the line position lever forward. Notice that the feed rolls still hold the paper firmly. Now, pull the paper release lever forward. You should be able to easily re-position the paper left and right.
5. *Platen Variable* – Push in on the left platen knob. The platen should now turn freely; the ratchet on the right end of the platen should not turn. When the knob is released, the platen should detent reliably.

(Continued On Next Page)

6. *Functional Check* – (Perform each step in sequence – exactly as instructed) Set machine: Carrier at left margin, 12P, all keybuttons up.

	PROCEDURE	MACHINE RESPONSE	INDICATION
1.	Turn Power "Off"– Then "On"	AC Motor Starts, Power Supply Fan "On."	110 To Motor And Power Supply–OK
2.	Operate The Character Keybutton Rows, One At A Time, Ending Each With A C/Ret. Tab, Then Repeat Above In Upper Case	Printer Responds Exactly As Keyboarded	Keyboard/Elec/ Printer–OK
3.	Depress "Page Start"	Printer C/Returns	"Page Start"–OK
4.	Depress "Auto"	Printer Plays Back Keyed Information On 2 Lines With Second Line Indented	Elec. Memory–OK C/Ret. Conv.–OK "Auto"–OK
5.	Backspace Several Times	Text Removed From Paper	Corr. Feat.–OK
6.	Depress "Code" And Backspace Several Times	Carrier Backs Up, Correction Feature Does Not Operate	Required Back-space–OK
7.	"Page Start," Switch To 10P,–Depress "Word"	Printer Plays Back 1st Character Keybutton Row Expanded	Word–OK Switch Pitch–OK
8.	Depress "Line"	Printer Plays Back Rest Of 1st Line Of Information	Line–OK
9.	Depress "Line Ret."	Printer C/Rets	Line Ret.–OK
10.	Depress "Par Adv"	Printer Space/b.s.	Par Adv–OK
11.	Depress "Char"	Printer Tabs	Char–OK
12.	Depress "Code" + "Line" Depress "Line Ret" – Then "Auto"	Printer Space/b.s. Printer Tabs And Stops	Delete Function–OK
13.	Depress "Page Start" Then "Line Adv"	Printer C/Rets, Then Space/b.s.	Line Adv–OK
14.	Depress "Code" + "3" Keybutton Depress "Store" Button	No Printer Response Yellow Light Flashes Approx. 7 Sec.	Store – OK
15.	Depress "Page Start" Depress "Auto"	No Printer Response Printer Tabs	(End of Store) Rec End–OK
16.	Depress "Code" + "6" Keybutton Depress "Page Start" + "Auto"	Printer C/Rets No Machine Response	Clr–OK
17.	Depress "Recall"	Yellow Light Flashes Approx. 3.5 Sec.	Recall – OK
18.	Keyboard 5 Hyphens, 5 Z's Then Depress "Code" And Keyboard 5 Hyphens. Depress "Auto"	Printer Responds As Keyboarded Printer Plays Back To Line End Zone And Stops	Line End Zone–OK

	PROCEDURE	MACHINE RESPONSE	INDICATION
19.	Depress "Hyphen," Then "Auto"	Printer C/Ret's And Finishes Play Back	
	Depress "Page Start" And "Auto"	Printer Plays Back On One Line Dropping The First 5 Hyphens And The Last Single Hyphen	Hyphen–OK
20.	Depress "Code" + "6" Keybutton	"Carrier Return"	
	Depress "Code" and "1/2" Keybutton Three Times, Keyboard 1.00, Then Car/Ret	Machine Prints Out As Follows:	
	Depress "Code" and "1/2" Keybutton Three Times, Keyboard 22.00 Then Car/Ret	1.00 22.00	Dec Tab–OK
21.	Space To Center Of Page. Depress "Code" And "C" Keyboard 5 "N's"–"Req. Space"–5 "N's" Depress "Code" and "I" Keybutton.	Machine Prints Out At Center Of Page NNNNN NNNNN	Centering And Word Underscore–OK
22.	Depress "Store" Then While The Tape Loop Is Operating Depress And Release The Selector Dial	Both Lights Flash At End Of Tape Loop Operation	Lights–OK
	TURN MACHINE "OFF," THEN BACK "ON" BEFORE CONTINUING		
23.	Latch Down "TPWR" Button. Tab Several Times	Carrier Stops Every 5 Spaces	5 Space Tab Grid–OK
24.	Depress "Tab Clr" And Car/Ret. Depress "Tab"	Carrier Returns Carrier Moves To Right Limit.	Tab Clear–OK
25.	Depress "Tab Set" And Car/Ret Tab Several Times	Carrier Returns Carrier Stops Every 5 Spaces	Tab Set–OK
26.	Tab Exactly 4" Out From Left Margin (8 Tabs) Then Depress "Code" And "Par Adv"	Carrier Returns	Line Length Set–OK
27.	Depress "Page Start" And "Auto"	No Machine Response	TPWR Button–OK

7. *Track 51* – To access information on Track 51 the top and center cover must be removed. The setscrew in the track selector knob must be turned into the knob until the knob can be turned to position 51. With the track memory, depression of the recall (read) button will activate the tape loop mechanism. The information on track 51 will be read from the tape loop and placed into memory. Turn the dial away from track 51 and replace the setscrew to protect track 51 information.

With the No Zone button latched down, the playout of the Track 51 material will appear as follows on the next two pages.

PLAYOUT OF TRACK 51

	PARA ADV	LINE ADV/DEL.
Before continuing, turn the Track Selector Dial away from track 51!--- Did you put the setscrew back into place?	1	1
The information to follow is a printer exercise. Set the Pitch Selector Lever on 12p and the Margin Lever on 18 on the 12p scale.	2	4
The green grass grew on the side of a hill.	3	8
SPACE/BACKSPACE TEST	4	15
SHIFT TEST	6	18
TAB TEST	8	22
WORD UNDERSCORE TEST	16	31
OVERBANK TEST	18	34
This is the end of the functional check.	27	44
Information for testing of the special applications	28	49

Before continuing, turn the Track Selector Dial away from
track 51!--- Did you put the setscrew back into place?

The information to follow is a printer exercise. Set the
Pitch Selector Lever on 12p and the Margin Lever on 18 on
the 12p scale.

The green grass grew on the side of a hill.
The bells can be heard any time of day.
Zebra run freely on the jungle plain.
Quickly men, victory is ours if we give a little extra.
Will we ever conquer the world? Some say yes, others say no.
Listen to the rhythm!

SPACE/BACKSPACE TEST

CcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcCcC

SHIFT TEST

WmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWmWm
AaBbCcDdEeFfGgHhIiJjKkLlMmNnOoPpQqRrSsTtUuVvWwXxYyZz[]@2#3$4%5¢6&7*8(9

TAB TEST

1	2	3	4	5	6	7	8	9	0	1	2	3
11	22	33	44	55	66	77	88	99	00	11	22	33
111	222	333	444	555	666	777	888	999	000	111	222	333
1111	2222	3333	4444	5555	6666	7777	8888	9999	0000	1111	2222	3333
111	222	333	444	555	666	777	888	999	000	111	222	333
11	22	33	44	55	66	77	88	99	00	11	22	33
1	2	3	4	5	6	7	8	9	0	1	2	3

WORD UNDERSCORE TEST

Now is the time for all good men to come to the aid of their country.

OVERBANK TEST

O
V
E
R
B
A
N
K

This is the end of the functional check. If more extensive
testing of a particular function is required, delete the
other information from memory and install a repeat(rept) code
after that section.

Information for testing of the special applications Paragraph
Indenting and Reverse Index follow this paragraph. Depress
"Auto" to continue.

PARAGRAPH INDENT TEST 29 53

A "required tab " instruction is given by depressing the "code" button and tapping the "tab" keybutton. A "required tab" sets up an automatic indent eliminating the need to tab for each indented line. As many as fourteen indent or tab levels may be stored in memory. To increase the indent level you have only to add an additional "required tab" instruction. When you want to cancel the indenting, you should end the line with a "required carrier return."

If you want to reduce the indent level you must end the line with a "required carrier return" and then give the "required tab" instruction again.

REVERSE INDEX TEST 35 68

Depressing the "code" button and tapping the "Y" or "H" keybutton will cause the index to operate independently of the index selector lever.

These are special codes that are inserted in memory which are used for "sub" and "super" scripts.

8. *Print Quality* – Check the functional test playout. All characters should have even color. No character should be obviously out of position. There should be even spacing between characters with no overlap.
9. *Repeat Characters* – Lightly depress the hyphen/underscore keybutton. The characters should print once for a single depression. The characters should repeat when more pressure is applied. You should not be able to stall the repeat operation by pushing hard on the keybutton.
10. *Impression Control* – Type a letter character with the impression control lever at 1 and at 5. You should hear a noticeable difference in the sound of the typehead hitting the paper.
11. *Scales* – Type a line of upper case V's. The horizontal line on the card holder should be parallel to the line of V's.

    The points of the V's should line up with the vertical lines on the cardholder.

    Set the left margin as far to the left as it will go. Operate the carrier return. The pointer should line up with 0 on the front scale.
12. *Selective Ribbon System* –
    A. Put a single sheet of bond paper in the machine. With the impression control lever on 3, make a complete strikeup in upper and lower case.
    B. Inspect the copy for character uniformity; that is, even color density throughout.
    C. Inspect the copy for ribbon flaking; that is, splattering of ribbon particles on the copy.
    D. With a film ribbon installed on your machine, the lift pattern should look like this:

    Inspect the lift pattern on the machine. The characters should not overlap one another, and the characters should be positioned on the ribbon with a margin of safety at the top and bottom.

    With a Tech III ribbon installed on the machine, inspect the ribbon pattern. The characters should overlap one another and there should be a margin of safety at the top and bottom of the ribbon. Type several lines of underscores. The typing must not fade.

    E. Inspect the ribbon throughout its path around the various guides and rollers. There should be no creases in the ribbon.
    F. Operate the spacebar singly and in repeat mode. The ribbon should not feed.
    G. Place the stencil control lever in the stencil position and type several characters. The ribbon should not feed or lift.
13. Reset the left margin for the operator as it was when you started. This concludes the detailed functional check.

MOTOR & DRIVE OPERATIONAL THEORY

The purpose of the I/O motor and drive mechanism is to provide a positive, constant drive for keyboard and printer operation. Rotational motion of the right motor pulley is transferred through the main drive belt, cycle clutch pulley, cycle clutch pulley hub, and operational shaft (Figure 1). Drive is taken off the cycle clutch pulley hub and the operational shaft to drive the various machine functions. The left motor pulley provides motion to drive the leadscrew drive assembly.

NOTE: The cycle clutch pulley hub is also a component of the cycle clutch mechanism. Its relation to this mechanism is covered in the character selection section of this manual. Leadscrew drive is covered in Escapement/Backspace section.

ON/OFF SWITCH

The on/off switch and switch lever are located on the right side of the keyboard (Figure 1). In addition to controlling the electrical power for the system, the switch lever also operates the keyboard lockout mechanism. This mechanism is discussed under Keyboard Selection.

An on/off switch stiffener (Figure 1) provides additional resistance to the on/off keybutton when the machine is turned OFF. The stiffer switch action in the OFF direction guards against accidentally turning the power off and losing text in memory. The stiffener mechanism consists of a spring loaded arm working against the lever on the on/off switch. As the switch is moved in the OFF position, the lever must overcome the additional spring load of the arm.

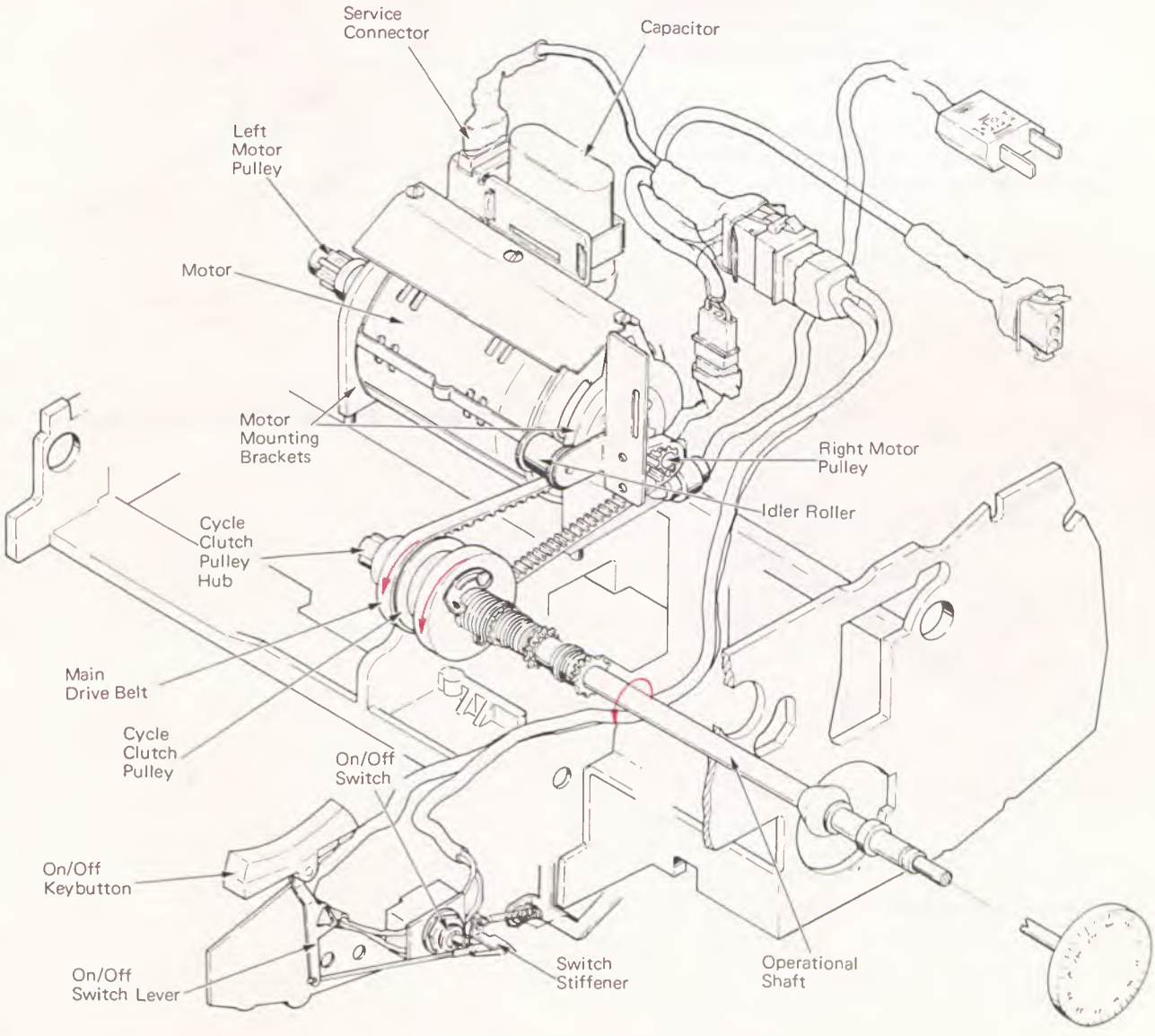


Figure 1 – Motor & Drive Mechanism

MOTOR

The motor used in the I/O is a capacitor start induction type motor that normally requires 115 VAC, 60 Hz.

The capacitor provides starting torque and controls the direction of motor rotation. The capacitor remains in the circuit to maintain power and control the direction of rotation if the motor is momentarily stalled.

The motor is mounted in the printer by two non-adjustable mounting brackets (Figure 1). Each mounting bracket is secured to the printer by two screws through the bottom of the casting.

NOTE: Motor wiring is covered in the Electrical section of this manual.

MAIN DRIVE

The motor drive shaft extends from both ends of the motor. The right motor pulley and main drive belt (Figure 2) drives the cycle clutch pulley, and pulley hub. Proper belt tension of the main drive belt is obtained through an idler roller which is adjustable up or down.

The cycle clutch pulley is double setscrewed to the cycle clutch pulley hub. The pulley and hub are supported by a sleeve bearing in the center of the printer casting.

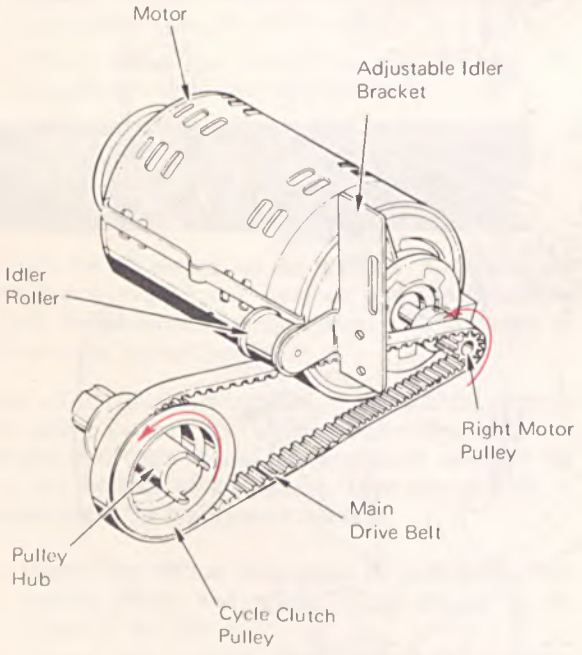


Figure 2 – Main Drive Belt & Idler

Rotational motion of the cycle clutch pulley is coupled to the operational shaft by two extensions of the cycle clutch pulley hub that fit into slots on the left side of the torque limiter hub. The torque limiter hub is setscrewed to the operational shaft (Figure 3).

Two inserts rest in the slots of the torque limiter hub, and fit tightly around the extensions of the cycle clutch pulley hub. The inserts provide a noiseless driving connection between the two hubs.

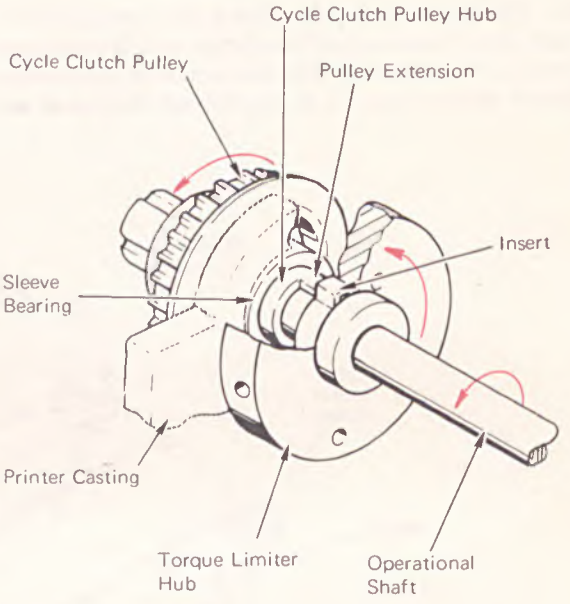


Figure 3 – Operational Shaft Drive Connection

HAND CYCLING

Hand cycling is accomplished through the hand cycle wheel and extension (Figure 4). The hand cycle wheel attached to the right end of the hand cycle extension. The extension is located under the tilt support retainer within the bottom cover. The left end of the extension attaches to the right end of the operational shaft and is used to turn the drive mechanism by hand.

When the I/O is to be hand-cycled, the hand cycle wheel should be rotated top to front. Manual rotation of the hand cycle wheel allows for visual observation of the various functions as they operate at a controlled rate of speed.

SERVICE CONNECTOR

The I/O service connector (Figure 4) allows the line voltage to the motor to be disconnected without affecting the voltages to the rest of the machine. With the service connector disconnected, information entered at the keyboard or played out from memory can be "hand-cycled" to view an adjustment or machine operation. For example, depressing a character keybutton and "hand cycling" the I/O will cause a character selection/print operation to occur.

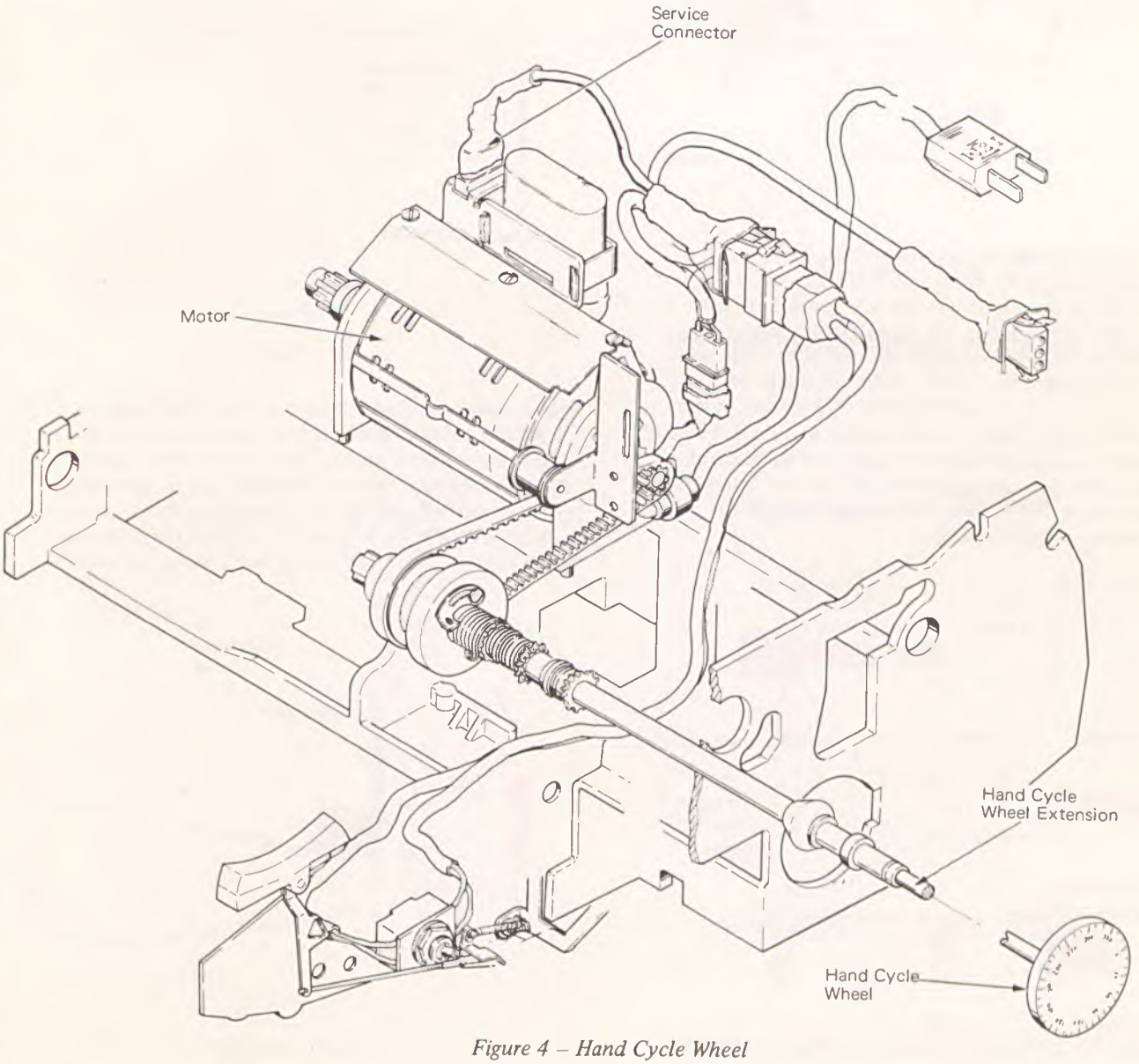


Figure 4 – Hand Cycle Wheel

ELECTRICAL

The System is available with two-wire double insulated or three-wire grounded circuitry. The two-wire double insulated system can be identified by a two-wire line cord and a jumper wire between the left hand motor mounting bracket and the printer casting (Figure 5).

The screw that mounts the jumper wire to the motor mounting bracket extends through the mounting bracket and contacts the rubber motor mount (Figure 5). This arrangement "bleeds off" static voltage, thus eliminating static sparks between the motor and the printer casting.

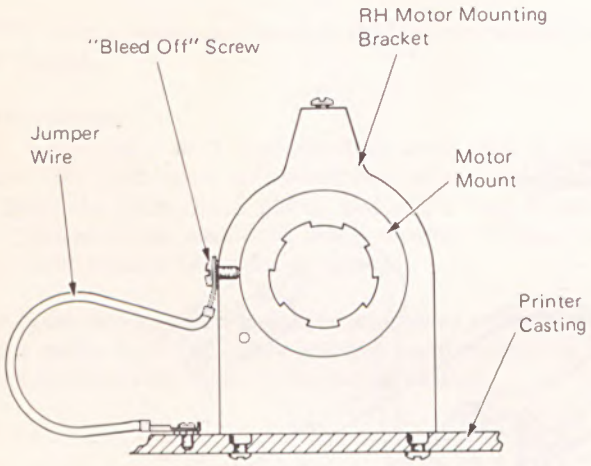


Figure 5 – Two-Wire Double Insulated (Left Side View)

On three-wire grounded systems (Figure 6) a jumper wire is connected between the printer casting and the motor housing. The three-wire grounded system also has a three-wire line cord and a R.F.I. capacitor jumper between the 3-wire line cord and primary wiring.

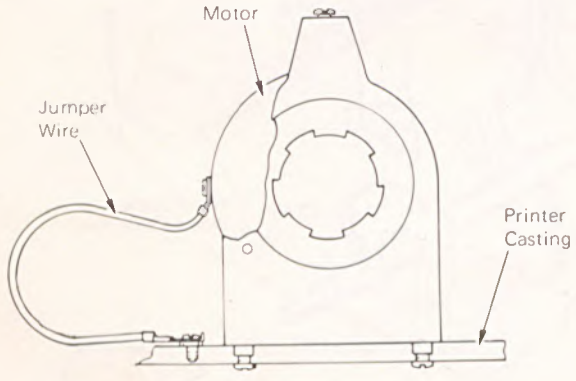
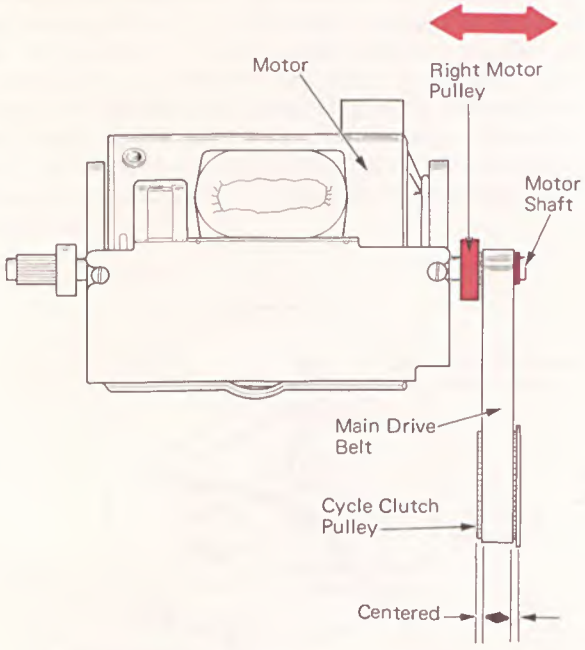


Figure 6 – Three-Wire Grounded (Left Side View)

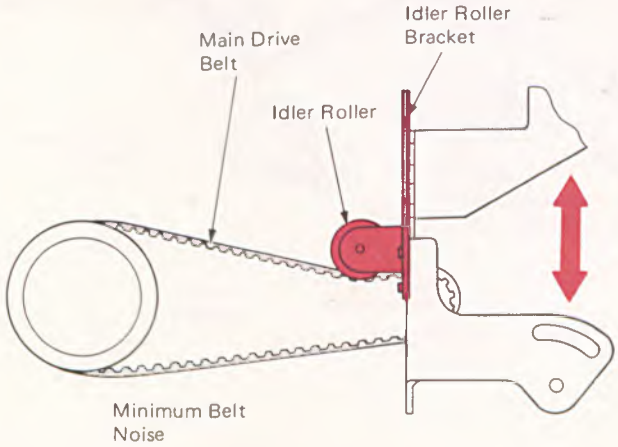
MOTOR & DRIVE ADJUSTMENTS

1. *Right Motor Pulley* – Position the right motor pulley left to right on the motor shaft so that the main drive belt tracks in the center of the cycle clutch pulley.



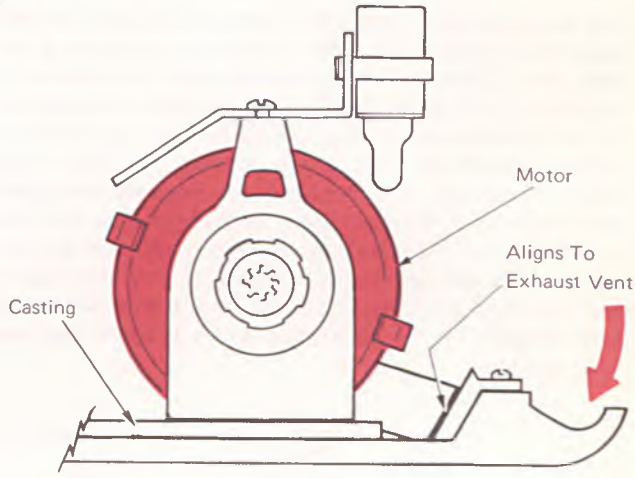
(Top View)

2. *Main Drive Belt Idler* – Position the idler roller bracket up or down to obtain a minimum amount of belt noise. The belt must not be loose enough to allow the belt to jump cogs on the motor pulley. Check by operating the carrier return mechanism and holding the carrier while manually picking the shift magnet armature. This loads the motor to the point where failure will be most probable.



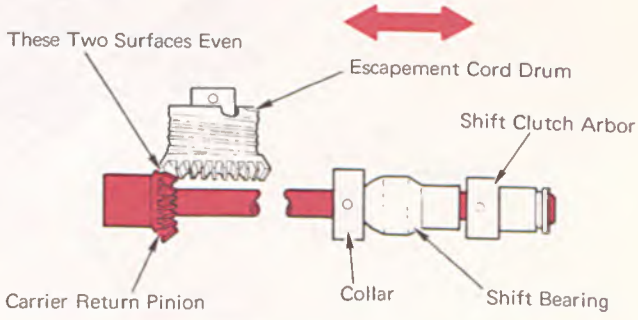
(Right Side View)

3. *Motor Rotational Position* – Position the motor rotationally so the motor snout aligns with the bottom cover exhaust vent.

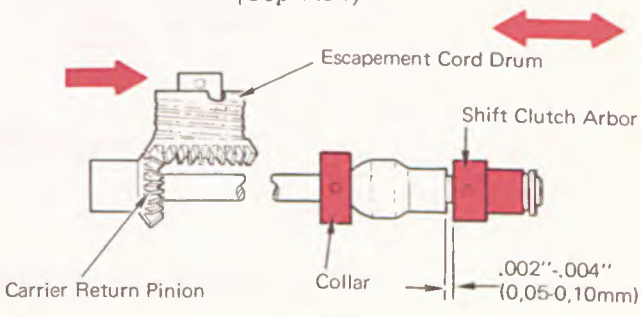


(Right Side View)

4. *Operational Shaft Position And End Play* – Position the operational shaft left or right so the edge of the escapement cord drum matches the crown surface of the carrier return pinion. Move the collar to the right against the shift cam bearing. Position the shift clutch arbor left or right for .002"-.004" clearance between the arbor and the shift cam bearing.



(Top View)



(Top View)

KEYBOARD OPERATIONAL THEORY

The keyboard is the command unit of the system. Its purpose is to provide a code for each character and function keybutton depressed.

This is accomplished through a keyboard selection mechanism which consist of a series of keylevers, interposers, and bails; and a Selection Contact Assembly which contains seven reed switches (Figure 1). When a keybutton is depressed, motion is transferred through its keylever to latch down a keylever interposer. This action activates the filter shaft clutch mechanism and positions the keylever interposer down in front of the filter shaft. As the interposer is driven forward by the filter shaft, motion is transferred through selector bails and selector interposers to close the proper reed switches. The code produced by the reed switches is then sampled by the electronics and translated into machine operation.

This section is divided into two parts: Character keylever operation and functional keylever operation. The character keylever operation part covers the complete keyboard selection mechanism. The functional keylever operation part covers the areas of the functional keylevers that differ from the characters keylevers.

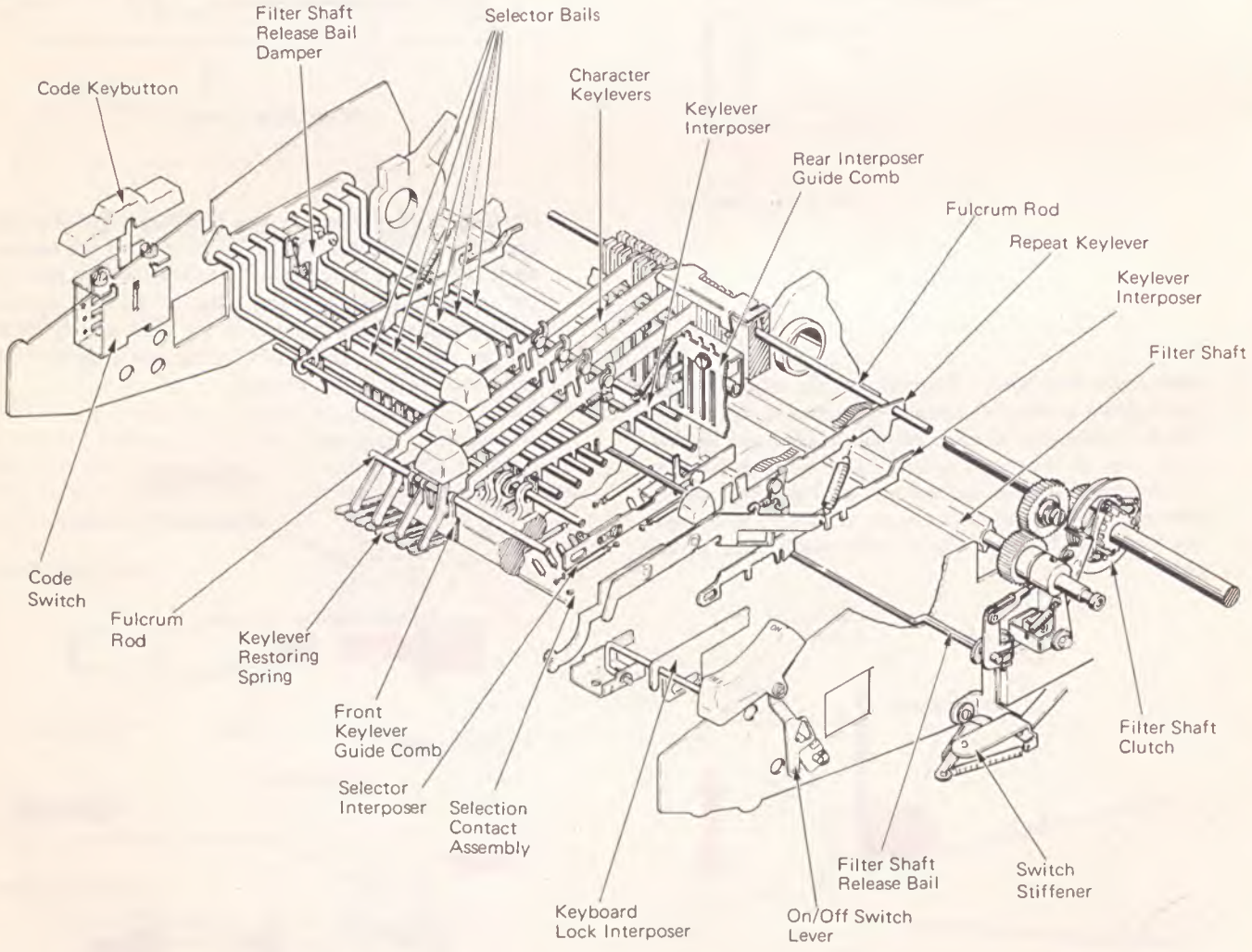


Figure 1 – Keyboard Selection – Character Keylevers

KEYLEVER OPERATION

The keyboard contains a keylever for each character and function. The keylevers pivot on a fulcrum rod at the rear of the keyboard (Figure 2). The up and down travel of the keylevers is limited by the front keylever guide comb.

Keylever tension is supplied by leaf springs under the front of the character keylevers. The forward end of each spring finger is cupped so the spring will maintain its position under the keylever. Different spring tension is supplied to the four rows of character keylevers by auxiliary leaf springs under the keylever springs (Figure 2). The auxiliary spring fingers vary in length to offset leverage differences between the four rows of keylevers. This variation in spring tension permits a uniform operating force requirement for all keylevers.

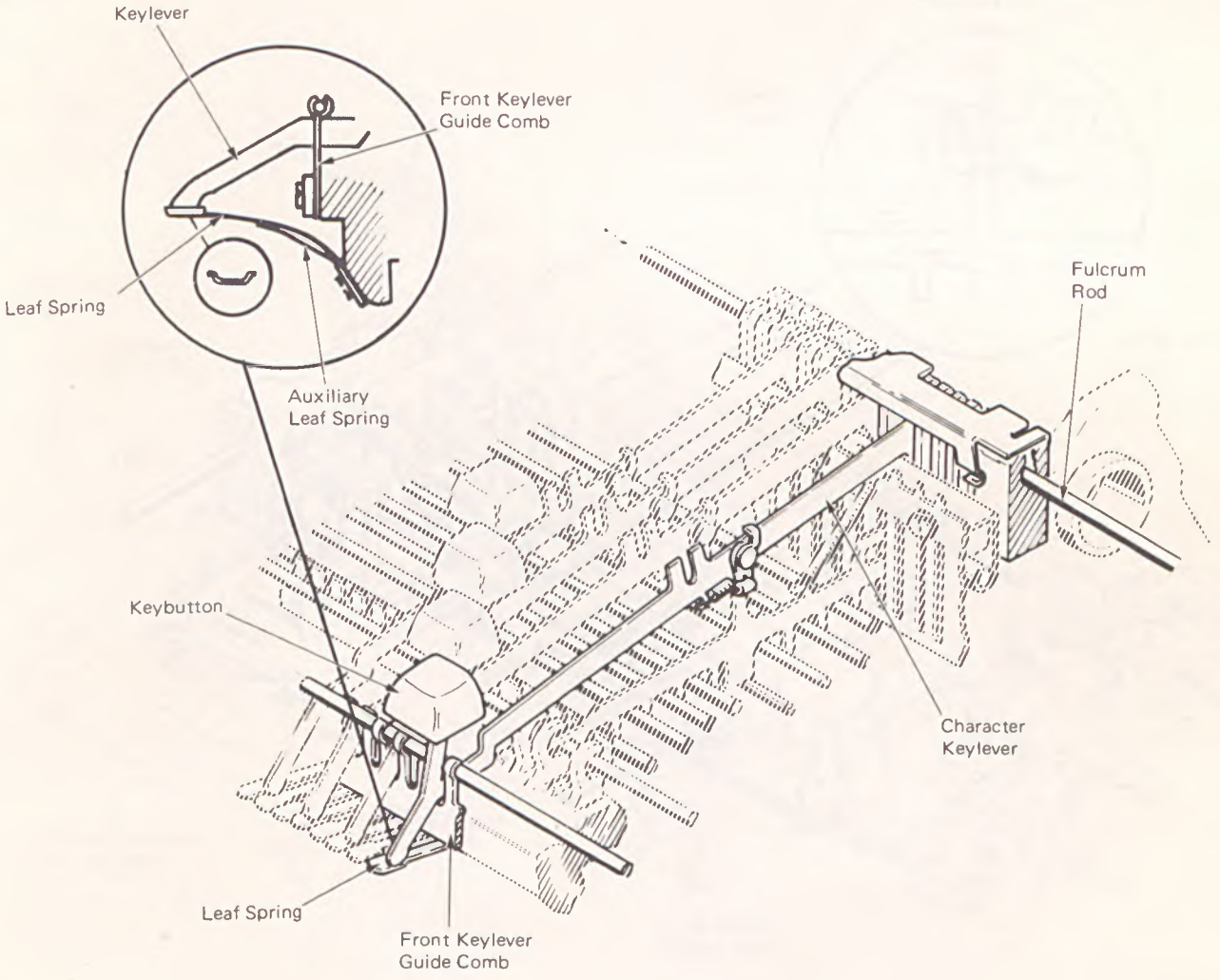


Figure 2 – Keylever Operation

Attached to each keylever by a shouldered rivet is a keylever pawl (Figure 3). This pawl is spring loaded in position to contact the top of an interposer when the keylever is depressed. If the keylever is held down throughout a keyboard operation, the rear edge of the interposer lug will strike the keylever pawl as the interposer restores to rest. The keylever pawl will be deflected to the rear until the keybutton is released. This arrangement ensures a single operation regardless of how long the keylever is held depressed.

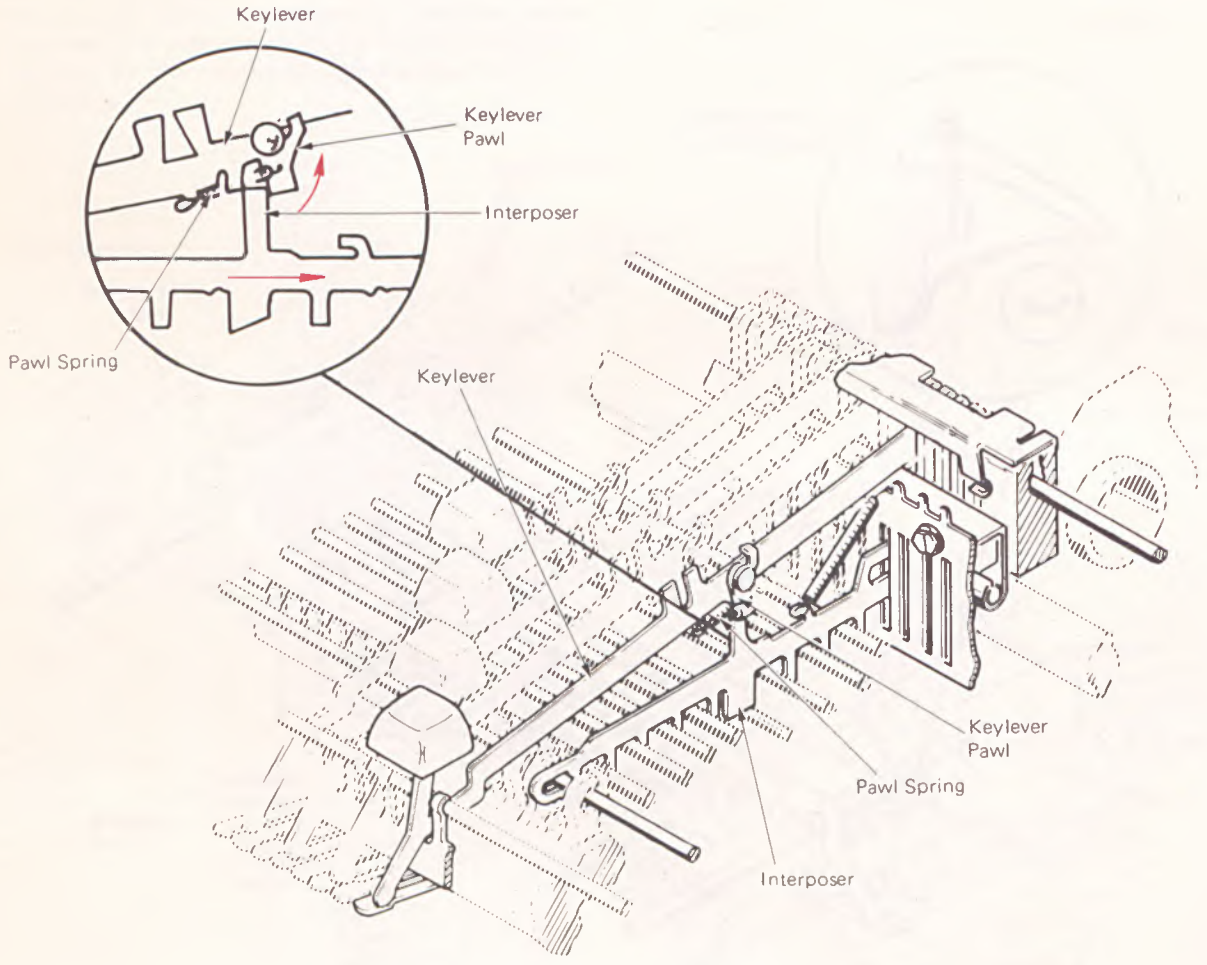


Figure 3 – Keylever Pawl Operation

KEYLEVER INTERPOSER

The keylever interposers pivot about a large fulcrum rod at the front and are spring loaded up at the rear (Figure 4). The front and rear of the interposers are supported by guide combs. The interposers are allowed to move vertically in the rear guide comb as well as front to rear.

Each interposer has from two to eight lugs extending down from it (Figure 4). Seven of these lugs are used to operate the selector bails. The presence or absence of any one of the lugs will determine which of the selector bails will be operated. No two interposers are alike.

The center or filter shaft release lug, is common to each keylever interposer. Its purpose is to operate the filter shaft release bail and thereby activate the filter shaft clutch mechanism.

To ensure the interposer will remain depressed long enough to operate the selector bails, an interposer latch is employed (Figure 4). The interposer latch is a series of flat leaf springs mounted to the rear keylever guide comb. The interposer latch springs are in position to latch the interposer down when they are depressed.

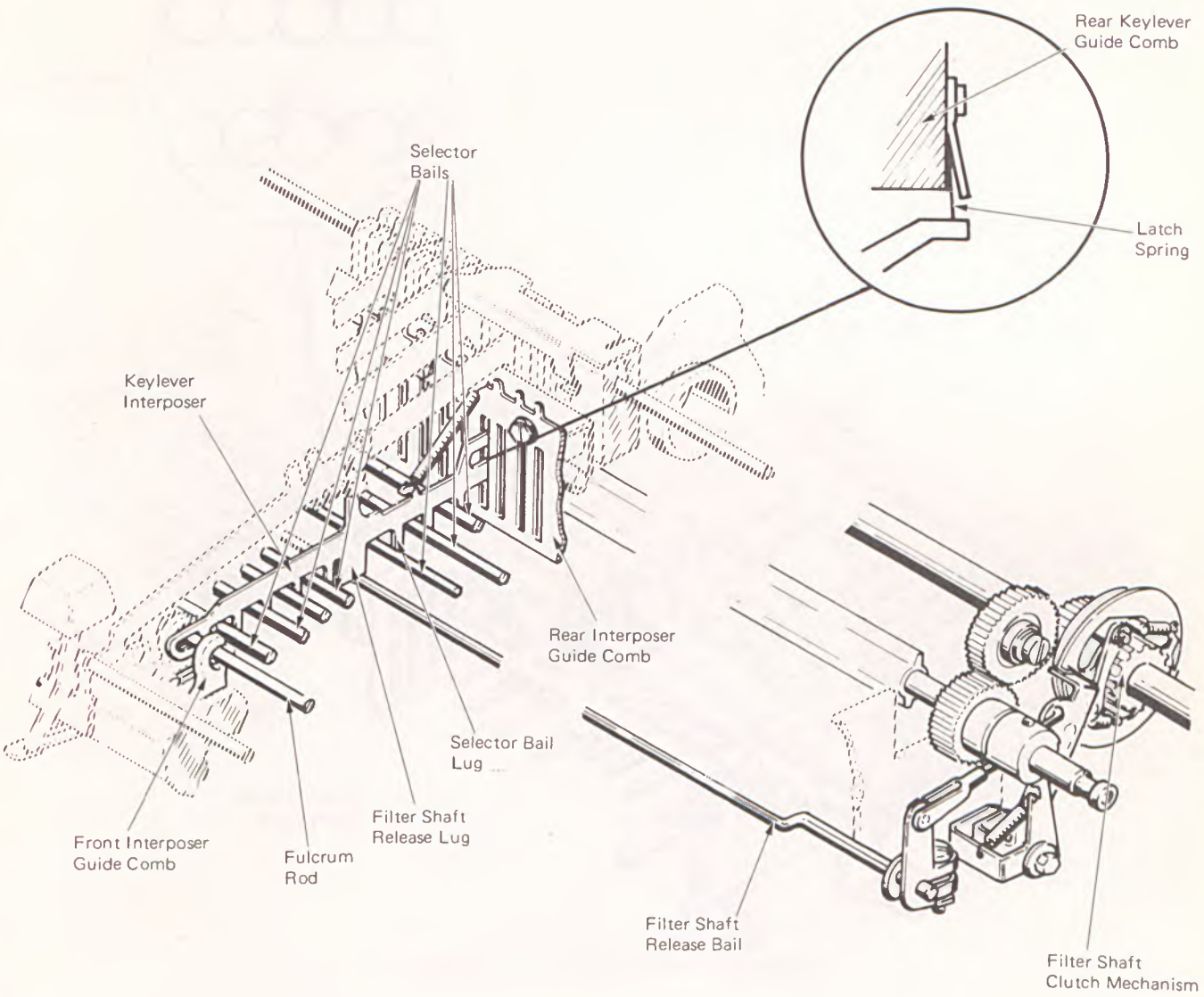


Figure 4 – Keylever Interposer And Interposer Latch

A compensator tube is used to prevent the latching of more than one interposer at a time. Each interposer has a lug that intersects the compensator tube (Figure 5). The compensator tube contains closely spaced steel balls. When an interposer is moved down, the steel balls shift in the compensator tube to block the downward movement of any other interposer, since there is only enough space between the steel balls for one interposer. When the interposer is driven forward the tube is cleared to accept another interposer.

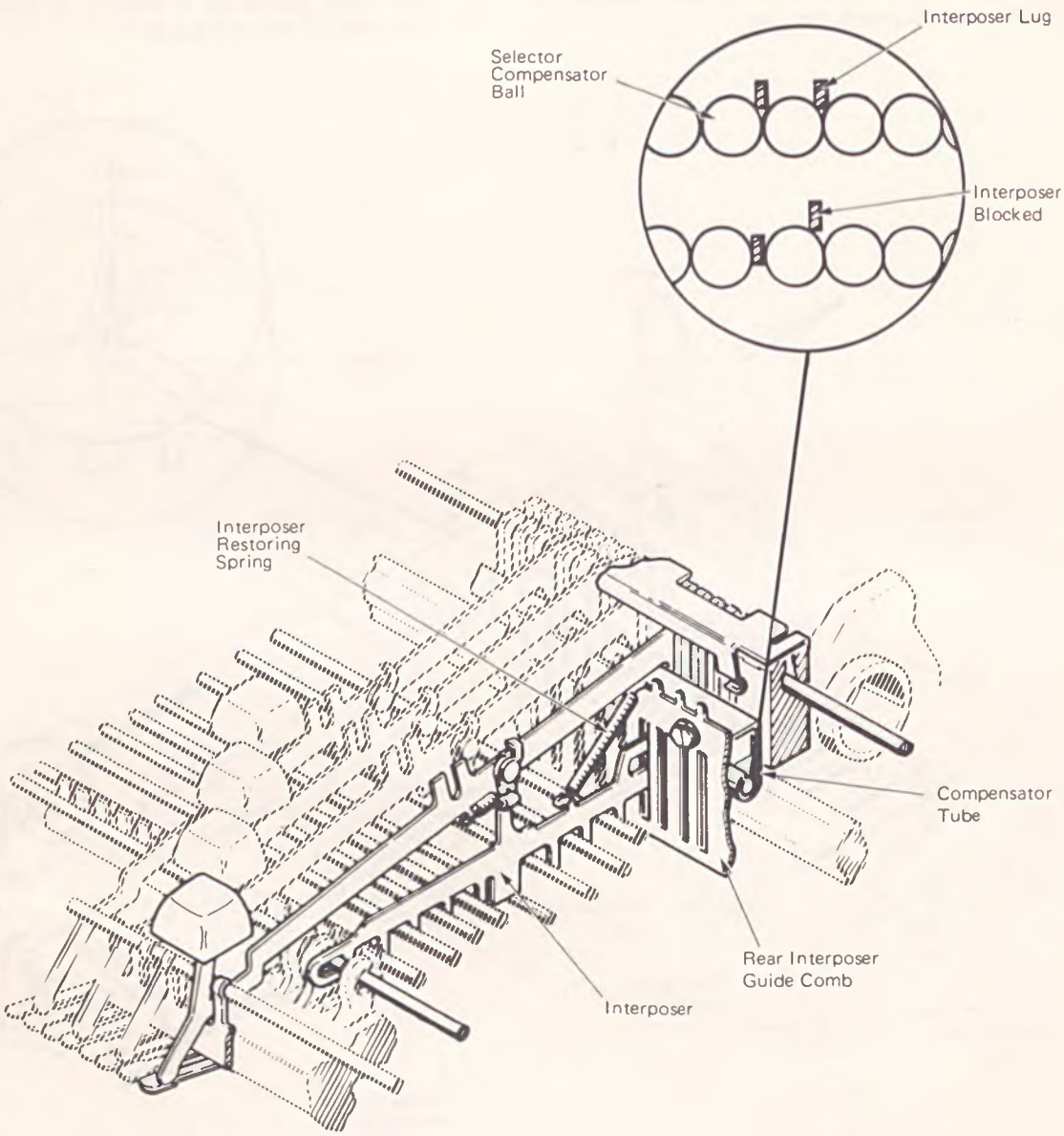


Figure 5 – Compensator Tube Operation

FILTER SHAFT CLUTCH

The purpose of the filter shaft clutch mechanism is to supply motion to the keylever interposers to operate the selector bails. This is accomplished through the filter shaft which is located to the rear of the interposers. When a keylever interposer is latched down, motion is transferred through the filter shaft release bail and the filter shaft clutch release arm to unlatch the filter shaft clutch (Figure 6). When the filter shaft release arm is pulled forward, the filter shaft clutch wheel is released allowing the spring loaded clutch pawls to engage the clutch ratchet, thus supplying drive through the gear train to the filter shaft.

Motion to drive the filter shaft clutch is taken off the index/filter shaft clutch ratchet which is setscrewed to the operational shaft (Figure 6). Rotational motion of the clutch is then transferred through the filter shaft to drive the interposer forward.

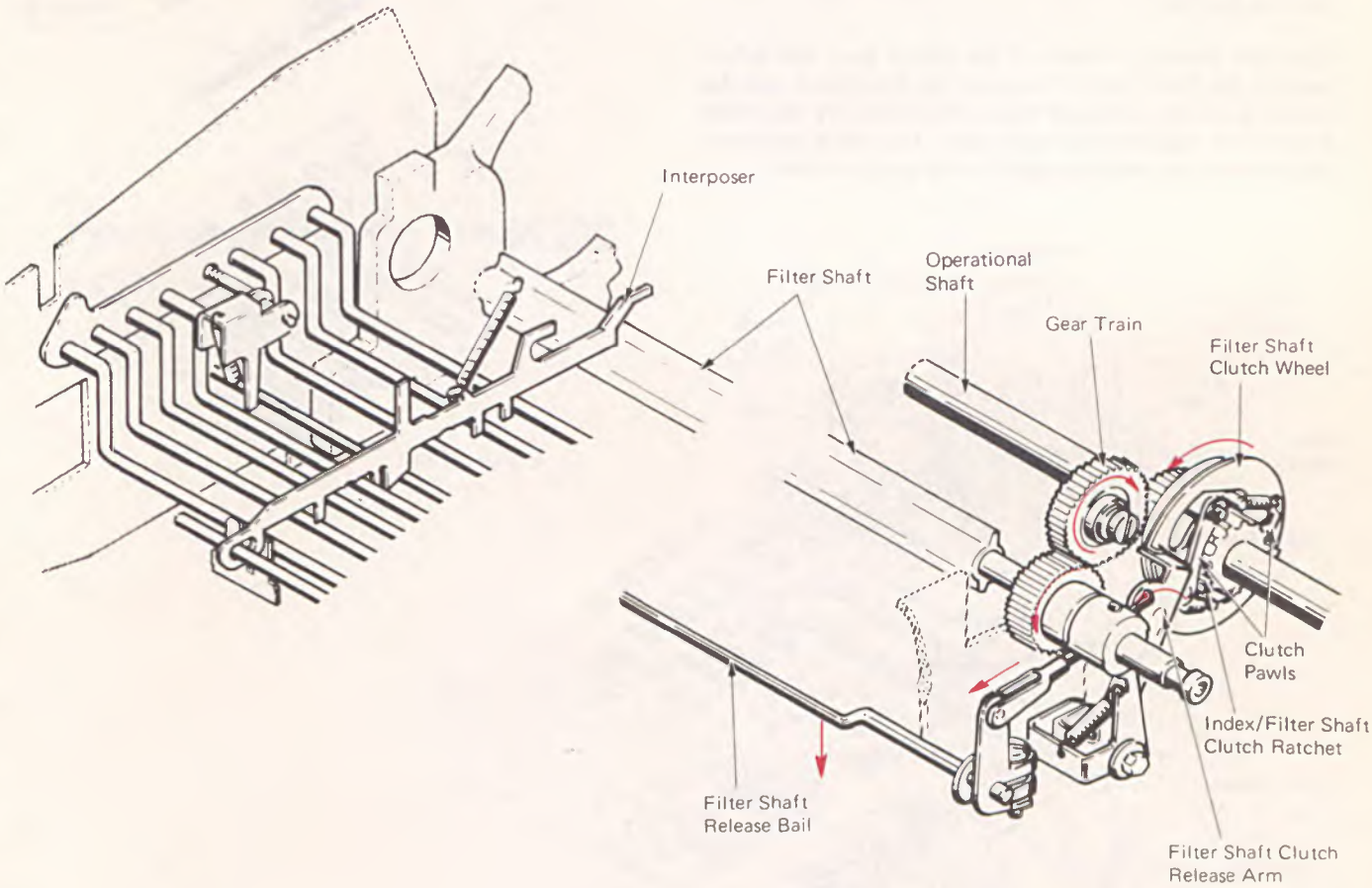
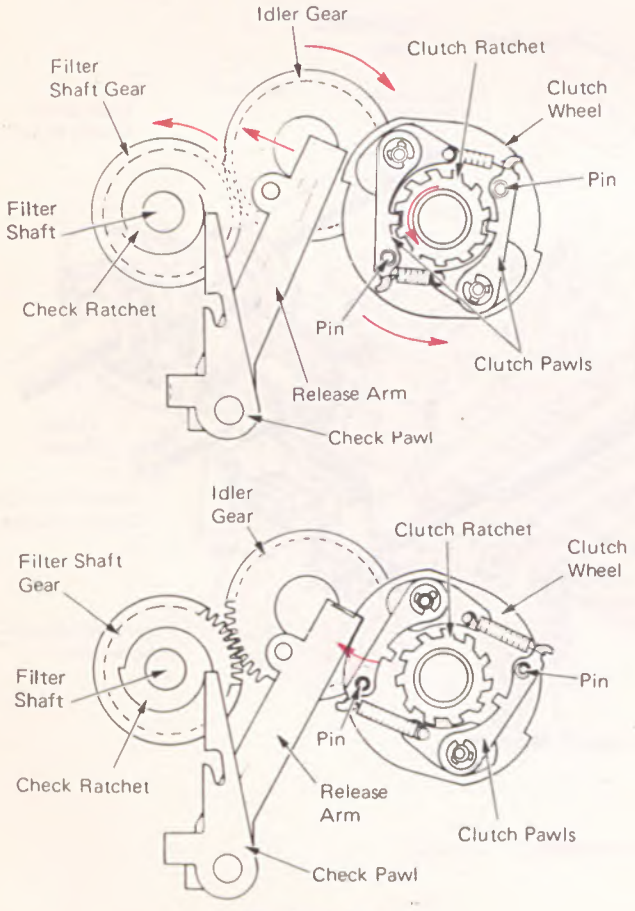


Figure 6 – Filter Shaft Clutch Mechanism

The clutch pawls are attached to studs on the clutch gear that extend through oversized holes in the clutch wheel. A pin at the tip of each pawl fits into camming slots in the clutch wheel. The camming slots are designed so the pawls are cammed into engagement with the clutch ratchet when the clutch wheel is unlatched, and cammed out of engagement with the ratchet when the clutch wheel is re-latched (Figure 7).

As the keylever interposer is driven forward during a keyboard operation, the filter shaft release bail is allowed to restore to rest. The filter shaft release arm is then repositioned to engage and latch the clutch wheel after 180 degrees of rotation. Further rotation of the clutch gear while the clutch wheel is held stationary will cause the pawls to cam up the inside of the clutch wheel cam slot, disengaging the pawls from the ratchet. The clutch gear will continue to rotate until the pawl mounting studs contact the clutch wheel.

Once the forward rotation of the clutch gear, and subsequently the filter shaft, is stopped, the filter shaft and the clutch gear are prevented from rebounding by the filter shaft check ratchet and check pawl. The check ratchet is setscrewed to the extreme right end of the filter shaft.



(Right Side View)

Figure 7 – Clutch Operation

A small lever, called the filter shaft release bail damper, pivots at the left side of the keyboard just above the release bail (Figure 8). Its purpose is to ensure that the filter shaft release bail will restore to rest smoothly; and, thereby, prevent the filter shaft release arm from bouncing out of engagement with the clutch wheel. The filter shaft release bail damper lightly retards the upward movement of the release bail.

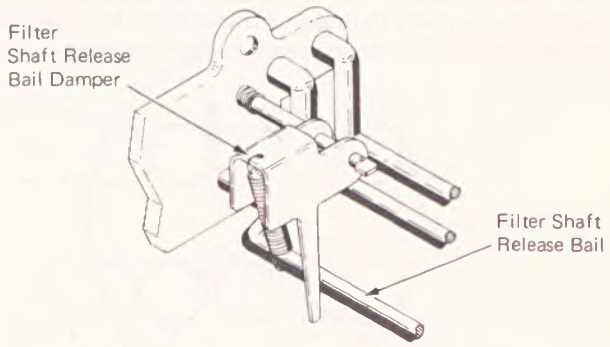


Figure 8 – Filter Shaft ReleaseBail Damper

SELECTOR BAIL

As the keylever interposer is driven forward by the filter shaft, motion is transferred through the selector bails which pivot between the keyboard side frames (Figure 9). There are seven selector bails; one for each reed switch. When a selector bail is driven forward, motion is transferred to operate the reed switches.

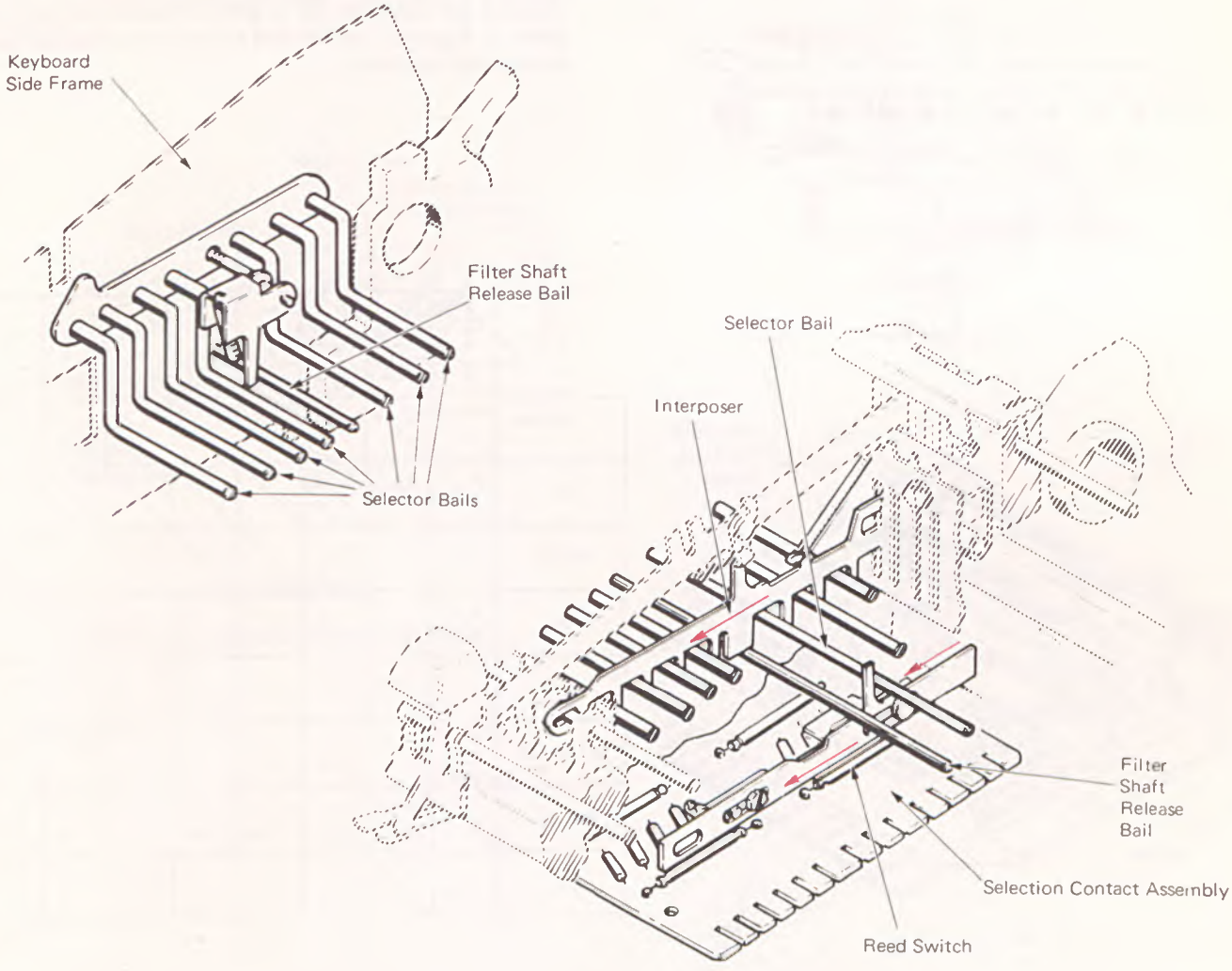
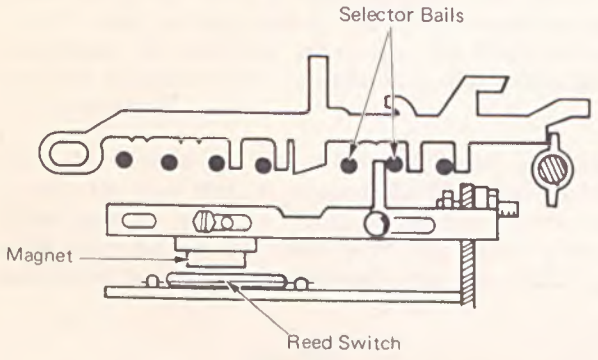


Figure 9 – Selector Bail Operation

SELECTION CONTACT ASSEMBLY

The reed switches are mounted in an assembly with the selector interposers (Figure 10). This assembly is located on the bottom right side of the keyboard.

Each selector interposer has a lug that extends up directly in front of its related selector bail. When the selector bail is driven forward by a keylever interposer, the selector interposer is also driven forward. Mounted on the bottom of each selector interposer is a permanent bar magnet. As the interposer is driven forward, the relationship between the magnet and its reed switch is changed, thus causing the switch to close.



(Right Side View)

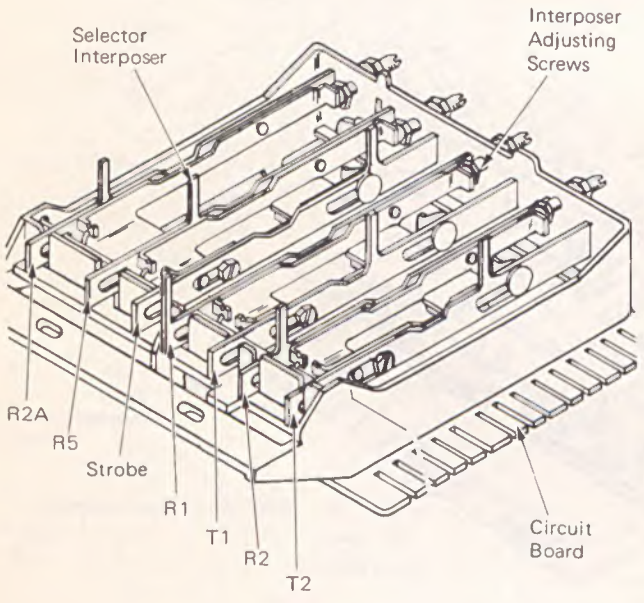


Figure 10–Selection Contact Assembly

Notice in Figure 10 that each selector interposer and reed switch combination is labeled. All of the selector interposers, with the exception of strobe, correspond to the character selection latch of the same name.

The strobe switch is timed to close later than the other reed switches. When the strobe switch closes, the electronics will sample the other reed switches and perform the action required for the code combination transmitted. When a character or symbol is to be printed, the reed switches that are operated will cause electronics to energize the character selection magnet of the same name; thus, operating the R1 reed switch will cause the electronics to energize the R1 selection magnet, etc.

NOTE: The character selection magnets are discussed in the Character Selection Section.

CHARACTER CODE CHART

The following chart may be used to determine which reed switches are operated for a given character or function. Refer to Figure 11 for the reed switch location in the selection contact assembly.

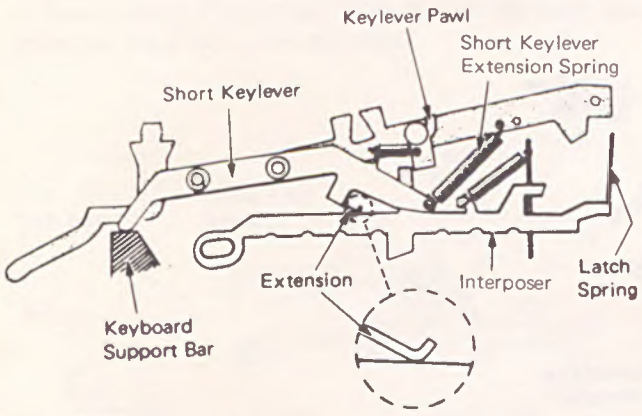
		R2a	R2 R2a	R2	R1 R2	R1 R2 R2a	R1 R2a	R1
		Q q	+ =			J j	P p	Y y
T2	B b	K k	N n			T t	F c	H h
T1–T2	(9	¢ 6	¤ 2			Z z	% 5	) 0
T1	W w	! 1	. .			? '	" "	S s
R5–T1		A a	V v			M m	R r	O o
R5–T1–T2	SPACE	* 8	= 3			| |	& 7	S 4
R5–T2	UC	C c	U u	Tab	CR	X x	D d	L l
R5	LC	- -	↑ ↑	BS	IND	G g	: :	; /

Figure 11 – Character Code Chart

REPEAT CHARACTER KEYLEVERS

The hyphen/underscore has a two piece keylever (Figure 12). The short keylever pivots on a shouldered rivet near the front of the long keylever. A second shouldered rivet extends through an elongated slot in the short keylever to control the up and down movement of the short keylever. An extension spring holds the rear of the short keylever up.

As the keybutton is depressed, the keylever pawl on the long keylever will latch down the interposer for a single (non-repeat) operation, and the front of the short keylever will contact the keyboard support bar. As the keybutton is depressed further, the rear of the short keylever is rotated downward. The extension on the bottom of the short keylever will then prevent the interposer from restoring as long as the keybutton is held depressed. The result is a repeat operation.



(Right Side View)

Figure 12 – Repeat Character Keylever

CODE KEYBUTTON

Located on the left side of the keyboard is the code keybutton (Figure 13). Its purpose is to condition the electronics to convert specific character and mode codes into machine operating codes. Holding the code keybutton depressed and depressing one of the front engraved keybuttons will cause the system to perform the function indicated on the front of the keybutton. For example: Holding down the code keybutton and depressing the No. 6 keybutton will clear the electronic memory.

The code switch is a slider type switch that supplies a ground input to the Planar Package to condition the electronics.

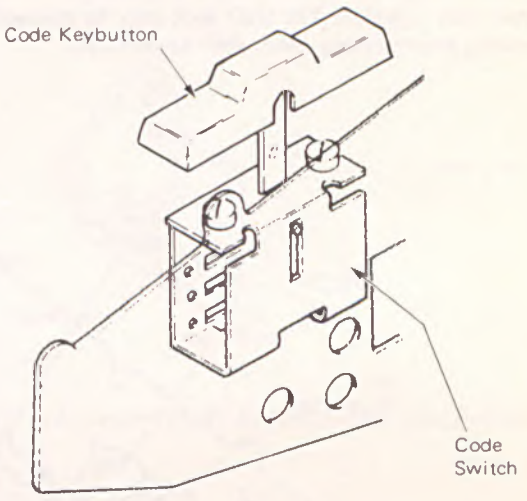


Figure 13 – Code Keybutton

FUNCTIONAL KEYLEVERS

The basic operation of the functional keylevers is the same as the character keylevers. A code is provided by the transmit reed switches whenever any of the functional keylevers are depressed. With the exception of shift, the differences lie in the area of the keylevers. Only the differences are discussed.

SHIFT KEYLEVERS

The shift keylevers are located on each side of the keyboard (Figure 14). Either keylever can be used to produce the shift code. The shift bail is used to tie the two keylevers together.

The left hand keylever has a lock mechanism attached to it to enable the operator to lock the keybutton down in the upper case position. The shift lock may be released by depressing and releasing either shift keybutton.

Since the shift button initiates two operations, shift up and shift down, two sets of keylevers and interposers are used. Both sets are located at the left side of the keyboard. When the shift button is depressed, the upper case keylever and interposer are operated for a shift up operation. When the shift keybutton is released, the lower case keylever and interposer are operated for a shift down operation.

The operation of the upper case keylever and interposer is the same as a character keylever and interposer. Depression of the shift keylever latches its interposer down and releases the filter shaft. The interposer is then driven forward to operate the selection bails.

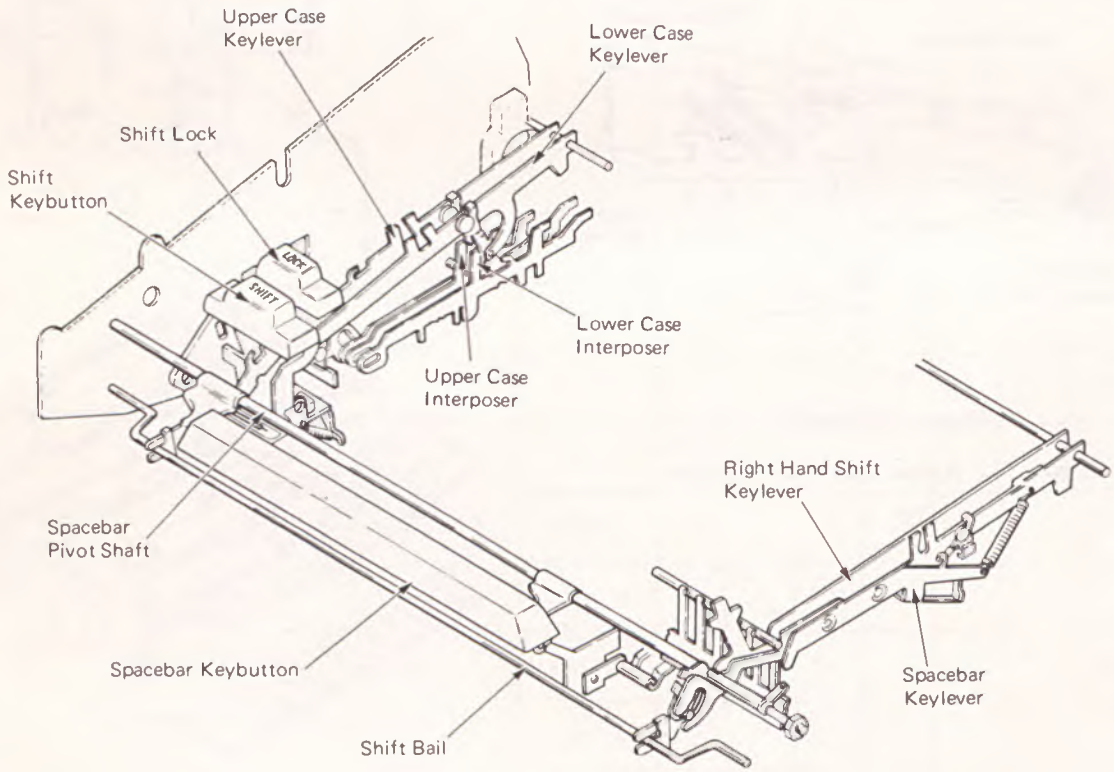
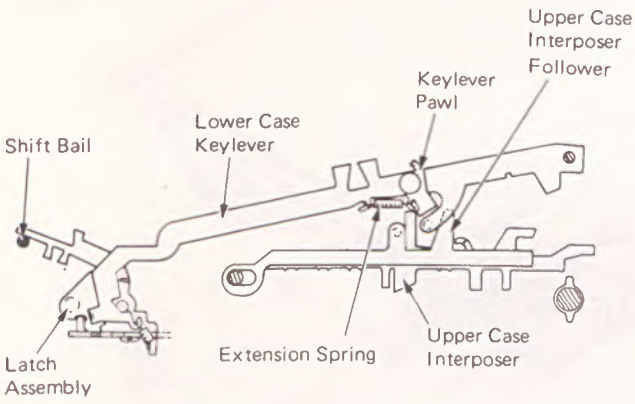


Figure 14 – Functional Keylevers

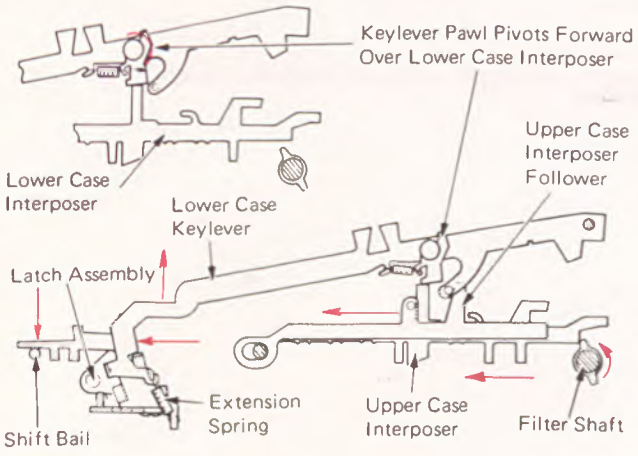
The lower case keylever does not have a keybutton and, at rest, is held down by an extension spring at the front. In this condition, the spring loaded keylever pawl is held to the rear of the lug on the interposer. For a shift down operation, the lower case keylever must be raised during a shift up operation, to position the keylever pawl above the interposer lug, and then pulled down to operate the interposer.

Motion to raise the lower case keylever is supplied through an upper case interposer follower (Figure 15). As the upper case interposer is driven forward for a shift up operation, motion is transferred through the interposer follower to cam the lower case keylever upward. The lower case keylever is then latched in the up position by the latch assembly at the front of the keylever.

When the upper case keybutton is released for a shift down operation, the lower case keylever is unlatched by an extension of the lower case keylever latch that rests on top of the shift bail and the lower case keylever is pulled down by its extension spring. This action will latch down the lower case interposer for a shift down operation.



Lower Case Keylever (At Rest) (Right Side View)



Lower Case Keylever Latching Action (Right Side View)

Figure 15 – Lower Case Keylever & Interposer Operation

KEYBOARD MODE SWITCH

The keyboard mode switch is a shunt operated reed switch mounted on the left front of the keyboard just below the shift keylevers (Figure 16). The switch is operated by an extension of the lower case keylever which serves as the shunt. When the shift keylevers are in their lower case positions, the shunt will be between the switch and the magnet and the switch will be open. With the upper case keylever latched down and the lower case keylever latched up, the shunt will be raised and the switch will be allowed to close. When a character is depressed on the keyboard, the electronics will sample the condition of this switch to determine if an upper or lower case character is being transmitted.

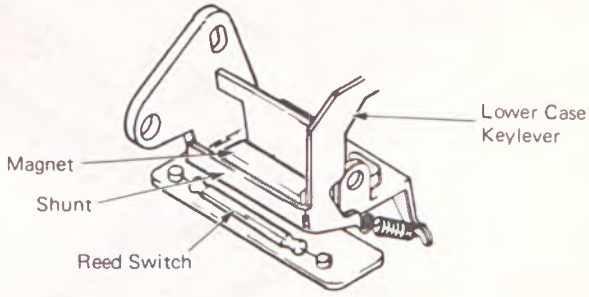


Figure 16 – Keyboard Mode Switch (Lower Case Position)

SPACEBAR

The spacebar is mounted at the front of the keyboard on the spacebar pivot shaft (Figure 17). The pivot shaft spans the width of the keyboard. When the spacebar is depressed, the pivot shaft is rotated top to front. Rotational motion of the pivot shaft is then transferred through its operating arm to depress the spacebar keylever.

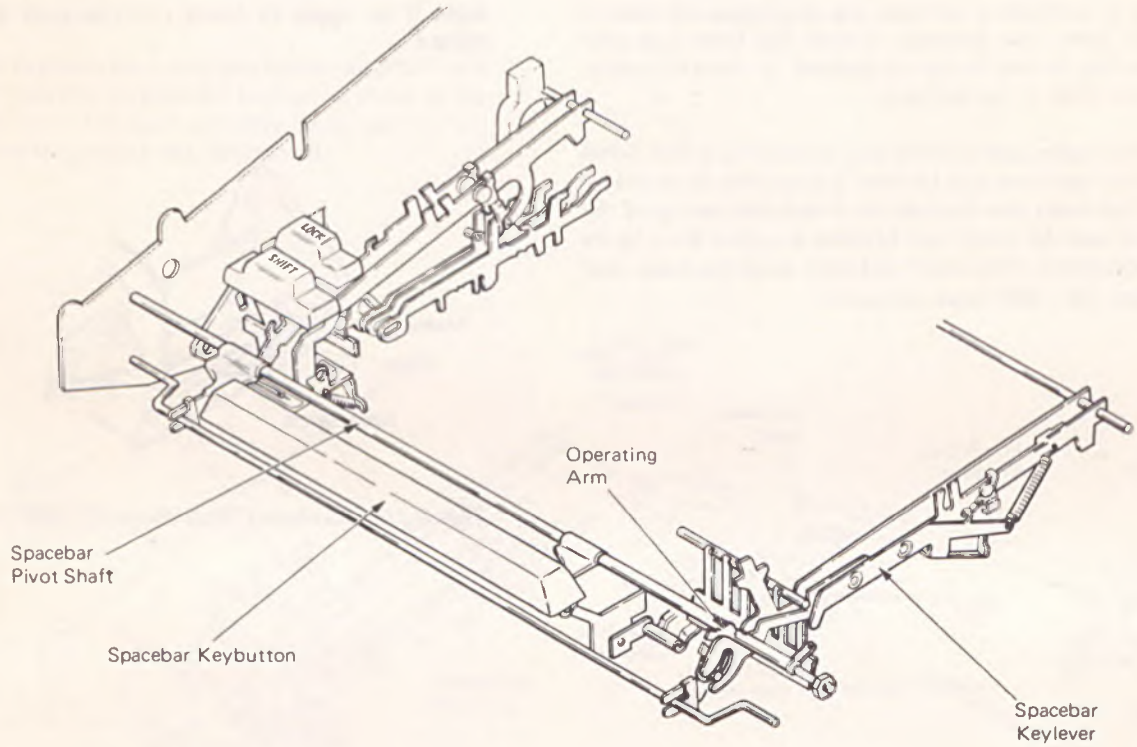


Figure 17 – Spacebar

REPEAT KEYLEVER

Certain functions are equipped with a repeat keylever as a standard feature. They are carrier return, backspace, spacebar, and index.

Repeat keylevers are two piece keylevers (Figure 18). The long keylever operates the same as a non-repeat letter keylever. The short keylever is used for repeat operations.

The short keylever pivots on a shouldered rivet near the front of the long keylever. A second shouldered rivet extends through an elongated slot in the short keylever to control the up and down movement of the short keylever. An extension spring holds the rear of the short keylever up.

As the keybutton is depressed, the keylever pawl on the long keylever will latch down the interposer for a single (non-repeat) operation, and the front of the short keylever will contact the keyboard support bar. As the keybutton is depressed further, the rear of the short keylever is rotated downward. The extension on the bottom of the short keylever will then prevent the interposer from restoring as long as the keybutton is held depressed. The result is a repeat operation.

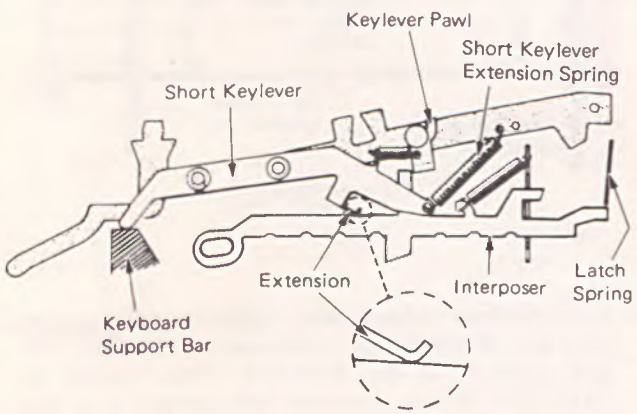


Figure 18 – Repeat Functional Keylevers (Right Side View)

KEYBOARD LOCK

When the machine is "turned off" it is necessary to lock the keyboard to prevent unwanted keyboard operation when it is "turned on" again. The keyboard lock is operated by the on/off switch lever. When the switch is put in the off position, a keyboard lock interposer is moved into the selection compensator tube to block the downward movement of any interposer (Figure 19).

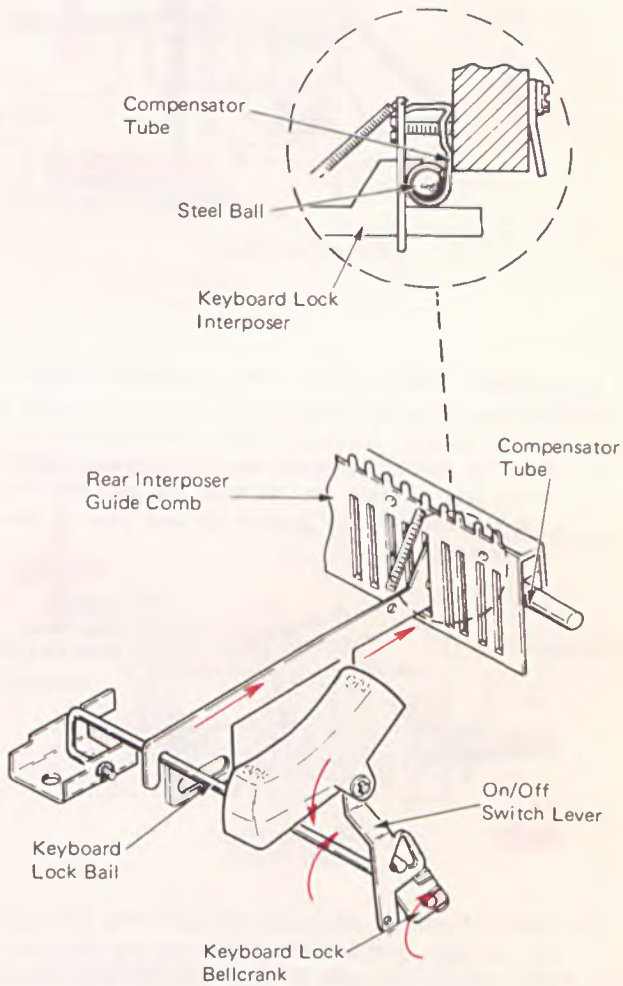
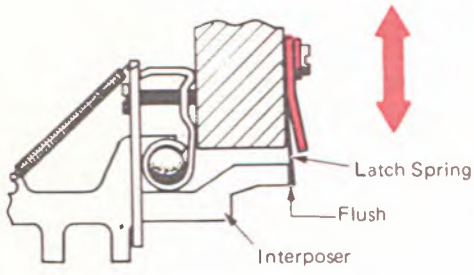


Figure 19 – Keyboard Lock

KEYBOARD ADJUSTMENTS

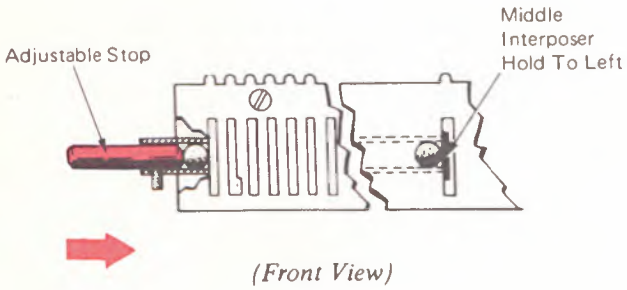
1. *Interposer Latch Springs* – With the interposer at rest, adjust the latch springs vertically so that the bottom of the latch springs are flush with the bottom of the interposer.



(Right Side View)

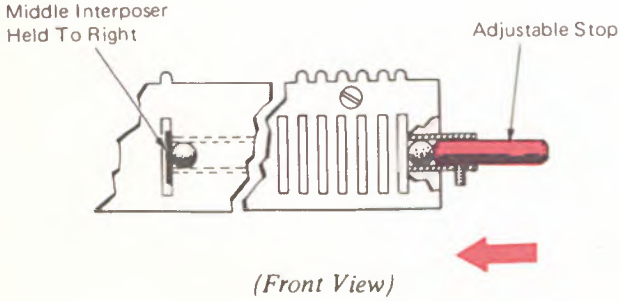
2. *Compensator Tube* – Adjust the compensator tube as follows:

   a. With the middle interposer latched down and held to the left, position the left hand end plug into the compensator tube to remove all end play of the compensator balls.



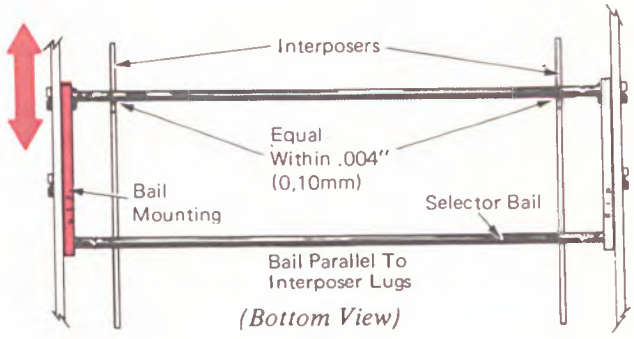
(Front View)

   b. With the middle interposer latched down and held to the right, position the right hand end plug into the compensator tube to remove all end play of the compensator balls.

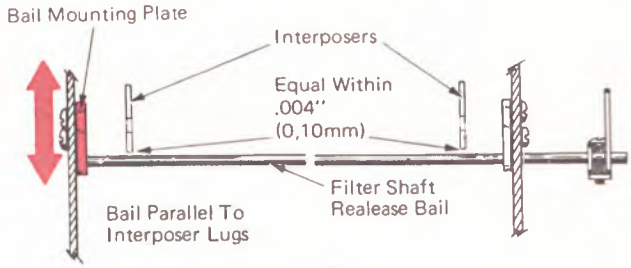


(Front View)

3. *Bail Mounting Plate* – Position the left hand bail mounting plate to satisfy the following conditions. The selector bails should be parallel, front to rear within .004" with the lugs on the interposers. At the same time, the filter shaft release bail, must be parallel vertically, within .004", with the lugs on the interposers.



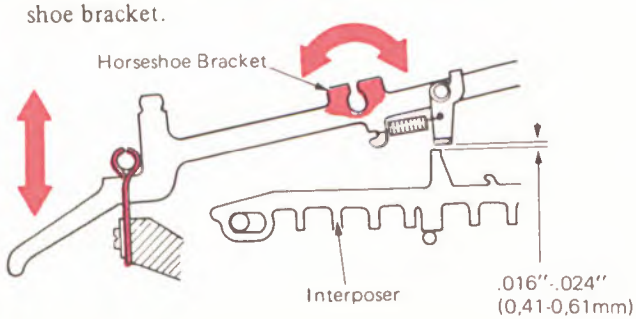
(Bottom View)



(Front View)

4. *Front Keylever Guide Comb* – With the power on, depress and slowly release keybuttons on the right, left and middle of the keyboard. There should be .016"-.024" clearance between each keylever pawl and its interposer extension after each keylever is released.

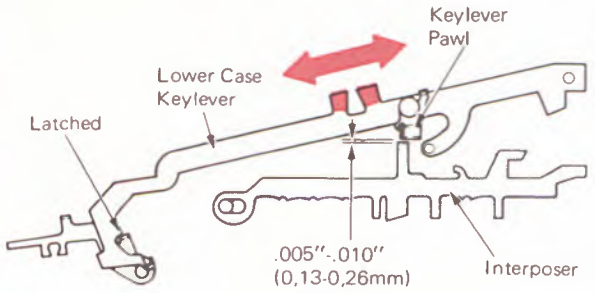
   Adjust the front keylever guide comb vertically to satisfy this condition. Individual keylevers that do not conform to the majority may be formed at the horseshoe bracket.



(Right Side View)

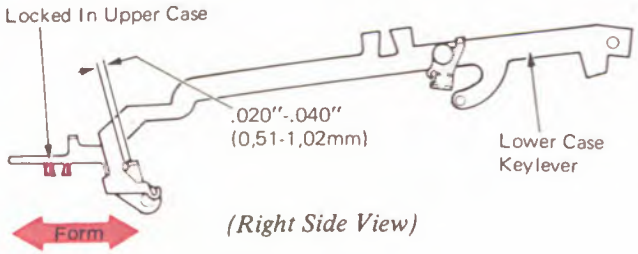
5. *Lower Case Keylever Latch* – With the lower case keylever latched up, form the horseshoe bracket in the lower case keylever for .005"-.010" clearance between the lower case interposer extension and the lower case keylever pawl. Keep this clearance toward the low side.

NOTE: This adjustment affects lower case keylever latch overthrow.



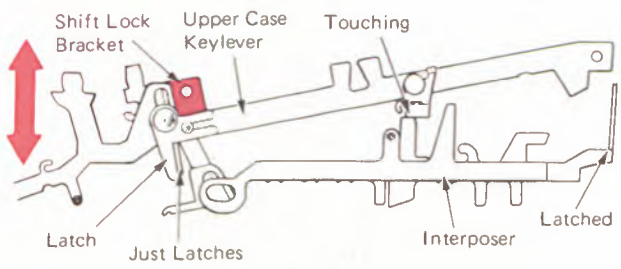
(Right Side View)

6. *Lower Case Keylever Latch Bite* – With the shift keylevers locked in upper case, form the horseshoe bracket in the lower case keylever latch for .020"-.040" bite of the lower case keylever latch on the step in the keylever.



(Right Side View)

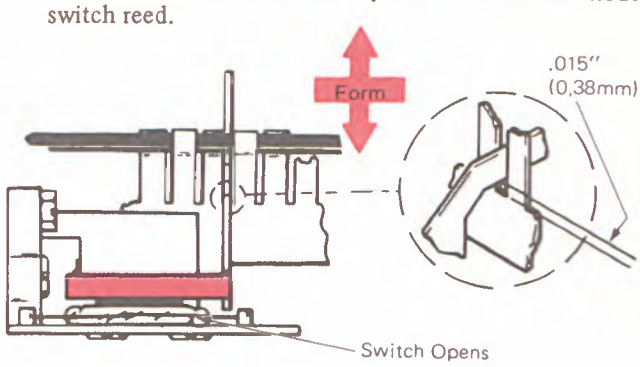
7. *Shift Lock* – Adjust the shift lock bracket vertically so the shift lock engages just as the upper case interposer latches or slightly afterward. The lock should not engage before the release occurs. The shift lock must be released easily by depressing either shift keybutton.



(Right Side View)

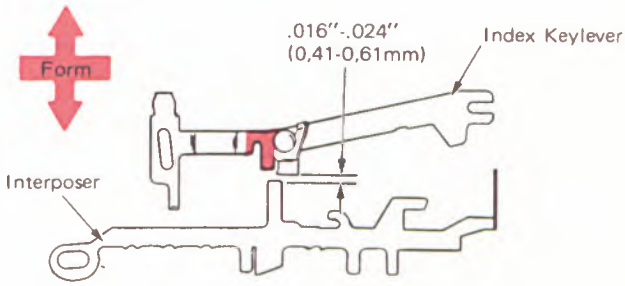
8. *Keyboard Mode Switch Shunt* – Form the shunt so that the mode switch opens when the shift down keylever is .015" from bottoming in the front keylever guidecomb.

NOTE: When forming the shunt, care should be taken not to create a bind in the keylever or break the mode switch reed.



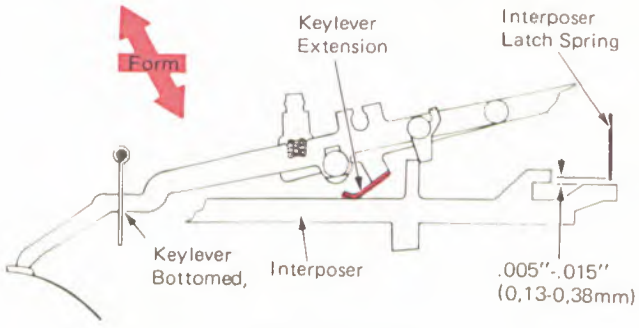
(Front View)

9. *Index Keylever* – Form the notch in the index keylever to provide .016"-.024" clearance between the keylever pawl and the interposer extension.



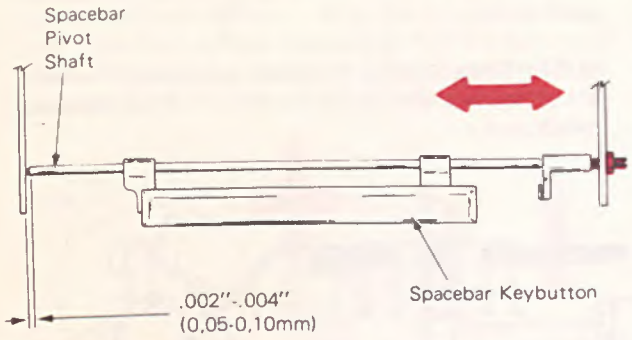
(Right Side View)

10. *Repeat Keylever* – Form the keylever extension to cause the interposer to travel .005"-.015" beyond the latched position with the keylever bottomed in the repeat position.



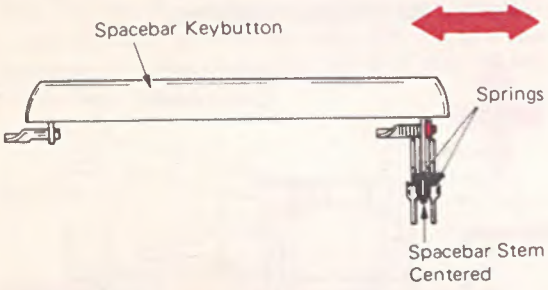
(Right Side View)

11. Spacebar Pivot Shaft – Adjust the spacebar pivot shaft for .002"-.004" end play of the shaft.



(Top View)

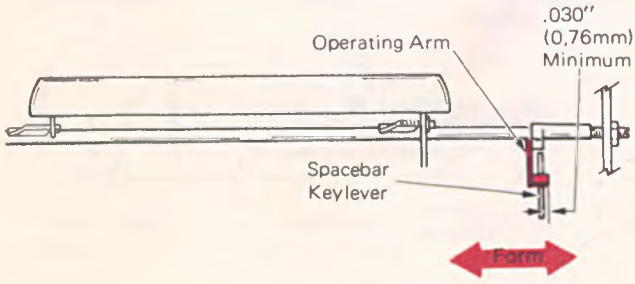
12. Spacebar Keybutton – Position the clip on the right of the spacebar stem laterally so the spacebar stem is centered between the keylever springs.



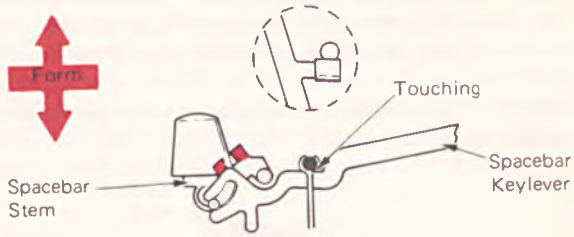
(Front View)

13. Spacebar Operating Arm – The spacebar operating arm is adjusted by opening or closing the horseshoe bracket. Adjust the operating arm to meet the following conditions:

a. The operating arm stud should extend a minimum of .030" through the spacebar keylever.

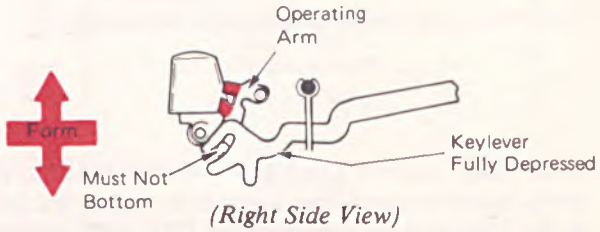


b. The spacebar keylever and spacebar stem should both be against their upstops in the rest position.



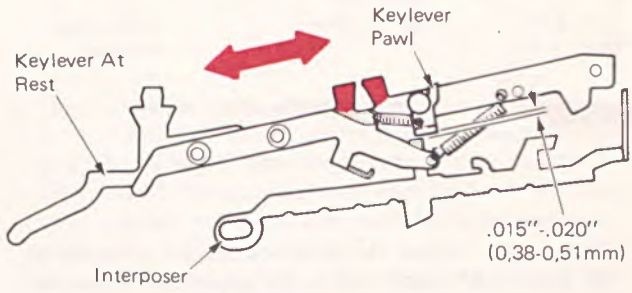
(Right Side View)

c. The spacebar keylever should have full travel from its upstop to the downstop. The operating arm stud must not bottom in the keylever slot when the keylever is fully depressed.



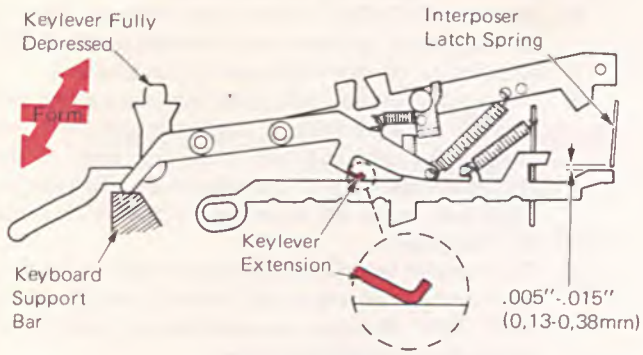
(Right Side View)

14. Repeat Keylever – Form the keylever horseshoe bracket for .015"-.020" between the keylever pawl and the interposer when the keylever is at rest.



(Right Side View)

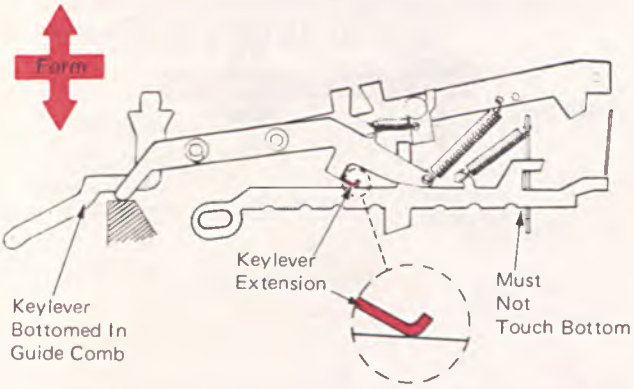
15. *Repeat Keylever Extension* – Form the keylever extension so the interposer overthrows its latch spring by .005"-.015" when the keylever is fully depressed.



(Right Side View)

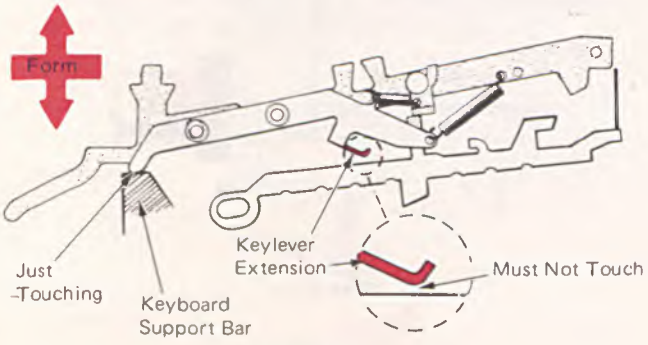
16. *Repeat Keylever WTC – Form the keylever extension to satisfy the following conditions:*

a. So the interposer does not bottom when the keylever is bottomed in its guide comb.



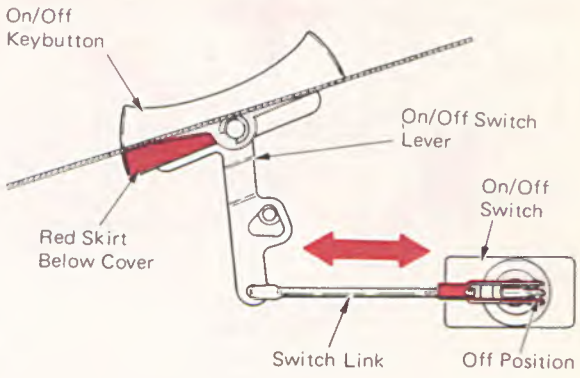
(Right Side View)

b. So the keylever extension does not touch the interposer with the keylever just touching the keyboard support bar.



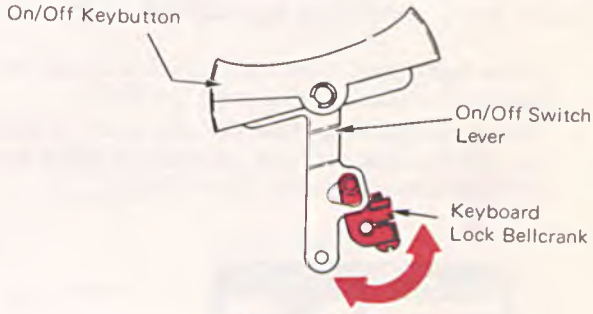
(Right Side View)

17. *On-Off Switch Link* – With the switch in the off position, adjust the switch link so that the red skirt of the switch button is below the top cover.



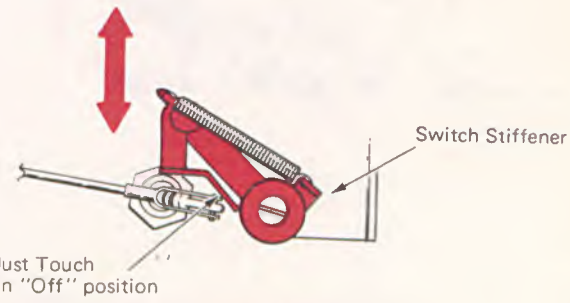
(Right Side View)

18. *Keyboard Lock* – Adjust the keyboard lock bellcrank rotationally about the lock bail so the keyboard is locked with the on/off switch in the "off" position and unlocked with the on/off switch in the "on" position.



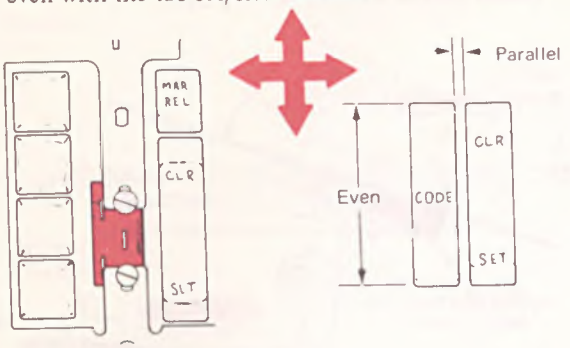
(Right Side View)

19. *On/Off Switch Stiffener* – Adjust the switch stiffener mounting plate front or rear to just touch the switch in the "off" position.



(Bottom View)

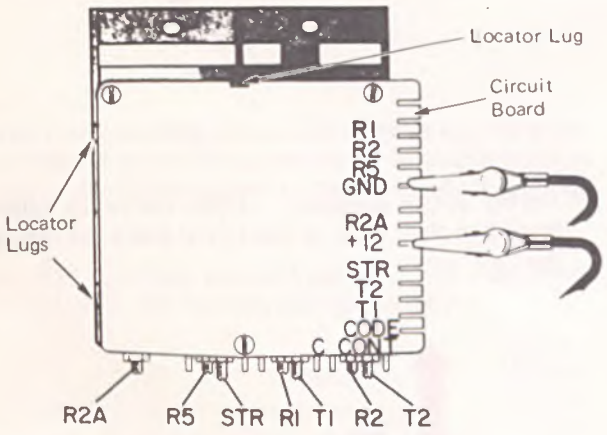
20. *Code Switch* – Position the code switch left to right and front to rear so the code button is parallel to and even with the tab set/clear button.



(Top View)

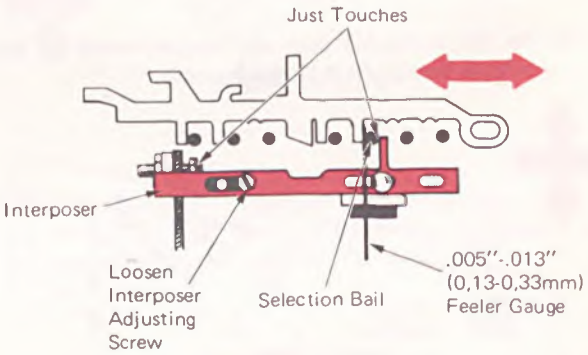
21. *Interposer Stop Screws* – This adjustment is made with the assembly out of the machine. Before making this adjustment, make certain that the circuit board is against the three locating lugs on the transmit block. If the cable wires are connected to the circuit board, remove the two black ground wires. Set an ohm meter on the RX100 scale and connect the leads between the 12V and ground connections on the board. The meter will indicate an open circuit connection until a switch makes, then it should read approximately 1500 ohms.

a. Strobe Interposer: Turn the stop screw in until the switch just makes and then out 2 1/4 turns.
b. Selector Interposers: Turn the stop screw in until the switch makes and then out until the switch just breaks plus an additional 1/3 to 1/2 turn.



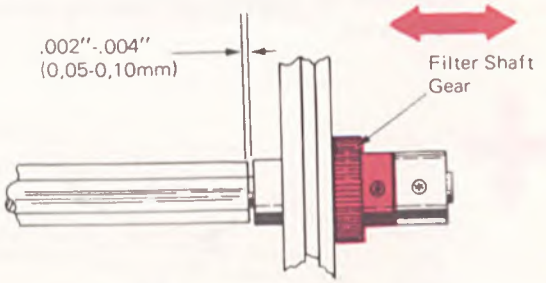
22. *Interposer Adjusting Screw* – An interposer adjusting screw is located on each transmit block interposer.

a. Mount the transmit block to the extreme forward position. Remove the transmit circuit board.
b. Insert a .005"-.013" feeler gauge between the lug on a keyboard interposer and the selection bail that operates the transmit interposer to be adjusted.
c. Loosen the transmit interposer adjusting screw and position the extension of the interposer so it just touches the selection bail while the shoe of the interposer is resting on the stop screw. Tighten the screw and repeat the adjustment steps for all transmit interposers.
d. The transmit interposer adjustment may be checked by moving a selection bail forward and observing .005"-.013" clearance between the bail and its corresponding transmit interposer.
e. Remount the circuit board and position it against the three locating lugs on the transmit block. Reinstall the two black ground wires if they were removed.



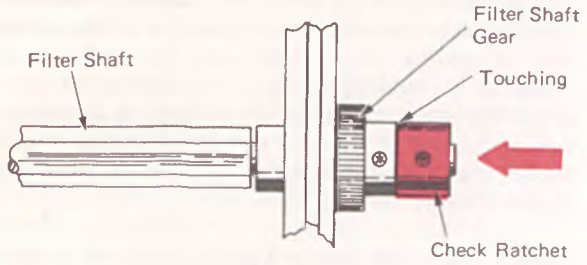
(Left Side View)

23. *Filter Shaft End Play* – Position the filter shaft gear for .002"-.004" end play of the filter shaft.



(Top View)

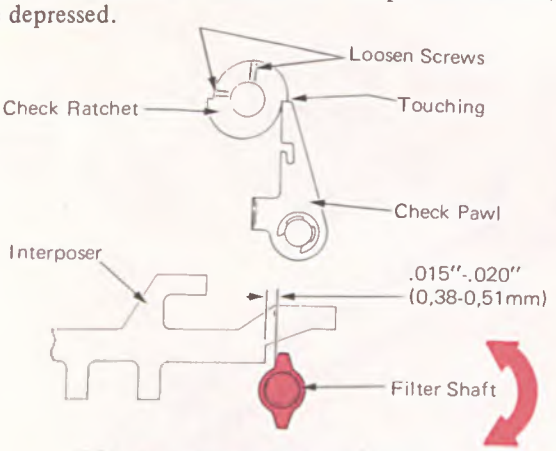
24. *Filter Shaft Check Ratchet* – Position the check ratchet to the left against the filter shaft gear.



(Top View)

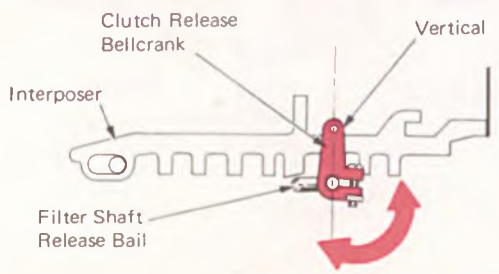
25. *Filter Shaft Timing* – With the machine at rest, the working surface of the filter shaft should clear the rear of any latched interposer by .015"-.020". Loosen the filter shaft check ratchet and adjust the filter shaft rotationally to meet this condition.

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



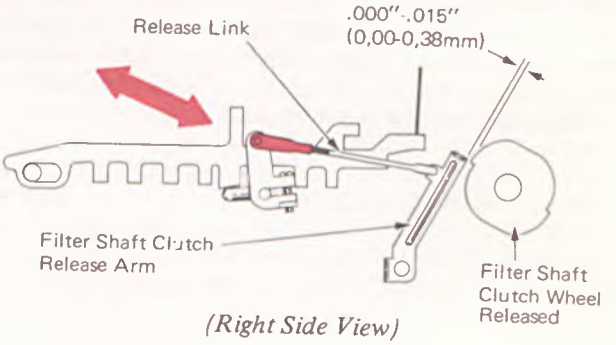
(Machine At Rest-Right Side View)

26. *Clutch Release Bellcrank* – Adjust the bellcrank rotationally on the release bail so the hole in the bellcrank is vertical with the center of the filter shaft.



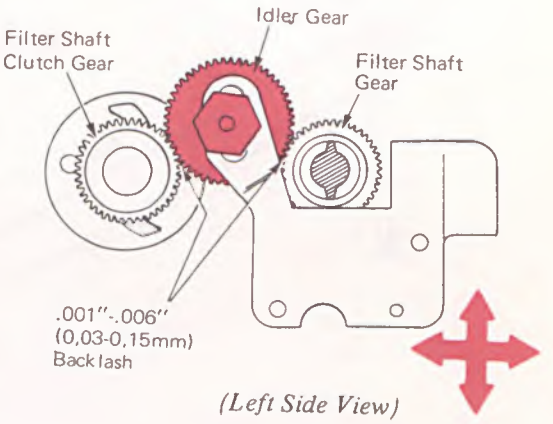
(Right Side View)

27. *Filter Shaft Clutch Release* – Adjust the release link for .000"-.015" overthrow clearance after the filter shaft clutch wheel is released.



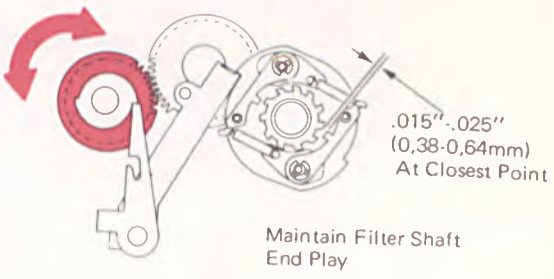
(Right Side View)

28. *Filter Shaft Clutch Idler Gear* – Adjust the idler gear for .001"-.006" backlash in the filter shaft gear train.



(Left Side View)

29. *Filter Shaft Clutch Pawl Clearance* – With the filter shaft latched at rest, rotate the filter shaft gear about the filter shaft to obtain .015"-.025" clearance between the filter shaft clutch pawls and the ratchet.



(Filter Shaft Latch At Rest-Right Side View)

SHIFT OPERATIONAL THEORY

The purpose of the shift mechanism is to rotate the typehead 180 degrees in the counterclockwise direction. This action places the upper case hemisphere of the typehead near the platen for typing capital letters. Each upper case character is in the same tilt and rotate band as its lower case counterpart, but 180 degrees from it.

The shift mechanism is operated through the shift magnet and clutch (Figure 1). When the magnet is energized, the shift clutch is released and rotary motion of the operational shaft is coupled to the shift cam. The shift arm is then driven to the right by the cam. Attached to the top of the arm is the shift arm pulley which supports the rotate tape. Lateral motion of the shift arm is transferred through the rotate tape and rotate pulley to shift the typehead 180 degrees (Figure 1).

NOTE: The rotate tape and pulley operation is covered in the Character Selection section of this manual.

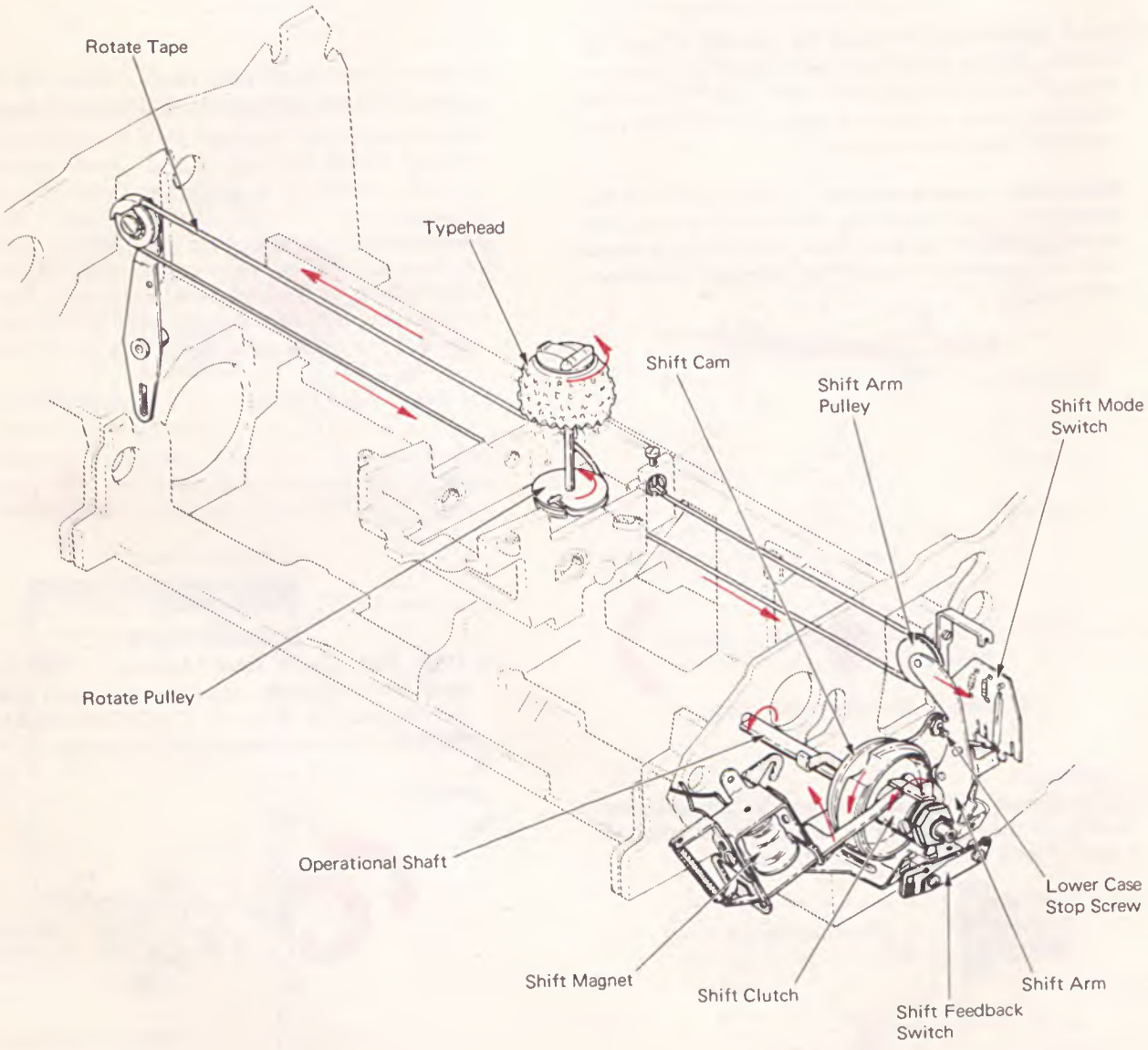
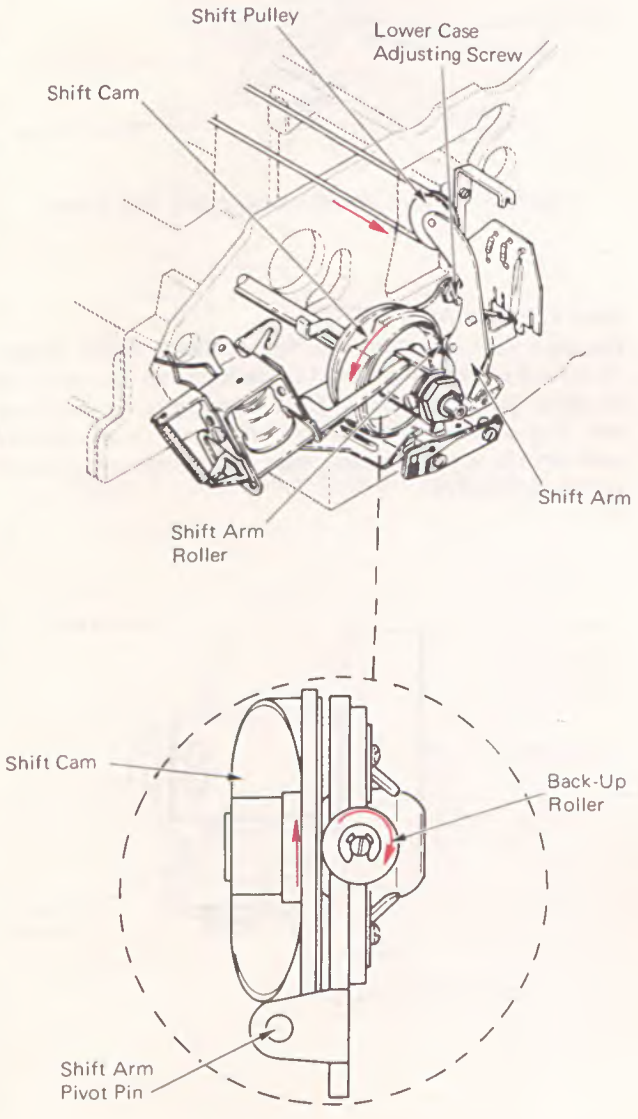


Figure 1 – Shift Mechanism

SHIFT ARM & CAM

The shift arm pivots left-to-right about a pin at the bottom of the arm. Mid-point on the shift arm is a roller that rides the surface of the shift cam (Figure 2). The lower case adjusting screw determines the rest position of the arm in lower case.

The shift cam is disc shaped and has a high rise on the right side. A roller is mounted in a fixed position to the left of the shift cam, directly opposite the roller on the shift arm, and serves as a backup roller for the cam. When the cam is rotated 180 degrees, the high point is encountered, forcing the shift arm to the right into the upper case position.



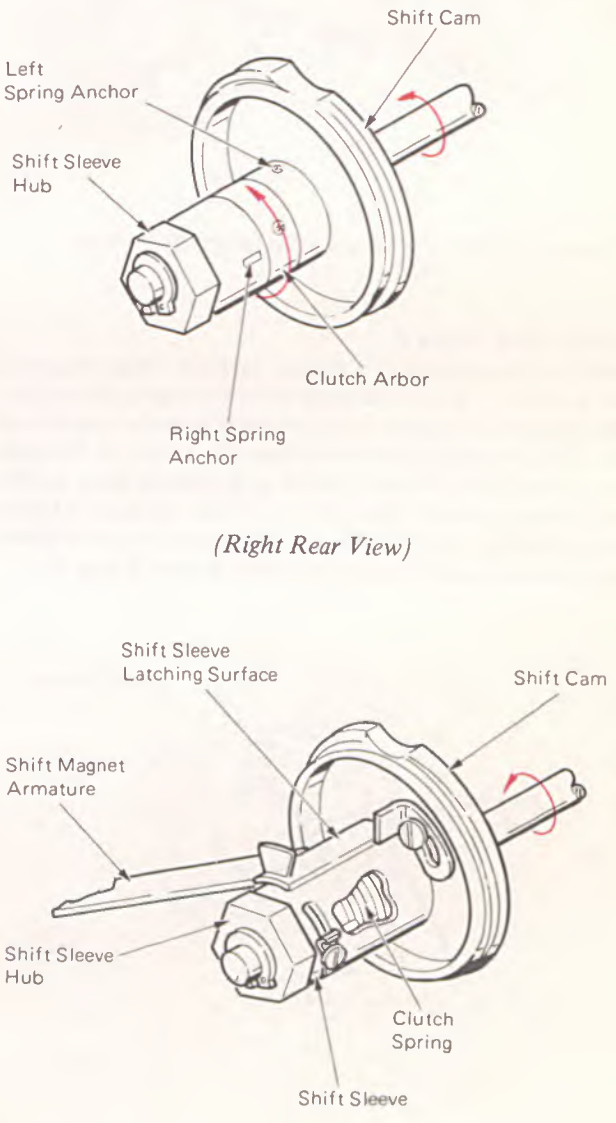
(Rear View)

Figure 2 – Shift Arm & Cam

SHIFT CLUTCH OPERATION

The shift clutch consist of a clutch spring, shift sleeve, and the shift sleeve hub (Figure 3). The left end of the clutch spring is anchored to the shift cam and the right end is anchored to the shift sleeve hub. Positioned between the shift sleeve hub and the shift cam is the clutch arbor which is setscrewed to the operational shaft.

The shift sleeve is solidly attached to the sleeve hub and has two latching surfaces 180 degrees apart. The armature of the shift magnet is positioned in front of the shift sleeve and contacts one of the latching surfaces. When the shift magnet is energized, its armature unlatches the shift sleeve and hub. This allows the clutch spring to tighten around the clutch arbor and drive the shift cam (Figure 3).



(Right Rear View)

Figure 3 – Shift Clutch Operation (Right Rear View)

SHIFT OVERTHROW STOP

De-energizing the shift magnet positions its armature to re-latch the shift sleeve and stop the shift clutch after 180 degrees rotation.

When the shift cam momentum has carried the cam far enough to properly disengage the spring clutch, the cam must be restricted from overthrowing its rest position. Overthrow of the shift cam is controlled by an adjustable overthrow stop attached to the cam (Figure 4). The shift overthrow stop operates against the rear of the raised latch on the shift sleeve.

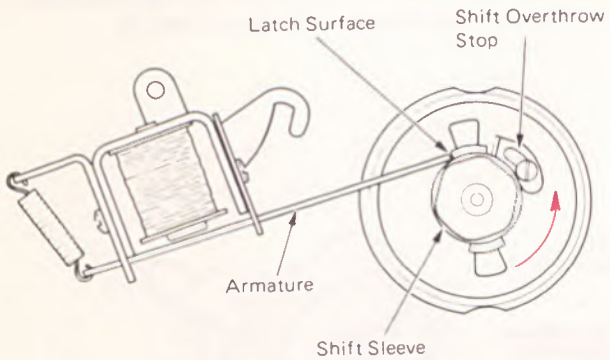


Figure 4 – Shift Overthrow Stop (Right Side View)

SHIFT CAM BRAKE

Shift cam overthrow is a greater problem when returning the machine to lower case than when shifting to upper case. This is due to the acceleration received from the pressure of the shift arm roller against the receding surface of the shift cam. To prevent excessive noise and possible parts breakage, a brake is used. The shift cam brake contacts a raised braking surface on the shift cam as the cam returns to lower case, preventing acceleration of the shift cam (Figure 5).

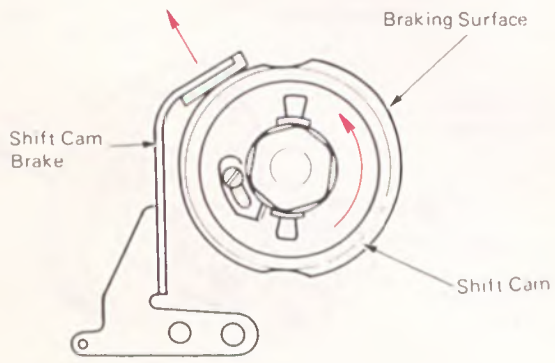


Figure 5 Shift Cam Break Operation (Right Side View)

SHIFT DETENT

Mounted on a pivot stud below the shift cam is the shift detent roller (Figure 6). As the cam approaches either the upper or lower case position, the detent roller is spring loaded into corresponding detent notches located on the outside surface of the cam. This detenting action helps to place and hold the cam in its proper rest position for both upper and lower case.

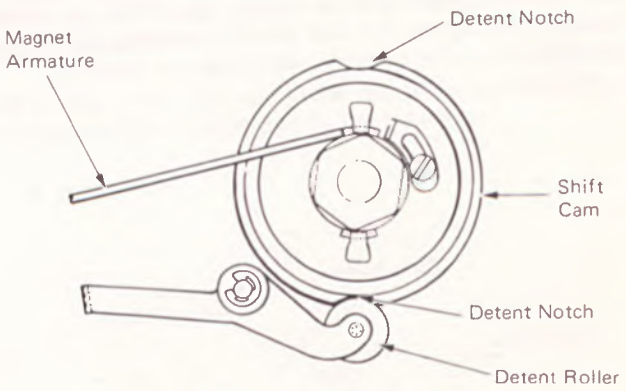


Figure 6 – Shift Cam Detented (Right Side View)

SHIFT FEEDBACK SWITCH

During a shift operation, the shift feedback switch (Figure 7) is used to prevent the next operation from occurring and to signal the electronics when to de-energize the shift magnet. The shift feedback switch, which is a shunt operated reed switch, is opened and closed by the two metal shunts on the shift sleeve.

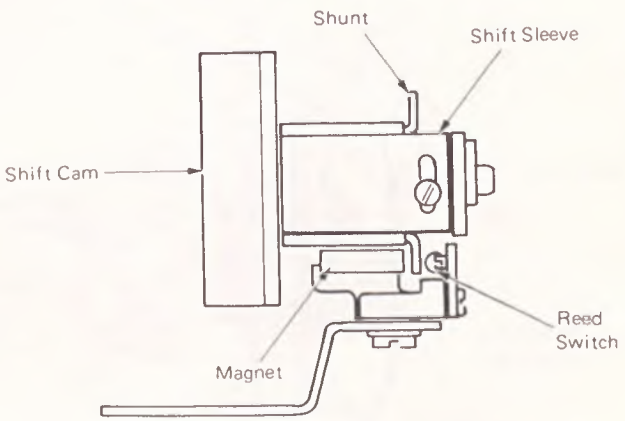


Figure 7 – Shift Feedback Switch (Front View)

SHIFT MODE SWITCH

The shift mode switch, monitors the position of the shift arm (Figure 8). The switch is operated by a magnet attached to the shift arm. When the shift arm is in the lower case position, the magnet is away from the reed switch and the switch is open. With the shift arm in the upper case position, the magnet will be positioned in front of the switch causing it to close (Figure 8). If the shift arm is in the lower case position when an upper case character is transmitted from the keyboard or memory, the electronics will pick the shift magnet allowing the typehead to be rotated before the character is selected. If the shift arm is in the upper case position, the shift magnet will not be picked and a shift operation will not occur.

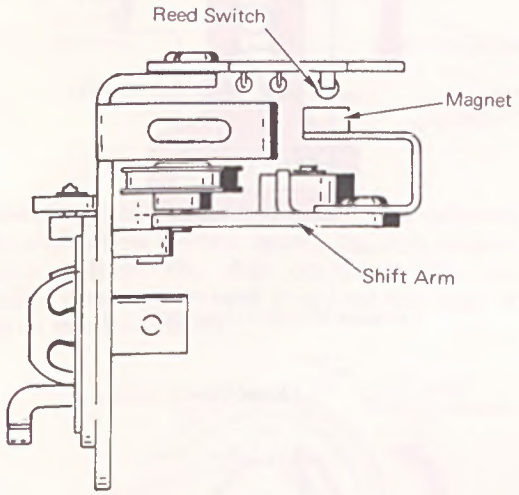
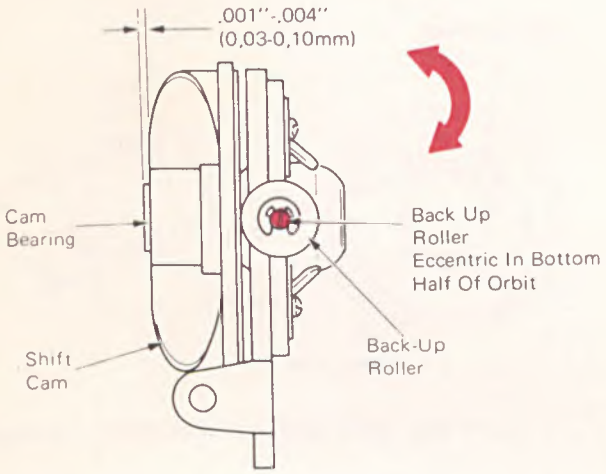


Figure 8 – Shift Mode Switch (Top View)

SHIFT ADJUSTMENTS

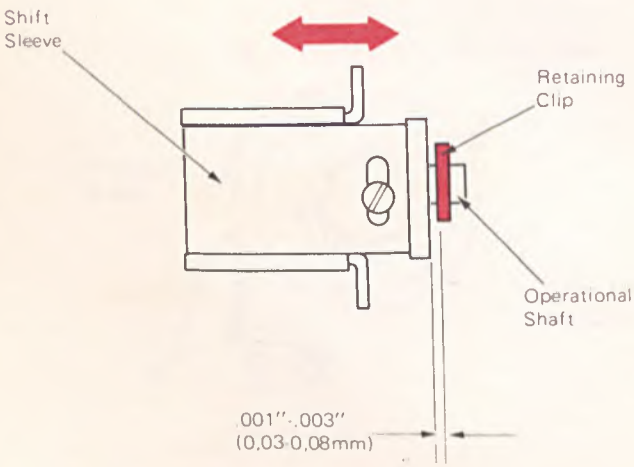
1. *Shift Cam Backup Roller* – Adjust the backup roller eccentric left or right so .001"-.004" of the cam bearing extends beyond the cam. The eccentric should be kept in the bottom half of its orbit.

CAUTION: Any change in the rest position of the backup roller, directly affects the typehead homing and the shift motion adjustments. Be sure to recheck these adjustments.



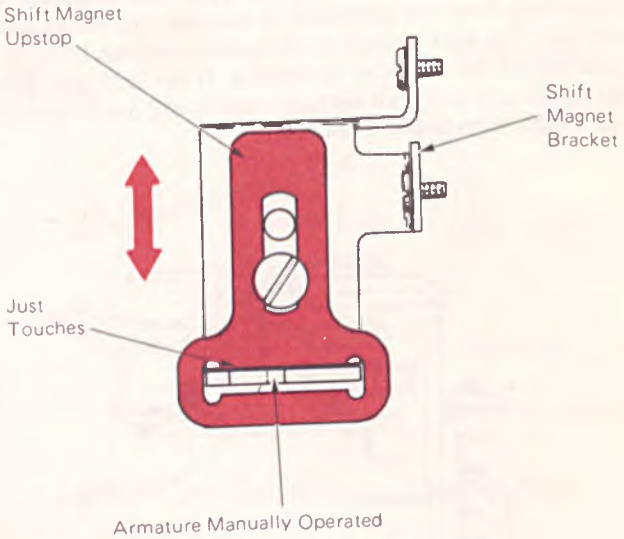
(Rear View)

2. *Shift Sleeve* – Position the retaining clip left-to-right on the operational shaft so the sleeve assembly has .001"-.003" end play.



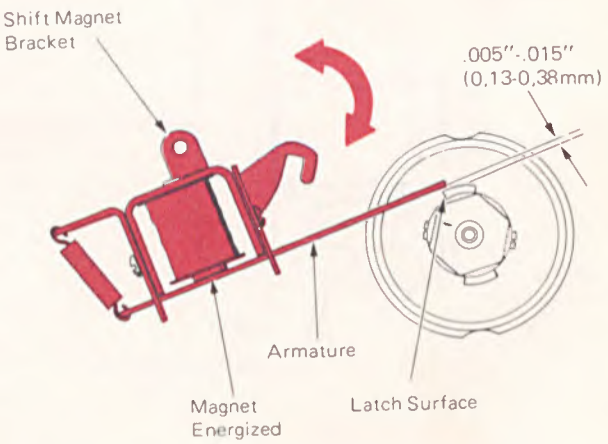
(Front View)

3. *Shift Magnet Upstop* – With the shift magnet armature manually operated, adjust the shift magnet upstop to just touch the armature.



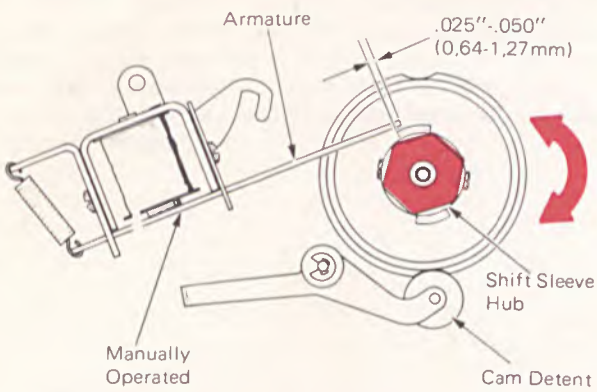
(Rear View)

4. *Shift Magnet Bracket* – With the shift magnet energized, adjust the magnet bracket so the magnet armature clears the latching surface on the shift sleeve by .005"-.015".



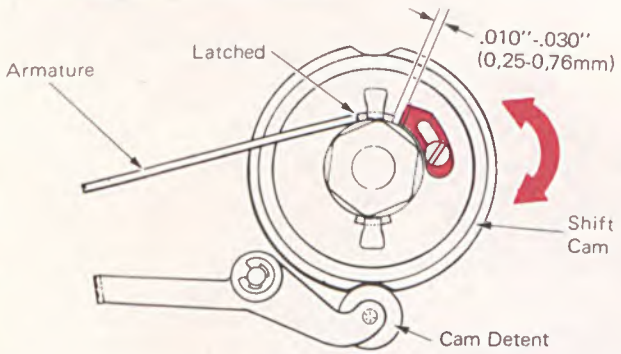
(Right Side View)

5. *Shift Sleeve* – Adjust the shift sleeve to advance .025"-.050" when the shift magnet is manually operated with the power off and the cam detented.



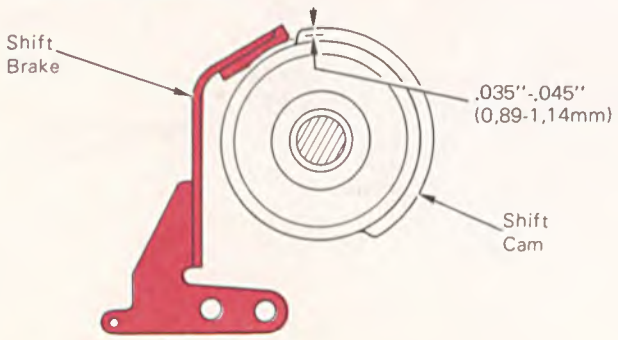
(Power Off Right Side View)

6. *Shift Overthrow Stop* – With the shift cam detented and the shift sleeve latched against the shift magnet armature, adjust the shift overthrow stop for .010"-.030" clearance between it and the rear edge of the stop on the clutch sleeve.



(Right Side View)

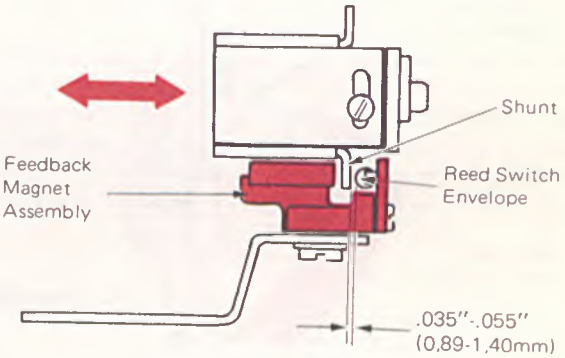
7. *Shift Cam Brake* – Adjust the shift brake to obtain .035"-.045" rise as the brake contacts the braking surface of the shift cam.



(Right Side View)

8. *Shift Feedback Switch* – Adjust the shift feedback switch as follows:

a. Position the feedback magnet assembly left-to-right for .035"-.055" clearance between the reed switch envelope and the shunt on the shift sleeve.



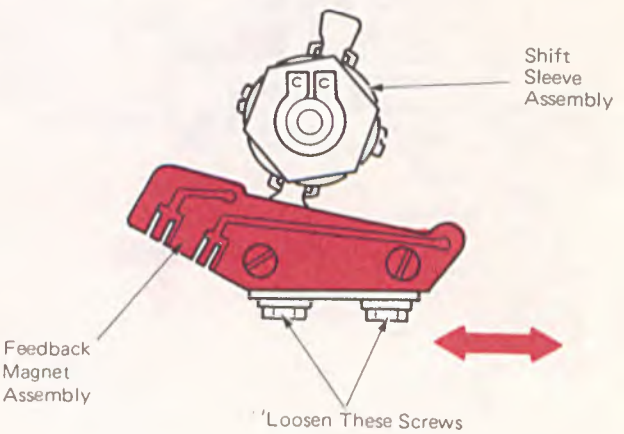
(Front View)

b. Position the feedback magnet assembly front-to-rear so the feedback switch reopens when a shift operation is cycled 129 degrees to 149 degrees into the shift cycle.

NOTE: The switch should close between 2 degrees and 15 degrees.

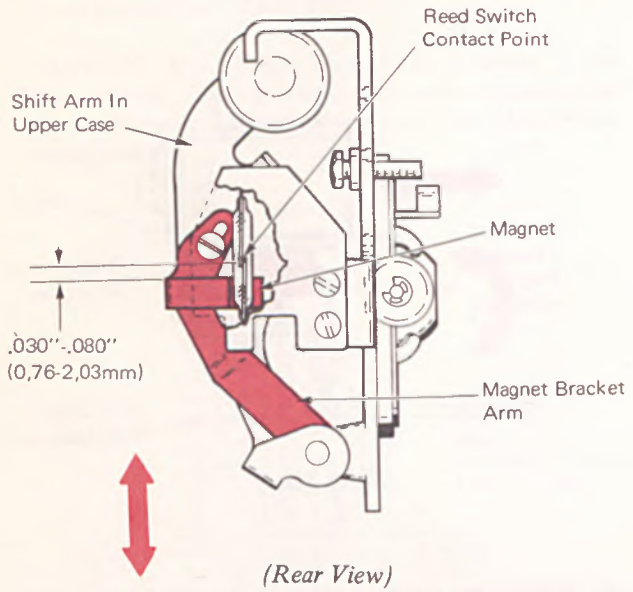
Switch Reopens
When Machine
Is Cycled To
129 Deg. – 149 Deg.

Note:
Switch Should Close
Between 2 Deg. – 15 Deg.



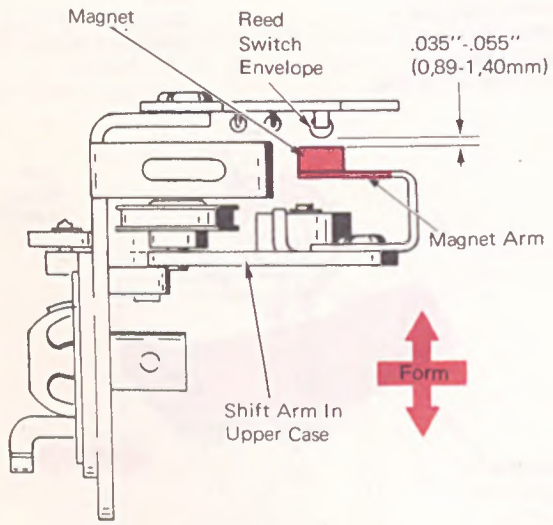
(Right Side View)

9. *Magnet Arm Vertical* – With the shift arm in upper case, adjust the magnet bracket arm vertically so the top edge of the magnet is .030"-.080" below the contact points of the reed switch.



(Rear View)

10. *Shift Mode Magnet* – Form the magnet arm so there is .035"-.055" between the magnet and the reed switch envelope.



(Top View)

CHARACTER SELECTION OPERATIONAL THEORY

The character selection mechanism positions the typehead in the desired character or symbol position for printing. At rest, the position of the typehead is such that the middle character of the upper band is in position to strike the platen. This home character is the letter "z". If any character other than the "z" is desired, the typehead must be tilted and/or rotated.

The character selection mechanism consists of three sub-mechanisms: tilt, rotate, and print selection. The tilt and rotate mechanisms transfer motion through their tape systems to tilt and rotate the typehead. The print selection mechanism operates the tilt and rotate mechanisms to control the amount of tilt and rotate of the typehead (Figure 1).

The components of the character selection mechanism covered in this section only tilt and rotate the typehead to the approximate character position. This is referred to as coarse alignment. Further positioning and locking of the typehead prior to printing is referred to as fine alignment and is covered in the Fine Alignment Section of this manual.

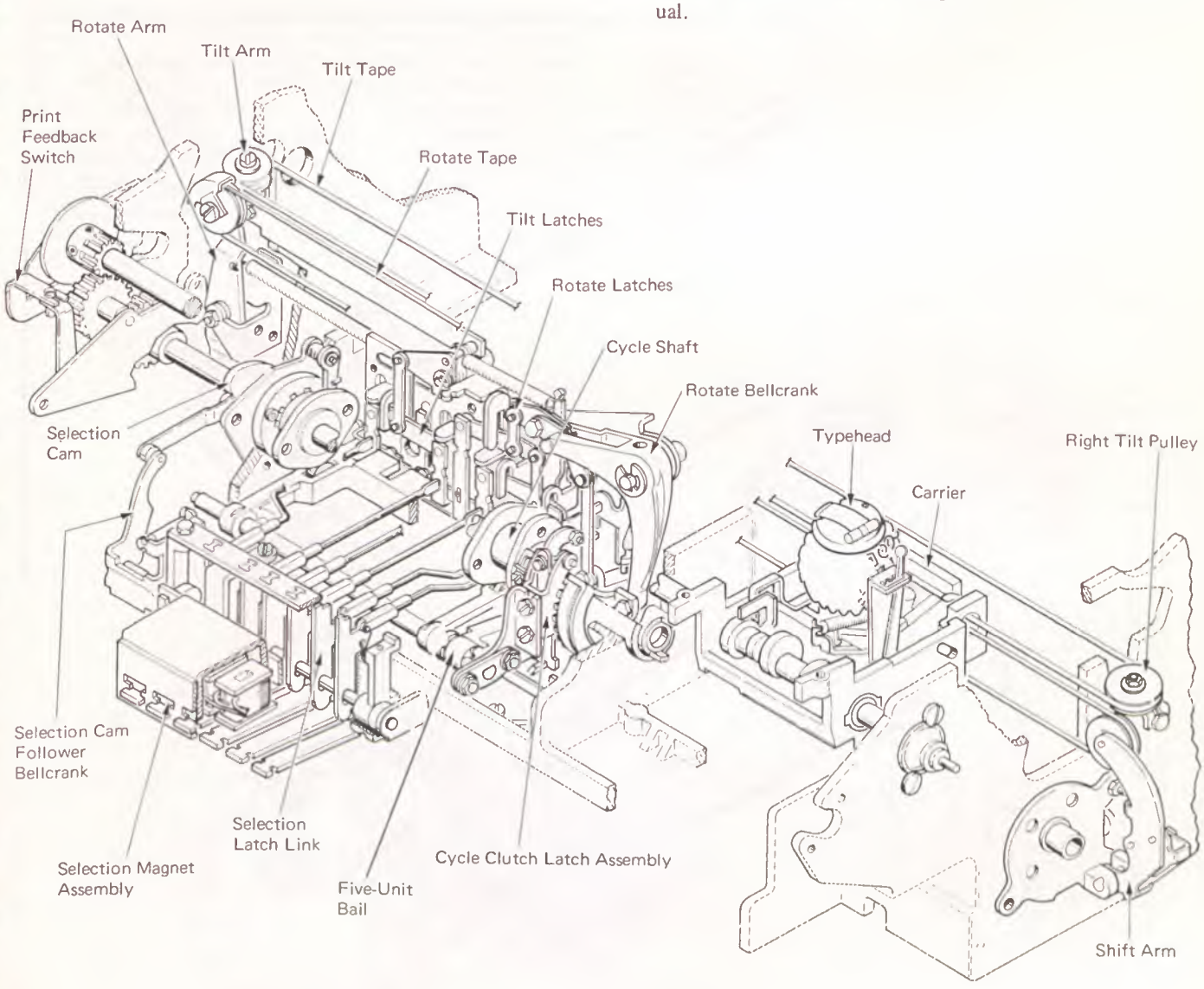


Figure 1 – Character Selection Mechanism

CHARACTER SELECTION DRIVE

Drive for the character selection mechanism is provided by the I/O motor and drive mechanism through the cycle clutch (Figure 2). When the cycle clutch is operated, motion is transferred through the cycle shaft and the character selection cam. The cycle shaft supplies motion to operate the tilt and rotate mechanisms. The print feedback shaft supplies motion to operate the print selection mechanism.

The cycle clutch is a spring clutch consisting of a clutch sleeve, clutch spring and clutch collar. The clutch spring couples rotary motion of the cycle clutch pulley hub to the cycle shaft. The left end of the clutch spring fits over the cycle shaft and is clamped securely to the cycle shaft by the clutch collar. The right end of the cycle clutch spring fits through the clutch sleeve and encloses the arbor surface of the cycle clutch pulley hub. A turned up ear on the right end of the clutch spring fits into a notch on the right side of the clutch sleeve. The clutch sleeve controls the expansion and contraction of the clutch spring. The arbor surface of the cycle clutch pulley hub is slightly larger than the inside diameter of the clutch spring when the spring is in its relaxed state. With the spring held unwound, its inside diameter is increased enough to allow the pulley hub to fit inside and have clearance. When the right end of the clutch spring is released, the spring will collapse around the pulley hub providing a drive connection between the cycle clutch pulley hub and the cycle shaft. When the right end of the clutch spring is stopped, as the left end continues to turn, the inside diameter of the spring will increase, thus breaking the drive connection between the pulley hub and the cycle shaft.

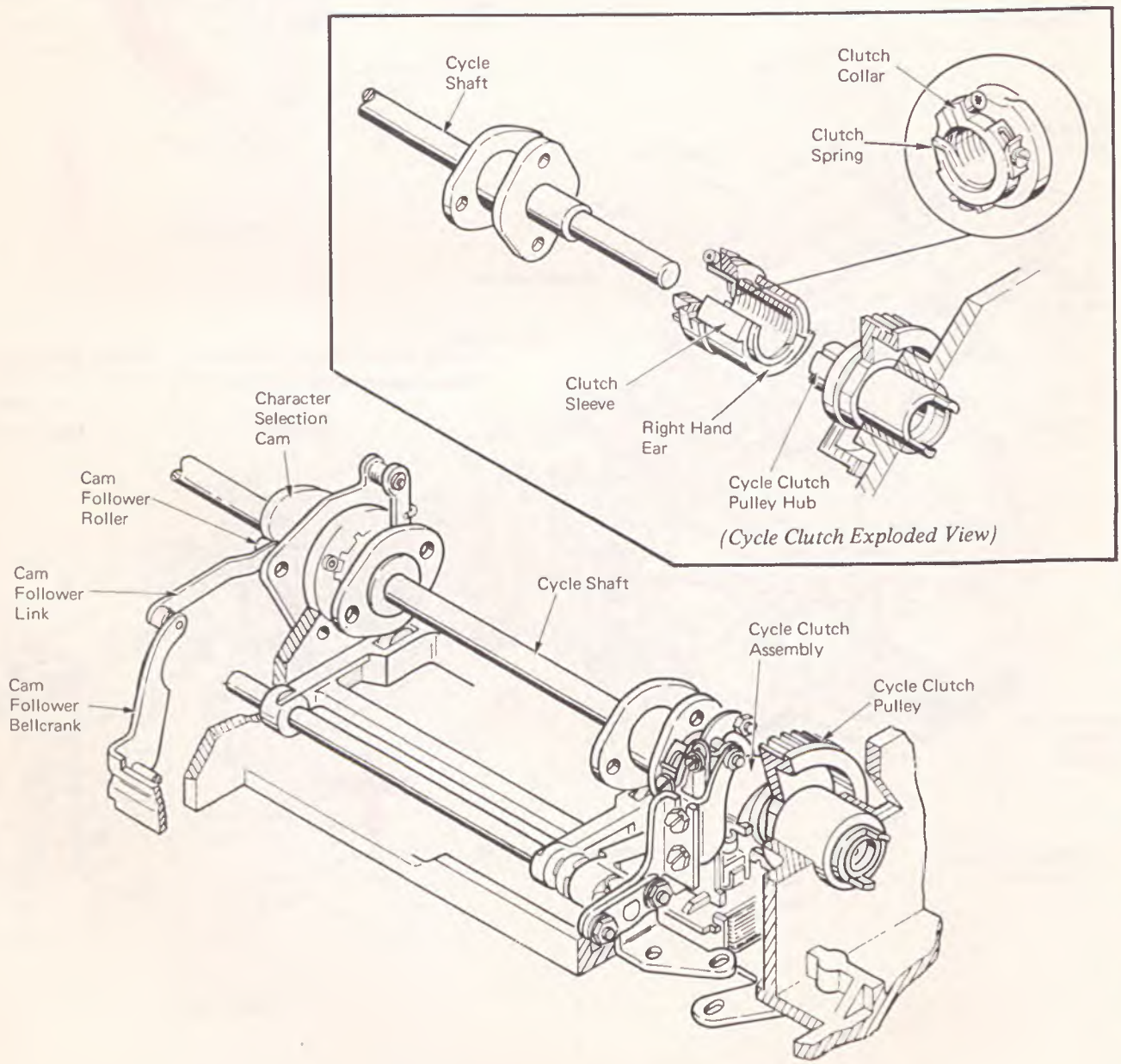


Figure 2 – Character Selection Drive

Starting and stopping the cycle clutch is controlled by two latching surfaces on the clutch sleeve, a clutch latch assembly and a cycle clutch magnet (Figure 3). The clutch latch assembly consists of a clutch latch, a clutch armature latch and a restoring cam follower arm. At rest, the clutch latch engages one of the latching surfaces on the clutch sleeve which holds the clutch spring in its unwound state. The clutch latch is prevented from disengaging the clutch sleeve by the clutch armature latch and the clutch magnet armature. When the magnet is energized the magnet armature is pulled down, allowing the clutch latch spring to pull the latch away from the clutch sleeve. The clutch spring will then collapse around the cycle clutch pulley hub and couple drive to the cycle shaft.

As the cycle shaft and clutch are rotated, the clutch latch is repositioned to engage the next latching surface of the clutch sleeve and the clutch armature latch is repositioned to latch on the cycle clutch magnet armature. This is accomplished by a restoring cam and restoring cam follower arm. The restoring cam is positioned around the clutch collar and rotates with the cycle shaft. The restoring cam follower arm moves the clutch latch and clutch armature latch to the rear as it moves to the high point of the restoring cam. The latch assembly will then stop the clutch sleeve and the right end of the clutch spring after 180 degrees of rotation. The cycle clutch magnet is de-energized by the print feedback switch. The print feedback switch is discussed later in this section.

The cycle shaft has inertia and tends to keep turning even though the sleeve has stopped. The result is the spring unwinds and is expanded to the point where the cycle clutch pulley hub is no longer driving the clutch spring. The cycle shaft continues to rotate until the restoring cam contacts a notch in the left side of the clutch sleeve which acts as an overthrow stop. The cycle shaft is then prevented from rebounding by the cycle clutch check pawl located at the left end of the cycle shaft. The check pawl engages a step on the cycle shaft check ratchet and prevents the cycle shaft from turning backwards and allowing the clutch spring to re-engage the cycle clutch pulley hub.

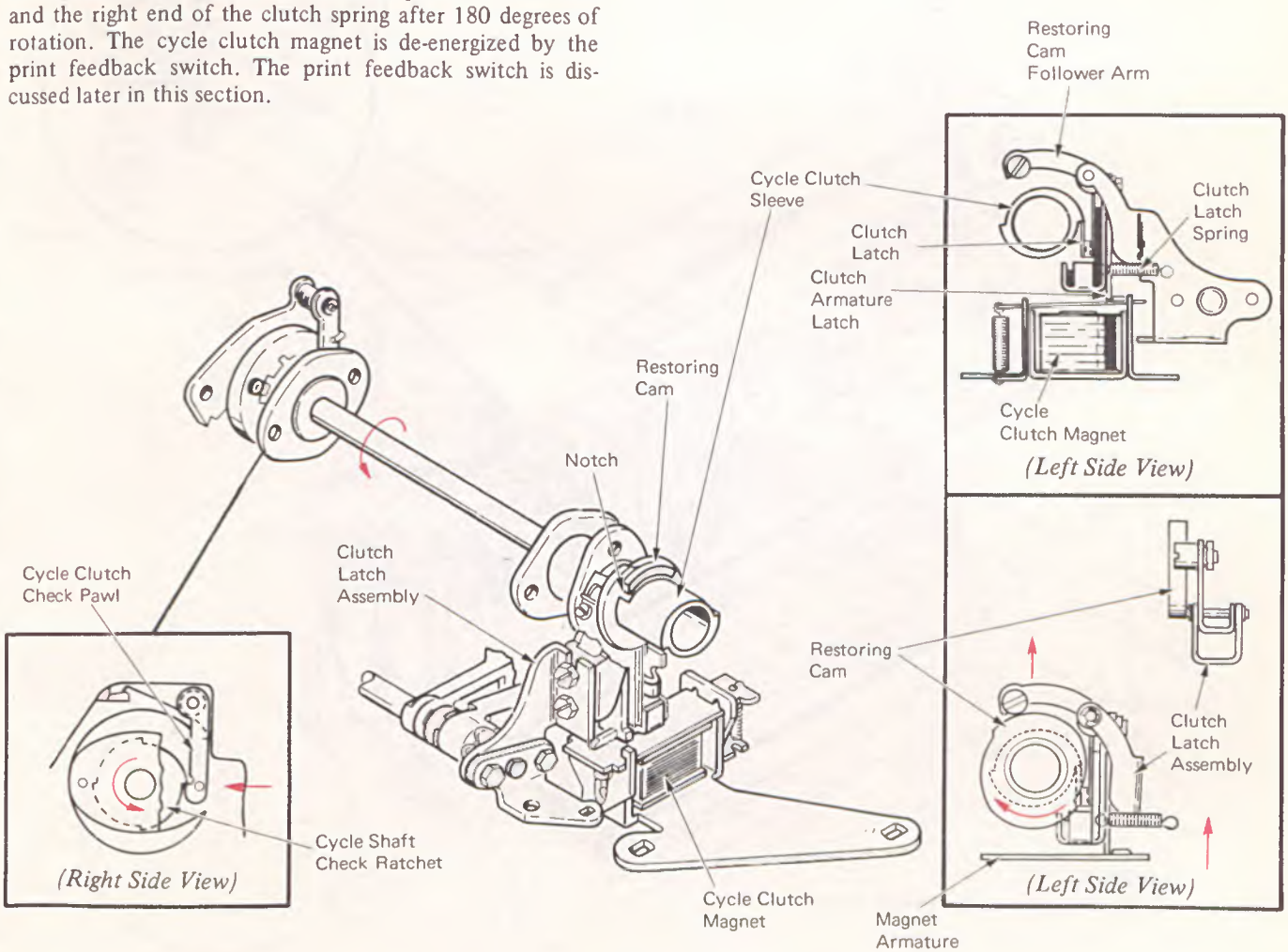


Figure 3 – Cycle Clutch Operation

CYCLE SHAFT AND LATCH BAIL

Drive is transmitted to the tilt and rotate mechanisms through three double lobed cams on the cycle shaft, the latch bail, and the five unit bail (Figure 4). The three cams are separated on the cycle shaft, one on the left and two on the right. The left cam and middle cam are paired to operate the latch bail. The right cam operates the five unit bail.

The latch bail is a box-shaped frame which pivots on the bail shaft at the front. Located at each side of the latch bail is a cam follower roller. An extension spring at the rear of the latch bail, applies a constant upward pressure to hold the follower rollers against the cycle shaft cams. Each time the cycle shaft rotates 180 degrees, the bail is forced down at the rear. Each selector latch has a lip which is formed to the rear just under the latch bail. An extension spring loads each latch to the rear.

The five-unit bail differs from the latch bail in that it rises when the cycle shaft rotates, but only if the five-unit latch is pulled forward. This will be discussed later in this section.

The selector latches are components of the rotate and tilt mechanisms and determine how much rotate and tilt motion the typehead will receive. The two latches to the left are concerned with tilting the typehead, while the three on the right and the five unit latch deal with rotating the typehead.

If the tilt and positive rotate selector latches remain to the rear under the latch bail, they will be pulled down when the latch bail is operated. If any latch is held forward, it will not be pulled down during an operation of the latch bail. The method of pulling the various latches forward is discussed under Print Selection in this section.

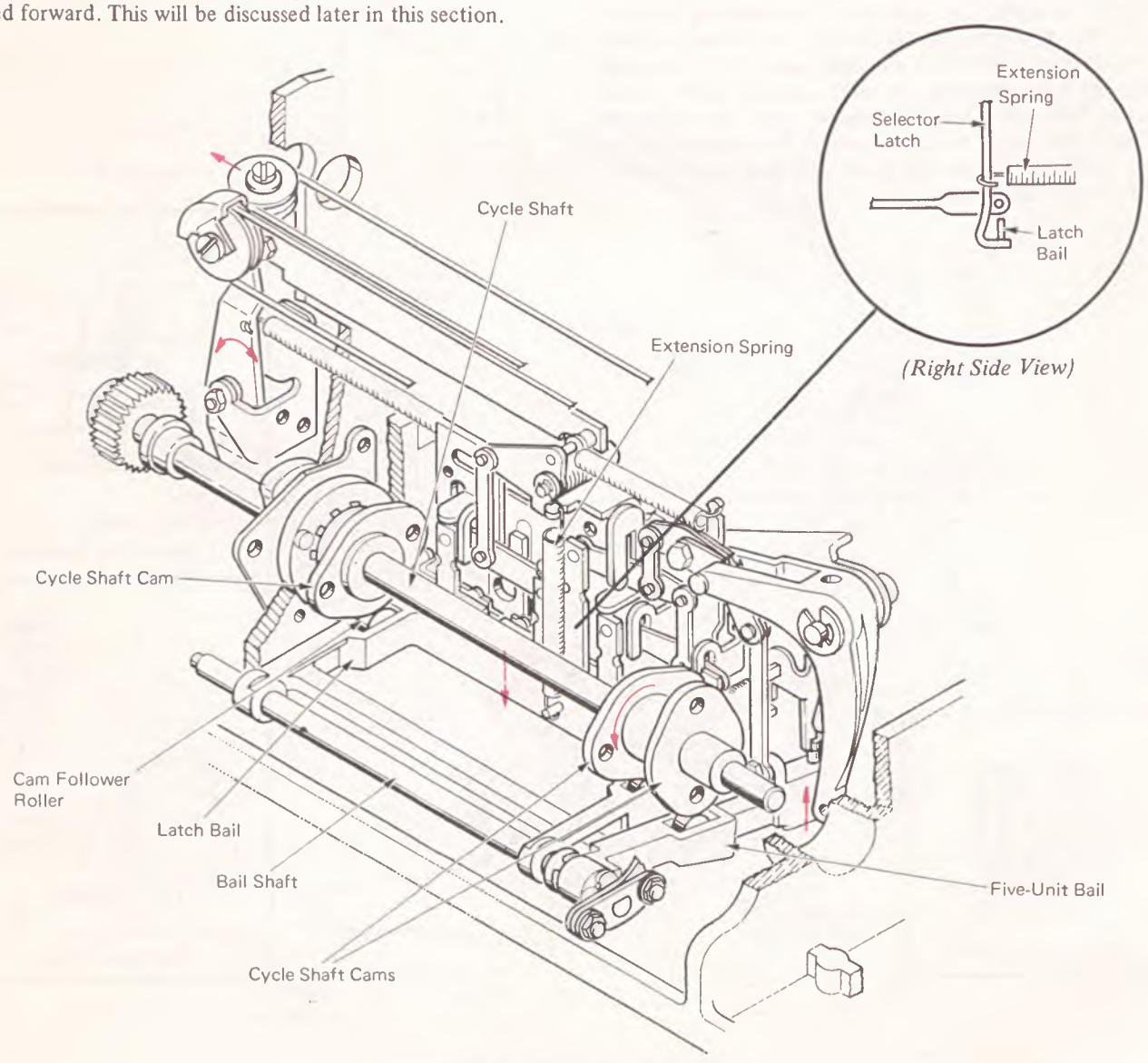


Figure 4 – Cycle Shaft And Latch Bail

TILT MECHANISM

The purpose of the tilt mechanism is to position the typehead vertically to any of four horizontal character bands so that a character in that band may be brought to the printing point. This is accomplished by transfering motion from the cycle shaft and latch bail, through a latch assembly, tilt arm, tilt tape, tilt bellcrank and a tilt ring to tilt the typehead.

TILT DIFFERENTIAL OPERATIONAL THEORY

Two tilt latches are attached at each end of a short lever by ball shouldered rivets (Figure 5). The ball shape of the shoulders allow the latches to pivot in all directions. The lever is attached by a double vertical link to a bellcrank. The bellcrank pivots on a stud at the top of the differential bracket. The connection of the double vertical link is not in the middle of the lever; therefore, the leverage developed by one tilt latch is twice that of the other.

A horizontal link connects the top of the bellcrank to the tilt arm. Operation of the bellcrank forces the tilt arm to the left to exert a pull on the tilt tape.

The left hand tilt pulley is mounted to the tilt arm on a ball shoulder pivot screw. This allows the pulley to remain horizontal regardless of the position of the tilt arm. It must remain horizontal to prevent the tilt tape from coming off the pulley.

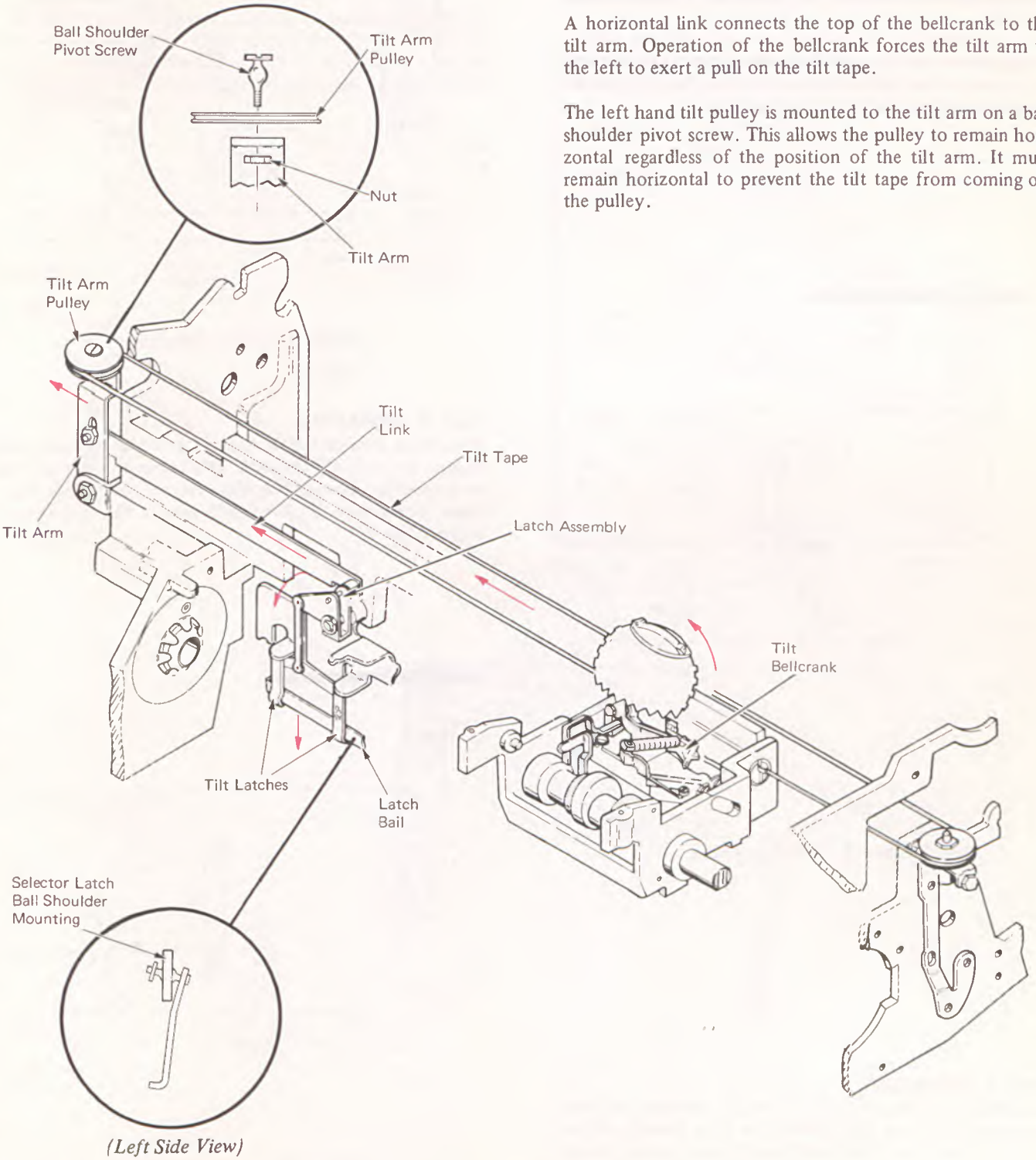


Figure 5 – Tilt Mechanism

TILT 1 OPERATION

The tilt arm is rotated by a pull on the tilt latches. When the left latch (T2 latch) is held to the front while the right latch (T1 latch) remains to the rear, only the T1 latch is pulled down by the latch bail (Figure 6). As the latch pulls down on the lever, the left end of the lever pivots against a stop lug formed out from the differential bracket. The vertical link from the lever is then pulled to operate the tilt arm. The same type of action occurs if the T2 latch is pulled down by the latch bail while the T1 latch is held forward.

Pulling down only the right latch causes the typehead to tilt a distance of one band of characters. This places the second band from the top in the printing position.

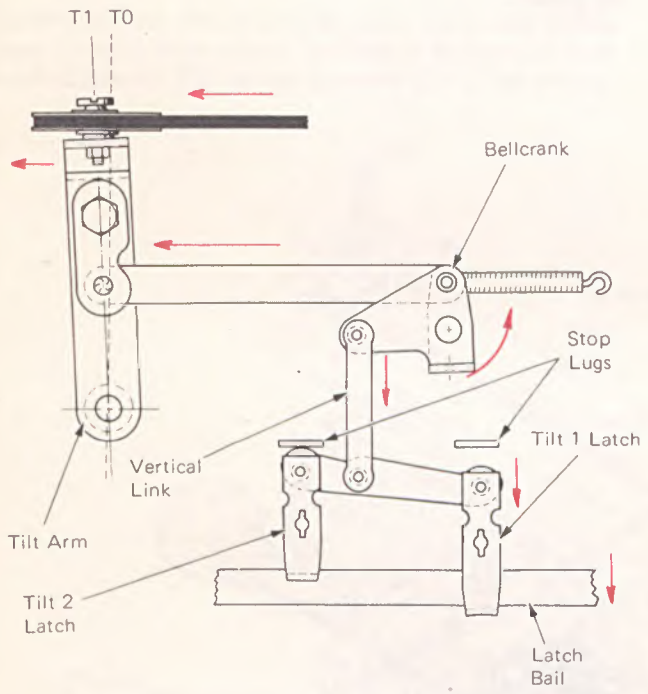


Figure 6 – Tilt 1 Operation

TILT 2 OPERATION

Operating only the T2 latch (Figure 7) develops sufficient movement to cause the typehead to tilt a distance of two bands of characters. The third band is then in the printing position.

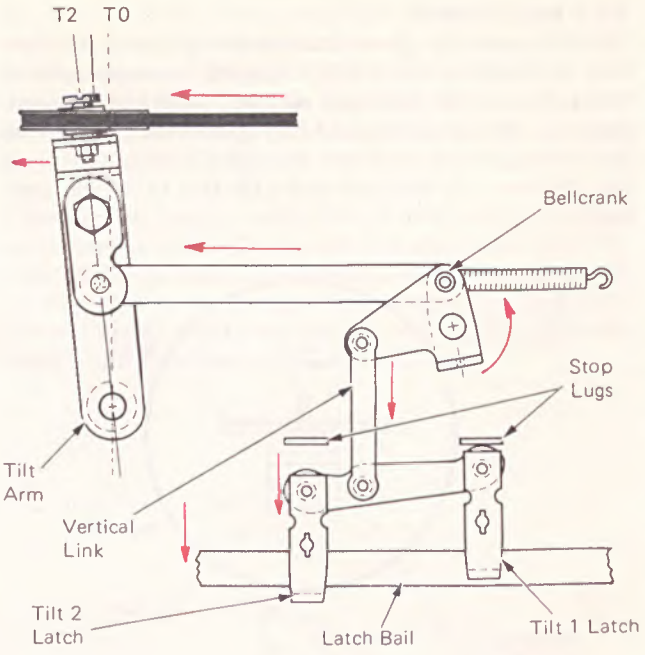


Figure 7 – Tilt 2 Operation

TILT 3 OPERATION

When both latches remain to the rear under the latch bail (Figure 8), both are operated. This causes the vertical link to receive the same motion as the latches, resulting in three character bands of tilt. The fourth band is then in the printing position.

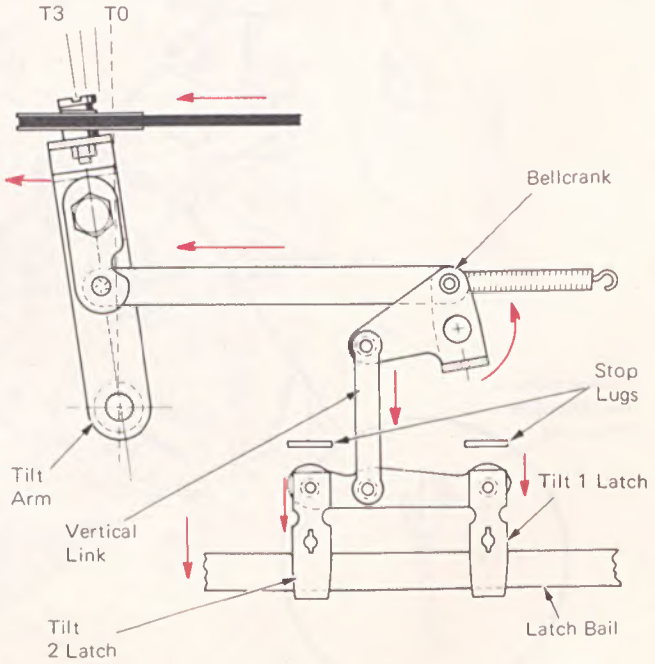


Figure 8 – Tilt 3 Operation

TILT TAPE

Mechanical motion of the tilt differential is transferred to the typehead through the tilt tape (Figure 9). The tilt tape connects to the tilt bellcrank on the rocker assembly, extends to the left around the tilt arm pulley, back to the right around the right hand tilt pulley, and is attached to the right side of the carrier. This arrangement allows left to right movement of the carrier without disturbing the tilt position of the typehead.

The right hand tilt pulley is solidly mounted and is moved for adjustment only. The tilt arm pulley moves with the tilt arm. Movement of the tilt arm to the left exerts a pull on the tilt tape, thus rotating the tilt bellcrank and causing the typehead to tilt.

TILT RING

From the tilt tape and bellcrank, mechanical motion is transferred through a link to the tilt ring (Figure 9). The tilt ring pivots on two pins between the yoke arms, inside the hollow part of the typehead. A pull on the tilt tape causes the tilt ring to pivot about its pins, thus, tilting the typehead. Because the typehead rests with the upper band of characters in the print position, all tilt operations are upward from the rest position. The tilt ring is restored to rest by an extension spring which connects to the tilt bellcrank.

NOTE: The tilt ring is discussed further in the Fine Alignment section of this manual.

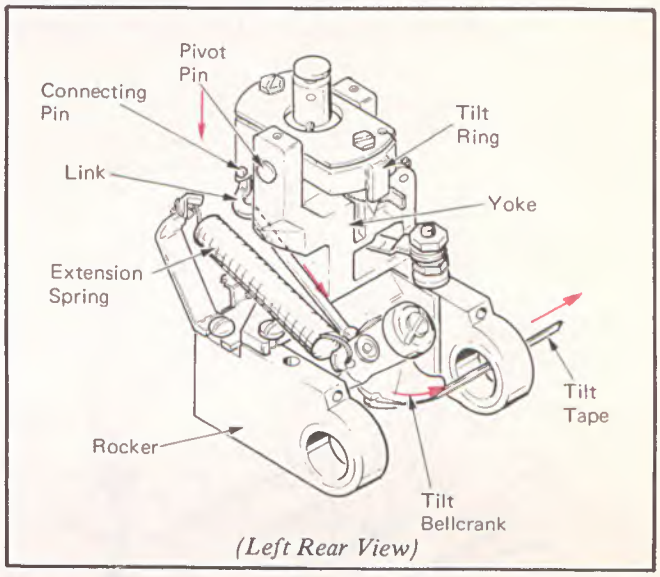


Figure 9 – Tilt Tape System

ROTATE MECHANISM

The rotate mechanism (Figure 10) positions the typehead rotationally to any of the eleven rotational positions. The rotate mechanism is similar to the tilt mechanism except more latches and levers are required. Motion is transferred through the latch assembly, balance lever, rotate bellcrank, rotate link, rotate arm, rotate tape, rotate pulley, rotate shaft and the dog bone to rotate the upper ball socket. The typehead is keyed to the upper ball socket and will rotate whenever the upper ball socket rotates.

ROTATE DIFFERENTIAL OPERATIONAL THEORY

Rotate selection is accomplished by four latches. Each latch operates with a different leverage for different amounts of rotation Various combinations of these latches position the typehead to one of the eleven rotational positions. The latches have rotational incremental values assigned to them. They are from left to right, R2A, R1, R2 and negative 5. Latch R2A is never used by itself and is only used for rotational positions 4, 5 and negative 1.

Rotation of up to five characters is required on either side of the typehead rest position. Latches R1, R2 and R2A provide 1, 2, 3, 4 and 5 increments of counterclockwise or positive rotation, depending on the combination operated. Those latches not needed are pulled forward by the print selection mechanism. The negative 5 rotate latch rotates the typehead five units in the clockwise or negative direction. Lesser increments of negative rotation are selected by including one or more positive increments (latches) with the negative 5. The negative 5 latch, however, must be pulled forward to be effective.

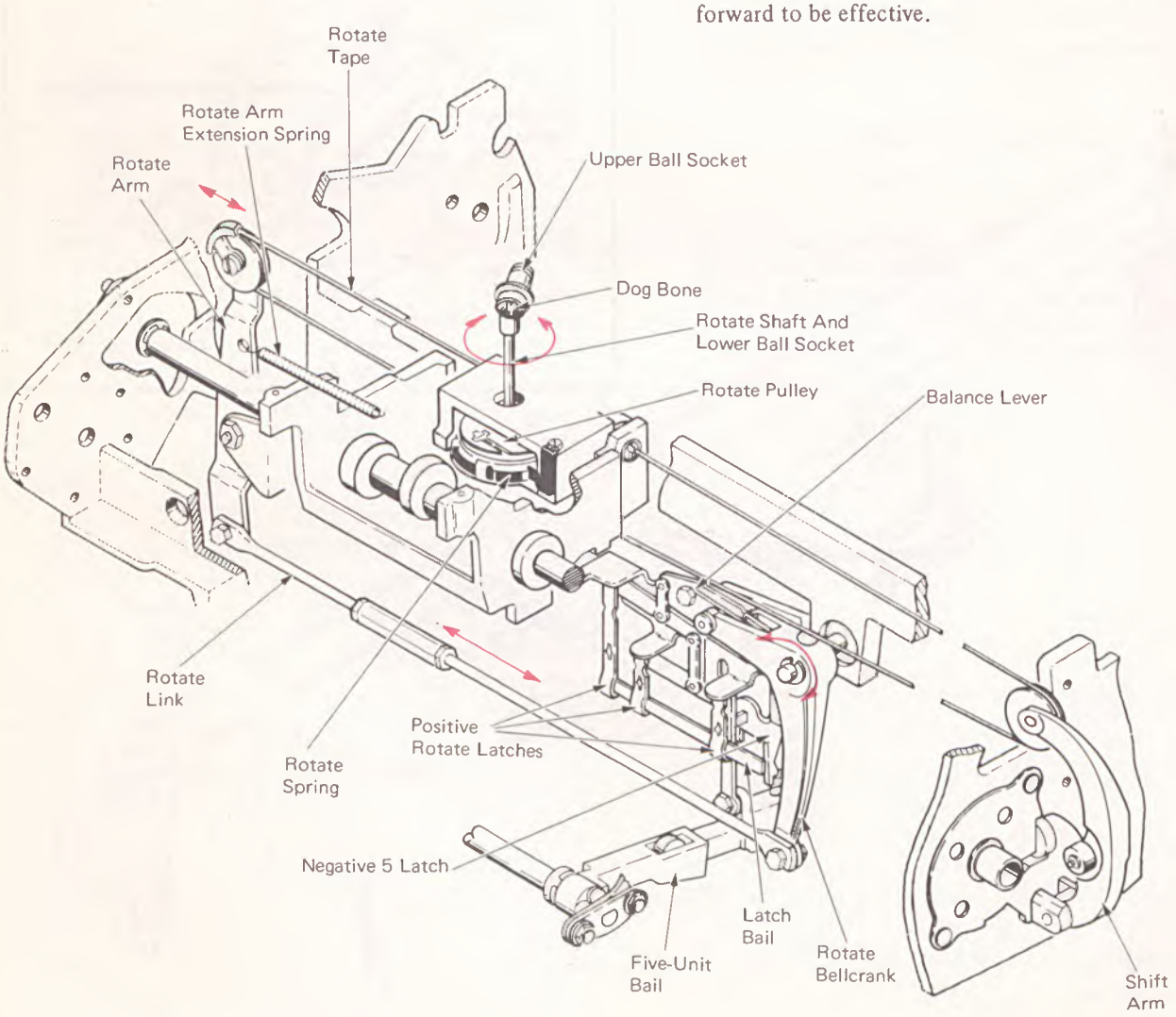


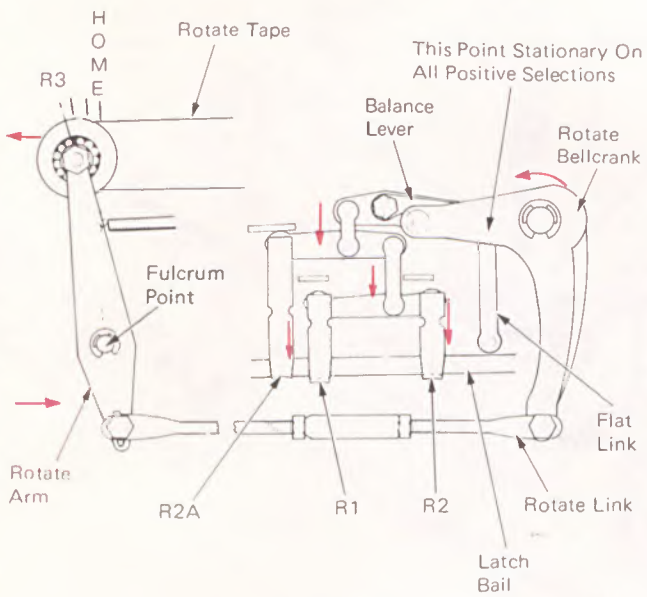
Figure 10 – Rotate Mechanism

POSITIVE ROTATION

Consider the positive rotation of the typehead first. The three selector latches involved in positive rotation are those farthest to the right under the latch bail. They are from left to right, R2A, R1, and R2.

The R1 latch is used for one-character rotation and the R2 latch for two-character rotation. The R1 and R2 latches are operated for a three-character rotation (Figure 11). The R2 and R2A latches are operated for a four-character rotation. A five-character rotation is obtained by pulling down the R1, R2 and R2A latches.

An adjustable balance lever at the middle of the rotate differential, is connected to the horizontal arm of the rotate bellcrank. It is referred to as the balance lever, because it balances the amount of motion between positive and negative rotation. The right end of the balance lever is held stationary during positive rotation by a flat link connected to the five unit bail. A downward pull at the left end causes the rotate bellcrank to rotate counterclockwise. The rotate link connects the bottom of the rotate bellcrank to the bottom of the rotate arm. Counterclockwise rotation of the bellcrank causes the rotate arm to pivot about its fulcrum point and exert a pull on the rotate tape.



(Front View)

Figure 11 – Positive Three Rotate Operation

NEGATIVE ROTATION

Positive rotation of the typehead is achieved by operating the rotate bellcrank counterclockwise to create a pull on the rotate tape. It follows then that operating the rotate bellcrank clockwise will allow the typehead to rotate in a negative direction.

In order for the bellcrank to rotate clockwise, the right end of the balance lever must be raised. The right end of the balance lever has a flat link connection to the five-unit bail assembly (Figure 12). The five-unit bail is a single arm located under the cycle shaft and pivots on the bail shaft. The bail has a cam follower roller located about mid-point on the bail and at rest, is held down (inactive) by the high point of the right hand cam on the cycle shaft. When the cycle shaft rotates and the five-unit bail is allowed to rise, the right end of the balance lever rises to allow clockwise operation of the rotate bellcrank.

The high point of the right hand cam is 90 degrees from the high point of the other two cams. This ensures that when the latch bail is driven DOWN in the active position, the five-unit bail can be UP in the active position.

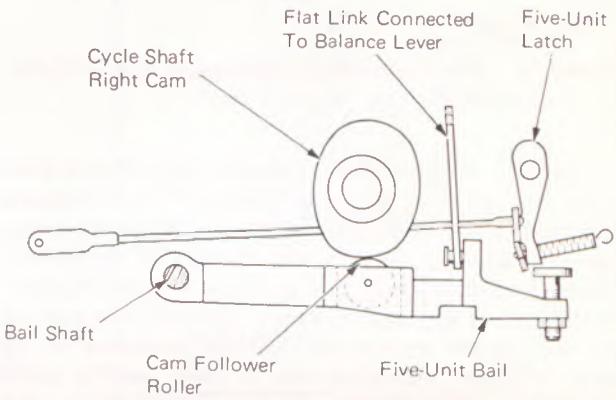


Figure 12 – Five-Unit Bail At Rest (Right Side View)

The five-unit bail is prevented from rising during a positive rotate operation by the five-unit latch (Figure 13). The latch is mounted to the differential bracket and pivots front to rear. In the rest position, the latch is positioned above the head of an adjustable screw at the rear of the five-unit bail. During a positive rotate operation, as the cycle shaft begins to rotate, the bail moves up slightly and is stopped by the five-unit latch. The slight amount of upward movement is compensated for by the balance lever adjustment and does not affect the positive rotate selection. This clearance between the five-unit latch and the bail adjusting screw at rest ensures resetting of the latch at the completion of a negative rotate cycle.

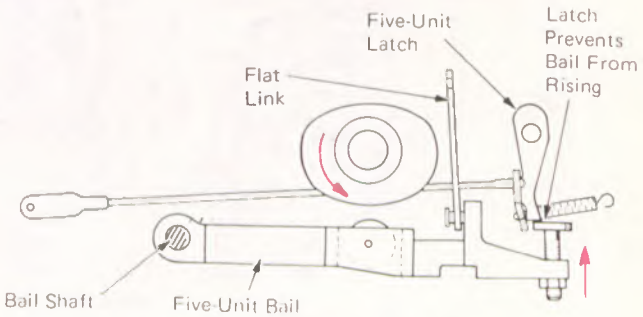


Figure 13 – Five-Unit Bail During Positive Rotate Cycle (Right Side View)

When the five-unit latch is pulled forward, the five-unit bail is allowed to rise (Figure 14). The force which raises the bail is applied by the rotate pulley spring and the extension spring attached to the rotate arm.

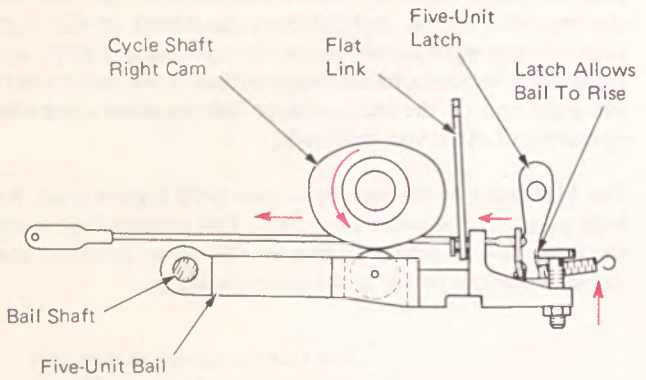
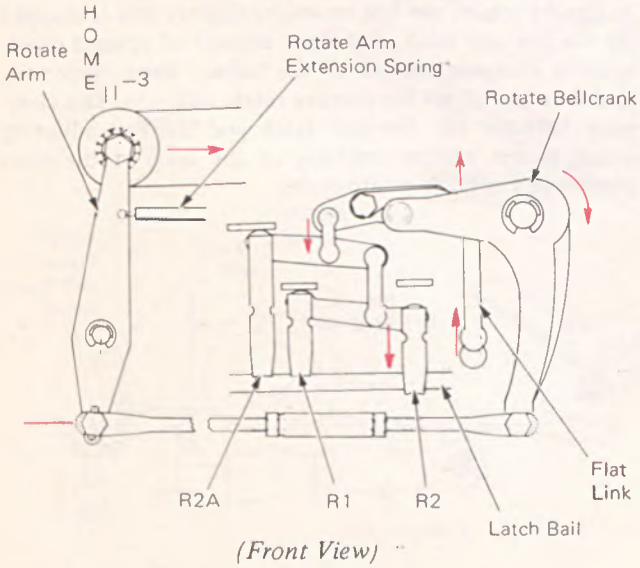


Figure 14 – Five-Unit Bail During Negative Rotate Cycle (Right Side View)

Movement of the five-unit bail from the latched-home point to the low point of the cam allows sufficient clockwise movement of the rotate bellcrank to permit a five-character negative rotation of the typehead. If less than five units of negative rotation is desired, it is necessary to pull down on the left end of the balance lever as the right end goes up. This reduces the amount of clockwise movement of the rotate bellcrank. Operating one or more positive rotate latches down while allowing the five-unit bail to rise, provides different amounts of negative rotation. The positive R1 and negative 5 combine to permit a negative four rotation. The positive R2 and negative 5 combination gives a negative three rotation (Figure 15). The positive R1 and R2 and a negative five operation permits a negative two rotation. And the positive R2 and R2A plus a negative five combination gives a negative one rotation.



(Front View)

Figure 15 – Negative Three Rotate Operation

Home position selection may be achieved in one of two ways: Pulling all of the positive rotate latches forward and not operating the five-unit latch results in no rotate motion. Allowing all of the positive rotate latches to be pulled down and pulling the five-unit latch foward allowing the five-unit bail to raise results in no rotate motion because the positive five and negative five cancel each other.

The first method is used when a home character is selected. The second method is used during a no-print space operation.

ROTATE TAPE

The rotate tape operation is similar to the tilt tape operation, however, the rotate tape transfers motion to rotate the typehead (Figure 16). The rotate tape is connected to the rotate pulley in the rocker, guided through the left side of the carrier, extended to the left around the rotate arm pulley, back to the right around the shift arm pulley, and connected to the right side of the carrier.

NOTE: The shift arm pulley moves only during a shift operation; therefore, consider it stationary for the present. (For more information on shift operation, refer to the Shift Section of this manual.)

When the rotate arm is moved away from the printer side frame, a pull is exerted on the rotate tape to rotate the typehead in a counterclockwise direction. When the rotate arm is moved toward the side frame, the typehead is rotated in the clockwise direction by allowing the rotate tape to wind around the rotate pulley under rotate spring tension.

The rotate spring is located beneath the rotate pulley and is enclosed in a stationary cage. The rotate spring cage is held stationary by a retainer attached to the rocker casting. The outer end of the spring is attached to the cage and the inner end of the spring is connected to the rotate pulley hub. The rotate spring loads the rotate pulley in the clockwise direction.

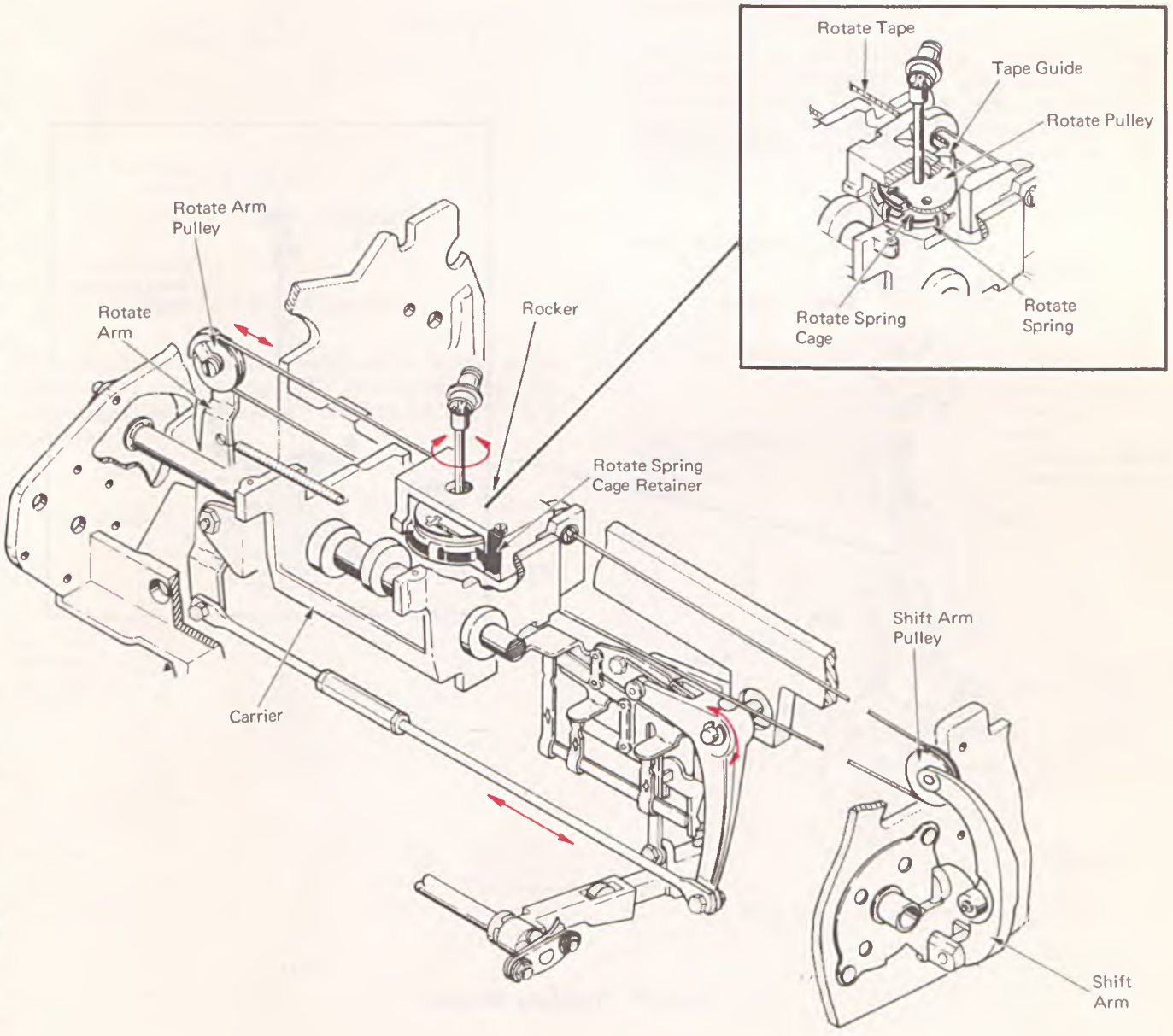


Figure 16 – Rotate Tape System

TYPEHEAD ROTATION

The typehead clips securely to the upper ball socket and rests over a key which is pressed into the upper ball socket. This arrangement ensures that the typehead will rotate whenever the upper ball socket rotates.

The upper ball socket has a shoulder at the bottom which fits into the tilt ring and is spring loaded to the front (Figure 17). The upper ball socket is held in place by the tilt ring spacer. The spacer is attached directly to the tilt ring and fits around a flange of the upper ball socket. The tilt ring spacer is shimmed to allow rotation of the upper ball socket yet restricts up and down play.

The underside of the upper ball socket is hollow and forms the socket for a ball joint connection. A dog-bone shaped ball joint fits into the socket over a pin that extends through the socket. The lower end fits over a pin in the lower ball socket. The lower ball socket is part of the rotate shaft. The rotate shaft operates directly inside the hollow of the yoke. Attached near the bottom of the shaft is the rotate pulley and rotate spring. The rotate pulley is secured to the rotate shaft by a wedging block and a setscrew.

These two ball socket connections act as universal joints to permit the typehead to be rotated and tilted at the same time.

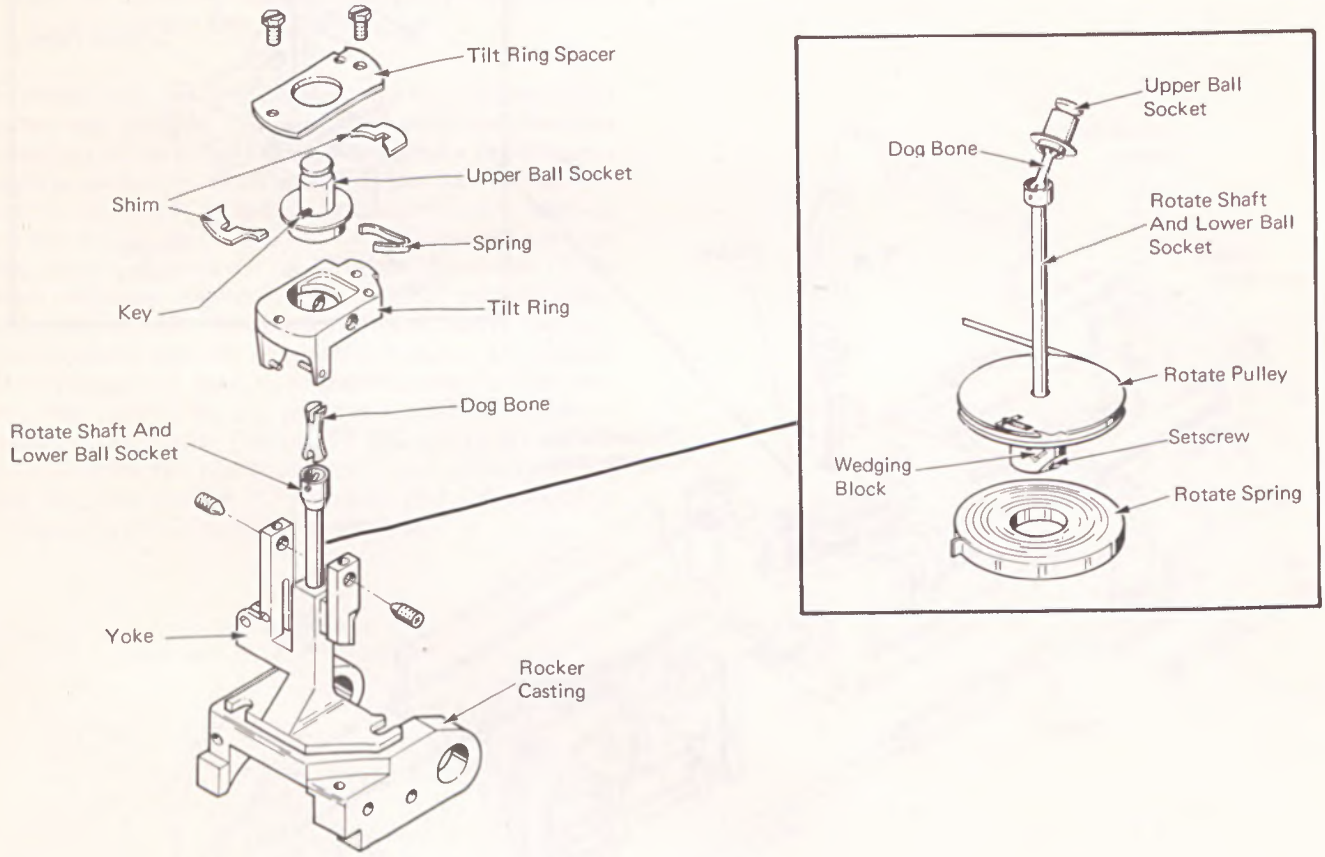


Figure 17 – Typehead Rotation

Operation of the rotate detent, shown in the following figures, is fully discussed in the Fine Alignment Section of this manual.

Any wear in the system will cause the typehead to drift in the negative direction with respect to the detent. This causes the headplay and bandwidth to drift in the negative direction with respect to the detent. This is because the rotate spring applies a constant pressure to the rotate system in a negative direction (Figure 18). Because of this drift, coarse alignment or homing adjustments should be checked each time the machine is serviced.

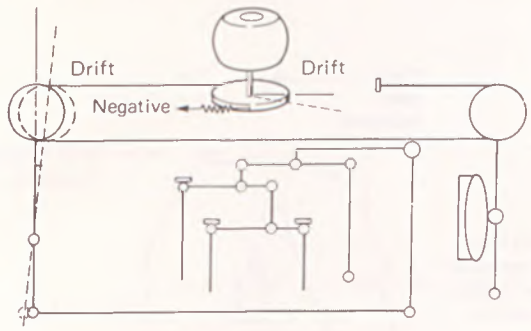


Figure 18 – Rotate System Drift

Wear potential in the rotate mechanism is defined as the ability of the rotate mechanism to properly align the typehead after a measurable amount of wear is left in the mechanism (Figure 19).

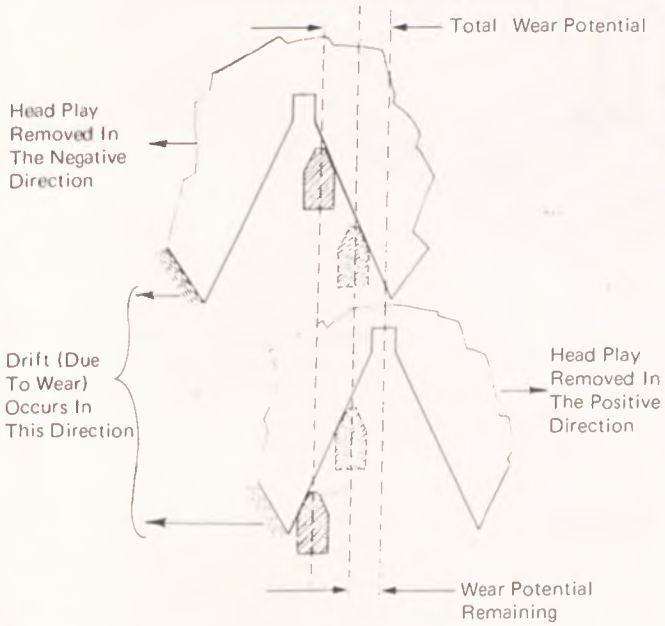


Figure 19 – Wear Potential

TYPEHEAD PLAY

A portion of typehead play provides the rotate system with a substantial amount of wear potential. Typehead play is the free motion of the typehead when the machine is at rest. It is due to the ball joint connection between the upper ball socket and the lower ball socket. To explain how this is accomplished look at the relationship between headplay, homing and bandwidth. Typehead play is .050"-.060" measured at the typehead skirt or slightly less than half the distance between teeth. The headplay is split between the positive and negative slopes of the typehead notch (Figure 20).

The element is homed so that the rotate detent contacts the notch slope, with the headplay removed in the negative direction, approximately .015" down the negative side of the notch (Figure 20).

The purpose of this adjustment is to provide maximum wear potential to the system. Also, this adjustment tends to allow more time to withdraw the detent before the typehead restores in the positive direction. Breakage in the system could occur if the detent did not withdraw prior to typehead movement.

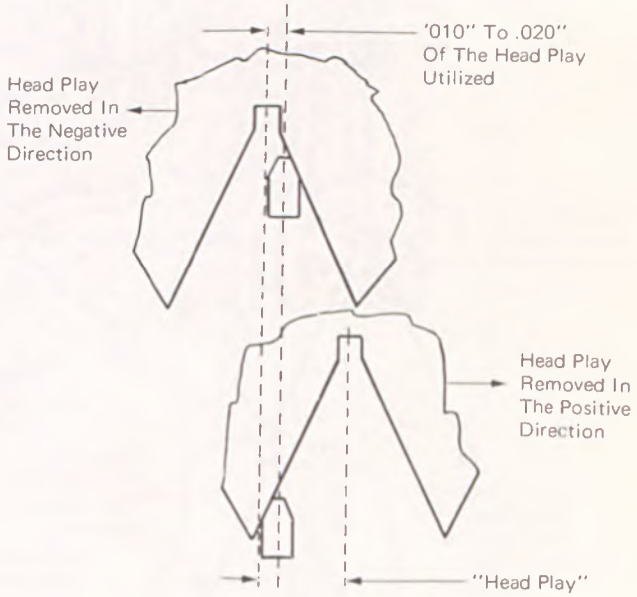


Figure 20 – Typehead Play & Homing

Next consider bandwidth. With the headplay removed in the negative direction, the greatest variation between detenting of one typehead position (Figure 21A) and another typehead position (Figure 21B) is called bandwidth. It is caused by unequal adjustment of the rotate latch stop pads. You will note that we have now used up almost 3/4 of the negative slope of the typehead notch. The remaining distance of the slope is considered the wear potential. The typehead can drift without causing problems until the most negative detented position falls near the end of the negative slope.

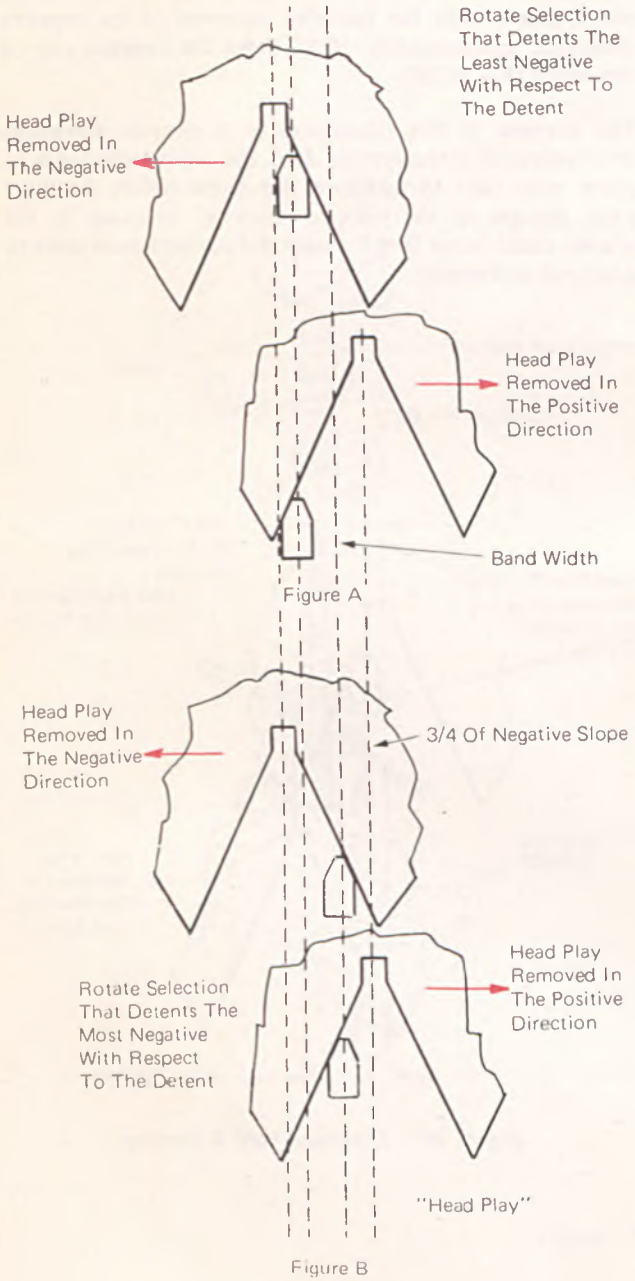


Figure 21 Bandwidth

When wear occurs in the system, the typehead drifts in the negative direction. As long as this drift does not exceed the wear potential portion of headplay, the detent will continue to fine align the typehead. Once the wear potential is exceeded, the rotate selection that coarse aligns the most negative, with respect to the detent, will fail to align the detent notch. The detent will then fail to seat causing that character to print out of alignment (Figure 22). From the preceding, one can see that for optimum performance, reliability and wear potential, bandwidth must be controlled to be as small as possible.

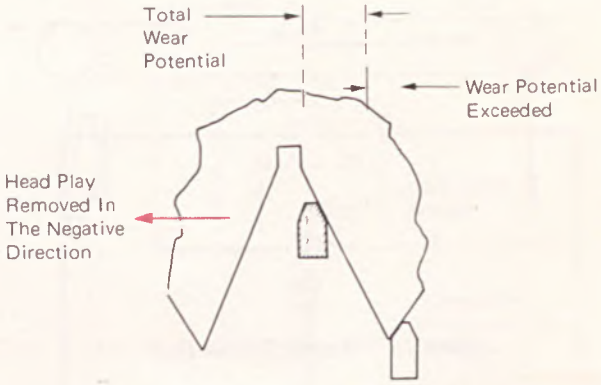


Figure 22 – Wear Potential Exceeded

PRINT SELECTION

Print selection provides the means by which the appropriate tilt and rotate selection latches are pulled forward during a character selection operation.

The print selection mechanism consists of a selection interposer bail and six selection interposers which are attached to the selection latches by adjustable links (Figure 23). Located beneath the selection interposers are six selection magnets; one for each interposer. The armatures of the selection magnets extend to the rear, just beneath their associated selection interposers. The purpose of the selection magnets is to raise the selection interposers into position to be pulled forward by the selection bail.

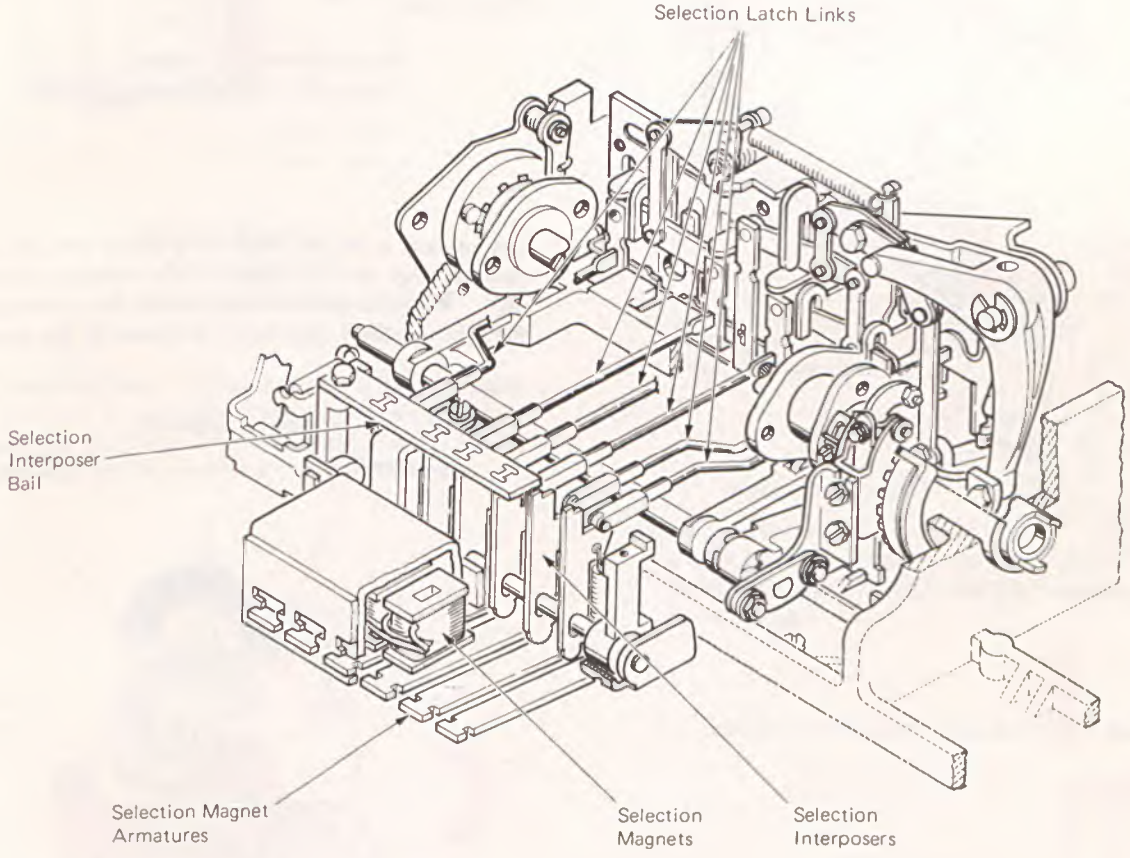


Figure 23 – Print Selection Mechanism

The selection interposers are mounted on the selection bail shaft through elongated holes and are spring loaded downward (Figure 24). The tops of the interposers fit into slots in the selection interposer bail. Picking a selection magnet will raise the working surface of its interposer into position to be operated by the bail. Motion to operate the selection bail is provided by a selection cam on the cycle shaft. When the printer is cycled, the selection interposer bail and the raised interposers will be moved forward by the selection cam and cam follower. The appropriate selection latches will be pulled forward. The tilt and rotate mechanisms will then produce the required amount of motion to position the typehead for the desired character or symbol.

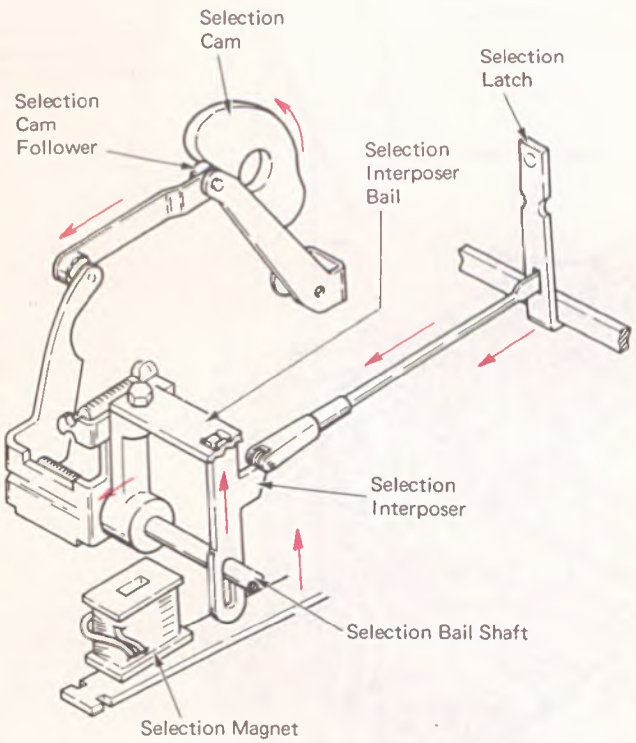


Figure 24 – Selection Interposer Operation

PRINT FEEDBACK

The purpose of print feedback is to prevent the next machine operation from occuring during a selection operation and to signal the electronics when to de-energize the cycle clutch and selection magnets.

The print feedback reed switch is located at the left end of the print shaft (Figure 25). The reed switch is operated by a magnet assembly which is part of the print shaft gear and setscrewed to the left end of the print shaft.

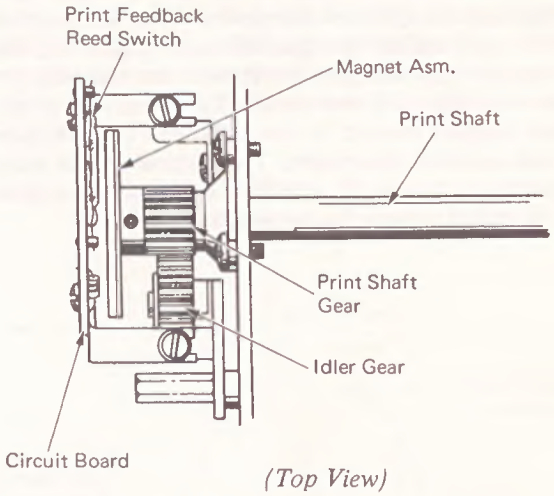


Figure 25 – Print Feedback Switch

The magnet is in the shape of a wheel with the magnetic material only on 160 degrees of the wheel's surface (Figure 26). When the print shaft is rotated for a print operation, the print feedback reed switch is closed by the magnet.

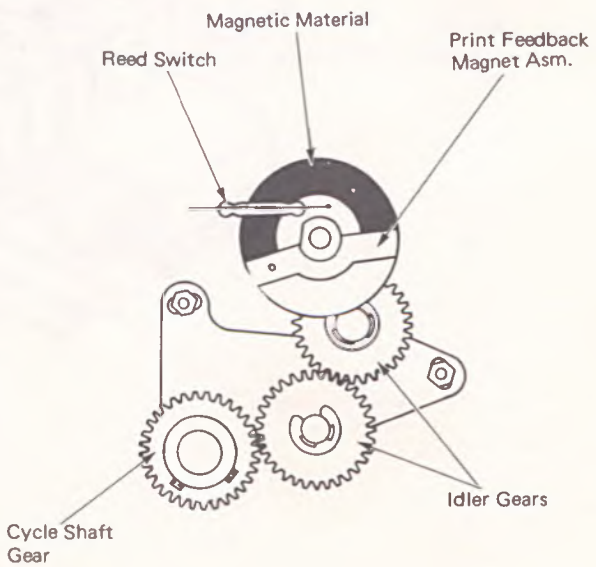
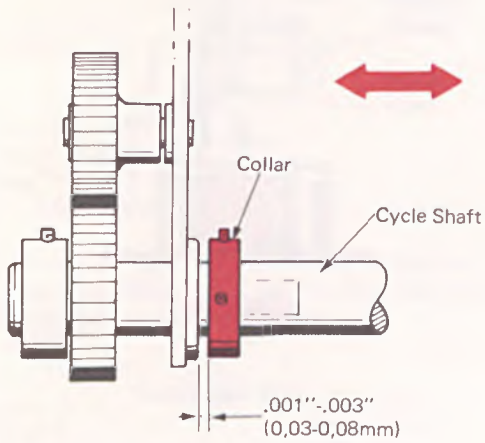


Figure 26 – Print Feedback Magnet (Left Side View)

CHARACTER SELECTION ADJUSTMENTS

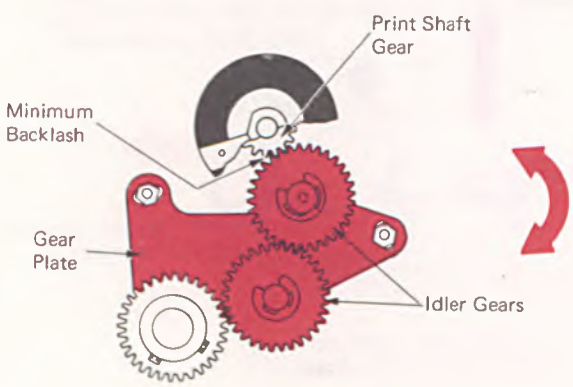
1. *Cycle Shaft Collar* – Position the collar left or right so there is .001"-.003" end play of the cycle shaft.

   CAUTION: The slight end play of the cycle shaft ensures that it will rotate freely. Excessive play could allow a coil of the cycle clutch spring to wedge between the two hub members of the clutch causing a machine lockup.



(Bottom View)

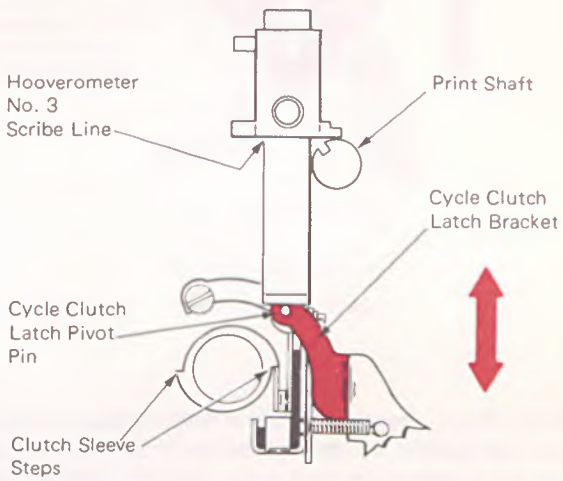
2. *Gear Train Backlash* – Position the gear plate so minimum backlash is present between the upper idler gear and the print shaft gear. The mechanism must be free of binds throughout 360 degrees rotation of the gears.



(Left Side View)

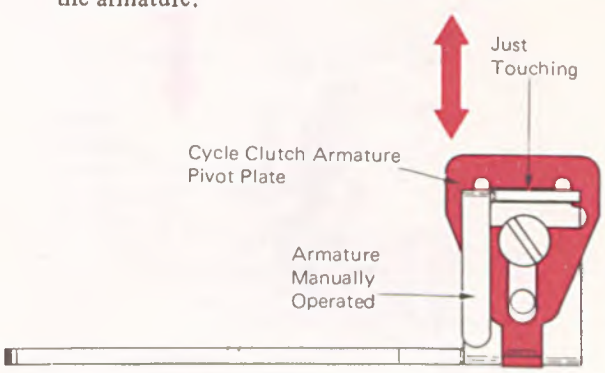
3. *Cycle Clutch Latch Height* – Adjust the cycle clutch latch bracket vertically so the Hoovermeter, set on the No. 3 scribe line, just spans the distance between the cycle clutch latch pivot pin and the print shaft.

   If the bracket were adjusted too low, the steps would be at an angle to the line of motion of the cycle clutch latch. The latch would have difficulty in moving forward to release the clutch sleeve, and a slow, hesitant operation would result. With the bracket too high, the force of stopping the cycle shaft through the cycle clutch sleeve would tend to cam the latch forward. A repeat cycle operation could result.



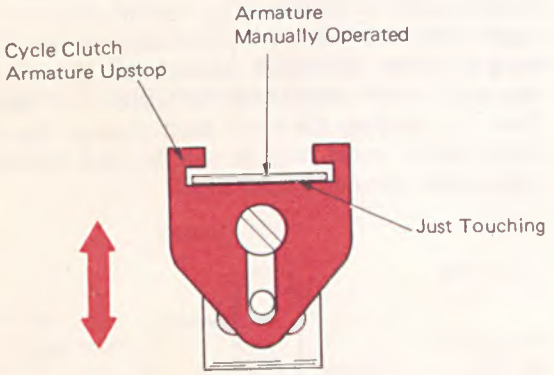
(Left Side View)

4. *Cycle Clutch Armature Pivot Plate* – With the cycle clutch armature manually operated, adjust the armature pivot plate up or down until it just touches the top of the armature.



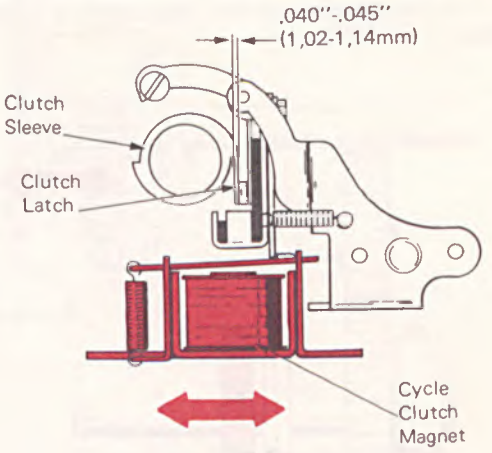
(Rear View)

5. *Cycle Clutch Armature Up-Stop* – With the cycle clutch armature manually operated, adjust the armature upstop up or down to just touch the bottom of the cycle clutch armature.



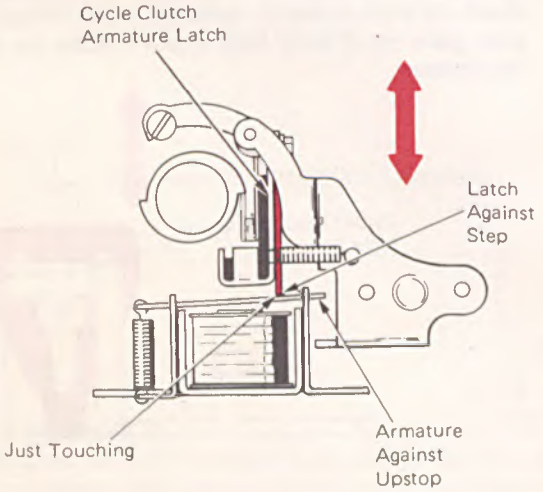
(Front View)

7. *Cycle Clutch Latch Bite* – With the cycle clutch sleeve latched, position the cycle clutch magnet front or rear for .040"- .045" bite of the clutch latch on the step of the clutch sleeve.



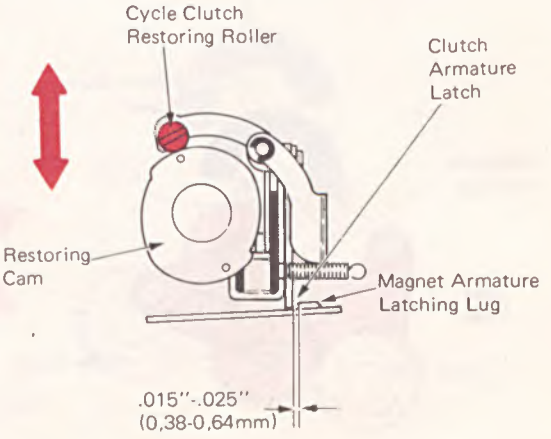
(Left Side View)

6. *Cycle Clutch Armature Latch* – With the magnet armature held against its up-stop and the cycle clutch armature latch against the step in the armature, position the armature latch to just touch the top surface of the armature.



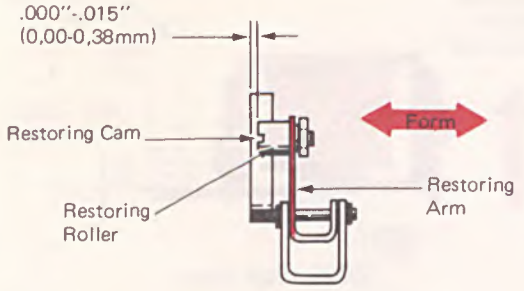
(Left Side View)

8. *Cycle Clutch Restoring Roller* – Adjust the restoring roller vertically so the clutch armature latch is driven .015"-.025" beyond the latching lug on the cycle clutch magnet armature as the machine is hand-cycled.



(Left Side View)

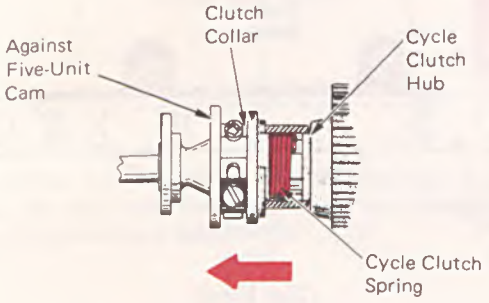
9. *Cycle Clutch Restoring Arm* – Form the arm left to right so the restoring roller stud is flush to .015" inboard from the left edge of the restoring cam.



(Top View)

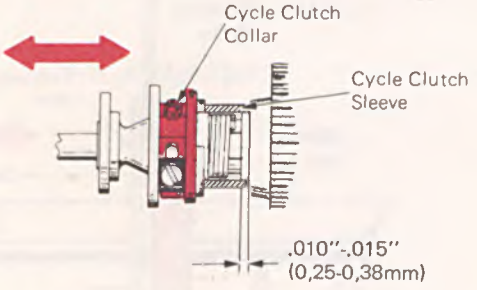
10. *Cycle Clutch* – Adjust the cycle clutch as follows:

a. Loosen the clutch collar and position the spring to the left against the five-unit cam.



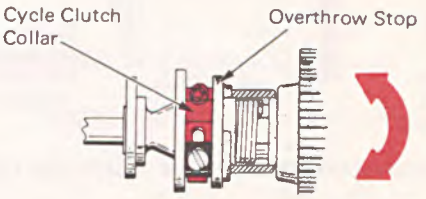
(Top View)

b. Position the collar left to right for .010"-.015" end play of the clutch sleeve.

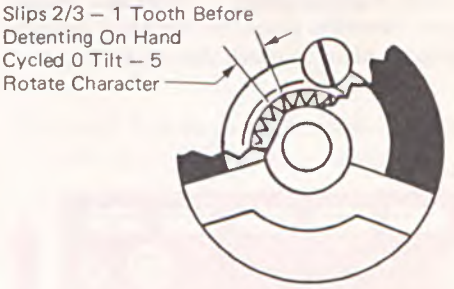


(Top View)

c. With a zero tilt, negative five rotate character hand cycled, adjust the collar and spring rotationally so the cycle clutch spring will begin to slip 2/3 to 1 tooth of print shaft rotation before the cycle shaft check pawl detents in the check ratchet.

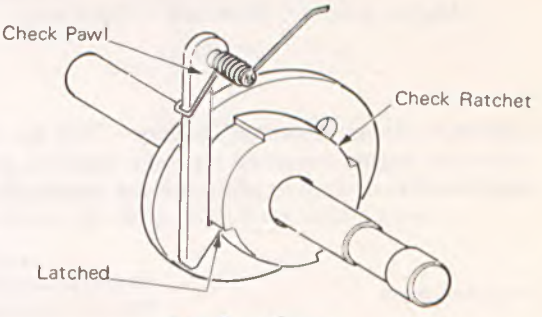


(Top View)

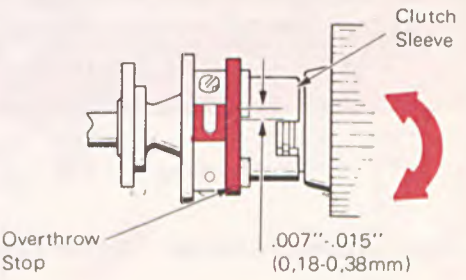


(Left Side View)

d. Position the overthrow stop so it will allow the cycle shaft to overthrow its latched position by .007"-.015".

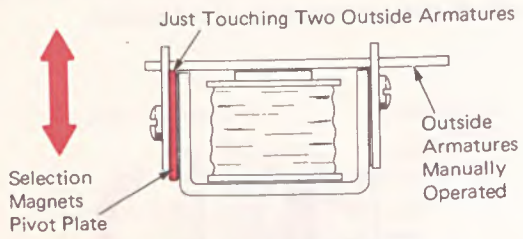


(Left Rear View)



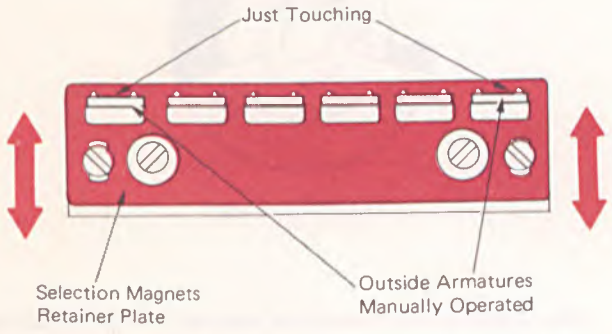
(Top View)

11. *Selection Magnets Pivot Plate* – With the outside selection magnet armatures manually operated, position the pivot plate to just touch the armatures.



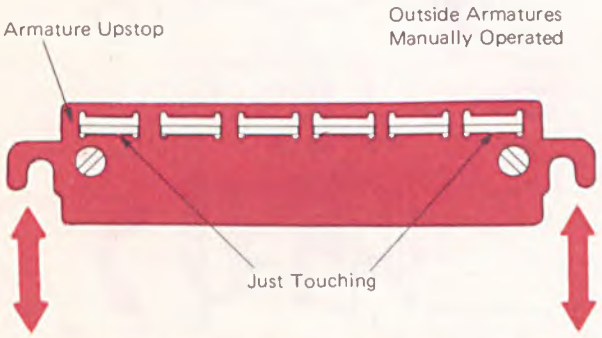
(Magnet Assembly Removed – Left Side View)

12. *Selection Magnets Retainer Plate* – With the outside selection magnet armatures manually operated, position the magnet retaining plate to touch the armatures.



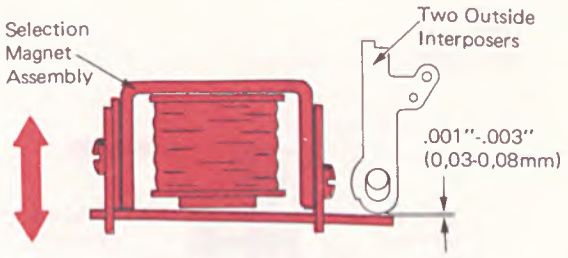
(Magnet Assembly Removed – Top View)

13. *Selection Magnet Armature Up-Stop* – With the outside selection magnet armatures manually operated, position the armature up-stop to just touch the armatures.



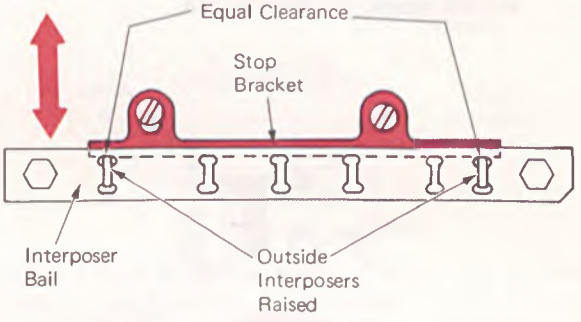
(Magnet Assembly Removed – Bottom View)

14. *Selection Magnet Assembly* – With the machine at rest, position the magnet assembly to provide .001"-.003 clearance between each outside magnet armature and its interposer.



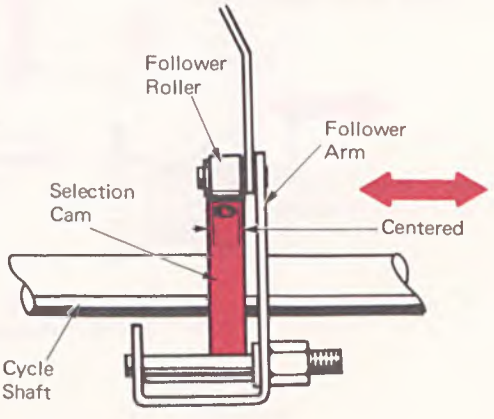
(Right Side View)

15. *Selection Interposer Stop Bracket* – With the outside selection interposers raised into the bail, position the stop bracket for equal clearance between the interposers and the bail.



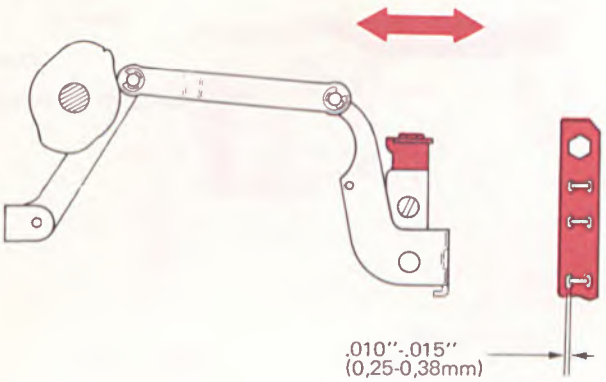
(Top View)

16. *Character Selection Cam* – Position the cam left to right so that the cam is centered with respect to the follower roller and does not interfere with the follower arm.



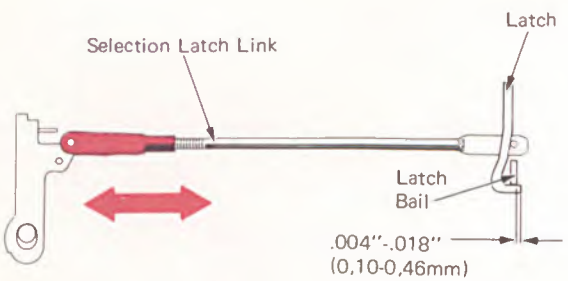
(Bottom View)

17. *Selection Interposer Bail* – With the selection cam follower on the low point of the selection cam and a selection interposer raised, adjust the interposer bail for .010"-.015" clearance between the working surface of the bail and the raised interposer.



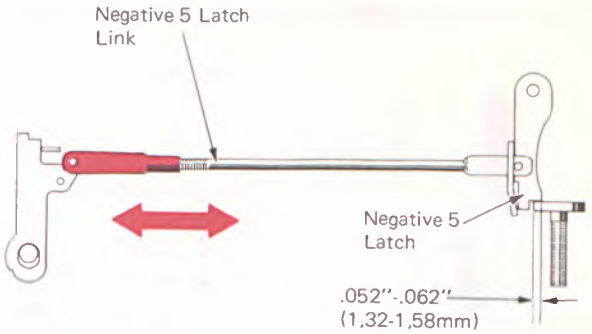
(Left Side View)

18. *Selection Latch Links* – With the machine at rest, adjust the selection latch links so the foot of the latches overhang the latch bail by .004"-.018".



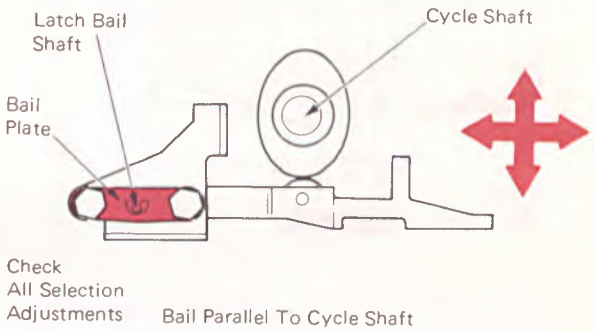
(Right Side View)

19. *Negative Five Latch Link* – With the machine at rest, adjust the negative 5 latch link so the negative 5 latch will overlap the stop screw by .052"-.062".



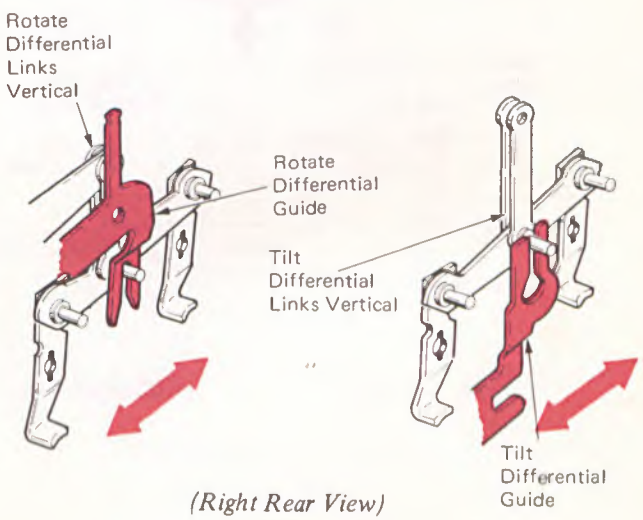
(Right Side View)

20. *Latch Bail Shaft* – Position the bail plate so the bail shaft is parallel to the cycle shaft.



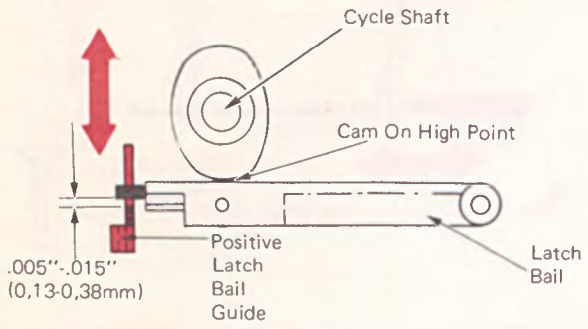
(Right Side View)

21. *Differential Lever Guides* – Adjust the differential guides so the differential links hang vertical.

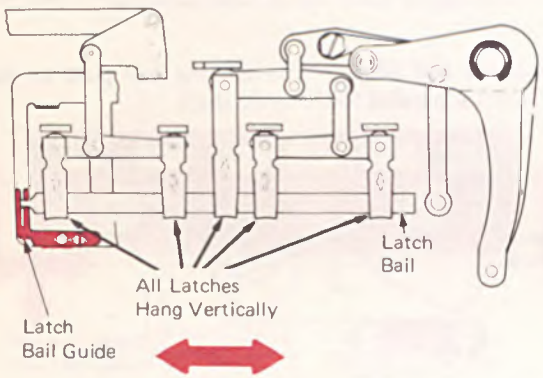


(Right Rear View)

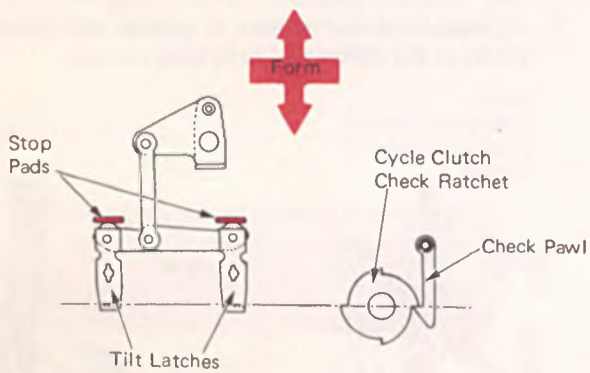
22. *Latch Bail Guide* – With the latch bail on the high point of the cycle shaft cams, adjust the latch bail guide for .005"-.015" between the latch bail and the bottom of the guide. Also, adjust the guide left to right so the latches hang vertically.



(Left Side View)

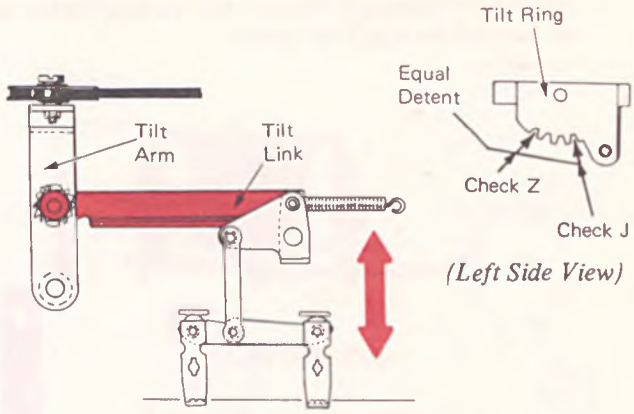


23. *Tilt Latch Stop Pads* – Form the latch stop pads so the tilt latches reset under the latch bail at the same time the cycle clutch check pawl resets.



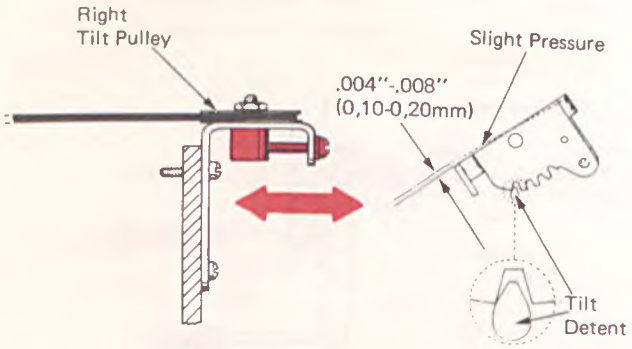
(Front View) *(Right Side View)*

24. *Tilt Arm Motion* – Adjust the tilt link up or down on the tilt arm so the tilt ring is detented the same for a "Z" as it is for a "J".



(Left Side View)

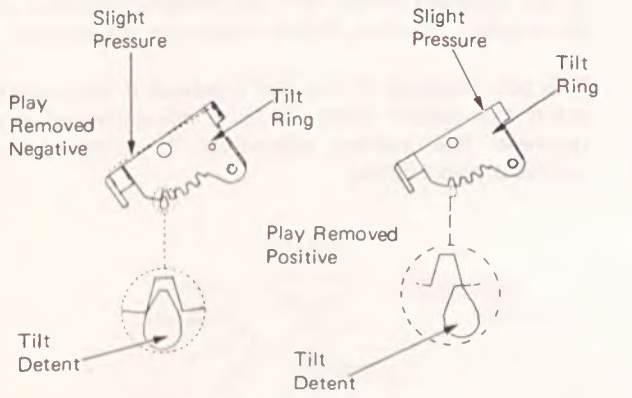
25. *Tilt Ring Homing* – With the character "Z" half cycled and the tilt ring play removed with a slight amount of pressure applied to the rear of the tilt ring, adjust the right hand tilt pulley so the rear of the tilt ring will rise .004"-.008" when the tilt detent is manually allowed to seat in the detent notch.



(Front View)

"Z" Half-Cycled
(Left Side View)

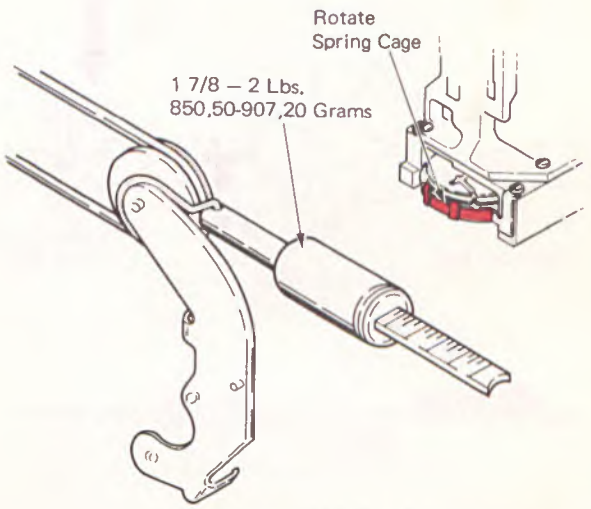
As a further check, remove the tilt ring play in the positive direction by applying a slight amount of pressure to the front of the tilt ring. Observe the detent entry on the forward side of the notch. The detent should enter far down the forward slope of the detent notch, but not so far that it contacts the tip of the tooth. By homing the tilt ring off center, favoring the positive side of the detent notch, a maximum amount of wear potential is achieved.



(Left Side View)
(Play Removed Positive)

(Left Side View)
(Play Removed Negative)

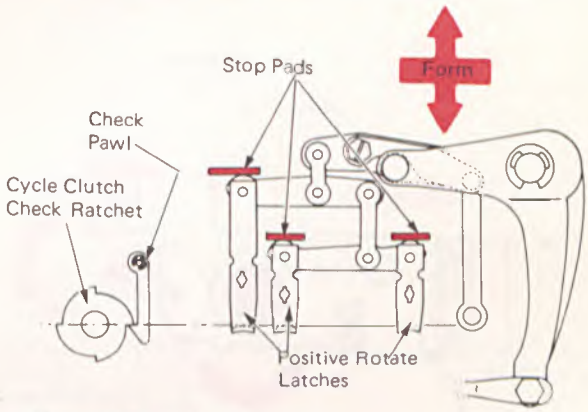
26. *Rotate Spring Tension* – Remove the typehead and shift the machine into lower case. Half-cycle an "m". Adjust the rotate spring cage until a 1 7/8 – 2 lb. reading is obtained on the spring scale just as the shift arm contacts the stop screw. This is a CRITICAL adjustment.



Lower Case "M" Typehead Removed

(Right Front View)

27. *Rotate Latch Stop Pads* – Form the latch stop pads so the positive rotate latches reset under the latch bail at the same time the cycle clutch check pawl resets.

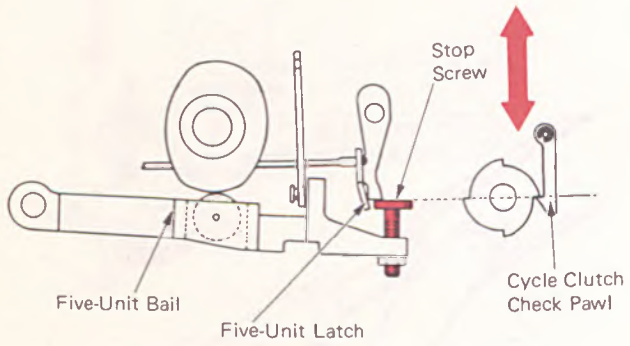


(Right Side View)

Check All
Detenting Positions

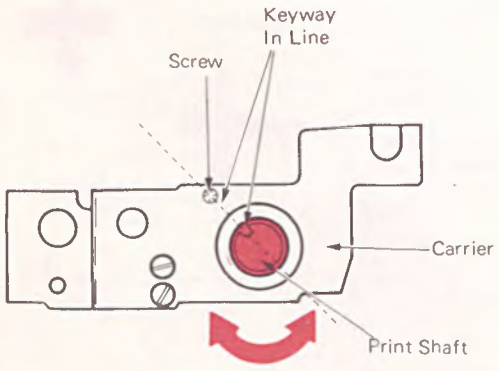
(Front View)

28. *Five-Unit Bail Stop Screw* – Adjust the stop screw so the five-unit latch resets at the same time the cycle clutch check pawl resets as a negative five character is slowly hand-cycled.



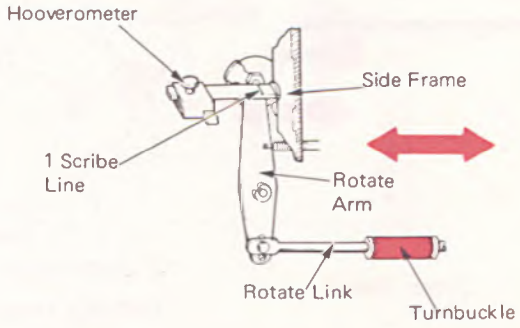
Negative 5 Character Hand Cycled (Right Side View)

29. *Print Shaft Timing (Preliminary)* – Loosen the print shaft gear and position the print shaft so its keyway is in line with the screw on the left side of the carrier casting. This coarse adjustment assures that the detents will operate at approximately the right time in the cycle.



(Left Side View)

30. *Rotate Arm Vertical* – With a zero rotate character half cycled, adjust the rotate link so the center of the top of the rotate arm is in line with the No. 1 scribe line of the Hooverometer when the Hooverometer is against the side frame. To ensure equal arcs of motion of the rotate arm for both negative and positive characters, the rotate arm must be vertical. This is a preliminary adjustment, and is made by adjusting the turnbuckle on the rotate link.

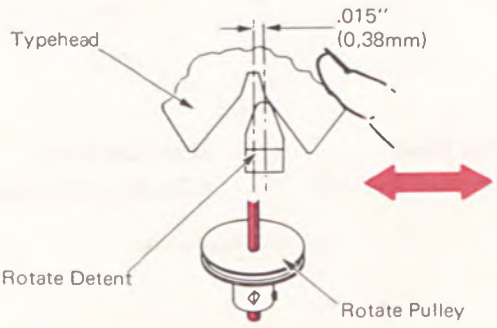


Zero Rotate Half Cycled

NOTE: Reinstall the typehead.

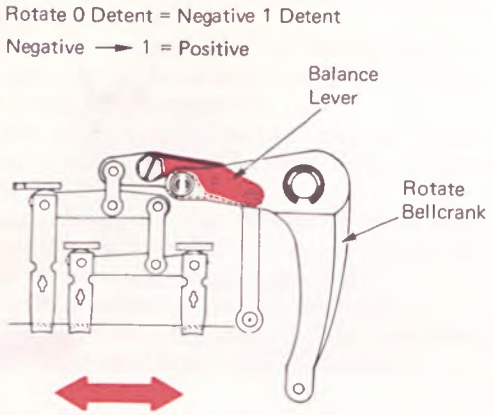
31. *Typehead Course Homing (Upper Case)* – Half-cycle the upper case "T" and check to ensure the detent enters the proper tooth. If it does not, loosen the rotate pulley setscrew and slip the typehead around until the detent enters the correct tooth. Set the detenting in this tooth to approximately .015" down the negative slope of the typehead notch, with the headplay removed in the negative direction, before tightening the setscrew.

    It is not necessary to slip the typehead if the detent enters the correct tooth. Usually, refinement of the typehead fine homing adjustment is sufficient to achieve proper homing.

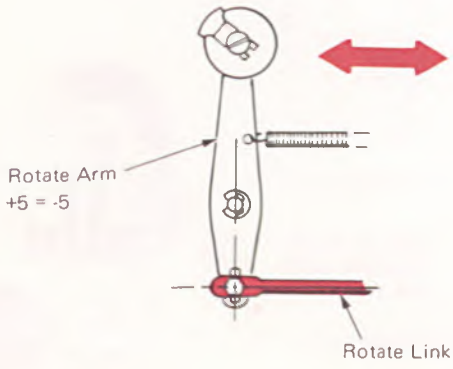


Half-Cycled Upper Case "T" (Rear View)

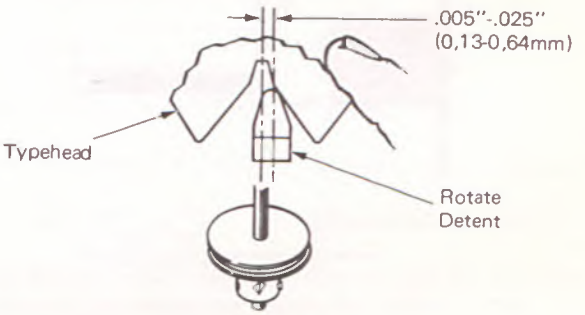
32. *Balance Lever (Upper Case)* – The balance lever is adjusted to obtain proper balance between positive and negative selections. Make this adjustment by half-cycling the "T" and observing its detent entry. Next, half-cycle the "L". Now, adjust the balance lever left or right until the detenting of the "L" matches that of the "T".



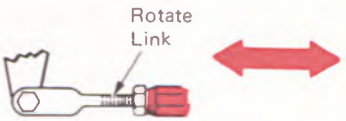
33. *Rotate Arm Motion (Upper Case)* – To provide the proper motion in each direction of typehead rotation, the stud at the bottom of the rotate arm must be vertically positioned in its slot. The correct position of the stud is determined by alternately observing the detenting of the "M" and "W" while changing the stud's position. When the detenting is equal, the stud is correctly positioned.



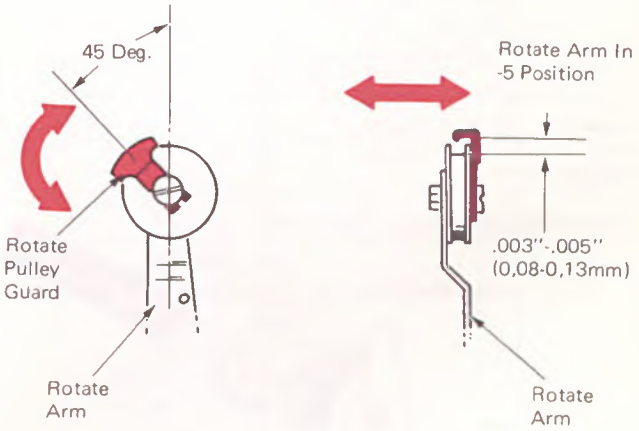
34. *Typehead Fine Homing (Upper Case)* – Adjust the rotate link so the rotate detent contacts the negative slope of the typehead .005"-.025" from the center of the notch when the upper case home character "Z" is half-cycled. This adjustment allows the greatest amount of wear potential before a failure can occur. Homing should be checked on EVERY call.



(Rear View)

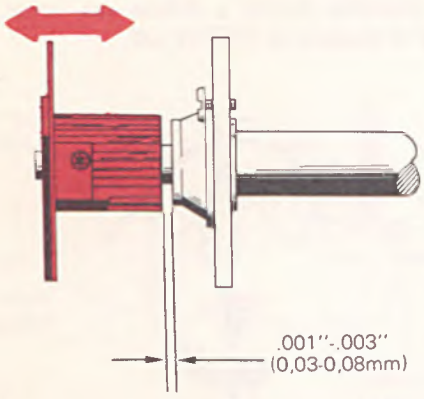


35. *Rotate Pulley Guard* – Adjust the guard rotationally, 45 degrees left of vertical. The guard must clear the rotate tape by .003".005" with the rotate arm in the negative 5 position.



(Left Side View)

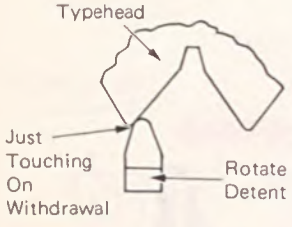
36. *Print Shaft End Play* – Position the print shaft gear left or right on the print shaft for .001"-.003" end play of the print shaft.



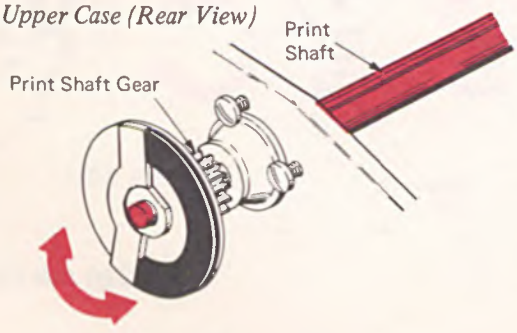
(Front View)

37. *Print Shaft Timing (Final) (Upper Case)* – With the printer in upper case, loosen the print shaft gear and advance or retard the print shaft so the rotate detent just touches the positive slope of detent notch as the detent leaves the detent notch. Be sure to maintain .002"-.004" end play of the print shaft when retightening the print shaft gear.

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

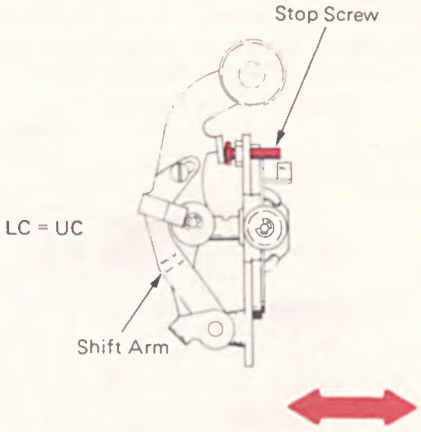


Printer In Upper Case (Rear View)



Left Front View

38. *Shift Motion* – Shift the machine into lower case so the shift arm stop screw will contact the side frame. Adjust the stop screw so a lower case "t" detents EXACTLY the same as an upper case "T".

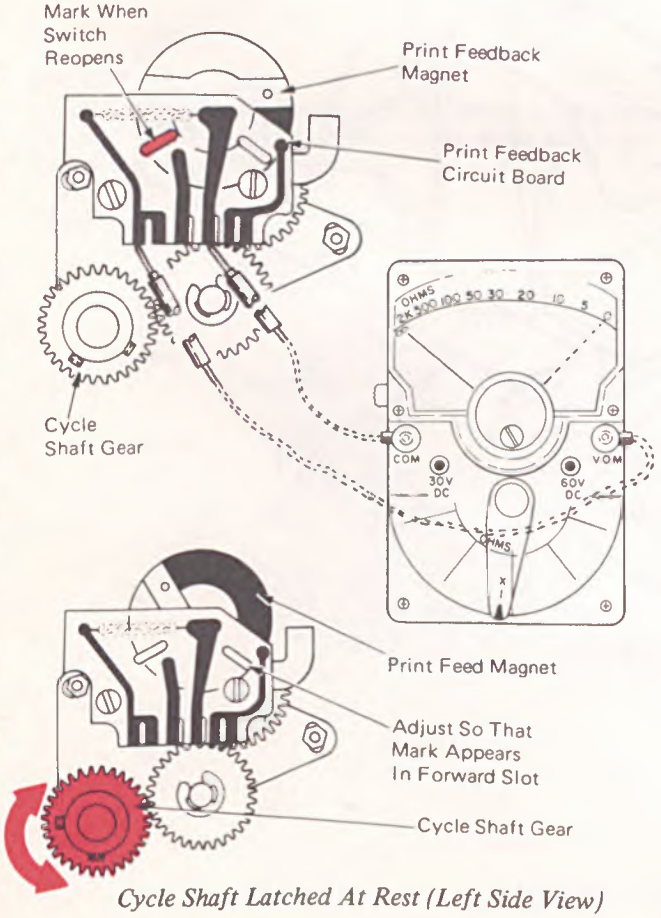


Printer In Lower Case (Rear View)

39. *Print Feedback Timing* – The print feedback timing adjustment is obtained by the following method:

a. Position the cycle shaft in latched home position.
b. Loosen the setscrews in both the cycle shaft gear and the print shaft gear. The gear train must be free to rotate.
c. With the meter set to the RX1 scale, connect meter leads as shown below.
d. Slowly rotate the gear train by turning the cycle shaft gear top to front until the print feedback switch closes, then just reopens.
e. Mark the print feedback circular magnet through the rear slot in the print feedback board as indicated in the illustration.
f. Continue rotating the gear train in the same direction until the mark on the magnet can be seen centered in the front slot in the circuit board.
g. Tighten the setscrews in the cycle shaft gear.
h. Since the fine timing adjustment of the print shaft may have been disturbed, readjust if necessary.

NOTE: Once the magnet has been marked, it should not be necessary to use the meter for this adjustment. The mark should always appear in the front slot when the cycle shaft is latched at rest. Do not scribe magnet.



Cycle Shaft Latched At Rest (Left Side View)

40. *Final Check* – After completing the foregoing adjustments a final check should be made to see if any refinements are necessary. Compare the detenting for the letters WOMT. These letters are chosen because of their rotate selections. If an excessive bandwidth exists (in excess of .015"), it will be greatest among these characters. In making the final check, follow this sequence:

EXCESSIVE BANDWIDTH

Between	May Be Caused By
"T" (zero) and "O" (-1)	Incorrect balance
"M" (-5) and "W" (+5)	Incorrect rotate arm motion
"M", "W" and "T"	Adjustments 28 and 29

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

Excessive play in the carrier or rocker.
Play or binds in the tilt or rotate detent.
Loose-fitting upper ball socket.
Binds in the rocker parts.

This completes the character selection adjustments. The following chart may be used to determine the rotate and tilt locations of characters on the typehead:

STANDARD U.S. TYPE ELEMENTS

-5	-4	-3	-2	-1	Home	+1	+2	+3	+4	+5	
[	#	&	*	S	Z	@	%	ç	)	(	T-0
X	U	D	C	L	T	N	E	K	H	B	T-1
M	V	R	A	O	°	.	"	I	S	W	T-2
G	F	:	,	?	J	+	P	Q	.Y	_	T-3

Upper Case

-5	-4	-3	-2	-1	Home	+1	+2	+3	+4	+5	
]	3	7	8	4	z	2	5	6	0	9	T-0
x	u	d	c	l	t	n	e	k	h	b	T-1
m	v	r	a	o	!	.	'	j	s	w	T-2
g	f	;	,	/	j	=	p	q	y	-	T-3
-5	-5, 1	-5, 2	-5, 1, 2	-5, 2, 2A	Home	1	2	1, 2	2, 2A	1, 2, 2A	

Lower Case

FINE ALIGNMENT OPERATIONAL THEORY

Fine alignment is defined as locking and supporting the typehead in place so that the desired character will print clearly. The desired character is brought to the approximate print position in front of the platen by the character selection mechanism. Just prior to printing, the typehead must be detented in position both horizontally and vertically. After the print operation occurs, the tilt and rotate detents are withdrawn, allowing the selection mechanism to return the typehead to rest (Figure 1).

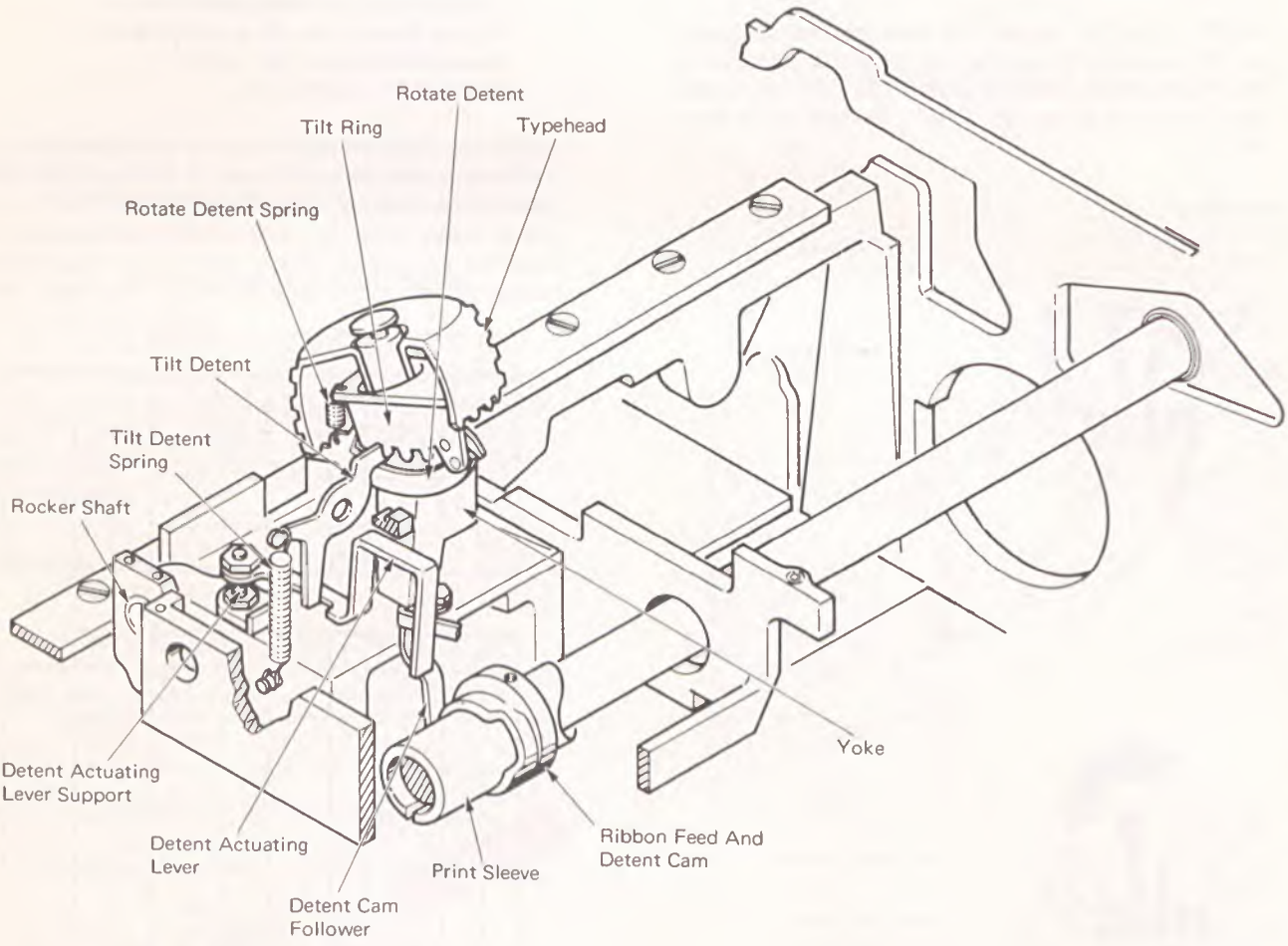


Figure 1–Fine Alignment

REAR CARRIER SUPPORT

The rear of the carrier is supported by the rear carrier support rail (Figure 2). The carrier has two shoes, an upper carrier shoe, and a lower carrier shoe. The lower shoe is mounted on the carrier. The upper shoe is mounted on a shouldered eccentric stud and spring loaded against the support rail. This arrangement eliminates any vertical play at the rear of the carrier during a print operation.

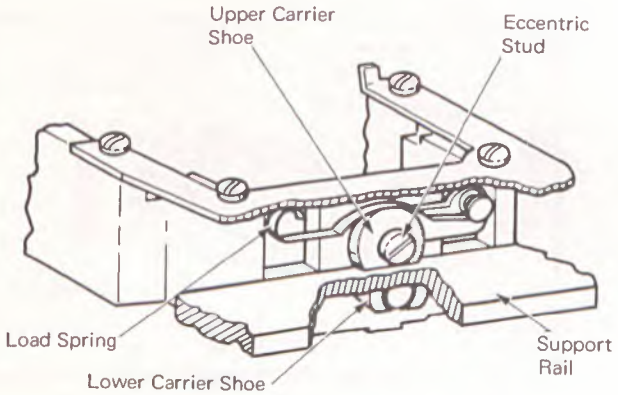


Figure 2 – Rear Carrier Support (Rear View)

ROCKER

Located within the rear portion of the carrier is the rocker (Figure 3). The rocker assembly pivots about the rocker shaft at the rear of the carrier.

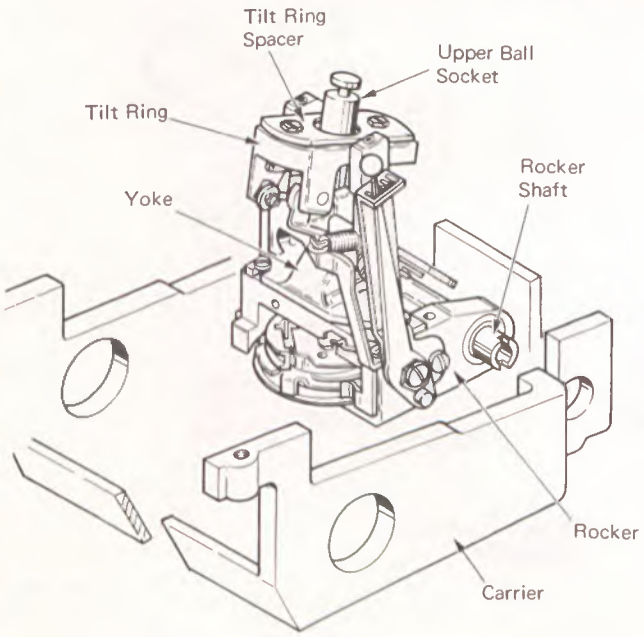


Figure 3 – Rocker Assembly

Attached to the top of the rocker platform is the yoke (Figure 4). The yoke has two arms that extend up to provide a mount for the tilt ring. Mounted at the top of the tilt ring is the upper ball socket to which the typehead is attached. The upper ball socket must be a tight fit with no binds. This is achieved by using shims under the tilt ring spacer.

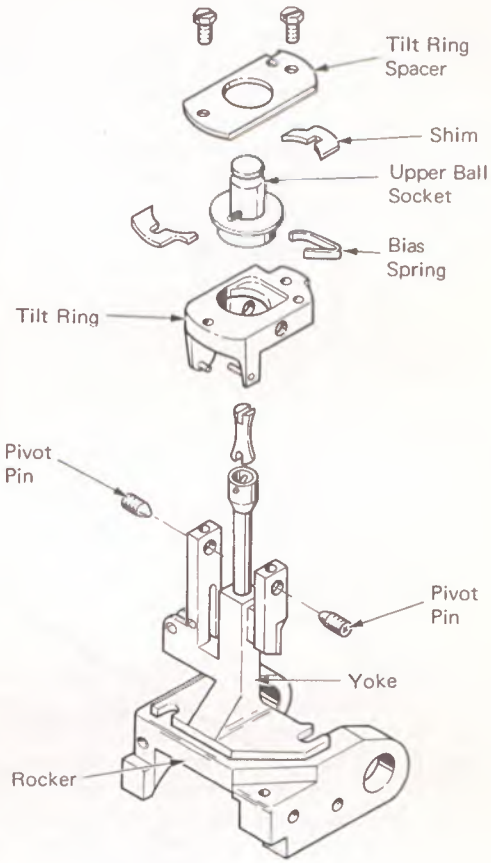


Figure 4 – Rocker (Exploded View)

The rocker biased tilt ring has an elongated hole to allow the upper ball socket to be spring loaded to the front of the machine (Figure 5). This keeps the tilt ring backup shoe in contact with the inside of the typehead providing a more consistent print impact.

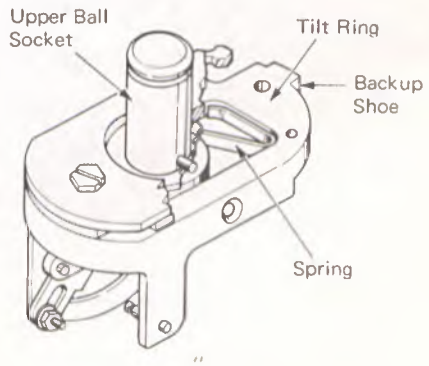


Figure 5 – Spring Biased Tilt Ring

DETENT OPERATION

The detent operation locks the typehead both horizontally and vertically during the print operation. Motion to operate the detents is taken off the print sleeve, which is keyed to the print shaft and rotates 360 degrees during each print cycle. This motion is coupled through the ribbon feed and detent cam, cam follower, and detent actuating lever (Figure 6). The spring load on the detents causes the detent cam follower to ride the surface of the detent cam. As the detent cam follower encounters the low dwell of the cam; the actuating lever allows the tilt detent to enter a notch in the tilt ring and the rotate detent to enter a notch in the typehead skirt. The tilt detent directly controls the rotate detent. If the tilt detent fails to seat in the tilt ring notch, the rotate detent cannot seat in the typehead notch.

The side play in the tilt and rotate detents must be minimum to securely lock the typehead. This is accomplished by using detent guides (Figure 6). As the print sleeve continues to rotate, the high dwell of the cam is encountered. The cam follower and actuating lever are then driven to the left to remove the detents from their notches. This permits the character selection mechanism to return the typehead to rest.

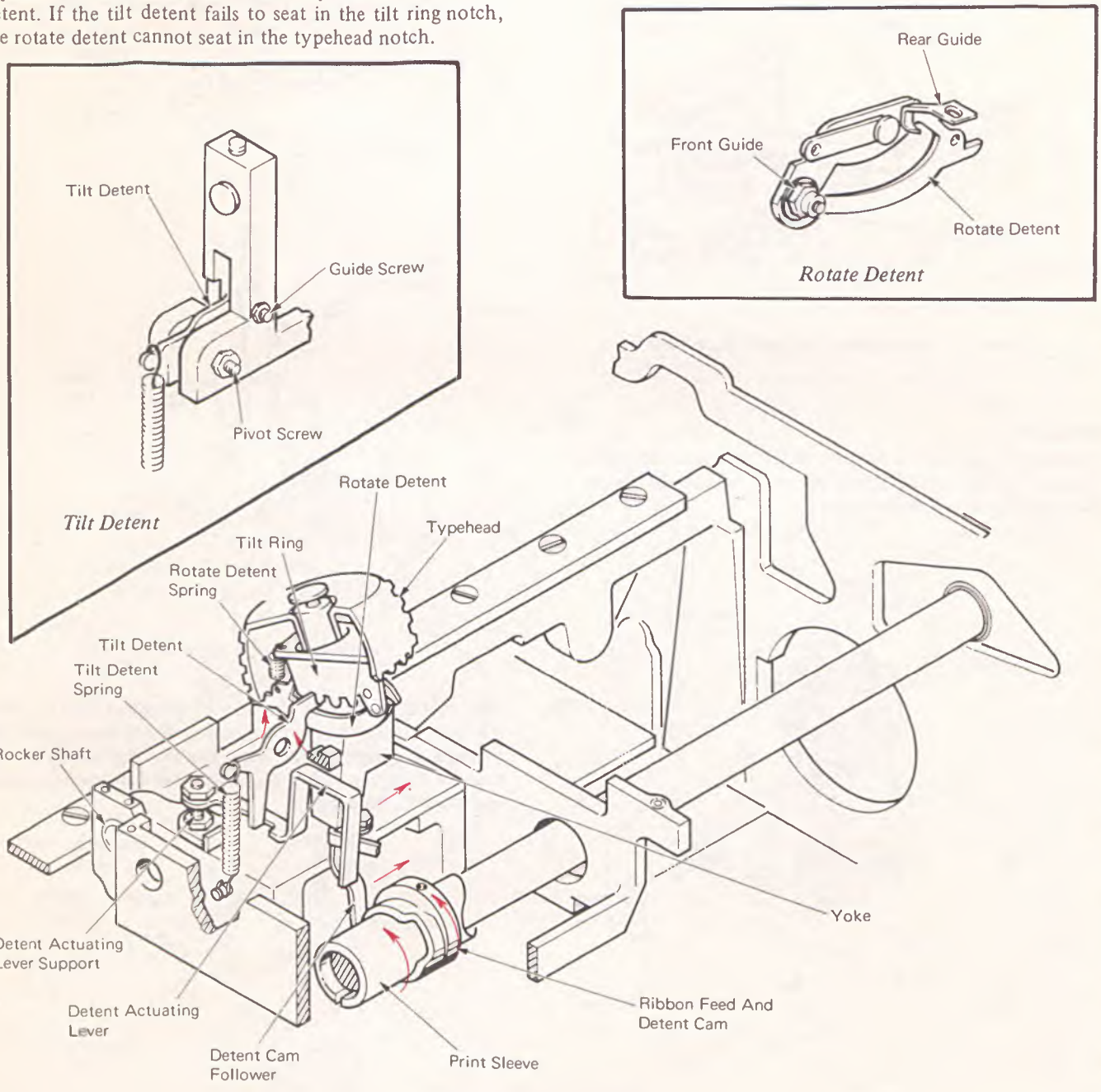
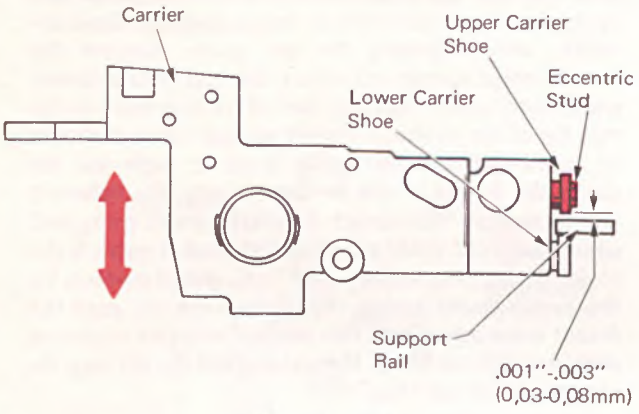


Figure 6 – Detent Operation

FINE ALIGNMENT ADJUSTMENTS

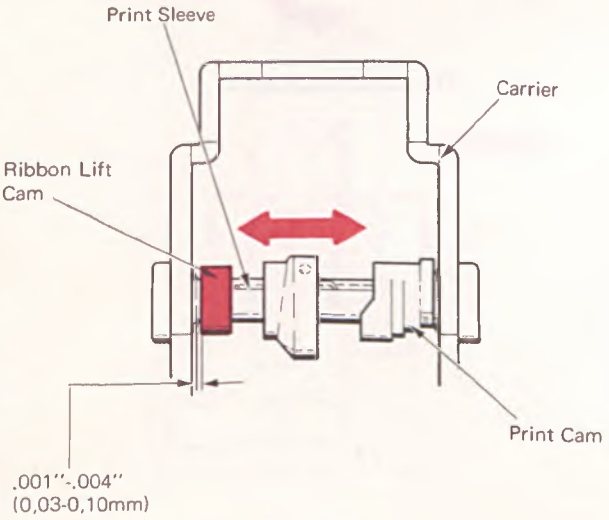
1. *Rear Carrier Shoe* – Loosen the locknut and adjust the carrier shoe eccentric stud for .001"-.003" of vertical movement with the spring pressure removed. This adjustment should be checked at several points along the support rail.



(Right Side View)

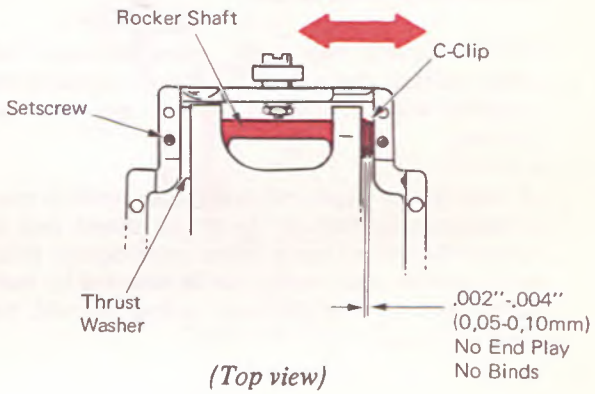
2. *Print Sleeve End Play* – The print sleeve must have .001"-.004" side play. This adjustment is obtained by adjusting the ribbon lift cam left to right.

NOTE: Ensure that the print cam setscrew is tightened onto the flat on the print sleeve prior to adjusting print sleeve end play.



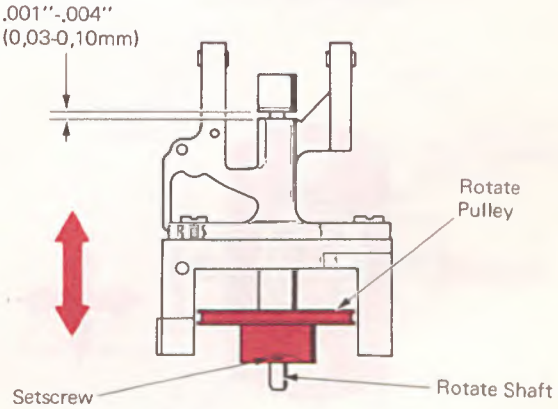
(Top View)

3. *Rocker End Play* – Adjust the rocker shaft to obtain .002"-.004" side play. The side play exists between a C-clip around the shaft at the right side of the rocker and a thrust washer against the carrier casting at the left of the rocker. The rocker shaft is held in place by a setscrew at the left end of the rocker shaft in the carrier casting. This adjustment should be kept to the minimum side of the specification.



(Top view)

4. *Rotate Shaft End Play* – Adjust the rotate pulley vertically to obtain .001"-.004" vertical motion of the rotate shaft. The pulley is accessible from the bottom of the machine with the carrier centered over the cycle shaft and the printer in upper case. DO NOT rotate the rotate shaft when the pulley is loose as this affects homing. Recheck typehead homing after making this adjustment.



(Front View)

5. *Upper Ball Socket* – Adjust for the following condition:

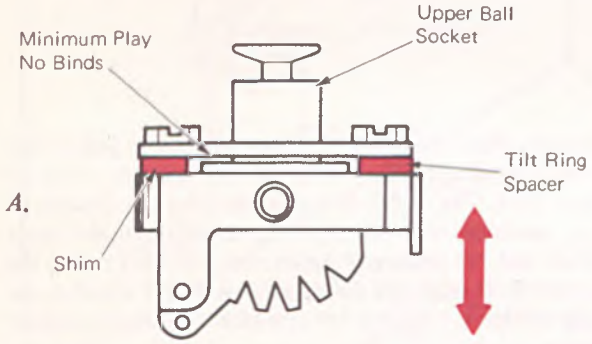
A. Shim the tilt ring spacer so there is no vertical play in the upper ball socket but it is still free to rotate.

B. Position the tilt ring spacer front to rear and left to right so that there is equal clearance between the upper ball socket and the front and both sides of the opening in the tilt ring spacer.

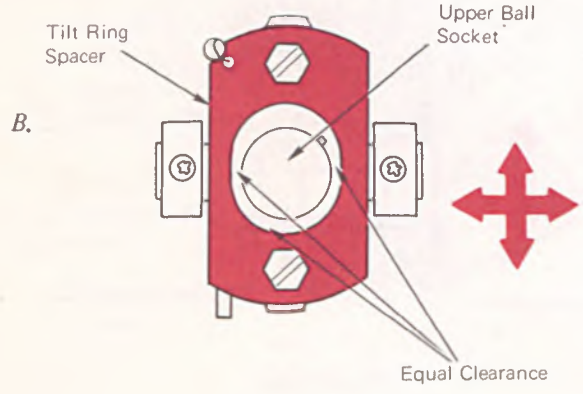
NOTE: To prevent malselection, all typeheads used with this tilt ring must be lubricated with No. 23 Grease on the inner surface.

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

A bind in the upper ball socket can result in poor horizontal alignment if the rotate detent fails to seat in the detent notch before print occurs. Binds in the carrier area usually can be detected by manually operating the shift arm in and out with the typehead installed.



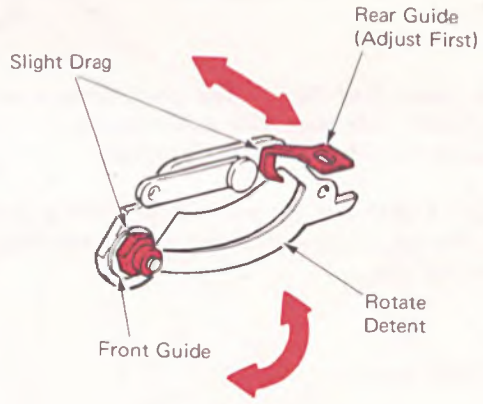
(Right Side View)



(Top View)

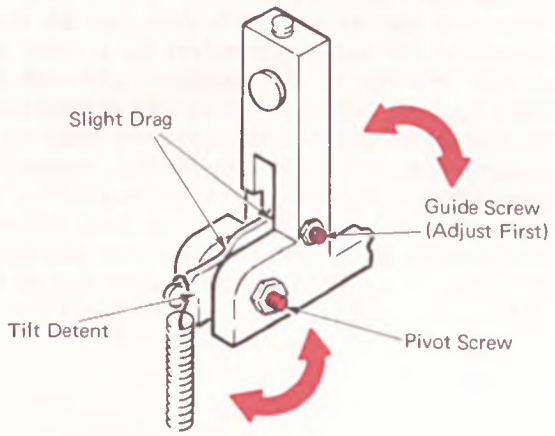
6. *Rotate Detent* – Adjust the front and rear rotate detent guides so the detent will operate vertically with no binds, but has no horizontal movement. This adjustment should be checked by half cycling a "J" and checking for rotational movement of the typehead. Excessive play in the rotate detent will cause poor horizontal alignment because the detent will not positively position the typehead.

NOTE: This adjustment can best be made with the tilt ring off the machine. Loosen the front guide nut approximately a half turn to assure that it will not interfere while adjusting the rear guide. Remove the rotate detent spring and adjust the rear rotate detent guide until a very slight amount of friction exists as the rear tip of the detent is moved up and down. It should be noted that the rear guide is on an angle and the closer the detent travels to the tilt ring, the tighter it will be wedged. Reconnect the rotate detent spring and adjust the front guide adjusting nut until it restricts the rotate detent from being pulled to its seated position by the rotate detent spring, then loosen the nut until the detent snaps into place. This method will give minimum clearance with no binds. If you removed the tilt ring, do not reinstall at this time.

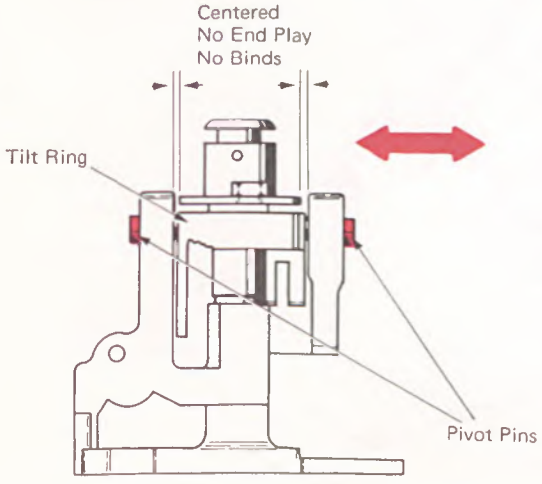


(Tilt Ring Removed)

7. *Tilt Detent* – The tilt detent should pivot freely about its pivot screw with no side play. This can best be achieved by loosening both the pivot screw and the guide screw and disconnecting the tilt spring. If you did not have to remove the tilt ring to perform the rotate detent adjustment, disconnect the rotate detent spring. Adjust the guide screw so that no side movement is allowed when the detent lever is operated past the guide screw. Adjust the pivot screw until it produces a very slight amount of friction on the tilt detent lever and tighten the lock nut. Reconnect the tilt and rotate detent lever springs.

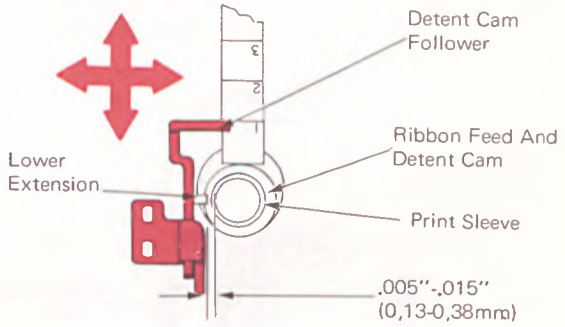


8. *Tilt Ring* – If the tilt ring had been removed previously, reinstall at this time. The tilt ring should be centered in the yoke with no side play. Adjust the pivot pins to satisfy this condition. Once installed there should be absolutely no side play to the tilt ring.



(Front View)

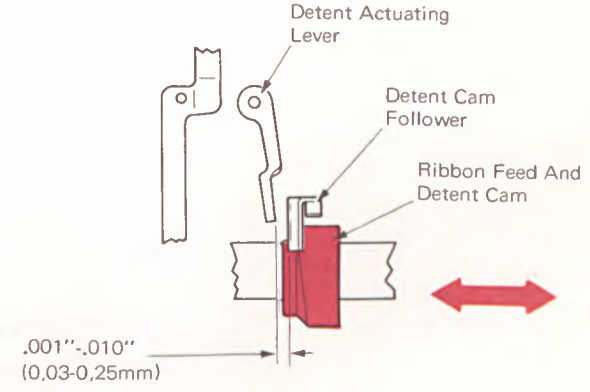
9. *Detent Cam Follower* – Adjust the detent cam follower to satisfy the following conditions: (a) With the hooverometer resting on the shoulder of the ribbon feed and detent cam, adjust the cam follower vertically so the top surface of the follower arm is in line with the No. 1 scribe line. (b) Front-to-rear for .005"-.015" clearance between the print sleeve and the end of the lower extension on the cam follower.



(Left Side View)

10. *Detent Skirt Clearance* – To obtain detent skirt clearance, adjust the detent cam and the detent actuating lever to satisfy the following conditions:

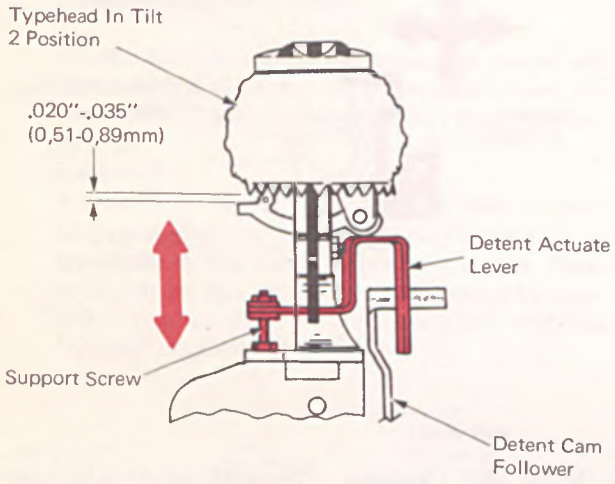
    a. With the detent cam follower on the low dwell of the cam, adjust the ribbon feed/detent cam left or right for .001"-.010" clearance between the detent actuating lever and the detent cam follower. Make sure that the tilt and rotate detents are fully seated.



(Top View)

b. With the cycle shaft at rest and the typehead manually held at the tilt two positions, adjust the detent actuating lever support screw up or down for .020"-.035" clearance between the rotate detent and the teeth on the typehead skirt.

NOTE: These two adjustments may affect each other and should be adjusted alternately to obtain the correct clearances.



(Left Side View)

VELOCITY CONTROL OPERATIONAL THEORY

The purpose of the velocity control and dead key inhibitor mechanism is to provide a means of overriding normal velocity selection and inhibiting the dead key mechanism. This feature is used in conjunction with the multi-lingual feature. A control wheel and indicator button are located just to the right of the ON/OFF keybutton (Figure 1). Two switches are mounted beneath the control wheel and are operated by camming surfaces on the lower portion of the wheel.

The control wheel has three positions. When operated towards the rear, both of the switches will be operated. In this position, all keyboard positions will be low velocity and dead key mechanism will be inhibited. The control wheel must be held to the rear. When the control wheel is in the center (normal position) neither of the switches will be operated. Velocity selection will be as programmed by the multi-lingual jumper plug and dead key mechanism will be active. When the control wheel is rotated forward, only the outside switch will be operated. All keyboard positions will be high velocity and dead key mechanism will be inhibited. This position is detented and need not be held.

All electronic logic necessary to operate the velocity control feature and the multi-lingual feature is contained in the electronic planar package. Dead key and low velocity selections are programmed by a jumper plug that plugs directly into the planar package.

NOTE: Inhibiting the dead key mechanism for the multi-lingual feature does not affect the dead key mechanism during a correcting ribbon correcting cycle.

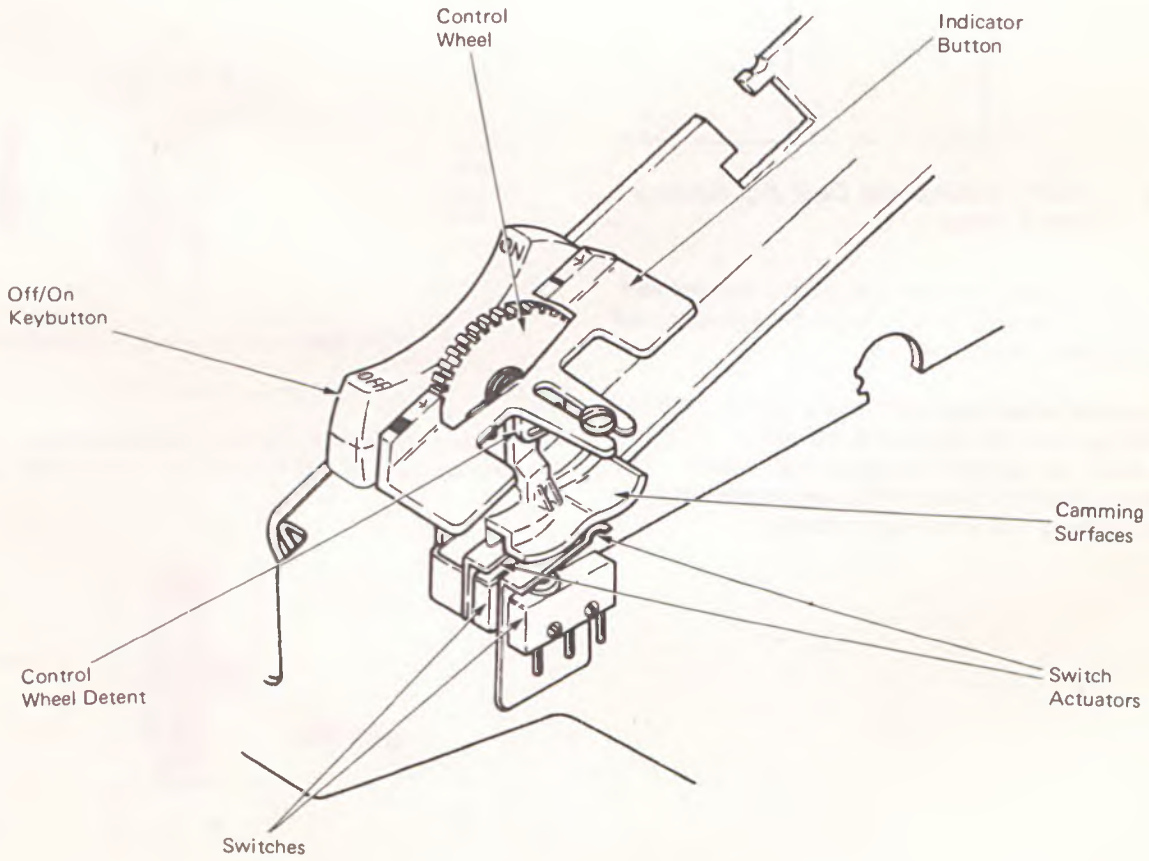


Figure 1 – Velocity Control And Dead Key Inhibitor

The wiring diagram in Figure 2 shows how the switches provide the signals to control velocity and inhibit dead key.

With the control wheel held to the rear, and both switches operated, the outside switch will supply a ground to planar package pin 2. This signals the electronics to inhibit dead key and to interrupt the electronic ground path to the low velocity magnet thus making all keyboard positions high velocity. However, since the inside switch has also operated, a ground is applied to planar package pin 13 signaling the electronics to override the high velocity instruction and to print all characters low velocity.

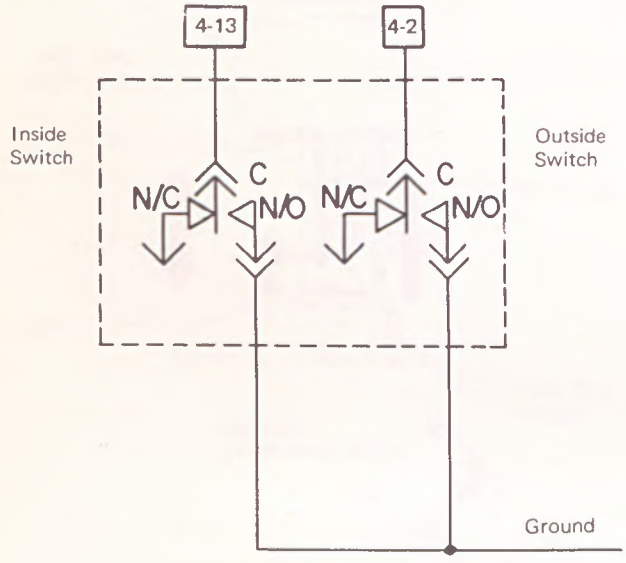


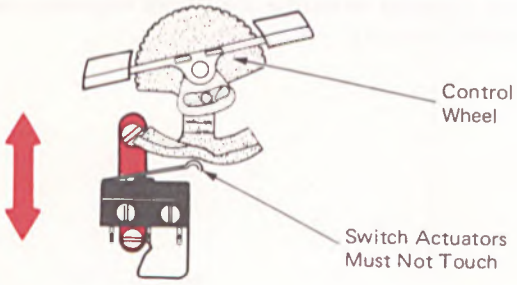
Figure 2 – Velocity Control And Dead Key Inhibitor Switch Wiring

With the control wheel centered and no switches operated, the dead key and velocity selections will be as programmed by the multi-lingual jumper plug.

With the control wheel detented forward, and only the outside switch operated, the electronics will again inhibit dead key and make all keyboard positions high velocity. This time, however, since the inside switch was not operated, the keyboard selections will remain high velocity.

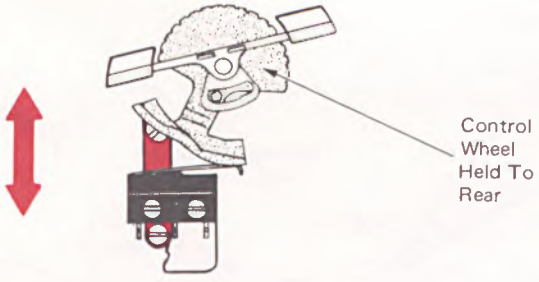
VELOCITY CONTROL ADJUSTMENTS

1. *The Velocity Control and Dead Key Inhibitor Switch Assembly* – Should be adjusted to satisfy the following conditions:
   a. With the control wheel in the center or normal position, the switch actuators must not touch the cam on the lower portion of the control wheel.



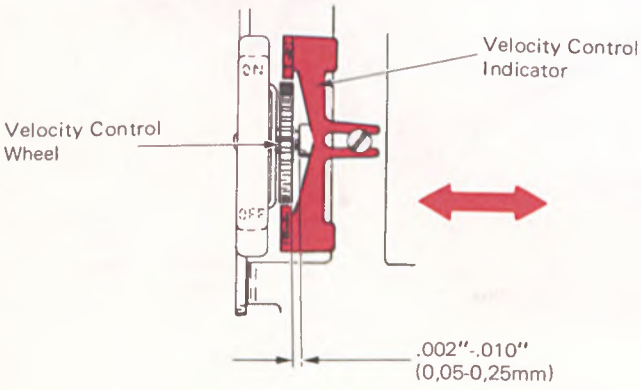
(Right Side View)

   b. With the control wheel held to the rear, both switches must be operated.



Both Switches Operated (Right Side View)

2. *Velocity Control Indicator* – Adjust the indicator left to right for .002"-.010" end play of the velocity control wheel.



(Top View)

PRINT OPERATIONAL THEORY

The purpose of the print mechanism is to power the typehead toward the platen. This is accomplished through a print cam located in the carrier assembly (Figure 1). When the printer is cycled for a character selection/print operation, motion is transferred through the print cam, print cam follower, and the rocker assembly to power the typehead toward the platen.

There are two basic conditions necessary for a correct print operation. They are correct velocity of the typehead as it strikes the paper and proper platen position.

The platen is supported by the carriage guide brackets and held in position by the platen latches.

The system has three velocity selections: high, low, and no-print. High velocity is used when printing characters and numbers. Low velocity provides a lighter impression for punctuation and symbols. No-print is used for no-print operations such as spacebar, leadscrew homing, etc.

The print mechanism contains an impression control lever which may be positioned to one of five settings to permit the operator to change the overall impression of the typehead (Figure 1).

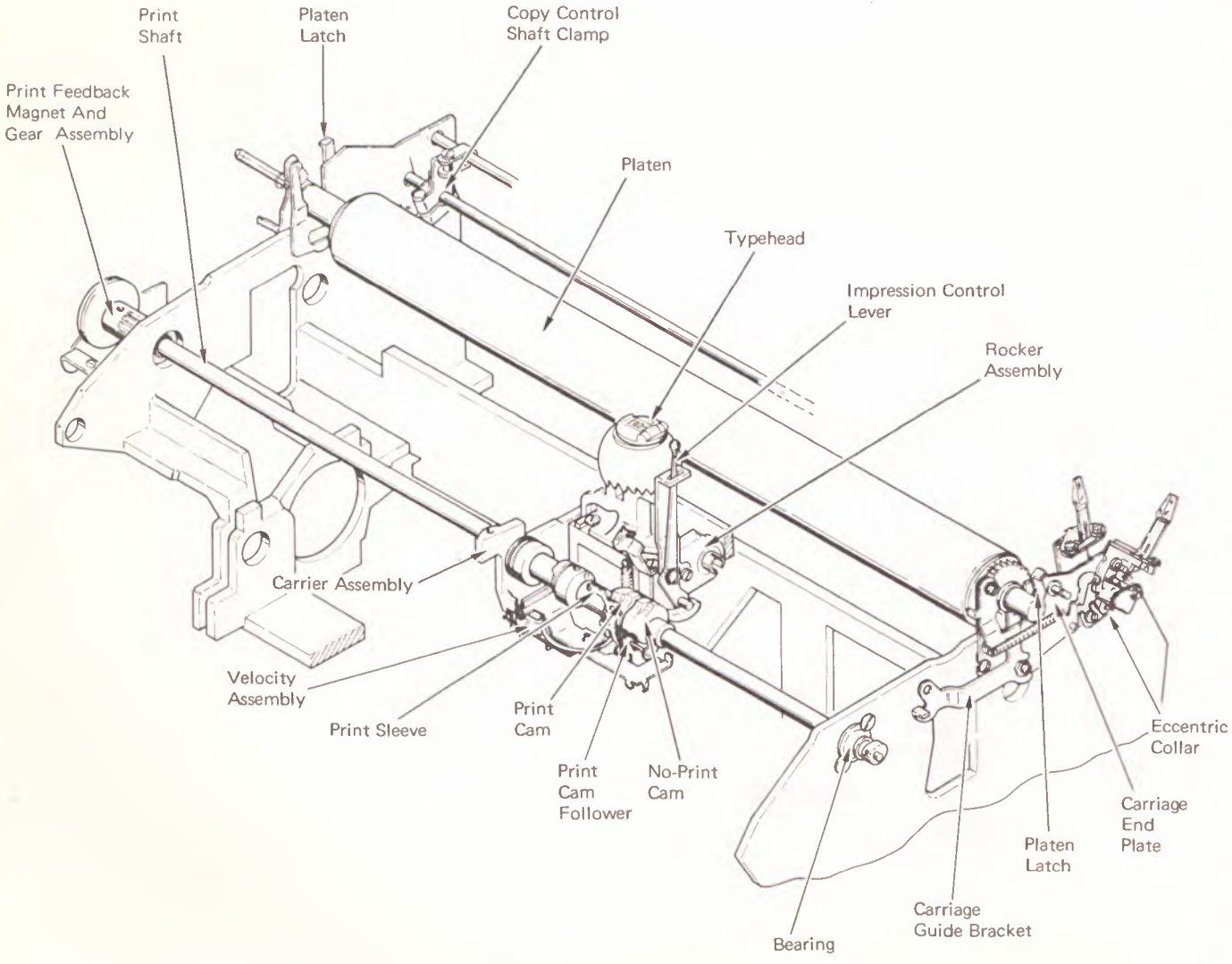


Figure 1 – Print Mechanism

CARRIER SUPPORT

The carrier assembly is supported in front by the print shaft. The print sleeve is keyed to the print shaft causing it to turn when the print shaft rotates. The print sleeve turns within two bearings in the carrier casting.

Due to print shaft flex, the front of the carrier needs additional support. A carrier support bar extends the width of the printer under the carrier. A carrier pad mounted under the front of the carrier contacts the support bar when flexing of the print shaft occurs.

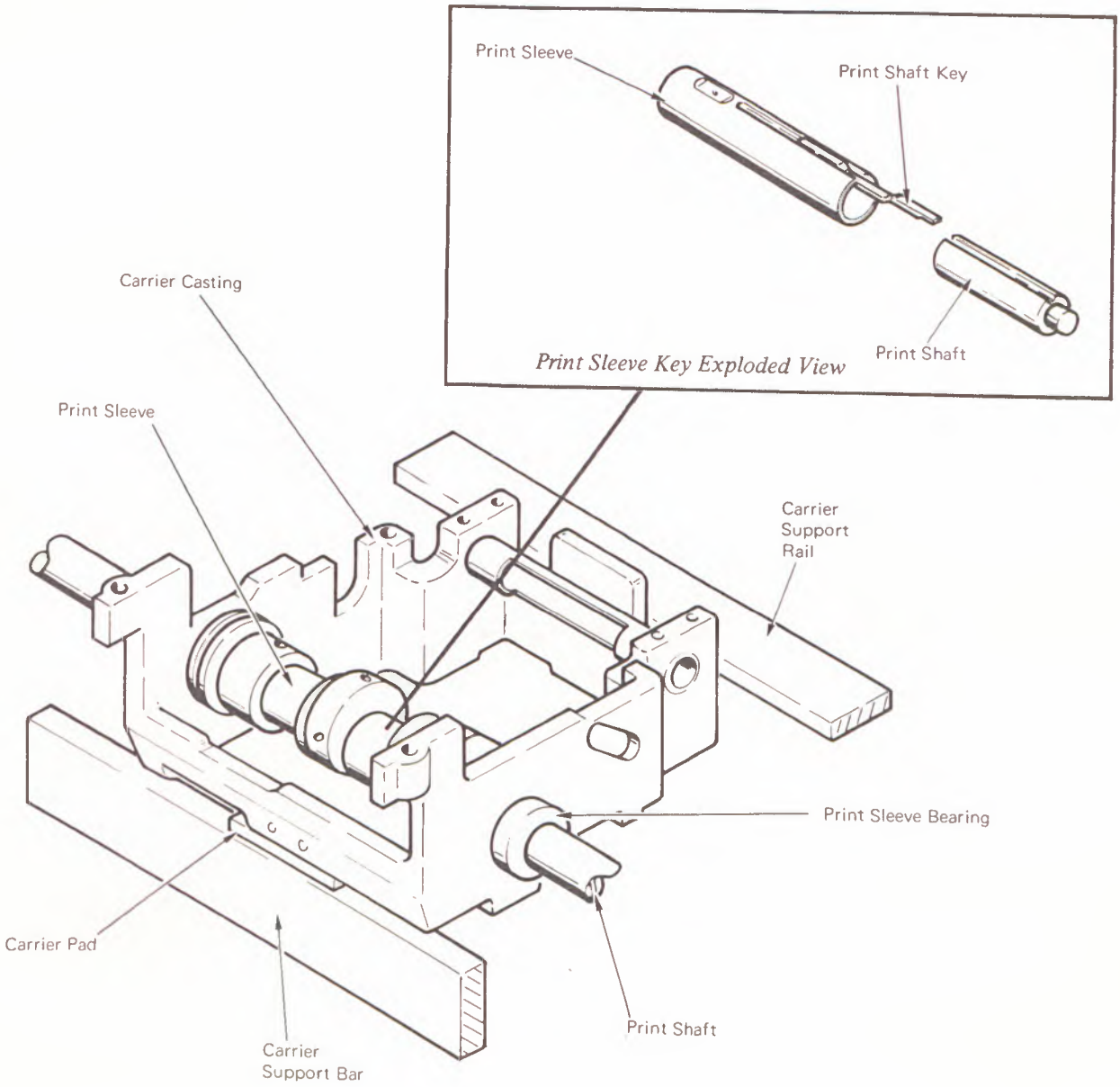


Figure 2 – Front Carrier Support

PRINT OPERATION

Drive to operate the print mechanism is supplied through the print shaft (Figure 3). The print shaft extends the width of the printer and is supported in a bearing at either end. The print shaft gear on the left end of the print shaft connects the print shaft to the character selection mechanism. When the character selection mechanism is cycled, motion is transferred to rotate the print shaft top to rear. The print shaft is rotated 360 degrees each cycle.

The print cam is setscrewed to the print sleeve which in turn is keyed to the print shaft. When the print shaft is rotated, motion is transferred through the print sleeve to rotate the print cam. Print cam motion is then transferred through the cam follower and the impression control lever to pivot the rocker assembly about the rocker shaft and power the typehead toward the platen.

A rocker up-stop attached to the carrier is in a position to be contacted by a buffer attached to the bottom of the rocker (Figure 3). The purpose of the rocker up-stop is to limit rocker travel if a print cycle occurs when the platen is removed.

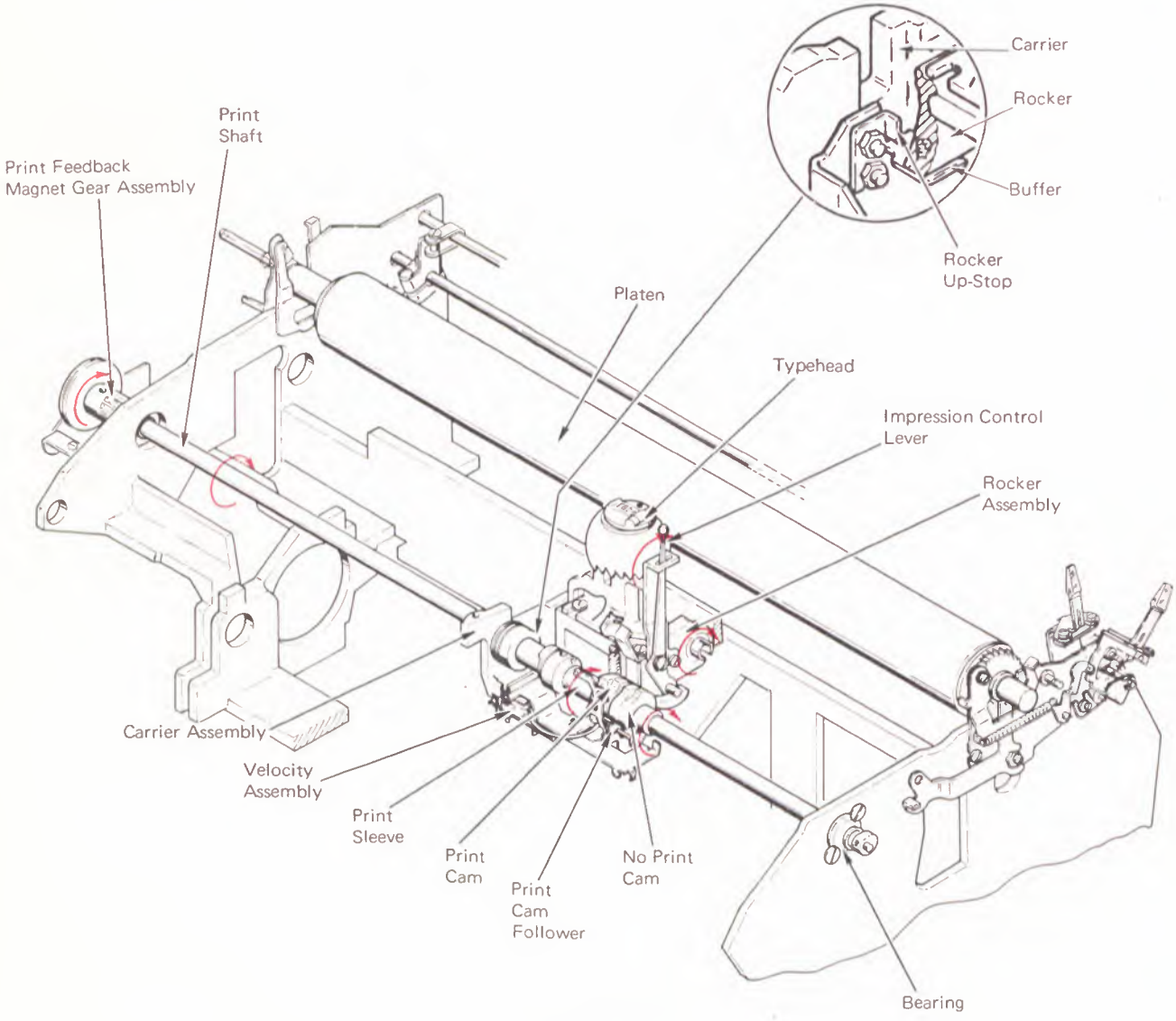


Figure 3 – Print Operation

IMPRESSION CONTROL LEVER

Impression is determined by the velocity of the typehead as it strikes the paper. By changing the position of the impression control lever, the impression for all characters can be changed equally.

The impression control lever is positioned within a detent plate to one of five different impression settings (Figure 4). Changing the position of the impression control lever causes the pin at the lower part of the lever to move to the front or rear of the print cam follower. The front to rear position of the pin determines the amount of travel the rocker receives from the print cam.

The distance that the print cam drives the rocker and typehead is called "powered" flight. The remaining distance that the typehead must travel to reach the platen is called "free" flight. These two factors determine the velocity of the typehead upon impact with the paper.

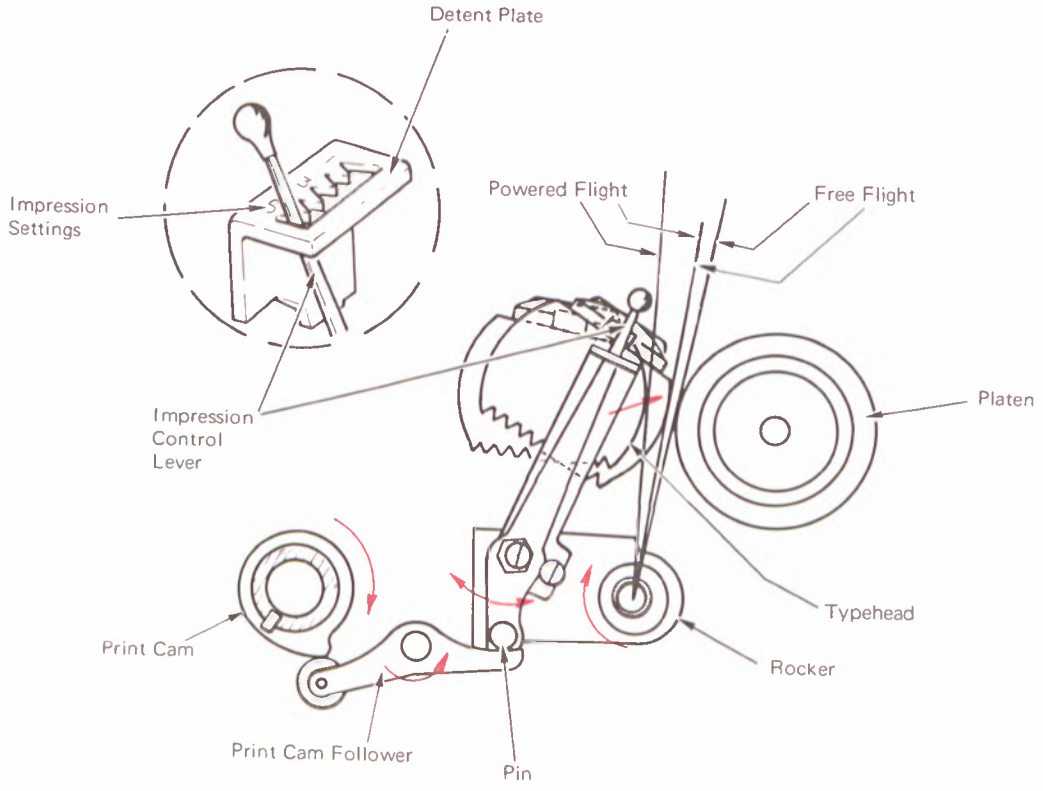


Figure 4 – Impression Control Lever (Right Side View)

VELOCITY SELECTION

The system has three velocity selections: high, low, and no-print. High velocity is used when printing characters and numbers. Low velocity provides a lighter impression for punctuation and symbols. No-print is used for no-print operations such as spacebar, leadscrew homing, etc.

The three velocity selections are obtained through the use of a print/restore cam, which has two different velocity lobes and a restore camming surface, and a no-print cam (Figure 5). Mounted on the print cam follower is a roller which is free to slide left or right to engage the desired velocity lobe of the print cam or the no-print cam.

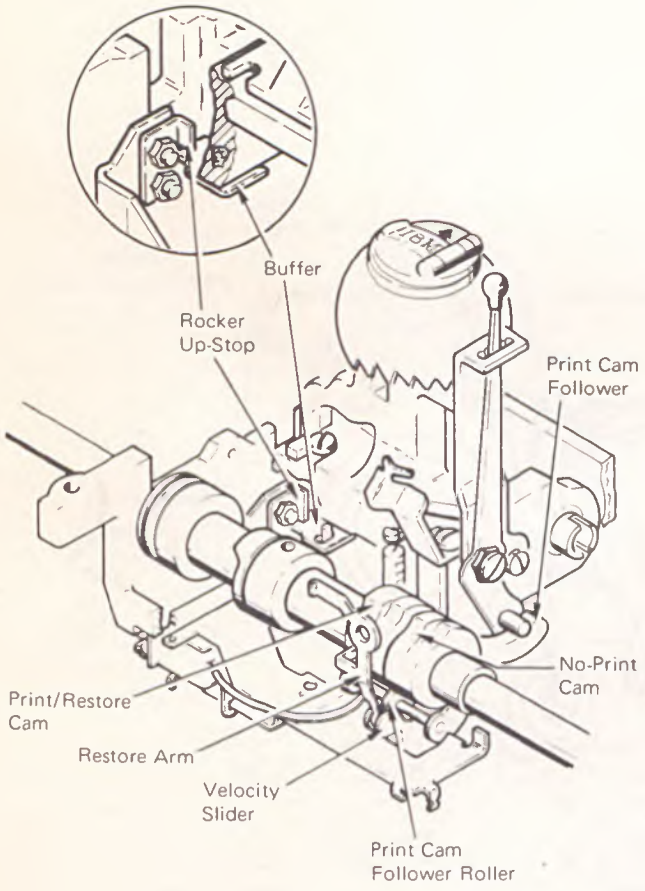


Figure 5 – Velocity Selection

The print cam follower roller is positioned under the desired cam lobe by the velocity slider. The velocity slider is spring loaded to the right but held to the left by the restore arm and restore camming surface on the left side of the print cam. A velocity selection is obtained by releasing the restore arm and allowing the velocity slider and print cam follower roller to be pulled to the right by the spring.

To prevent the print cam from interferring with the print cam follower roller as it shifts from one lobe to the other, the print cam follower is held away from the print cam by an adjustable stop screw. The stop screw contacts the rear of the print cam follower (Figure 6).

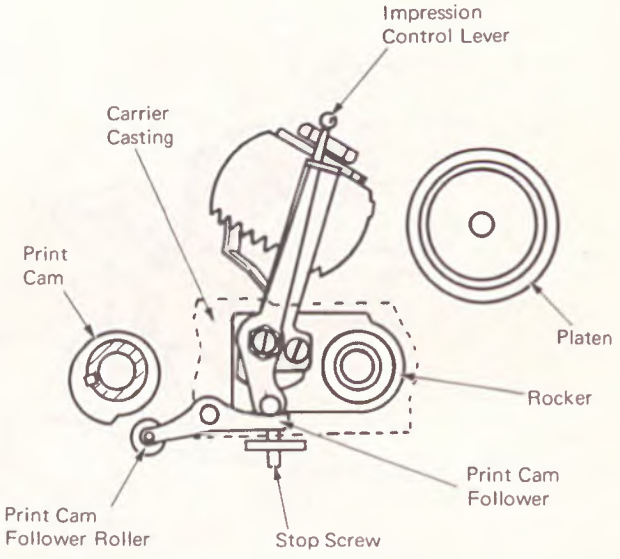


Figure 6 – Print Cam Follower (Right Side View)

VELOCITY CONTROL

At rest, the velocity slider is held to the left by the restore arm. The restore arm mounts on an extension of the ribbon feed bracket and has an extension which contacts the restore cam (Figure 7) The restore cam camming surface is on the left side of the print cam.

As the printer is cycled, the restore arm begins to move towards the low dwell of the restore cam, allowing the velocity slider to move to the right under its spring tension.

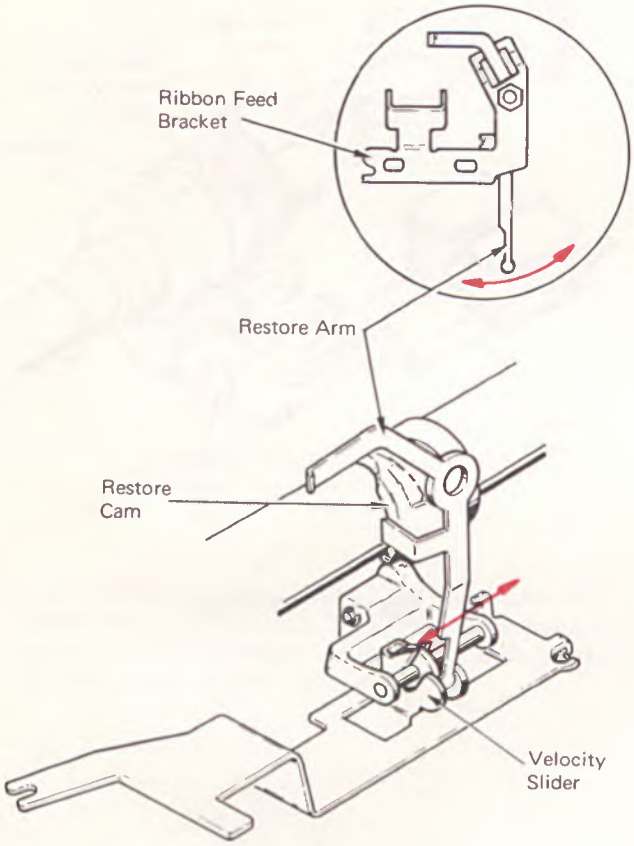


Figure 7 – Velocity Restoring Mechanism

The distance the velocity slider is allowed to move is controlled by two velocity magnets working in conjunction with slots cut in the velocity slider (Figure 8). The two magnets are called the No. 1 velocity magnet and the No. 2 velocity magnet. The electronics determines which velocity magnets will be used. The magnets are energized at the beginning of the cycle and remain energized until the print feedback switch closes.

Refer to the Character Selection Section for more information on the Print Feedback Switch.

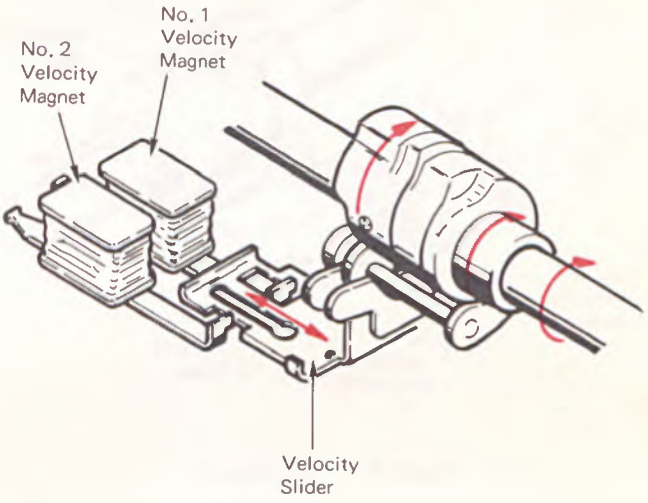


Figure 8 – Velocity Magnets And Slider

If neither velocity magnet is energized during a print operation, the velocity slider will be held by the No. 1 velocity armature and will not move. The print cam follower roller will be beneath the high velocity lobe of the print cam and high velocity print operation will occur (Figure 9).

If the No. 1 velocity magnet is energized, the velocity slider will be allowed to move to the right until it contacts the No. 2 magnet armature. The print cam follower roller will be beneath the low velocity lobe of the print cam and a low velocity operation will occur.

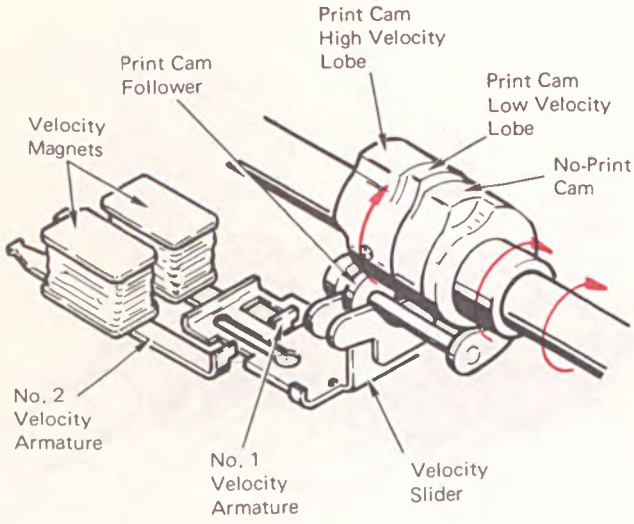


Figure 9 – High Velocity

Energizing both the No. 1 and the No. 2 velocity magnets will allow the velocity slider to move fully to the right. In this position, the print cam follower roller will be beneath the no-print cam and a no-print operation will occur (Figure 10).

As the printer reaches the end of the print cycle, the restore cam contacts the restore arm, moving the restore arm and velocity slider back to its restored or rest position, ready for another operation.

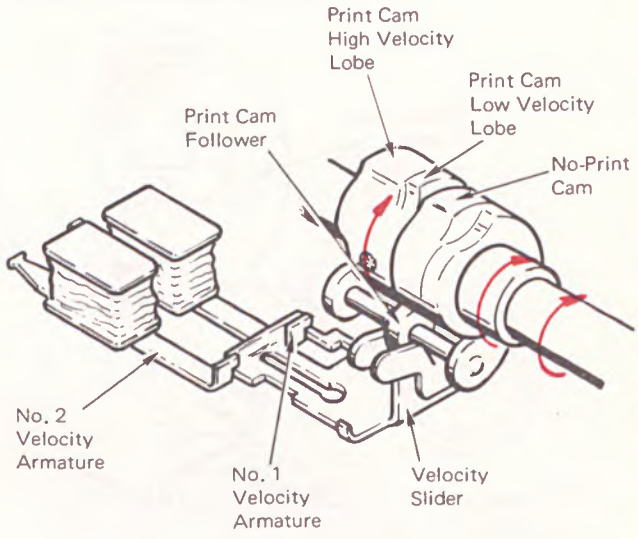
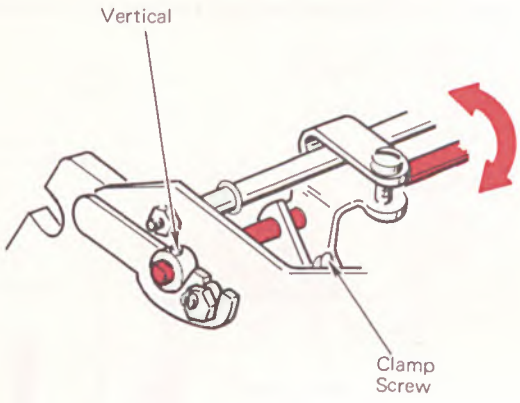


Figure 10 – No Print

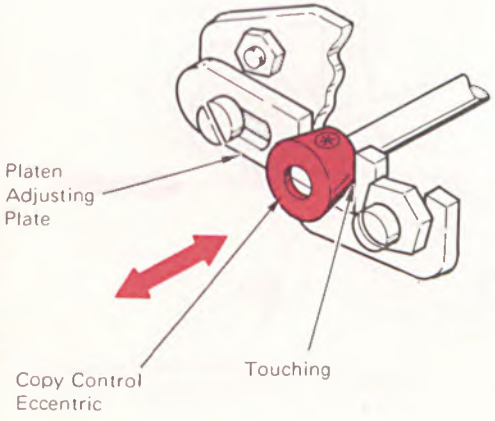
PRINT ADJUSTMENTS

1. *Copy Control Shaft Clamp* – Position the copy control shaft so that the setscrew in the eccentric collar is vertical, then tighten the clamp.



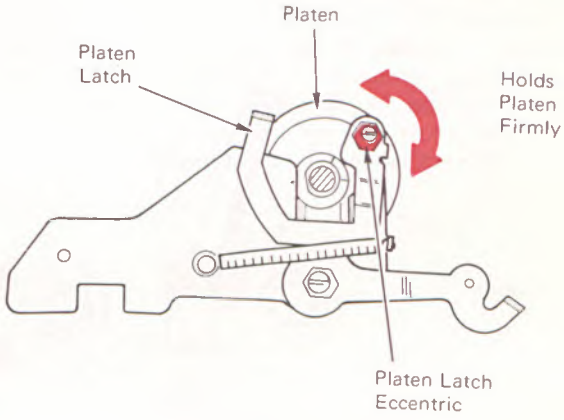
(Left Front View)

2. *Copy Control Eccentric* – Adjust the copy control eccentric left to right so there is no front to rear motion, and no binds exist between the eccentric and the platen adjusting plates on each side of the machine.



(Left Front View)

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

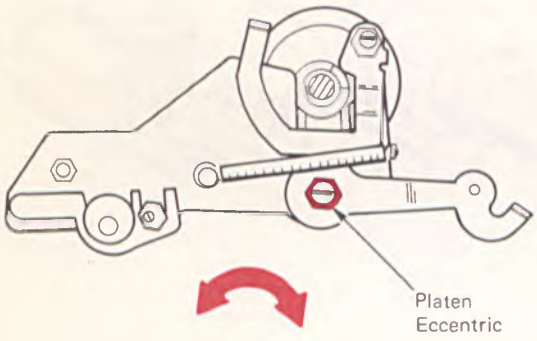


(Left Side View)

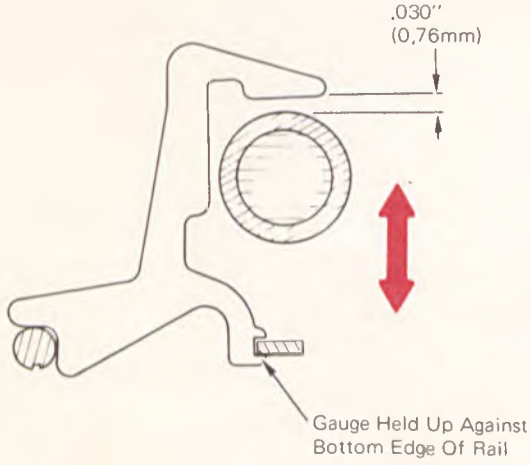
4. *Platen Position* – To properly adjust the print mechanism, the correct position of the platen must be established first and then the print adjustments made relative to the platen position. With the print shaft keyway down, loosen the platen eccentrics and move the platen to the extreme rear and down as low as possible.

Position the platen gauge on the print shaft and the rail at one extreme end of the machine. While holding the gauge up against the rail, adjust the platen to meet the following conditions:

a. Vertically for .030" clearance between the top of the platen and the horizontal edge of the gauge. (This is a preliminary adjustment.)



(Left Side View)

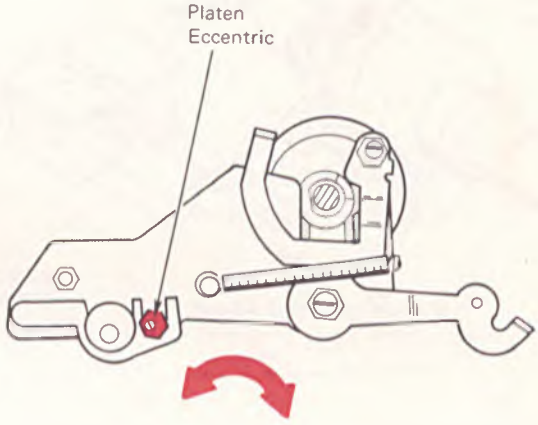


(Right Side View)

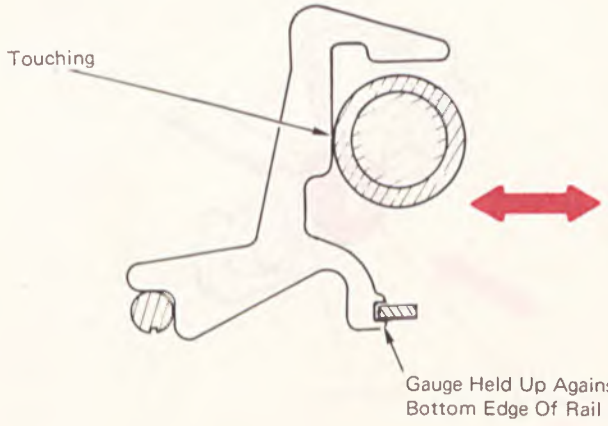
b. Front to rear until the platen touches the vertical edge of the gauge.

Move the gauge to the opposite end of the machine and repeat the procedure. Check for a parallel condition by sliding the gauge back to the beginning end.

CAUTION: Any change in the platen position may alter the paper feed adjustments. All paper feed adjustments should be checked and readjusted if necessary.

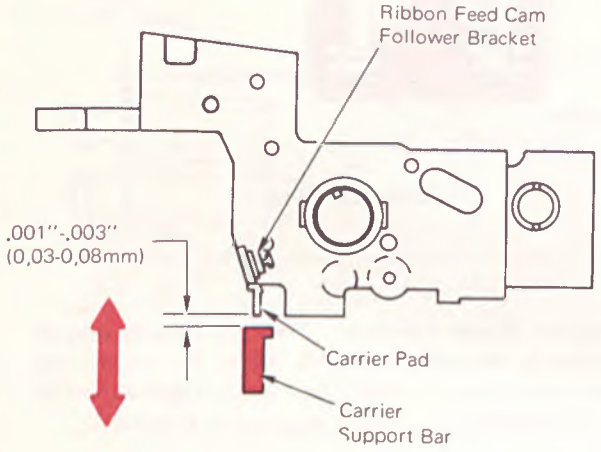


(Left Side View)



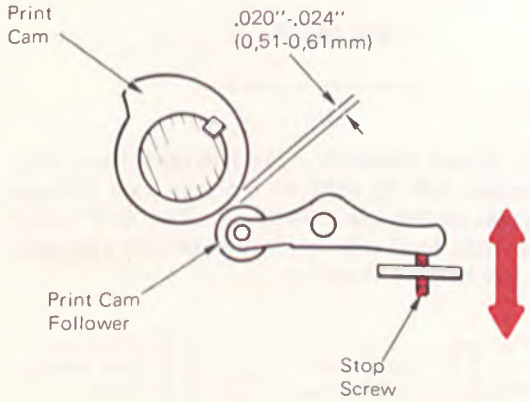
(Right Side View)

5. *Carrier Support Bar* – Adjust the carrier support bar up or down for .001"-.003" clearance between the bar and the carrier pad mounted under the ribbon feed cam follower bracket. Check at several places on the writing line.



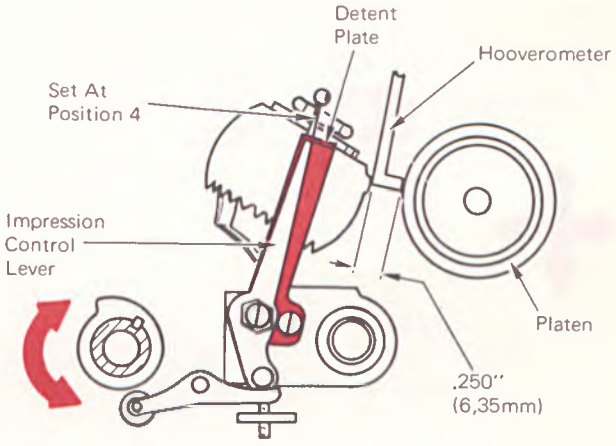
(Right Side View)

6. *Print Cam Follower Stop Screw* – With the machine at rest, adjust the print cam follower stop screw so the follower roller clears the print cam by .020"-.024".



(Right Side View)

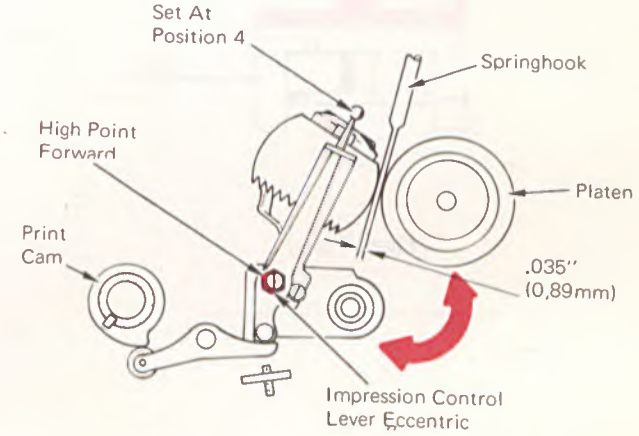
7. *Powered Flight* – With the machine latched at rest, set the impression control lever at position 4 and adjust the detent plate front to rear until the foot of the Hooverometer handle just spans the distance between the platen and the center of the letter Z.



(Right Side View)

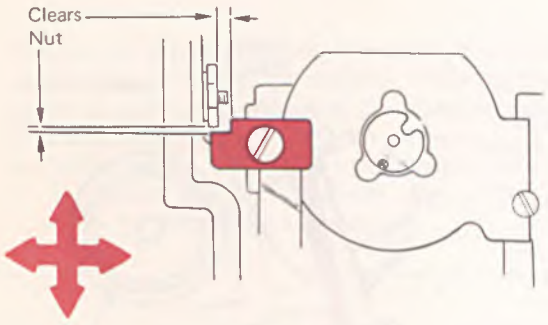
8. *Free Flight* – With the impression control lever set at 4 and a letter "Z" half cycled until the machine is resting on the high point of the print cam, the pusher end of a large spring hook (.035") should just span the distance between the letter "Z" and the platen. Adjust the eccentric on the impression control lever to obtain this condition, keeping the high point of the eccentric forward.

NOTE: Adjustment no. 7 and no. 8 directly affect each other and must be adjusted alternately until both are correct..



Letter "Z" Half-Cycled (Right Side View)

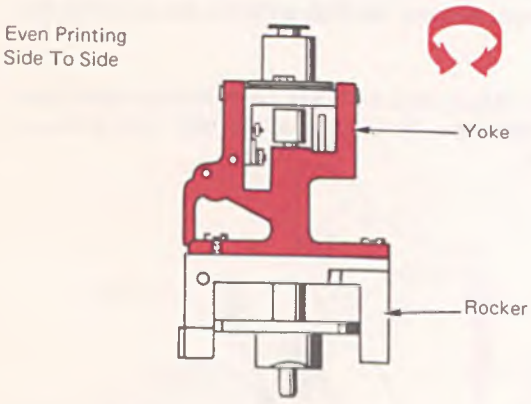
9. *Rocker Upstop* – Position the rocker up-stop buffer, on the bottom of the rocker, left to right and front to rear so it clears the up-stop mounting nut.



(Bottom View)

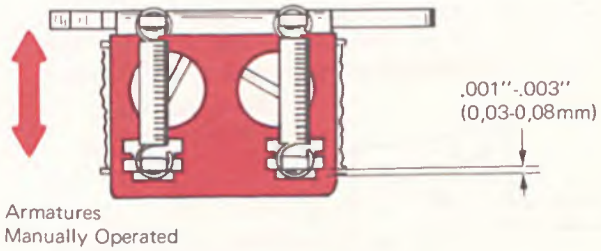
10. *Platen Height (Final)* – Check adjustment number 4 and refine if necessary to provide even top and bottom color of printed characters.

11. *Yoke Position* – Rotate the yoke to provide even printing "side to side" of a high velocity character with the impression control lever in position 1.



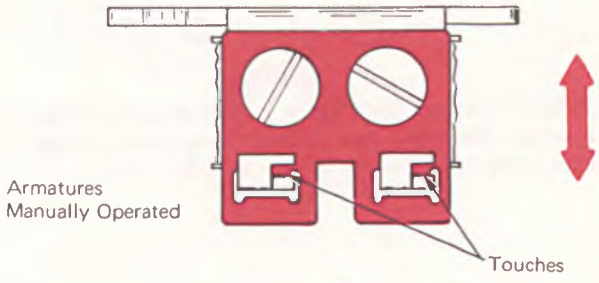
(Front View)

12. *Velocity Magnet Pivot Plate* – With the velocity magnet armatures manually operated, adjust the pivot plate up or down for .001"-.003" clearance between the pivot plate and the bottom surface of the armatures.



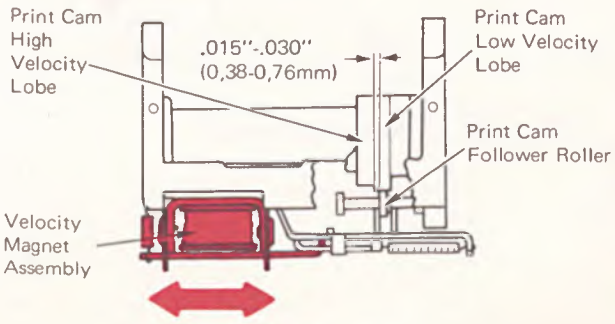
(Left Side View)

13. *Velocity Magnet Up-Stop* – With the velocity magnet armatures manually operated, adjust the magnet up-stop up or down so that it just touches the top surface of the armatures.



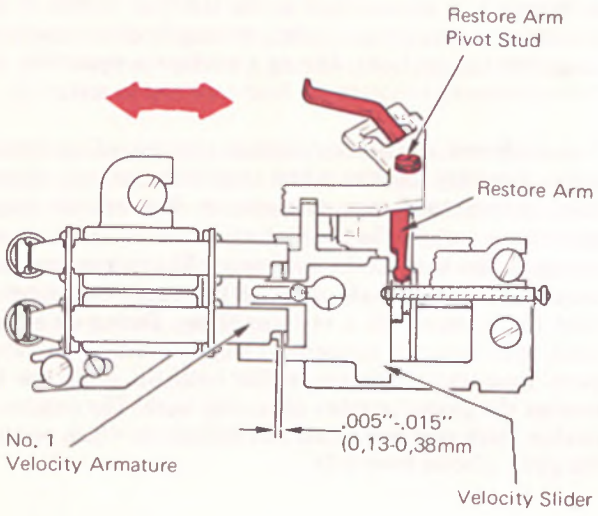
(Right Side View)

14. *Velocity Magnet Assembly* – Position the velocity magnet assembly left to right so the print cam follower roller tracks on the low velocity cam lobe .015"-.030" from the right hand edge of the high velocity cam lobe. Cycle a low velocity character.



(Low Velocity Cycled – Front View)

15. *Velocity Slider Overthrow* – With the restore arm on the high point of the restore cam, adjust the restore arm pivot stud left to right for .005"-.015" clearance between the velocity slider and the No. 1 velocity armature.



(Restore Arm On High Point – Bottom View)

ESCAPEMENT/BACKSPACE/DEAD KEY OPERATIONAL THEORY

The purpose of the escapement and backspace mechanisms is to control carrier movement through the use of a leadscrew and a leadscrew shoe (Figure 1). An escapement operation is obtained by rotating the leadscrew top to front and allowing the carrier to be pulled to the right under mainspring tension. For a backspace operation, the leadscrew is rotated in the reverse direction, causing the carrier to move to the left.

By controlling the amount of leadscrew rotation, the amount of carrier movement can be controlled.

The escapement and backspace mechanisms are discussed together because they each use the leadscrew drive and control mechanisms (Figure 1). The leadscrew drive mechanism is mounted in an assembly in the left rear corner of the printer, and supplies a constant driving force to rotate the leadscrew top to front. During a backspace operation, the drive is reversed to rotate the leadscrew top to rear.

The leadscrew control mechanism consists of an emitter sensor assembly, emitter wheel, leadscrew ratchet, escapement magnet, and magnet armature. The emitter sensor assembly monitors the amount of leadscrew rotation and transmits this data to the electronics. The escapement magnet armature engages the teeth of the leadscrew ratchet to hold the leadscrew in a rest condition. During an escapement operation, the escapement magnet holds the armature away from the leadscrew ratchet until the leadscrew has rotated the proper number of ratchet teeth. The number of ratchet teeth that will rotate will depend on which position the pitch selector lever is in.

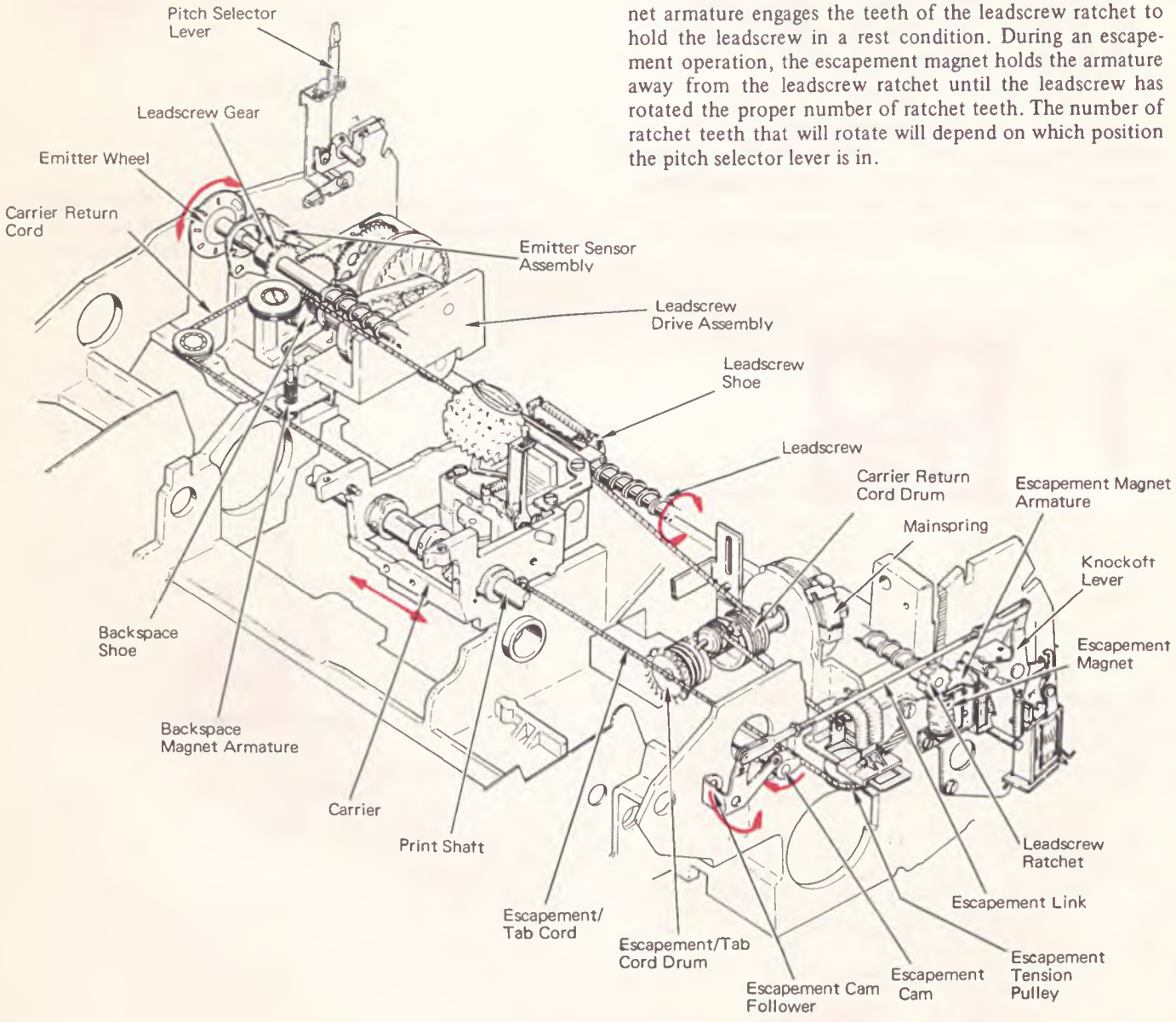


Figure 1 – Escapement/Backspace/Deadkey Mechanism

LEADSCREW/ESCAPEMENT BRACKET

The leadscrew extends the width of the printer and is supported at each end by ball bearings. The center of the leadscrew is supported by a support wheel (Figure 2).

The leadscrew support wheel mounts on a shouldered stud and is free to rotate with the vanes of the leadscrew. The shouldered stud is eccentric, thus making it possible to adjust the support wheel up or down for proper support of the leadscrew.

Rotary motion of the leadscrew is transferred to the carrier through the leadscrew shoe which engages the vanes of the leadscrew. The shoe is mounted on a shouldered stud on the shoe bracket. The extension spring attached to the shoe ensures that the working surface of the shoe will re-engage the leadscrew vane after being cammed over the vanes during a carrier return operation.

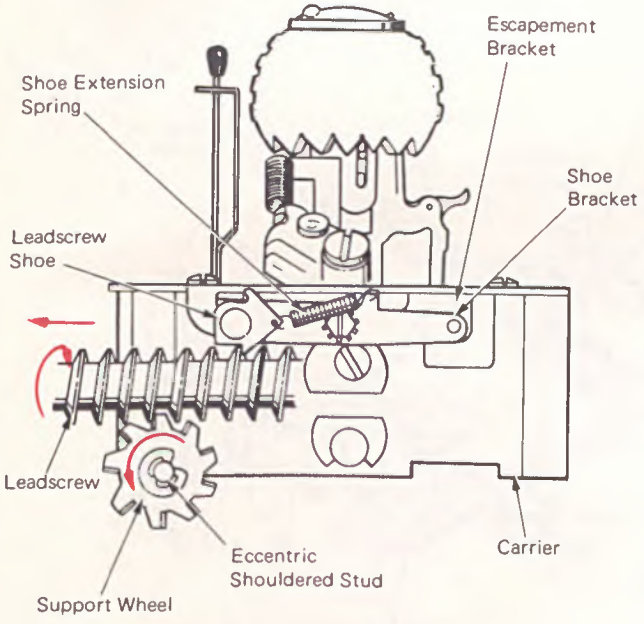


Figure 2 – Leadscrew Escapement Direction (Rear View)

ESCAPEMENT OPERATION

Escapement in the system is initiated by the print shaft. The escapement cam on the right end of the print shaft transfers motion through the cam follower, escapement link, and escapement knockoff lever to disengage the escapement magnet armature from the leadscrew ratchet (Figure 3). With the leadscrew ratchet unlatched, the leadscrew is rotated top to front by the leadscrew drive mechanism and the carrier starts to move to the right under mainspring tension. Once the leadscrew has rotated one tooth of escapement, the emitter assembly signals the electronics to energize the escapement magnet which prevents the magnet armature from re-engaging the teeth of the ratchet. When the electronics has received the proper number of emitter pulses for the pitch selected, the electronics will de-energize the magnet allowing the armature to re-engage the ratchet. The leadscrew will be prevented from further rotation.

The number of ratchet teeth allowed to rotate will determine the amount of carrier movement. The ratchet has ten teeth, each of which represents 1/60 of an inch of carrier movement.

For a ten pitch operation, the leadscrew ratchet would be allowed to rotate six teeth, which would be 6/60 or 1/10 of an inch, thus we have 10 pitch.

For a twelve pitch operation, the leadscrew ratchet would be allowed to rotate five teeth, which would be 5/60 or 1/12 of an inch, thus we have 12 pitch.

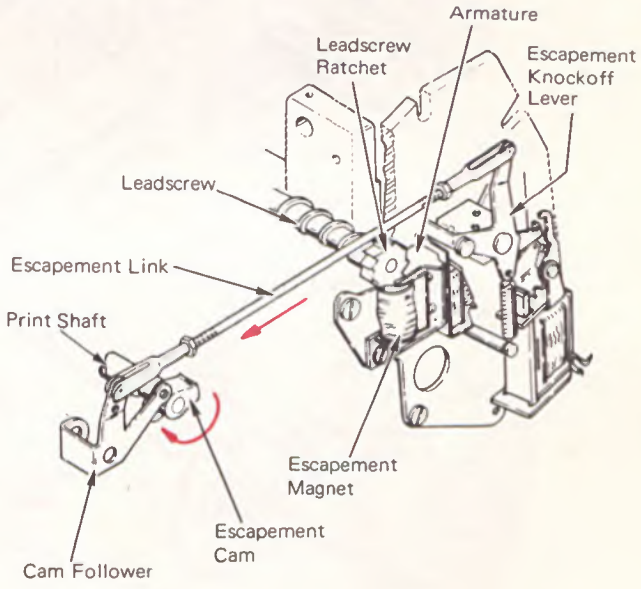


Figure 3 – Escapement Cam & Trip Lever Operation

MAINSPRING AND CORD SYSTEM

Any time the escapement magnet armature is removed from the leadscrew ratchet, the carrier is pulled toward the right by mainspring tension. The mainspring applies tension to the escapement shaft (Figure 4). Located on the escapement shaft are two drums upon which cords are wound in opposite directions. The front cord drum is the escapement/tab cord drum. It is connected to the carrier by the escapement/tab cord. This cord passes through the right side of the machine around the escapement tension pulley and is anchored to the right side of the carrier. When the escapement magnet armature is removed from leadscrew ratchet, the mainspring will turn the escapement/tab cord drum in a counterclockwise direction, pulling the carrier to the right.

The rear drum, or the carrier return cord drum, is connected to the carrier by the carrier return cord. It passes to the left, over a guide, around two pulleys, and is anchored to the left side of the carrier. The carrier return cord must be payed out in order for the carrier to move to the right. Likewise, the escapement/tab cord must be payed out from its drum in order for the carrier to return to the left. The mainspring is rewound during each carrier return operation.

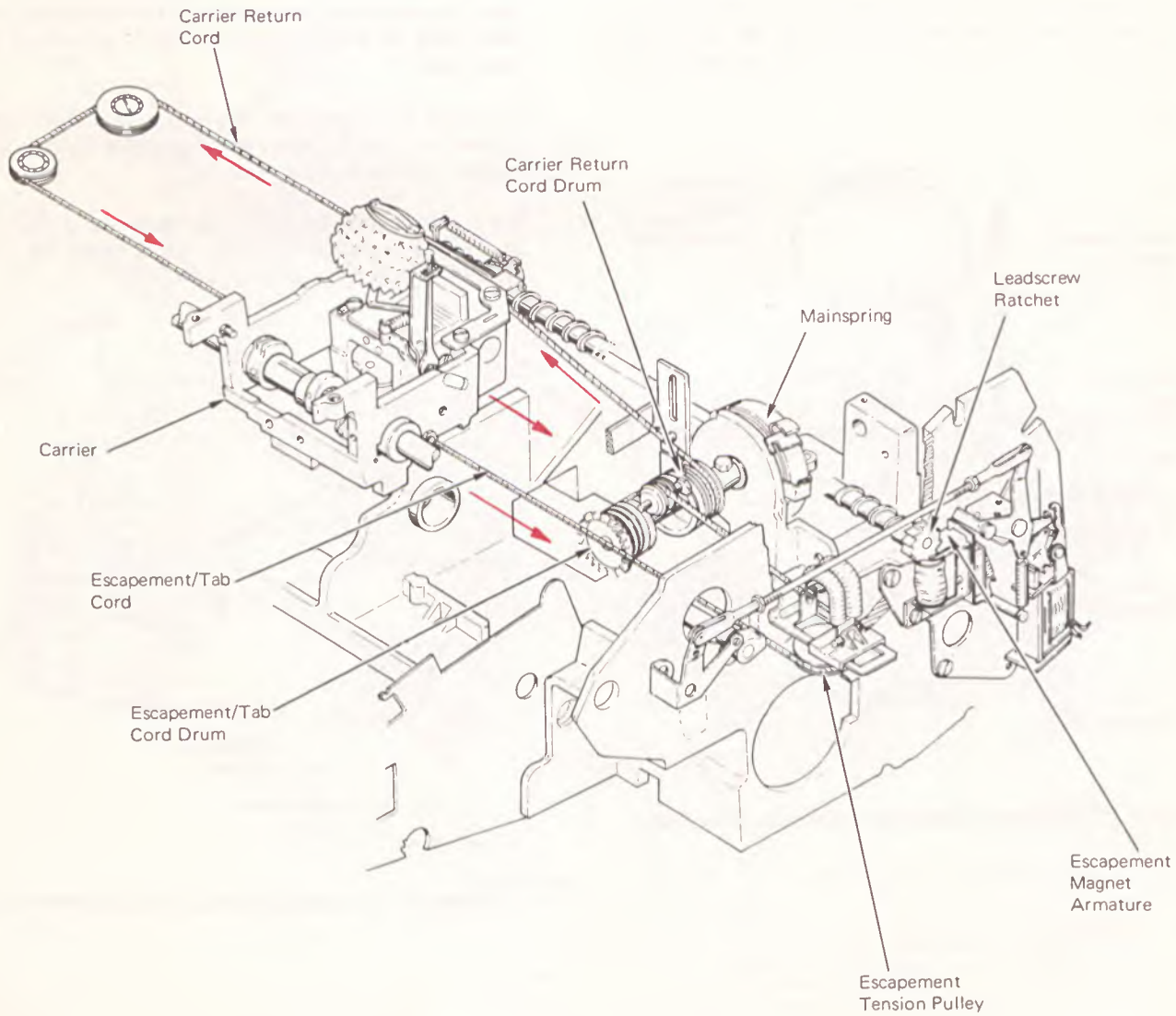


Figure 4 – Mainspring & Cord System

EMITTER OPERATION

The electronics monitors leadscrew rotation through the emitter sensor assembly (Figure 5). The emitter sensor assembly pulses the electronics each time the leadscrew ratchet has rotated one tooth of escapement. The emitter sensor assembly consists of a light emitting diode (LED), a phototransistor, and the emitter wheel which is setscrewed to the left end of the leadscrew.

Each of the ten windows in the emitter wheel corresponds to a tooth on the leadscrew ratchet. When the leadscrew rotates during an escapement operation, the windows of the emitter wheel are passed between the phototransistor and LED. The phototransistor pulses the electronics each time it is exposed to the light rays of the lamp (Figure 5). When the electronics senses the proper number of the emitter pulses for the pitch selected, it will de-energize the escapement magnet. The magnet armature will then engage the leadscrew ratchet to stop the escapement operation.

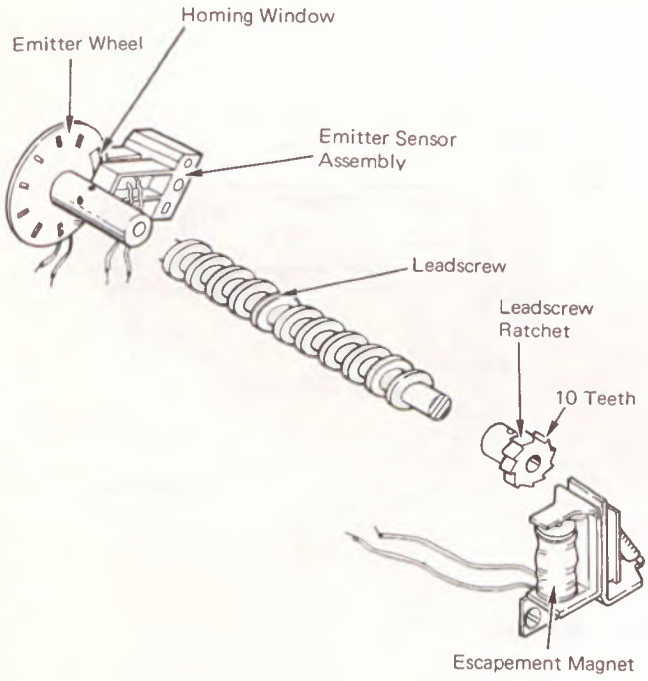
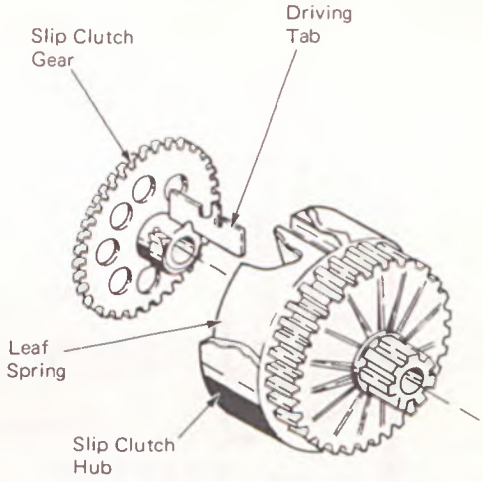


Figure 5 – Emitter Assembly

LEADSCREW DRIVE – ESCAPEMENT

The escapement portion of the leadscrew drive assembly consists of the slip clutch hub and slip clutch gear (Figure 6). The slip clutch hub is driven by the left hand motor pulley through the leadscrew drive belt. Rotary motion of the slip clutch hub is coupled to the slip clutch gear through a leaf spring and the driving tab. The leaf spring is located inside the slip clutch hub.

The tendency of the leaf spring to straighten out exerts pressure on the inner walls of the hub, producing a frictional drive connection. When the leadscrew is unlatched, the friction drive developed by the slip clutch is transferred through the slip clutch gear, backspace gear, and leadscrew gear to rotate the leadscrew top to front (Figure 6). When the leadscrew is re-latched, the leaf spring merely "slips" against the inner walls of the slip clutch hub.



(Cut-Away-Leaf Spring, Driving Tab)

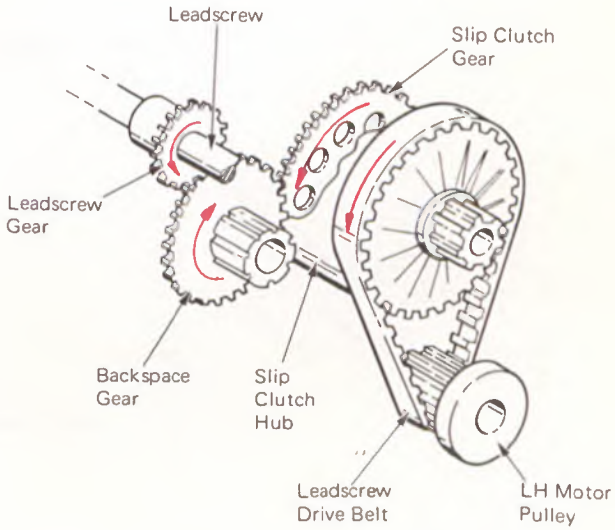


Figure 6 – Leadscrew Drive Mechanism

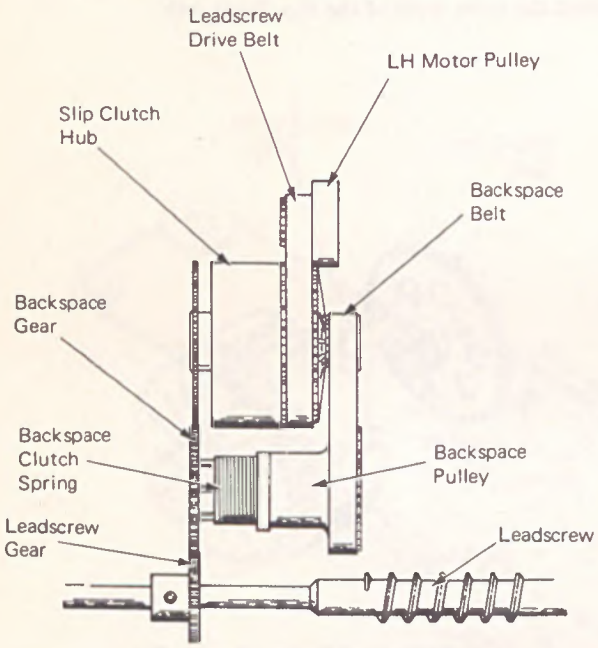
BACKSPACE OPERATION

A backspace operation is accomplished by rotating the leadscrew top to rear. Drive for backspace is supplied through the magnet operated backspace clutch in the leadscrew drive assembly (Figure 7). The backspace clutch consists of the backspace pulley, clutch spring, and backspace gear. The backspace pulley is driven by the backspace belt which is a positive drive cog belt. The backspace magnet is located beneath the backspace clutch.

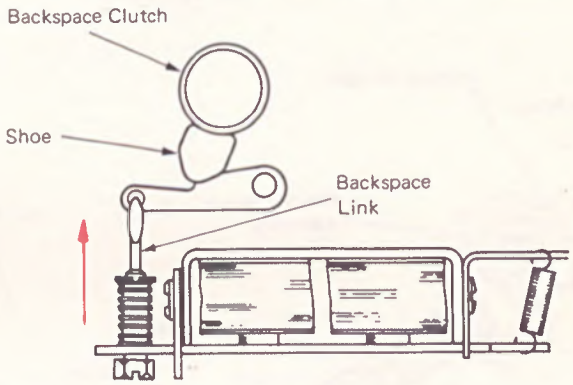
When the backspace magnet is energized, the backspace shoe will force the clutch spring to drive the backspace gear. This in turn drives the leadscrew gear and leadscrew top to rear. The frictional drive of the slip clutch is overcome when the leadscrew is driven in the reverse direction.

During a backspace operation, the escapement magnet is held energized. This reduces noise by holding the armature away from the leadscrew ratchet.

The duration of each backspace is controlled in the same manner as escapement. The rotation of the leadscrew and emitter wheel is sensed by the emitter assembly and transmitted to the electronics. When the correct number of emitter pulses are received, the electronics will de-energize the backspace magnet and drop the escapement magnet armature to hold the leadscrew ratchet.



(Top View)



(Right Side View)

Figure 7 – Leadscrew Drive – Backspace

When the carrier is backspaced into the left margin, the backspace mechanism is electrically interlocked by the overbank reed switch. The overbank reed switch is located under and operated by the overbank guide (Figure 8).

As the carrier reaches the left margin, the stop latch on the margin stop bracket contacts the left margin stop, forcing the margin stop and the margin rack to the left. The overbank guide, on the right end of the rack, operates the overbank reed switch as the margin rack moves to the left. The overbank reed switch then signals the electronics that the carrier is in overbank. The electronics will generate a space operation after the backspace is complete. This will maintain an even left margin.

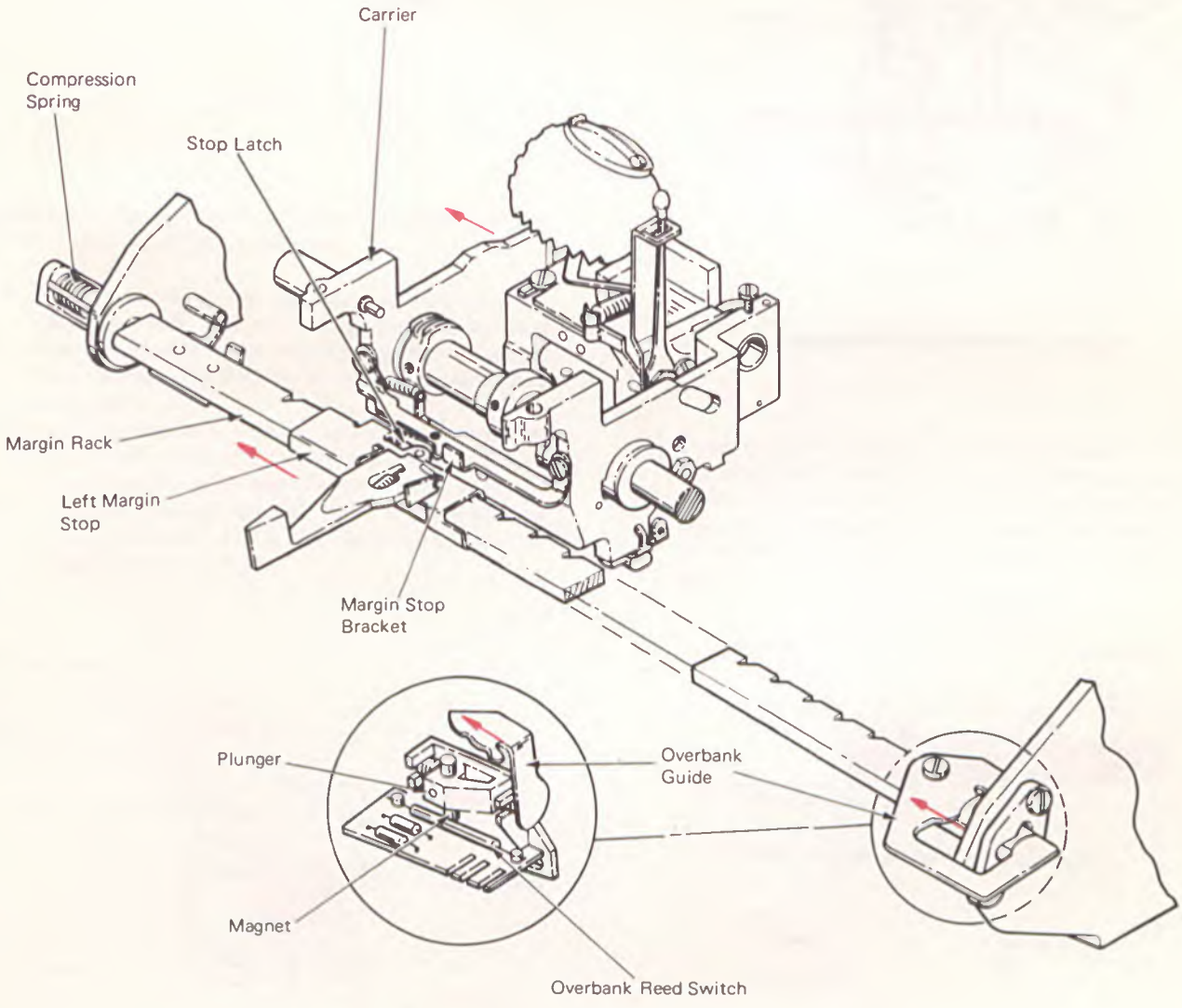


Figure 8 – Overbank Switch Operation

DEAD KEY MECHANISM

The purpose of the dead key mechanism is to prevent an escapement operation from taking place. When the dead key armature is attracted, the armature strikes the dead key latch causing the latch to rotate and latch up the escapement knockoff lever. Latching up the escapement knockoff lever prevents an escapement operation.

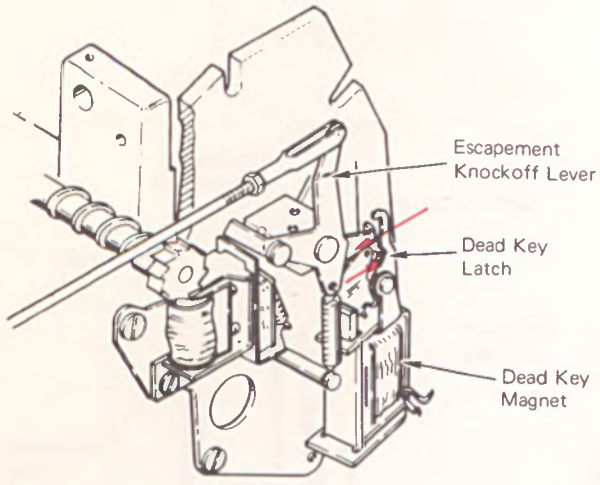
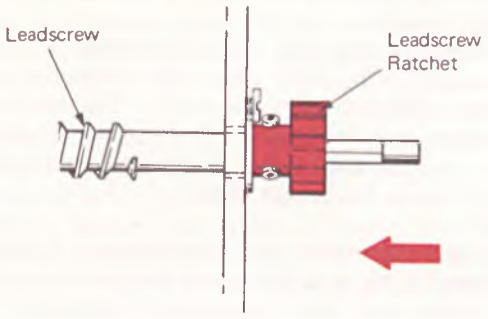


Figure 9 – Dead Key Mechanism

ESCAPEMENT/BACKSPACE/DEAD KEY ADJUSTMENTS

1. *Leadscrew Ratchet* – Position the leadscrew ratchet to the left on the leadscrew to obtain minimum end play of the leadscrew.

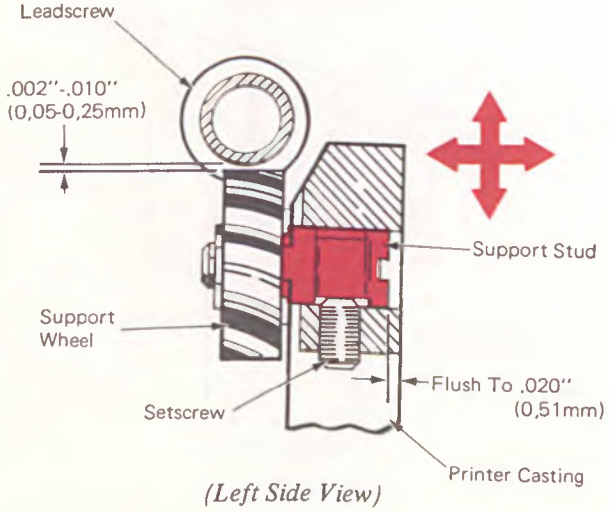
   NOTE: Be certain the setscrews tighten onto the flat spots of the leadscrew shaft.



(Top View)

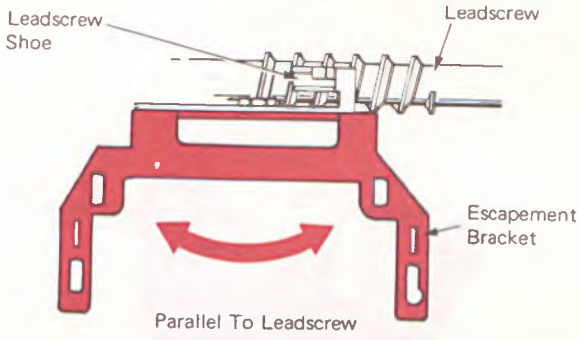
2. *Leadscrew Support Stud* – Adjust the leadscrew support stud to satisfy two conditions:

   A. Position the leadscrew support stud flush with the casting to .020" into the casting. Access to the stud setscrew, located in the power frame, may be gained from beneath the machine by moving the drive belt to the left.
   B. Turn the slotted end of the support stud to obtain .002"-.010" minimum clearance between the leadscrew support gear and the leadscrew. Turn the leadscrew through one full turn of the leadscrew support gear and observe this clearance at the minimum clearance position.

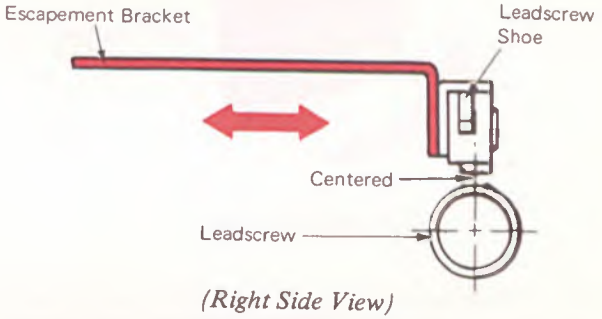


(Left Side View)

3. *Escapement Bracket* – Position the escapement bracket parallel to the leadscrew with the leadscrew shoe working surface centered over the leadscrew.

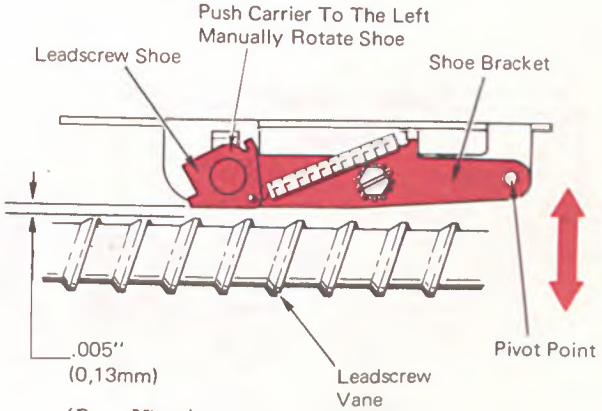


(Top View)



(Right Side View)

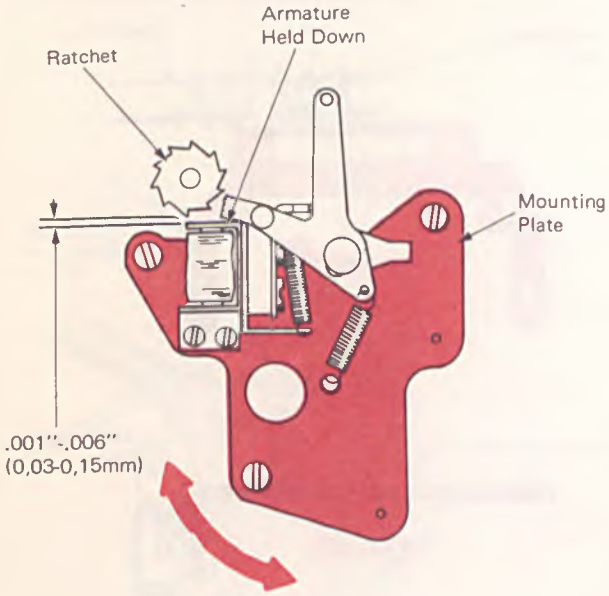
4. *Leadscrew Shoe Height* – With the leadscrew at home and power off, push the carrier to the left and manually rotate the leadscrew shoe. Adjust the leadscrew shoe bracket up or down for .005" clearance between the tip of the leadscrew vane and the horizontal surface of the shoe.



(Rear View)

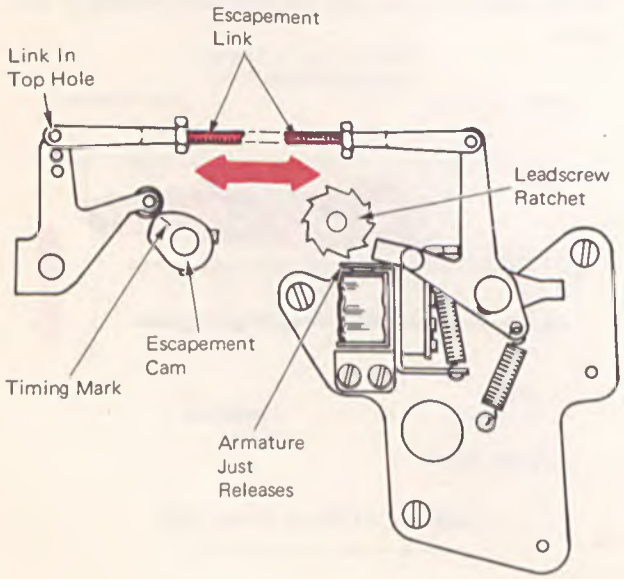
(Leadscrew At Home,Power Off)

5. *Escapement Magnet Mounting Plate* – With the escapement magnet armature held in the energized position, adjust the escapement magnet mounting plate up or down to obtain .001"-.006" clearance between the armature and the tip of a ratchet tooth.



(Right Side View)

6. *Escapement Link* – Connect the escapement link in the top hole of the escapement cam follower. Adjust the escapement link so that the leadscrew ratchet is released just as the escapement cam follower passes over the timing mark on the escapement cam.

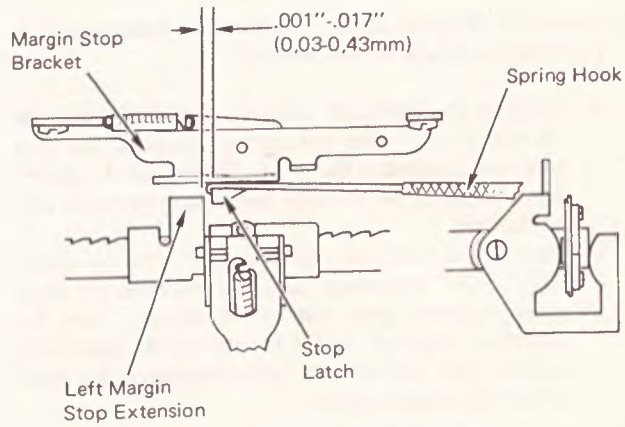


(Right Side View)

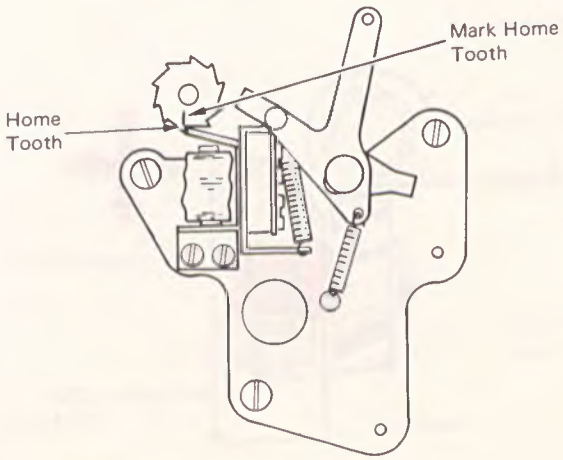
7. *Leadscrew Home Position* – This is a procedure for positioning the leadscrew so that it is aligned with respect to the margin rack. You will need to know this home position for other adjustments.

A. Turn power on, place machine in 12 pitch mode.
B. Move the left margin stop away from zero.
C. Depress carrier return.
D. Release the leadscrew ratchet one tooth at a time, each time checking the clearance between the margin stop extension and the stop latch on the margin stop bracket.
E. When the stop latch clears the margin stop extension by .001"-.017", this is the home position of the leadscrew. Mark this tooth. This tooth is referred to as the home tooth. When the leadscrew is in this position, it is aligned with respect to the notches on the margin rack.

As a final check to be sure the armature is holding on the home tooth, pull the margin stop latch away from the margin stop with a springhook as shown. There should be .001"-.017" clearance between the working surface of the stop latch and the margin stop extension when the leadscrew is holding on the home tooth.



Carrier At Left Margin (Top View)

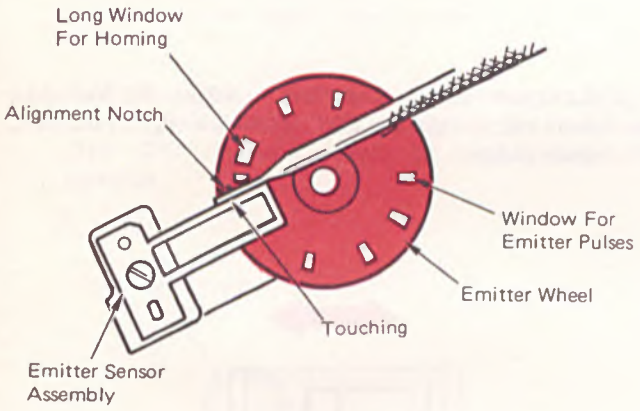


(Right Side View)

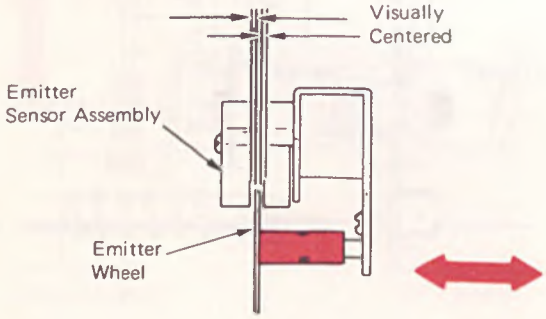
8. *Emitter Wheel Alignment* – The emitter wheel has a special notch for alignment in addition to the windows for escapement and the long window for homing. The emitter wheel is adjusted rotationally so that the alignment notch is in line with the top of the emitter sensor assembly. The procedure for aligning the emitter wheel is as follows:

A. Turn the machine on and position the leadscrew in the home position. (marked tooth from previous adjustment)
B. Loosen the setscrews in the emitter wheel.
C. Rotate the emitter wheel until the alignment notch is in line with the top of the emitter sensor assembly. This is done by inserting the pusher end of a spring hook into the notch and rotating the wheel top to rear until the rotation is stopped by the emitter sensor assembly. (See illustration.)
D. While holding the radial position of the emitter wheel, position the wheel left or right so that it is visually centered in the emitter sensor assembly.
E. Tighten the setscrews.

This completes the adjustment of the escapement mechanism. The remaining adjustments concern leadscrew drive and backspace.

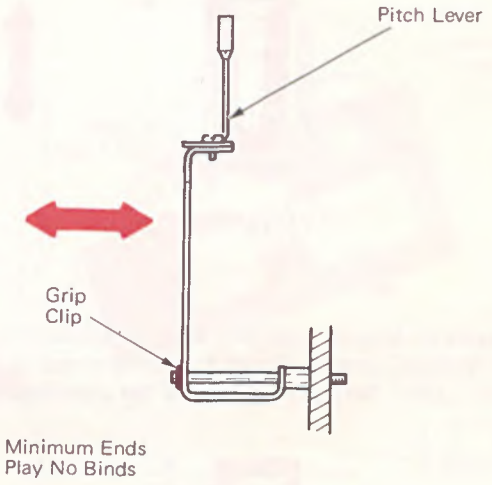


(Left Side View)



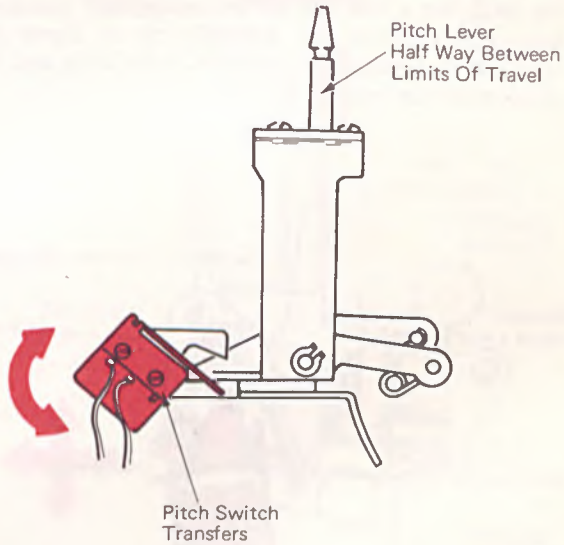
(Top View)

9. *Pitch Lever* – Position the collar left or right so there is minimum end play and no binds between the collar and the lever.



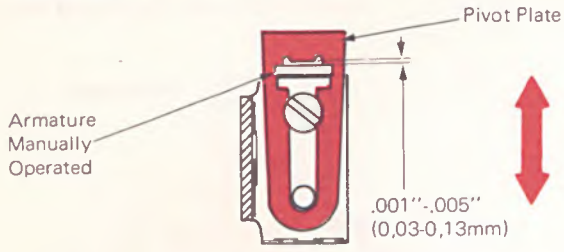
(Front View)

10. *Pitch Switch* – Position the switch rotationally so the switch transfers when the pitch lever is half way between the limits of travel.



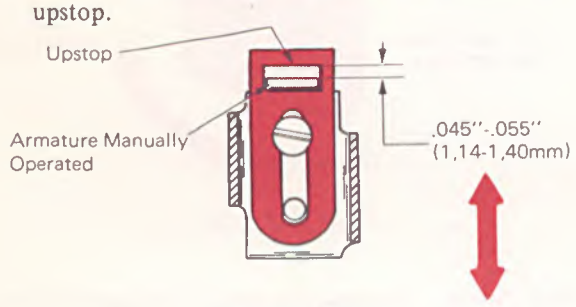
(Left Side View)

11. *Dead Key Pivot Plate* – With the armature manually operated, position the pivot plate front or rear so there is .001"-.005" between the top of the armature and the pivot plate.



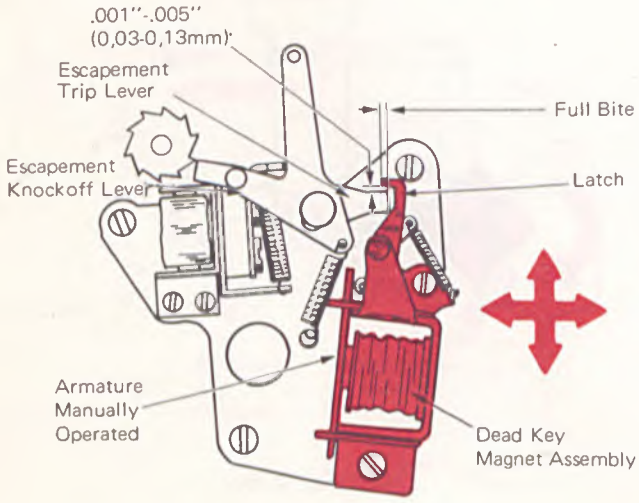
(Bottom View)

12. *Dead Key Magnet Upstop* – With the armature manually operated, position the upstop front or rear so there is .045"-.055" between the top of the armature and the upstop.



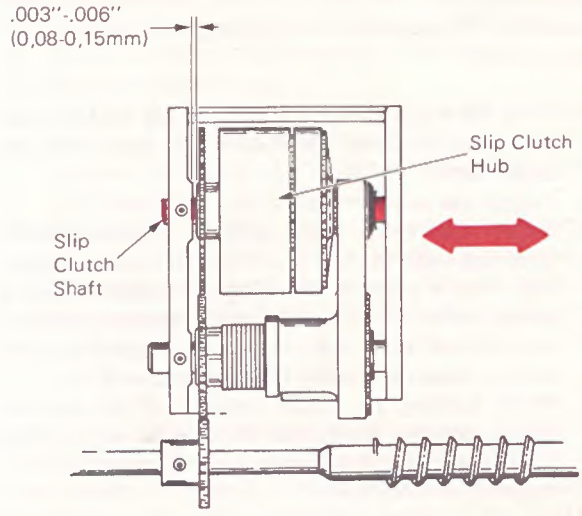
(Top Rear View)

13. *Dead Key Magnet Assembly* – With the armature manually operated, position the assembly front or rear so the latch has a full bite on the escapement knockoff lever and position the assembly up or down for .001"-.005" between the bottom of the latch and the escapement trip lever.



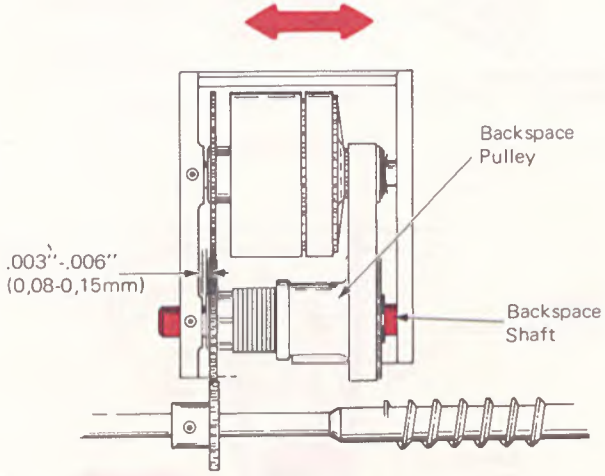
(Right Side View)

14. *Slip Clutch End Play* – Adjust the slip clutch shaft left to right for .003"-.006" end play of the slip clutch hub.



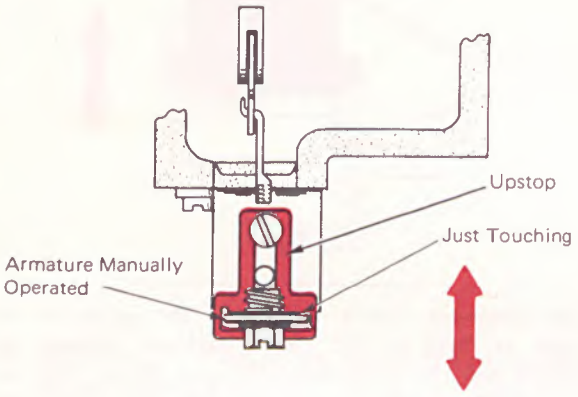
(Top View)

15. *Backspace Clutch End Play* – Adjust the backspace shaft left to right for .003"-.006" end play of the backspace pulley.



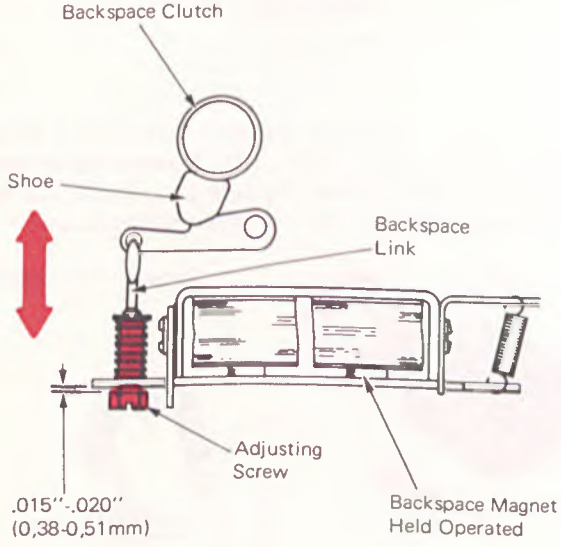
(Top View)

16. *Backspace Magnet Armature Upstop* – With the armature manually operated, position the backspace magnet armature upstop up or down so as to just touch the top of the armature.



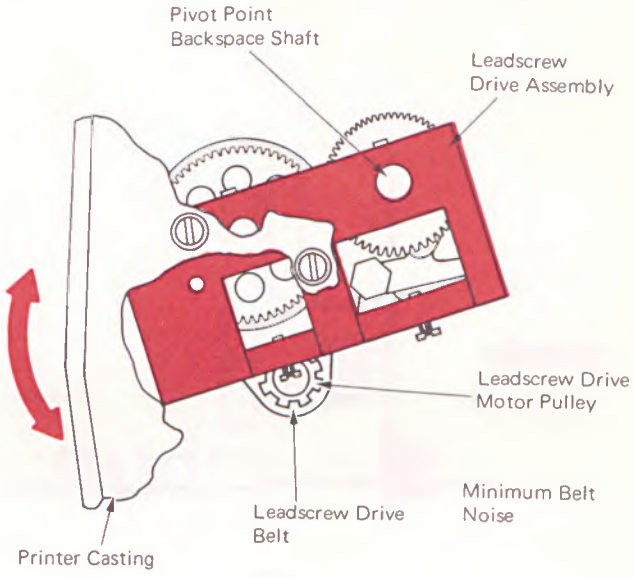
(Front View)

17. *Backspace Link* – With the backspace magnet held in the energized position, rotate the screw head to obtain .015"-.020" clearance between the screw head and the armature.



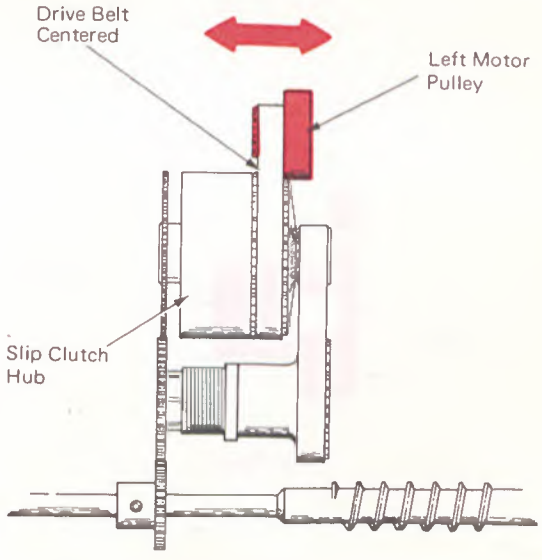
(Right Side View)

18. *Leadscrew Drive Belt* – Position the leadscrew drive assembly up or down for moderate belt tension with minimum belt noise.



(Left Side View)

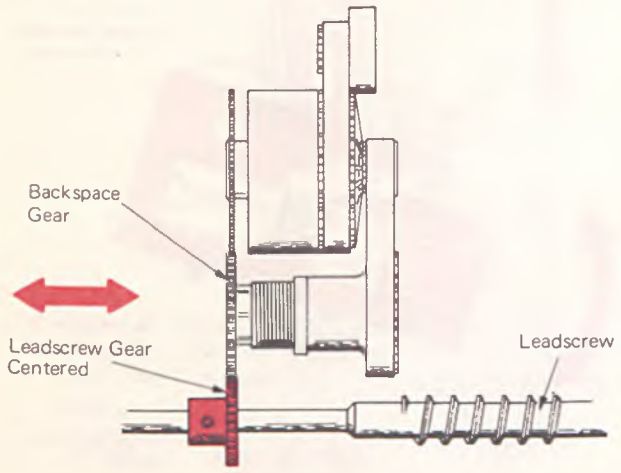
19. *Leadscrew Drive Pulley* – Position the motor pulley left to right so that, under power, the leadscrew drive belt tracks centered on the slip clutch hub.



(Top View)

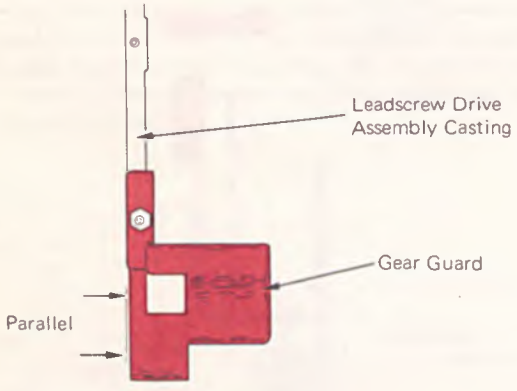
20. *Leadscrew Gear* – Position the leadscrew gear left to right on the leadscrew so that it is centered with the backspace gear.

NOTE: Be certain the setscrews tighten onto the flat spots of the leadscrew shaft.



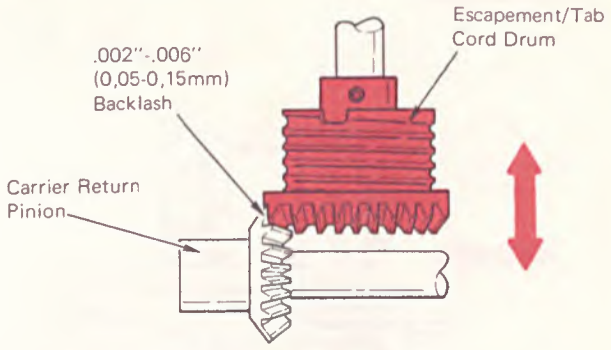
(Top View)

21. *Leadscrew Gear Guard* – Position the guide left or right so that the left edge of the guide is parallel with the left edge of the leadscrew drive assembly casting.



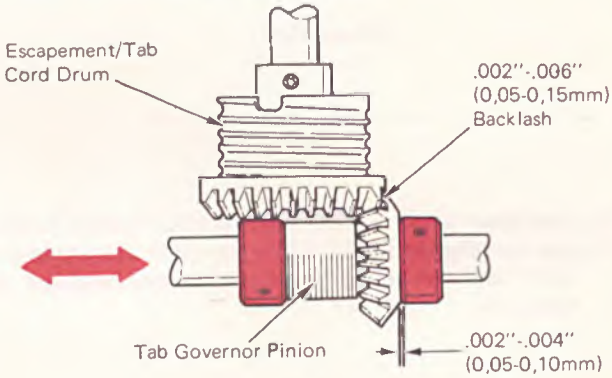
(Top View)

22. *Escapement/Tab Cord Drum* – Position the tab cord drum front or rear so the backlash between the drum teeth and the carrier return pinion teeth is .002"-.006".



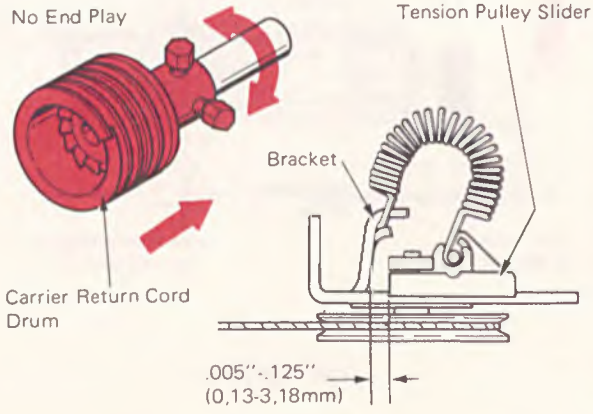
(Top View)

23. *Tab Governor Pinion* – Position the pinion left or right so there is .002"-.006" backlash between the pinion and the escapement/tab cord drum. The pinion collars should be adjusted for .002"-.004" end play of the tab governor pinion.

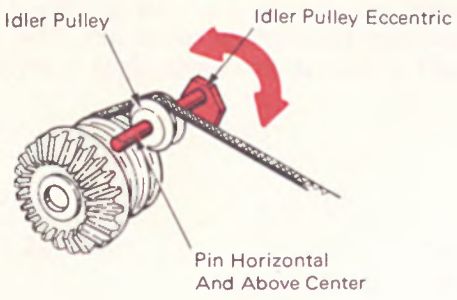


(Top View)

24. *Cord Tension* – Position the carrier return cord drum rotationally so there is .005"-.125" between the tension pulley slider and bracket. The cord drum should also be positioned to the rear for no end play of the drum.



25. *Idler Pulley Eccentric* – Position the eccentric rotationally so the pin is horizontal and the pin is above center.



(Front View)

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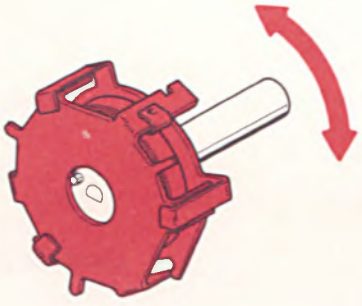
26. *Mainspring* – Position the mainspring rotationally so the mainspring is wound 4 2/3 to 5 1/3 turns when the carrier is at the right limit.



(Rear View)

TABULATION OPERATIONAL THEORY

The purpose for tab is to allow for a quick position of the carrier to a pre-determined position on the writing line.

The set/clear lever (Figure 1) has a magnet mounted on the lower part of the lever. This magnet, when positioned along side either the set or clear reed switch will signal electronics to set or clear a tab stop. The tab stops are located in the electronics. When the machine is turned on, a grid of tab stops every five spaces, will automatically be set. If this tab grid is not desirable, it can be cleared by depressing tab clear and a carrier return. All tabs will be cleared regardless of where the carrier is located. Individual tab stops can be set or cleared by spacing to the desired location and depressing set or clear. The electronics remembers where tab stops are set by counting emitter pulses from the leadscrew emitter wheel. This count takes place starting from the left margin. If the left margin set lever is moved, the tab stops will move in relation to the new left margin settings. EXAMPLE: If the margin is set at five and a tab at twenty-five, moving the margin to ten would cause the tab stop to move to thirty. The tab grid may be recalled by holding the tab set keybutton depressed and depressing carrier return. Refer to the Escapement/Backspace Section for information on the leadscrew and emitter wheel.

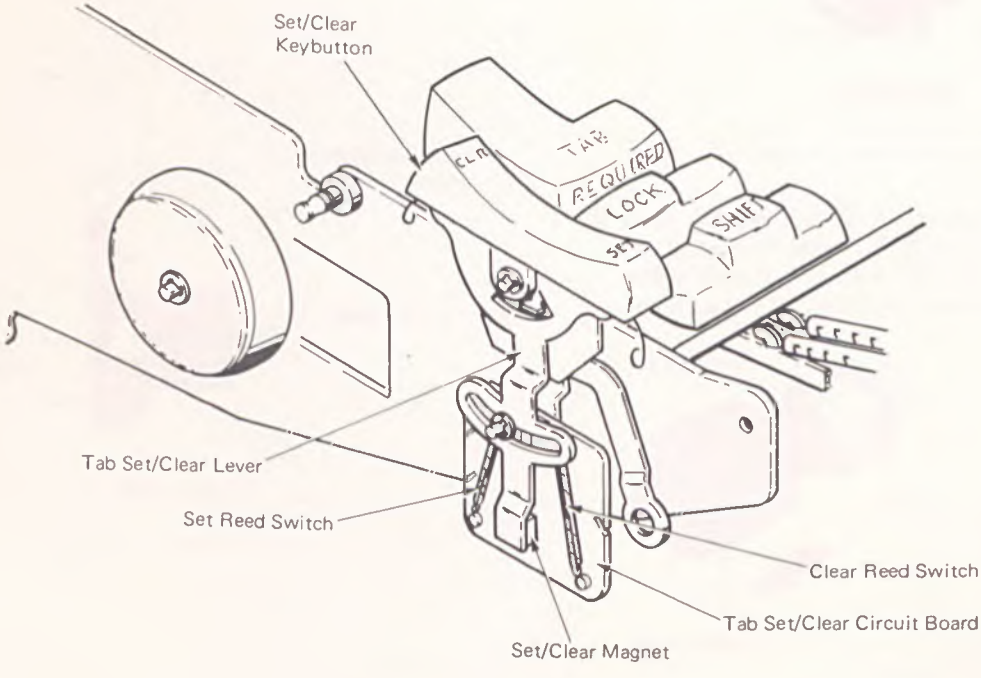


Figure 1 – Tab Mechanism

REQUIRED TABULATION

The required tab feature enables an operator to easily record indented material so that it can be revised and played back with the NO ZONE button up. Indented material includes many types of applications, such as those in Figure 1.

I. Two additional Vice Presidents will be appointed at the annual meeting. They will be:

A. Vice President - Office Supplies Division
B. Vice President - World Marketing Division

II. A motion will be introduced to approve Foreign requests for patent rights to our newest products.

Budget — The Budget Department is at the present time compiling figures for 1972. They are running behind projections at this time.

Personnel — Increases in staff needs have burdened the Personnel Department. They will not meet the objectives for end-of-year staffing.

1. To elect a Board of Directors for a one-year term of office, such term to begin on July 1, 1972.

2. To consider and act upon any other matters which may properly come before the meeting.

Figure 1 – Indented Material

Without the required tab feature, Part A of Figure 2 could not be played back with the No Zone button up. Every time the carrier return/tab combination is read, the system would return the carrier as shown in Part B.

A	B
1. TAB The Budget Department is CR TAB at the present time CR TAB compiling figures for CR TAB the second half of 1972.	1. TAB The Budget Department is CR TAB at the present time TAB compiling figures for CR TAB the second half of 1972.

Figure 2 – Indented Material Without Required Tab Feature

On the system with the required tab feature, required tab codes are recorded in the first line of each indented level, Part A, Figure 3. The required tab code causes a tab action and puts the tab into memory. After a carrier return, the carrier will automatically tab once for each required tab code entered for that indent level as in Part B of Figure 3. Up to fourteen tabs can be stored in the memory.

Tab memory can be cleared by using either a required carrier return code, an index return code or by turning the machine off. During playback, tab memory is cleared when a required carrier return code or an index return code is read from memory.

If the carrier return is depressed after a required tab, the printer will only index the paper. Only an index operation is needed since a carrier return and tab operation would bring the carrier back to the same place, one line space down the paper.

A	B
REQ. TAB 1. The Budget Department is AUTO TAB at the present time AUTO TAB compiling figures AUTO TAB for AUTO TAB the second half of 1972. REQ. TAB	REQ. TAB 1. The Budget Department AUTO TAB is at the present time AUTO TAB compiling figures for AUTO TAB the second half of AUTO TAB 1972.

Figure 3 – Indented Material With Required Tab Feature

DECIMAL TABULATION

The decimal tab feature is designed specifically for typing columns of figures aligned to the decimal point (Figure 1).

35.00	67.00
100.00	100.00
1,000.00	1,000.00
1,135.00	1,167.00

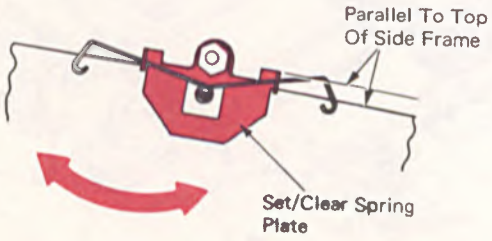
Figure 1 – Decimal Tabulation

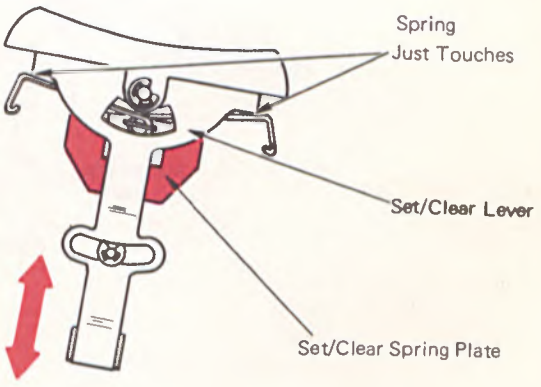
The decimal tab operation is initiated by depressing CODE and the 1/4 / 1/2 keybutton. The entire function is controlled by the electronics.

The operator enters the decimal tab instruction (CODE + 1/4 / 1/2), keyboards the figures, the carrier automatically backspaces once for each figure keyboarded **until** the decimal point is keyboarded. After the operator keyboards the decimal point, the carrier does not move for the remaining figures. When the operator has keyboarded the entire number, another decimal tab, word underscore, or carrier return instruction will initiate printout.

TABULATION ADJUSTMENTS

1. *Set/Clear Spring Plate* – Position the plate rotationally to be parallel to the slope of the side frame and up or down so the spring finger joint touches the set/clear lever.





(Left Side View)

CARRIER RETURN OPERATIONAL THEORY

The purpose of the carrier return mechanism is to return the carrier to the left margin stop (Figure 1). During a carrier return operation, the carrier return shoe is applied against the carrier return clutch spring by a solenoid located directly behind the carrier return clutch spring. The electronics provides a ground for the carrier return solenoid until the carrier reaches the left margin.

NOTE: The index mechanism is discussed in the Paper Feed and Index Section of this manual.

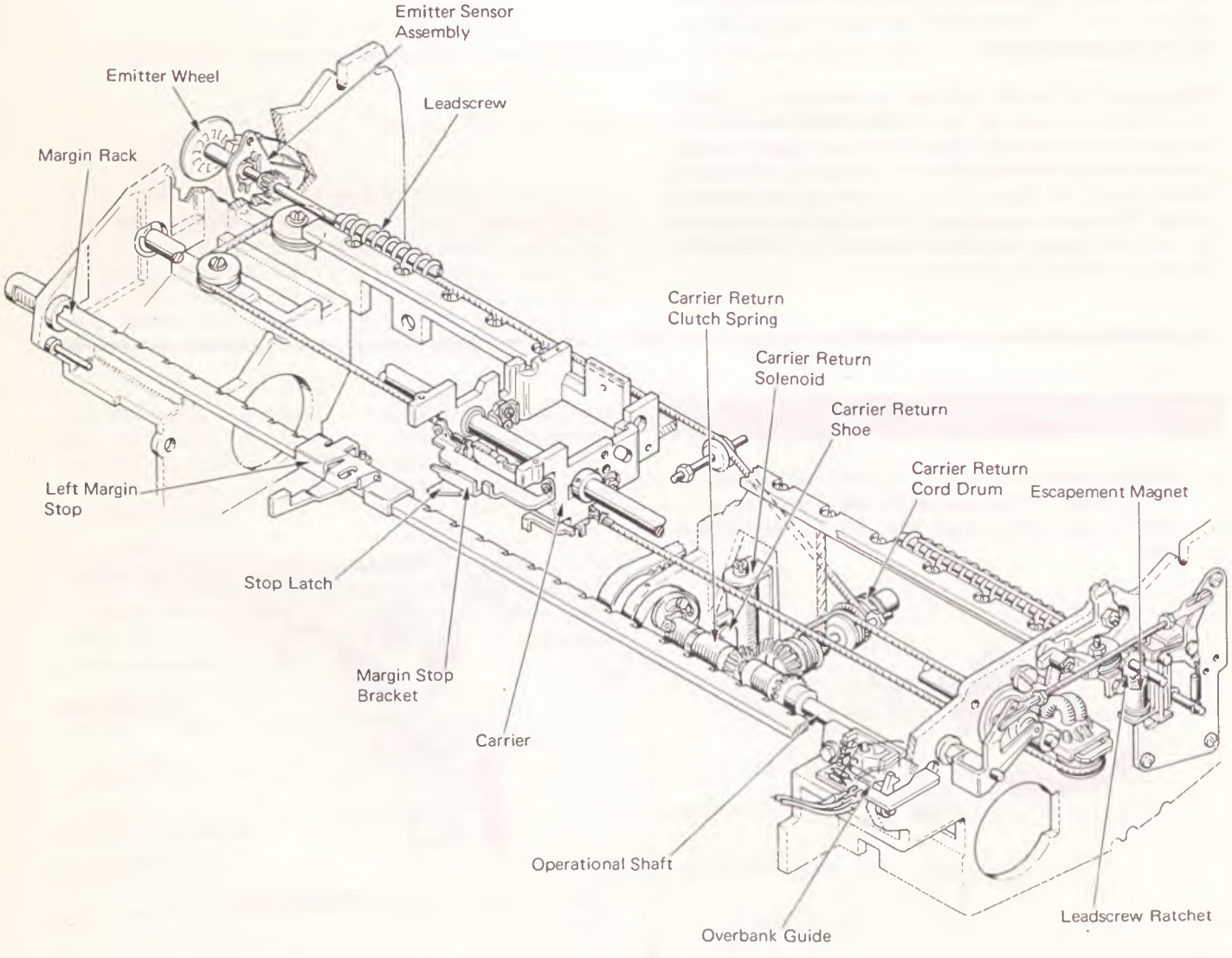


Figure 1 – Carrier Return Mechanism

CARRIER RETURN CLUTCH

The carrier is moved to the left margin by winding the carrier return cord onto the carrier return cord drum mounted on the rear of the escapement shaft (Figure 2). As the escapement shaft is rotated clockwise, the drum will wind up the cord and pull the carrier to the left. The carrier return cord passes from the drum to the left over a guide roller, around two pulleys on the left hand side of the machine and hooks to the bottom of the carrier.

Power to turn the escapement shaft is supplied by the operational shaft through the carrier return clutch.

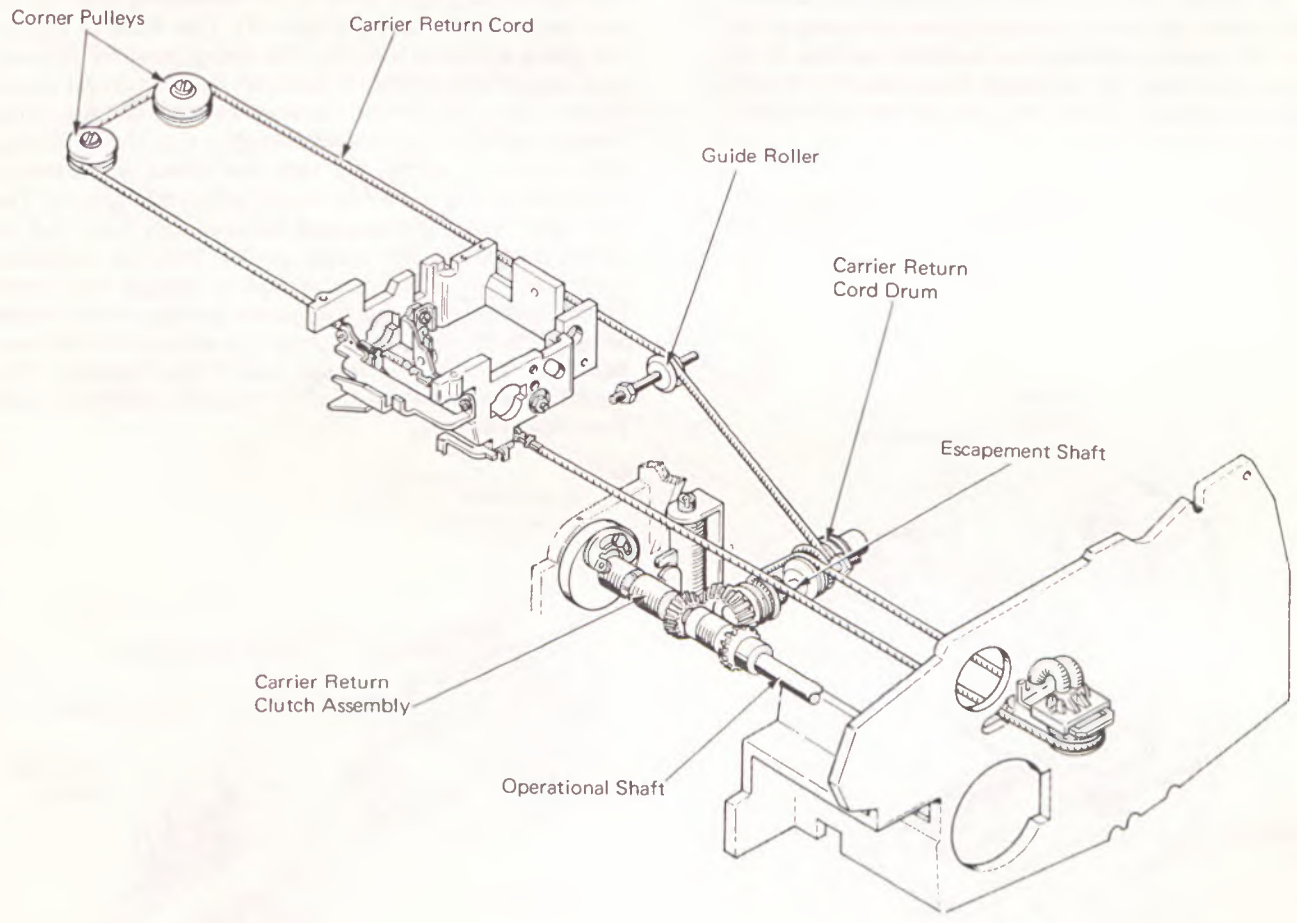


Figure 2 – Carrier Return Clutch

CARRIER RETURN CLUTCH OPERATION

The carrier return clutch is a spring clutch consisting of a clutch arbor, clutch spring, and a pinion gear (Figure 3). The left of the clutch spring is clamped to the clutch arbor which rotates with the operational shaft. The right end of the clutch spring fits over the hub of the pinion gear. The operational shaft turns in the tightening direction of the spring, however, no drive occurs because the pinion hub is smaller than the inside diameter of the spring clutch. When the right end of the clutch spring is pressed against the pinion hub by the nylon shoe, the clutch spring will tighten around the hub and drive the pinion. The tension of the clutch spring resists any change in size and will snap back to its normal size when the external pressure is released.

The external pressure required to activate the carrier return clutch spring is applied by the nylon clutch shoe (Figure 3). When the carrier return solenoid is energized, the solenoid plunger rotates the clutch activating lever. A spring at the front of the clutch activating lever connects the lever to the shoe arm. Rotating the activating lever transfers motion through the spring to rotate the shoe arm top to the front, activating the carrier return clutch.

The carrier return clutch is held in its activated state until electronics releases the carrier return solenoid at the left margin.

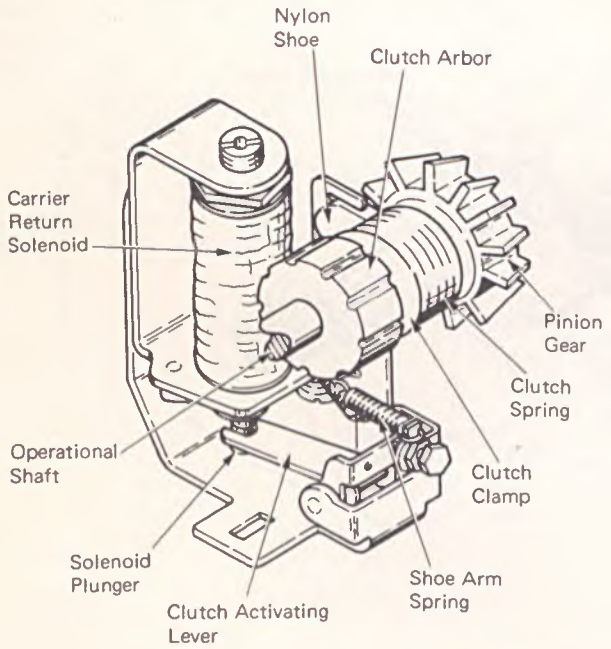


Figure 3 – Carrier Return Clutch Operation

TORQUE LIMITER

If the carrier is already resting at the left margin when a carrier return operation is initiated, the carrier return mechanism must be allowed to slip in order to reduce strain and prevent parts breakage. To accomplish this, rotational motion of the operational shaft is supplied to the carrier return clutch arbor through a torque limiter (Figure 4). The torque limiter is a spring clutch which imparts a controlled amount of force to the carrier return clutch arbor.

The torque limiter consists of the torque limiter hub, which is setscrewed to the operational shaft, and the torque limiter spring. The left end of the torque limiter spring is anchored to the torque limiter hub by an adjustable clamp. The right half of the torque limiter spring fits over the large shoulder of the carrier return clutch arbor.

The operational shaft turns in the unwinding direction of the torque limiter spring (Figure 4). This tends to expand the spring and allow it to slip. The spring, however, is heavy and considerably smaller in diameter than the carrier return clutch arbor. The friction between the arbor and the spring tends to drive the arbor even though it is in the unwinding direction to the spring. The right end of the torque limiter spring has a loop formed to accept an extension spring. The extension spring is connected between this loop and an eccentric stud on the torque limiter hub. The extension spring increases the force required to unwind the torque limiter spring so no slippage occurs during normal carrier return. The torque limiter spring slips when the carrier cannot move to the left. It also slips at the beginning of a carrier return operation to allow smooth acceleration and prevent erratic start.

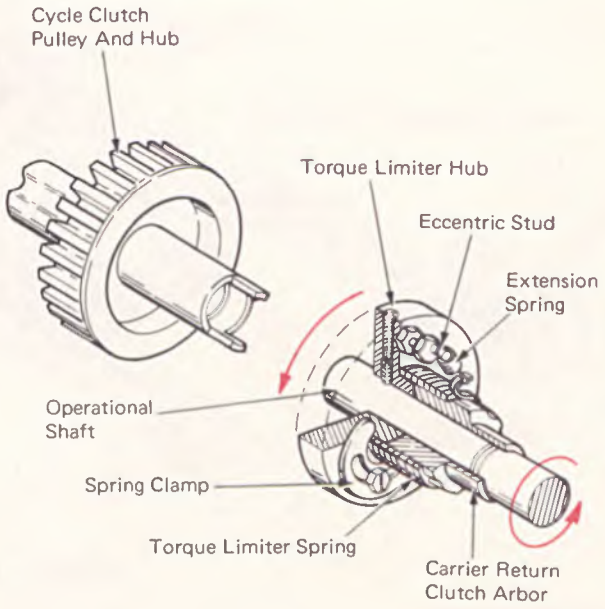


Figure 4 – Torque Limiter

OVERBANK

As the carrier return reaches the left margin, the stop latch on the margin stop bracket contacts the left margin stop (Figure 5) forcing the margin stop and the margin rack to the left. The overbank guide on the right end of the rack operates the overbank reed switch as the margin rack moves to the left. The overbank reed switch then makes and signals the electronics to de-energize the carrier return solenoid.

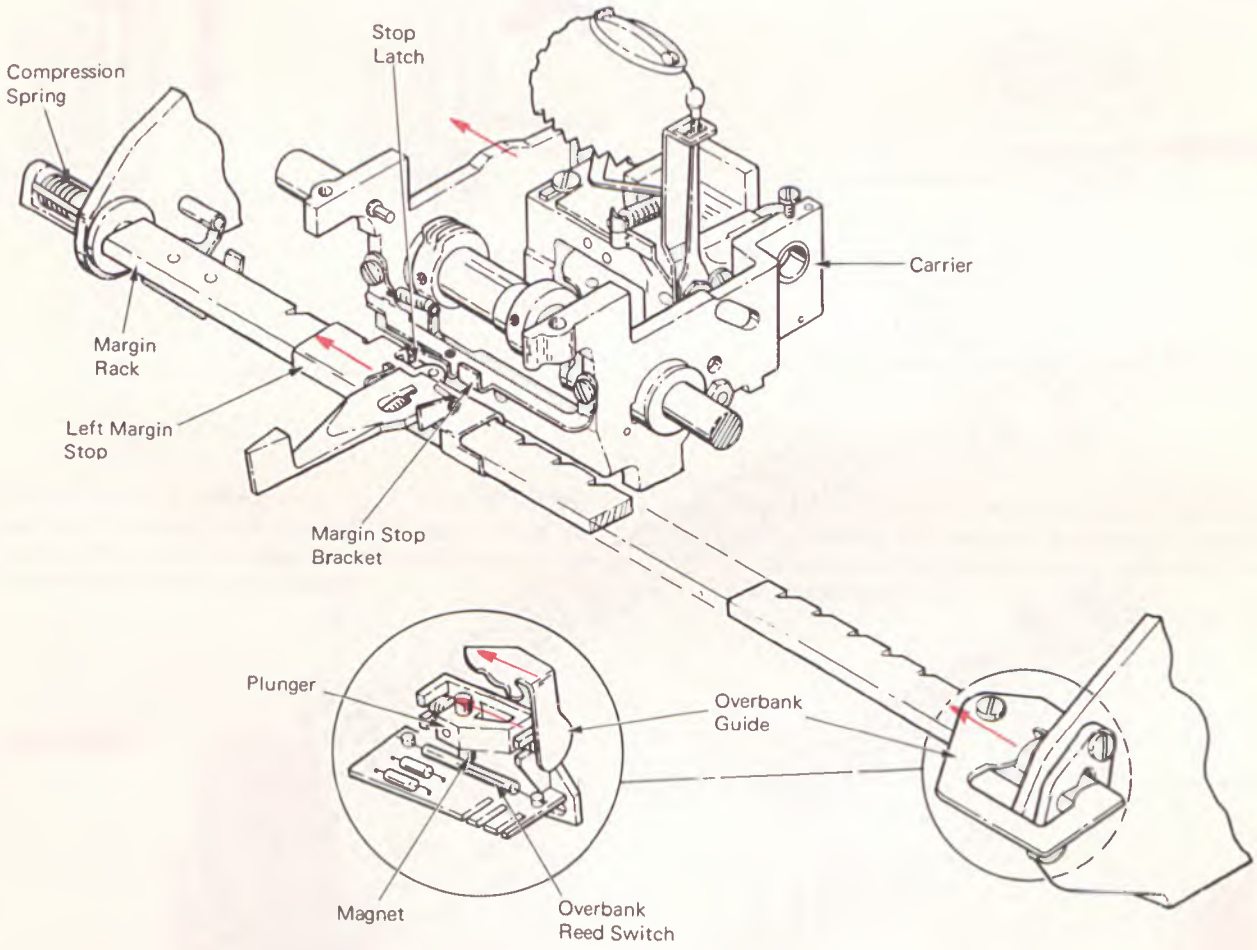


Figure 5 – Overbank Reed Switch

LEADSCREW HOMING

To obtain an even left hand margin, the top of the leadscrew vanes must be aligned with respect to the margin rack during each carrier return. This ensures that the carrier will consistently come to rest at the same point on the writing line.

The leadscrew must be aligned with the margin rack before the electronic logic will allow a carrier return operation to take place. If the leadscrew is not aligned when a carrier return code is received, the electronics will initiate a no-print cycle and allow the leadscrew to rotate until the top of the leadscrew vanes are aligned to the margin rack. Once the leadscrew is aligned, the electronics will energize the carrier return solenoid.

The operation in which the leadscrew is aligned to the margin rack is called homing. The electronics senses home position through input from the emitter sensor assembly (Figure 6). When the leadscrew reaches the home position, the homing window, the long window on the emitter wheel, moves between the phototransistor and the light emitting diode (LED). This allows the phototransistor to conduct and signal the electronics to drop the escapement magnet.

If the leadscrew is resting in the home position and the power to the machine has not been turned off, the printer will carrier return without homing.

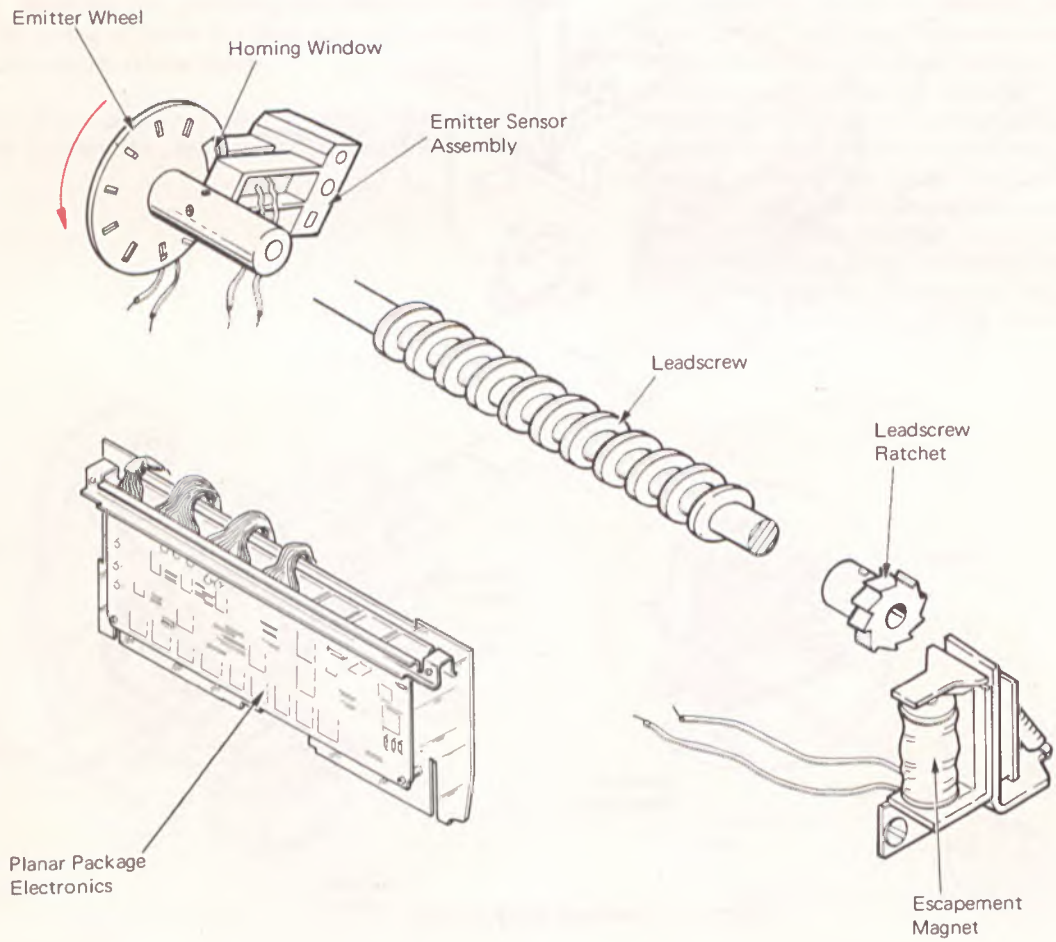
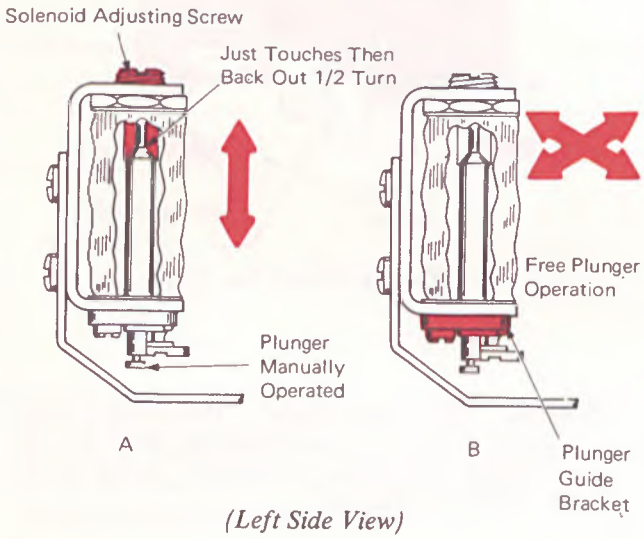


Figure 6 – Homing Operation

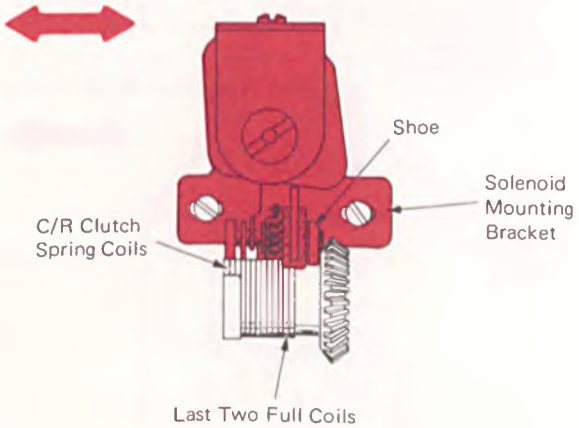
CARRIER RETURN ADJUSTMENTS

1. *Carrier Return Solenoid* –
   A. With the plunger manually operated, adjust the solenoid adjusting screw in until the screw just touches the plunger and then back out one half turn.
   B. Position the plunger guide bracket for free plunger operation.



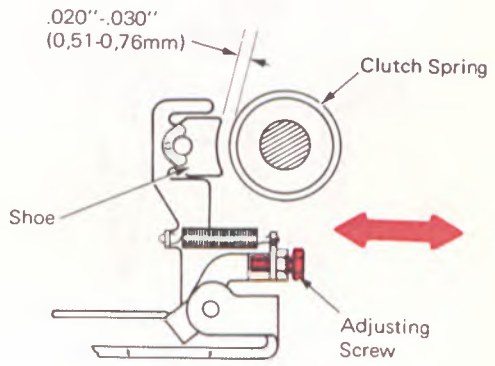
(Left Side View)

2. *Carrier Return Solenoid Assembly* – Position the carrier return solenoid assembly left or right so that the carrier return shoe overlaps the last two full coils of the carrier return clutch spring.



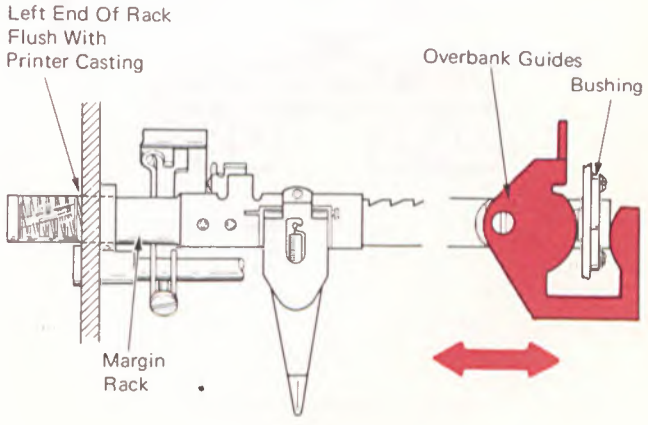
(Top View)

3. *Carrier Return Shoe Clearance* – With the solenoid at rest (de-energized), adjust the screw at the bottom of the carrier return solenoid assembly for .020"-.030" clearance between the carrier return clutch spring and the carrier return shoe.



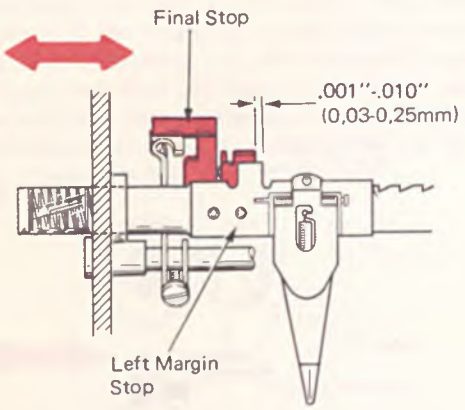
(CR Solenoid De-energized Left Side View)

4. *Margin Rack Position* – With the margin rack at rest (to right), position the overbank guide left or right so the left hand end of the margin rack is flush with the outside printer casting.



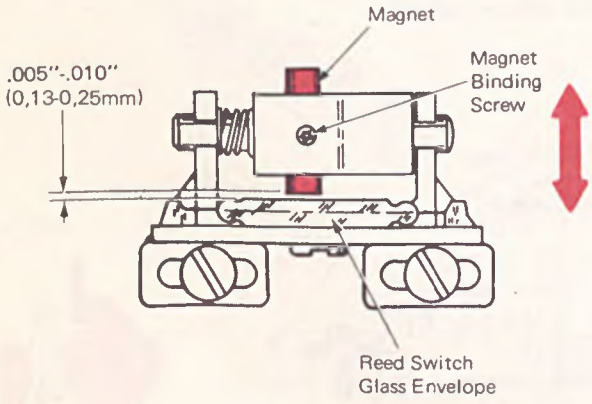
Margin Rack At Rest (Top View)

5. *Margin Final Stop* – With the left hand margin stop at position zero, position the final stop left or right for a .001"-.010" clearance between the final stop working surface and the left hand margin stop working surface.

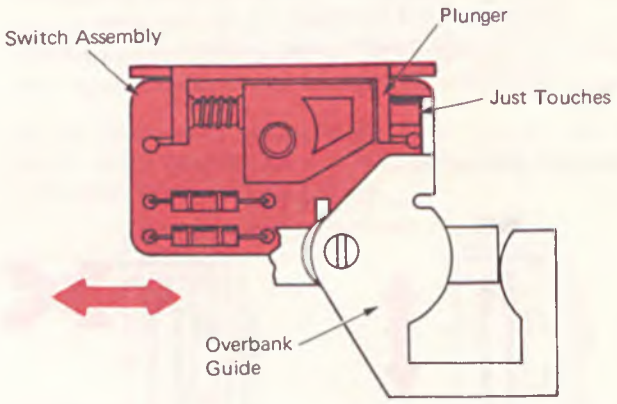


(Left Hand Margin Stop At 0 Top View)

6. *Overbank Switch Magnet* – Loosen the magnet binding screw and position the magnet for .005"-.010" clearance between the magnet and the reed switch glass envelope.



7. *Overbank Switch Assembly* – With the plunger at rest, position the switch assembly left or right so that the overbank switch plunger just touches the overbank guide.

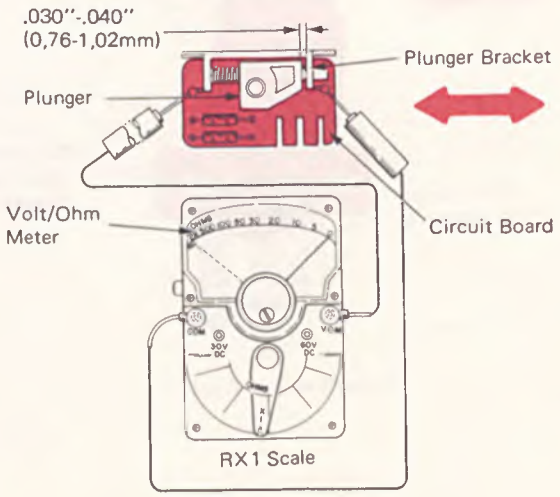


(Plunger At Rest Top View)

8. *Overbank Switch Circuit Board* – The overbank switch is adjusted so that it is open when the carrier is at the left margin and closed when the carrier moves .030"-.040" into overbank.

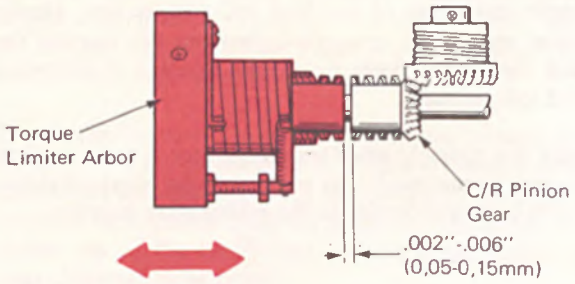
A method of adjusting the switch is as follows:

a. With the ohmeter on the RX1 scale, connect the test leads across the reed switch.
b. Place a .035" feeler gauge between the plunger and plunger bracket.
c. Position the overbank switch circuit board left to right until the switch just closes (zero ohms).
d. Remove the feeler gauge.
e. With the feeler gauge removed, the switch should re-open before the plunger fully restores to rest.



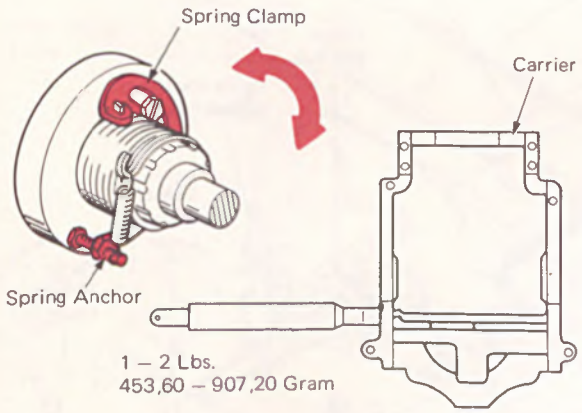
(Top View)

9. *Torque Limiter Arbor End Play* – Position the arbor left or right for .002"-.006" end play between the arbor and the carrier return pinion gear.



(Top View)

10. *Carrier Return Torque Limiter* – Position the torque limiter spring clamp or the tension spring anchor rotationally so there is 1 to 2 pound torque, measured on the carrier, when the carrier is being returned to the left margin under power.



(Carrier Returned Under Power–Top View)

PAPER FEED & INDEX OPERATIONAL THEORY

The purpose of the paper feed and index mechanism is to hold the paper firmly against the platen so that it will move with the platen as it is indexed vertically. The paper is held against the platen by the front and rear feed roll assemblies located beneath the platen. Each feed roll assembly contains three rubber rollers equally spaced along the feed roll shaft and molded to the shaft (Figure 1).

The feed rolls mount in the front and rear feed roll arm assemblies. The front feed roll arms pivot on the feed roll actuating shaft. Also pivoting on the feed roll actuating shaft is a feed roll tension arm. There are several holes in the upper extension of the feed roll tension arm. Heavy extension springs are connected between the carriage tie rod and one of the holes to provide a means of adjusting the feed roll pressure.

To assist the operator when inserting paper, a paper stacker mechanism is employed. The paper stackers ensure that the paper will be perpendicular to the platen after insertion.

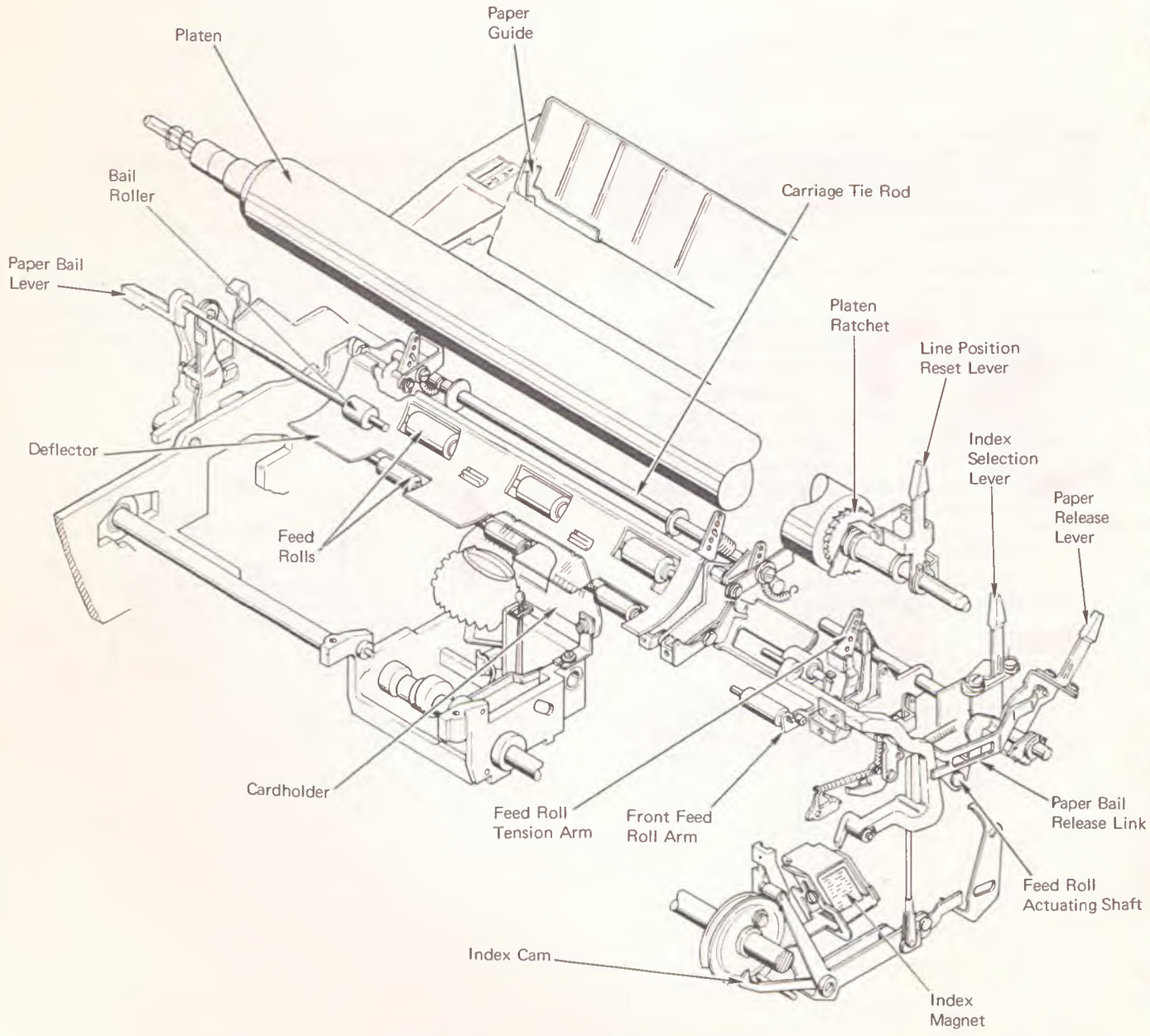


Figure 1 – Paper Feed & Index Mechanism

PAPER FEED

As the paper is inserted into the machine, an adjustable paper guide serves to position the paper for its left margin position (Figure 2). The paper deflector guides the paper between the rear feed roll and the platen. As the platen is turned, the paper is forced to move with the platen. The deflector guides the paper around the platen into position between the front feed roll and the platen. As the paper is fed farther, the end of the paper is guided upward by the cardholder attached to the rear of the carrier.

The cardholder assists in holding the typing material against the platen in the printing area. A scale on each side of the cardholder aids the typist in re-inserting material into the machine to a specific printing point. A single mark, located at the top of the cardholder, indicates the middle of the next character to be typed.

Above the writing line, the paper is engaged by three rubber rollers mounted on the paper bail (Figure 2). These rollers hold the paper against the platen above the writing line to reduce the possibility of over-printing on the paper.

The paper bail is supported by a lever at each end and pivots front-to-rear. A spring attached to each bail lever serves as a toggle to hold the bail rolls either to the rear against the platen, or forward in the release position.

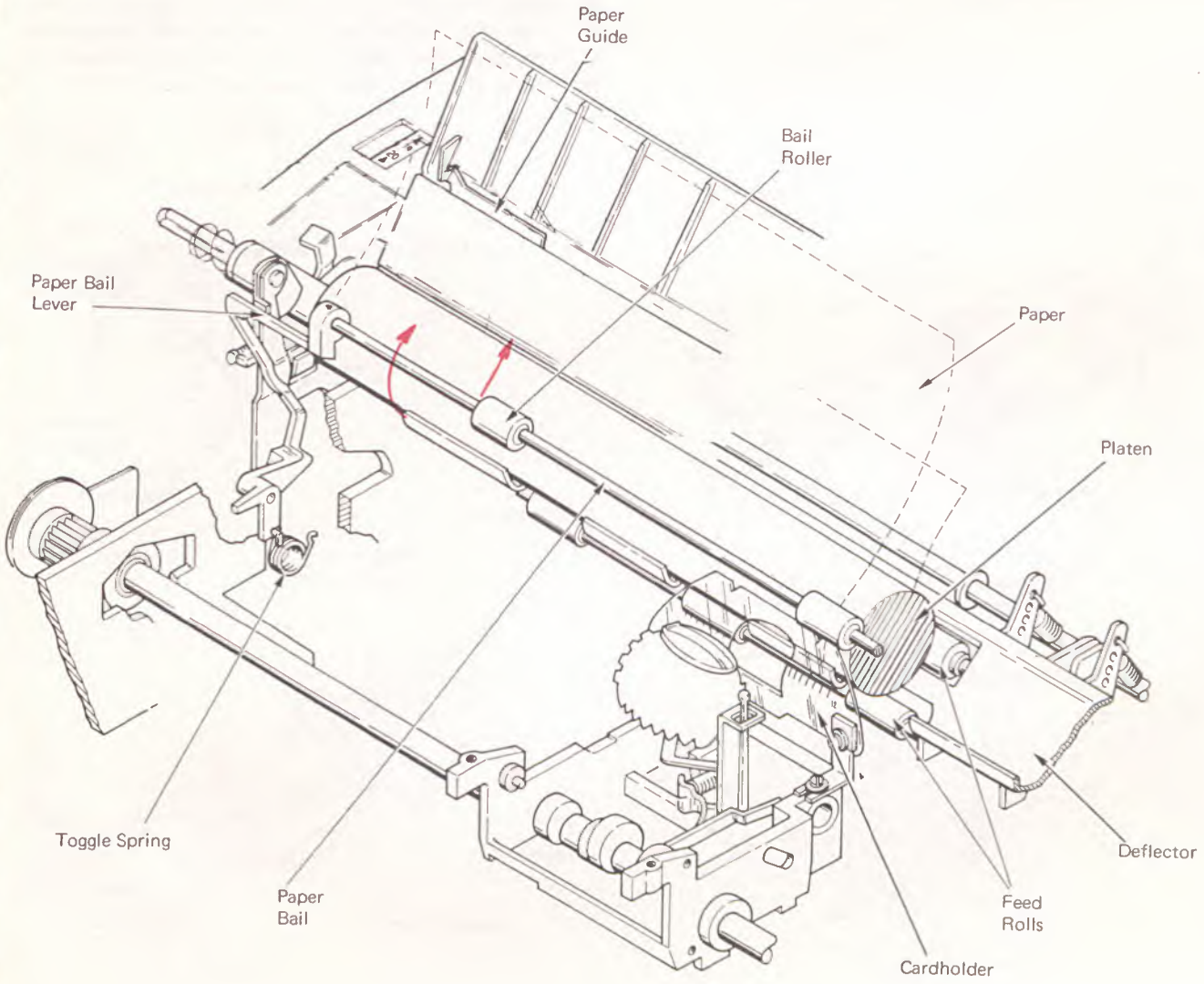


Figure 2–Paper Feed

PAPER RELEASE

The pressure of the feed rolls can be released from the platen to allow the operator to position the paper more accurately and to allow easier insertion and removal of the paper (Figure 3). Paper release is accomplished by pulling forward on the paper release lever located at the right end of the machine. The front of the paper release lever cams the feed roll release arm forward to rotate the feed roll actuating shaft. The feed roll release levers are clamped to the feed roll actuating shaft and rest behind a lug on each feed roll tension arm. As the shaft rotates, the feed roll release levers rotate the feed roll tension arm and the front feed roll arms down, away from the platen. Due to the inter-connection between the front feed roll arm and the rear feed roll arm, the rear feed roll arms are forced away from the platen. When the paper release lever has been pulled all the way forward, the end of the feed roll release arm detents to hold the feed roll release lever in the released position.

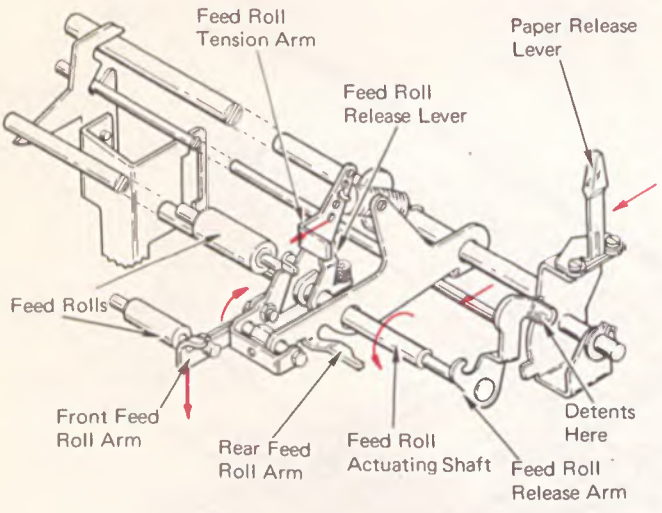


Figure 3 – Paper Release Mechanism

PAPER STACKER MECHANISM

The paper stackers are used to horizontally align the paper during insertion. This is accomplished by moving paper stacker fingers against the platen when the feed rolls are released. The stacker fingers are then in position to stop and align the paper before the paper is fed around the platen.

The paper stackers are mounted on the paper feed mounting arms (Figure 4). Two paper stackers are used. One for each side of the paper feed mechanism. (For simplicity, only one side is shown.) The paper stackers are spring loaded against the platen when the paper release lever is pulled forward. Each stacker has four fingers which extend through the deflector and rest against the platen. When a sheet of paper is inserted into the machine, it will contact the stacker fingers and be held perpendicular to the platen while it is inserted.

The stacker fingers are pivoted away from the platen when the paper release lever is returned to rest. Motion to pivot the stackers is transferred from the feed roll release lever through the release lever follower. The paper stackers are screwed to the release lever follower and pivot with it.

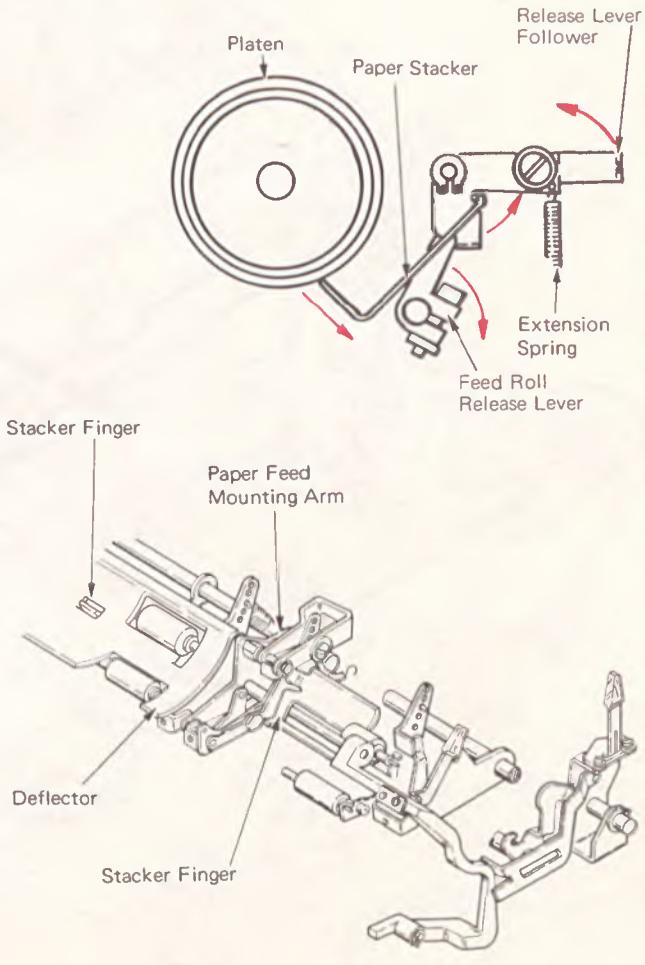


Figure 4 – Paper Stacker Mechanism

PAPER BAIL RELEASE

A link connection between the paper release lever and the right paper bail arm (Figure 5) pivots the paper bail away from the platen when the paper release lever is pulled forward. The paper bail must be manually returned to rest against the platen after the paper release lever is returned to rest.

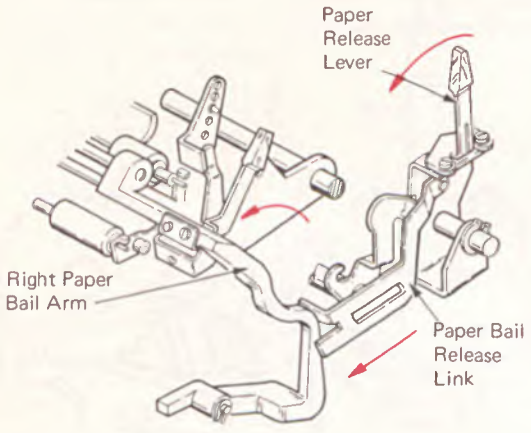


Figure 5 – Paper Bail Release Operation

INDEX MECHANISM

The index mechanism operates to line space the paper vertically. An index operation can be obtained by depressing either the carrier return keylever or the index keylever. Depressing the carrier return keylever also causes the carrier to move to the left margin, whereas depressing the index keylever causes only an index operation. The index selector lever may be positioned so the mechanism will line space either one or two lines during each operation. With the lever in the forward position, single line spacing will occur. The mechanism will double line space if the lever is to the rear. Indexing is achieved by a pawl which engages and rotates a ratchet on the right end of the platen (Figure 6). The ratchet is locked to the platen so the platen will rotate also.

Motion to operate the index mechanism is supplied through the index cam. When the index magnet is energized, the cam wheel is released and the cam pawl is allowed to engage the continuously rotating operational clutch ratchet. Motion is then transferred through the cam follower.

From the cam follower, motion is transferred through the multiplying lever and the index link. The rear of the multiplying lever is always in contact with the multiplying lever stop which is attached to the power frame. The index link will receive the same amount of motion each time the cam operates regardless of the position of the index selector lever.

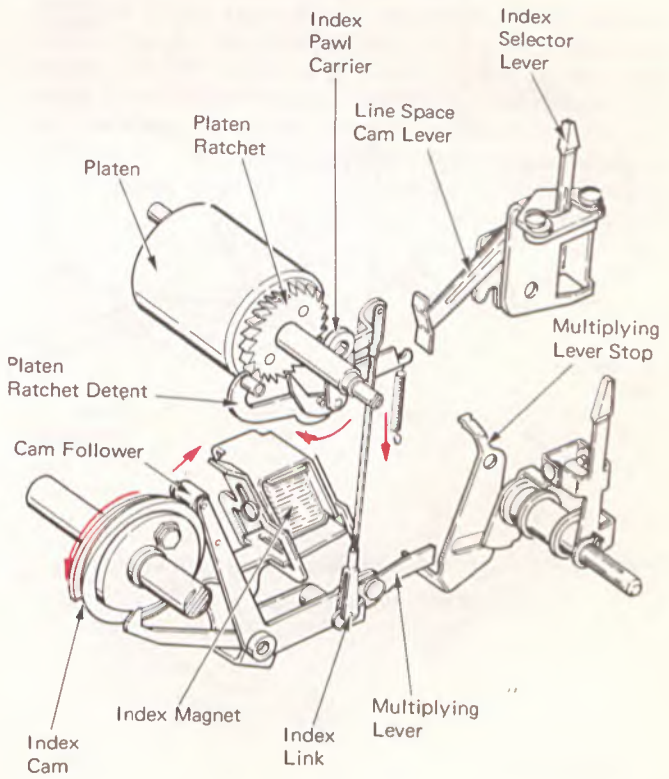


Figure 6 – Index Operation

The index pawl entry into the platen ratchet is controlled by the line space cam lever located on the index selector lever. The line space cam lever has two steps at the forward end, in a position to contact the rear of the index pawl. The index pawl is spring loaded toward the ratchet.

The index selection lever is held in the single or double space position by a toggle spring (Figure 7). The index selection lever movement is restricted by two extensions at the bottom of the lever, that contact the toggle spring mounting stud.

During a double space operation, the index pawl is allowed to enter the platen ratchet immediately. The index pawl then forces the ratchet forward two spaces until the pawl contacts the platen overthrow stop. The platen overthrow stop wedges the pawl into the ratchet teeth to prevent further rotation of the platen.

During an index operation, the platen detent roller is spring-loaded into the next tooth of the platen ratchet to maintain platen position.

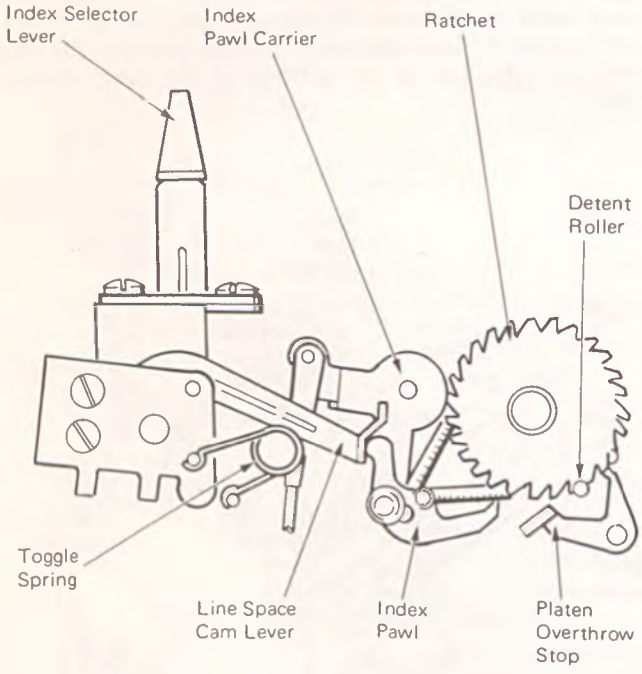


Figure 7 – Index Selection Mechanism – Double Space Position (Left Side View)

If only a single space operation is desired, the index pawl is prevented from entering the ratchet until it has passed one tooth of the ratchet (Figure 8). The index pawl maintains contact with the line space cam lever longer and delays the entry of the pawl into the platen ratchet. The remaining travel after the index pawl enters the ratchet is only sufficient to cause one tooth of rotation to the platen.

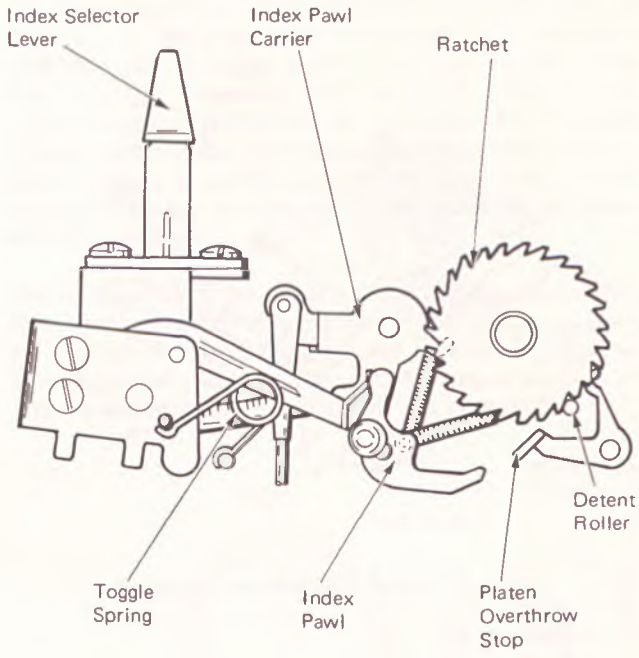


Figure 8 – Index Selection Mechanism – Single Space Position (Left Side View)

The index pawl is designed with an elongated pivot hole so that it "floats" forward during a porition of the index stroke (Figure 9). As the index mechanism operates, the pawl engages the ratchet tooth. There is a slight delay until the pawl carrier reaches the end of the elongated slot in the index pawl. Because the pawl carrier is operated so sharply the platen is caused to move ahead of the index stroke. Without the elongated hole in the index pawl, the platen ratchet would reach the final position ahead of the index pawl. This is prevented by the pawl moving with it and reaching the overthrow stop at the same time the platen reaches the final position. The pawl is then able to wedge into the ratchet and block any further rotation caused by the momentum of the platen.

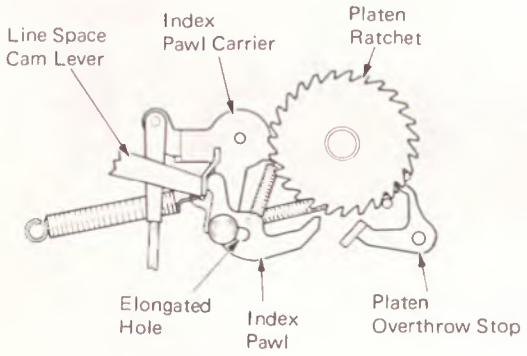


Figure 9 – Index Pawl Operation (Left Side View)

LINE POSITION RESET LEVER

The line position reset lever mechanism (Figure 10), located on the right end of the platen, permits the operator to leave a typewritten line and return again. When the lever is moved forward, the ratchet detent is cammed away from engagement with the platen ratchet. The platen is then free to turn without being detented. Once the operator has made the insertion or correction, she must return the platen to the approximate typing line and return the lever to its home position. This relocates the typing line by allowing the ratchet detent to engage the platen ratchet.

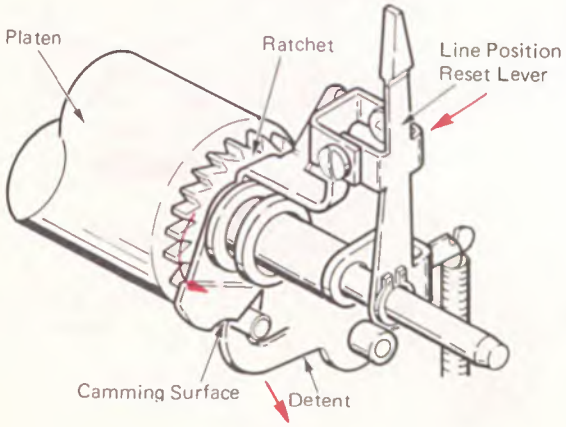


Figure 10 – Line Position Reset Lever

54 TOOTH

The 54 tooth index mechanism (Figure 11) operates basically the same as the mechanism just described. However, there are three positions for the index selector lever. The line space cam lever has an elongated hole with three detent positions on the lower side. An adjustable stud, mounted on the index bracket, detents the line space cam lever to control index pawl entry into the platen ratchet. This permits feeding two, three or four ratchet teeth to index the platen a space, space and a half or two spaces.

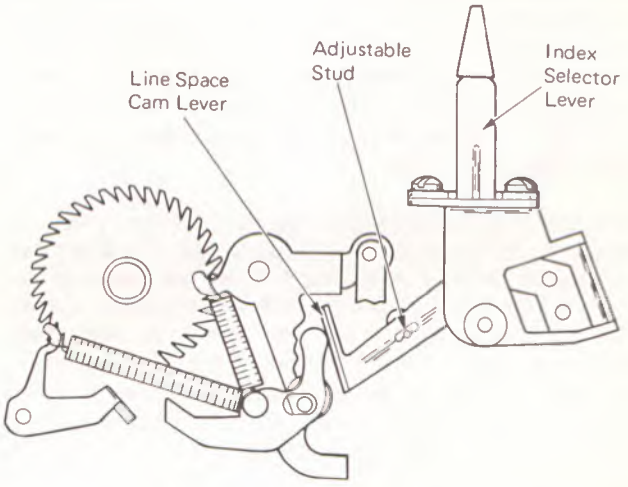


Figure 11 – 54 Tooth Index Mechanism (Right Side View)

OPERATIONAL FEEDBACK SWITCH

Attached to the right side of the index cam is the cam check ring. As the index cam is rotated, the camming surface of the check ring pushes down on the cam check pawl. When the check pawl is cammed down during an index operation, motion is transferred through the arm to raise the magnet, thus causing the switch to close (Figure 12). The operational feedback switch serves to inhibit the system and signal the electronics to drop the index magnet.

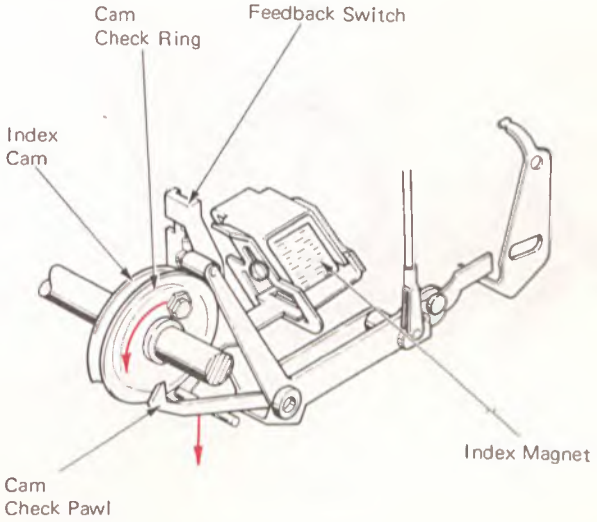


Figure 12 – Feedback Switch

PLATEN VARIABLE

The platen variable mechanism provides the operator with a means of rotating the platen to a position other than the normal writing line (Figure 13). The platen variable is used for typing permanently above or below the writing line or locating the writing line after reinserting the paper. The platen ratchet must remain stationary when selecting a new writing line so that the detent roller will be seated between the two teeth of the ratchet at the new position. A clutch mechanism connects the ratchet at the new position. A clutch mechanism connects the ratchet to the platen so that it can be engaged for line spacing and disengaged by pushing the left platen knob toward the right. As long as the platen knob is held to the right, the platen can be rotated freely while the ratchet remains stationary. When the knob is released, the clutch is automatically re-engaged by spring tension.

When the driver is disengaged from the platen end plug, the platen can be turned to the desired position. The driver can then engage different serrations and lock the platen in the new position. The left platen knob is mounted to a shaft that slides left-to-right inside the platen. A light compression spring holds the shaft toward the right to prevent free play. The shaft pushes against the platen driver. Movement of the platen knob toward the right is transferred to the driver to disengage it from the platen end plug.

The left side of the platen ratchet contains two pins that fit into a slot on the platen driver. The platen driver operates left-to-right and always turns with the ratchet. A compression spring between the ratchet and the driver loads the driver to the left so the serrations on the outer surface of the driver mesh with matching serrations inside the platen end plug. The meshing of the serrations cause the platen, the driver, and the ratchet to be locked together and turn as a unit.

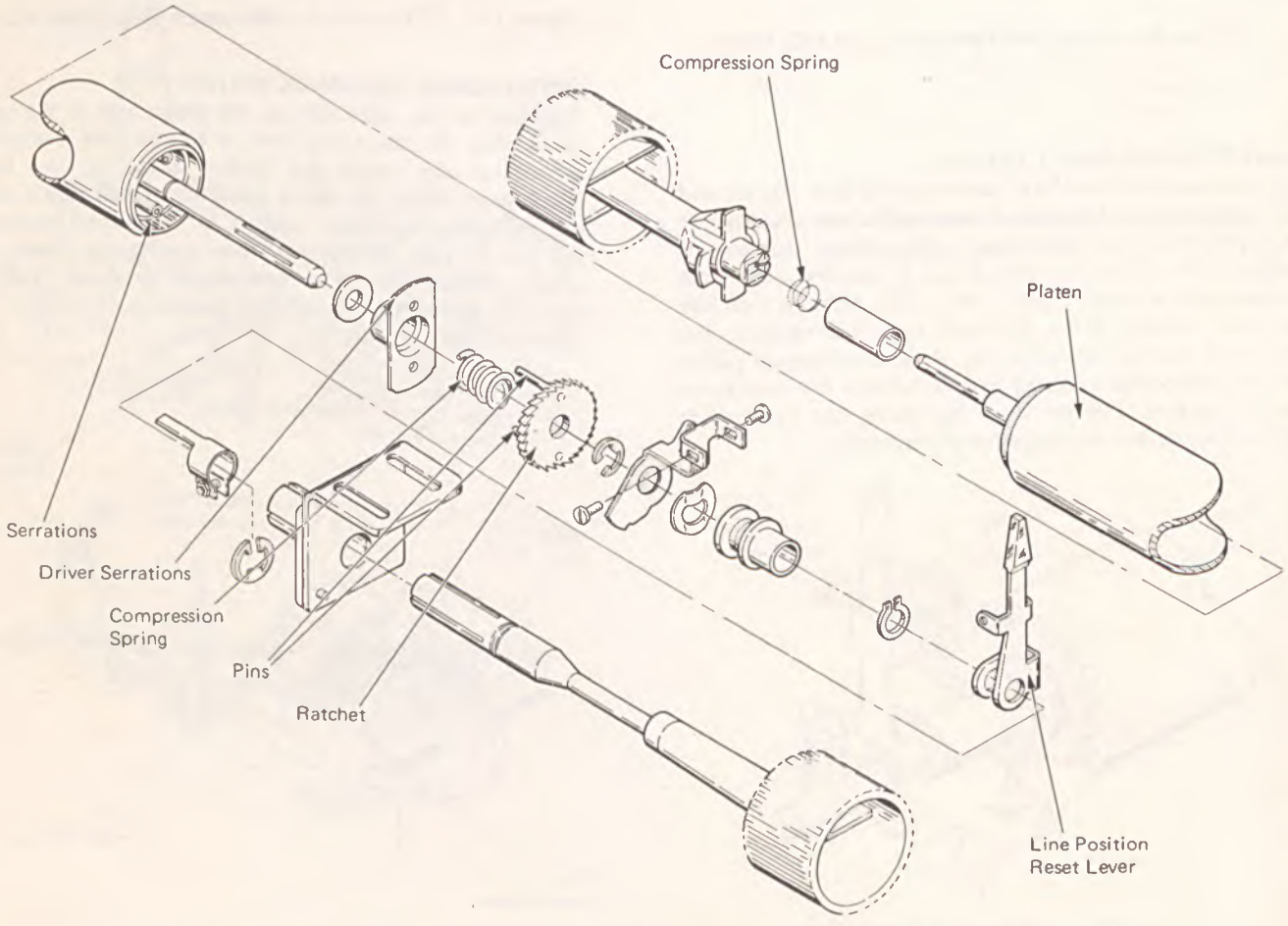
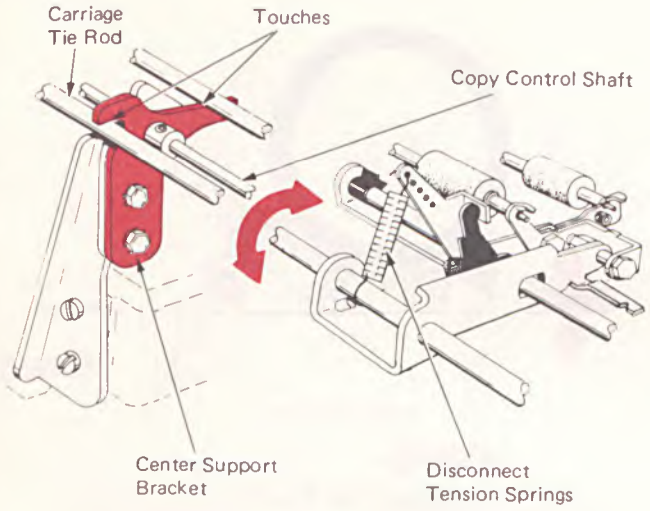


Figure 13 – Platen Variable And Page End Indicator

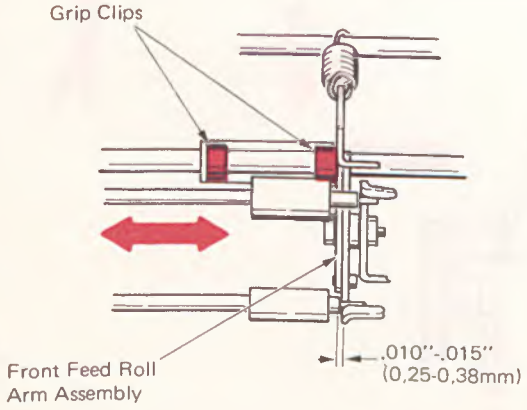
PAPER FEED & INDEX ADJUSTMENTS

1. *Paper Feed Support* – With the feed roll tension springs disconnected, the center support bracket should be positioned so that the forward lug just touches the underside of the feed roll actuating shaft while the rear lug just touches the top of the carriage tie rod. The center support bracket should not bow the copy control shaft.



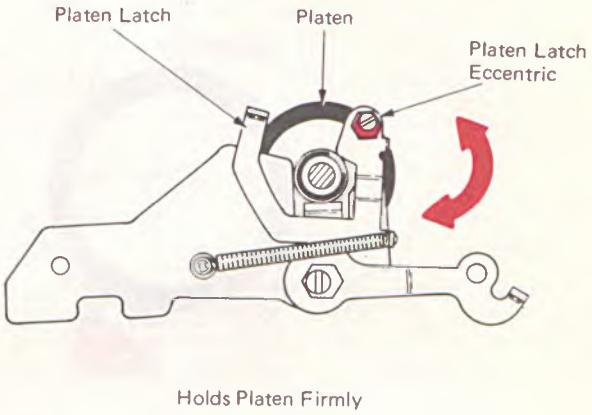
(Left Rear View)

2. *Feed Roll End Play* – Adjust the left and right front feed roll arm assemblies for .010"-.015" side play of the feed roll shaft.



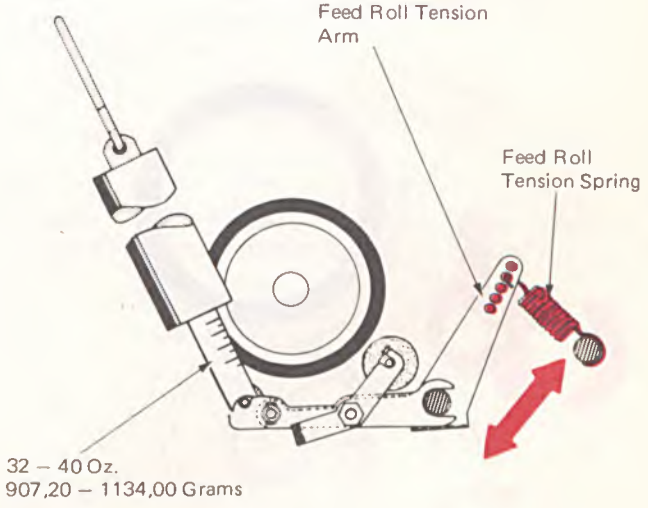
(Top View)

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



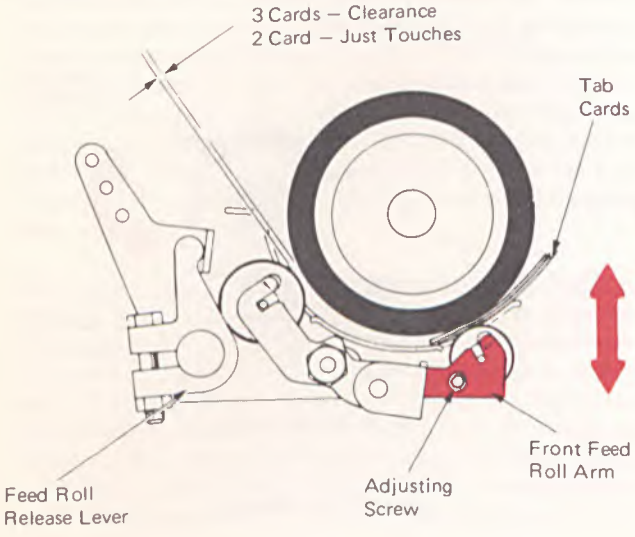
(Right Side View)

4. *Feed Roll Tension* – Place the feed roll tension springs in the hole of the feed roll tension arms that will provide 32–40 oz. tension measured at the front feed roll pivot points.



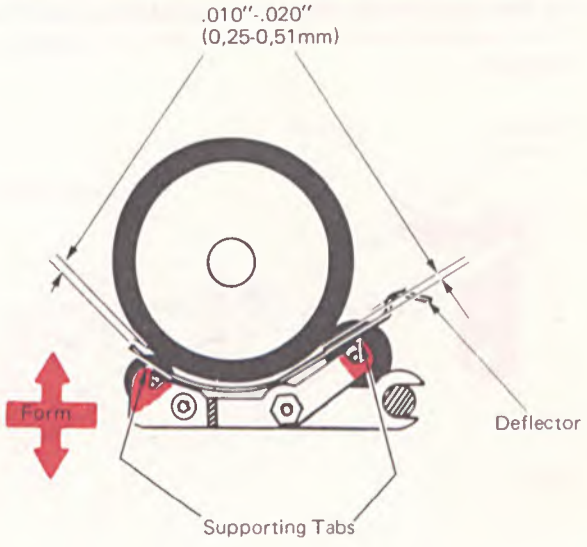
(Right Side View)

5. *Feed Roll Adjustment* – Adjust the front feed roll arms vertically to obtain a slight clearance between the rear feed rollers and the platen when three tab cards are between the front feed rollers and the platen. With two tab cards between the front feed rollers and the platen, the rear feed rollers should have a slight drag on the platen.



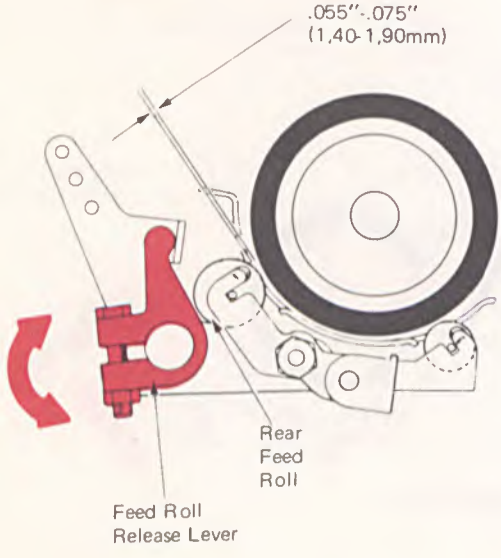
(Left Side View)

7. *Deflector* – Form the deflector supporting tabs on the front and rear feed roll arms to obtain a clearance of .010"-.020" between the deflector and the platen. Three tab cards inserted between the platen and deflector, at the front and rear, should provide a slight drag. No drag should be felt when one tab card is inserted.



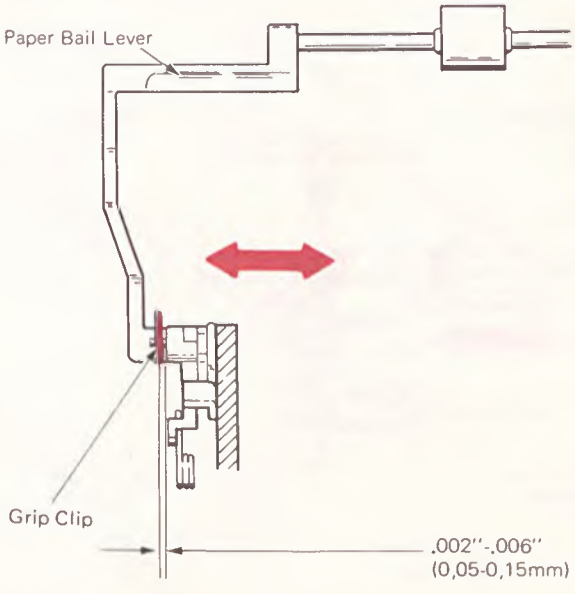
(Right Side View)

6. *Paper Release* – Adjust the feed roll release arms to obtain .055"-.075" clearance between the rear feed rollers and the platen when the feed rollers are released.



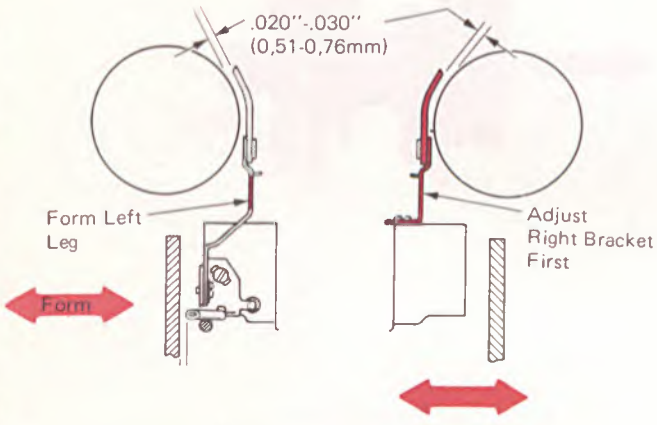
Feed Rolls Released (Left Side View)

8. *Paper Bail* – Adjust the grip clip on the paper bail pivot shaft to obtain .002"-.006" end play of the paper bail arm.

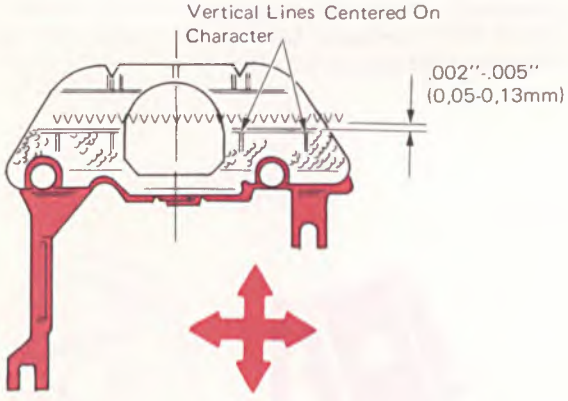


9. *Cardholder* – Adjust the cardholder brackets front to rear to obtain .020"-.030" clearance with the platen. The vertical adjustment should be such that the horizontal graduation is parallel and .002"-.005" below the feet of the typed characters when viewed from the operator's position. Adjust the cardholder left to right so the point of the letter "v" will align with the vertical graduations on the cardholder.

NOTE: Depress TPWR button before keyboarding "v".



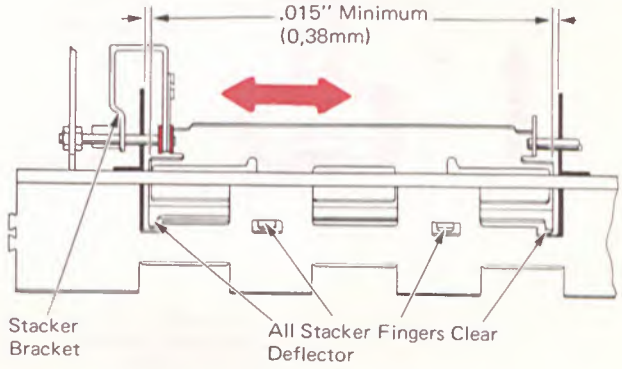
(Left Side View) *(Right Side View)*



(Front View)

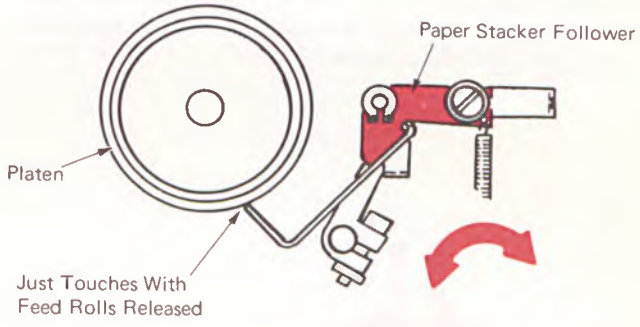
NOTE: The paper feed adjustments should be correct before making these adjustments.

10. *Paper Stacker* – Adjust the stacker bracket left to right for .015" minimum clearance between the feed roll arm and the paper stacker. All fingers must clear deflector.



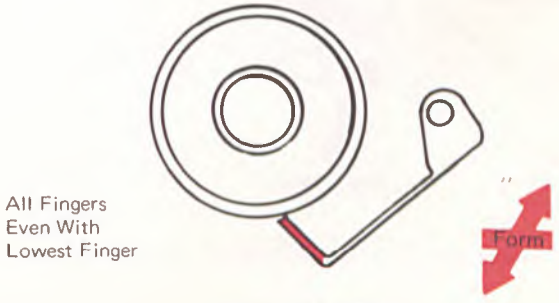
(Top View)

11. *Paper Stacker Follower* – With the paper release lever forward, adjust the paper stacker follower rotationally so that the stacker fingers just touch the platen.



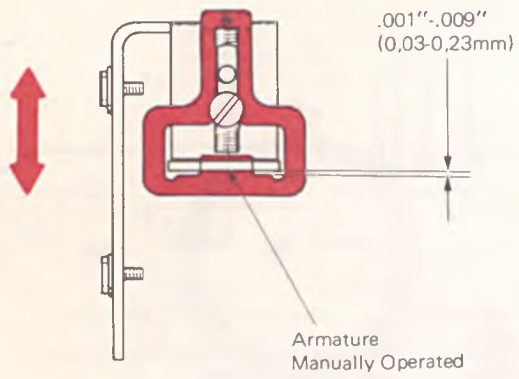
(Right Side View)

12. *Paper Stacker Fingers* – Form the stacker fingers so that all fingers are parallel to the lowest finger.



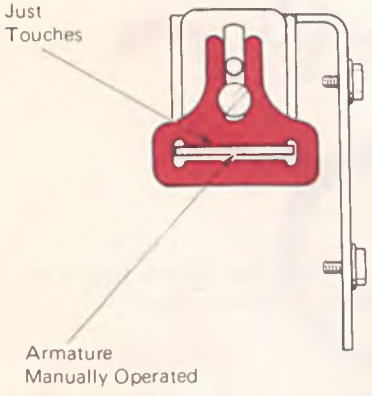
(Right Side View)

13. *Index Magnet Pivot Plate* – With the index magnet armature manually operated, adjust the magnet pivot plate up or down for .001"-.009" clearance between the pivot plate and the bottom of the armature.



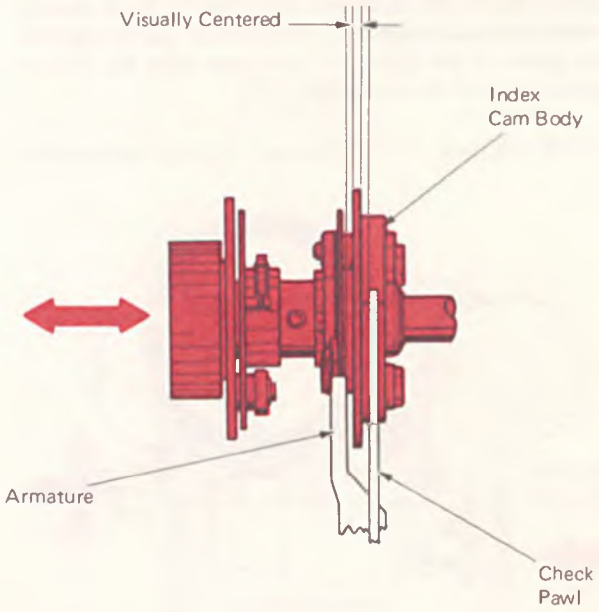
(Front View)

14. *Index Magnet Armature Upstop* – With the index magnet armature manually operated, adjust the upstop to just touch the top of the armature.



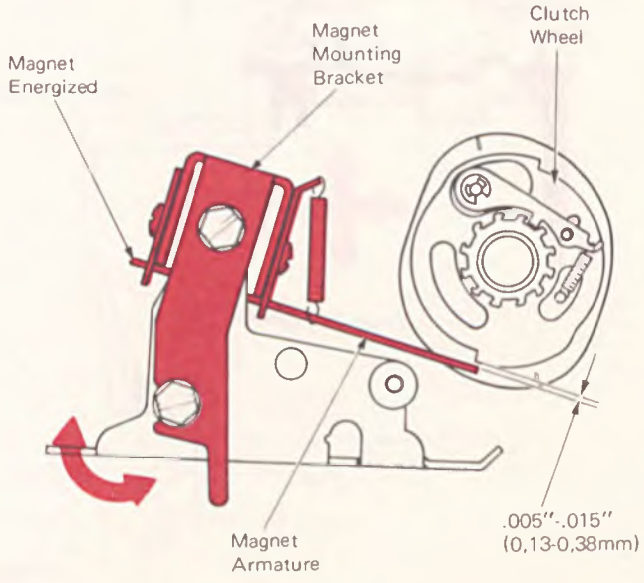
(Rear View)

15. *Index Cam* – Adjust the index cam assembly left or right to center the cam body between the index magnet armature and the index cam check pawl.



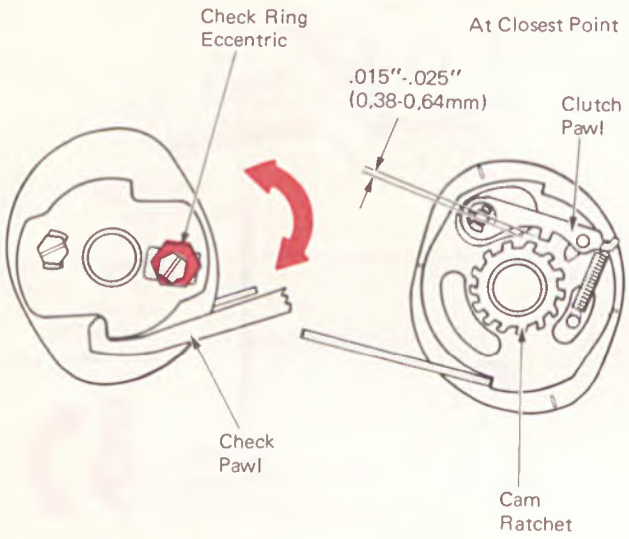
(Bottom View)

16. *Index Cam Release* – With the index magnet armature energized, adjust the magnet mounting bracket for .005"-.015" clearance between the index cam clutch wheel and the magnet armature.



(Left Side View)

17. *Index Clutch Pawl Clearance* – With the index cam latched at rest, adjust the check ring eccentric for .015"-.025" clearance between the cam ratchet and the clutch pawl at the closest point.



Cam Latched At Rest

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

18. *Line Space Cam Lever* – With the index link disconnected, the index selector lever in the double space position, and the index pawl carrier manually operated, adjust the cam lever front to rear for .020"-.030" clearance between the working surface of the pawl and the platen ratchet tooth (Figure 1). With the index selector lever in the single index position, adjust the cam lever vertically so that the index pawl is centered on the cam surface (Figure 2).

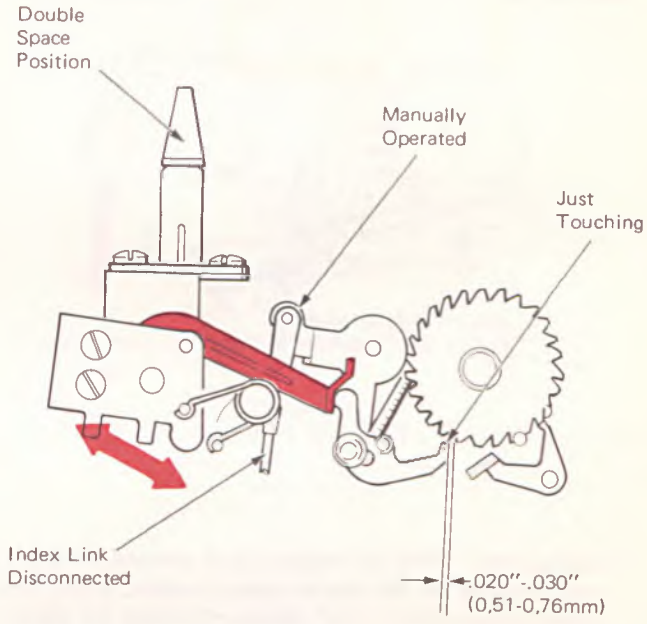


Figure 1

(Left Side View)

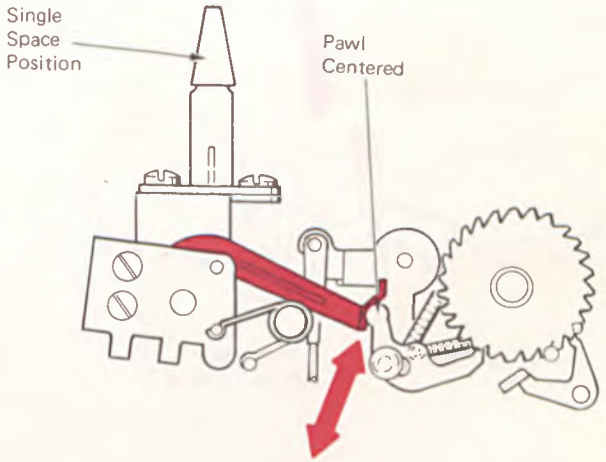
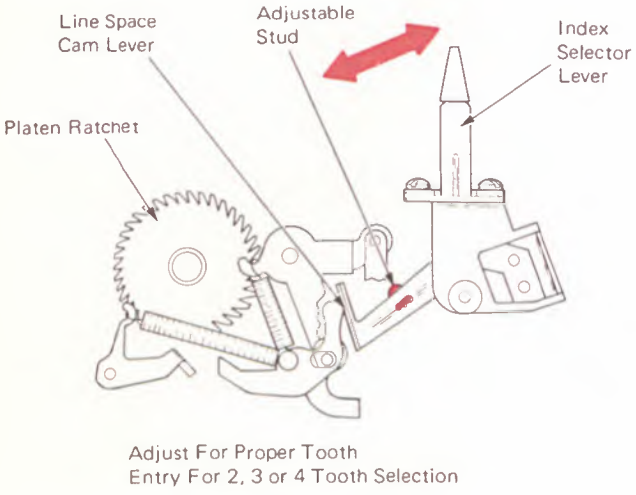


Figure 2

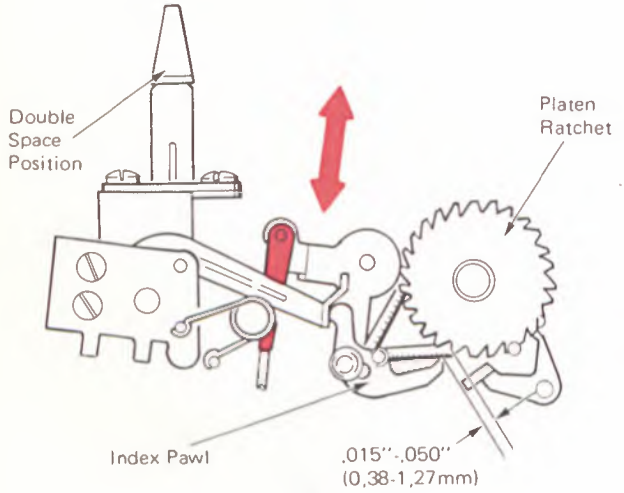
Cam At Rest Single Space Position (Left Side View)

19. *Line Space Cam Lever (54 Tooth)* – Position the adjustable stud front to rear on the index bracket so that the index pawl will enter the proper ratchet tooth to feed 2, 3 or 4 teeth with the index selector lever in the forward, center or rear position respectively.



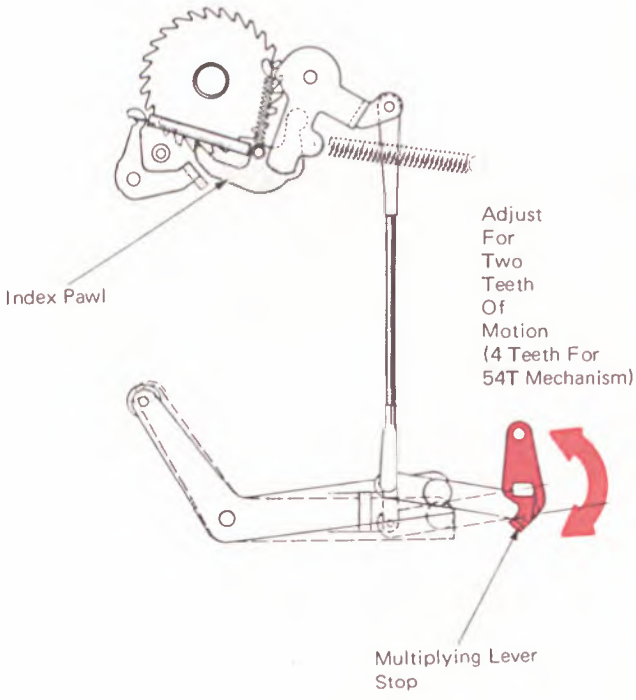
(Right Side View)

20. *Index Link* – With the index cam at rest and the index selector lever in the double space position, adjust the index link for .015"-.050" clearance between the platen ratchet and the index pawl.



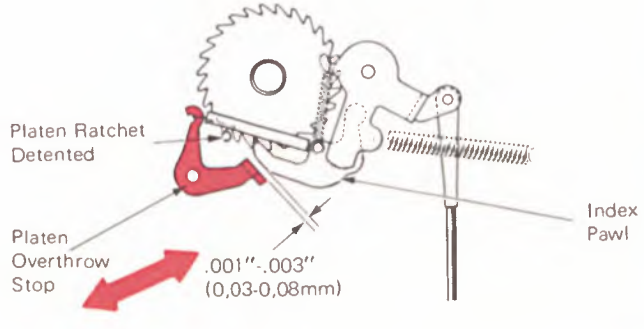
Cam At Rest (Top View)

21. *Multiplying Lever Stop* – With the index selector lever in the double position, adjust the multiplying lever stop front to rear to obtain two full teeth of motion from the index pawl, after it begins to drive the platen.



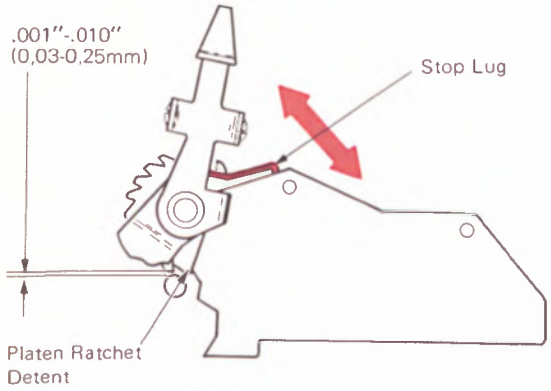
Index Selector Lever In Double Position (Left Side View)

22. *Platen Overthrow Stop* – With the index cam follower on the high point of the cam and the platen ratchet detented, adjust the platen overthrow stop front to rear for .001"-.003" clearance between the index pawl and the platen overthrow stop.



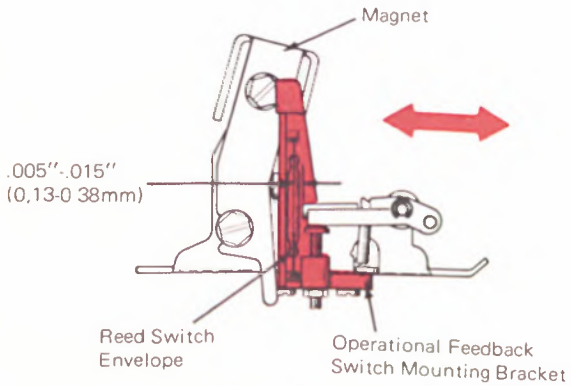
Cam On High Point (Right Side View)

23. *Line Position Reset Lever* – With the detent lockout in the rest position, form the stop lug on the lockout to provide .001"-.010" clearance between the platen ratchet detent and the detent lockout.



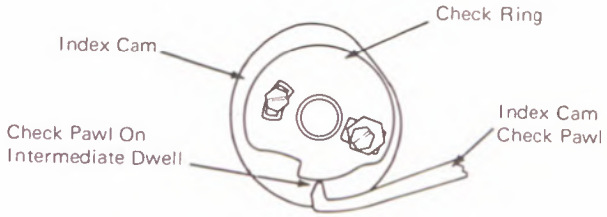
(Right Side View)

24. *Operational Feedback Magnet Clearance* – Adjust the operational feedback switch mounting bracket front-to-rear for .005"-.015" clearance between the magnet and the reed switch envelope.

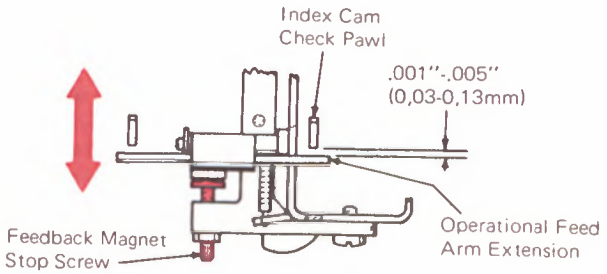


(Left Side View)

25. *Operational Feedback Magnet Stop Screw* – With the index cam check pawl on the intermediate dwell of the check ring, adjust the magnet stop screw for .001"-.005" clearance between the index cam check pawl tail and the operational feedback arm extension.



(Right Side View)

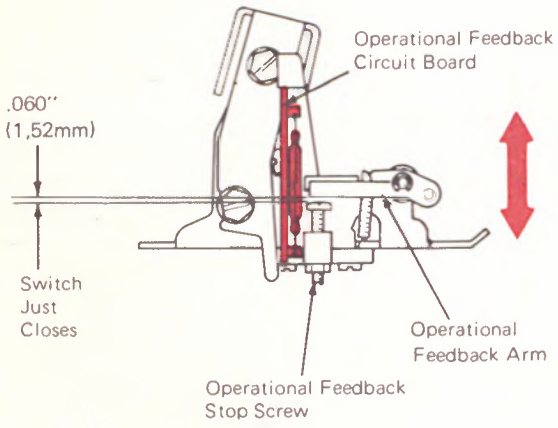


(Front View)

26. *Operational Feedback Circuit Board* – With the machine at rest, adjust the circuit board up or down so that the reed switch will close when the magnet has moved up .060". This can be accomplished by using the threads on the stop screw to gauge the .060" movement. The procedure is as follows:
    a. Note the position of the slot in the stop screw so that it can be returned to that position.
    b. Turn the stop screw in (clockwise) 2 turns.
    c. Connect meter on the OHM scale between the white wire of the operational feedback switch and ground.

NOTE: The meter may be connected to the white wire closest to the power frame on the print feedback switch or to the white wire on the shift feedback switch. These three switches are connected in parallel.

    d. Loosen the circuit board mounting screw and push the board all the way up in its slotted mounting hole. Move the board down slowly until the switch just closes. Tighten the board mounting screw.
    e. Return the stop screw to its original position. The switch should re-open when the screw is at least 1/2 turn from its original position.



(Left Side View)

MARGIN & BELL OPERATIONAL THEORY

The purpose of the margin and bell mechanism is to allow the operator to vary the line length and position of the writing line and to warn the operator when approaching the line end (right margin) (Figure 1). The left margin position is determined by the position of the left margin stop on the margin rack. The line end position is determined electronically.

The line end warning bell is activated by a bell ringer magnet. The electronics will pick the magnet to ring the bell eight spaces before the carrier reaches the line end location.

The carrier can be allowed to move to the left beyond the left margin stop by depressing the margin release button.

When text is played out with the no zone button down, the hard copy line length will be the same as it was when the text was entered into memory. When text is played out with the no zone button up, the line length will automatically adjust to correspond to the line end location in the electronics. When playout is complete, the text in memory will look exactly like the hard copy with space and carrier return codes being converted and hyphens inserted.

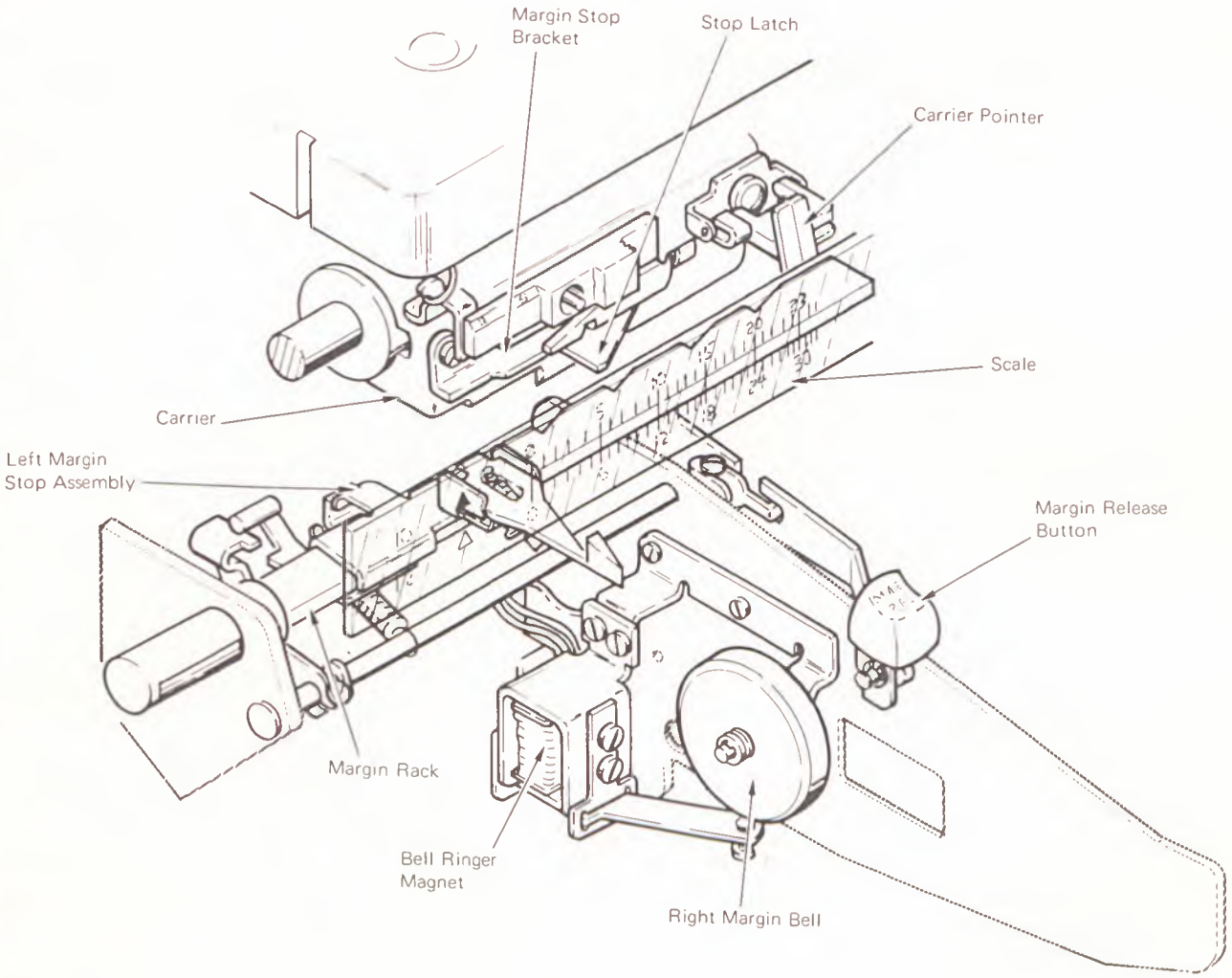


Figure 1–Margin And Bell

MARGIN RACK & STOP OPERATION

The margin rack spans the width of the printer and contains teeth along its rear edge spaced at one half inch intervals (Figure 2). The left margin stop is set at half inch intervals.

The left margin stop consists of a pin and slider assembly operated by a set lever. The pin and slider assembly is spring loaded into engagement with the teeth of the margin rack. The margin stop may be repositioned by pushing the margin set lever to the rear to disengage the pin from the rack and sliding the margin stop assembly left or right along the rack to the desired position.

Movement of the carrier to the left is restricted by the left margin stop and the margin stop bracket (Figure 2). The margin stop bracket is attached to the front of the carrier. As the carrier is returned to the left, the stop latch contacts the left margin stop. This action forces the margin rack to the left to operate the overbank switch. The overbank switch signals the electronics to release the carrier return mechanism and leave the carrier resting at the left margin.

NOTE: The relation of the margin rack to the carrier return mechanism is discussed further in the Carrier Return section of this manual.

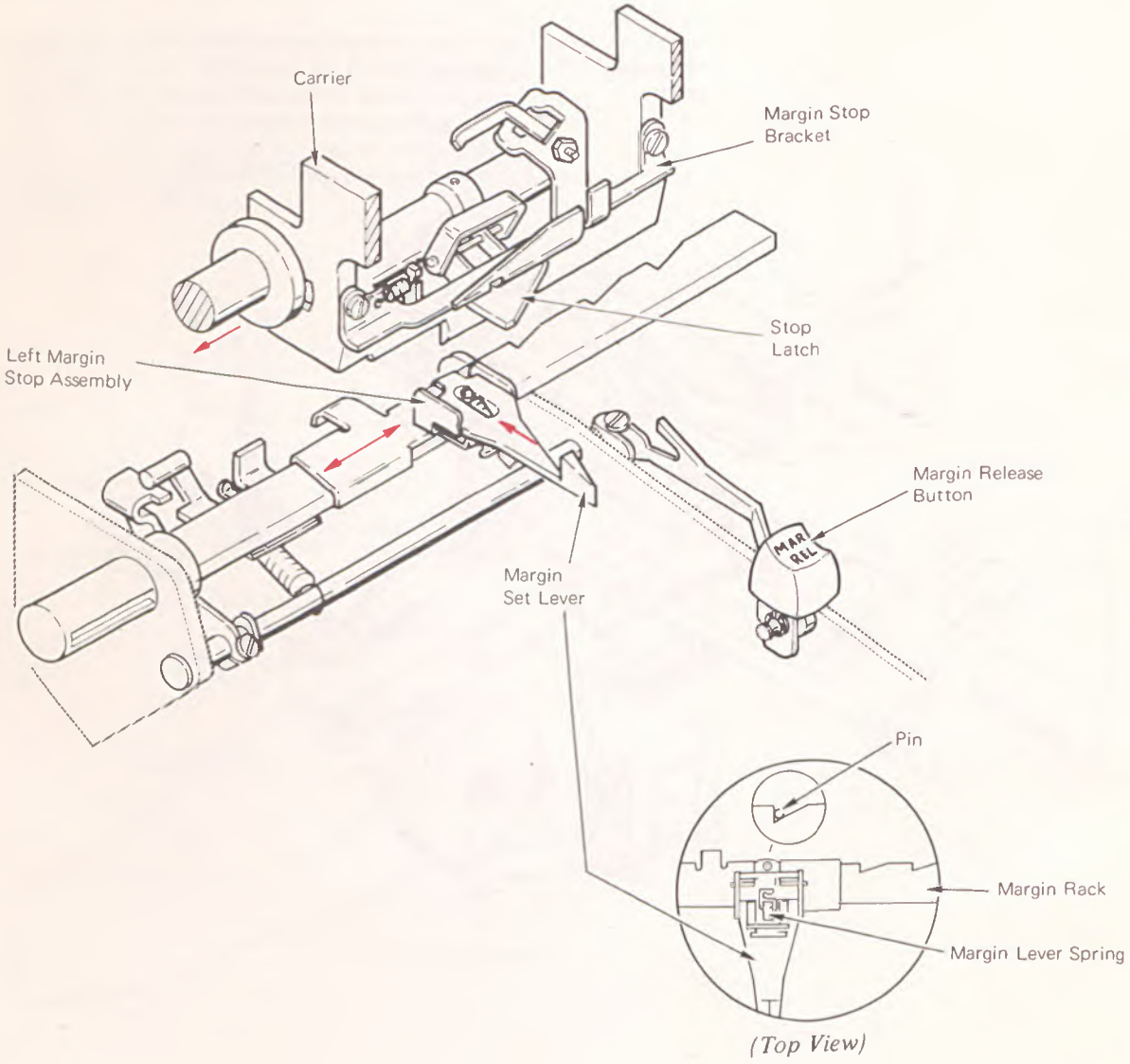


Figure 2–Margin

MARGIN SET LEVER AND SCALE

The margin set lever extends through a slot under the top cover scale (Figure 3). The indicator mark on the margin set lever serves as a pointer to indicate the position of the margin stop in relation to the scale. A pointer located on the front of the carrier indicates the position of the carrier. The scale is graduated to correspond to both 10 and 12 pitch.

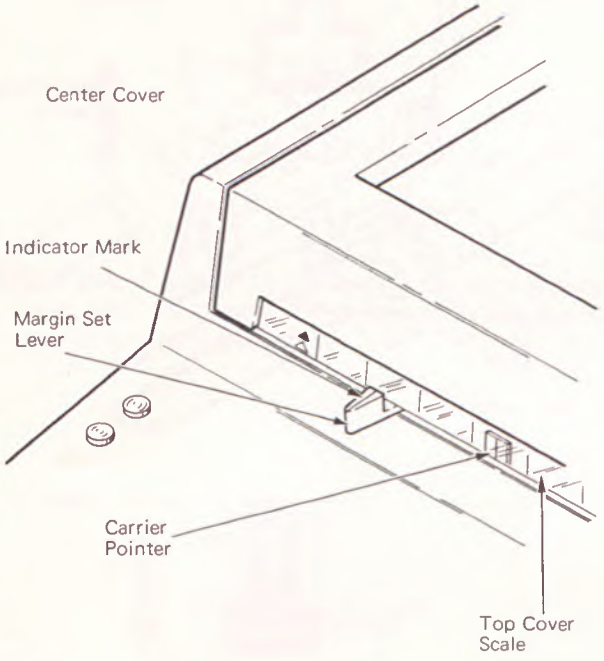


Figure 3 – Margin Set Lever And Scale

LINE END AND BELL

The line end location is controlled electronically. When the machine is turned on, the line end is automatically set six inches from the left margin. If the left margin is moved, electronics will automatically move the line end location to maintain the desired line length. If a six inch line length is not desired, a new position can be set by depressing the typewriter button, then spacing or tabbing from the left margin to the desired location. Depressing a "coded" line

The machine will always rearrange line endings and, if necessary, stop at the line end for a hyphenation decision during playout when the no zone button is up. Depressing a

Line endings are rearranged during playout within a distance of six spaces of the line end location. This distance is called the Line End Zone and is controlled electronically. The electronics will terminate a line on the last space, hyphen or carrier return within this zone. For example, if two spaces separated by a short word fell within the zone, the line would be terminated on the last space. For more information on how line endings are rearranged, see the Principles of Operation section of this manual.

The bell is controlled by the electonics. The bell will ring when the carrier is exactly eight spaces from the line end location.

The bell is mounted to the left side of the keyboard (Figure 4). The bell is activated by the bell ringer magnet mounted just to the rear of the bell. A bell clapper is located on the magnet armature just below the bell and is free to move up and down in a hole in the armature. When the magnet picks and the armature stops against the upstop, the bell clapper continues to move upward and strikes the bell.

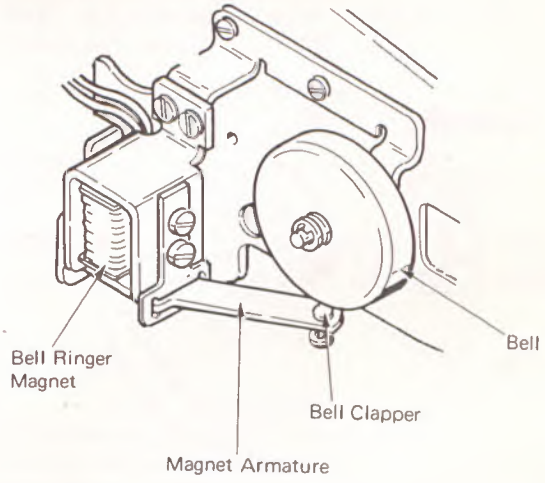


Figure 4 – Right Margin Bell (Left Side View)

MARGIN RELEASE MECHANISM

The margin release mechanism allows the operator to type beyond the left margin without changing the position of the margin stop. Margin release operates by rotating the margin rack so that the margin stop moves upward out of the path of the margin stop latch on the margin stop bracket (Figure 5).

The margin release keylever pivots at the left side of the keyboard. Depression of the keylever causes the rear of the margin rack to raise. A final stop on the left end of the margin rack remains in the path of the margin stop latch to unlatch the carrier return if it is operated with the margin release keylever depressed. An extension spring restores the margin release mechanism and holds it in the rest position.

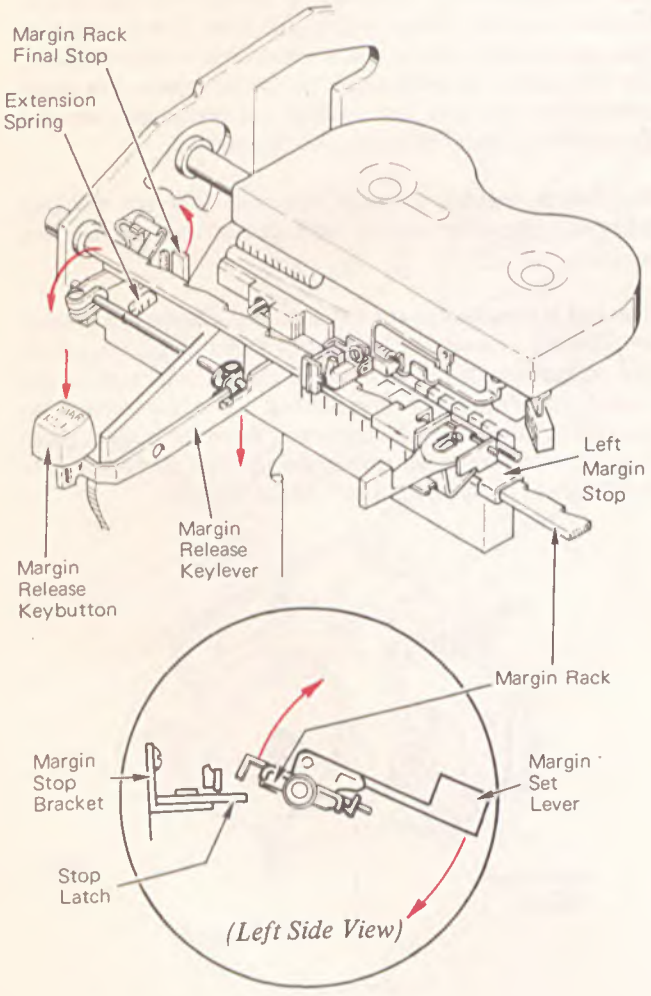


Figure 5 – Margin Release Mechanism

To allow the carrier to space or tab through the left margin, the margin stop latch cams clockwise (Figure 6) as it moves past the left margin stop. The margin stop latch will return to rest under its spring tension.

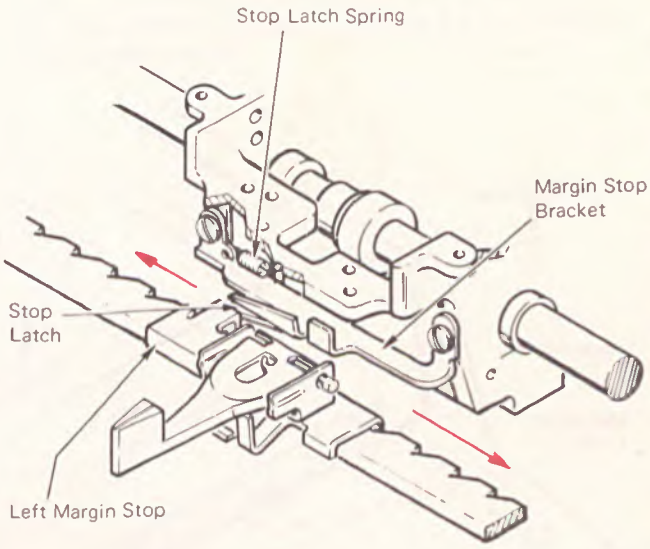
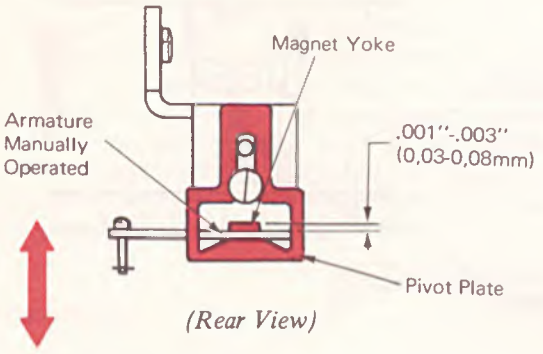


Figure 6 – Left Margin

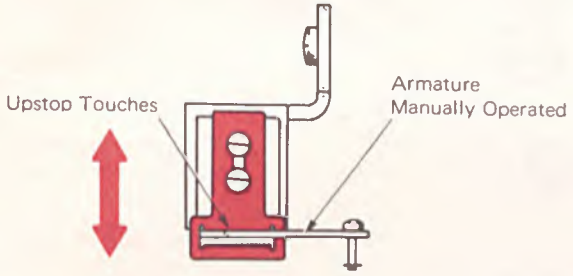
MARGIN & BELL ADJUSTMENTS

1. Bell Ringer Magnet Pivot Plate – With the armature manually operated, position the pivot plate up or down for .001"-.003" between the armature and the magnet.



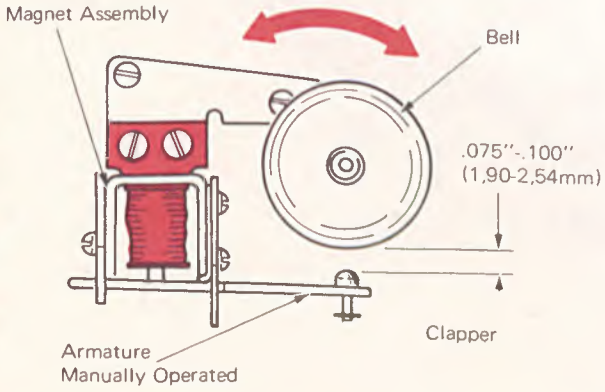
(Rear View)

2. Bell Ringer Magnet Upstop – With the armature manually operated, position the upstop up or down so the upstop touches the armature.



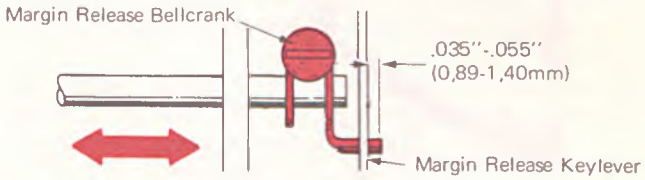
(Front View)

3. Bell Ringer Magnet Assembly – Position the assembly rotationally for .025"-.075" between the clapper and the bell.



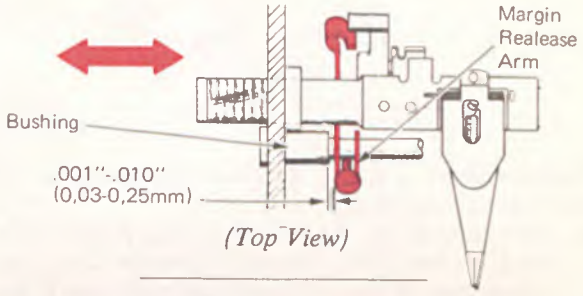
(Left Side View)

4. Margin Release Bellcrank – Adjust the bellcrank left to right to protrude through the margin release keylever by .035"-.055".



(Top View)

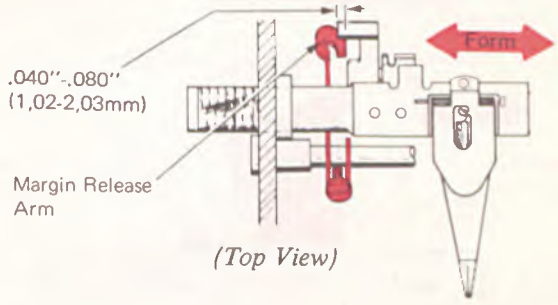
5. Margin Release Pivot Shaft – Adjust the margin release arm left or right for .001"-.010" end play of the pivot shaft.



(Top View)

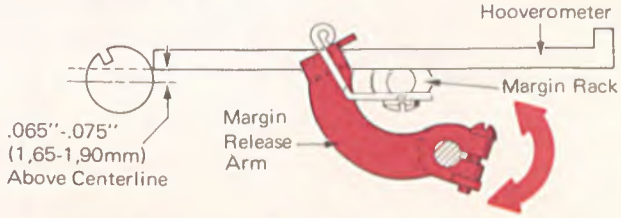
6. Margin Release Arm – The margin release arm is adjusted for the following conditions:

a. Form the arm left or right so the final stop pin overlaps the arm by .040"-.080".



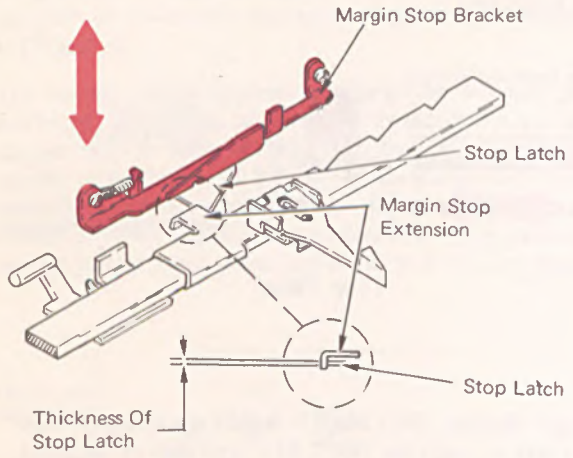
(Top View)

b. With the margin release keylever fully restored, adjust the release arm about the pivot shaft so that the margin rack is horizontal. Maintain .001"-.010" end play of the pivot shaft.



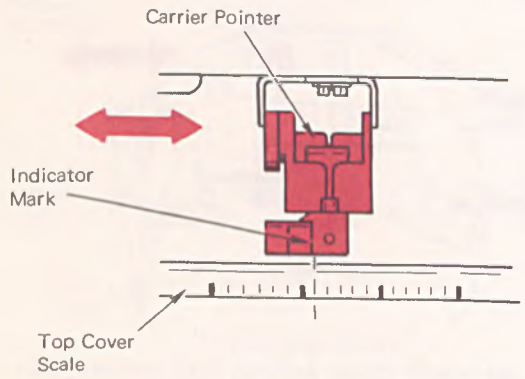
(Keylever At Rest Left Side View)

7. *Margin Stop Bracket* – Position the bracket up or down so the stop latch engages the margin stop extension by the thickness of the stop latch.



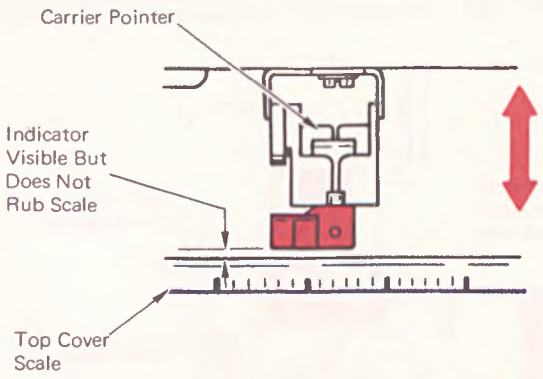
(Left Front View)

8. *Carrier Pointer* – Adjust the carrier pointer to satisfy the following conditions:
   a. Left to right so the indicator mark aligns with a pitch graduation on the top cover scale. Check this adjustment on the left, center and right sides of the scale and if necessary, readjust the pointer to compensate for variations in the scale.



(Top View)

   b. Front to rear so the indicator is visible behind the scale but does not rub on the back side of the scale. Check this adjustment along the entire writing line.



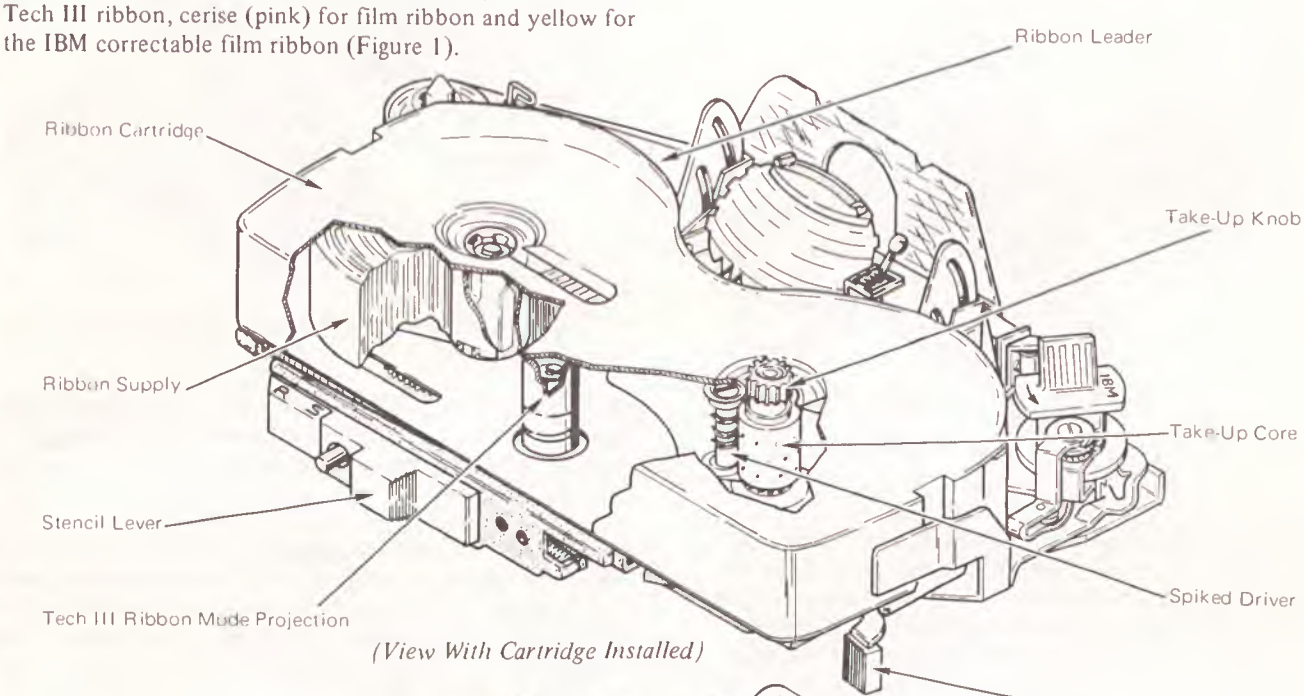
(Top View)

SELECTIVE RIBBON OPERATIONAL THEORY

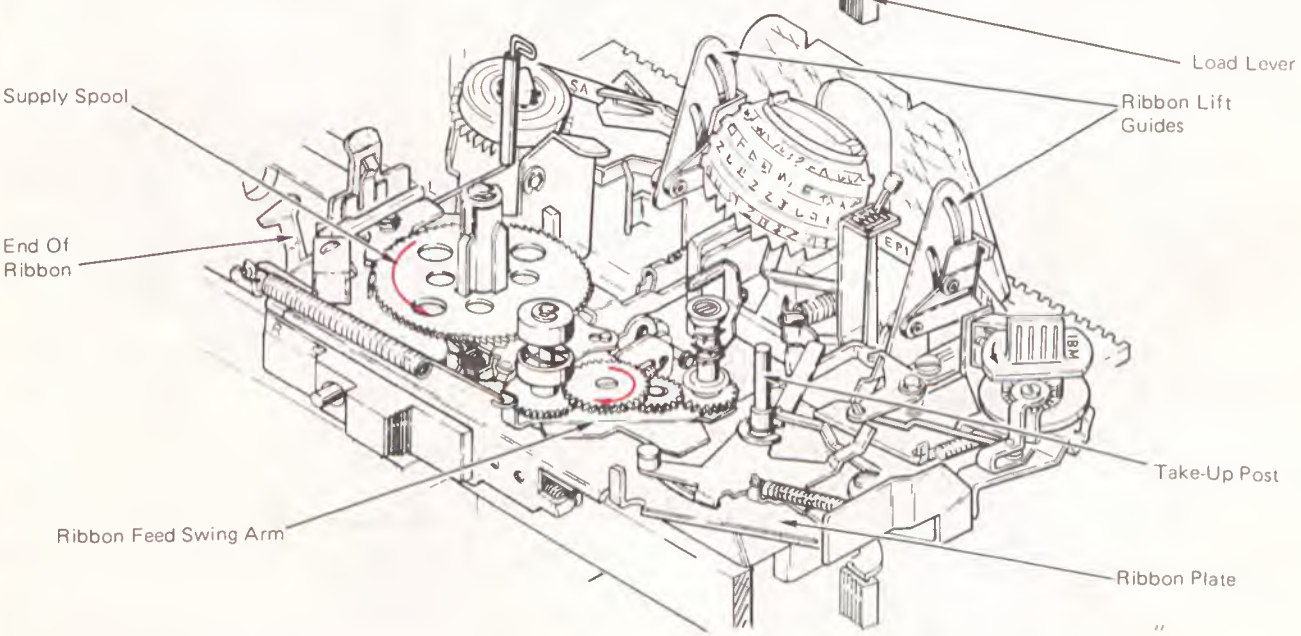
The purpose of the selective ribbon system is to operate with either the film ribbon, correctable film ribbon or the IBM Tech III ribbon. All three ribbons are contained in a cartridge similar in appearance to the "Selectric" Typewriter fabric ribbon cartridge, but considerably larger. The complete supply of ribbon is in the left side of the cartridge. The used ribbon will be wound around the take-up core on the right side and the cartridge will be discarded when the ribbon is used up. The cartridges for the three types of ribbons look the same but have different color take up knobs and leaders for identification; blue for IBM Tech III ribbon, cerise (pink) for film ribbon and yellow for the IBM correctable film ribbon (Figure 1).

The feed modes for the three ribbons are completely different. The film ribbons must be fed so that no characters overlap whereas the IBM Tech III ribbon is fed in much smaller increments to use the overstrike capabilities of the ribbon. The inner construction of the cartridge determines in which ribbon feed mode the mechanism will operate.

A ribbon lift pattern of three tracks is used for both type ribbons. However, the IBM Tech III ribbon lift is wobbled (varied) slightly to maintain even color.



(View With Cartridge Installed)



(Viewed With Cartridge Removed)

Figure 1 – Selective Ribbon System

RIBBON FEED

Ribbon feed is accomplished by the ribbon feed cam follower assembly operating a ribbon feed pawl. During a print cycle, the ribbon feed pawl operates in one of the eighteen feed windows on the ribbon feed and lift wheel rotating it in a counterclockwise direction. At rest, the ribbon feed cam follower in on the high point of the ribbon feed cam and the ribbon feed pawl is engaged in one of the feed windows (Figure 2).

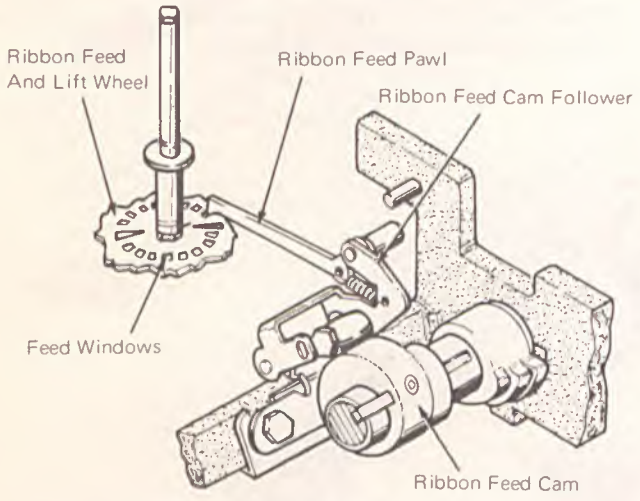


Figure 2 – Ribbon Feed At Rest (Right Rear View)

The ribbon feed cam follower is spring loaded against the ribbon feed cam. At the early stages of a print cycle, the cam follower moves toward the low dwell of the cam. The feed pawl moves toward the rear of the machine causing it to cam out of the window of the ribbon feed and lift wheel. As the cam follower approaches the low point of the cam, the pawl drops in the next window to the rear. The ribbon feed and lift wheel is held detented, preventing clockwise movement by the ribbon lift control lever (Figure 3).

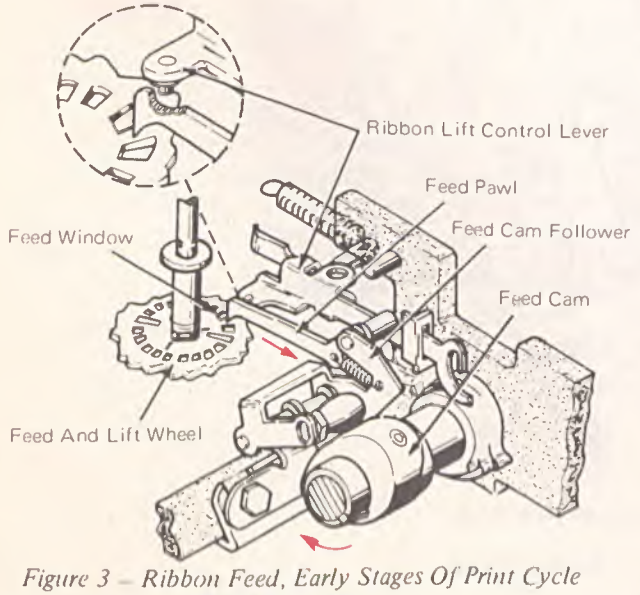


Figure 3 – Ribbon Feed, Early Stages Of Print Cycle (Right Rear View)

As the print cycle nears completion, the cam follower rises toward the high point of the cam moving the pawl toward the front of the machine. The pawl operates against the front surface of the window rotating the ribbon feed and lift wheel in a counterclockwise direction (Figure 4).

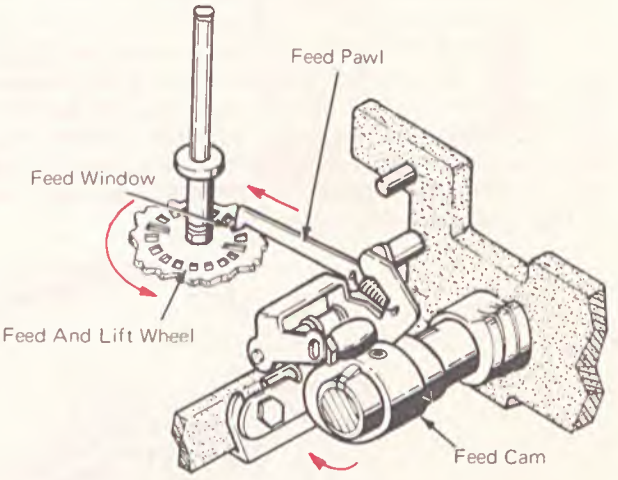


Figure 4 – Ribbon Feed, Print Cycle Near Completion (Right Rear View)

At the completion of the print cycle, the feed cam follower is again on the high point of the cam and the ribbon feed and lift wheel has been rotated 1/18 of a turn to its next detented position.

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

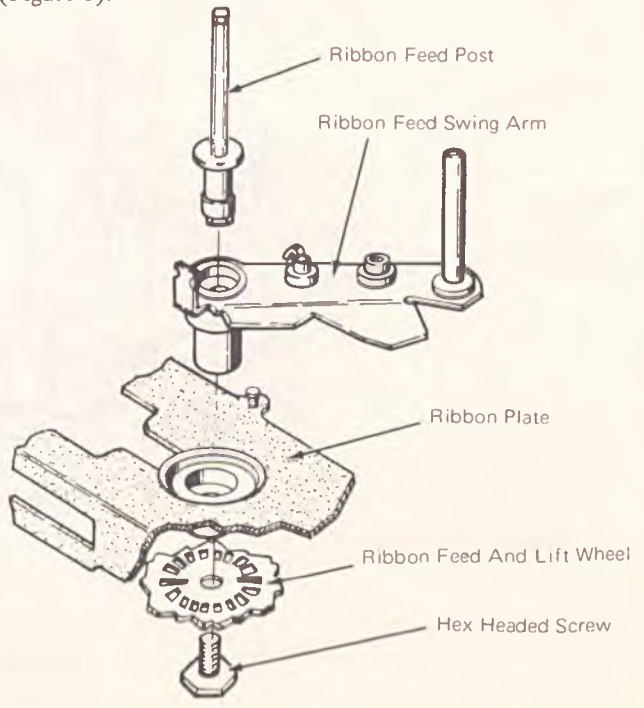


Figure 5 – Ribbon Feed Post And Swing Arm Mounting

The rotation of the ribbon feed and lift wheel rotates the ribbon feed post. The ribbon feed gear, mounted on a flat surface of the feed post, also rotates (Figure 6).

The spiked driver is mounted on a post at the free end of the swing arm. Two intermediate gears mounted on the swing arm transfer the feed gear rotation to the spiked driver.

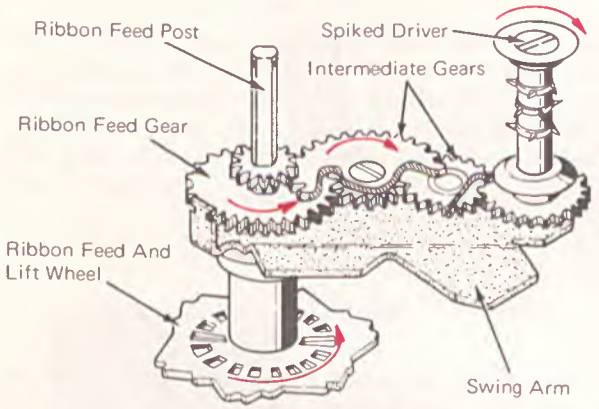


Figure 6 – Spiked Driver Rotation

The free end of the swing arm is heavily spring loaded toward the ribbon take-up post by the swing arm spring (Figure 7). This causes the spikes of the spiked driver to dig into the used ribbon. When the spiked driver rotates, it causes the take-up core to rotate about the take-up post pulling new ribbon into the print position and winding up the used ribbon.

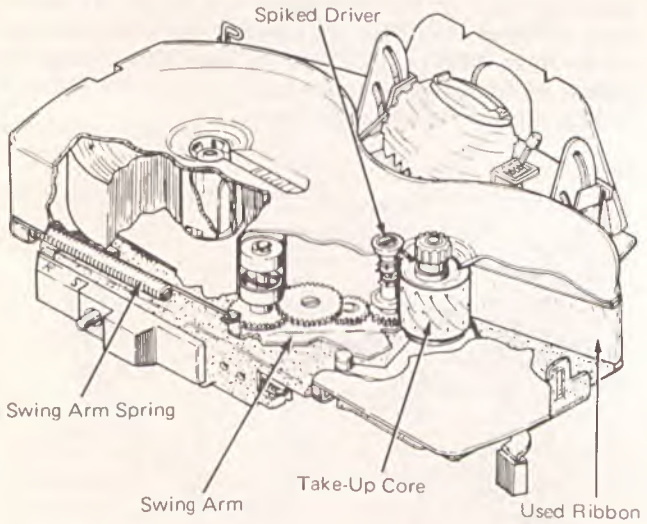


Figure 7 – Ribbon Feed Operation

The different feed increments for the two types of ribbon are controlled by the amount of spiked driver rotation for each print cycle.

The ribbon feed gear is free to slide vertically on the ribbon feed post. Its vertical position determines the amount of spiked driver rotation. In the film ribbon mode, the ribbon feed gear is spring loaded upward by the feed gear spring allowing its large gear to engage the small gear of the first intermediate gear. This causes the spiked driver to rotate a sufficient amount to feed film ribbon so the characters do not overlap (Figure 8).

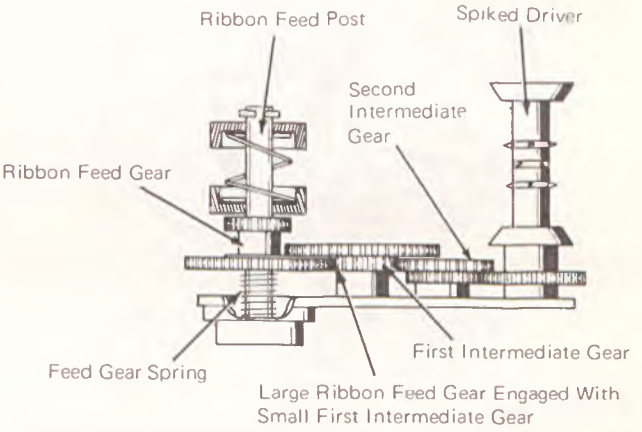


Figure 8 – Film Ribbon Mode

In the IBM Tech III ribbon mode, a projection within the cartridge depresses the ribbon mode button which, through a compression spring, depresses and holds down the ribbon feed gear. This allows the small gear on the ribbon feed gear to engage the large gear of the first intermediate gear and causes the spiked driver to rotate approximately 1/6 of the amount in the film ribbon mode (Figure 9).

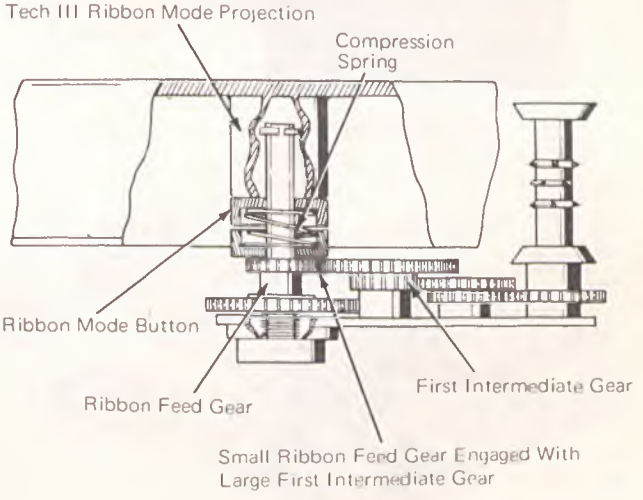


Figure 9 – IBM Tech III Ribbon Mode

The ribbon must be kept slightly taut throughout the ribbon path for proper feed and tracking. This is accomplished by the ribbon shock wire detenting the ribbon supply spool. The ribbon supply spool is not allowed to rotate until the ribbon applies sufficient tension on the shock wire to release the detent. As fresh ribbon is supplied, some tension is released from the shock wire allowing the detent to reseat in the teeth of the supply spool (Figure 10).

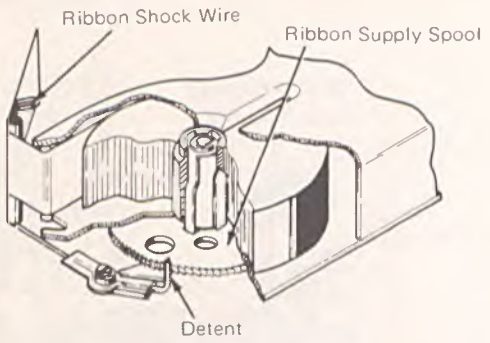


Figure 10 – Ribbon Tension System (Left Front View

RIBBON LIFT

Both types of ribbons used with this mechanism are slightly less than 11/16 inch wide. In order to get the maximum character yield, the mechanism uses three different ribbon lift positions. The ribbon lift mechanism includes a lift cam, lift cam follower assembly, lift control lever, lift arm and lift guide assemblies (Figure 11).

The lift cam follower pivots above and to the rear of the lift cam. A lift spread adjusting plate is mounted to the cam follower by two small screws. A lug on the adjusting plate contacts the head of the height adjusting screw in the lift arm. As the cam follower is pivoted by the lift cam it supplies vertical motion to the lift arm.

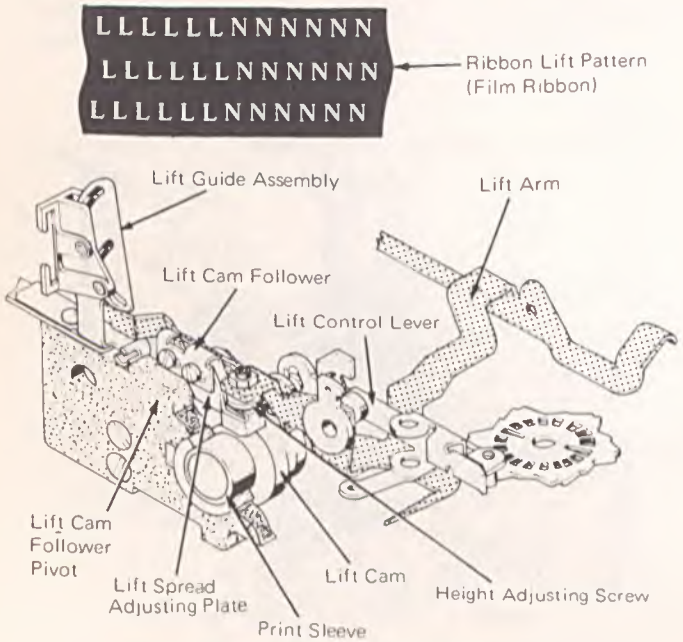


Figure 11 – Ribbon Lift Mechanism (Left Front View)

The ribbon is threaded through the ribbon lift guides which move vertically in curved slots in the lift guide brackets. The lift guides are connected to the lift arms by the lift guide links which are a part of the lift guide assemblies. The lift arms and lift guides are biased together by the lift guide bias springs to prevent erratic ribbon lift (Figure 12).

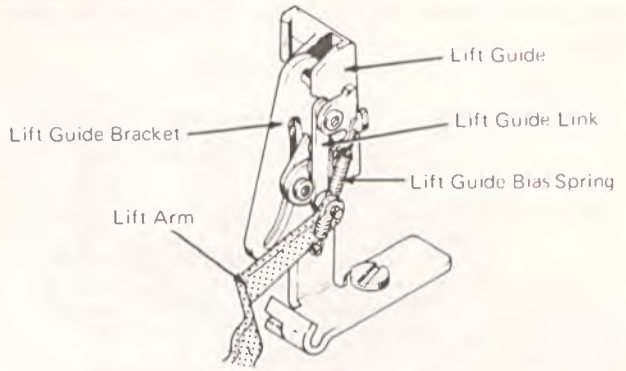


Figure 12 – Ribbon Lift Guide Assembly

The three ribbon lift positions are determined by the lift cam which has three different height lobes. The amount of motion that the lift cam follower receives depends on which of the three lobes is used (Figure 13)

The cam follower roller is free to slide on its shaft. Its lateral position is controlled by a yoke on the ribbon lift control lever. A stud on the forward end of the ribbon lift control lever is spring loaded against the camming surface of the ribbon feed and lift wheel.

The ribbon feed and lift wheel camming surface has three different heights. As the forward end of the ribbon lift control lever follows the feed and lift wheel camming surface, the yoke on the rear end of the ribbon lift control lever positions the ribbon lift cam follower roller over one of the three lobes of the ribbon lift cam. This changes the ribbon lift from high lift to medium lift to low lift and back to high lift again to repeat the cycle.

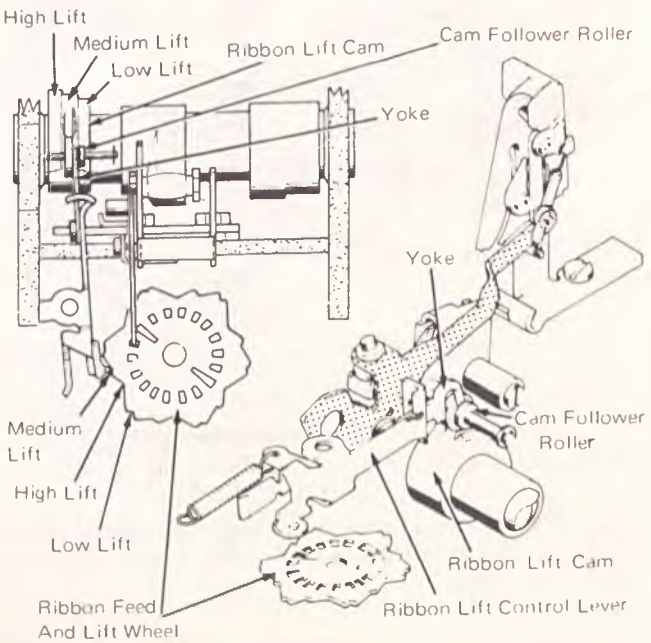


Figure 13 – Ribbon Lift Operation

In the IBM Tech III ribbon mode, the ribbon lift pattern is "wobbled" or varied slightly to ensure even print color. This is accomplished by the wobbler cam, the wobbler bellcrank and the wobbler eccentric (Figure 14). The left pivot point of the ribbon lift arm assembly is the wobbler eccentric. The wobbler eccentric has an upright lug that extends above the surface of the ribbon plate. Moving this lug front to rear causes the wobbler eccentric to rotate, moving the left lift arm pivot point up or down.

The wobbler bellcrank operated by the wobbler cam, pivots on a stud on the ribbon plate. The tip of the left wobbler bellcrank arm rests in a cutout in the upright lug of the wobbler eccentric. The wobbler eccentric spring loads both the wobbler eccentric lub and the wobbler bellcrank arm toward the front.

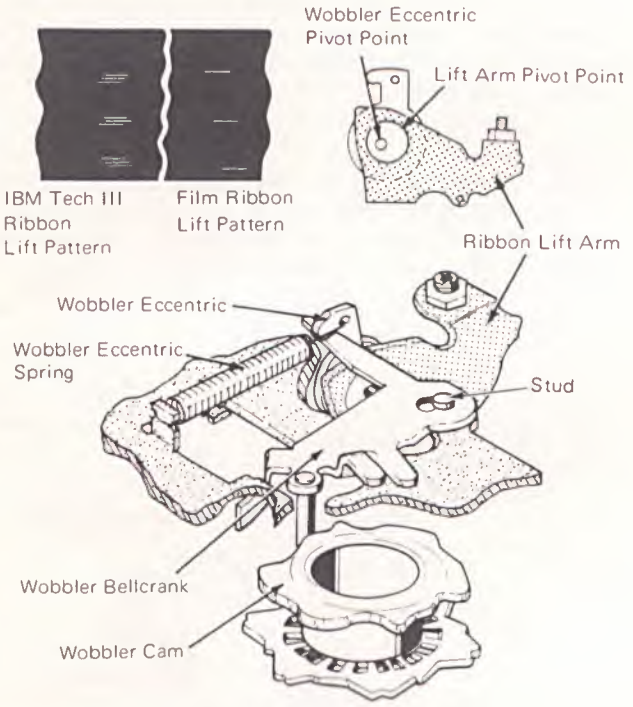


Figure 14 – Ribbon Lift Wobble Mechanism

The wobbler mechanism is active only in the IBM Tech III ribbon mode. The front of the wobbler bellcrank is free to move vertically. Its vertical position is controlled by two lugs on the wobbler bellcrank contacting the ribbon feed gear (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. When the wobbler bellcrank is in the operated position, a stud on the forward end of it follows the wobbler cam which is mounted directly above and turns with the ribbon feed and lift wheel. The motion from the wobbler cam rotates the wobbler bellcrank which operates the wobbler eccentric causing the desired variation in the ribbon lift pattern.

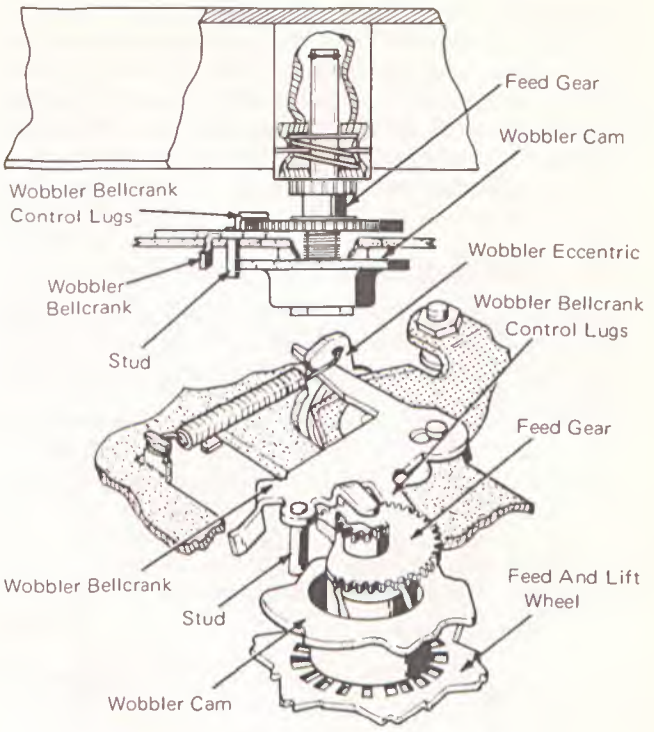


Figure 15 – IBM Tech III Ribbon Mode – Wobbler Active

When the mechanism is in the film ribbon mode, the feed gear is up (Figure 16). This allows a lug on the wobbler bellcrank to be latched against the ribbon plate causing the bellcrank to be inactive.

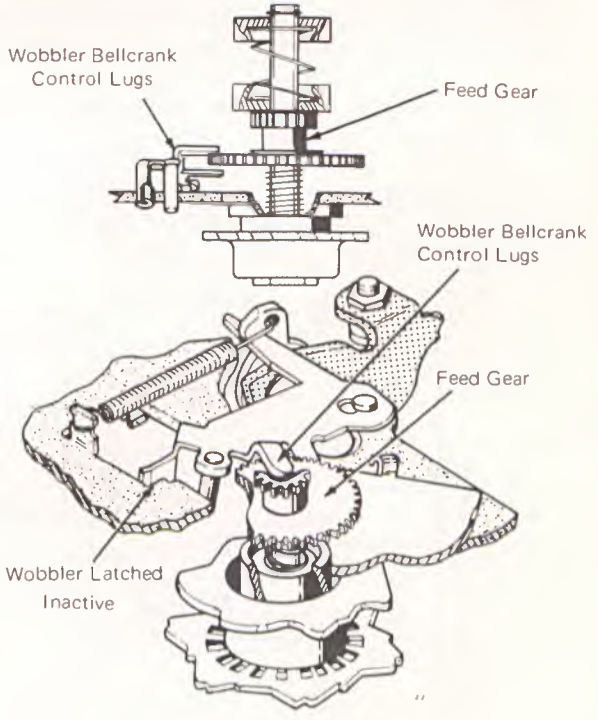


Figure 16 – Film Ribbon Mode – Wobbler Inactive

STENCIL MODE

When the I/O is used for typing stencils, the ribbon feed and lift operations must be locked out (Figure 17). This is achieved by moving the stencil lever to the stencil position. The lever will latch in the stencil position and is released by pushing the release button. A lug on the stencil lever contacts an extension on the front of the lift control lever moving the rear of the lift control lever to the right. This moves the lift cam follower roller completely off the lift cam, inhibiting ribbon lift.

When the lift control lever is in the stencil position, a feed lockout lug on it moves behind the feed pawl mounting stud. This prevents rearward movement of the feed pawl inhibiting ribbon feed.

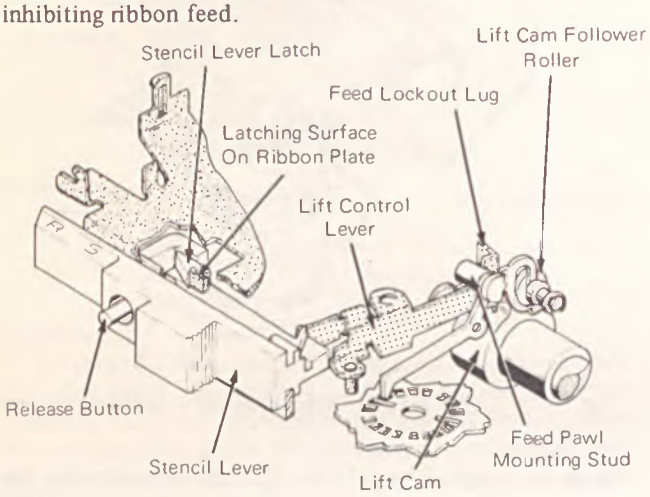


Figure 17 – Stencil Operation

RIBBON INHIBITOR

The purpose of the ribbon inhibitor is to prevent the ribbon from feeding during a no-print operation e.g. spacebar.

The ribbon inhibitor is the upper part of the velocity restore cam (Figure 18).

During a no-print operation, the arm is rotated into position to prevent the ribbon feed cam follower from following the ribbon feed cam.

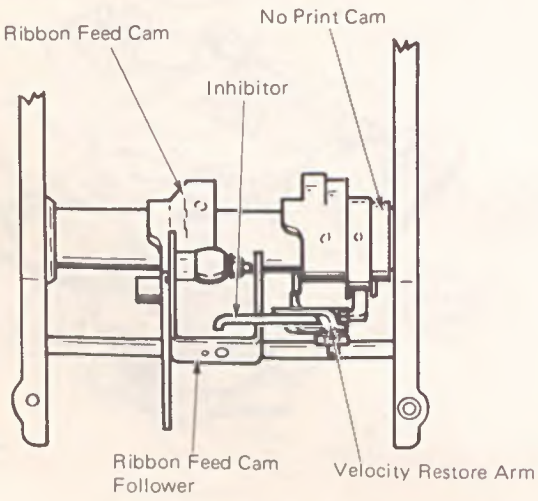


Figure 18 – Ribbon Inhibitor

RIBBON LOAD

When the ribbon needs to be changed the load lever is moved to the left to the load position. An inclined surface on the underside of the load lever contacts a lug on the right front of the lift arm assembly. This cams the front of the lift arm down and raises the lift guides for easier ribbon installation (Figure 19).

During the loading of a ribbon, the operator must be prevented from turning the take-up core in the wrong direction. The take-up core interlock extends to the left from the right cartridge retaining spring. In the load position, the take-up core interlock engages the teeth on the take-up core preventing it from being rotated in a clockwise direction. In the normal operating position, the take-up core interlock is held away from the take-up core by a lug on the load lever.

The load lever latch will not allow the load lever to restore to the operate position until a cartridge is installed. This depresses the latch and allows the load lever to be restored to the operate position.

A stud and roller on the left side of the load lever contacts the right side of the swing arm. As the load lever rotates, it rotates the swing arm to the load position. The load lever detents on a flat surface on the swing arm.

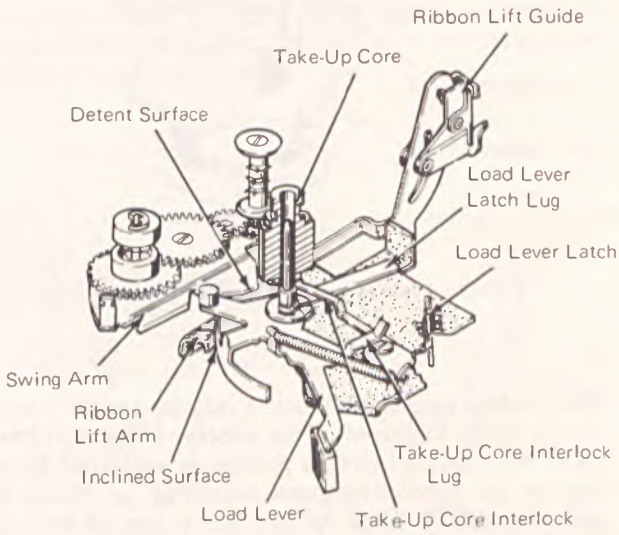


Figure 19 – Load Lever Operation

As the swing arm moves to the load position, it contacts the wobbler bellcrank, rotating it clockwise. This positions the wobbler bellcrank so that when it restores, it will reliably latch against the ribbon plate if in the film ribbon mode or easily move down into the operated position if in the IBM Tech III ribbon mode (Figure 20).

As the wobbler bellcrank rotates, it moves the upright 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 rides on a camming surface of the shock wire. As the left arm moves to the front, it cams the shock wire detent from the ribbon supply spool. This action is necessary to enable the operator to easily wind the leader onto the take-up core when installing a ribbon.

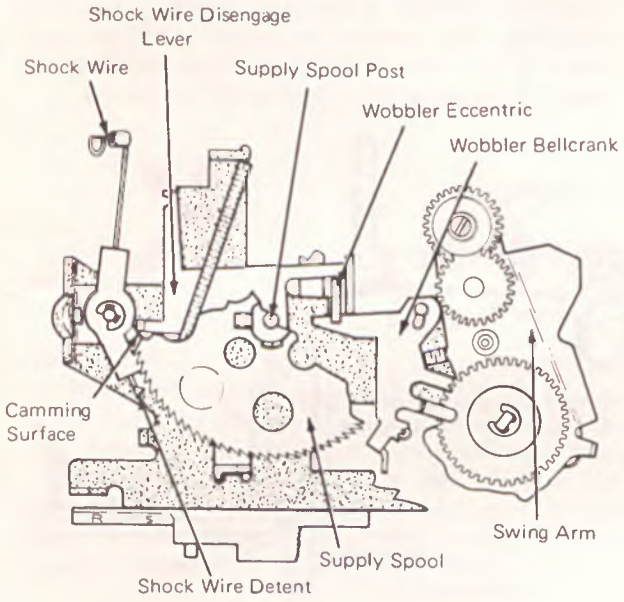


Figure 20 – Load Operation – Wobbler Release – Shock Wire Disengage (Top View)

END OF RIBBON MECHANISM

The end of ribbon feature stops playout prior to the end of the ribbon. When the machine stops, the operator has the option of changing the ribbon at that time or resuming playout one line at a time until the copy is complete or the end of the ribbon is reached. When the end of ribbon mechanism is active, the machine will stop each time a carrier return is read.

The end of ribbon mechanism incorporates a sensor which senses the amount of ribbon remaining on the supply spool inside the ribbon cartridge. The sensor operates through a slot in the bottom of the ribbon cartridge and is held down (inactive) by the unused ribbon on the supply spool. When the diameter of the ribbon on the supply spool falls below a certain point, the sensor will snap up into its active position. In this position, the lower extension of the sensor, which has a magnet attached to it, will rotate against a reed switch circuit board, causing the switch to close. With the switch closed, the machine will operate in the LINE mode and will stop whenever a carrier return code is read from the card.

The sensor must be held down while installing a new ribbon cartridge to prevent interference between the sensor and the ribbon cartridge. A lift tab is provided on the sensor for use by the operator for this purpose. The operator must hold the sensor down while installing the ribbon cartridge.

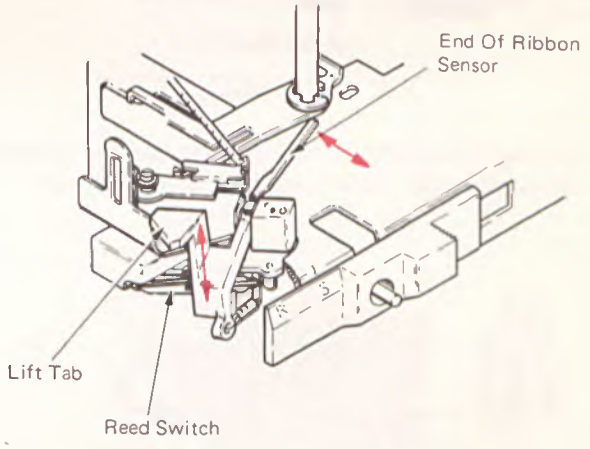


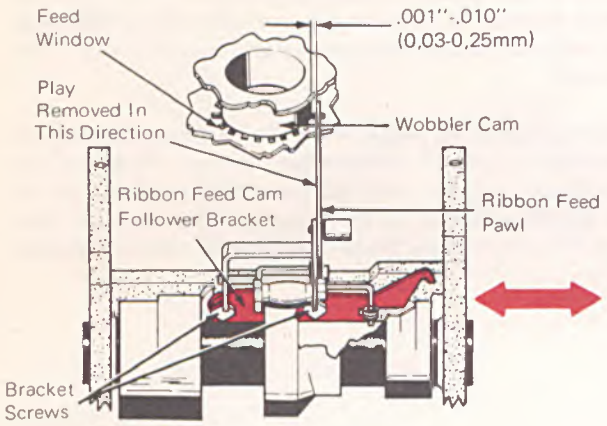
Figure 21 – End Of Ribbon Sensor (Left Side View)

SELECTIVE RIBBON ADJUSTMENTS

1. *Ribbon Feed Cam Follower Bracket* – Adjust the ribbon feed cam follower bracket left or right so the ribbon feed pawl is .001"-.010" from the wobbler cam at the closest point, with the play in the ribbon feed pawl held away from the wobbler cam.

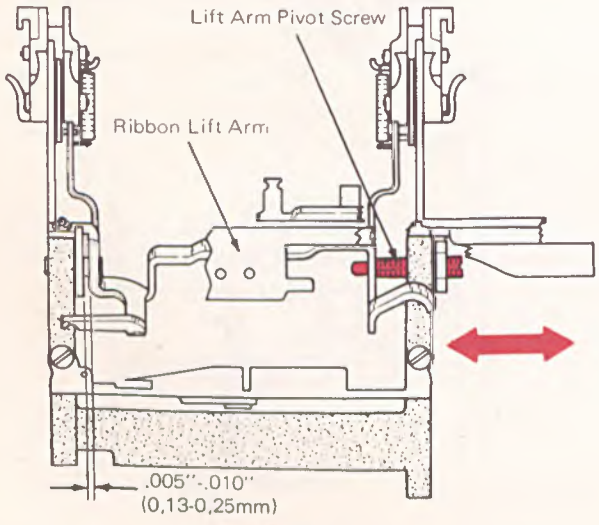
   This adjustment will ensure that the feed pawl will not bind against the wobbler cam and will not move beyond the outside limits of the feed window.

   The bracket screws can be made accessible from the top by removing the ribbon plate and feed cam follower assembly or from underneath by removing one of the cable anchor bracket screws and pivoting the cable anchor out of the way.



(Rear View)

2. *Ribbon Lift Arm* – Adjust the right hand lift arm pivot screw for .005"-.010" end play of the lift arm.



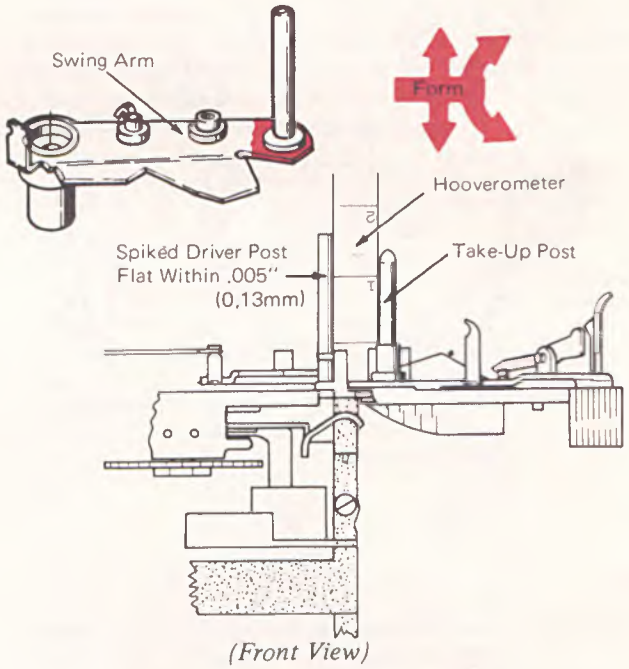
(Top View)

3. *Spiked Driver Post* – The spiked driver post must be parallel to the take-up post within .005". This must be checked in two ways, with the swing arm spring connected.

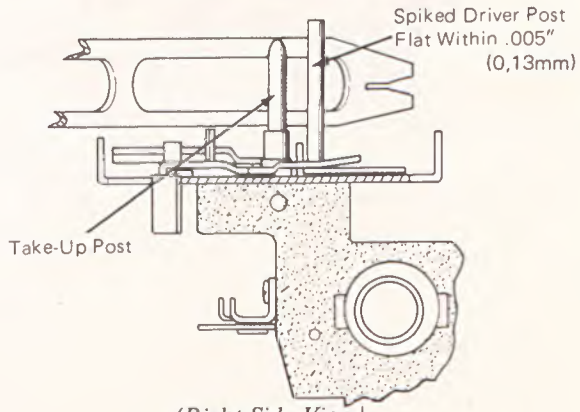
   a. Hold the Hooverometer edge flat against the take-up post. Allow the swing arm to close until the spiked driver post contacts the other edge of the Hooverometer. The spiked driver post should be flat to the Hooverometer edge within .005".

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

   Form the free end of the swing arm to obtain these conditions. The symptom of an out of parallel condition will be a bind within the cartridge caused by the used ribbon coning. This could cause feed failures.

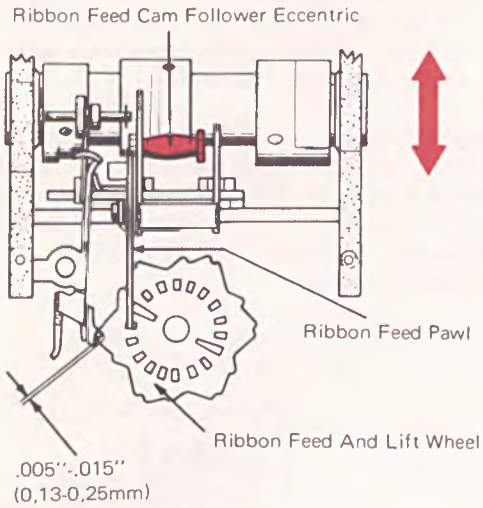


(Front View)



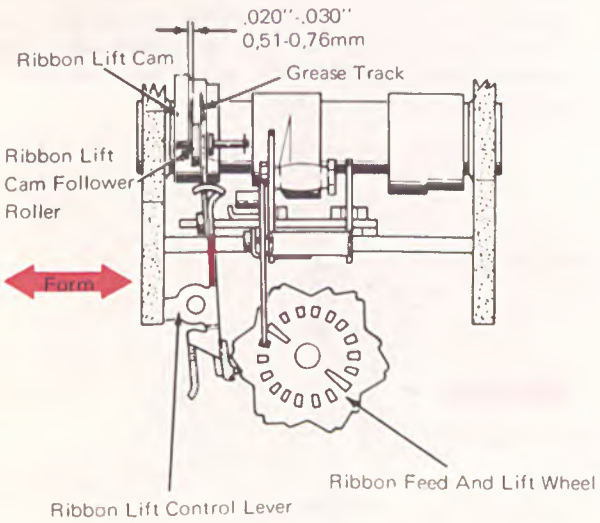
(Right Side View)

4. *Ribbon Feed Cam Follower Eccentric* – Adjust the ribbon feed cam follower eccentric to cause the ribbon feed pawl to drive the ribbon feed and lift wheel .005"-.015" past the detented position on a high lobe of the ribbon feed and lift wheel camming surface. Keep the eccentric in the lower front half of its orbit.



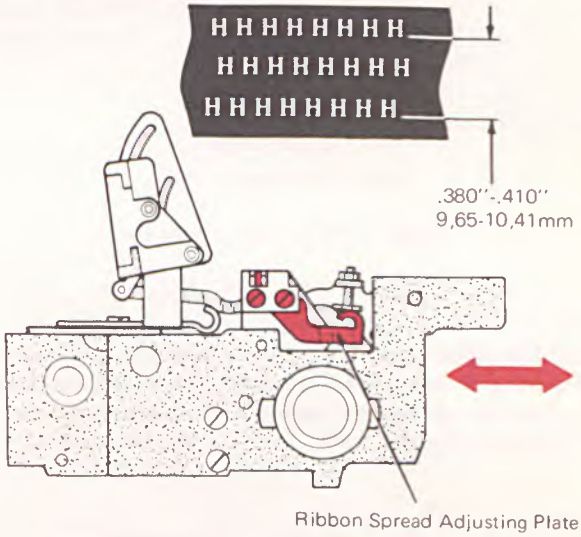
(Top View)

5. *Ribbon Lift Control Lever* – With the ribbon feed and lift wheel detented in the medium lift position (middle lobe). Form the ribbon lift control lever to position the left edge of the ribbon lift cam follower roller .020"-.030" from the edge of the high lift lobe. This may also be observed dynamically by putting fresh grease on the ribbon lift cam and observing the roller track in the grease on the medium lift lobe.



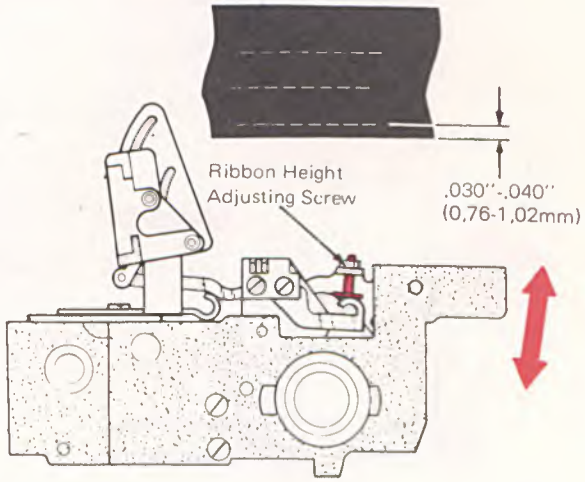
(Top View)

6. *Ribbon Spread Adjusting Plate* – In the film ribbon mode, adjust the ribbon spread adjusting plate front to rear to obtain .380"-.410" from the bottom of a high lift character to the bottom of a low lift character. This may be measured with the aid of the 6 inch steel rule or the Hooverometer handle which is .375" wide. The ribbon spread adjusting plate must be biased in a clockwise direction as viewed from the left side of the carrier when tightening the binding screws. This is easily accomplished by tightening the screws with the machine half cycled. This takes out the play in the mounting holes in the direction of the lifting force and ensures that the adjustment does not change. Ribbon height must be checked after making this adjustment.



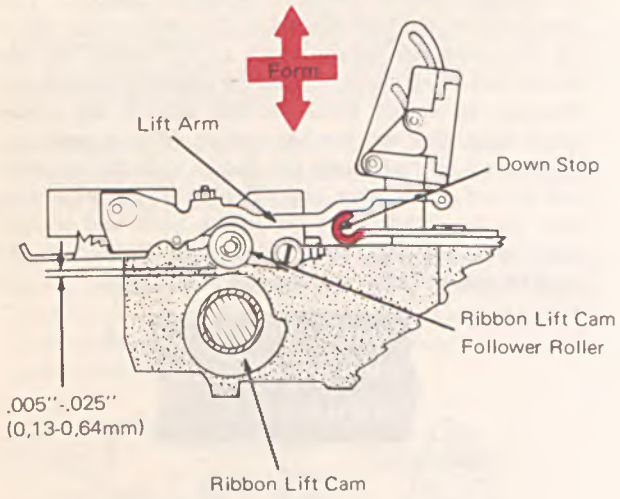
(Left Side View)

7. *Ribbon Height* – In the film ribbon mode, adjust the ribbon height adjusting screw so the bottom edge of the underscore clears the bottom of the ribbon by .030"-.040". Ribbon spread must be checked after making this adjustment.



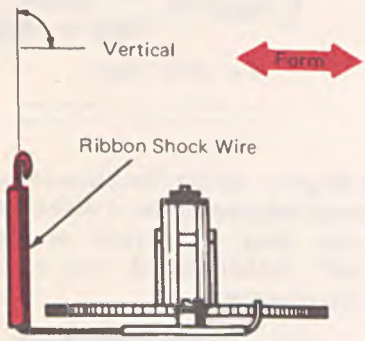
(Left Side View)

8. *Ribbon Lift Arm Lower Stop* – Form the left ribbon lift arm down stop so the ribbon lift cam follower roller clears the ribbon lift cam by .005"- 025" at rest. This ensures free left to right movement of the roller.

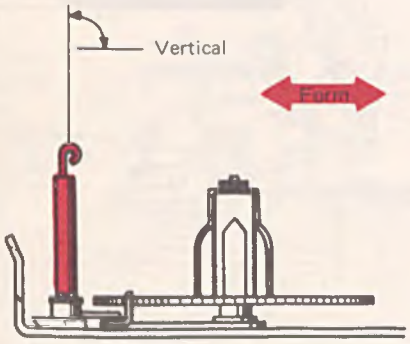


(Right Side Cut-Away View)

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



(Left Side View)

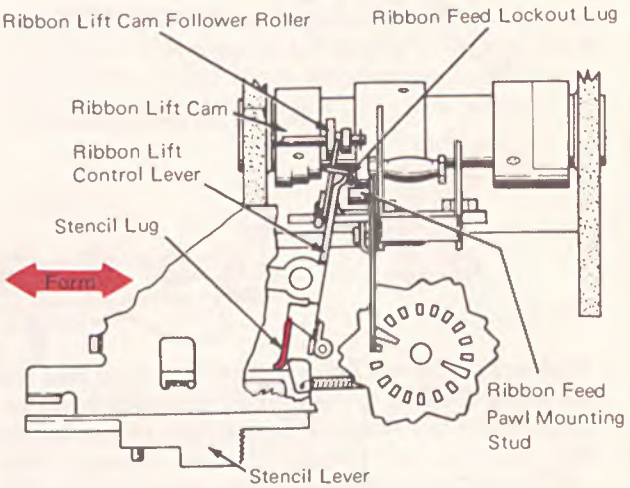


(Front View)

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.

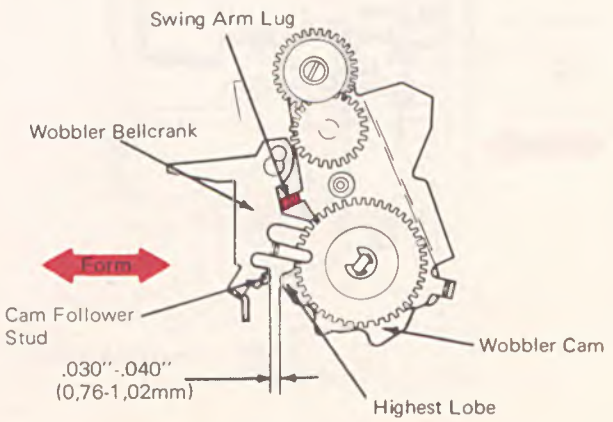
a. The ribbon feed lockout lug must engage the ribbon feed pawl mounting stud by approximately the thickness of the lockout lug.
b. The ribbon lift cam follower roller must be moved to the right, completely off the ribbon lift cam, but still have some clearance between the roller and the C-clip at the end of its shaft.

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



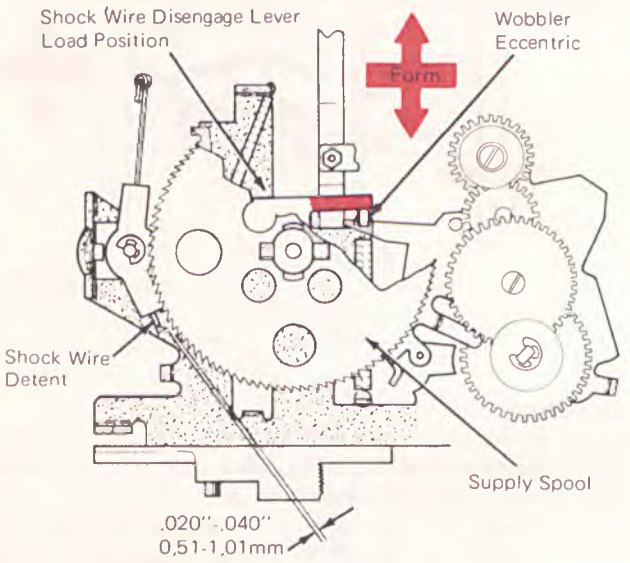
(Top View)

11. *Swing Arm Lug* – Form the lug on the swing arm that contacts the wobbler bellcrank so the cam follower stud on the wobbler bellcrank clears the highest lobe of the wobbler cam by .030"-.040" when the load lever is detented in the load position.



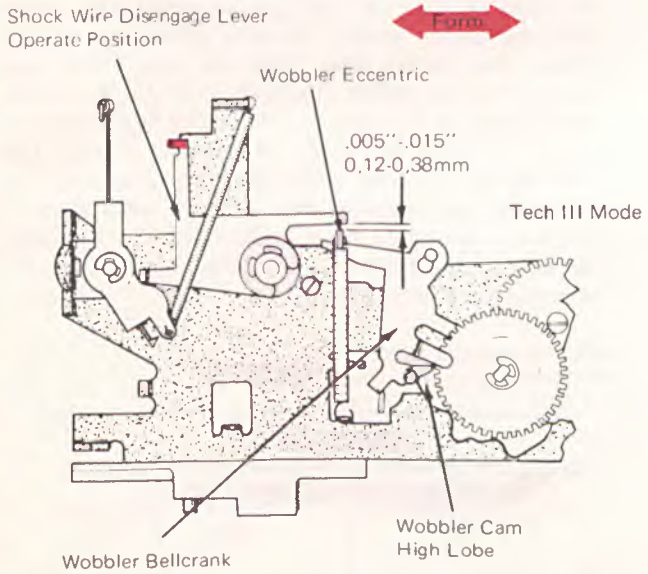
Tech III Ribbon Mode (Top View)

12. *Shock Wire Disengage Lever (Load Position)* – With the load lever in the load position, form the right hand arm on the shock wire disengage lever so the shock wire detent clears the ribbon supply spool by .020"-.040". Ensure that the wobbler eccentric cannot get under the arm. If necessary, form the arm down.



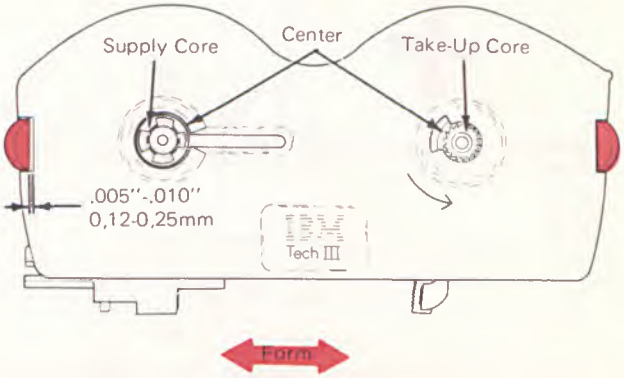
(Top View)

13. *Shock Wire Disengage Lever (Operate Position)* – With the wobbler bellcrank on the high point of the wobbler cam and in the IBM Tech III ribbon mode, form the shock wire disengage lever rest position lug so the shock wire disengage lever arm clears the wobbler eccentric by .005"-.015".



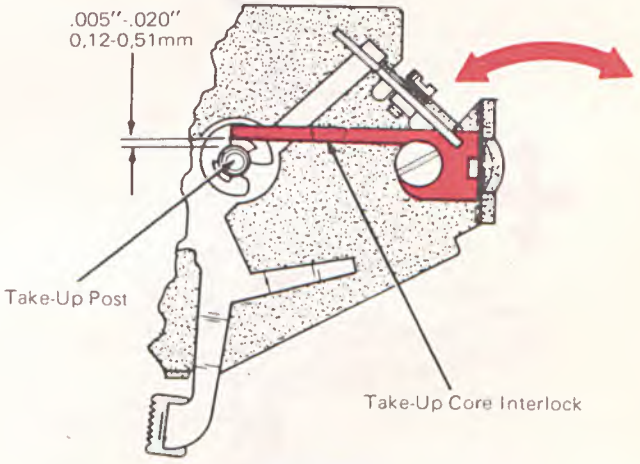
(Top View)

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"-.010" end play of the cartridge.

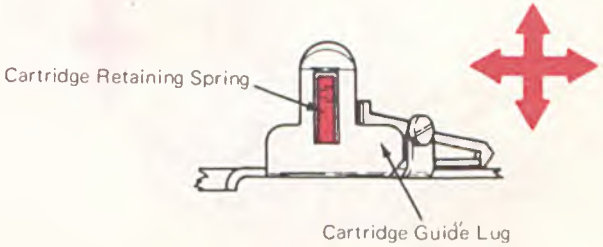


(Top View)

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 positively hold the IBM Tech III ribbon cartridge down against the ribbon feed plate. Refine the right spring rotationally so the take-up core interlock clears the middle surface of the take-up post by .005"-.020".

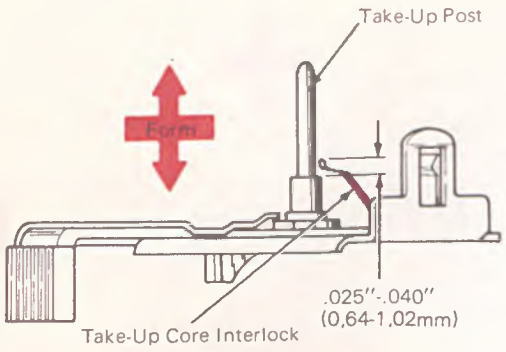


(Top View)



(Right Side View)

16. *Take-up Core Interlock* – Form the take-up core interlock so that in the load position the tip of the interlock is .025"-.040" above the top edge of the middle surface on the take-up post.

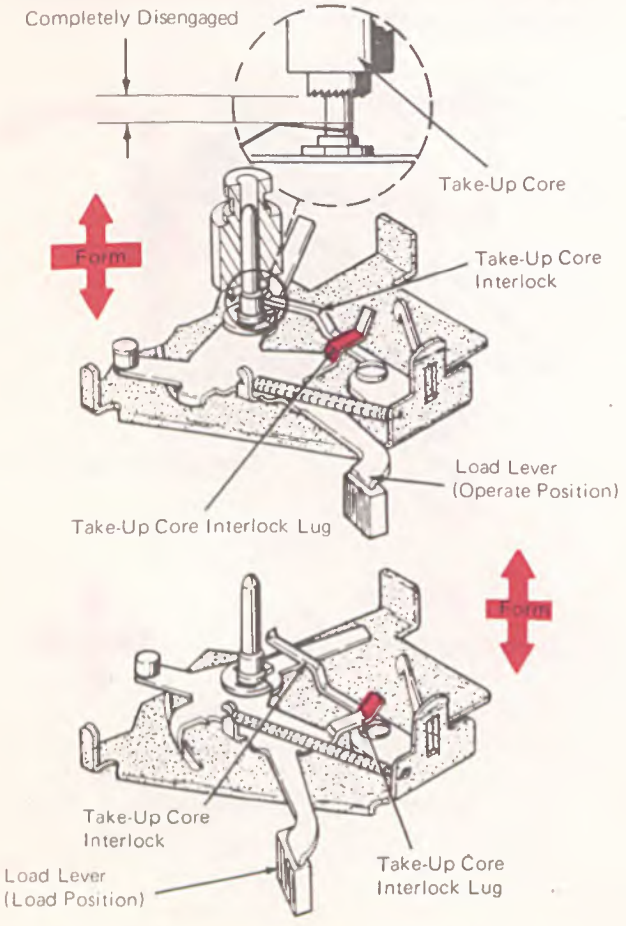


(Right Side View)

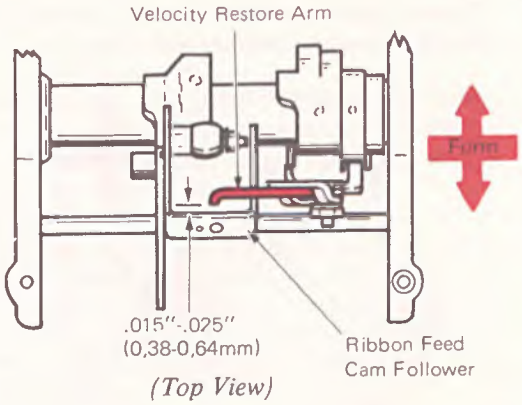
17. *Load Lever* – Form the take-up core interlock lug on the load lever to meet two conditions.

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

b. When going from load to operate, the tip of the lug must clear the top surface of the take-up core interlock by a sufficient amount to reliably depress it.



18. *Ribbon Inhibitor* – Form the velocity restore arm so there is .015"-.025" between the arm and the ribbon feed cam follower.



(Top View)

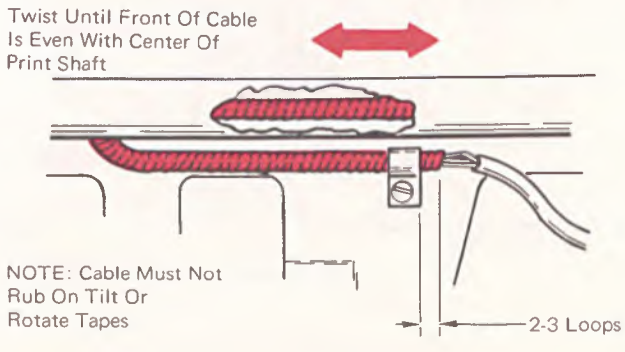
19. *Cable Sheath* –

a. Position the cable sheath left to right under the rear clamp so that the cable sheath extends 2 to 3 loops beyond the RH edge of the clamp.

b. Loosen the rear cable clamp slightly and twist the cable sheath enough so that, with the carrier at the extreme RH end of the writing line, the rear of the cable sheath does not touch the rotate or tilt tape and the front of the cable sheath is approximately even with the print shaft.

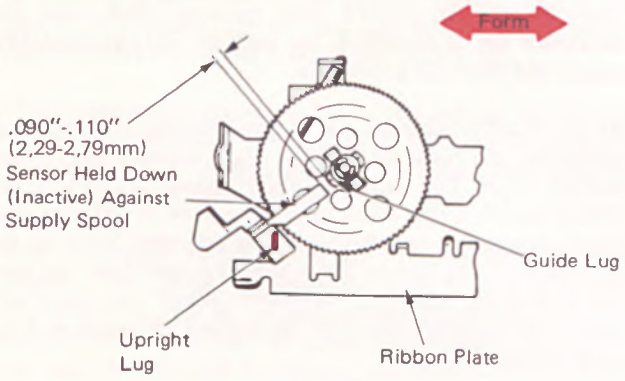
This adjustment prevents interference between the cable sheath and the carrier.

One method for obtaining this adjustment is to remove the RH dust shield, tab carrier to the RH side of the machine and loosen the rear cable clamp slightly. Grasp the cable sheath at a point approximately four inches from the carrier. Rotate the cable sheath between the fingers, top to the front. Hold the cable sheath and tighten the rear clamp. (Maintain 2 to 3 loops of the cable sheath to the right of the clamp.) Depress carrier return and then tab to the extreme right again. The cable sheath must not touch the tapes in the rear and should be approximately even with the print shaft in the front. Introduce more or less twist to the cable sheath until these conditions are met following the carrier return and long tab operation.



20. *End Of Ribbon Sensor* – Form the upright lug on the ribbon plate left to right for .090"-.110" between the tip of the sensor and a guide lug on the ribbon supply spool center post.

NOTE: It may be necessary to form the detent end of the ribbon shock wire to the rear to prevent interference between the shock wire and the sensor.



(Top View)

CORRECTING RIBBON OPERATIONAL THEORY

The purpose of the correcting ribbon mechanism is to enable the operator to produce an error free original copy or an error free draft copy while typing the text into memory. The operator need not play out another copy for proofreading. This reduces turnaround time when a document is proofread before the final copy is played out.

A correcting tape supply spool is mounted at the left rear corner of the ribbon plate and a tape take-up spool is mounted at the right rear corner of the ribbon plate (Figure 1). The correcting tape is guided from the tape supply spool on the left, across the front of the cardholder, to the tape take-up spool on the right. A correcting magnet assembly is mounted in the left side of the machine which is activated by the electronics to operate a torque bar which in turn operates the correcting mechanism.

Two error correct procedures can be used depending on the position of the typewriter button. To correct a typographical error with the typewriter button down, the operator depresses a "coded" backspace. The machine will backspace and the electronics will be set up for the correcting sequence. The operator then depresses the incorrect character. The machine will activate the correcting mechanism and the dead key mechanism to inhibit escapement, then print the character to correct the copy.

NOTE: Dead Key Operational Theory is covered in the Escapement/Backspace Section of this Manual.

To correct a typographical error with the typewriter button up, the operator depresses the backspace key. The machine will backspace the printer and the memory. The machine will read the incorrect character from memory, activate the correcting ribbon and dead key mechanisms and automatically re-type the character to correct the copy. The character will be deleted from memory. Each time the backspace key is depressed, the machine will automatically initiate the correcting sequence.

As the incorrect character is re-typed during the correcting operation, the correcting tape is lifted between the ribbon and the paper. The impact of the typehead causes the correcting tape to either cover up the character or lift it off the paper, depending on which supplies are used. Since no escapement occurs during the correcting operation, the carrier is still positioned at the point where the error was made. The operator can type the correct character and resume normal typing.

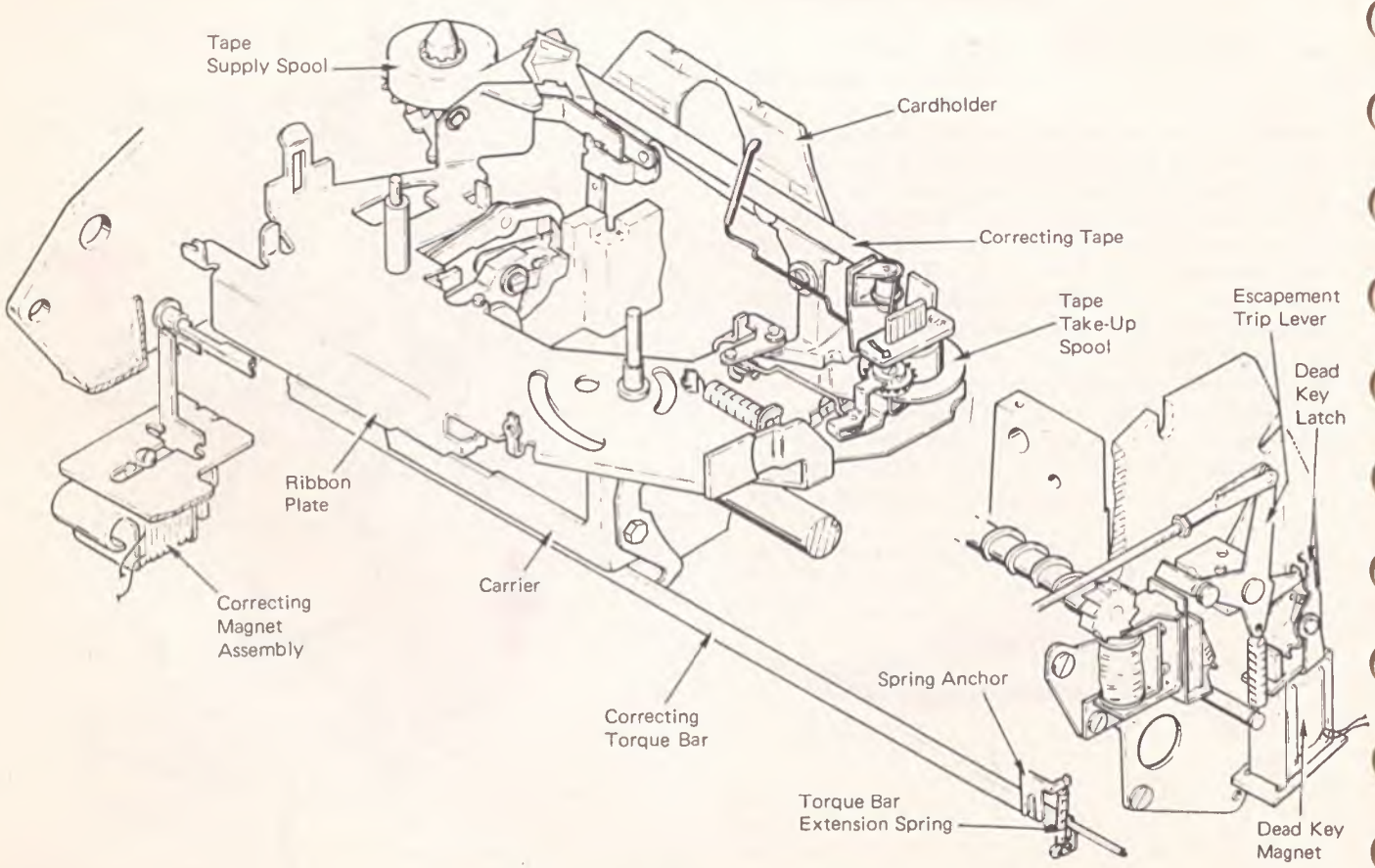


Figure 1 – Correcting Ribbon Mechanism

Using the IBM Tech III Cover-Up Tape (blue) with the IBM Correctable Film Ribbon (yellow) or visa-versa is not recommended.

Each of the correcting tapes is designed to be used with a specific IBM ribbon. The IBM Tech III Cover-Up Tape is used with the IBM Tech III Ribbon (both are color coded blue). The Lift-Off Tape is used with the IBM Correctable Film Ribbon (both are color coded yellow).

CORRECTING TORQUE BAR OPERATION

The correcting torque bar extends across the machine just to the rear of the front carrier support (Figure 2). Its purpose is to activiate tape lift and tape feed on the carrier no matter where the carrier is along the writing line.

The torque bar is spring loaded to rest against the correcting magnet armature. An adjustable back-stop is mounted onto the bottom of the carrier to provide a back-up for the torque bar at the carrier position.

The correcting torque bar is activated by the correcting magnet. The correcting magnet is mounted on the left side of the printer, just to the rear of the margin bell. When the magnet picks, the bottom of the torque bar is rotated to the rear. Rotation of the torque bar activates tape lift and tape feed.

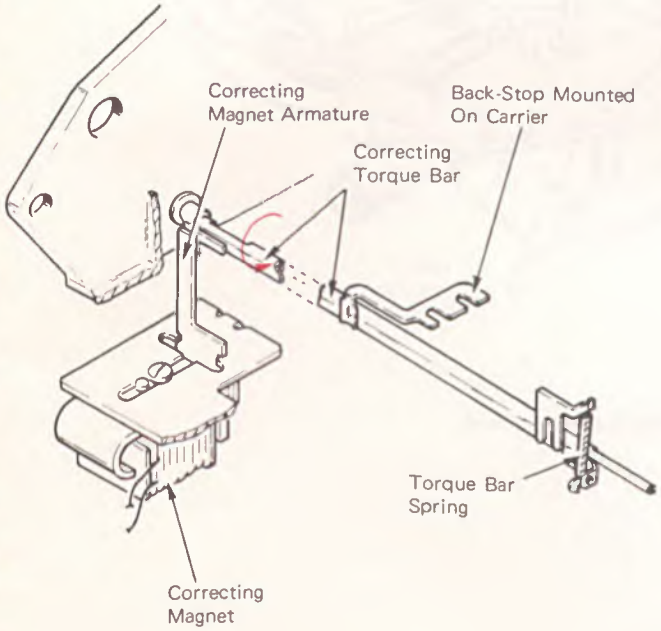
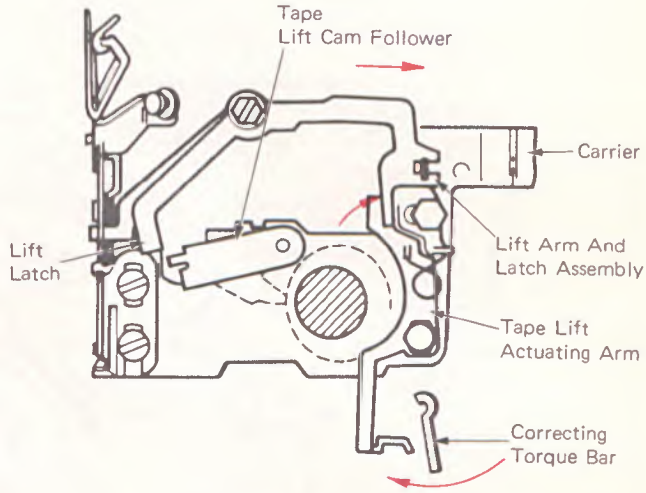


Figure 2 – Correcting Torque Bar Operation

CORRECTING TAPE LIFT

The tape lift mechanism is located on the left side of the carrier (Figure 3). As the correcting torque bar is rotated to its actuated position, it pivots the tape lift actuating arm top to front which in turn slides the lift arm and latch assembly forward. This positions the lift latch above the tape lift cam follower.



(Left Side View)

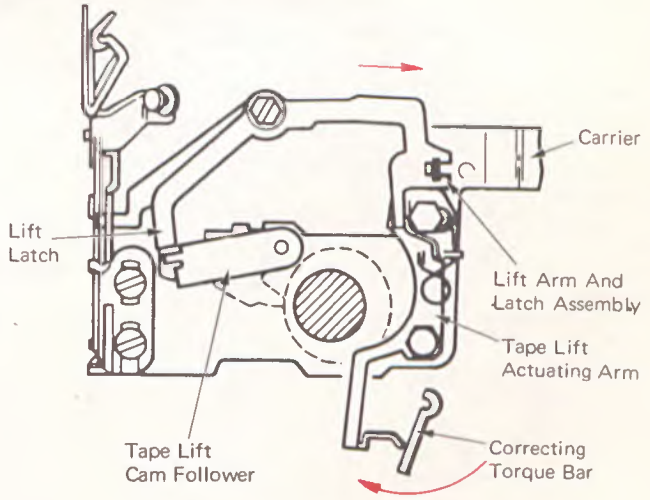


Figure 3 – Correcting Tape Lift (Left Side View)

When the print sleeve rotates, the tape lift cam raises the tape lift cam follower which in turn raises the lift arm and latch assembly (Figure 4). When the lift arm and latch assembly is raised the rear of the lift arm will raise the tape lift assembly. An arm on the tape lift assembly engages the tape supply cradle fork on the tape supply cradle assembly. As the tape lift assembly raises, the cradle assembly is tilted to maintain tape alignment and prevent folding of the correcting tape.

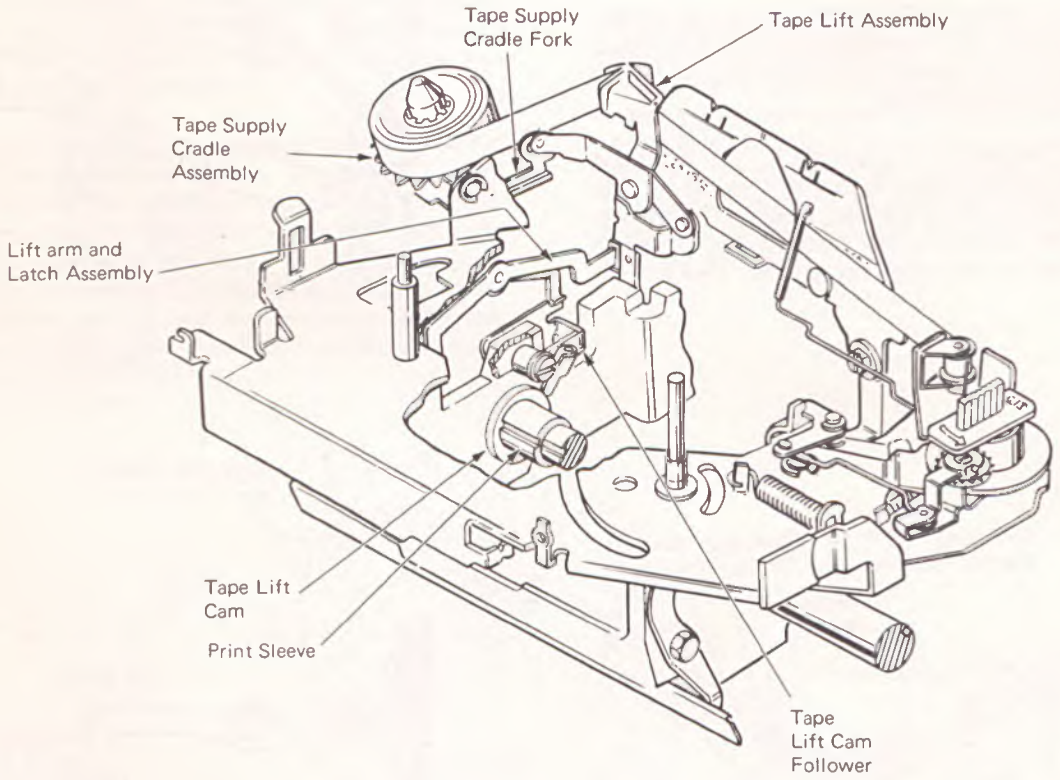


Figure 4 – Tape Lift Operation

CORRECTING TAPE FEED

The correcting tape feed mechanism is located on the right side of the carrier (Figure 5). It is designed so that the correcting tape is fed in two increments. One-third is fed before print and two-thirds is fed after print. This is accomplished by a tape feed cam with two high points, the second high point supplying twice as much motion as the first.

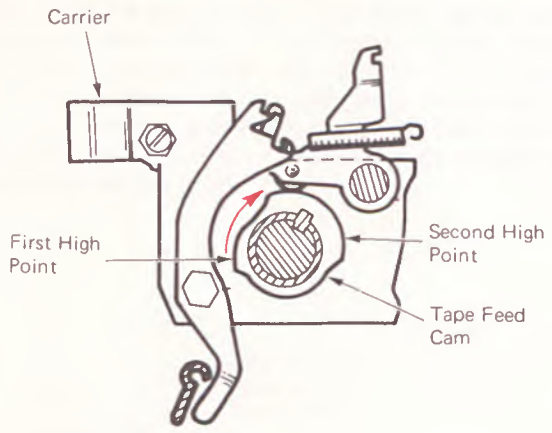
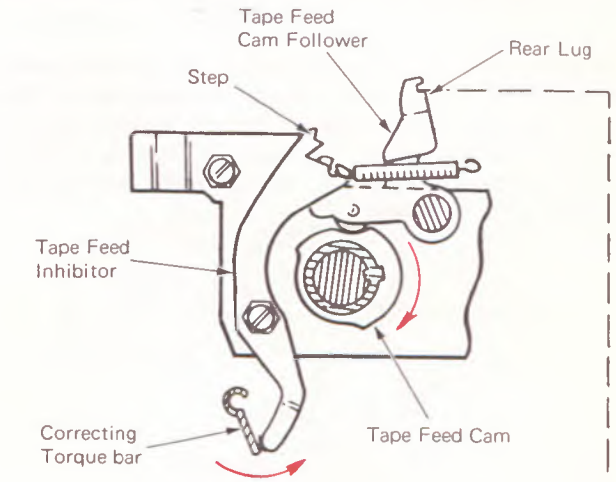
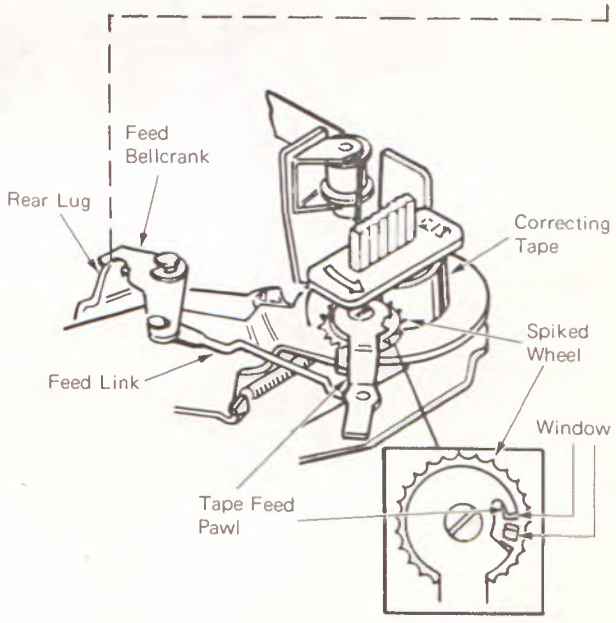


Figure 5 – Correcting Tape Feed (Right Side View)

The feed mechanism is actuated by the operation of the correcting torque bar. The torque bar rotates the step on the tape feed inhibitor out of the path of the tape feed cam follower (Figure 6). As a print operation occurs and the tape feed cam rotates, the tape feed cam follower is allowed to follow the contour of the cam toward its low dwell. The rear lug on the follower moves forward allowing the feed bellcrank and link to rotate the tape feed pawl counterclockwise, engaging a window in the spiked wheel.



(Right Side View)



(Top View)

Figure 6 – Tape Feed Inhibitor

The tape feed cam then rotates to its first high point. The cam follower rotates the tape feed pawl and spiked wheel clockwise for the first one-third of the tape feed (Figure 7). The feed cam then rotates to a low dwell position again. The follower is prevented from contacting the cam on its low dwell by the inhibitor. The inhibitor prevents placing the heavy cam follower spring load on the cam during print which occurs at this time. The cam then begins its rise to the second high point and the cam follower causes the correcting tape to be fed the remaining two-thirds of the tape feed increment. The spiked wheel rotates a total distance of one window for each correcting operation.

The spiked wheel which is mounted on the tape feed swing arm is heavily spring loaded towards the take-up spool. This causes the spikes on the wheel to dig into the used tape. As the spiked wheel rotates, it causes the take-up spool to rotate, pulling new tape into the correcting position and winding up the used tape.

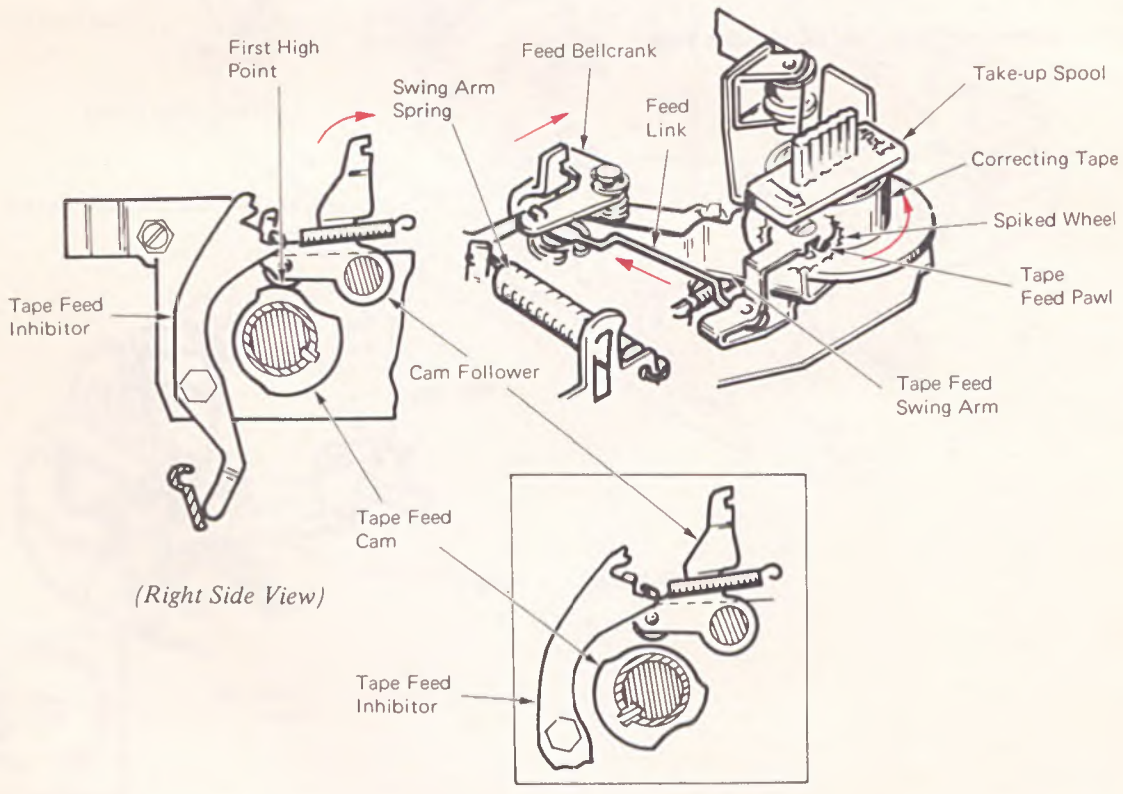
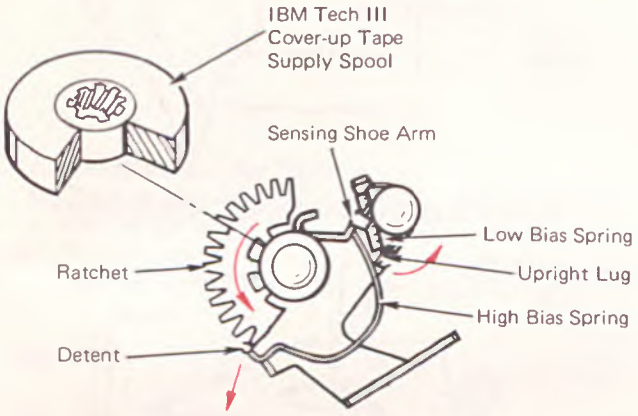


Figure 7 – Tape Feed Operating

TAPE BIAS SYSTEM

The correcting tape supply cradle assembly contains a bias system that performs three functions. First, the detent on the high bias spring prevents the supply spool from being rotated clockwise (Figure 8).

Second, it supplies a low bias for use with the Tech III Cover-Up Tape. This bias is produced by the low bias spring. As tape is being pulled off the supply spool and the tape supply spool ratchet turns counterclockwise, the detent on the high bias spring cams over a tooth on the ratchet. The other end of the high bias spring contacts the upright lug on the sensing shoe arm, pivoting the arm. The low bias spring connected to the upright lug on the sensing shoe arm is extended thus producing the low bias.

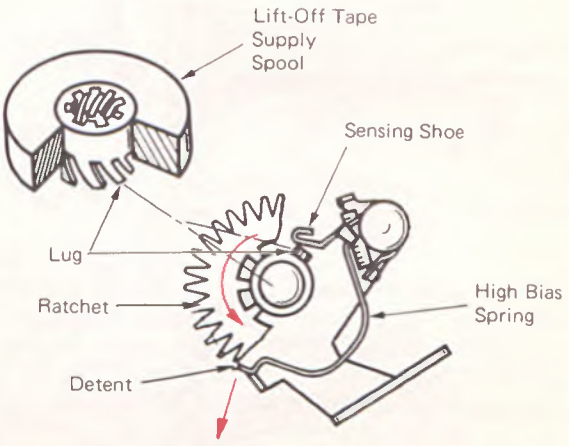


(IBM Tech III Cover-Up Tape)

Figure 8 – Low Bias Operation (Top View)

Finally, it supplies high bias for use with the Lift-Off Tape. As the detent on the high bias spring cams over a tooth on the ratchet, high bias is developed due to lugs on the bottom of the lift-off tape supply spool preventing the sensing shoe from rotating inward (Figure 9). This causes the high bias spring to flex, producing the high bias.

One lug on the bottom of the Lift-Off Tape supply spool is shorter than the rest. It is shorter to permit the spool to seat completely on the supply spool ratchet in the event that the sensing shoe is under a window in the ratchet while the operator is loading the tape.



(Lift-Off Tape)

Figure 9 – High Bias Operation (Top View)

CORRECTING TAPE LOAD

When the correcting tape needs to be changed, the tape load lever is moved to the right to the load position (Figure 10). The load lever performs three functions to facilitate installation and removal of the tape.

1. A guide roller mounted on the rear of the load lever pivots forward.

2. The separator wire is pivoted top to the front by means of a camming slot in the load lever.

3. The spiked wheel which is mounted on the tape feed swing arm is pivoted forward by a lug on the load lever.

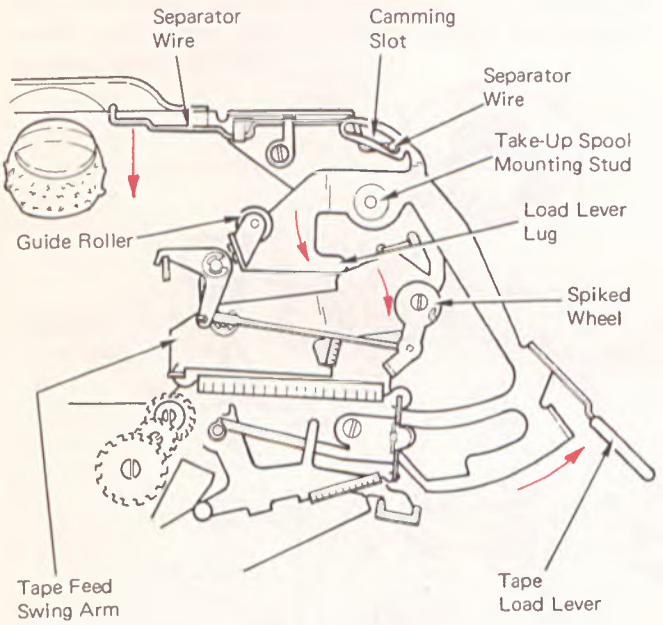
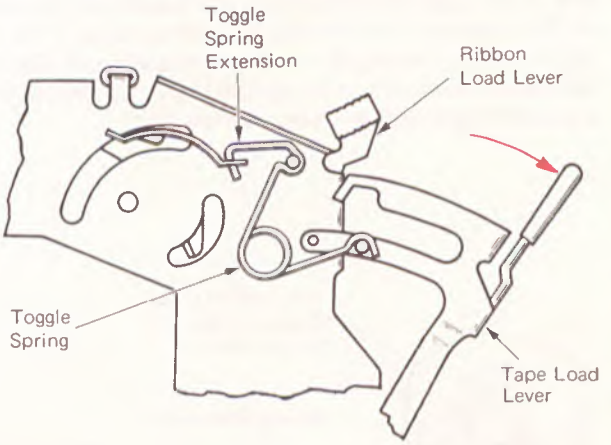


Figure 10 – Tape Load (Top View)

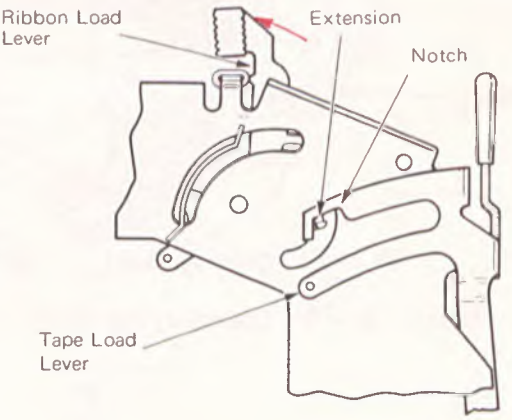
LOAD INTERLOCKS

A toggle spring (Figure 11) holds the tape load lever in either the load or type position. An extension on the toggle spring engages a hole in the ribbon load lever so it cannot be moved to the load position while the tape load lever is in the load position.

When the ribbon load lever is operated, an extension on the ribbon load lever enters a notch in the tape load lever to prevent operating the tape load lever to the load position.



Ribbon Load Lever Interlocked (Bottom View)



Tape Load Lever Interlocked (Bottom View)

Figure 11 – Load Interlocks

To prevent the operator from turning the take-up spool in the wrong direction when taking up the slack, a take-up spool detent engages a ratchet on the bottom of the take-up spool (Figure 12).

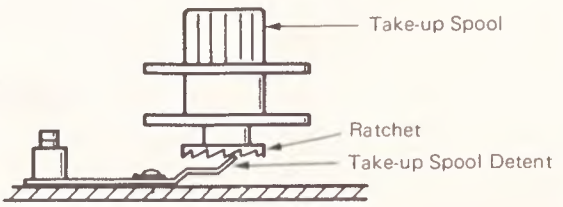
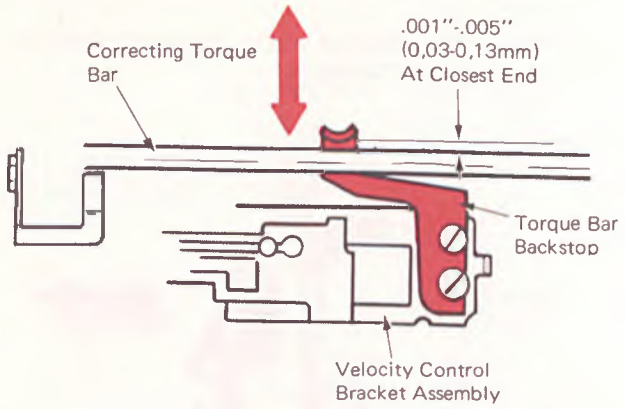


Figure 12 – Take-Up Spool Detent (Front View)

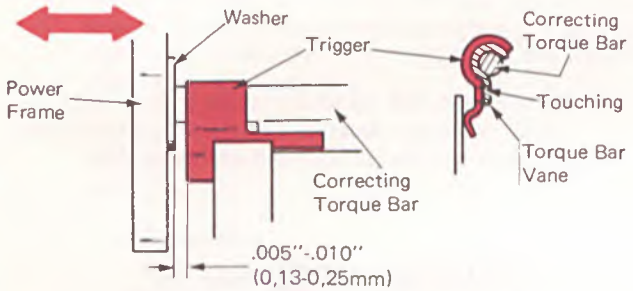
CORRECTING RIBBON ADJUSTMENTS

1. *Correcting Torque Bar Back-Stop* – Adjust the torque bar back-stop for .001"-.005" clearance between the torque bar and the back-stop at the closest end.



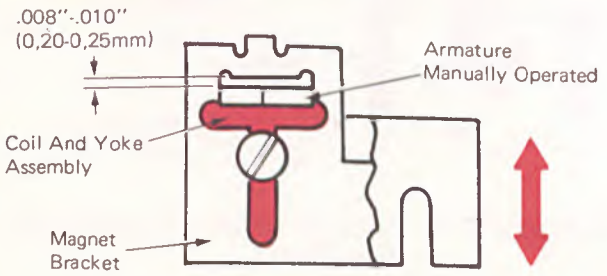
(Bottom View)

2. *Correcting Torque Bar Trigger* –
   a. Position the trigger left or right for .005"-.010" end play of the torque bar.
   b. Position the clip rotationally so the tab on the trigger rests against the front of the torque bar vane.



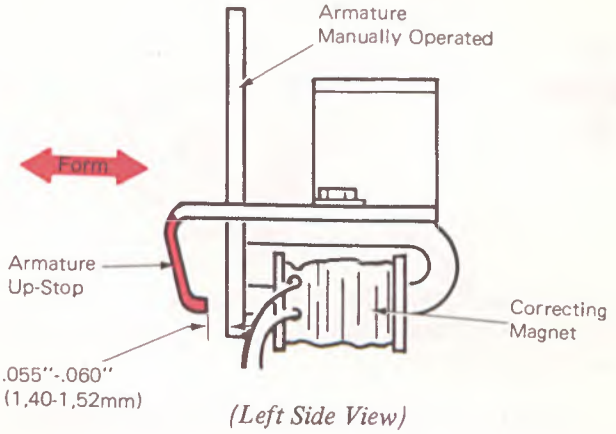
(Front View) *(Right Side View)*

3. *Correcting Magnet Pivot* – With the armature manually operated, adjust the coil and yoke assembly front to rear on the magnet bracket for .008"-.010" between the armature and magnet bracket.



(Top View)

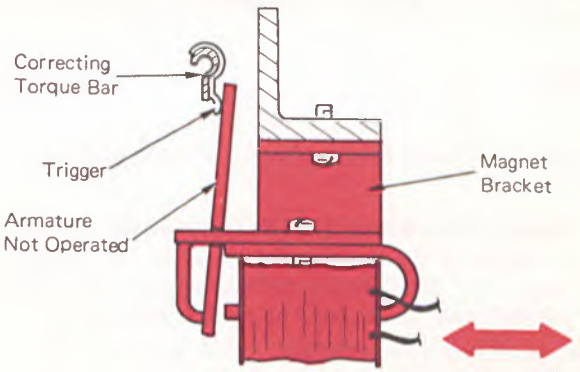
4. *Correcting Magnet Up-Stop* – With the magnet armature manually operated, form the up-stop for .055"-.060" clearance between the up-stop and the armature.



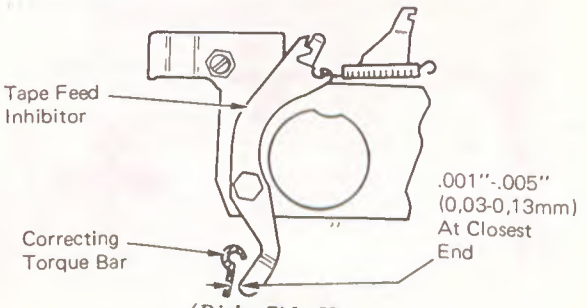
(Left Side View)

5. *Correcting Torque Bar Rest Position* – With the correcting magnet armature not operated and against the torque bar trigger, position the magnet bracket front to rear for .001"-.005" clearance between the correcting torque bar and the tape feed inhibitor at the closest end.

NOTE: Make certain the lift actuating arm does not interfere with this adjustment.

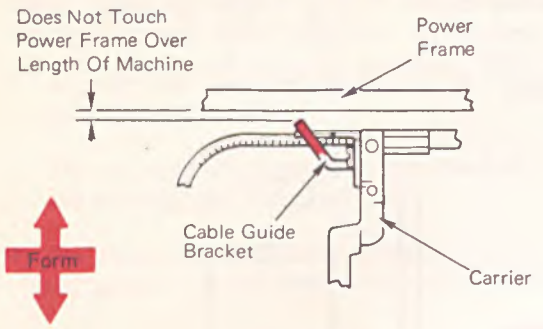


(Left Side View)



(Right Side View)

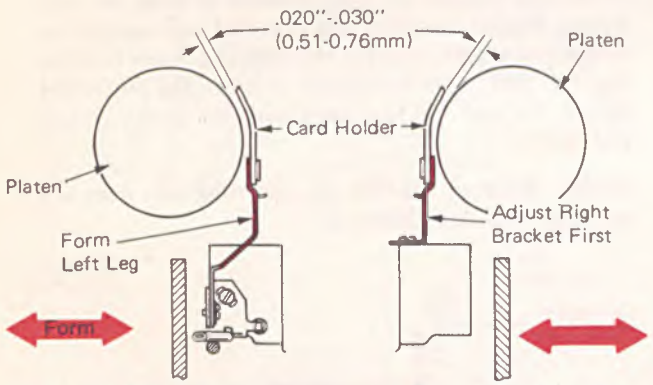
6. *Cable Guide Bracket* – Form the cable guide bracket as far to the rear as possible and still not touch the power frame over the entire length of the machine.



(Top View)

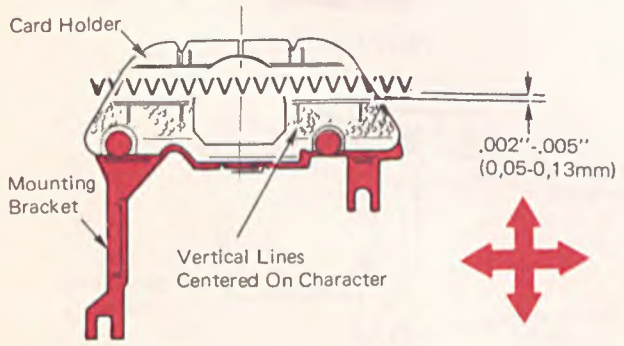
7. *Card Holder* – With the copy control lever forward, adjust the card holder mounting brackets to satisfy the following condition:

a. Front to rear so the card holder clears the platen by .020"-.030". To meet this condition, adjust the right bracket first and then form the left leg.



(Left Side View) Copy Control Lever Forward (Right Side View)

b. Position the mounting bracket left or right and up or down so the horizontal line on the card holder rests .002"-.005" below the writing line. The vertical lines must be centered on a printed character.

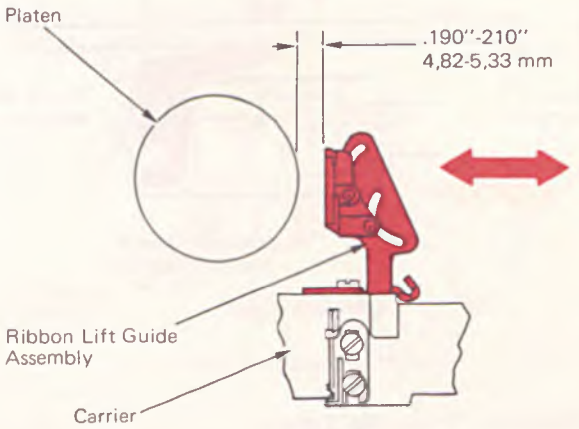


(Front View)

8. *Ribbon Lift Guide* – Adjust the left hand ribbon lift guide to satisfy the following conditions:

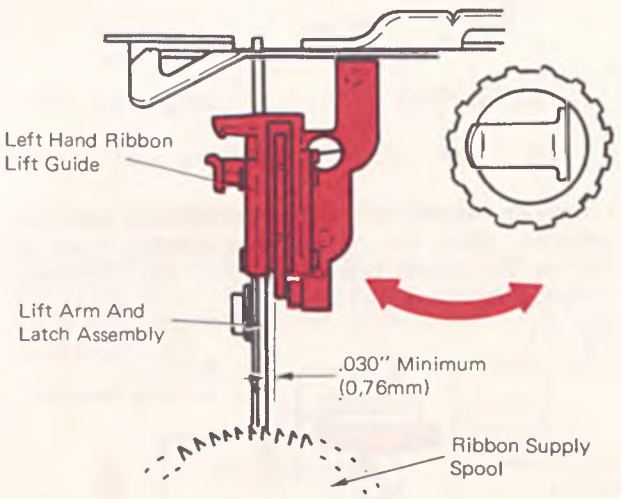
a. With the machine half-cycled and the ribbon in a center lift position, adjust the ribbon lift guide assembly front to rear for .190"-.210" clearance between the rear face of the guide and the platen.

NOTE: This clearance can be checked by using the six inch rule (P/N 450158).



(Left Side View) (Machine Half-Cycled. Ribbon In A Center Lift Position)

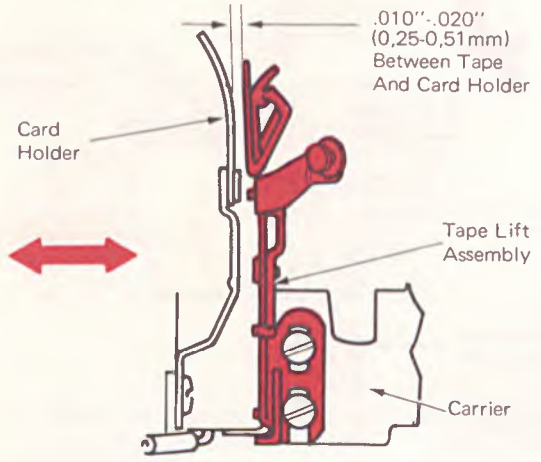
b. Position the left hand lift guide left to right for .030" minimum clearance between the front of the lift guide and the left arm and latch assembly.



(Top View)

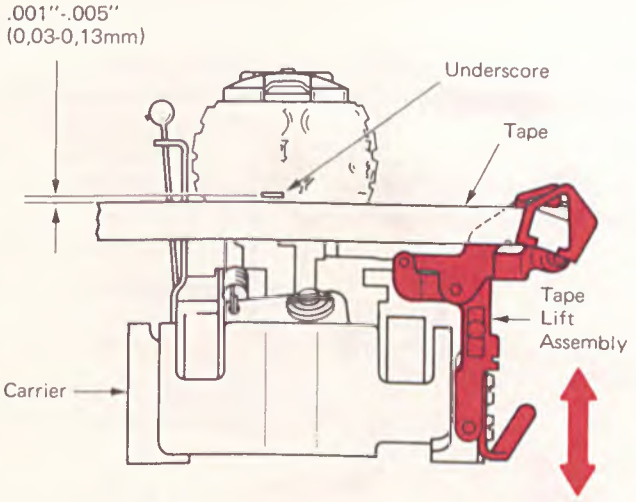
9. *Tape Lift Assembly* – Adjust the tape lift assembly to satisfy the following conditions:

a. With the tape supply cradle fork loose, adjust the tape lift assembly front to rear so the tape clears the face of the card holder by .010"-.020".



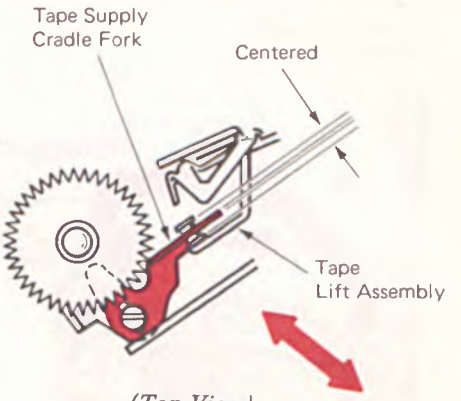
(Left Side View) (Tape Supply Cradle Fork Loose)

b. Adjust the tape lift assembly vertically so the bottom of the underscore clears the top of the tape by .001"-.005" with the tape at rest and the underscore in the print position.



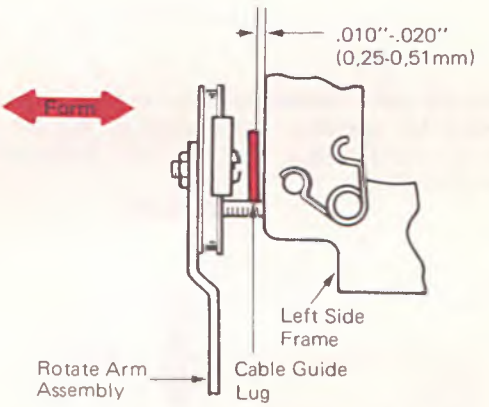
(Rear View) (Tape At Rest Underscore In Print Position)

10. *Tape Supply Cradle Fork* – Adjust the cradle fork so it centers in the groove of the stud mounted on the tape lift assembly.



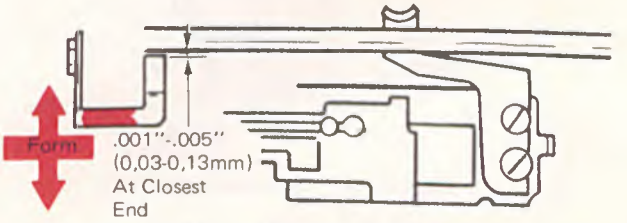
(Top View)

11. *Cable Guide Lug* – With the carrier at the extreme left margin, form the cable guide lug on the tape lift assembly front to rear for .010"-.020" clearance between the power frame and the guide lugs.



(Left Side View) (Carrier At Extreme Left Margin)

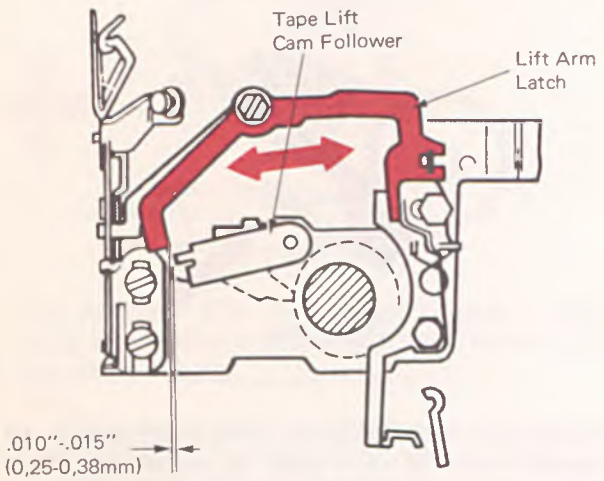
12. *Lift Actuating Arm* – With the correcting torque bar at rest, form the lift actuating arm for .001"-.005" clearance between the lift actuating arm and the correcting torque bar at the closest end.



(Bottom View) (Correcting Torque Bar At Rest)

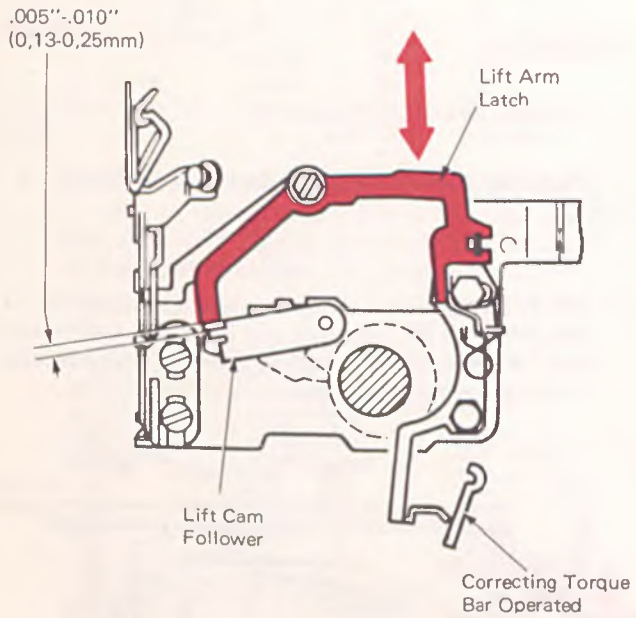
13. *Lift Arm Latch* – Adjust the lift arm latch to satisfy the following conditions:

a. With the correcting mechanism at rest, position the lift arm latch front to rear so the tape lift cam follower clears the latch by .010"-.015".



(Left Side View) (Correcting Mechanism At Rest)

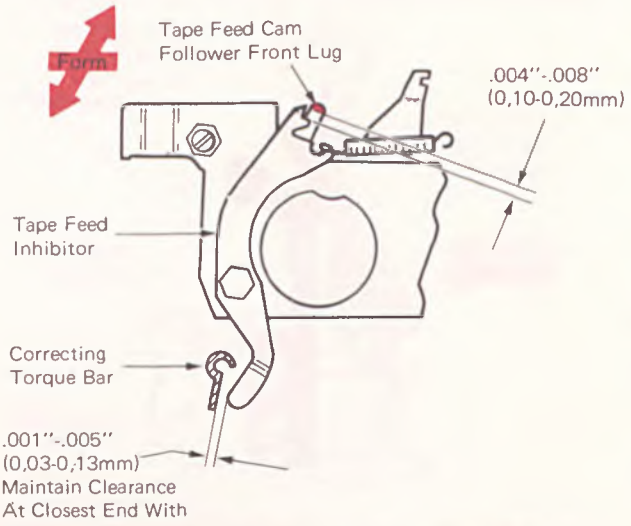
b. With the print mechanism at rest and the correcting torque bar operated, the bottom of the lift arm latch must clear the lift cam follower by .005"-.010".



(Left Side View) (Print Mechanism At Rest)

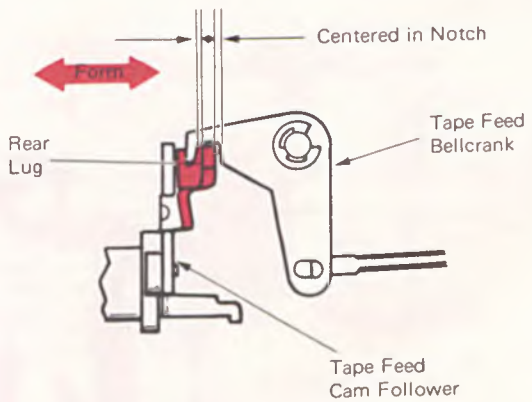
14. *Tape Feed Cam Follower, Front Lug* – With the cycle shaft in its extreme overthrow position, form the lug vertically for .004"-.008" clearance between the bottom of the lug and the step on the tape feed inhibitor.

NOTE: If necessary, form the lug front to rear to maintain torque bar to inhibitor clearance.



(Right Side View) (Cycle Shaft In Extreme Overthrow Postion)

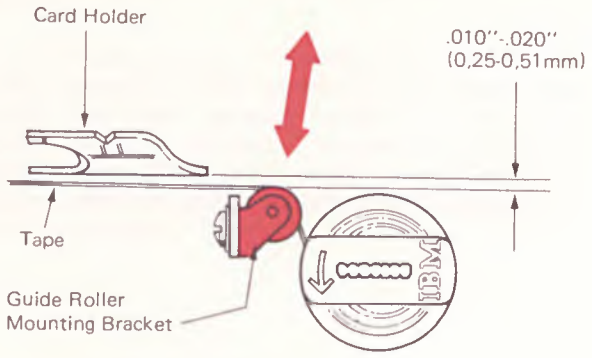
15. *Tape Feed Cam Follower, Rear Lug* – Form the rear lug on the tape feed cam follower left or right so it centers in the notch in the tape feed bellcrank.



(Top View)

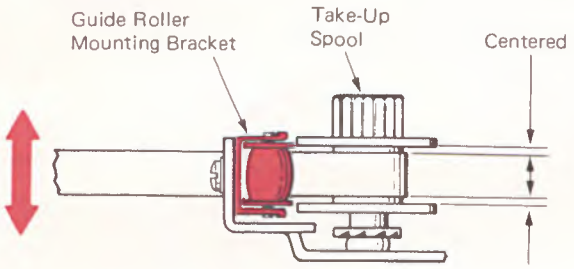
16. *Guide Roller* – The guide roller mounting bracket should be adjusted to satisfy the following conditions:

a. Adjust the bracket front to rear so the tape clears the card holder by .010"-.020"



(Top View)

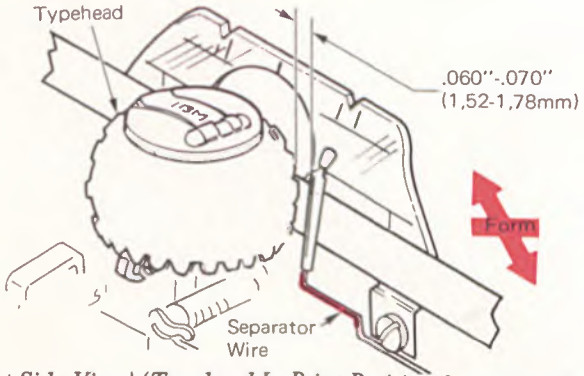
b. Adjust the bracket up or down so the used tape is centered on the take-up spool.



(Front View)

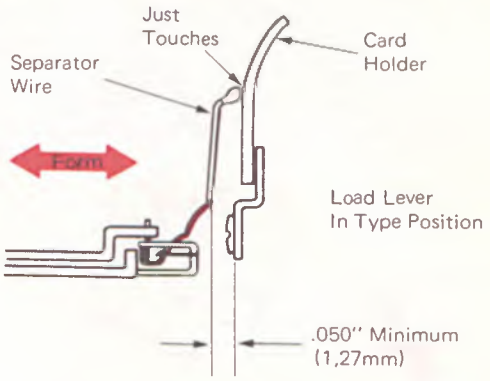
17. *Separator Wire* – Form the separator wire to satisfy the following conditions:

a. Left or right so the wire clears the typehead by .060"-.070" when the typehead is in the print position and the load lever is in the type position.



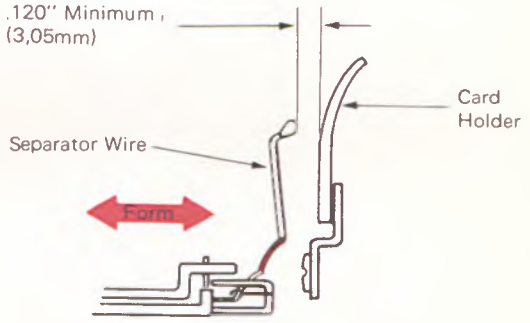
(Right Side View) (Typehead In Print Position Load Lever In Type Position)

b. With the load lever in the type position, the top of the separator wire should just touch the card holder while maintaining a minimum of .050" clearance at the bottom of the upright portion of the separator wire.



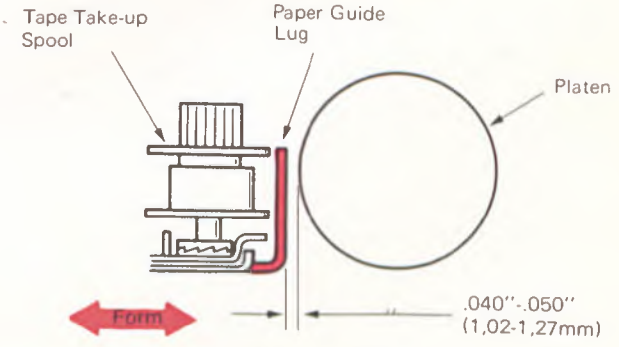
(Right Side View) (Load Lever In Type Position)

c. With the load lever in the load position, the top of the separator wire must clear the card holder by at least .120".



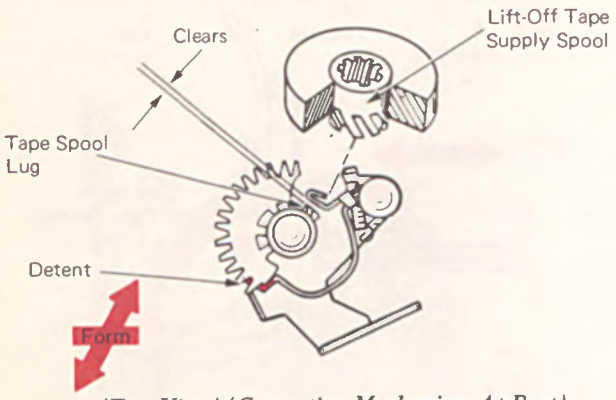
(Right Side View) (Load Position)

18. *Paper Guide Lug* – Form the paper guide lug front to rear so the lug clears the platen by .040"-.050".



(Right Side View)

19. *High Bias Spring* – With a Lift-Off Tape installed and the correcting mechanism at rest, form the detent on the high bias spring in or out so that the sensing shoe clears the lugs on the tape supply spool.



(Top View) (Correcting Mechanism At Rest)

COVERS OPERATIONAL THEORY

The covers protect and enhance machine appearance. The machine is enclosed by the cover assembly which consists of three major sections: top cover, center cover and bottom cover.

The cover design employs an acoustical filter hood to reduce the amount of noise emitted by the printer. The acoustical filter hood assembly mounted on the center cover just above the platen and completely encloses the opening between the top and center covers (Figure 1). Noise emitted by the printer is muffled by foam insulation in the filter chamber.

Paper is inserted into the machine through a paper entry slot between the rear of the acoustical filter hood and the center cover. During insertion, the paper is aligned by the paper stackers. Refer to Paper Feed/Index section for more information on the paper stackers.

A margin scale is attached to the front lower edge of the top cover. The scale is numbered and graduated in both 10 and 12 pitch.

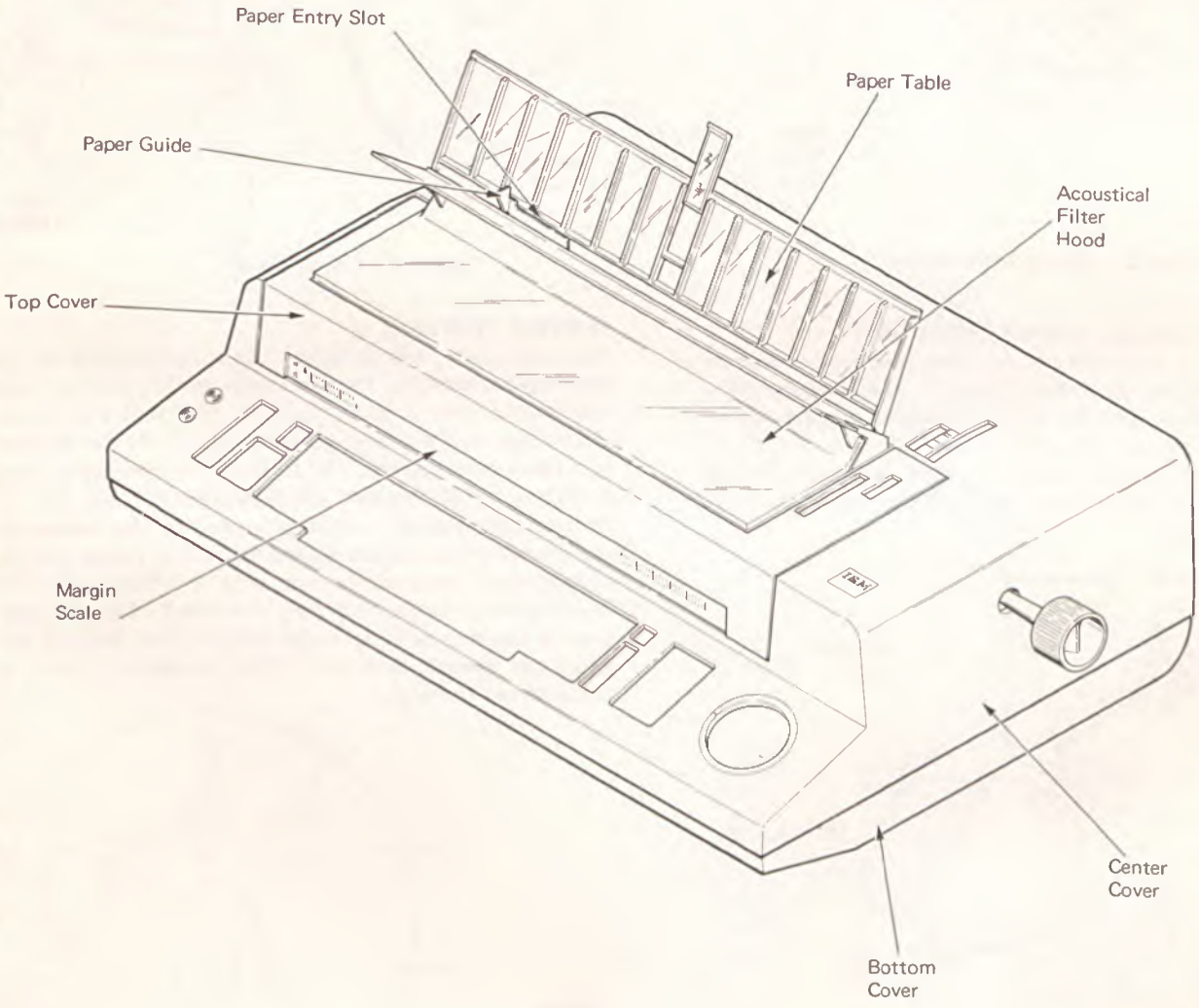


Figure 1 – Covers

PLATEN KNOBS

The platen knobs have been designed to snap off the platen shaft but stay with the center cover. To release the knobs, pull each one straight out until they release from the platen shaft. If you continue to pull the knobs they will seat themselves in the brackets that support them.

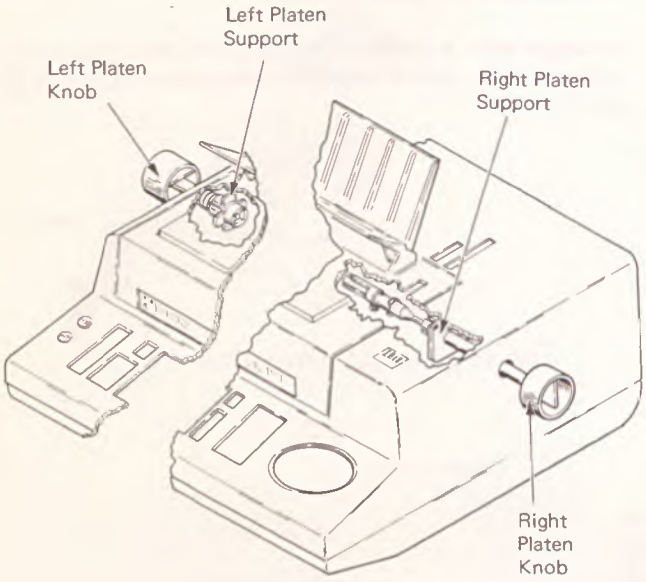


Figure 2 – Platen Knob Mounting

TOP AND CENTER COVER MOUNTING

The top cover is attached to the center cover by a hinge on each side of the top cover (Figure 3). The hinge uses friction washers to hold the top cover in the raised position. Near the front on each side of the top cover is a spring latch. When the top cover is lowered, the spring latches snap over the center cover, latching the top cover in its closed position.

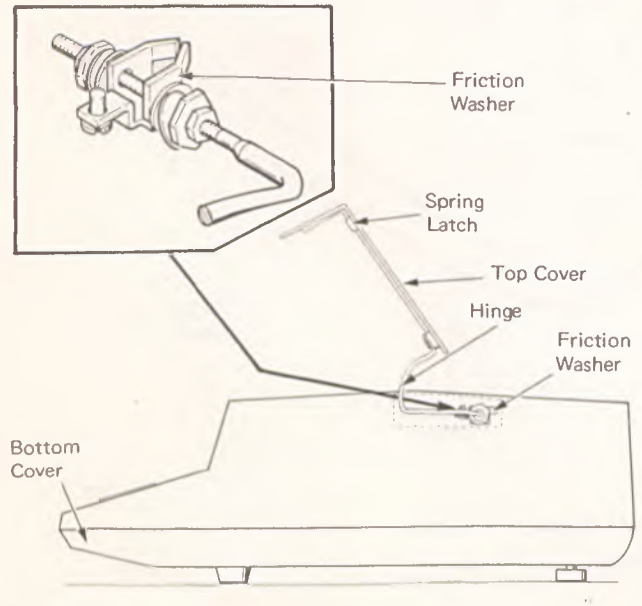


Figure 3 – Top Cover

The center cover is attached to the bottom cover by two latches (Figure 4). The latches are attached to the center cover and engage latch brackets on the bottom cover. The center cover may be removed by first pulling the left and right platen knobs out from the platen shaft and seating them in the center cover. Then pivot the left latch lever toward the front of the machine and the right latch lever to the right. The top and center cover can now be lifted off the bottom cover.

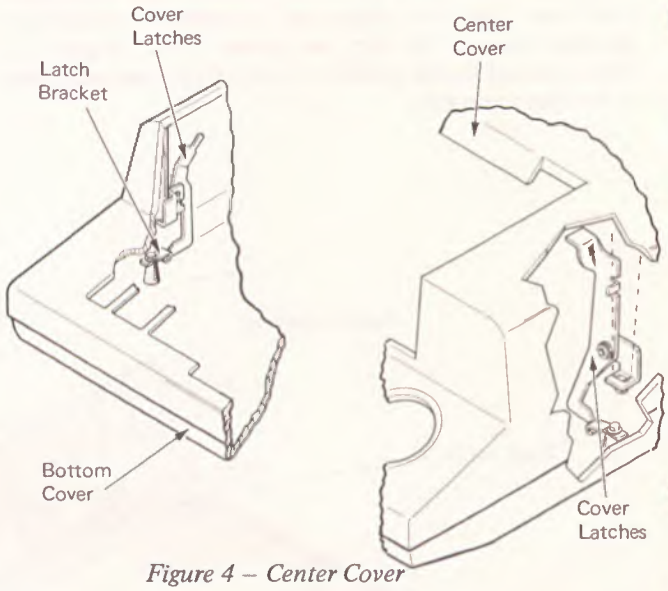


Figure 4 – Center Cover

SERVICE POSITION

The covers are constructed to allow the machine to be tilted up for servicing without removing the machine from the bottom cover (Figure 5). A tilt support is attached to the bottom of the printer power frame. To tilt the machine into the service position, the front of the machine is raised as high as the tilt support will allow, then released. The tilt support pivots in its mounting bracket on the bottom of the printer power frame. As the machine is raised, the tilt support slides along the bottom cover and drops into a slot which prevents further rearward movement of the tilt support. A retainer mounted to the bottom cover prevents any additional upward movement of the tilt support once it is in the service position.

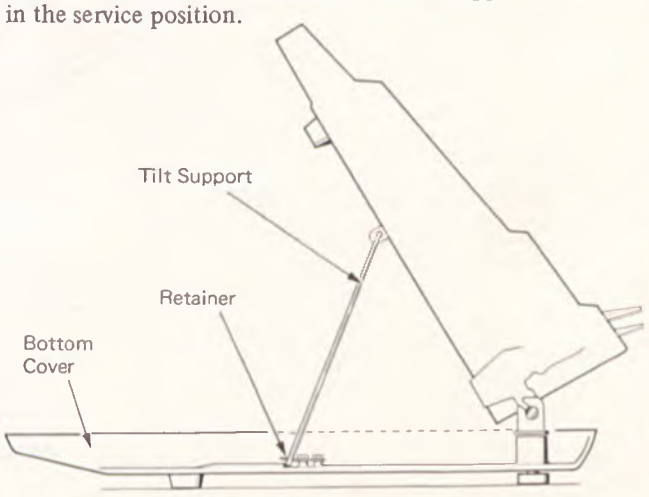


Figure 5 – Service Position

MACHINE MOUNTING

The machine is suspended inside the cover assembly by shock mounts which are attached to the machine (Figure 6). With this design, the bottom cover rests on the desk, and the machine rests on the bottom cover.

The front of the machine is supported by shock mounts on the keyboard which rest in cups in the bottom cover. The rear of the machine is supported by the rear cover brackets which have shock mounts attached. The rear shock mounts also rest in cups in the bottom cover.

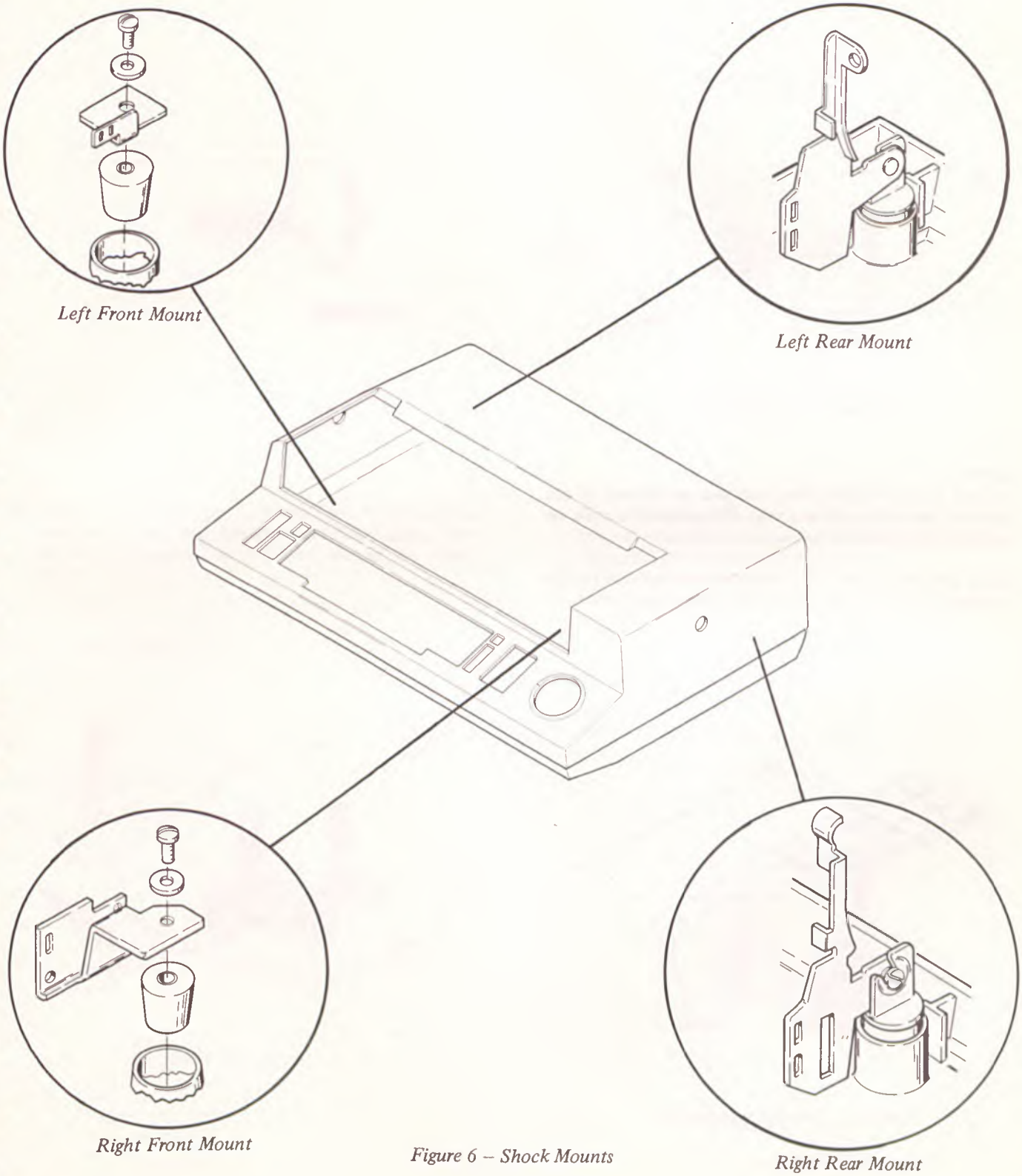


Figure 6 – Shock Mounts

DUST SHIELDS

Two dust shields are located just below the carrier (Figure 7). The purpose of the dust shield is to prevent dust and other foreign objects from falling into the cycle shaft or operational shaft area. The dust shields are metal and snap under the power frame at the rear and into three mounting brackets at the front.

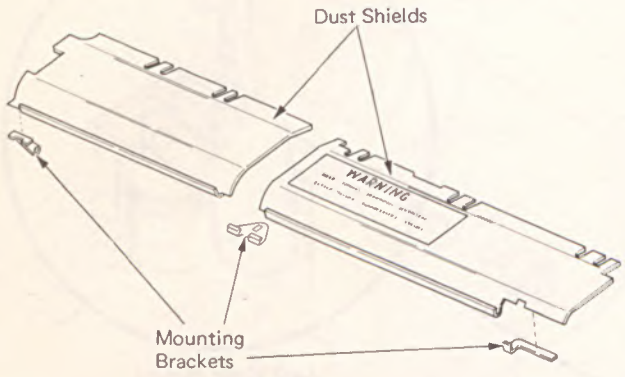


Figure 7 – Dust Shields

VENTS

Located in the bottom cover and just to the rear of the motor is the motor exhaust vent. This vent directs the air from the motor out the rear of the machine.

In the left rear corner of the bottom cover is a vent for the expulsion of air from the planar and power supply areas.

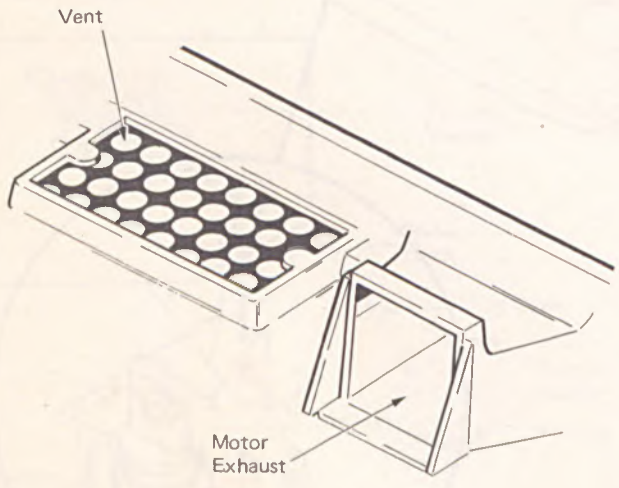
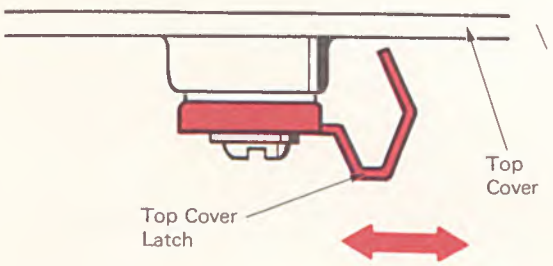


Figure 8 – Vent & Motor Exhaust

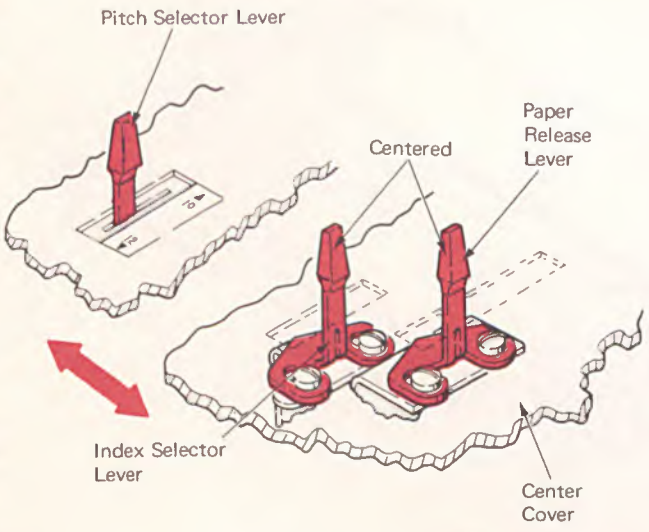
COVERS ADJUSTMENTS

1. *Top Cover Latches* – Adjust the cover latches left or right so the top cover is latched securely in the closed position.



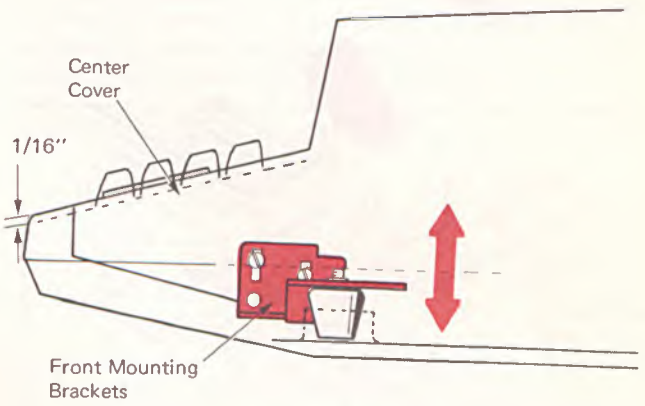
(Front View)

2. *Levers* – Adjust the pitch selector lever, index selector lever, and paper feed release lever left or right so that the lever is centered in the foam seal in the center cover.



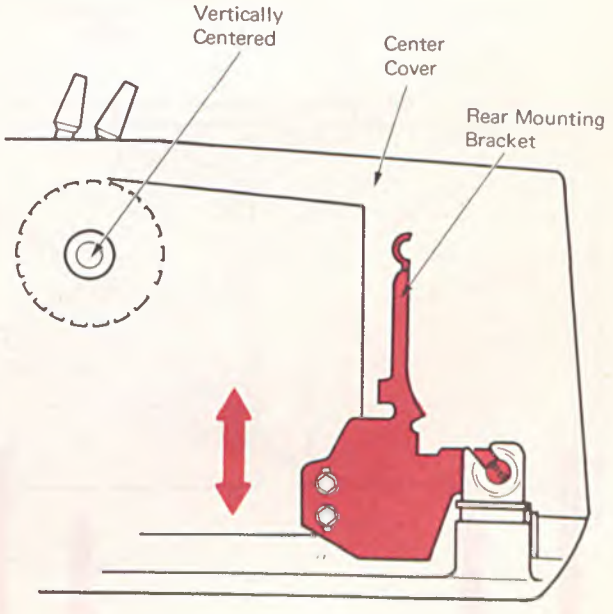
(Right Rear View)

3. *Front Mounting Brackets* – Adjust the front mounting brackets vertically so that the top of the cover is 1/16 inch above the bottom of the keybuttons.



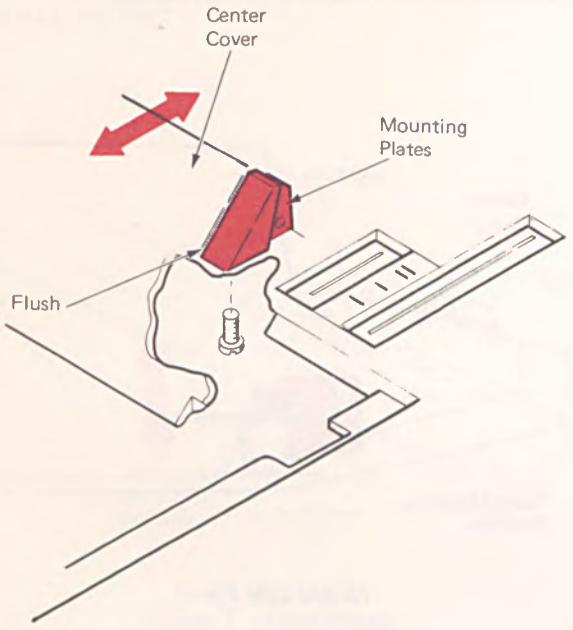
(Right Side View)

4. *Rear Mounting Brackets* – Adjust the rear mounting brackets vertically so that the platen shaft is vertically centered in the hole in the top cover.



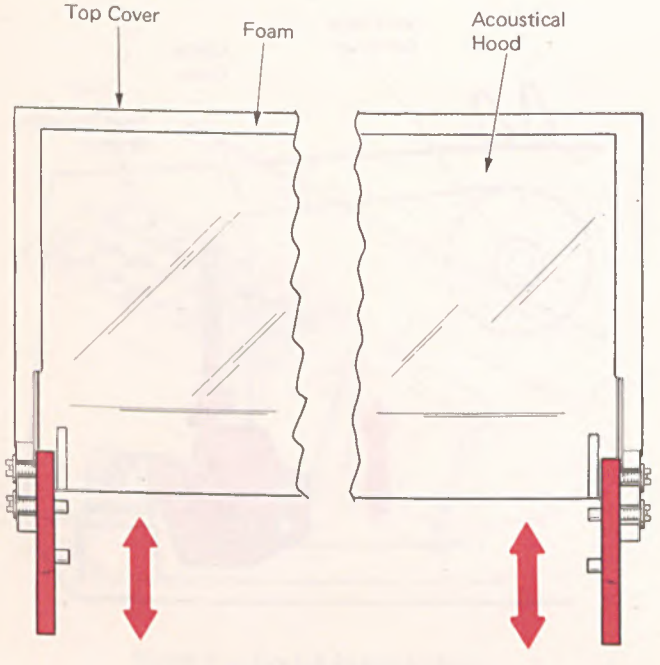
(Right Side View)

5. *Hood Mounting Plates* – Adjust the acoustic hood mounting plates front or rear to be flush with the slope on the center cover.



(Top Right Rear View)

6. *Acoustical Filter Hood* – Adjust the acoustic hood front or rear so that the hood rests solidly on the foam in the top cover.



(Top Rear View)

PINFEED PLATEN OPERATIONAL THEORY

The purpose of the pin feed platen is to feed continuous forms (Figure 1). This is accomplished by pin wheel assemblies, on each end of the platen, which engage perforations along the outside edges of the form. Platen cores come in lengths to accommodate most standard width forms. The pin feed platen is compatible with the acoustic filter hood.

During operation, the feed roll release lever should be forward in the released position because the feed rolls are not required to feed the paper.

The platen core is keyed to the right hand pin wheel body. The pin wheel body is setscrewed to a hexagon shaped platen shaft and rotates with the shaft whenever the platen is indexed. Each pin wheel body contains 9 pins, symmetrically spaced around its surface. A cam mounts over the hub of the pin wheel and fits into a guide slot in each pin. Mounted onto the cam is a locating fork which prevents the cam from rotating. The locating fork is prevented from rotating by an anchor rod. The anchor rod extends the width of the platen and is mounted into anchor rod plates which are attached to each side of the center cover.

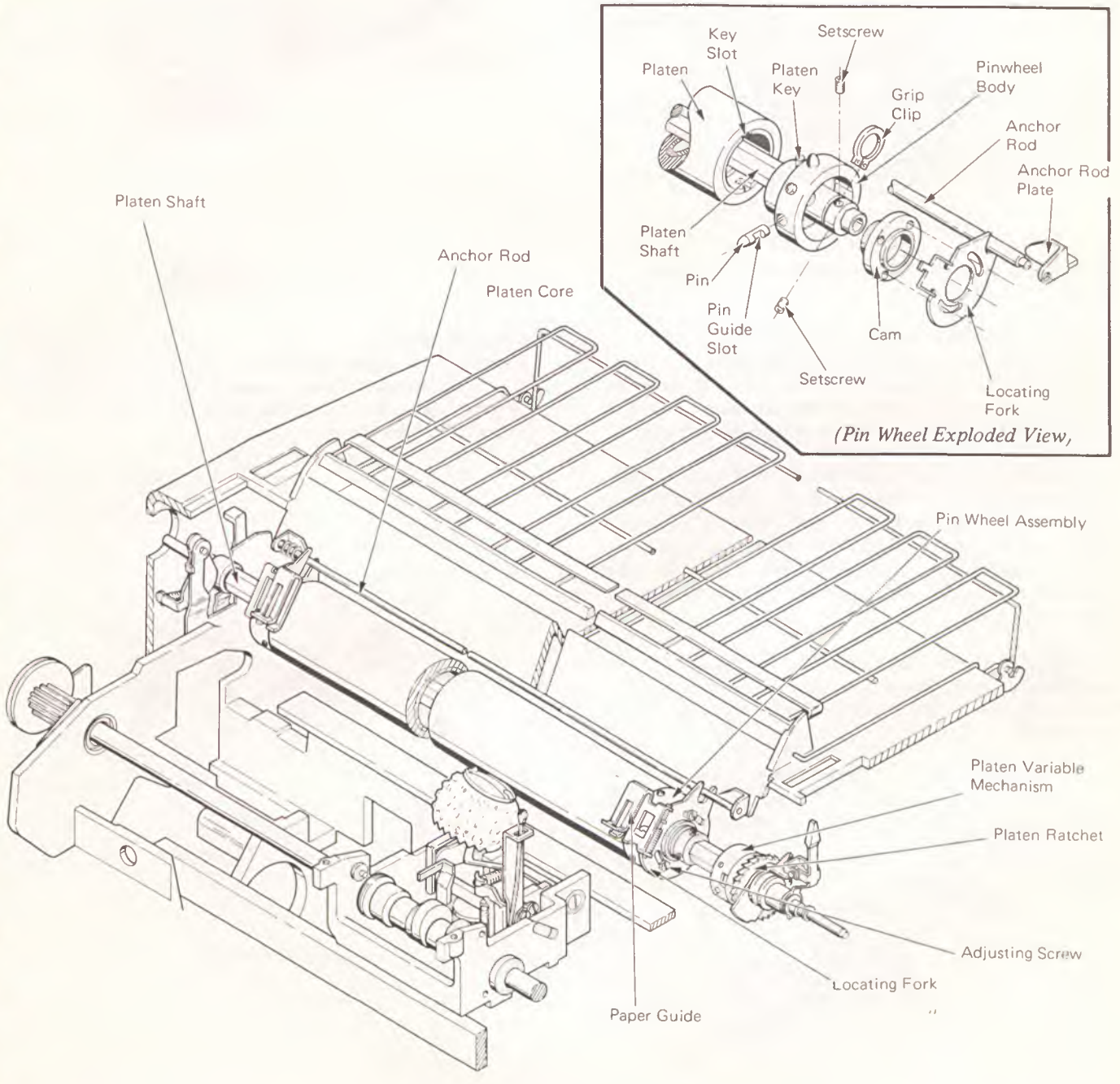


Figure 1 – Pin Feed Platen Assembly

PIN WHEEL OPERATION

As the pin wheel body turns, the pins move around the stationary cam and move in and out of their holes as they pass the high point of the cam. This means that the pins will exit and enter the pin wheel body at an exact radial position thus providing the motion necessary to feed forms through the typewriter (Figure 2). The point at which the pins reach their fully extended position can be varied by adjusting the position of the cam high point.

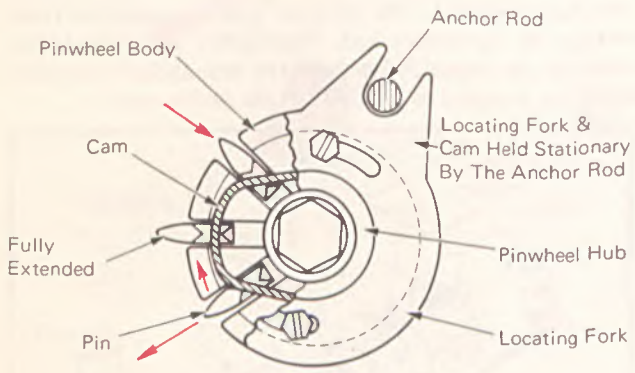


Figure 2 – Pin Wheel Operation (Right Side View)

PLATEN RATCHET AND VARIABLE

The platen ratchet is attached to the right end of the platen shaft (Figure 3). The platen ratchet is rotated by the index mechanism. Rotational motion of the ratchet is coupled to the platen shaft through the platen variable mechanism.

The platen variable mechanism consists of a variable shaft, compression spring, driver pin, variable driver and a driver guide which is setscrewed to the platen shaft. The variable driver may be disconnected from the platen ratchet by pushing in on the right hand platen knob. This enables the operator to reposition the writing line without moving the platen ratchet.

The pin feed platen mechanism also incorporates a line position reset lever. (For information on the line position reset lever, refer to the Paper Feed and Index Section of this manual.)

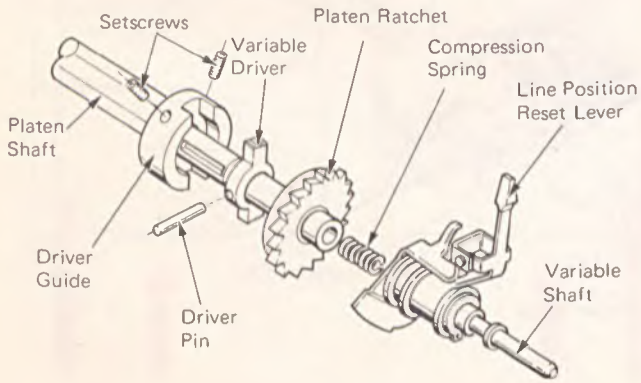


Figure 3 – Platen Ratchet And Variable

PAPER GUIDE

The paper guides are attached to the right and left locating forks and are positioned in front of the extended pins to guide the paper (Figure 4). The paper guides are mounted by a spring loaded hinge and may be unlatched and pivoted aside to aid in positioning the form paper around the platen and over the extended pins.

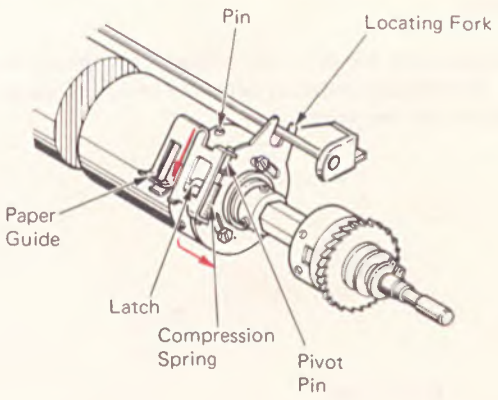


Figure 4 – Paper Guide

CARDHOLDER

The pin feed platen mechanism uses a short cardholder (Figure 5) to prevent interference between the pin wheels or paper guides and cardholder when the carrier is close to either end of the platen.

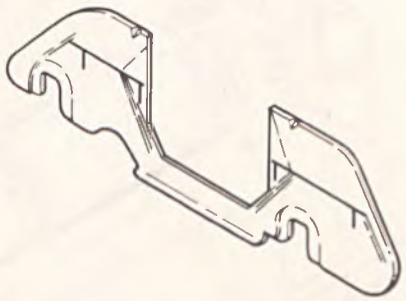
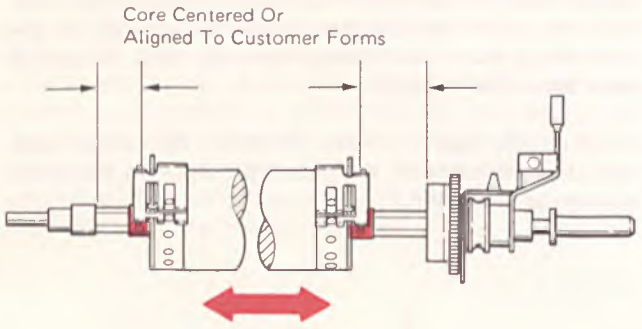


Figure 5 – Cardholder

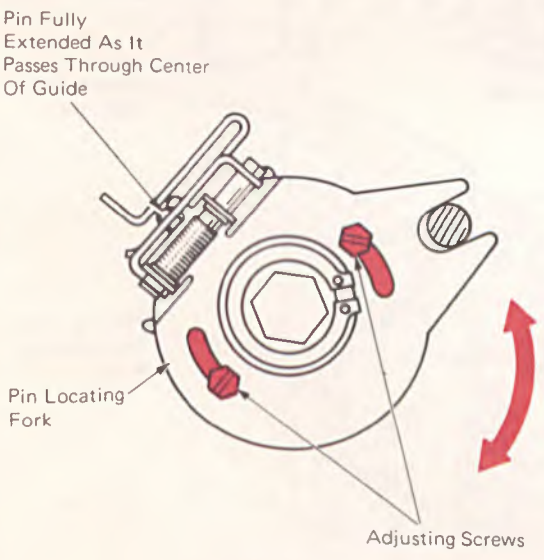
PINFEED PLATEN ADJUSTMENTS

1. *Platen Core Lateral Position* – Loosen the setscrews in the pin wheel bodies. Center the core and slide the pin wheel assemblies up against each end or align the pin wheel/core assembly to the customer forms.



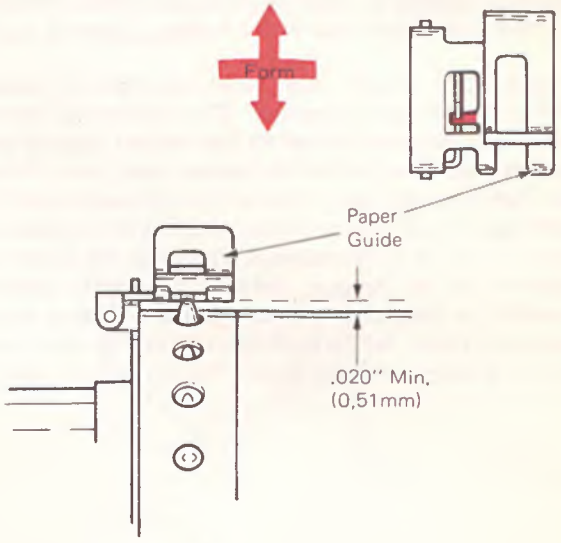
(Front View)

2. *Pin Wheel Assembly* – Rotate the cam within the slots in the locating fork so that a pin is fully extended as it passes through the center of the paper guide.

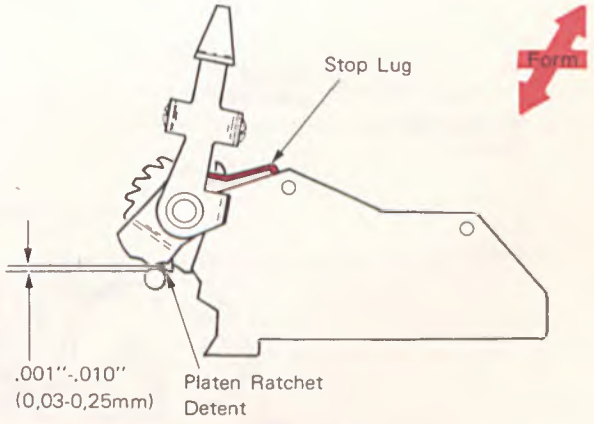


(Right Side View)

3. *Paper Guide Latch* – Form the ear on the paper guide for a minimum of .020" clearance between the platen and guide when the guide is latched.



4. *Line Position Reset Lever* – Form the rear extension of the reset lever for .001"-.010" clearance between the reset lever and the detent when the detent is seated in the platen ratchet.



(Right Side View)

REVERSE INDEX OPERATIONAL THEORY

The purpose of the reverse index feature is to enable the index mechanism to index the paper 1/2 space in either direction. With this feature installed, the operator can cause the paper to roll up or down for superscripts or subscripts without stopping to manually turn the platen. This feature is active in both play and record modes (Figure 1).

Forward and reverse index pawl operation is similar to standard index pawl operation. This section will cover the mechanism necessary to select the desired spacing and to operate either the forward or reverse index pawl. (Refer to the Paperfeed and Index Section for information on index pawl operation.) Reverse index machines are equipped with either 48 or 54 tooth ratchets. To enable the platen to be indexed in the reverse direction, a reverse ratchet is mounted to the platen assembly on the outside of the right hand side frame. All forward indexes feed two teeth and all reverse indexes feed one tooth. Two codes are added for this feature. The Superscript code is produced by depressing the Code button and the "y/↑" keybutton. This generates one reverse index operation and positions the paper one-half space above the writing line. The Subscript code is produced by depressing the Code button and the "h/↓" keybutton. This generates one forward index which positions the paper one full space below the writing line and one reverse index which brings the paper back to one-half space below the writing line.

All electronic logic necessary to operate the reverse index feature is contained in the planar package. No additional electronics is required.

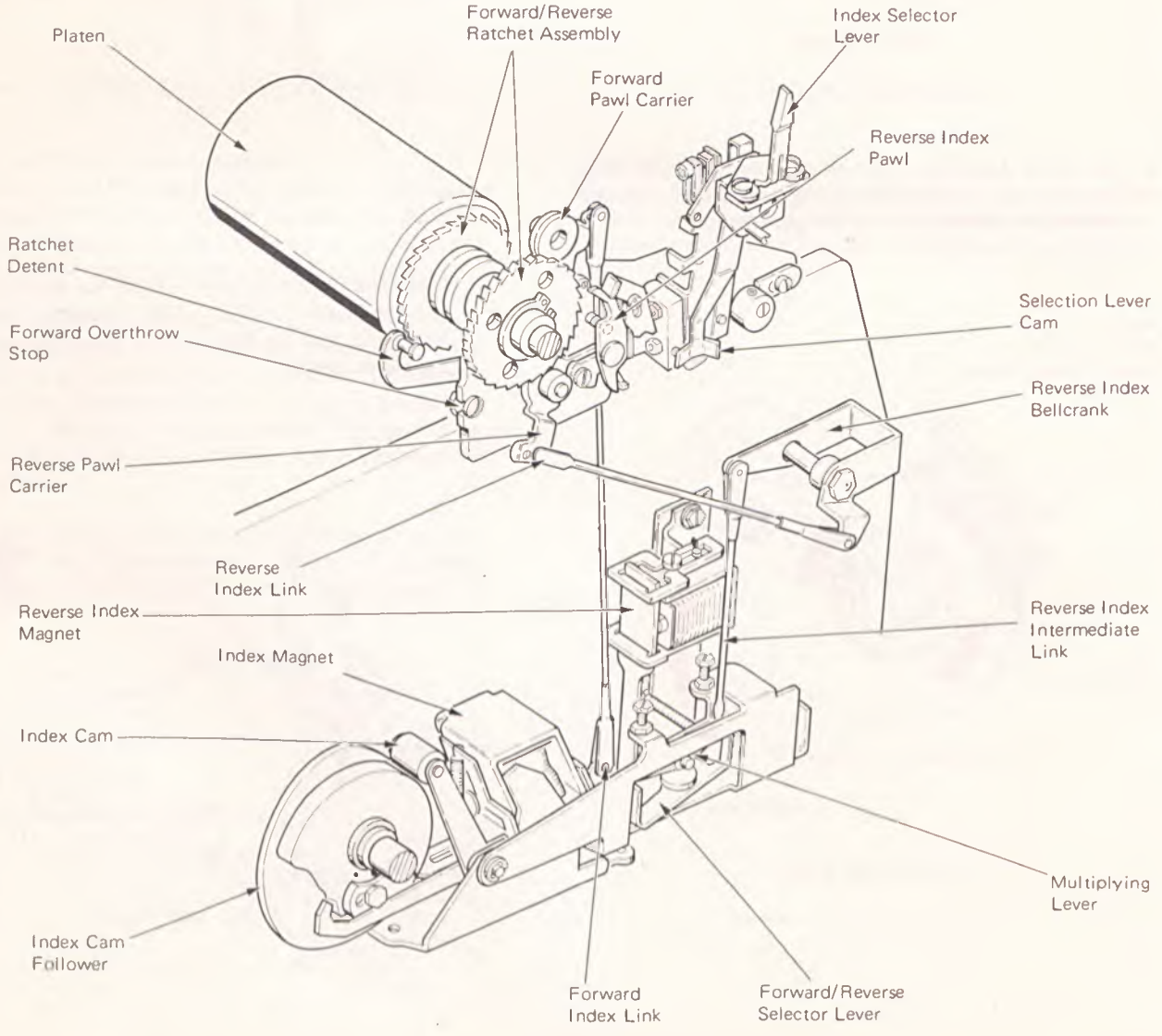


Figure 1 – Reverse Index Mechanism

Motion for index operation is obtained from the index cam on the operational shaft. This motion is transferred through the cam follower, which connects to the center of the multiplying lever, to pull down either the forward index link or the reverse index intermediate link.

A reverse index magnet is mounted to an upward extension of the reverse index bracket and controls the position of the forward/reverse selector lever (Figure 2). The forward/reverse selector lever functions as a moveable multiplying lever stop. When the reverse magnet is at rest, the forward/reverse selector lever is spring loaded into the forward index position and provides a pivot point for the rear of the multiplying lever. When the reverse index magnet picks, it pivots the forward/reverse selector lever to block the front portion of the multiplying lever. This provides a pivot point for the front of the multiplying lever.

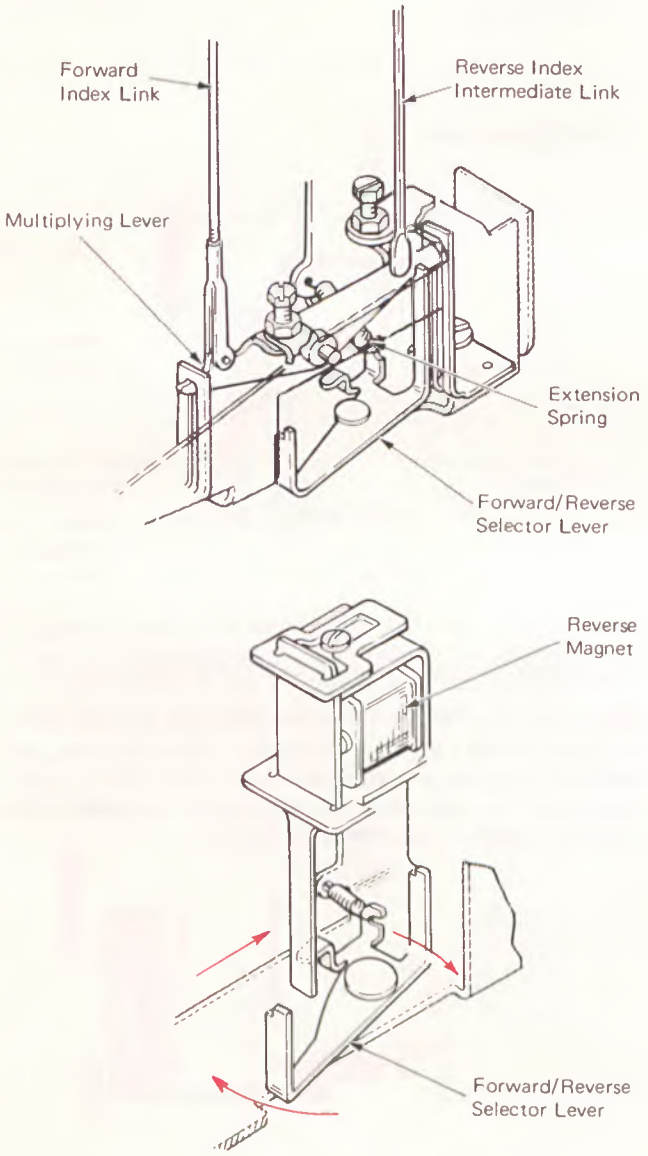


Figure 2 – Reverse Index Magnet

FORWARD INDEX

When the index cam starts to rotate and the rear of the cam follower moves down, the multiplying lever will move down until the rear extension contacts the forward/reverse selector lever (Figure 3). This will prevent the rear of the multiplying lever from moving down and allow the front to move down as in a normal index operation. The forward index link will pull the forward index pawl carrier and the result will be a forward index.

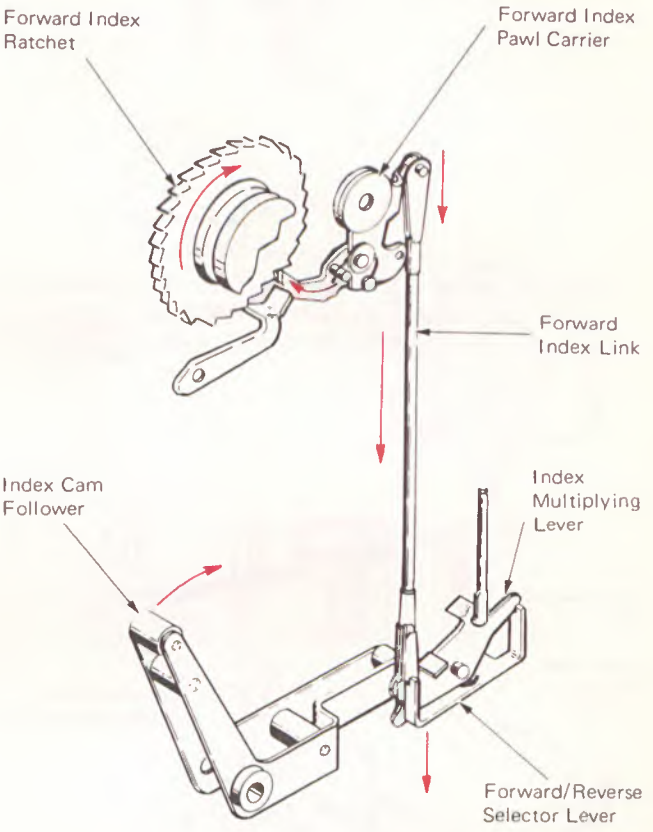


Figure 3 – Forward Index

REVERSE INDEX

For a reverse index operation the reverse index magnet will pick and rotate the forward/reverse selector lever (Figure 4). When the index cam starts to rotate and the rear of the index cam follower moves down, the front extension of the index multiplying lever will contact the forward/reverse selector lever and allow the rear of the multiplying lever to move down. This will pull down the reverse index intermediate link which rotates the reverse index bellcrank. The reverse index bellcrank will pull the reverse index link and cause the reverse index pawl carrier to index the platen in the reverse direction.

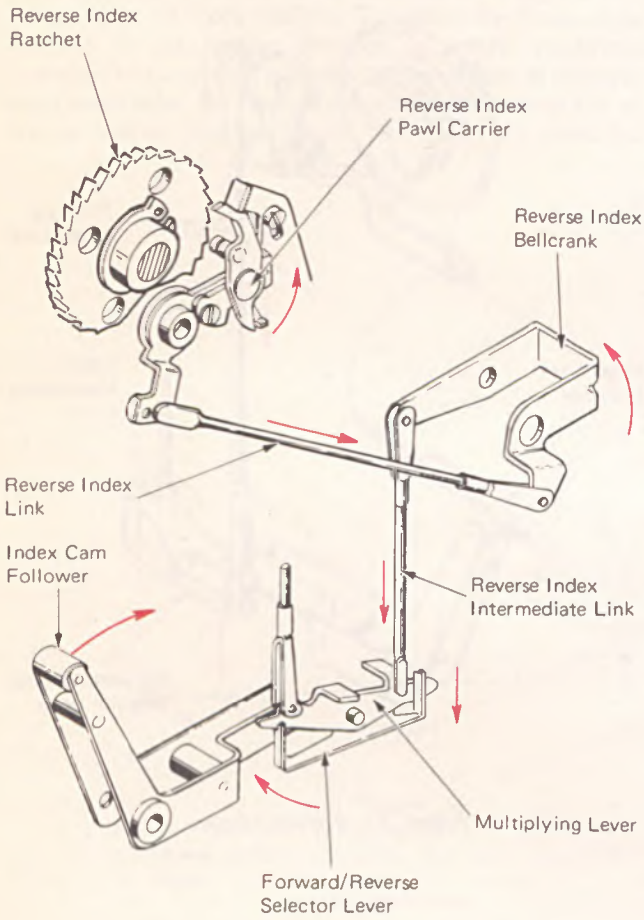


Figure 4 – Reverse Index

INDEX SELECTOR LEVER

There is no longer a mechanical connection between the index selector lever and the index pawl (Figure 5). Line space selection is now the result of two normally closed micro switches which are operated by a cam on the index selector lever. When the selector lever is in the forward or single line space position the switch on the rear of the bracket will be open. This will signal the electronics to generate one forward index operation. If the selector lever is in the middle or 1-1/2 space position, the cam is between the two switches and both switches will be closed. This will cause two forward indexes and one reverse index. The result will be 1-1/2 space in the forward direction. If the index selector lever is in the rear or double line space position, the front switch will be open. The result will be two forward indexes.

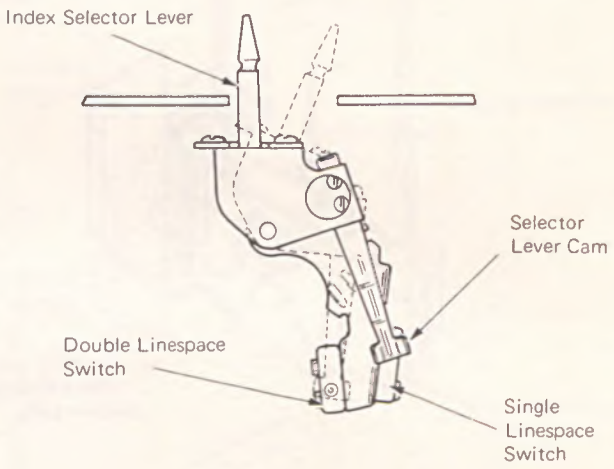
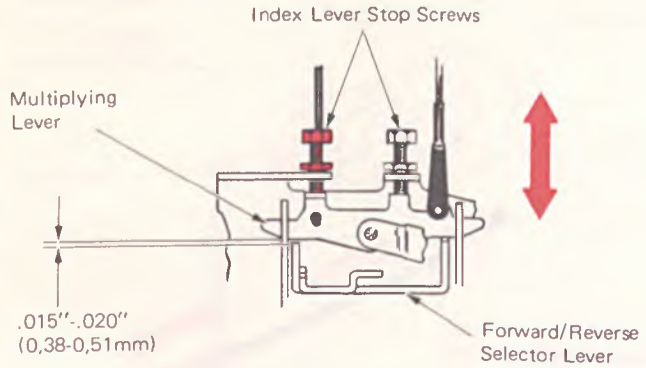


Figure 5 – Index Selector Lever (Right Side View)

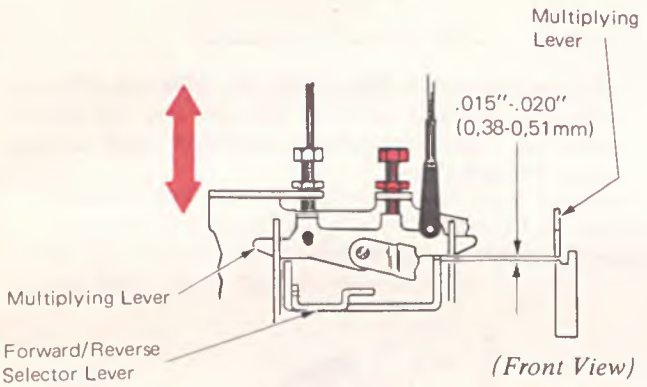
When using the "y" or "h" keybutton with the code key, the machine will operate independent of the index selector lever. If 1/2 space up is used for a superscript, the 1/2 space down must be used when the superscript is completed to return the paper to the original writing line.

REVERSE INDEX ADJUSTMENTS

1. Index Lever Stop Screws – With the machine at rest, adjust the index lever stop screws up or down for .015"-.020" clearance between the multiplying lever extensions and the forward/reverse index selector lever.



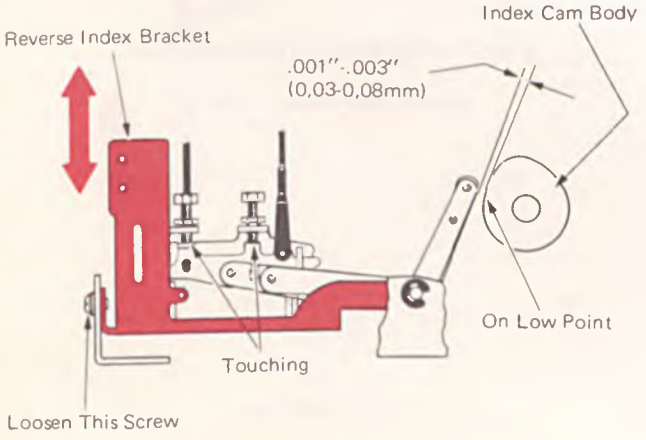
(Left Side View)



(Front View)

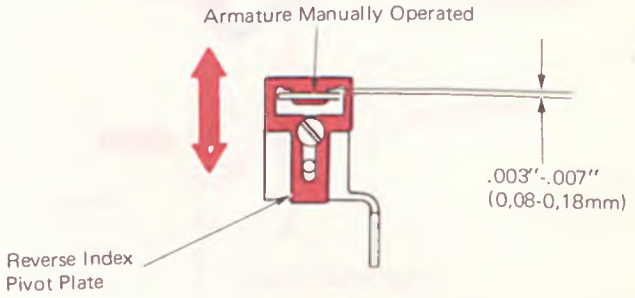
(Left Side View)

2. Reverse Index Bracket – With the index cam follower on the low point of the cam, adjust the reverse index bracket up or down for .001"-.003" clearance between the cam follower roller and the cam body.



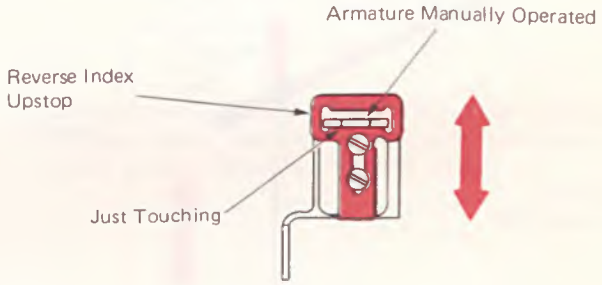
(Left Side View)

3. Reverse Index Pivot Plate – With the reverse index magnet armature manually operated, adjust the pivot plate up or down for .003"-.007" clearance between the pivot plate and the magnet armature.



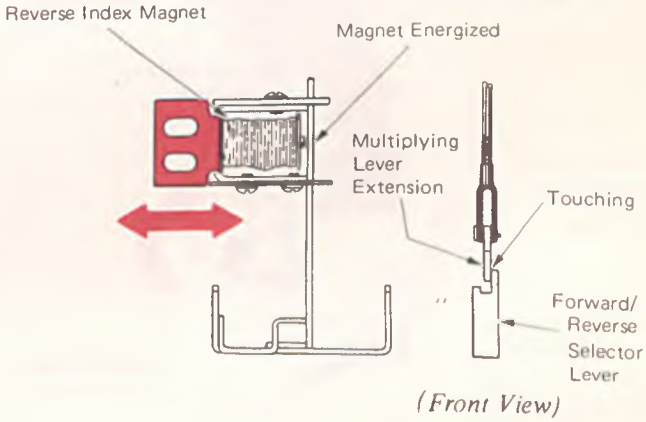
(Top Rear View)

4. Reverse Index Upstop – With the reverse index magnet armature manually operated, adjust the armature upstop up or down to just touch the bottom of the armature.



(Bottom Rear View)

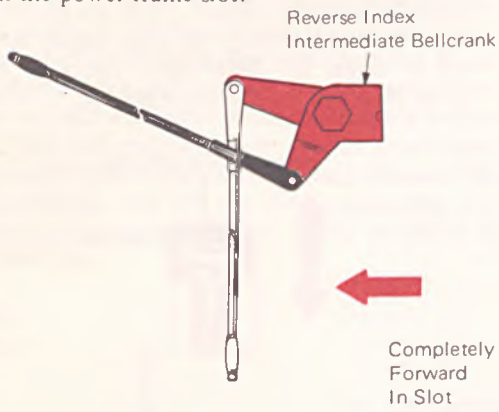
5. Reverse Index Magnet – With the magnet energized, adjust the magnet mounting bracket so that the forward/reverse selector lever just touches the multiplying lever extension.



(Front View)

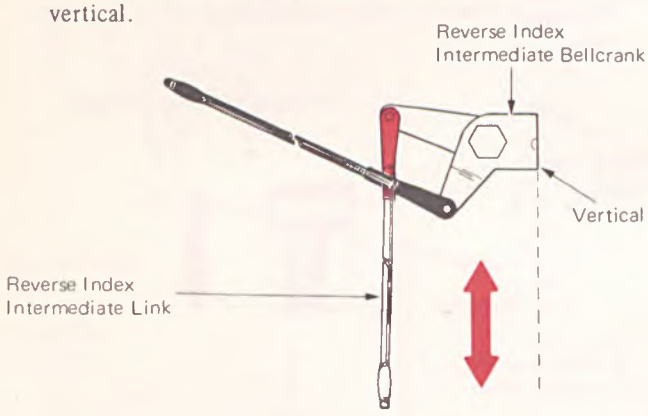
(Left Side View)

6. *Reverse Index Intermediate Bellcrank* – Adjust the reverse index intermediate bellcrank assembly completely forward in the power frame slot.



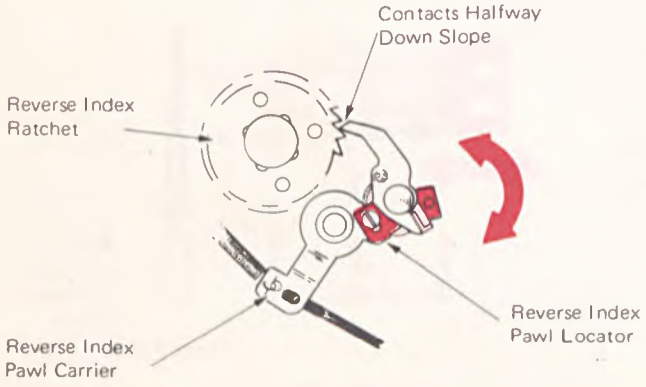
(Right Side View)

7. *Reverse Index Intermediate Link* – With the machine at rest, adjust the reverse index intermediate link so that the rear of the reverse index intermediate bellcrank is vertical.



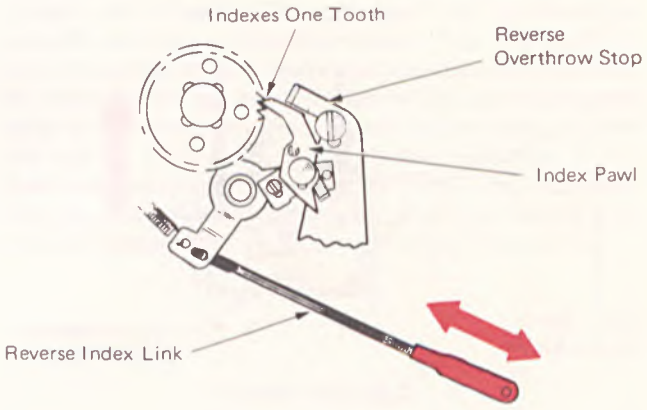
(Right Side View)

8. *Reverse Index Pawl Locator* – With the reverse index pawl carrier manually operated, adjust the index pawl locator so that the index pawl contacts the reverse index ratchet halfway down the slope of a ratchet tooth.



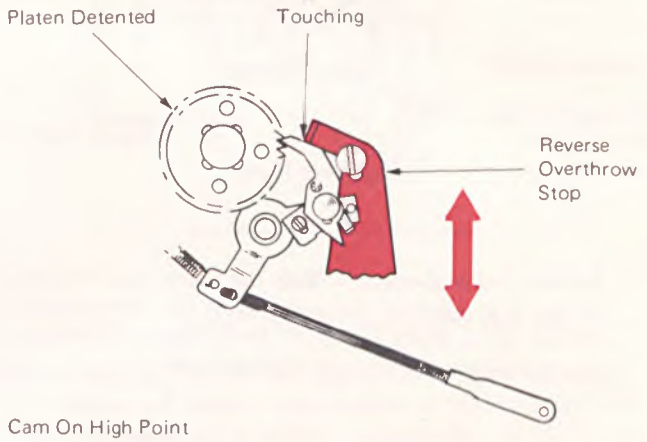
Pawl Carrier Manually Operated (Right Side View)

9. *Reverse Index Link* – With the reverse overthrow stop at the upper limit of its adjustment, adjust the reverse index link so that the index pawl moves the reverse ratchet one tooth when the index cam is rotated one complete revolution.



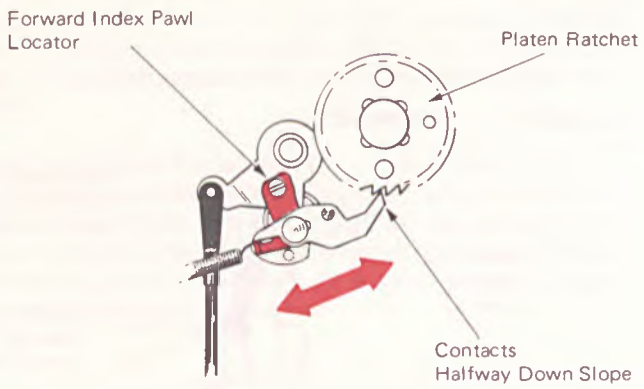
(Right Side View)

10. *Reverse Overthrow Stop* – With the index cam follower roller on the high point of the cam and the platen detented, adjust the reverse overthrow stop to just touch the index pawl.



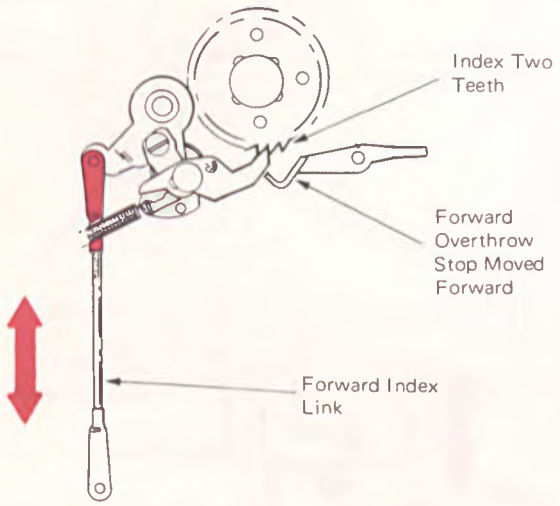
Cam On High Point (Right Side View)

11. *Forward Index Pawl Locator* – With the forward index pawl carrier manually operated, adjust the forward index pawl locator so that the index pawl contacts the forward index ratchet tooth halfway down the slope.



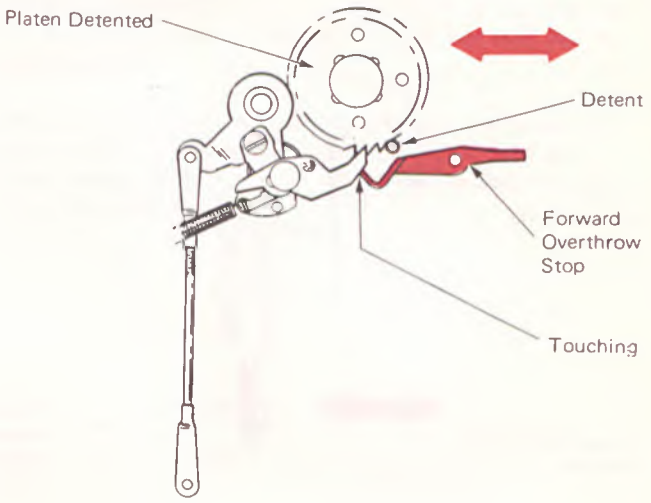
Pawl Carrier Manually Operated (Left Side View)

12. *Forward Index Link* – With the forward overthrow stop moved to the front, adjust the forward index link so that the forward ratchet is moved two teeth when the index cam is rotated one revolution.



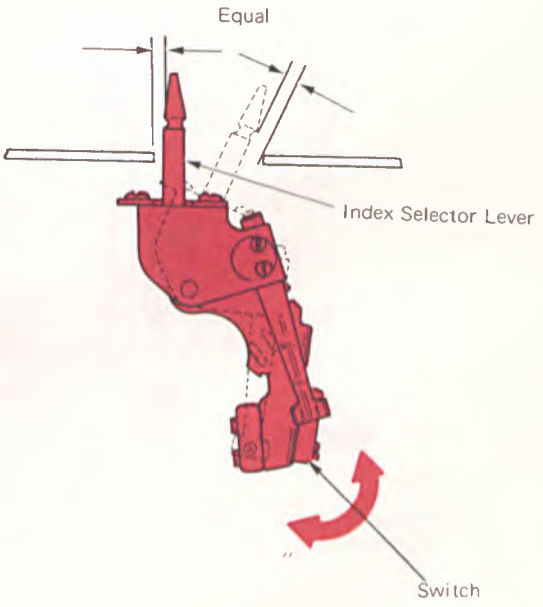
(Left Side View)

13. *Forward Overthrow Stop* – With the platen detented and the index cam follower roller on the high point of the cam, adjust the forward overthrow stop front to rear to just touch the forward index pawl.



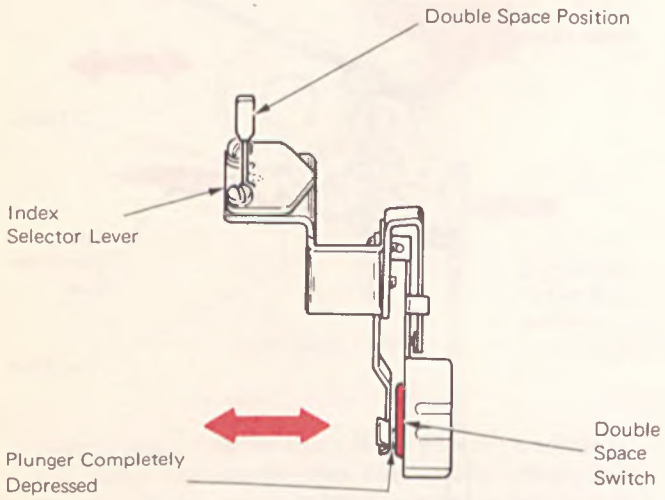
Cam On High Point (Left Side View)

14. *Detent Lever* – With the detent lever in the single space position, adjust the selector lever cam front-to-rear so that it is centered on the rear index switch.



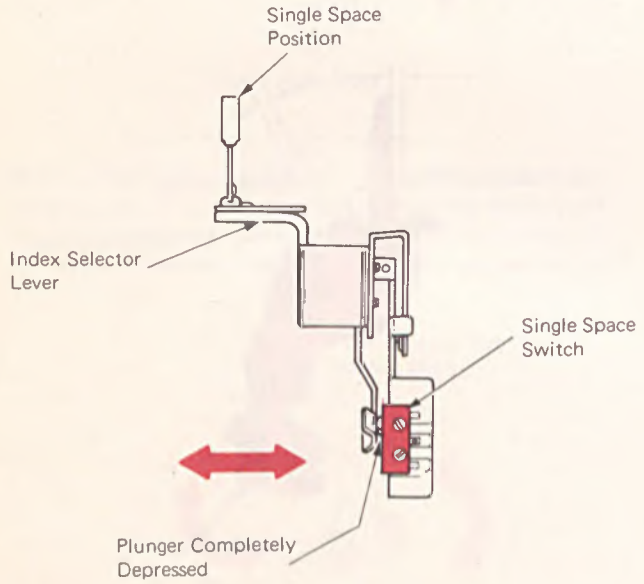
(Right Side View)

15. *Double Space Switch* – With the index selector lever in the double space position, adjust the double space switch left to right until the switch plunger is completely depressed.



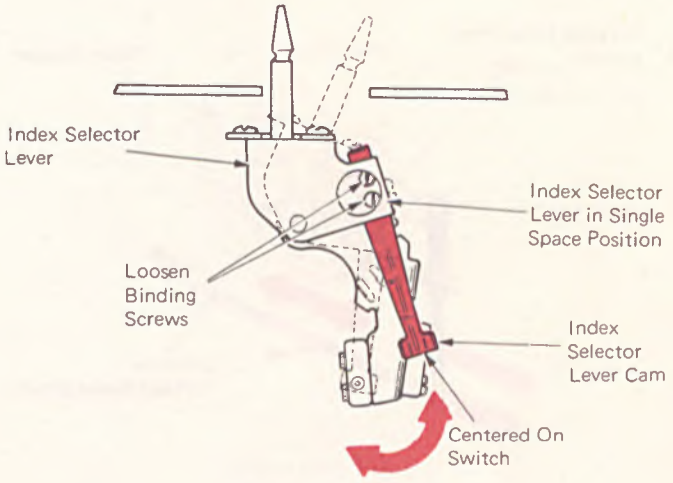
(Rear View)

16. *Single Space Switch* – With the index selector lever in the single space position, adjust the single space switch left to right until the switch plunger is completely depressed.



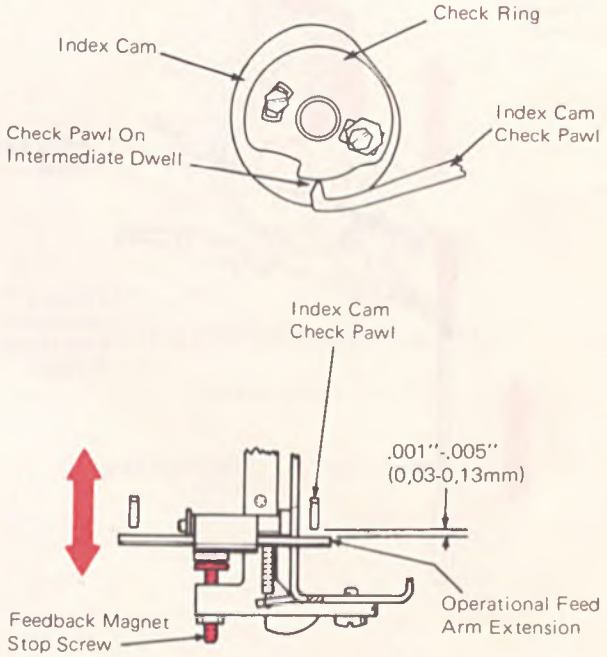
(Rear View)

17. *Index Selector Lever* – Adjust the index selector lever front to rear for equal clearance between the index lever and the top cover in the single space and double space position.



(Right Side View)

18. *Operational Feedback Magnet Stop Screw* – With the index cam check pawl on the intermediate dwell of the check ring, adjust the magnet stop screw for .001"-.005" clearance between the index cam check pawl extension and the operational feedback magnet pin.



(Front View)

TAPE LOOP OPERATIONAL THEORY

The Tape Loop provides storage for information the operator wishes to retain for future use. The tape loop is a continuous magnetic tape 2 inches wide and 46.5 inches long, sealed within a plastic tape cartridge (Figure 1). The tape loop mechanism cannot be handled or removed by the operator. A tape security lever is provided for the operator's use. It actuates a microswitch to prevent the use of the tape loop.

The tape loop is divided into 51 separate tracks. Each track is capable of storing 4,000 characters, codes or functions. 50 of these tracks can be accessed by the operator. The 51st track can only be used by service personnel. The information contained on track 51 is used to check all major output functions of the machine.

One track of information can be recorded on the tape loop in approximately 7.5 seconds. One track can be read from the tape loop in approximately 3.75 seconds. The difference between record speed and read speed is because the tape loop makes two revolutions in record, but only one for a read operation.

The electronics associated with tape loop operation are contained in Board "0", mounted on the side of the tape cartridge. Board "0" is covered in the electrical/diagnostic section of this manual.

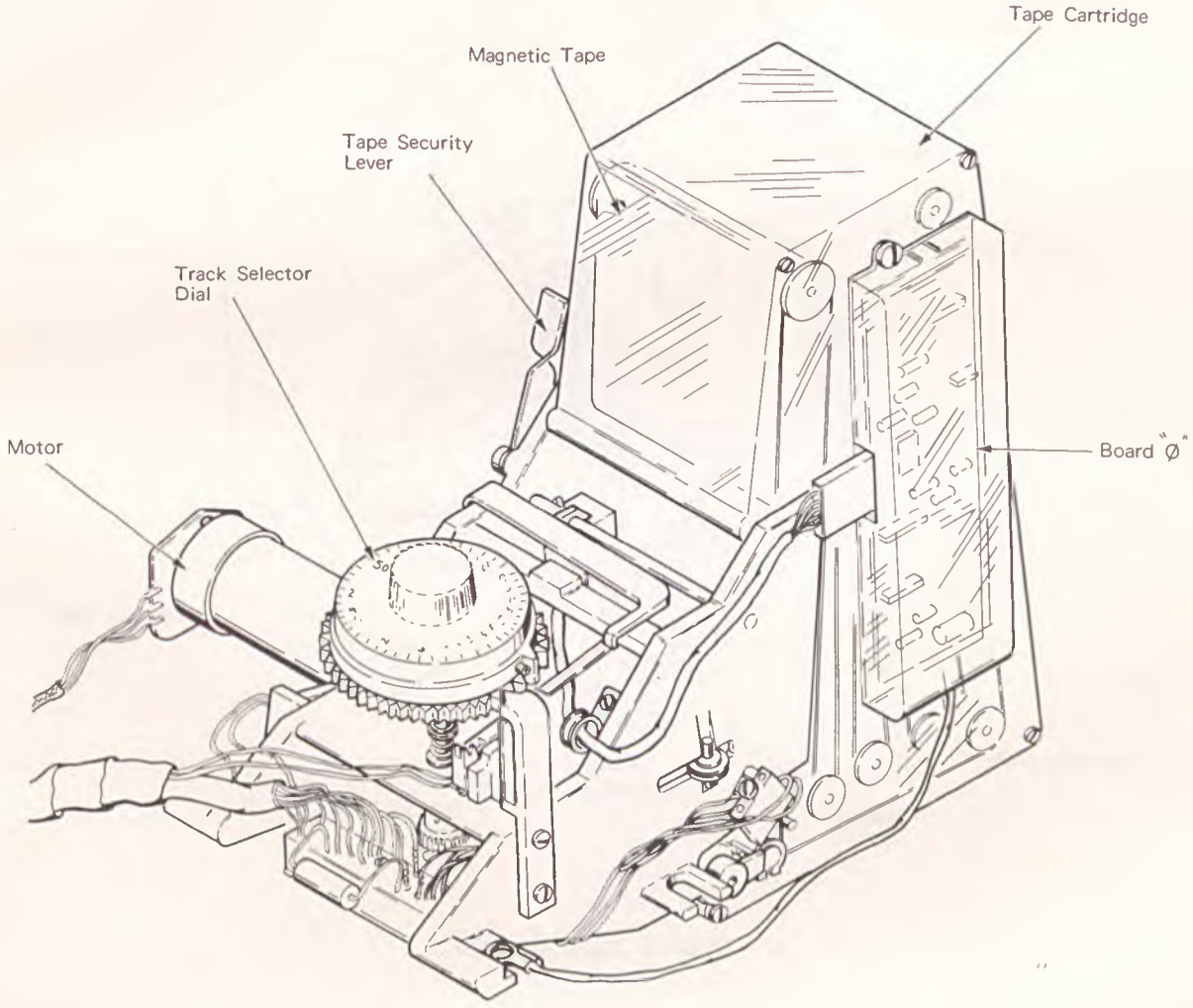


Figure 1 – Tape Loop

TRACK SELECTION

To select a track, the selector dial must be depressed. Depression of the dial (Figure 2) moves the dial shaft downward. Mounted on the lower portion of the dial shaft are the selector gear and restoring collar. Trapped between the selector gear and restoring collar is the selector bellcrank. As the selector gear moves down, it pushes the front of the bellcrank down, causing the rear of the bellcrank to move top to front. The carrier rack is mounted on the top rear of the bellcrank. As the bellcrank rotates top to front, the rack disengages from the hear carrier tooth. As the selector dial moves down, it disengages its detent. When the detent is completely disengaged, the selector dial will contact the final stop. With the head carrier tooth removed from the rack and the detent removed from the selector dial, the selector dial is free to rotate.

Movement of the head carrier is accomplished through the selector gear, selector tape drum, and selector tape. The selector gear is setscrewed to the selector dial shaft and turns with the selector dial. The teeth on the selector tape drum mesh with the selector gear. Wrapped about the selector tape drum is the selector tape, which transfers motion to the head carrier. The head carrier is clamped to the selector tape, therefore, as the selector tape drum pays tape, the carrier moves. Each tooth in the rack corresponds to a number on the selector dial.

Once the selector dial reaches the desired location, the knob must be released. Without the downward pressure on the knob, the restoring spring can return the selector dial shaft, and selector bellcrank to rest. The head carrier tooth will seat in the appropriate rack tooth. The selector dial detent will engage between two selector dial teeth.

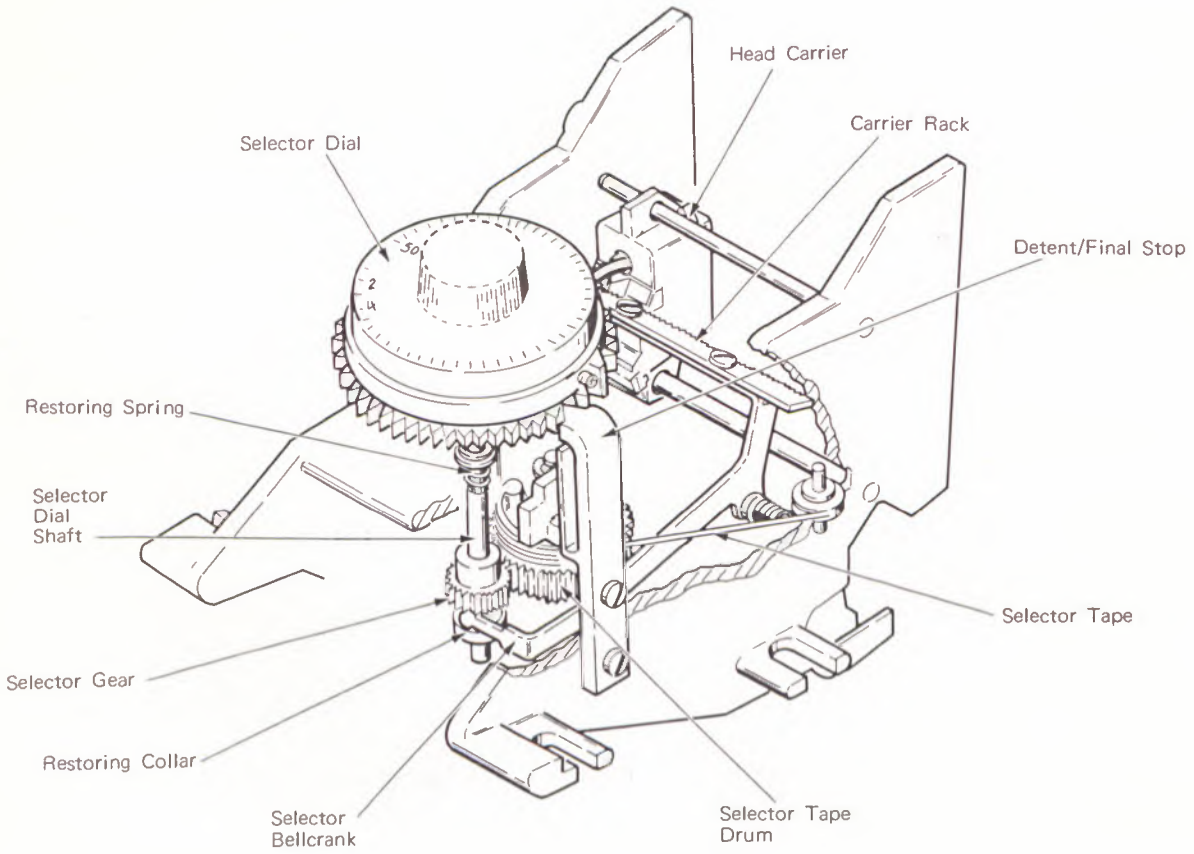


Figure 2–Track Selection

TAPE DRIVE

The tape is driven by a D.C. motor. The motor shaft extends across the tape loop casting (Figure 3). Drive is accomplished by the spring-loaded drive roller pressing the tape against the motor shaft. Because of the spring tension applied to the drive roller and the tape trapped between the driver roller and motor shaft, the tape and drive roller must rotate whenever the motor shaft rotates. One revolution of the tape requires approximately 3.75 seconds. The home position or stopping point is recognized through the use of a sensor. The tape has a transparent section 3.300 inches long which allows light from the sensor to pass through. When the transparent section of the tape is sensed, the electronics removes voltages from the motor.

The motor drives the tape at a constant speed of 12.438 inches per second. The speed of the motor is kept constant through the use of an emitter wheel and sensor. The emitter wheel is setscrewed to the motor shaft. As the emitter wheel rotates, the window section allows the light from the sensor to pass, which pulses the electronics. These pulses allow the electronics to monitor the speed of the motor, and maintain the 12.438 inch per second tape speed.

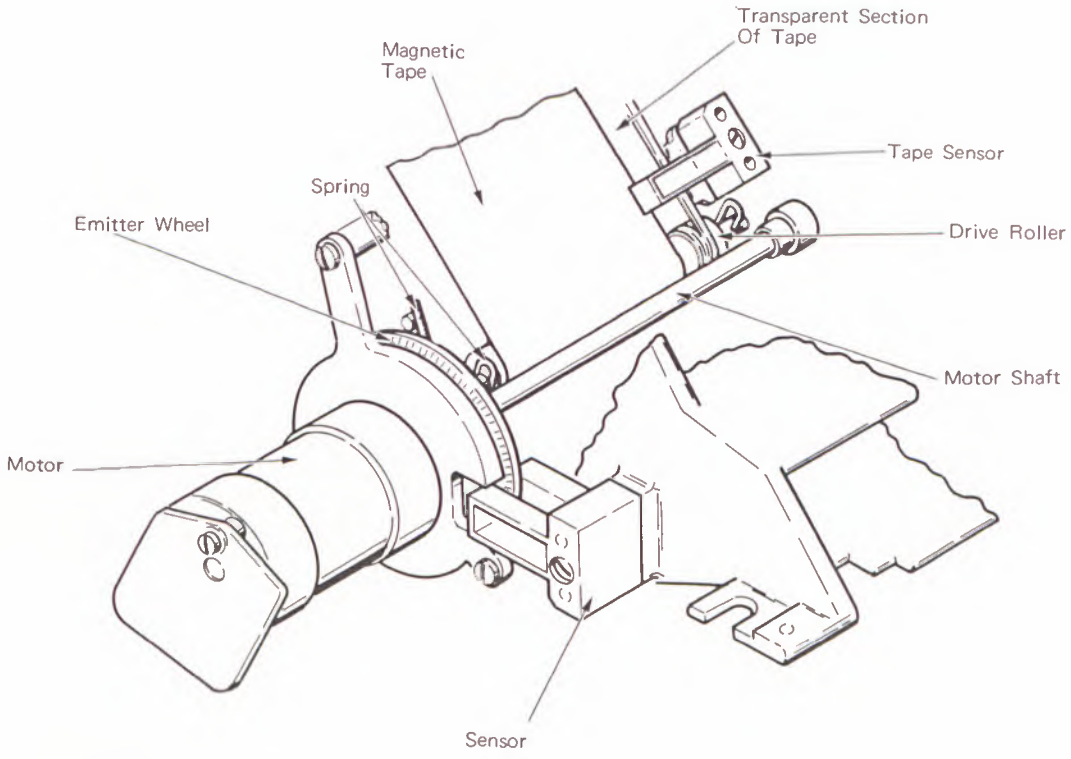
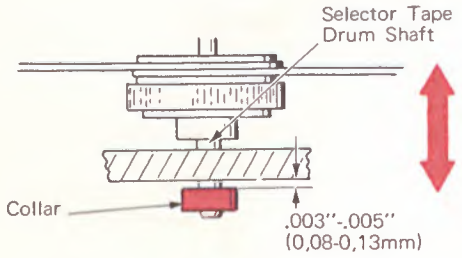


Figure 3–Tape Drive

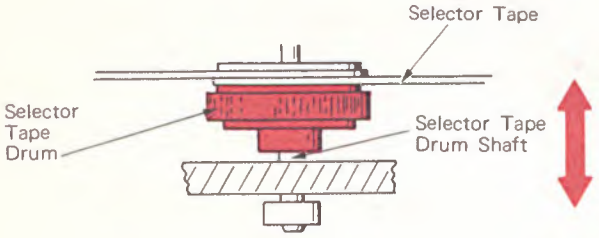
TAPE LOOP ADJUSTMENTS

1. *Selector Tape Drum Shaft End Play* – Position the collar on the selector tape drum shaft for .003"-.005" end play of the shaft.



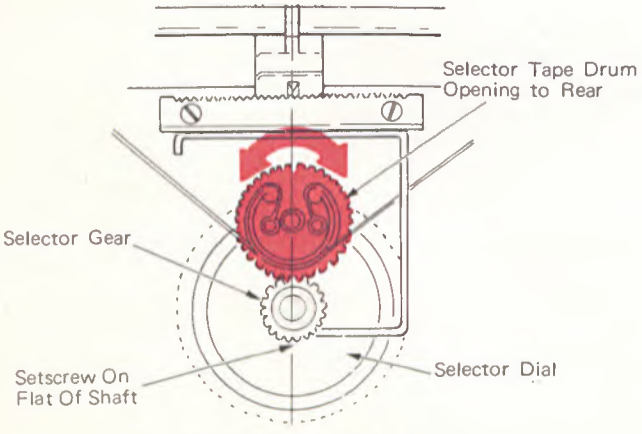
(Front View)

2. *Selector Tape Drum* – With its opening to the rear, position the selector tape drum up or down on its shaft so that the selector tape will not wrap upon itself when the drum is rotated 90 degrees in either direction.



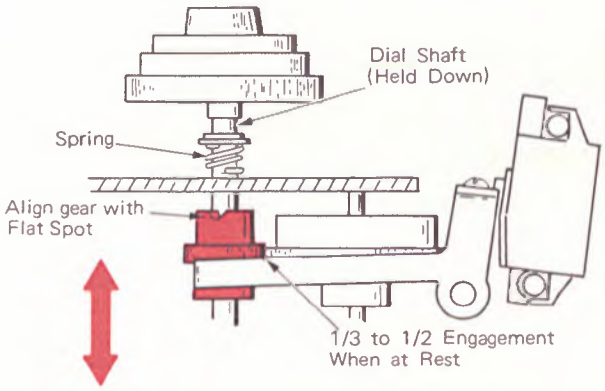
(Front View- Drum Opening To Rear)

3. *Selector Tape Drum Travel* – With the selector dial at 26, and the selector gear setscrew pointing towards the front of the machine, the selector drum opening should be facing the rear of the machine. Disengage the selector gear from the drum gear and rotate the drum gear to achieve this condition. Keep the selector gear setscrew on the flat of the shaft.

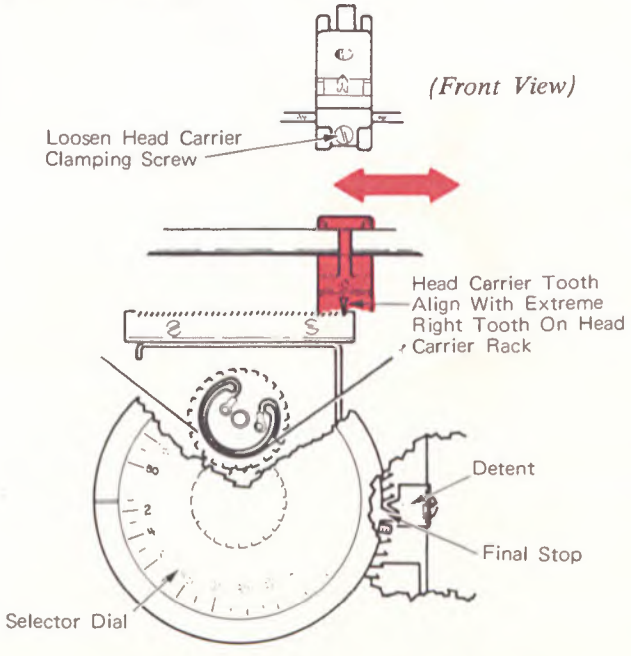


(Top Front View - Dial At 26)

4. *Dial Shaft Spring Force* – With the dial shaft held down, align the top of the selector gear with the top of the flat spot on the dial shaft and tighten in place. NOTE: Refine the adjustment of the drum gear for 1/3 to 1/2 engagement of the selector gear at rest.

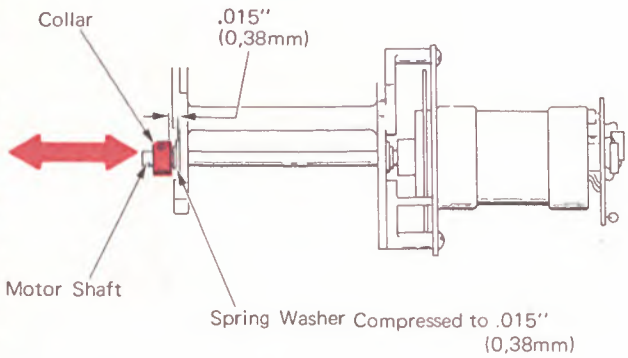


5. *Head Carrier* – With the selector dial rotated counterclockwise against its stop (Position 1), loosen the head carrier clamping screw and align the head carrier tooth with the extreme right tooth on the head carrier rack. Then tighten the clamping screw. Check this adjustment in the center and on the left end of the rack and refine as necessary.



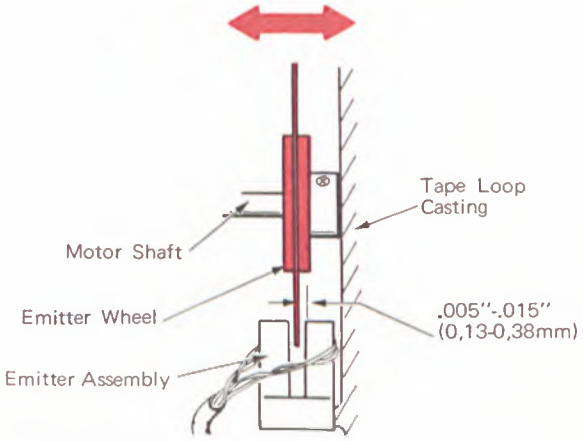
(Top View - Selector Dial At 1)

6. *Motor Shaft End Play* – With the motor shaft held towards the collar, adjust the collar left or right so that the spring washer is held compressed to .015".



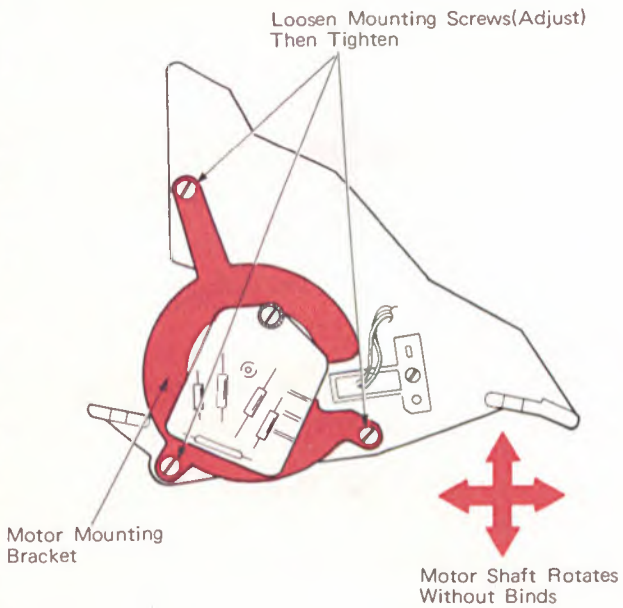
(Rear View)

8. *Emitter Wheel* – Position the emitter wheel on the motor shaft to obtain a .005"-.015" clearance between the emitter wheel and the portion of the emitter assembly closest to the tape loop casting. This adjustment should be checked through one complete revolution of the emitter wheel.



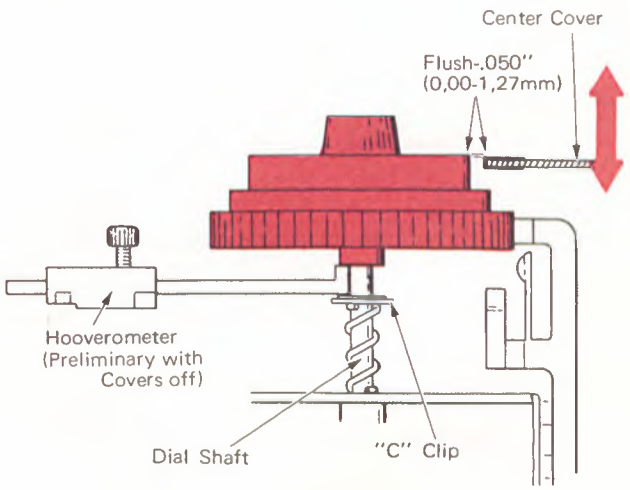
(Top View)

7. *Motor Mounting Bracket* – Loosen the three mounting screws and adjust the mounting bracket to allow the motor shaft to rotate without binds.

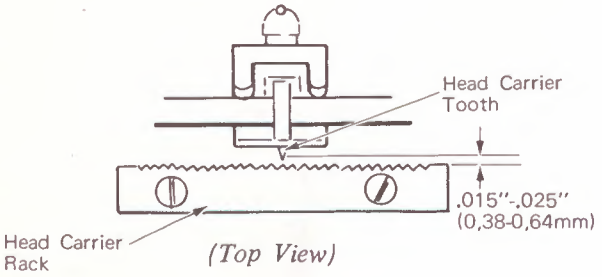


(Left Side View)

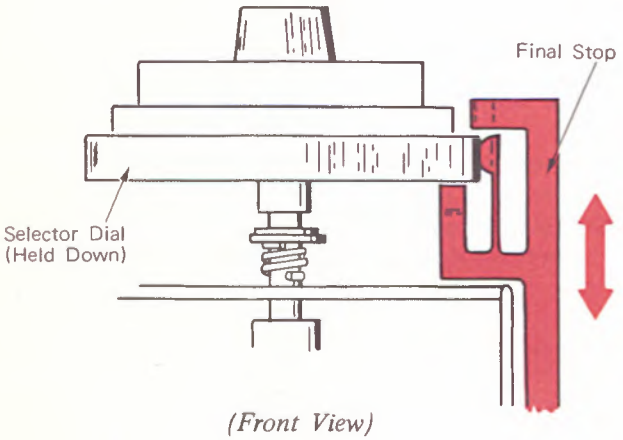
9. *Selector Dial Height* – When the cover is installed, the numbered face of the dial should be flush to .050" above the opening in the center cover. An approximate adjustment can be made with the cover off by loosening the setscrew and trapping the blade of the Hooverometer between the dial and the "C" clip on the dial shaft, then tightening the setscrew.



10. *Detent/Final Stop* – Adjust the stop up or down so that the head carrier track clears the head carrier tooth by .015"-.025" when the selector dial is held down against the final stop.

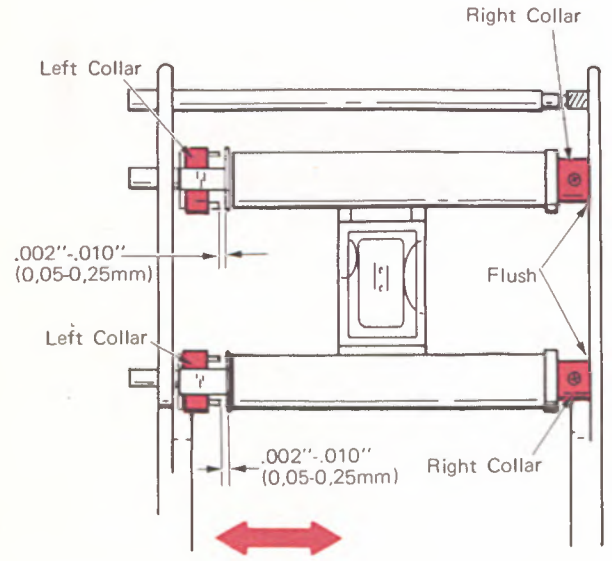


(Top View)

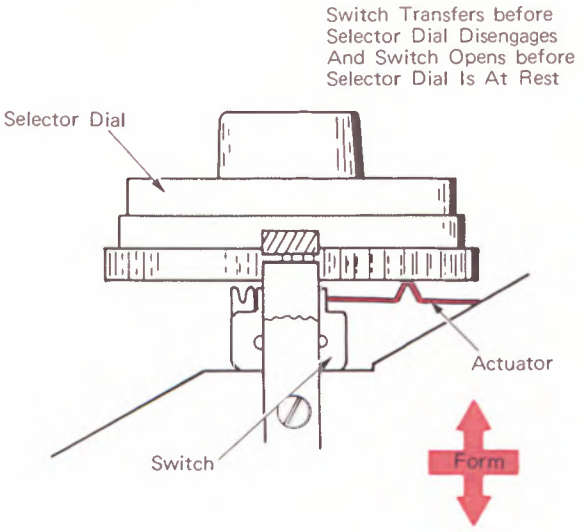


(Front View)

11. *Guide Roller End Play* – First, position the right collars against the casting. Then, adjust the left collars to obtain .002"-.010" end play of the guide rollers.

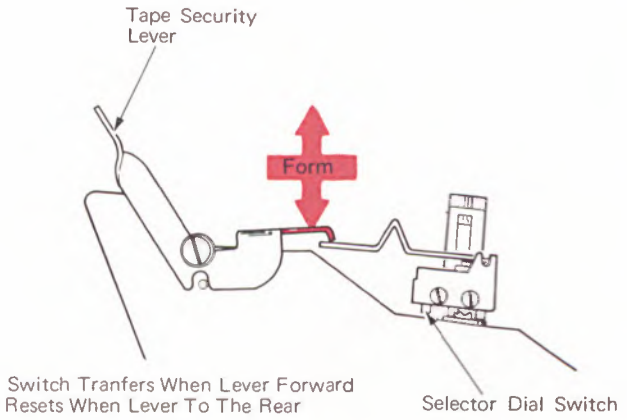


12. *Selector Dial Switch* – Form the actuator so the switch transfers just before the selector dial disengages the detent. Check to make sure that the switch opens before the selector dial returns to rest.



(Right Side View)

13. *Tape Security Lever* – Form the tape security lever so the selector dial switch will transfer when the lever is forward and will reset when the lever is to the rear.



(Left Side View)

REMOVALS

This section contains removal procedures for major parts and assemblies. The drawings in the Parts Catalog should be used when more detailed removal or assembly information is required.

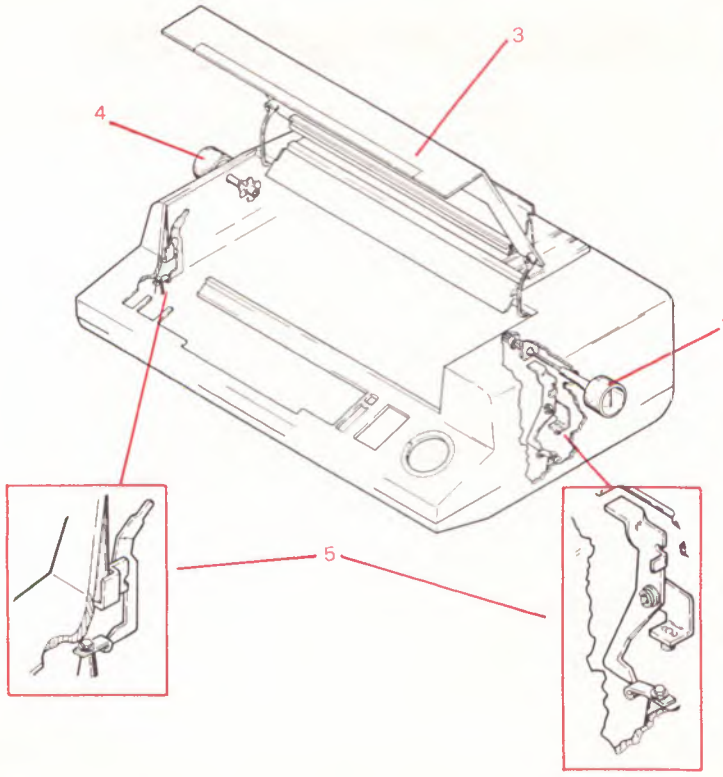
Parts in the illustration accompanying the removal procedure are numbered with reference to the removal sequence. Some removals refer to certain steps of a previous removal procedure to eliminate producing duplicate information. (Refer to the Removal Contents).

The procedures in this section reflect the most direct method of removal or replacement. Some individuals may find one method superior to another, however, these procedures should be used as a guide to supplement individual service techniques.

REMOVAL CONTENTS

I/O COVER REMOVAL

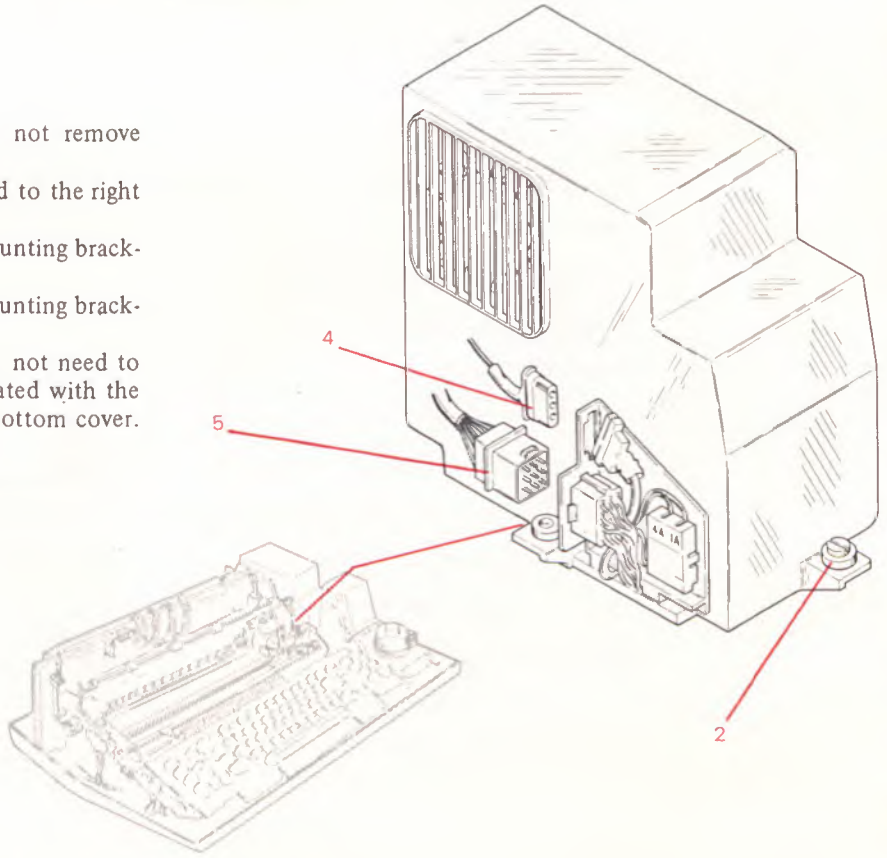
1. Position carrier near the center.
2. Move the margin stop away from carrier.
3. Raise the top cover along with the acoustical filter hood.
4. Pull the right and left platen knobs straight out until they seat themselves in their supporting brackets.
5. Pivot the left latch lever toward the front of the machine and the right latch lever to the right.
6. Latch the margin lever and carrier pointer up.
7. Lift the top and center cover assembly off the machine.



POWER SUPPLY REMOVAL

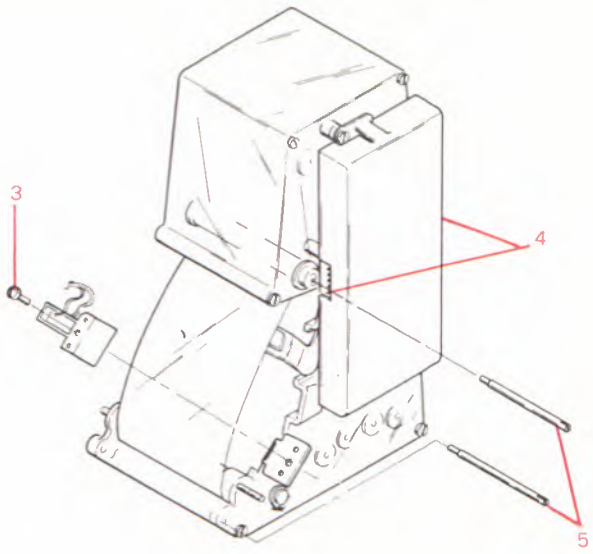
1. Perform cover removal.
2. Unscrew the front mounting screw. Do not remove from rubber mount.
3. Power supply can be lifted straight up and to the right out of the bottom cover.
4. Disconnect the AC connector from the mounting bracket.
5. Disconnect the DC connector from the mounting bracket.

   NOTE: The power supply connectors do not need to be removed if the machine is to be operated with the power supply sitting to the right of the bottom cover.



TAPE LOOP CARTRIDGE REMOVAL

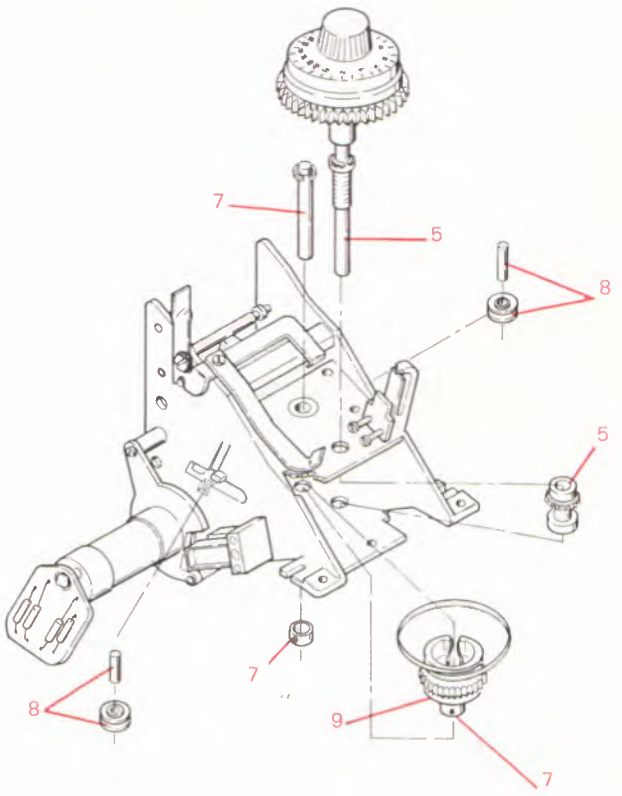
1. Perform cover removal.
2. Perform tape loop assembly removal.
3. Remove LED mounting screw from right side of cartridge and slide LED from tape carefully.
4. Disconnect read/record head leads and planar leads from board "O".
5. Remove the two cartridge mounting screws.
6. Remove cartridge assembly from casting.
   NOTE: When replacing cartridge, make sure spring rails are in proper position on the guide rollers.



SELECTOR TAPE REMOVAL AND REPLACEMENT

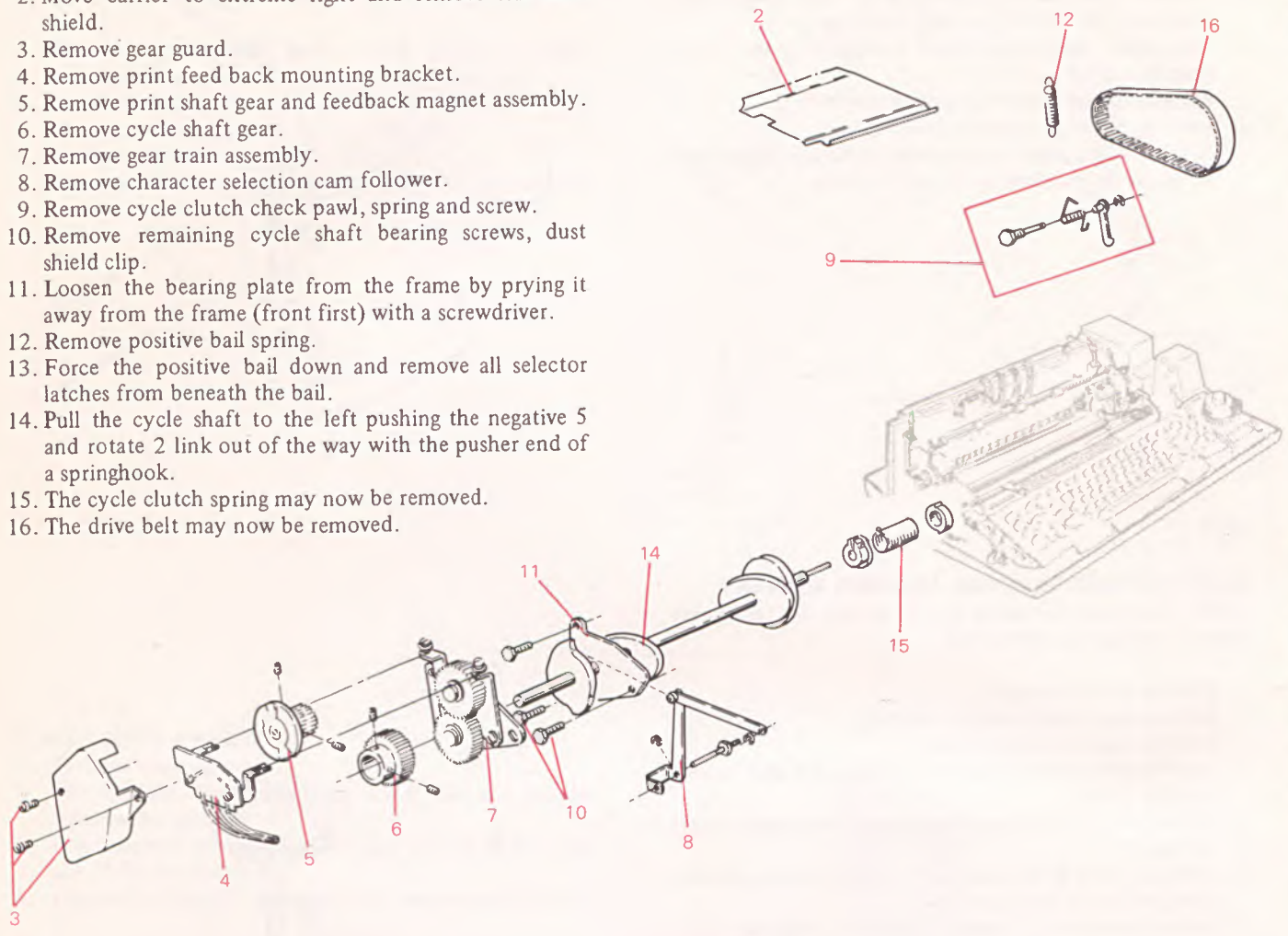
NOTE: Care must be taken not to scratch the tape guide rollers or damage the spring rails.

1. Perform cover removal.
2. Perform tape loop assembly removal.
3. Perform tape cartridge removal.
4. Remove the terminal block mounting screw and remove terminal block.
5. Loosen selector gear setscrew and remove selector shaft and gear.
6. Remove screw from head carrier that attaches selector tape and release selector tape.
7. Loosen setscrews in selector drum and selector drum shaft collar and remove drum shaft and collar.
8. Remove corner pulleys and pins.
9. Remove selector drum and selector tape.
10. TO REPLACE TAPE ON SELECTOR DRUM.
    A. Hold selector drum with opening up and facing you.
    B. Attach one end of tape to stud on right.
    C. Wrap tape counterclockwise around selector drum twice.
       (1) First revolution uses lower part of drum.
       (2) Second revolution uses upper part of drum.
    D. Attach other end of tape on left stud.
    E. Pull tape that covers drum opening toward you.
    F. Tape may be secured to drum with transparent tape on side opposite opening.
11. Install the selector drum through the front of the casting, threading the selector tape over the track step rack.
12. Install selector shaft and collar.
13. Wrap selector tape around left corner pulley and install pin.
14. Place right hand corner pulley on tape and maintain tape tension.
15. Remove transparent tape from drum and push corner pulley through frame and install pin.



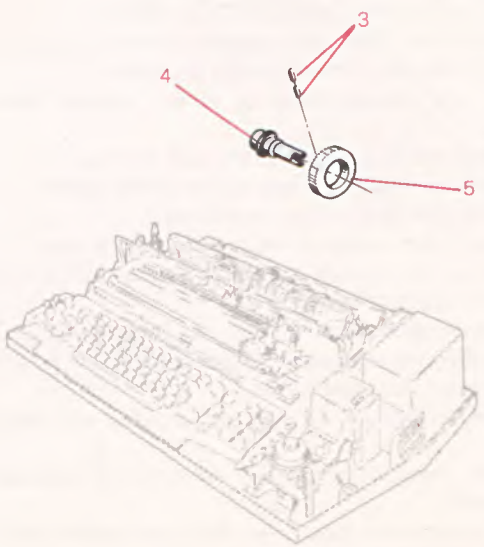
CYCLE SHAFT, CYCLE CLUTCH AND DRIVE BELT REMOVAL

1. Perform cover removal.
2. Move carrier to extreme right and remove left dust shield.
3. Remove gear guard.
4. Remove print feed back mounting bracket.
5. Remove print shaft gear and feedback magnet assembly.
6. Remove cycle shaft gear.
7. Remove gear train assembly.
8. Remove character selection cam follower.
9. Remove cycle clutch check pawl, spring and screw.
10. Remove remaining cycle shaft bearing screws, dust shield clip.
11. Loosen the bearing plate from the frame by prying it away from the frame (front first) with a screwdriver.
12. Remove positive bail spring.
13. Force the positive bail down and remove all selector latches from beneath the bail.
14. Pull the cycle shaft to the left pushing the negative 5 and rotate 2 link out of the way with the pusher end of a springhook.
15. The cycle clutch spring may now be removed.
16. The drive belt may now be removed.



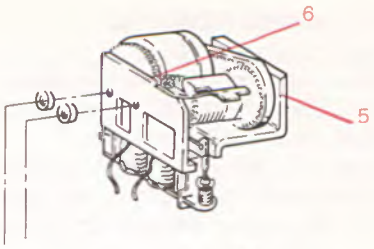
CYCLE CLUTCH PULLEY REMOVAL

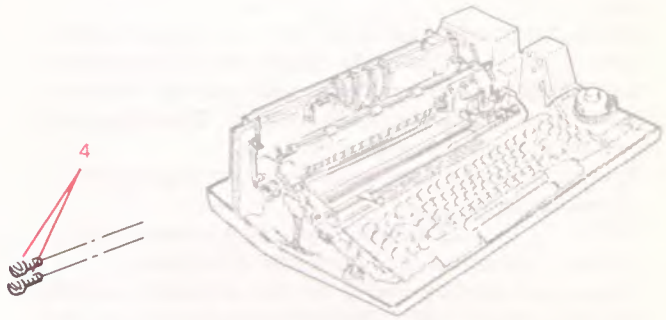
1. Perform the cover removal.
2. Perform the cycle shaft, cycle clutch and drive belt removal.
3. Remove the two setscrews from the cycle clutch pulley. (One is on top of the other)
4. Slide cycle clutch pulley hub out to the left.
5. Lift out the cycle clutch pulley.



LEADSCREW DRIVE AND BACKSPACE REMOVAL

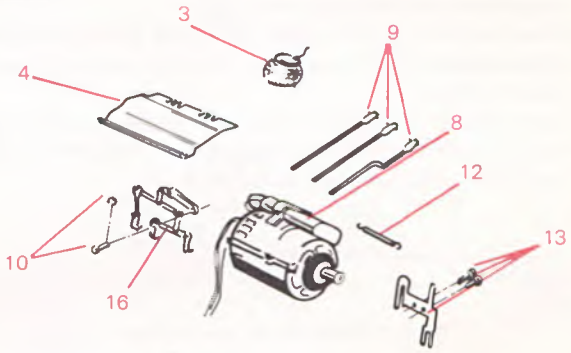
1. Perform cover removal.
2. Perform planar package removal.
3. Disconnect backspace magnet wires on D edge connector.
4. Remove mounting screws.
5. Remove leadscrew drive belt from motor pulley.
6. Remove complete leadscrew drive and backspace assembly.

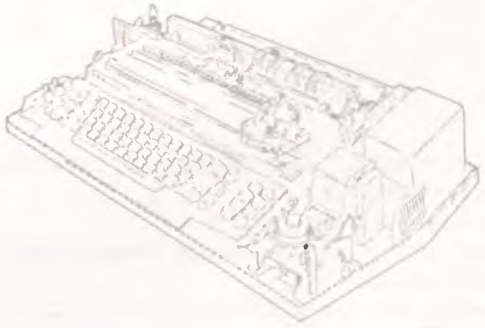


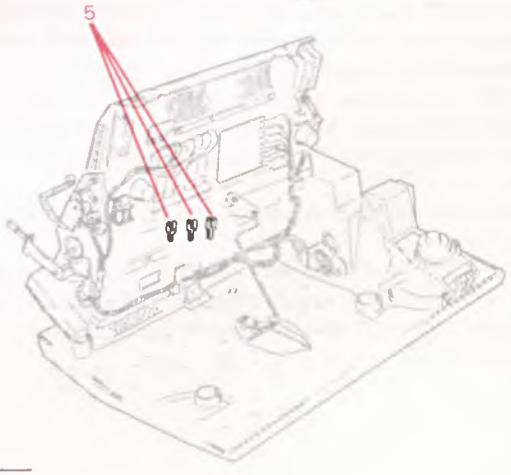


ROTATE SELECTION LATCH REMOVAL

1. Perform cover removal.
2. Perform planar package removal.
3. Remove typehead.
4. Position carrier at extreme right side and remove left dust shield.
5. Disconnect positive rotate latch links from selection interposer assembly and remove the clevises from the links.
6. Remove the latch springs from the positive rotate latches.
7. Perform leadscrew drive and backspace removal.
8. Remove motor
9. Remove latch links through the rear of the machine.
10. Remove the balance arm mounting stud.
11. Rotate the cycle shaft to its half cycle position and remove rotate latches from under the bail.
12. Remove the tilt differential spring.
13. Remove the rotate latch guide bracket.
14. Disconnect the rotate link from rotate bellcrank.
15. Disconnect the negative 5 bail link from the right end of the balance arm.
16. Remove the rotate latch assembly.







CENTER BEARING REMOVAL

1. Perform cover removal.
2. Perform cycle shaft removal procedure.
3. Perform the cycle clutch pulley removal procedure.
4. Remove the cycle clutch latch.
5. Perform the operational shaft removal procedure, sliding the operational shaft to the right far enough to remove the torque limiter; carrier return and tab pinions.
6. Install the bearing tool as shown in a. Gauge the position of the worn bearing by placing the Hooverometer foot against the power frame and slide the Hooverometer head against the bearing pusher. This setting will be used to reposition the new bearing.
7. By tightening the bolt, push the worn bearing out of the power frame.
   NOTE: If the cup turns, a tool can be inserted in the hole near the end of the cup to hold it stationary.
8. Using a new bearing, install the tool as shown in b with the tool "finger" tight. Align the lubrication hole in the new bearing so it will line up with the hole in the power frame when the bearing is installed.
9. Press the new bearing into the power frame until the Hooverometer just spans the distance originally measured in Step 6, a.
10. Re-assemble the machine. Be sure to check cycle shaft end play as it may have changed with the new bearing and cycle shaft assembly installed.

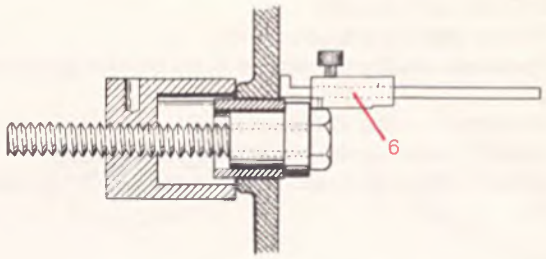


Figure A

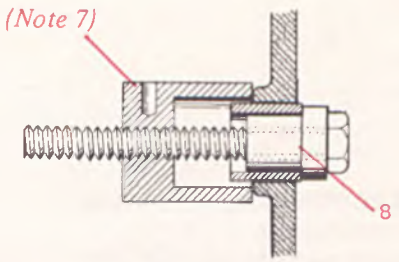
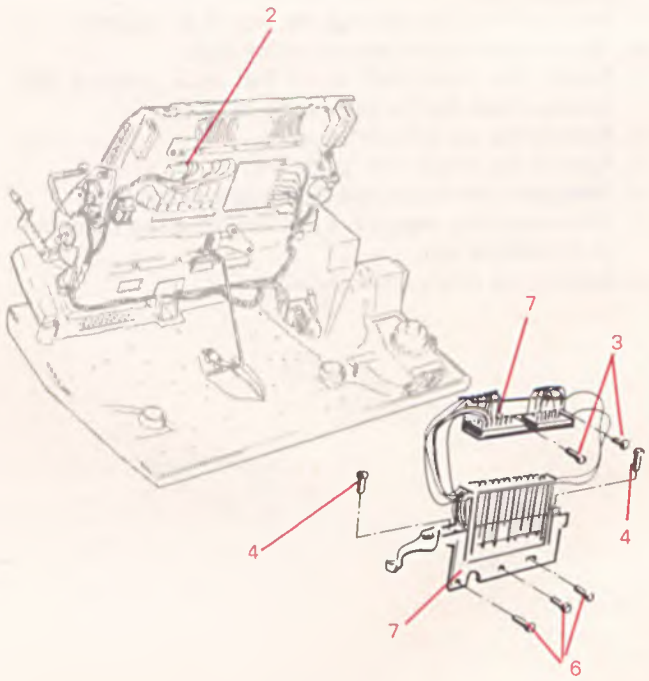


Figure B

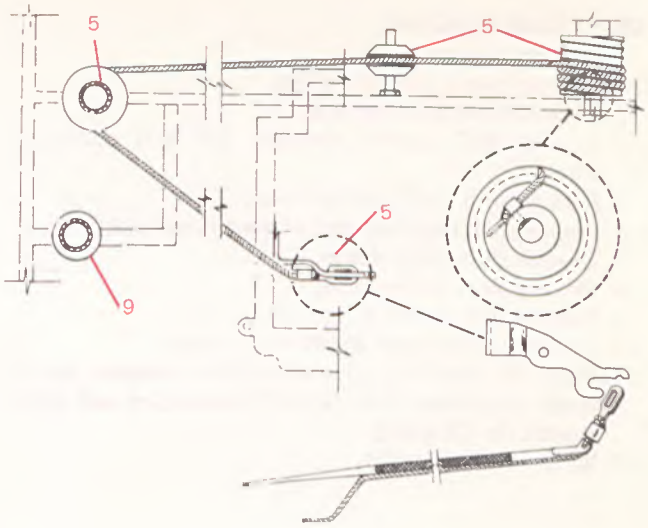
SELECTION MAGNET AND SELECTION INTERPOSER ASSEMBLY REMOVAL

1. Perform cover removal.
2. Remove cable wires from magnet assembly edge connectors if necessary.
3. Remove the T.B. bracket mounting screws.
4. See note. Remove two screws that mount the magnet assembly onto the section interposer assembly and remove selection magnet.
   NOTE: To remove selection interposer assembly, the magnet and interposer bracket should be removed as a unit. Disregard step 4 and continue with the following steps.
5. Disconnect tilt and rotate latch links from interposer assembly.
6. Remove the three interposer assembly mounting screws.
7. Remove the magnet and interposer bracket assembly.
8. Perform step 4 to remove magnet assembly from interposer assembly.

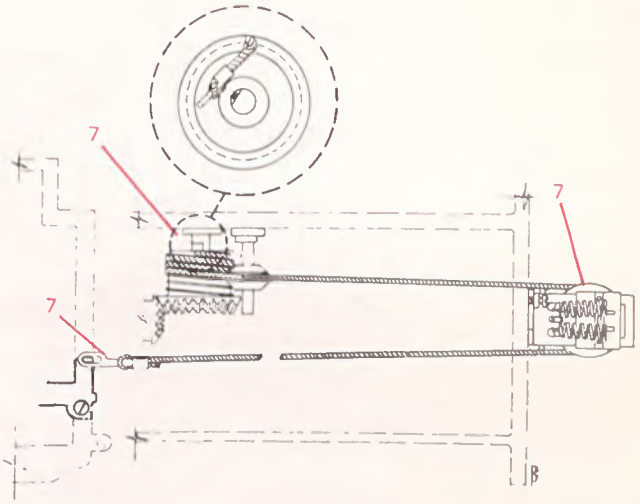


CORD REPLACEMENT

1. Perform cover removal.
2. Remove dust shields.
3. Remove both cords and hand cycle the machine.
4. With the carrier to the extreme right, hand cycle a carrier return while counting escapement shaft revolutions until the mainspring is wound 4 2/3 to 5 1/3 turns.
5. Connect the carrier return cord to the carrier return cord drum, position cord to the left over the idler pulley, around the left rear corner pulley and connect to the carrier using scissor clamps or the pusher end of a spring hook.
6. Hold the slack out of the carrier return cord and rotate the turning wheel until the carrier approaches the left side frame. Stop hand cycling when the notch in the escapement cord drum is visible.
7. Connect the escapement cord to the escapement cord drum and wrap approximately one turn of the cord around the drum.
8. Thread the cord around the cord tension pulley and connect it to the carrier.
9. Pull the carrier return cord over the left front corner pulley.



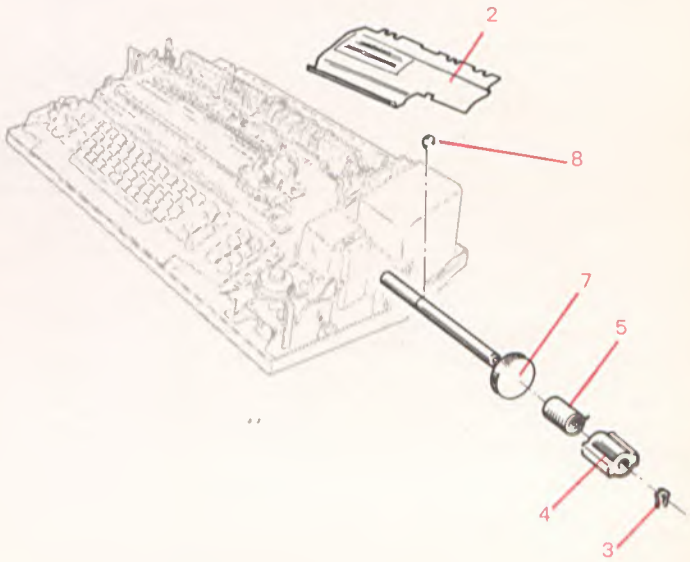
(Top View)



(Top View)

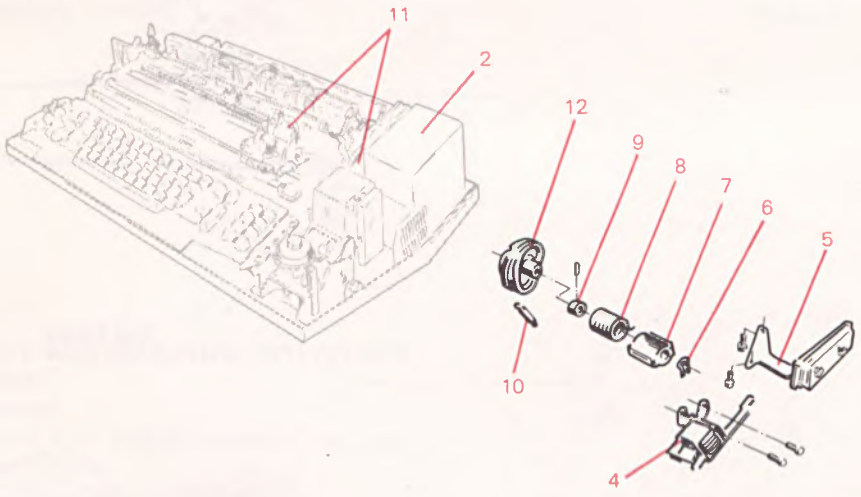
OPERATIONAL SHAFT REMOVAL

1. Perform cover removal.
2. Remove the right dust shield.
3. Remove grip ring from end of operational shaft.
4. Release shift clutch sleeve, rotate clutch until shunts on sleeve are horizontal and remove sleeve.
5. Remove shift clutch spring.
6. Loosen all setscrews on the operational shaft except those in the shift clutch arbor.
7. Install hand cycling wheel and extension.
8. Pull the operational shaft 1/4 inch to the right and remove the retainer clip just to the right of the carrier return pinion gear.
9. Pull operational shaft out through the right shift bearing.



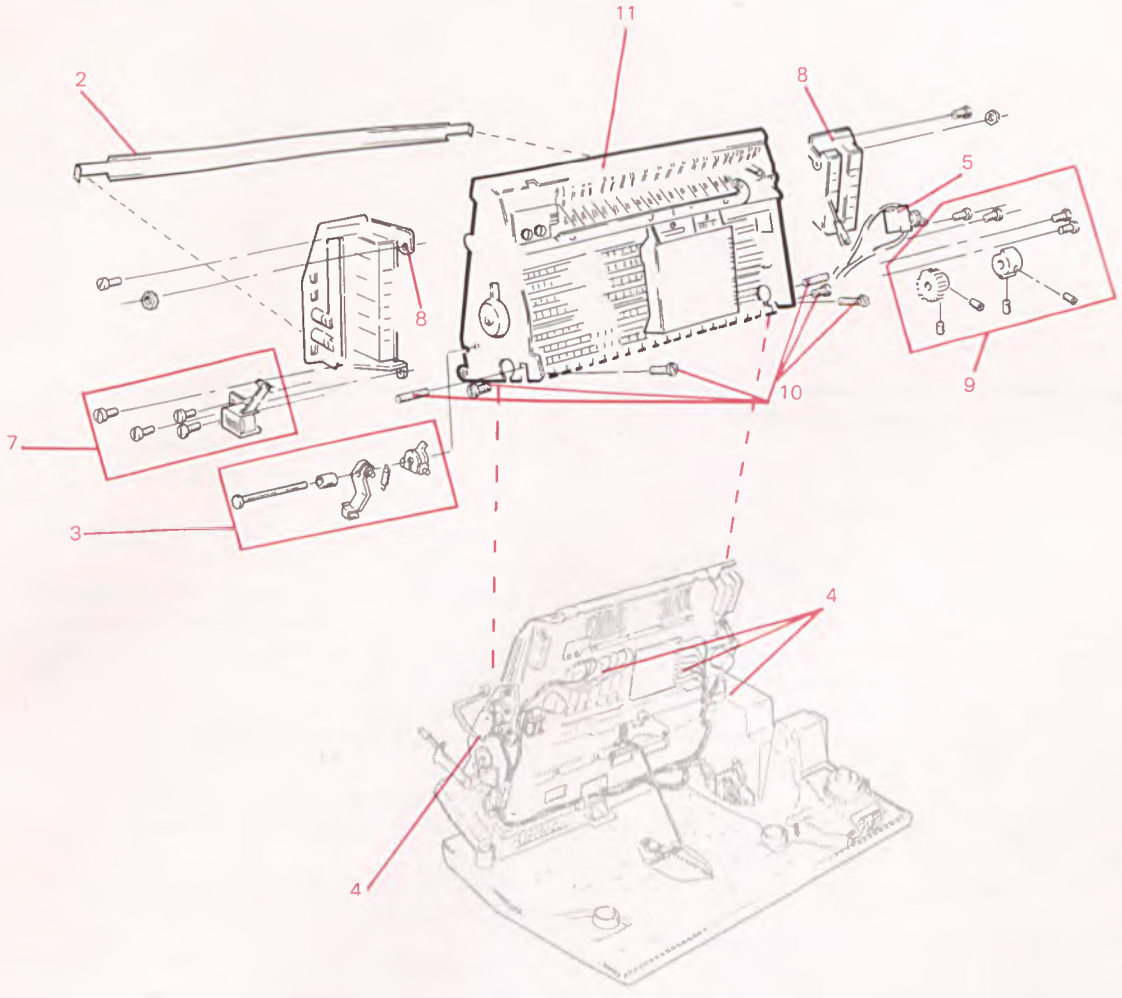
SHIFT CAM REMOVAL

1. Perform cover removal.
2. Perform power supply removal.
3. Place machine in lower case.
4. Remove shift magnet assembly. DO NOT disconnect wires.
5. Remove shift feedback switch bracket.
6. Remove grip ring from end of operational shaft.
7. Remove shift shunt sleeve.
8. Remove shift clutch spring.
9. Remove shift clutch arbor.
10. Disconnect shift cam detent roller spring.
11. Turn the typehead counterclockwise, remove the relaxed rotate tape from the shift arm pulley and pull it around the tilt pulley.
12. Remove the shift cam.



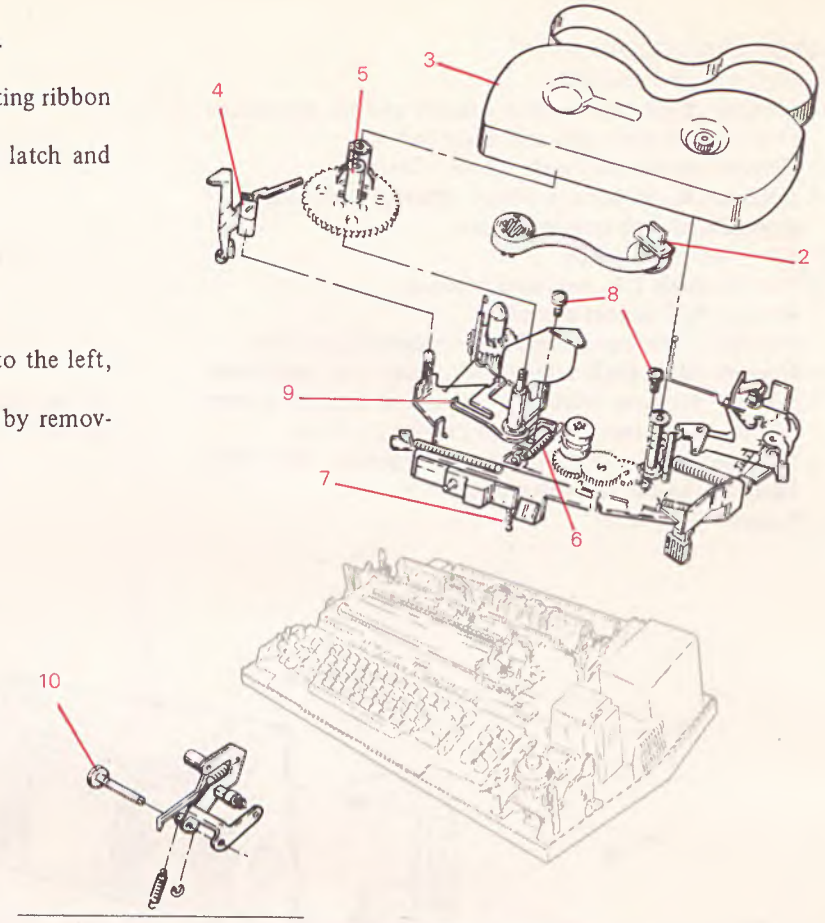
KEYBOARD REMOVAL

1. Perform cover removal.
2. Remove membrane support bracket and the membrane from around the access and mode buttons.
3. Remove margin release shaft and bellcranks.
4. Remove wires from transmit board, keyboard shift mode switch, tab set/clear board.
5. Remove on/off switch.
6. Remove A&B T.B. mounting bracket.
7. Remove bell magnet assembly.
8. Remove access and mode button mounting brackets.
9. Remove filter shaft release link, drive gear, and check ratchet. Remove idler gear mounting bracket screws (the idler gear assembly remains in the machine).
10. Remove the four keyboard mounting screws, filter shaft bearings and the two roll pins.
11. Remove keyboard.



SELECTIVE RIBBON MECHANISM REMOVAL

1. Perform cover removal.
2. Remove correcting ribbon, return the correcting ribbon load lever.
3. Remove ribbon cartridge, release load lever latch and restore load lever.
4. Remove end of ribbon inhibitor and spring.
5. Remove supply spool.
6. Remove wobble spring.
7. Remove ribbon lift spring.
8. Remove ribbon plate mounting screws.
9. While holding the correcting feed bellcrank to the left, pull ribbon plate forward and lift off.
10. Remove ribbon cam follower and feed pawl by removing the pivot pin.



ROTATE TAPE REMOVAL AND REPLACEMENT

1. Perform cover removal.
2. Remove dust shields.
3. Position carrier approximately 6 inches from left side frame.
4. With element installed, half cycle an upper case zero rotate, tilt two character. (T)
5. Withdraw the detents and turn the typehead one complete turn counterclockwise or until the "T" slot is in the front of the rocker. Allow the detents to restore.
6. Remove the tape from the rotate pulley.
7. Raise the tape anchor screw and remove the rotate tape.
8. **When replacing a broken tape,** half cycle a zero rotate, tilt two character.
9. Withdraw the detents, turning the typehead, wind up the rotate spring approximately 3 1/2 turns or until the "T" slot is in the front of the rocker after the third turn.
10. Raise the tape anchor screw and install the rotate tape below the tilt tape.
11. Thread the tape around the shift arm pulley, under the carrier return cord, around the rotate arm pulley, through the left end of the rocker pivot shaft, under the plastic guard on the tape guide, around the rotate pulley and insert the "T" end into the rotate pulley "T" slot.

    NOTE: It will be necessary to put a twist in the rotate tape between the rotate arm pulley and the rocker pivot shaft. Twist the tape so that when the rocker is in print position, the twist is at a maximum. The top of the tape should be to the front when coming out of the rocker shaft.
12. Hold the typehead and withdraw the detents, allowing the rotate spring to slowly wind up the tape.

TILT TAPE REMOVAL AND REPLACEMENT

1. Perform cover removal.
2. Position carrier three inches from the left side frame.
3. Half cycle a zero rotate, zero tilt character. (Z)
4. Withdraw the detents, rotate the typehead counterclockwise one rotate position, tilt the typehead to the three tilt position, allow the detents to reseat.
5. Remove the tape from tilt bellcrank.
6. Raise the tape anchor screw and remove the tilt tape. (Do not allow the rotate tape to relax.)
7. **Replacing a broken tilt tape,** remove tape from tilt bellcrank.
8. Riase the tape anchor screw and install the tilt tape above the rotate tape. (Do not allow the rotate tape to relax.)
9. Thread the tilt tape around the right tilt pulley, under the escapement bracket, and around the left tilt arm pulley.
10. Insert the tilt tape through the left end of the rocker pivot shaft and install the tilt tape on the tilt bellcrank.
11. Hold the typehead, withdraw the detents and slowly allow the typehead to return to home, while ensuring both the tilt and rotate tapes are positioned on their respective pulleys.