IBM®
International Business Machines Corporation
Office Products Division
Customer Engineering

Electronic Typewriter

Expanded Theory And Diagnostics

S241-6235-2

IBM Electronic Typewriter 50
IBM Electronic Typewriter 60
IBM Electronic Typewriter 75

Printed In USA (Revised) March, 1981

CONTENTS
(Alphabetical)

INTRODUCTION

This Expanded Theory and Diagnostic Manual is designed to help the CE attain a better understanding of the Electronic 50/60/75 Typewriters. It is to be used in conjunction with these other service publications:

- APM (F/N S241-6057)
- Service Manual (F/N S241-6056)
- Call Prevention Check (F/N Z241-6317)
- CSI (F/N S241-6307)
- CEMs

To help understand the overall machine operation and attain a better diagnostic approach, it is important to keep in mind that the Electronic Typewriter is basically divided into three units:

1	2	3
KEYBOARD	ELECTRONICS	PRINTER

KEYBOARD: The keyboard is the command unit of the machine. It tells the electronics what operations to perform.

ELECTRONICS: The electronics (logic) includes the logic board on the Models 50/60 and the driver board and processor board on the Model 75. The electronics receives signals from the keyboard and sends out instructions for printing and other operations.

PRINTER: The printer includes the mechanical parts of the machine (carrier, power module, leadscrew, and paper feed mechanism, etc.) It receives commands from the electronics and then sends feedback signals back to the electronics.

This manual is organized into two sections:

Section 1 – Diagnostics
Section 2 – Expanded Theory

Section 1 – Diagnostics – This section includes the Entry Diagnostic Chart and all other available diagnostic charts for the 50/60/75. The purpose of the Entry Diagnostic Chart is to allow the CE to categorize a machine's failure with those included in the failure column. The corresponding "diagnostic" lists the available diagnostic, service tips, etc., to aid in repairing the failure.

Section 2 – Expanded Theory – This section includes additional information (expanded theory) on keyboard, escapement, print feedback, print shaft cycle clutch, shift, index and character selection adjustments. These sections contain operational theory (to be used in conjunction with the Service Manual), failure modes, diagnostics and service tips.

This information should be thoroughly understood by the CE and used as reference material to help resolve machine failures.

Also included in this section are function charts. The purpose of these charts is to provide a sequence of events of the machine operation. These function charts are based on the concept of dividing the machine into three units: keyboard, logic, and printer. There is one chart for a keyboard operation and six for the printer operations. With these basic charts, the CE should have a thorough understanding of the interrelationship between the mechanical, electro-mechanical and electronic components of the machine.

NOTE: The function charts are read from top to bottom. Included in the right hand column is a written description of "what" action is taking place. A complete listing of all of the symbols used in the function charts is available in General Administrative CEM No. 4.

ENTRY DIAGNOSTIC CHART

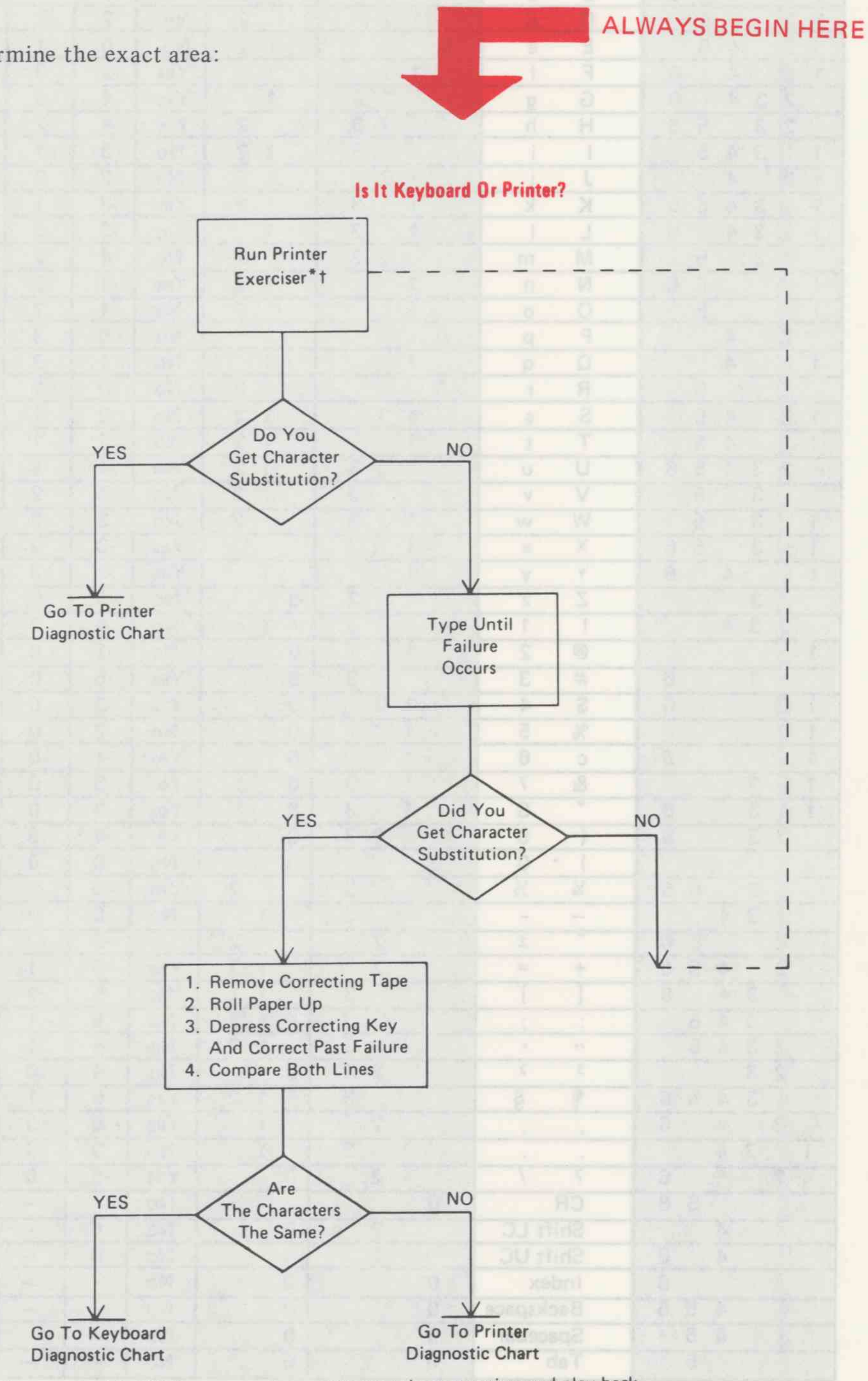
Failure	Diagnostic
Escapement Failures	See Escapement Service Tips Page 25 Escapement Diagnostic Chart
Character Substitution	Begin with the Character Substitution Isolation Chart
Correction Shadows	See the Incomplete Lift Off Chart Page 9
System Busy (Intermittent 75)	Check PFB Extra cycles of PSCC Escapement Diagnostic Chart
Shift	See Shift Section Page 26
Splitting Characters	Check/Adjust/Etc.: Excessive Typehead Play Typehead Homing Pin Block (Left to Right) Loose Print Shaft Belt or PSCC Arbor Adj. PSCC Restore Cam to Low End [.020" (0.51 mm)] Lubricate the PSCC
Index	50/60 – Ensure all adjustments are per APM 75 – See Index Section Page 28
Carrier Returns to "0" and advances to Left Margin while typing	Check P1 and P2 Reeds 50/60 – Check POR Reed.
Model 75 Returns to "0", then advances to Previous Position	POR Reed
Extra Characters	Extra Cycles of Keyboard Clutch Insufficient Filter Bail Drive See Keyboard Section Page 12
Blank Spaces e.g., TH T for THAT	Check Velocity Extra Cycles of PSCC Check PFB

CHARACTER SUBSTITUTION ISOLATION CHART

When experiencing Character Substitution problems, it is IMPORTANT to begin by isolating the problem area BEFORE any parts are replaced in the machine.

It must be decided whether the problem is in the printer or in the keyboard before adjusting or replacing a component.

Use the chart below to determine the exact area:



*On the Models 60/75 you may store your own printer exerciser and play back automatically. It is best to enter one line using the suspected failing characters.
†If playout stops on the Model 75, go to the printer exerciser flow chart.

BEFORE ADJUSTING OR REPLACING A COMPONENT, ENSURE THAT THE FAILURE HAS BEEN ISOLATED TO THE KEYBOARD OR PRINTER.

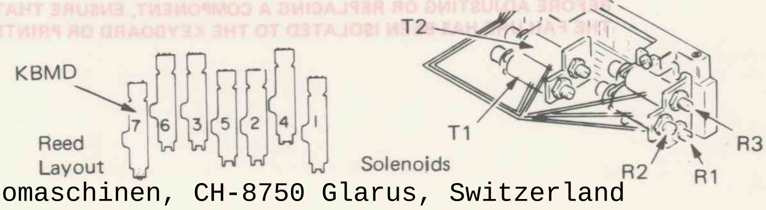
COMBINATION CHART

KEYBOARD REEDS (ACTIVE)	CHARACTER		PRINTER SOLENOIDS (ACTIVE) ROTATE	TILT	RK	PINS ROT	TIL	VEL
1 2 5 6	A	a	1 2	2	Yes	-2	2	H/M
1 2 4 5 6	B	b	1 2	1 2	Yes	-2	1	H/H
1 4 5 6	C	c	1	1 2	Yes	-1	1	H/M
1 2 5	D	d	1 2	2	No	2	2	H/H
2 4 5	E	e	0	1 2	No	0	1	H/M
1 2 4 6	F	f	1 2	1	Yes	-2	3	H/M
2 3 4 6	G	g	2 3	1	Yes	-4	3	H/H
2 3 5 6	H	h	2 3	2	Yes	-4	2	H/H
1 3 4 5	I	i	1 3	1 2	No	3	1	M/M
1 2 4	J	j	1 2	1	No	2	3	M/M
1 3 4 5 6	K	k	1 3	1 2	Yes	-3	1	H/H
1 3 4 6	L	l	1 3	1	Yes	-3	3	H/M
2 3 5	M	m	2 3	2	No	4	2	H/H
1 5 6	N	n	1	2	Yes	-1	2	H/M
1 5	O	o	1	2	No	1	2	H/M
2 4	P	p	0	1	No	0	3	H/H
1 4	Q	q	1	1	No	1	3	H/H
2 5	R	r	0	2	No	0	2	H/M
1 2 4 5	S	s	1 2	1 2	No	2	1	H/M
1 4 5	T	t	1	1 2	No	1	1	H/M
2 3 4 5 6	U	u	2 3	1 2	Yes	-4	1	H/H
3 5	V	v	3	2	No	5	2	H/M
1 3 5	W	w	1 3	2	No	3	2	H/H
1 3 5 6	X	x	1 3	2	Yes	-3	2	H/M
1 4 6	Y	y	1	1	Yes	-1	3	H/H
3	Z	z	3	0	No	5	0	H/M
2 3 4	!	1	2 3	1	No	4	3	L/M
1	@	2	1	0	No	1	0	H/M
3 6	#	3	3	0	Yes	-5	0	H/H
1 2 6	$	4	1 2	0	Yes	-2	0	H/H
1 2	%	5	1 2	0	No	2	0	H/H
1 6	c	6	1	0	Yes	-1	0	M/H
1 3	&	7	1 3	0	No	3	0	H/M
1 3 6	*	8	1 3	0	Yes	-3	0	M/H
2 3 6	(	9	2 3	0	Yes	-4	0	M/H
2	) ·	0	0	0	No	0	0	M/H
3 5 6	¼	½	3	2	Yes	-5	2	H/H
3 4	—	-	3	1	No	5	3	L/L
2 5 6	°	±	2	2	Yes	-6	2	L/M
2 4 5 6	+	=	2	1 2	Yes	-6	1	M/M
3 4 6	[	]	3	1	Yes	-5	3	M/M
3 4 5	:	;	3	1 2	No	5	1	L/L
2 3 4 5	"	'	2 3	1 2	No	4	1	L/L
2 3	³	²	2 3	0	No	4	0	M/M
3 4 5 6	¶	§	3	1 2	Yes	-5	1	H/H
2 4 6	,	,	2	1	Yes	-6	3	L/L
1 3 4	.	.	1 3	1	No	3	3	L/L
2 6	?	/	2	0	Yes	-6	0	M/M
5 6	CR		0		No	–	–	–
4	Shift LC		2	0	No	6	–	–
4 6	Shift UC		2	0	No	6	–	–
6	Index		0	0	No	–	–	–
4 5 6	Backspace		0	0	No	–	–	–
4 5	Spacebar		0	0	No	–	–	–
5	Tab		0	0	No	–	–	–

Before adjusting or replacing a component, ensure that the failure has been isolated to the keyboard or printer.

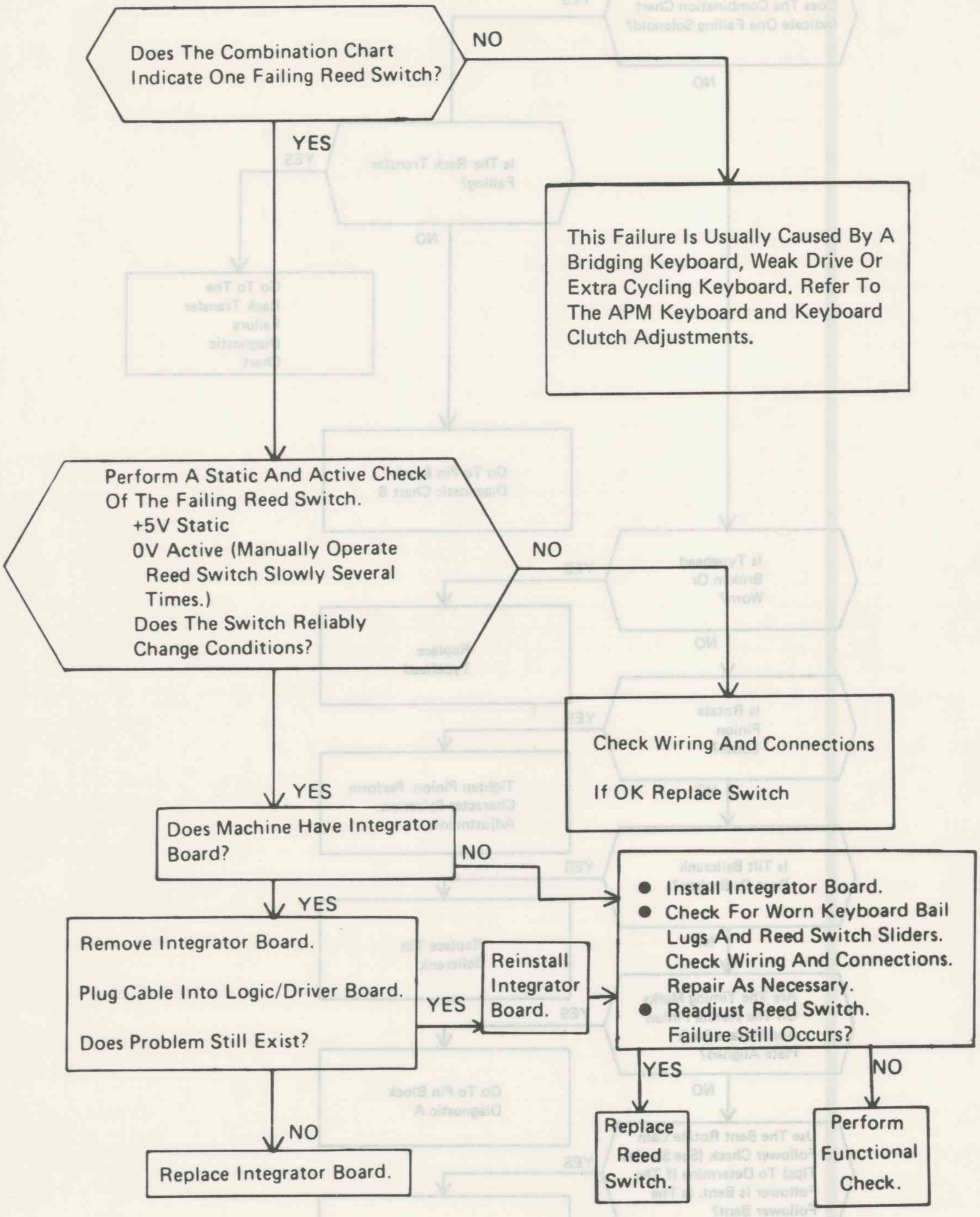
VELOCITY MAGNET CHART

VELOCITY	MAGNETS ENERGIZED
No Print	None
Low Velocity	V-2 (Lower Magnet)
Medium Velocity	V-1 and V-2
High Velocity	V-1 (Upper Magnet)
Correction	Center Magnet



KEYBOARD
DIAGNOSTIC CHART

Refer To The Combination Chart (Keyboard). Compare The Keyboarded Character With The Printed Character.

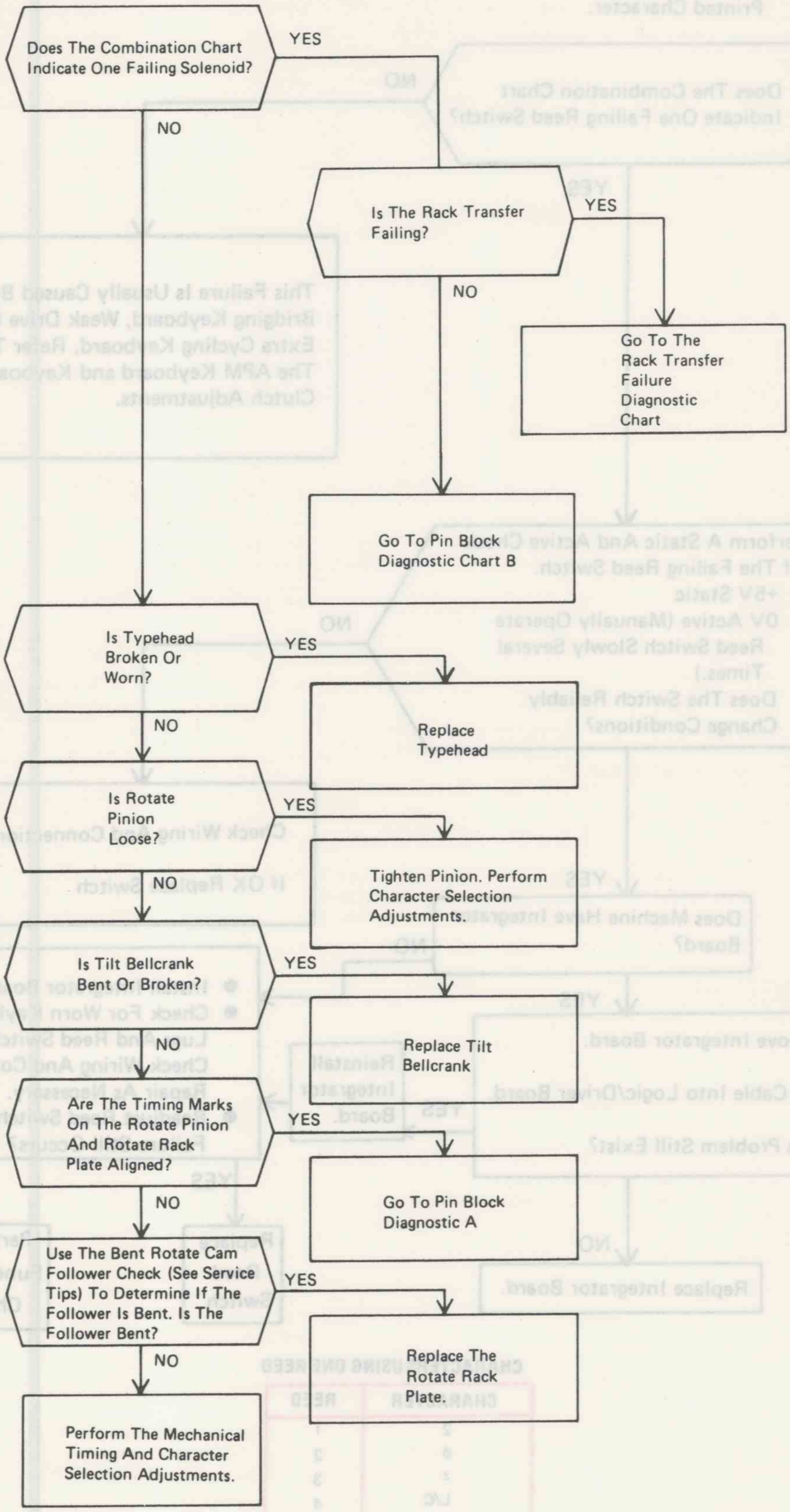


CHARACTERS USING ONE REED

CHARACTER	REED
2	1
ɸ	2
z	3
L/C	4
Tab	5
Index	6

PRINTER
DIAGNOSTIC CHART

1. Refer To The Combination Chart (Printer)
2. Compare The Solenoids Used For The Correct Characters With The Incorrect Characters



PIN BLOCK
DIAGNOSTIC CHART

A

Most Probable Cause Is A Mechanical Malfunction Of The Pin Block Assembly. Check For The Following:

1. Missing Vane Spring
2. A Binding Pin/Vane
3. Pin Block Adjustment
4. Weak Or Broken Pin Spring
5. Print Shaft Belt Tension
6. Print Shaft Timing
7. Selection Cam Fine Timing
8. Extra Cycles Of PSCC
9. Loose PSCC Studs (10-72, 151)
10. PSCC Drive/Loose Arbor
11. Check Pawl/Restore Cam Adjustment
12. Print Feedback
13. If No Problem Is Found, Replace Pin Block Assembly And Selection Cams

CHARACTERS USING ONE SOLENOID

CHARACTER	SOLENOID
2	R1
/	R2
z	R3
p	T1
r	T2

PIN SELECTION CHART			
ROTATE		TILT	
Pin No.	Solenoids Required	Pin No.	Solenoids Required
1	R-1	1	T-1 T-2
2	R-1 R-2	2	T-2
3	R-1 R-3	3	T-1
4	R-2 R-3	No Pin = No Tilt	
5	R-3		
6	R-2		
No Pin = No Rotate			

B

Problem Is a Failing Selection Solenoid

This Condition Is Usually Caused By:

1. Binding Plunger/Vane
2. Air Gap Maladjusted
3. Loose Carrier/Pin Block Connections

YES → Adjust As Necessary Replace Pin Block

NO ↓

Refer To Wiring Diagram. Ground Shot Failing Solenoid At Logic/Driver Board Does Solenoid Pick?

YES → With Ground Shot Applied (Solenoid Picked). Flex The Carrier Cable. If Solenoid Picks And Drops, Replace Carrier Cable.

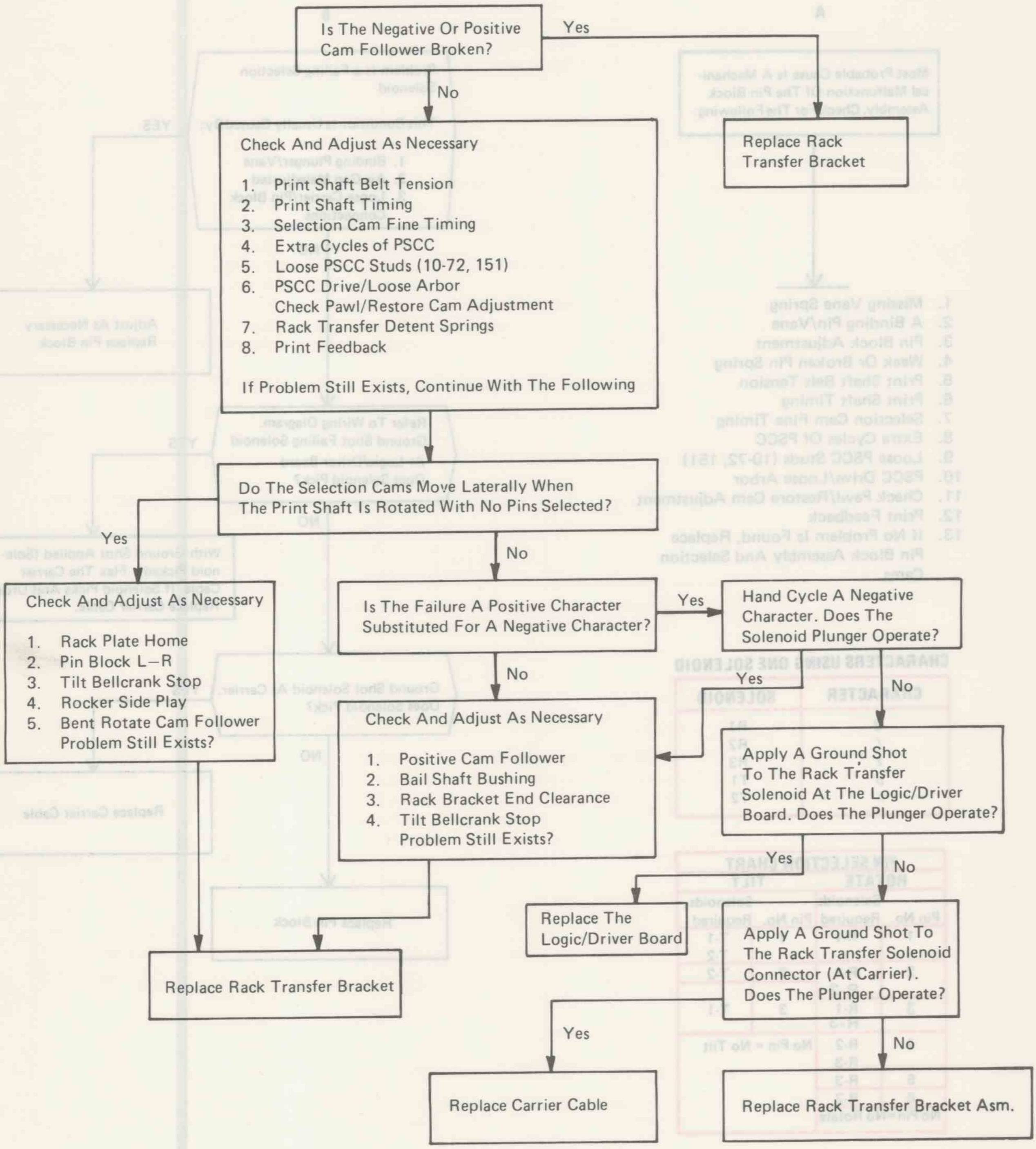
NO ↓

Ground Shot Solenoid At Carrier. Does Solenoid Pick?

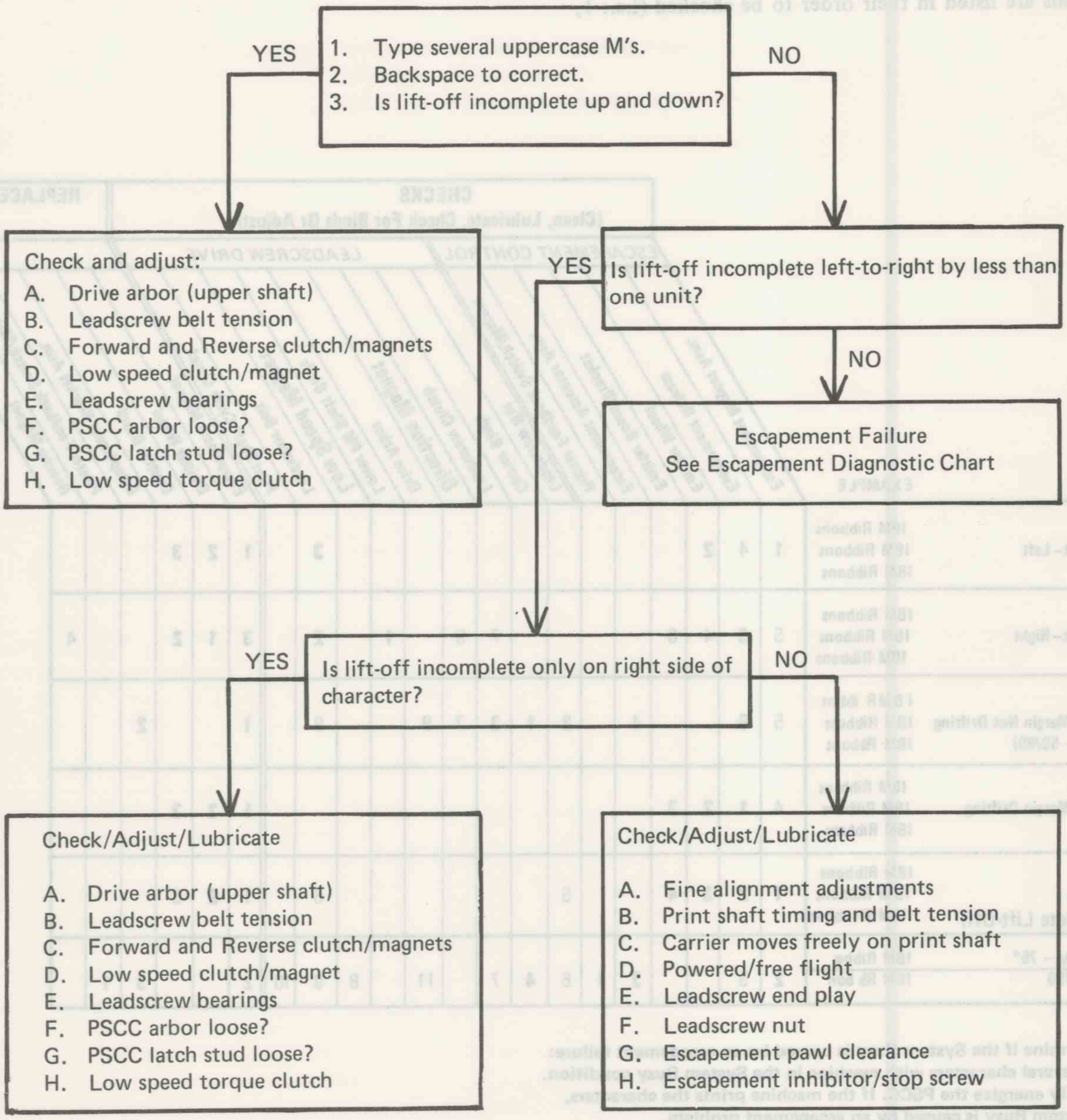
YES → Replace Carrier Cable

NO → Replace Pin Block

RACK TRANSFER FAILURE DIAGNOSTIC CHART



INCOMPLETE LIFT-OFF CHART



NOTE: Problem may be caused by one or any combination of these symtoms.

ESCAPEMENT DIAGNOSTIC CHART

This is a sequence chart (Figure 1) that will assist Customer Engineers in diagnosing and repairing escapement failures.

To use this chart, start by identifying the failure from the symptom column. An example of each symptom is shown to the right of the symptom. Printer exerciser can be used to help in identifying symptoms. Next, go to the "CHECKS" section. The items listed are divided into two sections of the machine: "Escapement Control" and "Leadscrew Drive." (See Service Tips, next page.) Each of the items are listed in their order to be checked (i.e.: 1, 2, 3).

The **bold numbers** are the most **probable causes** and should be checked first. The **lighter numbers** are other possible causes and should be checked also. If failure still exists, carefully check all other items listed before replacing any parts.

The "REPLACE" section should be used the same way as the "CHECKS" section. After each part is replaced, be sure to check the machine to see if the failure is still present.

		CHECKS (Clean, Lubricate, Check For Binds Or Adjust)															REPLACE					
		ESCAPEMENT CONTROL								LEADSCREW DRIVE												
SYMPTOM	EXAMPLE	Escapement Magnet Asm.	Escapement Release	Emitter Wheel	Emitter Board/Bracket	Escapement Actuator Asm.	Printer Feedback Switch/Magnet	Leadscrew Nut	Carrier Binds	Leadscrew Clutch	Direction Magnet	Drive Arbor	Lower PM Shaft Binds	Low Speed Magnet	Leadscrew Belt	Print Shaft Cycle Clutch	Escapement Magnet	Emitter Wheel	Emitter Board	Escapement Bracket Asm.	Printer Feedback Switch/Magnet	Reverse Magnet
Margin Drift–Left	IBM Ribbons IBM Ribbons IBM Ribbons	**1**	4	**2**											**3**		**1**	**2**	**3**			
Margin Drift–Right	IBM Ribbons IBM Ribbons IBM Ribbons	5	**3**	4	6					7	8		**1**		**2**		**3**	**1**	**2**			4
Crowding–Margin Not Drifting (Chugging – 50/60)	I B M R ibbns IBM Ribbons IBM Ribons	5	6			4		**2**	**1**	**3**	7	**9**			8		**1**			**2**		
Crowding–Margin Drifting	IBM Ribbons IBM Ribbons IBM Ribbons	4	**1**	**2**	**3**												**1**	**2**	**3**			
Extra Units (Incomplete Lift-Off)	IBM Ribbons IB M Ribbons IBM R ibbons	**1**	**2**	**3**	**4**			5							6		**1**	**2**	**3**			
System Busy – 75* Piling – 50/60	IBM Ribbo IBM Rb bon	**2**	5			**3**	**1**	6	**4**	7		**11**		8	9	10	**2**			**3**	**1**	

***To determine if the System Busy is caused by an escapement failure:**

- **Type several characters with machine in the System Busy condition.**
- **Manually energize the PSCC. If the machine prints the characters, the System Busy is caused by an escapement problem.**

Figure 1

ESCAPEMENT CONTROL – SERVICE TIPS

Escapement Magnet Assembly – Remove the assembly and the escapement pawl. Clean the pawl, the magnet core and the pivot points with a clean shop cloth. Reassemble the magnet and be sure the pawl moves freely with no binds, and the pawl spring hangs to the side. Check for loose shockmount screws. If screws are loose, replace the magnet assembly. Reinstall the magnet assembly. Adjust the escapement pawl-to-ratchet clearance and emitter.

Escapement Release – Adjust the escapement inhibitor, the escapement inhibitor stopscrew and the escapement link.

Escapement Wheel And Ratchet Assembly – Check the inhibitor entry on three or four teeth of the ratchet. If the entry differs, replace the ratchet. Apply a thin film of No. 23 grease on all the ratchet teeth.

Emitter Board/Bracket – Check for good electrical contact of the emitter board wires. Check the emitter board adjustment left-to-right. Make the emitter bracket adjustment.

Escapement Actuator Assembly – Check the assembly for binds. If a bind exists, remove the assembly. Check for a loose stud. Clean the assembly and the stud. Relubricate with No. 23 grease. (It is normal for some actuator assemblies **not** to restore during a hand cycle operation.)

Print Feedback Switch/Magnet – Check the print feedback switch for a broken reed switch glass. Check the wire connections and all the adjustments. Check the print feedback magnet for scratches or cracks in the magnet.

LEADSCREW DRIVE – SERVICE TIPS

Leadscrew Nut – This adjustment must be made; it cannot be checked. Loosen the four mounting screws, leave the bracket mounting screws (06-28) friction tight. Hand cycle the print shaft until the leadscrew lock is engaged. Loosen the lock link. Center the nut mounting screws (06-17) left-to-right and tighten. Loosen bracket mounting screws. Center the screws left-to-right and tighten. Rotate the print shaft until the lock link moves approximately .020", then tighten the link.

Carrier Binds – Remove the escapement pawl spring and direction magnet spring. Rotate the emitter wheel to move the carrier. There should be no binds. Check front rail support, carrier buffers and rear carrier shoe adjustment.

Leadscrew Clutch – Check for 2-4 pounds of carrier drive during low speed using a spring scale. Check leadscrew belt tracking.

Lower Power Module Shaft Binds – Check all clearances between the lower shaft components per the APM. Also, put two drops of No. 10 oil between the leadscrew pulley and the lower shaft.

Print Shaft Cycle Clutch – Check for extra cycling. There should be no lubrication anywhere on the magnet assembly. Clean if lubrication is present. Check for loose studs (10-72, 151). Lubricate the PSCC with No. 23 grease. Check the adjustments per the APM.

Low Speed/Direction Magnets – There should be no lubrication anywhere on these magnet assemblies. Remove the assemblies, if necessary, and check for binds. Check/adjust the adjustments per the APM. Also, put two drops of No. 10 oil between the leadscrew pulley and the upper shaft.

Low Speed Arbor and Leadscrew Belt – Check these adjustments per the APM.

KEYBOARD

The keyboard is the command unit of the machine. Its purpose is to operate a combination of reed switches which provide a code for each keybutton depressed.

A "keyboard" operation is performed using two separate mechanisms:

1. Keyboard Assembly – Mechanism 21
2. Keyboard Clutch – Mechanism 10

The following sequence provides a check procedure and describes some of the failures associated with the components involved:

1. *Keybutton Depressed* – Interposer Latched (Figure 1)

   Ensure that the interposer reliably latches down in front of the filter bail.

   Most problems in this area are caused by:

   a. Keyboard top section maladjusted.
   b. Keylever pawl broken.
   c. Interposer latch out of position. (Mech. 21, Ref. 148)
   d. Filter bail height maladjusted (covered in bridging).

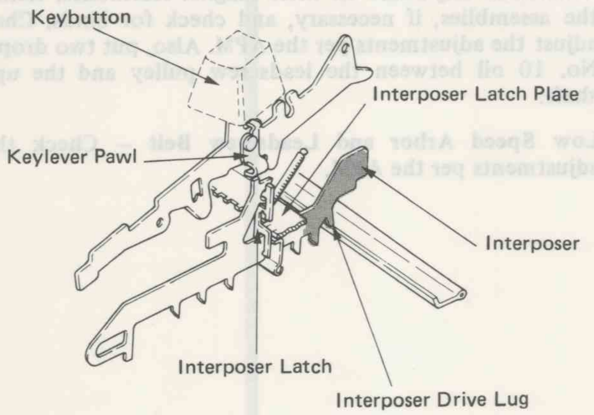


Figure 1

2. *Keyboard Clutch Release:*

   The release link (Figure 2) serves two functions:

   a. It releases and restores the keyboard clutch in the power module; and

   b. It restores the release latch in the keyboard. As the upper shaft is turned, the keyboard clutch release latch should drive .005"-.015" (0.13-0.38 mm) past the latching surface in the latch plate window (Figure 3).

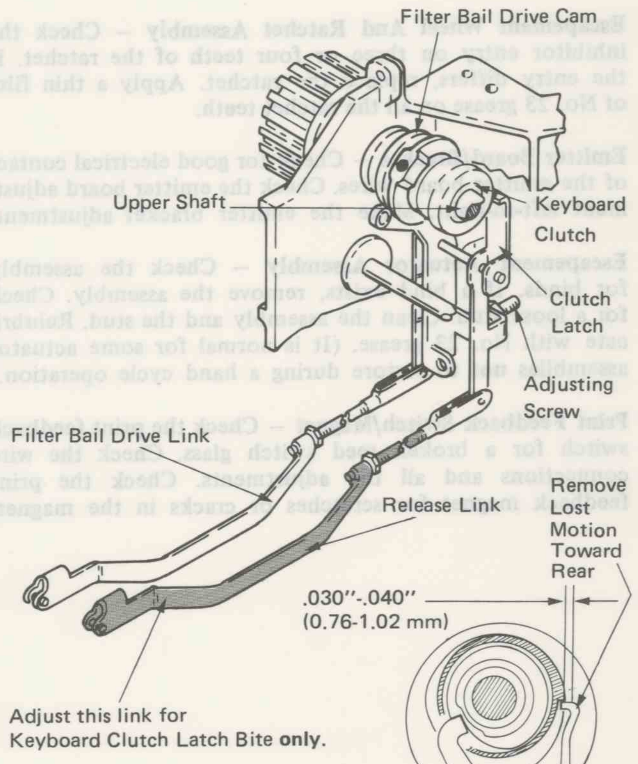


Figure 2

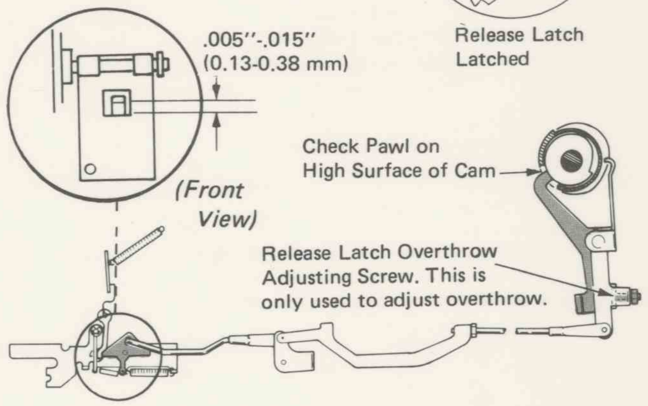


Figure 3

Most problems in this area are caused by:

a. Keyboard clutch latch worn or broken (Mech. 10, Ref. 124) – This can cause keyboard extra cycles.
b. Keyboard clutch cam backcheck latch surface worn (Mech. 10, Ref. 108) – This can cause power module noise.

3. *Keyboard Clutch Drive* – Manually cycle the keyboard clutch. Turn the power module upper shaft top-to-rear. The keyboard clutch should begin to drive.

Most problems in this area are caused by:

a. Keyboard clutch release link maladjusted. Too short causes extra cycles of keyboard clutch. Too long causes the keyboard clutch to fail to unlatch, resulting in a locked keyboard.
b. Keyboard clutch arbor screws loose. (Mech. 10, Ref. 95) – The keyboard clutch fails to drive the filter bail, causing a locked keyboard, sluggish drive, touch problems.
c. Keyboard clutch spring broken (Mech 10, Ref. 101) – The keyboard clutch fails to drive the filter bail, causing a locked keyboard.
d. Weak or erratic keyboard clutch drive (lack of lubrication) – This may cause insufficient or erratic drive to the filter bail which can cause keyboard malselection. This is discussed in reed switch operation.

4. *Filter Bail Drive* – The **filter bail drive link** (Figure 4) transfers the drive motion from the filter bail drive cam through the filter bail cam follower to the filter bail. As the upper shaft is turned, the filter bail will drive .000"-.016" (0.00-0.41 mm) beyond where the filter bail pawl restores (Figure 5).

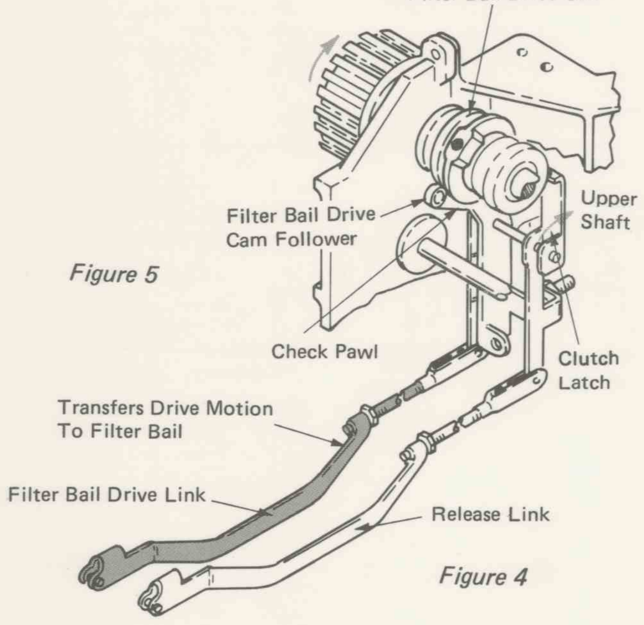


Figure 4

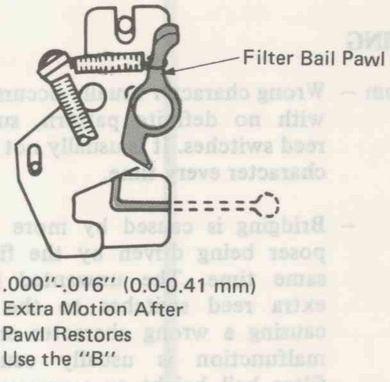


Figure 5

Most problems in this area are caused by:

a. Filter Bail Drive Link Maladjusted –

(1.) **Too Long** – Fails to restore latched interposer, causing repeating character.
(2.) **Too Short** – Overdrives the keyboard reed switch sliders into their overthrow stops. This causes a vibration of the reed switch which may cause it to bounce.

b. Keyboard Clutch Spring Broken (Mech. 10, Ref. 101) – Locked Keyboard.
c. Wear of left rear casting of power module, causing power module noise (Figure 6). See CEM No. 152/CSI, Power Module.

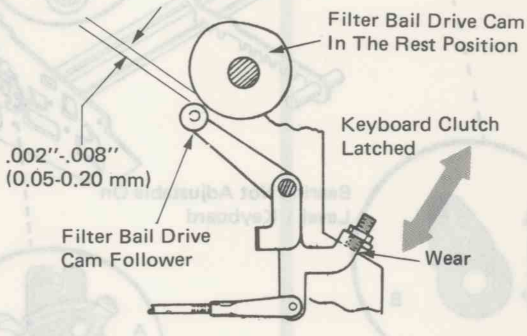
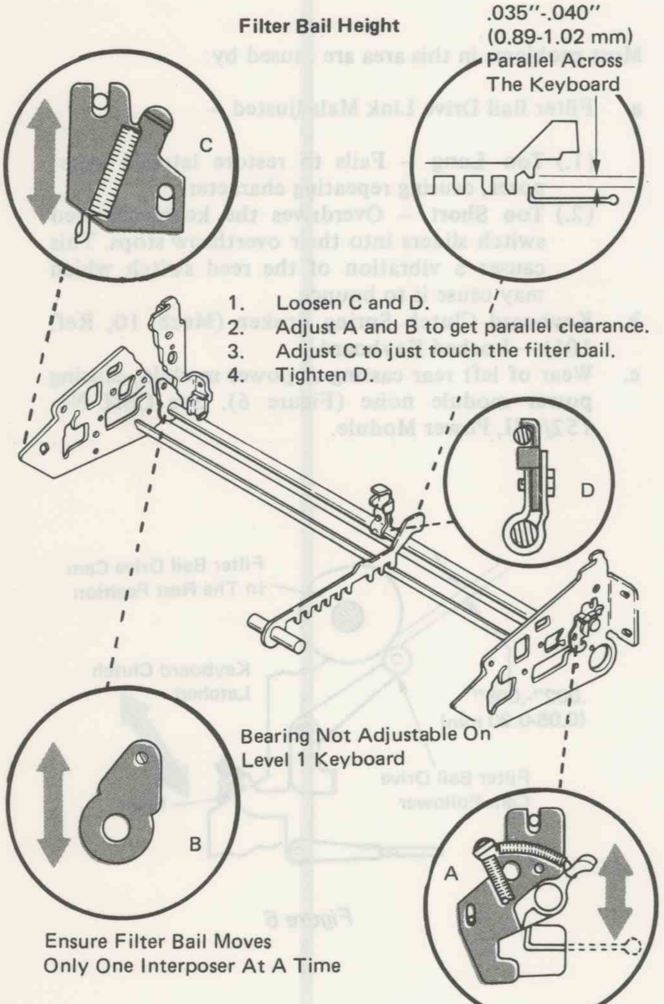


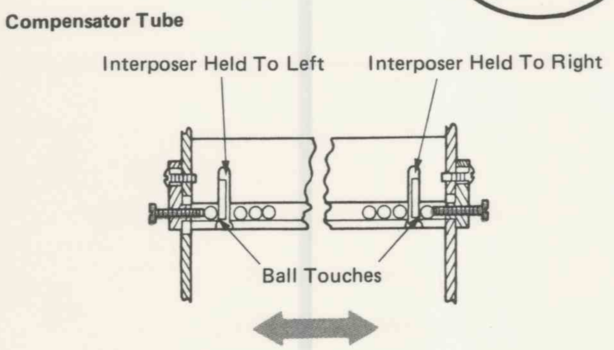
Figure 6

BRIDGING

Symptom – Wrong character usually occurs intermittently, with no definite pattern, such as common reed switches. It is usually not the same wrong character every time.

Cause – Bridging is caused by more than one interposer being driven by the filter bail at the same time. The unwanted interposer adds extra reed switches to the selected code, causing a wrong character or function. This malfunction is usually caused by either filter bail height or compensator tube being maladjusted.





EXTRA CYCLES OF KEYBOARD CLUTCH

Extra cycles are usually caused by a maladjusted release link, release latch overthrow, or filter bail drive link.

1. *Release Link And/Or Release Latch Overthrow* – Failures occur because the filter bail is being driven through an extra cycle by the keyboard clutch instead of being in its rest position. When the interposer is depressed, the filter bail is in motion and interferes with the latching sequence of the selected interposer. If the interposer does not latch down, it will not operate the proper reed switches when it is driven by the filter bail, and any of the symptoms listed below may occur.

   SYMPTOMS: Dropping characters intermittently, e.g., THT for THAT

   Substituting characters intermittently, e.g., THNT for THAT

   Adding characters intermittently, e.g. THNAT for THAT

2. *Filter Bail Drive Link* – Failures occur because the filter bail has insufficient drive to restore the latched interposer. As a result, a repeat of this interposer (intermittently) occurs.

   SYMPTOM: Repeating characters intermittently, e.g., THAAT for THAT

REED SWITCH OPERATION

There are seven (7) keyboard reed switches.

SELECTION REED SWITCHES – Reeds 1-6 are selection reed switches. Combinations of these reeds supply the code for each character and function selected from the keyboard.

KEYBOARD MODE REED SWITCH – Reed 7 identifies the character selected as an upper or lowercase character to the electronics.

The following information gives an insight into how the keyboard reed switches operate in conjunction with the electronics.

1. The electronics starts a 5 milliseconds (ms) "clock" when the first selected reed switch becomes active (closes). All selected reed switches must become active (closed) within this 5 milliseconds. At 5 milliseconds the logic "looks at" (samples) those reeds that are active and processes that code. This timing sequence in the electronics is referred to as "Strobe" (See Figure 7).
   If any reed switches do not become active (closed) within 5 milliseconds, the late reed switches will not be included in the selected code and a keyboard malselection will occur.

   NOTE: Although 5 milliseconds is a very short period of time, the correct adjustment of the reed switches is very easily made. The important thing to remember is the relationship between reeds 1 through 6. For example, if one reed is set too "tight," it will begin strobe "early" in relation to the other reed switches. The failure symptom may indicate other reeds as the cause of the failure. Therefore, it is important to adjust reeds 1 through 6 at the same time.

STROBE

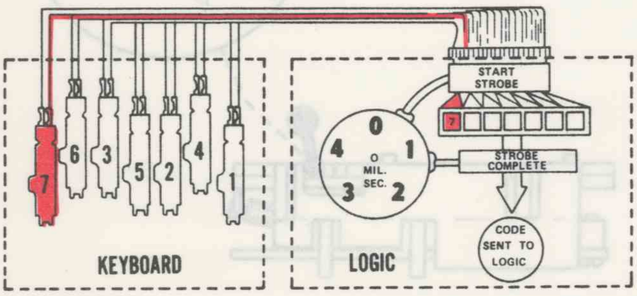


Figure 7A

1. Static

   Keyboard at rest; all reeds 5 V (static).

   NOTE: Keyboard is in upper case.

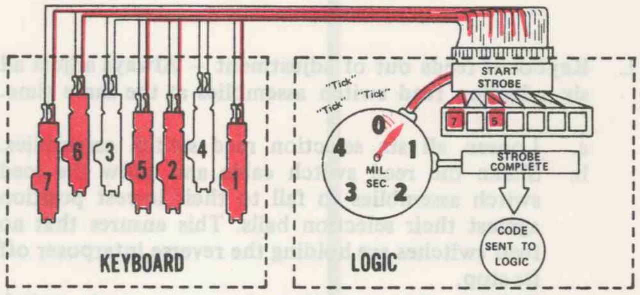


Figure 7B

2. Start Strobe

   A keybutton has been depressed; the filter bail begins to drive the selected interposer. "Strobe" starts when the first reed becomes active (0 V); in this case, the No. 5 reed is first.

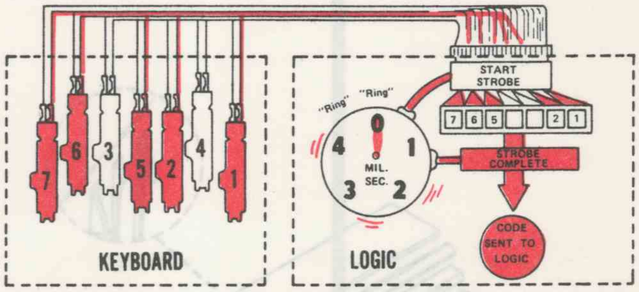


Figure 7C

At 5 milliseconds, the logic samples those reeds that are active and "processes" that code.

KEYBOARD REED SWITCH FAILURES

1. Keyboard reeds out of adjustment – **Always** adjust all six selection reed switch assemblies at the same time.
   a. Loosen **all** six selection reed switch assemblies.
   b. Shake the reed switch cable and allow the reed switch assemblies to fall to their lowest position against their selection bails. This ensures that no reed switches are holding the reverse interposer off its stop.
   c. Tighten the mounting screw on each switch assembly in this position.
   d. Locate the reverse interposer – Look between the leading edge of the keyboard bottom section and the center section at the right front corner of the keyboard (See Figure 8). The reverse interposer is the third interposer from the right. Observe this interposer as you move each slider manually.

   Depress each reed switch slider (Figure 9). Each slider should move .001"-.005" (0.03-0.13 mm) before the reverse interposer starts to move. Adjust each switch individually to obtain this condition.

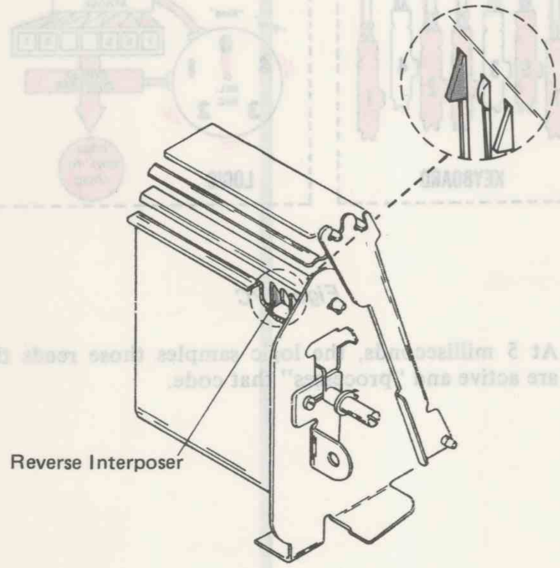


Figure 8

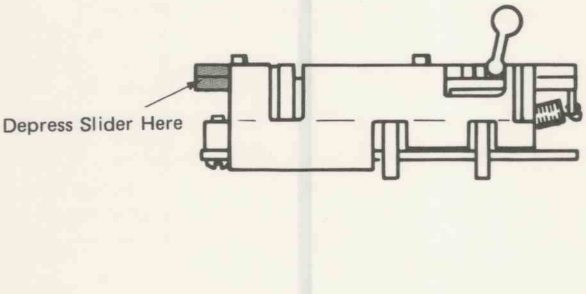


Figure 9

This adjustment procedure sets the minimum play between the reed switch slider, the selection bail lug, the selection bail, and the reverse interposer, at rest (Figure 10). Adjusting all six reed switch assemblies ensures an even relationship of minimum play in the system.

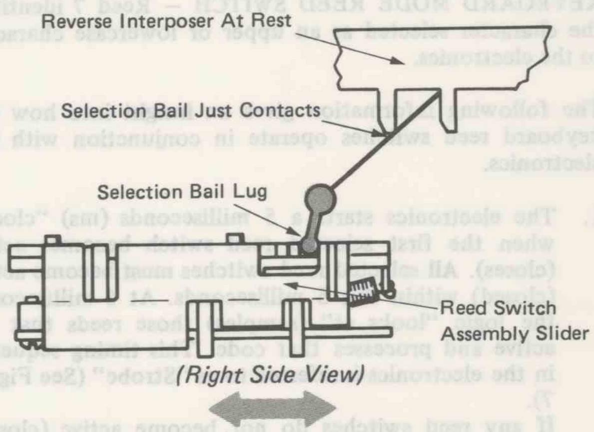


Figure 10

2. Wear – Wear usually occurs in the slot of the slider where it contacts the bail lug (Figure 11). This wear will cause insufficient drive to operate the reeds. **Wear cannot be compensated for by adjustment.**

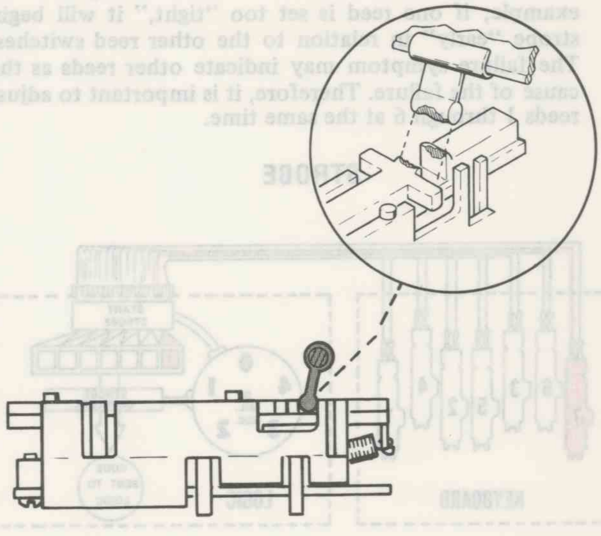
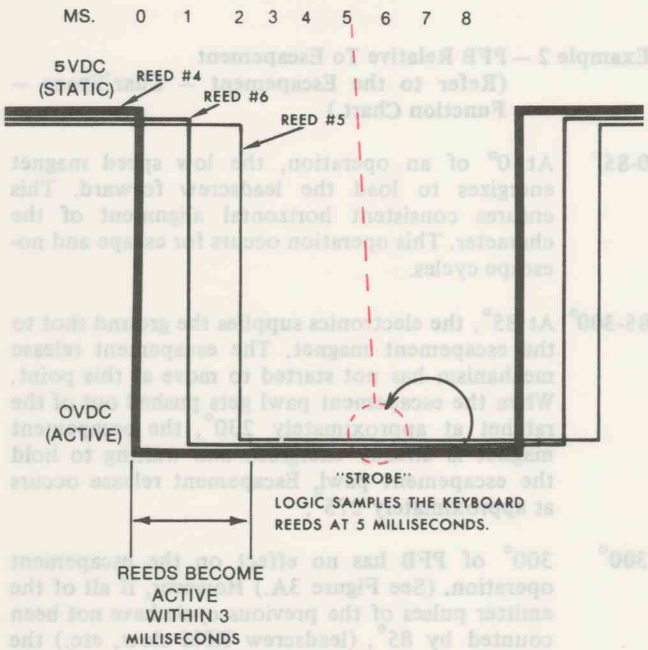


Figure 11

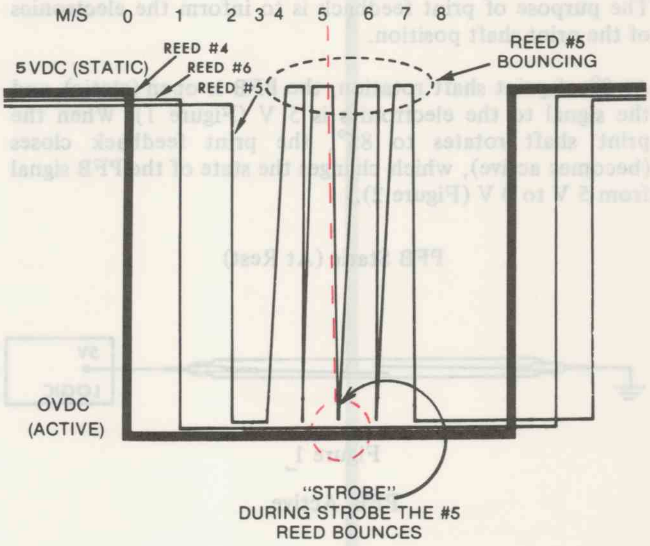
The reed switch sliders and bail lugs should be checked for wear before being adjusted. **If any wear exists on either the slider or bail lug, always replace both the reed switch and bail lug.**

PURPOSE OF THE INTEGRATOR BOARD

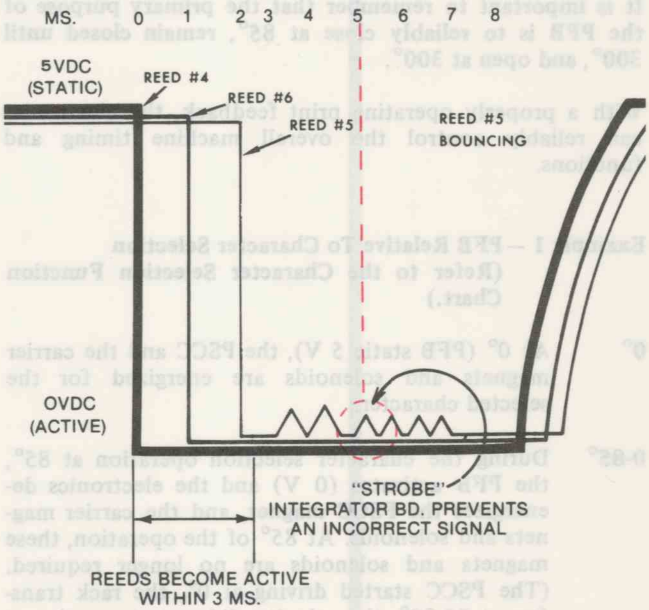
The purpose of the integrator board is to filter the signals sent from the keyboard reed switches to the electronics. Even though a reed switch bounce may occur, the integrator board will filter the bounce to acceptable tolerances.



In this illustration, reeds 4, 5, 6 are selected. Reed 4 becomes active first, which starts strobe. Reeds 5 and 6 become active within 3 milliseconds. At 5 milliseconds the logic samples the reeds, and the Code 4, 5, 6 is sent to the processor, resulting in a proper keyboard selection.



In this illustration, the same reeds are selected, but reed 5 is bouncing. At 5 milliseconds the reed is open when the logic samples the reeds. It only "see's" reeds 4 and 6, and therefore the code 4, 6 is sent to the processor. This results in a keyboard malselection.



With the integrator board installed, the bouncing reeds signal is held so that the logic will recognize that signal as active. The code 4, 5, 6 is sent to the processor, resulting in a proper keyboard selection.

PRINT FEEDBACK

The purpose of print feedback is to inform the electronics of the print shaft position.

At 0° of print shaft rotation, the PFB is open (static), and the signal to the electronics is 5 V (Figure 1). When the print shaft rotates to 85°, the print feedback closes (becomes active), which changes the state of the PFB signal from 5 V to 0 V (Figure 2).

PFB Static (At Rest)

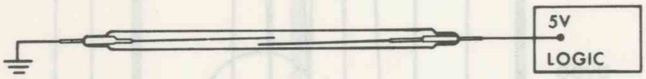


Figure 1

PFB Active

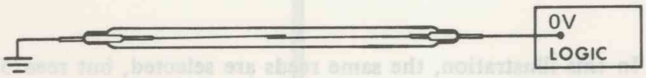


Figure 2

When the print shaft rotates to 300°, the PFB opens (becomes static) and the signal to the electronics becomes 5 V again.

It is important to remember that the primary purpose of the PFB is to reliably close at 85°, remain closed until 300°, and open at 300°.

With a properly operating print feedback, the electronics can reliably control the overall machine timing and functions.

Example 1 – PFB Relative To Character Selection (Refer to the Character Selection Function Chart.)

0° At 0° (PFB static 5 V), the PSCC and the carrier magnets and solenoids are energized for the selected character.

0-85° During the character selection operation at 85°, the PFB activates (0 V) and the electronics de-energizes the PSCC magnet, and the carrier magnets and solenoids. At 85° of the operation, these magnets and solenoids are no longer required. (The PSCC started driving at 0°, the rack transfers at 25-30°, the velocity slider starts moving at 22°, the selection pins enter their tracks at 55°.)

Therefore, at 85° of print shaft rotation, the electrical function is no longer required because the required electro-mechanical functions have already taken place (magnets and solenoids started mechanical operation), and the mechanical operation is in progress.

85-300° During 85° to 300° of print shaft rotation (PFB active), the electronics knows that the printer is performing the operation. Therefore, the electronics cannot start the next operation.

300° At 300° of print shaft rotation, the PFB becomes static (5 V) and the electronics knows that the printer is ready for the next operation; the system is ready. If another character is waiting in the electronics (buffer) to be printed, the required magnets and solenoids will energize to begin the next cycle. This allows the printer to print out at maximum output speed, or "repeat speed" instead of waiting for the print shaft to come to rest at 360° and begin the next operation.

Example 2 – PFB Relative To Escapement (Refer to the Escapement – Char/Space – Function Chart.)

0-85° At 0° of an operation, the low speed magnet energizes to load the leadscrew forward. This ensures consistent horizontal alignment of the character. This operation occurs for escape and no-escape cycles.

85-300° At 85°, the electronics supplies the ground shot to the escapement magnet. The escapement release mechanism has not started to move at this point. When the escapement pawl gets pushed out of the ratchet at approximately 230°, the escapement magnet is already energized and waiting to hold the escapement pawl. Escapement release occurs at approximately 275°.

300° 300° of PFB has no effect on the escapement operation. (See Figure 3A.) However, if all of the emitter pulses of the previous cycle have not been counted by 85°, (leadscrew RPM slow, etc.) the electronics senses this as a failure. (See Figure 3B.)

When the Model 75 senses the failure, it goes into a "System Busy." However, when the 50/60 senses this failure, it may "chug" or go into a "System Busy."

NOTE: It should be noted that the 50/60 logic "looks" at PFB differently than that of the 75. The 50/60 logic samples the PFB when it "thinks" it needs it. The 75 logic looks at PFB continuously. Therefore, the 75 PFB operation may be defined as "more sensitive" than the 50/60 PFB operation.

1. "System Busy" can be defined as: when the main power and motor switch are on and the motor is running, a keybutton is depressed (keyboard cycles), but there is no printer response.
2. "Chugging" can be defined as a condition when the carrier is at rest, the leadscrew belt is turning and the escapement pawl is in the ratchet; or, the printer appears to "lag" in the repeat speed.

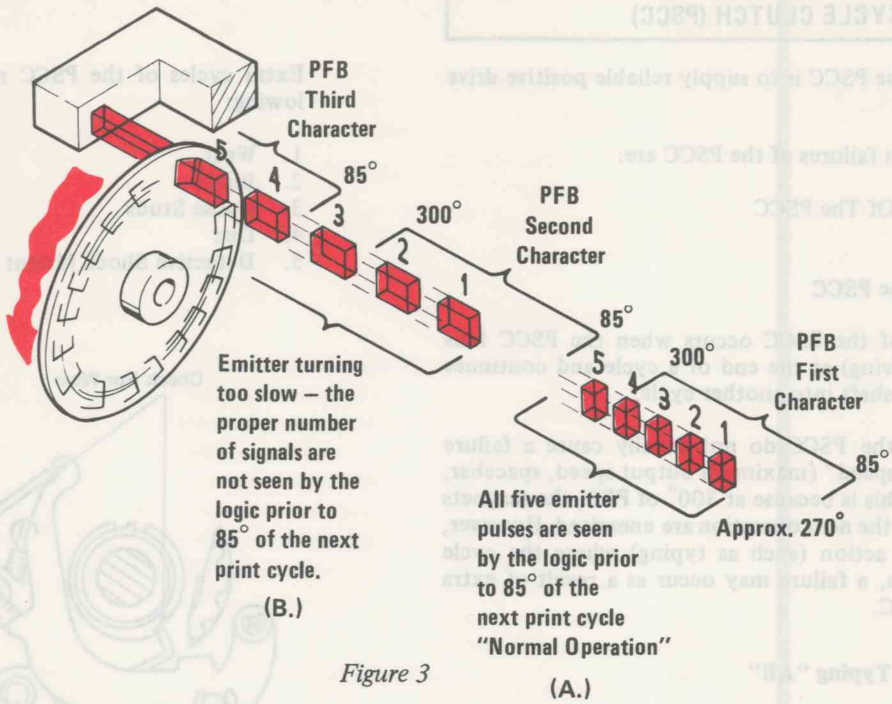


Figure 3

PRINT FEEDBACK FAILURES (PFB)

The most common PFB failure is a Bouncing PFB Reed Switch.

Bouncing PFB Reed Switch
A reed bounce is defined as a reed switch momentarily changing states. For example, if the PFB reed switch is closed (0 V) and a bounce occurs, the switch momentarily opens (5 V) and closes again (0 V) (Figure 4). This could result from: (1) a faulty reed switch; (2) a faulty magnet; (3) insufficient clearance between the switch and magnet causing vibration to the switch; and (4) excessive print shaft end play or incorrectly formed PFB bracket, causing the end of the shaft to hit the reed switch.

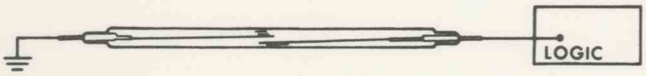


Figure 4

Example 1 – Bouncing PFB relative to character selection and escapement.

Situation – The characters "ABC" are ready to be printed and the PFB bounces between 85° and 300° of the "A" Cycle.

When the PFB bounces, the electronics actually sees another cycle. This is because the PFB reed is closed between 85° and 300°. When the bounce occurred, the PFB opened (the logic thinks this is 300° of "A"), and closed (the logic thinks this is 85° of "B").

Different types of failures occur depending upon where the bounce occurs in the cycle.

For example, the following errors may occur:

1. "A C"
2. "A" System Busy (75) or Chugging (50/60)*
3. "B" System Busy (75) or Chugging (50/60)*
4. "ASC" (Character Substitution)

*NOTE: The 50/60 will "chug" and will be cleared by a carrier return or a no-escape cycle, such as a shift operation. A system busy will occur if the operator depresses the back-space or a coded function while the 50/60 is chugging.

From the example given, it is apparent that print feedback can cause a variety of failures. The actual failure depends on the point in the cycle at which the PFB failure occurred. It is not the intent of this manual to include a comprehensive list of all of the possible failures associated with print feedback. However, a thorough understanding of how PFB operates in relation to each machine function can be included in an overall diagnostic approach to the actual cause of failure.

PRINT SHAFT CYCLE CLUTCH (PSCC)

The purpose of the PSCC is to supply reliable positive drive to the print shaft.

The most common failures of the PSCC are:

1. Extra Cycles Of The PSCC
2. Erratic drive

Extra Cycles of the PSCC

An extra cycle of the PSCC occurs when the PSCC fails to latch (stop driving) at the end of a cycle and continues to drive the print shaft into another cycle.

Extra cycles of the PSCC do not usually cause a failure when in "repeat speed" (maximum output speed, spacebar, playback, etc.). This is because at 300° of PFB, the magnets and solenoids for the next operation are energized. However, during a printer action (such as typing) where the cycle clutch must latch, a failure may occur as a result of extra cycles of the PSCC.

Example 1 — Typing "AB"

During typing, the PSCC fails to latch at the end of the "A" cycle and allows the print shaft to continue to rotate past zero.

The logic does not know that the print shaft is rotating until PFB closes at 85° If the "B" is typed after 85°, the logic will "hold" the "B" until PFB opens at 300°. However, if the "B" is typed before 85°, a failure of the "B" may result.

The Character Selection Function Chart shows that:

The velocity slider starts to move at 22°

The rack transfers at 25-30°

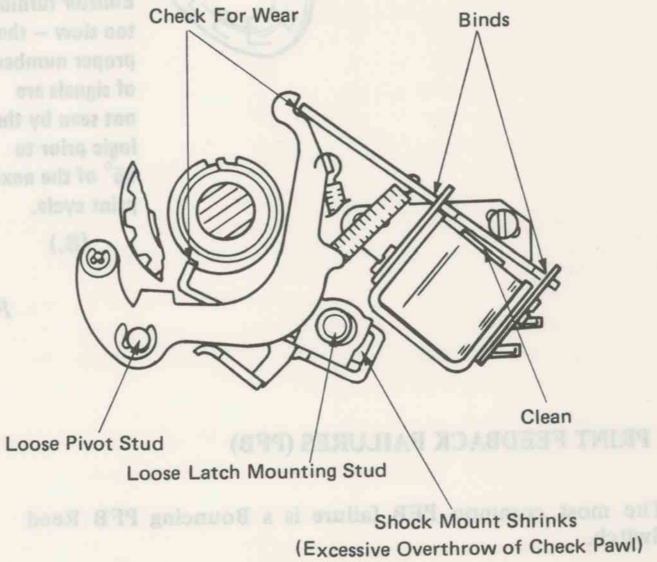
The selection pins leave the high dwell of the cam at 50-55°

If the carrier magnets/solenoids are energized after 25° of print shaft rotation, a velocity failure will result. When the velocity slider comes in contact with the velocity armatures, the slider prevents the armatures from moving, and therefore, no velocity is applied. The failure on paper is "A ." (The "A" printed and escaped properly, the "B" did not print but did escape properly, leaving a blank space).

NOTE: If the pin block solenoids were energized at or after 55°, the selected pin may not align with its track and enter a wrong track. This was a common cause of carrier crashes until the new pins and cams were introduced.

Extra cycles of the PSCC may be caused by the following:

1. Wear
2. Binds
3. Loose Studs
4. Dirt
5. Defective Shock Mount



Ensure all PSCC adjustments are correct.

Figure 1

Erratic Drive

Erratic drive will cause the print shaft to rotate at uneven speeds. When the print shaft speed is not constant, it will affect some of the critical timing relationships within the carrier.

Example 1 – Erratic Drive Can Cause Bouncing Selection Pins

As the selection cams come to the rest position, the selection pins contact the high dwell of the cams. If erratic drive occurs at this point, a selection pin is "hit" by the cam (several times), which causes a pin block vane to vibrate. As the next selection cycle starts, the vane is still in motion. This will allow an unwanted pin, or no pin to fall.

The symptom of this is a substituted character or a zero (0).

Example 2 – Erratic Drive Can Cause Print Feedback Failures

If erratic drive occurred at 85° as the print feedback closed, it will cause the switch to bounce. The associated failures will be the same as illustrated in the print feedback section.

Example 3 – Erratic Drive Can Cause Splitting Characters

As the rotate detent is about to enter the tooth of a rotating typehead, erratic drive can cause the typehead to overdrive or underdrive. The detent will not enter the correct typehead tooth, and the failure on paper will be a "split character."

To ensure constant PSCC drive:

1. The PSCC must be well lubricated
2. Arbor screws must be tight (CEM No. 138)
3. PSCC must be adjusted per APM
4. Belt tensions must be correct

NOTE: The PSCC should be lubricated (No. 23 grease) on every service call.

ESCAPEMENT

The escapement system of the Electronic Typewriter consists of two distinct mechanisms.

1. Escapement Control Mechanism (Mech 06)
2. Leadscrew Drive Mechanism (Mech 10)

Escapement Control Mechanism

The escapement control mechanism performs the functions of holding and releasing the leadscrew when required. This mechanism also provides the electronics (logic) with a means of monitoring how much leadscrew rotation (units of escapement) has occurred. This is accomplished through the emitter wheel and emitter assembly.

Leadscrew Drive Mechanism

The leadscrew drive mechanism is physically housed in the power module. It is important to remember that this mechanism makes up 1/3 of the power module function and operates completely independent of the remaining 2/3 of the power module (Keyboard Clutch and PSCC).

The purpose of the leadscrew drive mechanism is to supply reliable and positive drive to the leadscrew. Leadscrew drive is provided in either of 2 speeds, low speed or high speed, in either a forward or reverse direction.

The four modes of leadscrew drive can be summed up as:

1. Low Speed Forward Drive – (Low speed magnet energized and direction magnet de-energized)
2. Low speed reverse drive – (Low speed magnet energized and direction magnet energized)
3. High Speed Forward Drive – (High speed magnet energized and direction magnet de-energized)
4. High Speed Reverse Drive – (High speed magnet energized and direction magnet energized)

There can only be **one mode** of leadscrew drive **at a time.** Low speed and high speed are **never** operated at the same time, nor can forward and reverse be operated at the same time.

In order to better understand the leadscrew drive mechanism, the names of the drive magnet and reverse magnet have been changed. The drive magnet has been changed to "low speed" because it provides low speed drive, just as "high speed" provides high speed drive. The reverse magnet (Level 2 power module only) has been changed to the "direction magnet" because it provides the direction of drive. With the direction magnet energized, reverse drive will be applied; with the direction magnet de-energized (at rest), forward drive will be applied.

LEADSCREW ROTATION MEASURED

During all escapement operations (tab, C/R, B/S, char/space, S/B), drive is supplied to the leadscrew and the leadscrew is allowed to rotate after escapement release occurs. Escapement release consists of pivoting the inhibitor into the ratchet, pivoting the escapement pawl out of the ratchet, and then pivoting the inhibitor out of the ratchet.

The rotation of the leadscrew is measured by a "counter" in the logic.

The "counter" counts the number of windows that pass the emitter. (The emitter consists of an emitter wheel, an LED, and a photo-transistor). Each emitter wheel window causes the emitter to generate an emitter pulse, which equals one unit of escapement. A 12-pitch character requires 5 units of escapement, a 10-pitch character requires 6 units of escapement. This allows the logic to keep track of the carrier position.

Notice the following example of a 5-unit escapement operation of a 12-pitch character (Figure 1).

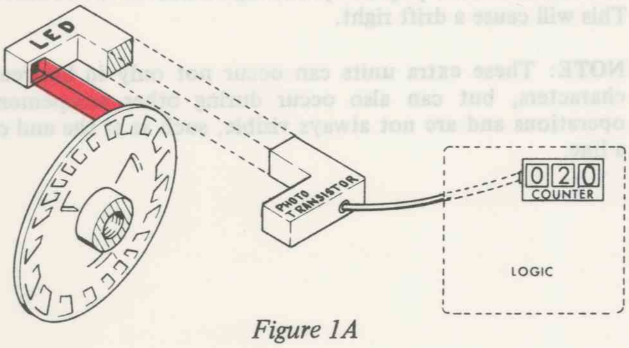


Figure 1A

1. With the escapement pawl holding the leadscrew at rest, the light beam is blocked by the emitter wheel.

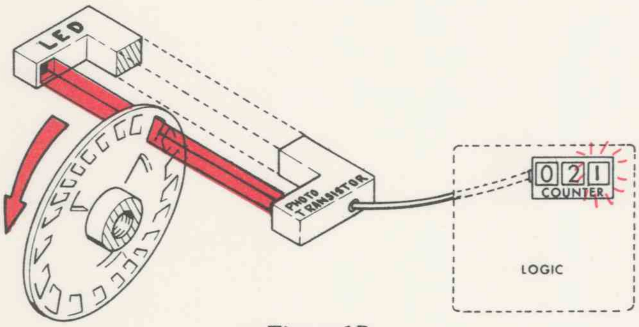


Figure 1B

2. As the leadscrew starts to rotate, the light beam is allowed to pass through a window to the photo transistor which generates an emitter pulse. For each emitter pulse, the counter increases by one unit.

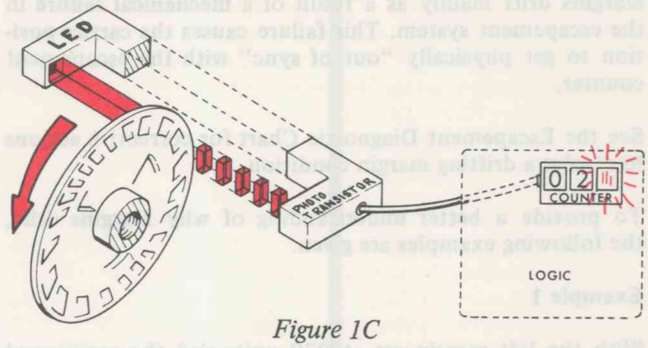


Figure 1C

3. The leadscrew continues to turn and the counter counts the pulses.

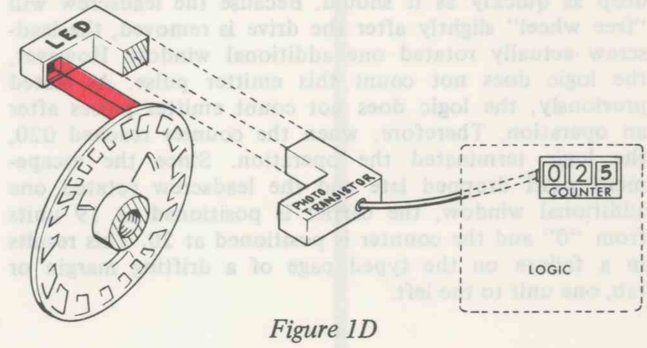


Figure 1D

4. When the counter reaches 025, the logic terminates the operation, and the carrier has moved one character space.

When the logic applies forward drive and emitter pulses are counted, they are added to the counter. When the logic applies reverse drive and emitter pulses are counted, they are subtracted from the counter.

Whenever a POR is performed, the carrier is homed to "zero" and the escapement counter is reset to "zero." This is called a carrier reset. As the carrier is moved, the emitter pulses are counted and the logic "knows" the physical position of the carrier. For example, if the carrier is escaped 20 units and the left margin is set, the counter registers 020 units as the left margin. If the carrier is positioned at 80 units from zero and a carrier return is performed, the counter counts the emitter pulses and subtracts until position 20 of the counter is reached. The escapement pawl and leadscrew drive are deactivated and the carrier is positioned at the left margin.

The logic only counts emitter pulses during an escapement operation. If an emitter pulse is generated after the logic counts the proper amount, **these additional pulses will not be counted** and the physical position of the carrier will no longer be "known" by the logic.

MARGIN DRIFT

Margins drift mainly as a result of a **mechanical failure** in the escapement system. This failure causes the carrier position to get physically "out of sync" with the escapement counter.

See the Escapement Diagnostic Chart for corrective actions to resolve a drifting margin condition.

To provide a better understanding of why margins drift, the following examples are given.

Example 1

With the left margin set at 020 units and the carrier and counter set at 180 units, a carrier return operation is performed. The logic will monitor emitter pulses until the counter reaches 020. When the counter reaches 020, the escapement magnet and drive/direction magnets are de-energized. In this example, the escapement pawl did not drop as quickly as it should. Because the leadscrew will "free wheel" slightly after the drive is removed, the leadscrew actually rotated one additional window. However, the logic does not count this emitter pulse. As stated previously, the logic does not count emitter pulses after an operation. Therefore, when the counter reached 020, the logic terminated the operation. Since the escapement pawl dropped late and the leadscrew rotated one additional window, the carrier is positioned at 19 units from "0" and the counter is positioned at 20. This results in a failure on the typed page of a drifting margin or tab, one unit to the left.

Example 2

With the left margin set at 20 units, and the carrier and counter at 180 units, a carrier return operation is performed. During this carrier return, a mechanical bind* occurred which caused the emitter wheel to change direction and generate a "false" emitter pulse (Figure 2). The counter is now decreased by 1 unit in relation to the physical position of the carrier. When the counter reaches 020 and terminates the operation, the carrier is physically at 021 units. This results in a margin drift to the right.

*This type of bind can happen at the transition from high to low speed or because the "C" clip is missing on the lower power module shaft. As the high speed arbor begins to drive, it jams into the lower right power module bearing. The "C" clip acts as a shim, and prevents a bind from occurring between the bearing and the high speed arbor. The Model 75 emitter board will reduce the possibility of this condition causing a failure.

Figure 2

Edge of emitter window at emitter when the bind occurred. The emitter wheel actually changes direction for a split second, causing the "false" emitter.

Example 3

During normal typing, an extra unit is added, e.g., add ed. The carrier is now physically one unit ahead of the counter. This will cause a drift right.

NOTE: These extra units can occur not only in between characters, but can also occur during other escapement operations and are not always visible, such as at the end of a line.

SERVICE TIPS

When experiencing any escapement related failure, use the following sequence of checks and adjustments. This escapement control and leadscrew drive sequence will establish a timing relationship of all escapement related components. These adjustments and checks must be made in the sequence shown.

Before beginning the check and adjustment sequence, apply a light film of No. 23 grease on the escapement ratchet and remove and clean the escapement pawl and magnet assembly. Ensure that the dust shield is properly installed. Reinstall the magnet assembly.

1. *Escapement Pawl Clearance* – Check for: .003" (0.08 mm).
2. *Escapement Inhibitor* – Check for 50/50 engagement on both sides of the ratchet.
3. *Inhibitor Stop Screw* – The knockoff lever should touch the pawl, but not move it, with the inhibitor manually bottomed in the ratchet.
4. *Escapement Link* – Adjust for maximum pivot with no noise. Shorten the link until the inhibitor drags on the ratchet when a long tab is operated, then lengthen it until the inhibitor just fails to drag. Check adjustment per APM. Should not pivot more than .020" (0.51 mm).
5. *Emitter Board/Bracket* –
   a. Must be centered in reference to the emitter wheel.
   b. Must be adjusted exactly four (4) turns from where the meter goes to 0 VDC.

Leadscrew Drive

6. *Leadscrew Nut* – With the print shaft half cycled, center the carrier play and ensure the leadscrew does not flex when the top screws are tightened.
7. *Leadscrew Lock Link* – Loosen the link adjusting screw in the leadscrew lock link. Hand cycle the print shaft until the leadscrew lock adjusting link stops moving to the rear. Rotate the print shaft slowly until the leadscrew lock adjusting link has moved forward .015" (0.38 mm). Rotate the leadscrew lock top-to-rear until it stops. Tighten the link adjusting screw.
8. *Torque Limiter* – Should be adjusted for 2-4 lbs. Low speed forward should be the same as low speed reverse within 1/2 lb.
9. Manually hold the escapement inhibitor into the escapement ratchet for each of the following operations. Release the inhibitor before operating each successive operation.
   a. Operate one spacebar for a low speed forward operation.
   b. Operate one backspace for a low speed reverse operation.
   c. Operate a 4" tab for a high speed forward operation.
   d. Operate a 4" carrier return for a high speed reverse operation.

During each of these operations, observe the 60 tooth gears and leadscrew drive belt for positive drive. If erratic drive exists, clean/adjust/check the power module leadscrew drive.

To Adjust The Leadscrew Drive Belt:

Ensure the leadscrew torque clutch tension is properly adjusted. Set a tab approximately four inches from the left margin. Type a "T" to identify where the tab is set.

With the carrier at the left margin, manually prevent the low speed magnet from operating and depress tab.

The carrier should stop 1/4" to 3/4" before the tab stop.

NOTE: Use the card holder center line as the reference point.

If the carrier drives to the tab stop, the leadscrew belt is too loose.

CAUTION: If belt needs to be adjusted excessively tight, check the high speed magnet and clutch adjustments.

If the carrier stops more than one inch from the tab, the belt is too tight.

CAUTION: If the belt needs to be adjusted excessively loose, check for binds in carrier movement (lube print shaft, carrier rails and leadscrew).

DIRECTION MAGNET ADJUSTMENT CHECK

Manually energize the high speed magnet

Observe the 60 tooth gears for:

- Good positive forward drive.

  Pull up slowly on the direction magnet armature (with a spring hook just below the adjusting screw locknut).

Observe:

- The 60 tooth gears should stop driving and then a good positive reverse drive should occur.

If the escapement failure still exists after performing all of the preceding adjustments and checks, refer to the Escapement Diagnostic Chart.

- The following test may be helpful to check for drifting margins/tabs.

  Set the left margin away from 0 and set at least 2 tabs along the writing line. The tab spacing should be sufficient to cause a high speed operation.

  At the left margin and at each tab, type the characters "123" for several lines. This should be performed rapidly, or stored and played out, if possible.

Example of this test showing a margin drift right:

L/M		Tab		Tab
123		123		123
123	*(High Speed Tab)*	123	*(High Speed Tab)*	123
123		123		123

Refer to the Escapement Diagnostic Chart to correct the failure.

SHIFT

There are two (2) distinct stages of shift. These are keyboard shift and carrier shift. In many cases, carrier problems are mistaken as keyboard problems and vice versa. The following descriptions should clarify how to idenify the failing mechanism.

Keyboard Shift

There are two (2) shift keylevers, uppercase and lowercase. These keylevers are mechanically connected so that when the uppercase keylever is depressed, a keyboard shift will occur. Just as the shift occurs, the lowercase keylever pawl should reset above the lug on the lowercase interposer. When the upper case keylever is unlocked and allowed to restore upward, the lowercase keylever is driven downward by the mechanical connection. The **lowercase keylever adjusting screw** sets the timing of this operation. This adjustment can be checked by observing the lowercase keylever pawl. This pawl should reset above the lug on its interposer just as the keyboard cycles.

The **only** purpose of reed switch seven (7) is to indicate to the electronics the case of the selected character.

Carrier Shift

A carrier shift is a +6 selection and a change in condition of the shift mode switch. A carrier shift failure may be indicated by different symptoms on different types of machines.

The following describes the **different** symptoms for the **same** failure:

The operator types, "On January 6, a Major Event occurred."

In the Model 50/60 – The shift mode switch is checked by the electronics **before** each character is printed. If a carrier shift failure occurs, the symptom will be "typehead hunting."

Example:

On January 6, a Major E *"Typehead Hunts"*

In the Model 75 With A Level I Processor – The shift mode switch is **not** checked during a character selection operation. In the event of a carrier shift failure, the symptom will be all characters out of phase (i.e., uppercase for lowercase and vice versa). The only way for the operator to correct this condition is to perform a motor switch reset.

Example: **On jANUARY¢ A mAJOR eVENT occurred.**

If a failing machine has a Level 1 processor installed, it should be replaced by a Level II.

In The Model 75 With A Level II Processor – The shift mode switch is checked **after** each character is printed. If a carrier shift failure occurs, one or two characters will be out of phase, but the carrier will automatically go back into phase.

Example: **On january 6, a Major Event OCCurred.**

This type of failure may be mistaken as a keyboard problem. If the lowercase keylever screw adjustment is correct and the number seven (7) reed switch adjustment and operation is correct, the keyboard is **not** the cause of the problem.

NOTE: If a failure of the reed switch No. 7 operation occurs, all of the characters will generally print in the same case:

Example: **ON JAN ¢, A MAJOR EVENT OCCURRED.**

Example: **on jan. 6, a major event occurred.**

An intermittent No. 7 reed failure may be:

On JAn 6, a Major EVent occurred.

NOTE: Replacing a Level I processor with a Level II processor does **not** fix a carrier shift failure, it just changes the symptom. Therefore, when a carrier shift failure exists on a Model 75 with a Level II processor, **do not replace the processor board.** The problem is a mechanical failure.

CARRIER SHIFT FAILURE DIAGNOSTICS (MODEL 75)

The three major causes for carrier shift failures are:

1. Pin Block
2. Rack Transfer
3. Shift Mode Switch

Use the following as a guide to diagnose and correct carrier shift problems on Model 75 with either Level I or Level II processor board.

Condition	Corrective Action
1. Shift failure can be duplicated, with evidence of character substitution.	Refer to Character Substitution Diagnostics.
2. Shift failure can be duplicated, and there is **no** character substitution.	CHECK: PFB (timing and wheel left to right), extra cycles of PSCC, loose PSCC studs (10-151, 72). Perform appropriate shift mode check (below). Check/adjust/replace pin block and rack transfer. Check rotate cam for wear on restore surface.
3. Shift failure is intermittent, cannot be duplicated and there is no character substitution.	Ensure new level pin block and cams (CEM No. 144) are installed. Replace Level I processor (if present) with Level II processor board. Also Check: PFB (timing and wheel left to right), extra cycles of PSCC, loose PSCC studs (10-151, 72). Perform Level II shift mode check (below).

Shift Mode Check – Level I Processor Installed

1. Shift to lowercase
   Motor off
   Shift to uppercase
   Motor on
   Type "R"

2. Shift to uppercase
   Motor off
   Shift to lowercase
   Motor on
   Type "r"

If the character prints in the wrong case in either check, replace shift mode switch. (Ensure timing marks are aligned.)

NOTE: If keyboard locks up, check shift stopscrew and keyboard adjustments.

Shift Mode Check – Level II Processor Installed

Type a line of "R"
Type a line of "r"

If a shift failure occurs in either check, refer to Character Substitution Isolation Chart. Perform the correcting operation to verify: printer (shift mode) failure or keyboard (reed No. 7) failure.

INDEX

The index mechanism on the Electronic Typewriter is **adjusted differently** than other typewriters. The Model 75 Service Manual Supplement explains these adjustments in detail.

The unique part of the Electronic typewriters index adjustments is the overthrow stop. The stop is in a fixed position and all the adjustments are made to it. Because of this, it is important to first check for enough motion (drive) of the index pawl carrier to drive the index pawl to the stop. Next, check to see that the ratchet detents in the proper position (1 tooth, 2 teeth, etc.).

INDEX ADJUSTMENT SUMMARY

Use the APM to check the following index adjustments. Read the additional adjustment information provided in this summary.

1. Index driven gear and index magnet.
2. Index Cam Check Pawl – On the Model 75, the index cam does not always latch against the check pawl after an index cycle. This does not affect the operation of the mechanism.
3. Index timing and motion.
4. Platen Overthrow Stop – On machines without a fixed overthrow stop, the stop should be centered in the adjusting slot. Future production machines will have the fixed stop and will not be adjustable.
5. Index Link – To check this adjustment, cycle an index operation until the index cam follower is approximately 1/4" from the high point of the cam or the adjusting scribe mark. Check for a minimum amount of motion between the index pawl and the overthrow stop. Continue to cycle the machine until the cam follower reaches the high point or scribe mark. Now, check for no motion between the index cam and the overthrow stop.
6. Platen Detent – After the pawl carrier drive is adjusted, adjust the platen detent to fully engage the detent roller in the ratchet teeth.
7. Platen detent release
8. Index Selector Guide – Check this adjustment carefully to ensure the index pawl engages the correct ratchet tooth, and the platen moves the selected number of teeth.
9. All other index adjustments should also be checked.

CHARACTER SELECTION ADJUSTMENTS

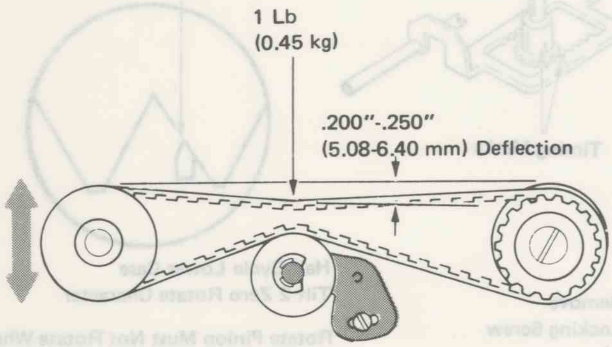
This adjustment sequence for character selection is designed to help you understand the character selection adjustments more fully. It includes adjustments that are not in the character selection mechanism, but can affect the character selection mechanism.

1. *Print Shaft Belt* – The print shaft drive belt is not part of the character selection adjustment sequence. However, its adjustment affects character selection. A loose belt will cause the selection cams to be out of time intermittently. This will cause intermittent rack transfer failures.

   To adjust print shaft belt:

   a. Rotate print shaft so correction restore cam follower is detented in restore cam.
   b. Latch the print shaft cycle clutch.
   c. Adjust idler so belt deflects between .200"-.250" (5.08-6.40 mm).
   d. Cycle the print shaft cycle clutch one time. Check belt tension again and refine as necessary.

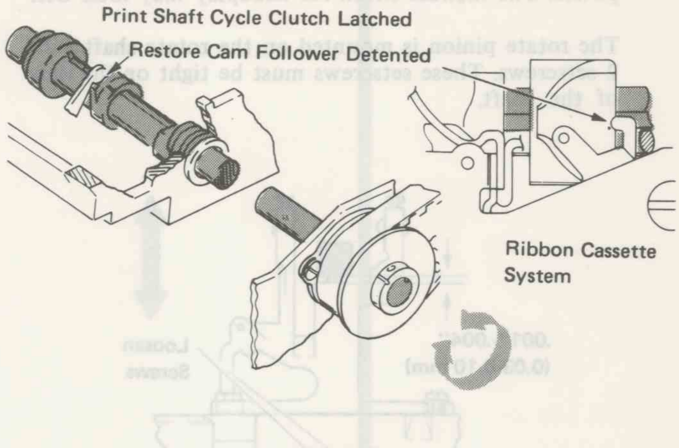
NOTE: If you cannot get the correct tension, replace the belt.



2. *Print Shaft Timing* – Print shaft timing is not part of the character selection adjustment sequence. However, if print shaft timing is **advanced** and selection cam fine timing **looks** OK, the relationship between the selection cams and the negative rack transfer cam follower is advanced. This will reduce the time that the rack transfer solenoid has to operate and can result in a rack transfer failure even if the rack transfer bracket assembly is good.

To adjust print shaft timing:

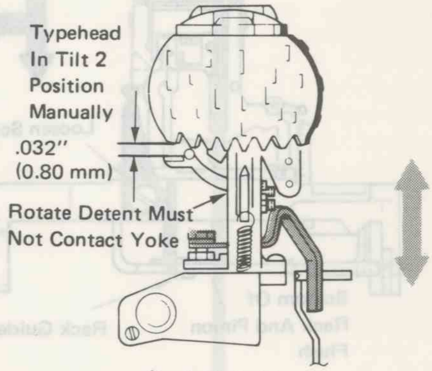
a. Install print shaft drive belt and adjust tension.
b. Latch the print shaft cycle clutch.
c. Loosen the print shaft drive pulley.
d. Rotate the print shaft until the restore cam follower is detented in the restore cam.
e. Make sure that a setscrew does not go in the keyway. Tighten setscrews.
f. Cycle print shaft one time under power and check timing. Refine as necessary.



3. *Typehead Skirt Clearance* – This adjustment is not part of the character selection adjustment sequence. However, it affects selection cams fine timing. If selection cam fine timing is incorrect, the rack transfer function can fail intermittently even if the rack transfer bracket assembly is good.

   To check typehead skirt clearance:

   a. Rotate print shaft so the keyway is down. This will allow you to manually move the typehead.
   b. Pivot the typehead to approximately the tilt 2 position.
   c. Check that there is at least .032" (0.80 mm) clearance between the top of the rotate detent and the bottom of the typehead teeth.
   d. Make sure that the rotate detent does not contact the yoke.



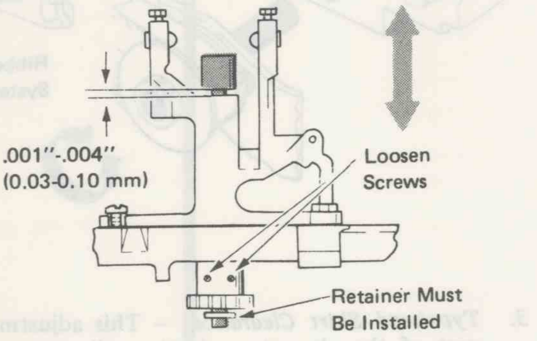
(Left Side View)

To adjust the typehead skirt clearance:

a. Rotate the print shaft so the keyway is down. This will allow you to manually move the typehead.
b. Loosen the tilt bellcrank stop locknut.
c. Turn the detent actuating lever pivot stud in or out until the top of the rotate detent clears the bottom of the typehead teeth by a minimum of .032" (0.80 mm) with the typehead in approximately the tilt 2 position.
d. Readjust the tilt bellcrank stop and tighten the tilt bellcrank stop locknut.
e. Check selection cams fine timing.

4. *Rotate Shaft End Play* – If this clearance is excessive, the rotate shaft will move up or down before rotating the "dog bone." This will increase headplay under power. The manual check for headplay may look OK.

The rotate pinion is mounted on the rotate shaft with 2 setscrews. These setscrews must be tight on the flats of the shaft.

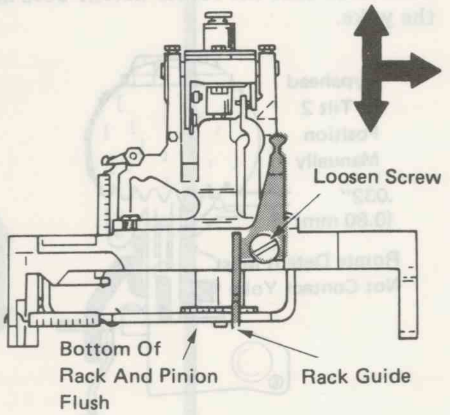


(Rear View)

To adjust rotate shaft end play:

a. Loosen both rotate pinion setscrews.
b. Remove the selection cams.
c. Position the pinion up or down for minimum end play with no binds .001"-.004" (0.03-0.05 mm) and tighten the setscrews.
d. Observe that the rotate shaft rotates freely when you move the rotate rack left and right.

5. *Rotate Rack Plate Guide* – The guide supports the front of the rotate rack plate.



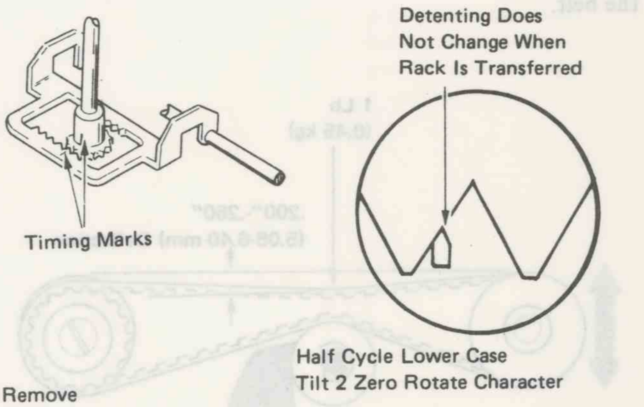
To adjust the rotate rack plate guide:

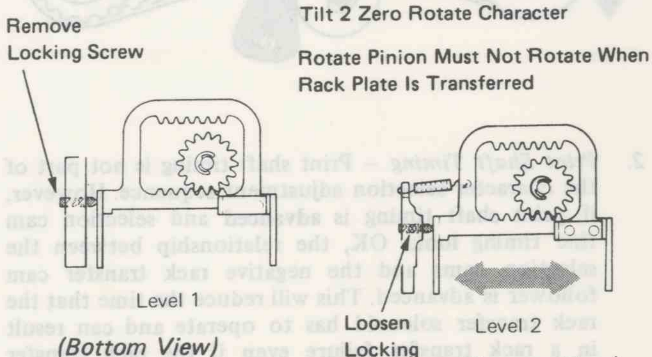
a. Loosen the guide mounting screw.
b. Move the guide up so it holds the rotate rack plate flush with the bottom of the pinion gear and tighten the mounting screw. You can check if the pinion is flush by sliding a spring hook or similar tool across the bottom of the pinion and rack plate.
c. Install the selection cams and check selection cams fine timing.

6. *Rotate Rack Plate Home Position* – The purpose of this adjustment is to ensure that there is no pinion movement when the rack is transferred. If there is, it will cause selection cam breakage. As the rack transfers, the pinion gear will move slightly and become caught between the positive and negative teeth on the rack plate. On early level machines, the stop screw is locked by installing 2 screws in one hole. The stop screw may be an "allen" screw on these machines. Later level machines will have the locking screw installed from the bottom of the carrier.

To check rotate rack plate home position:

a. Rotate the print shaft until the typehead is detented.
b. Remove the tilt spring so the typehead will be easier to work with.
c. Manually tilt the typehead to tilt 2 or 3. This will position the tilt cam so it does not interfere with the adjustment check.
d. The detenting does **not** have to be correct when you make this check and you only have to check one side of the tooth. Check detenting. (Do not rotate print shaft.)
e. Manually transfer the rotate rack plate.
f. Compare detenting. It should match the detenting before rack transfer. If it does not, adjust the stop screw until it does.





(Bottom View) *(Bottom View)*

To adjust rotate rack plate home position:

a. Shift to lower case and ensure the timing mark on the rotate pinion is aligned with the timing mark on the rotate rack plate.
b. Disconnect the tilt spring so the typehead will be easier to work with.
c. Remove the selection cams.
d. Remove (L–1) or loosen (L–2) locking screw.
e. Half cycle the print shaft.

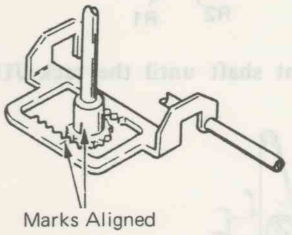
f. Manually transfer the rotate rack plate front to the rear and adjust the stop screw until the detenting is equal in both positions of the rotate rack plate.
g. Tighten locking screw.
h. Recheck the adjustment.
i. Reinstall selection cams.
j. Connect the tilt spring.

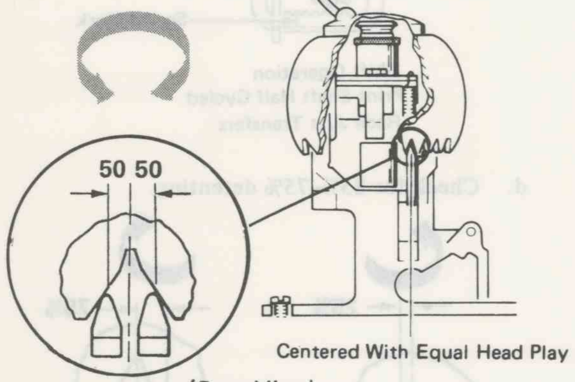
7. *Typehead Homing* – This ensures total typehead play is EVENLY distributed between the element teeth in the home position.

To check typehead play:

a. Latch typehead on upper ball socket.
b. Check for even distribution of play (50/50 split).
c. Check for .050" (1.27 mm) maximum headplay (halfway down tooth).

NOTE: If excessive play exists, check for worn parts (ball joint, upper and lower ball sockets)





(Rear View)

NOTE: Typehead homing must be correct before making any further adjustments.

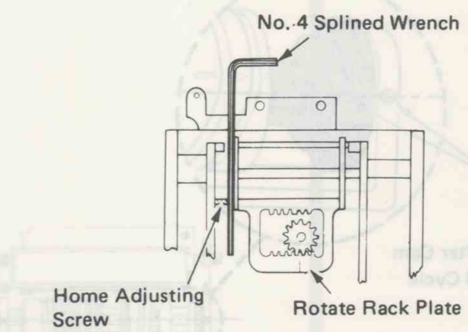
To adjust typehead homing:

a. Shift to lower case.
b. Align timing mark on the rotate rack plate with the timing mark on the rotate pinion.
c. Half Cycle a tilt 2, rotate 0 character.
d. Loosen the rotate locking screw and move the typehead radially to obtain the 50/50 split.
e. Tighten the locking screw.
f. Readjust if necessary.

SERVICE TIP:

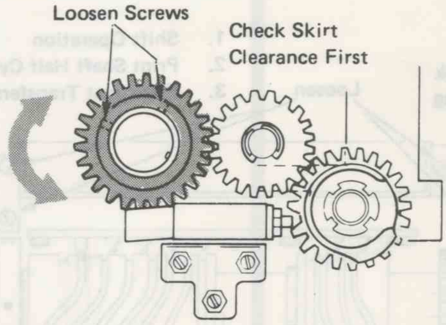
This is an alternate method of performing this adjustment.

a. Remove platen and deflector.
b. Half cycle print shaft to detent typehead.
c. Loosen rotate locking screw (02-253). Leave lever up.
d. Remove detent and rotate element counterclockwise 1 tooth; release detent.
e. Move rotate rack plate (02-302) to right.
f. Trap No. 4 splined wrench between home adjusting screw (02-308) and left side of rotate rack plate. Make sure no other parts interfere with splined wrench.
g. Push down on element while tightening rotate locking screw.
h. Remove No. 4 splined wrench and check rotate homing.



(Top View)

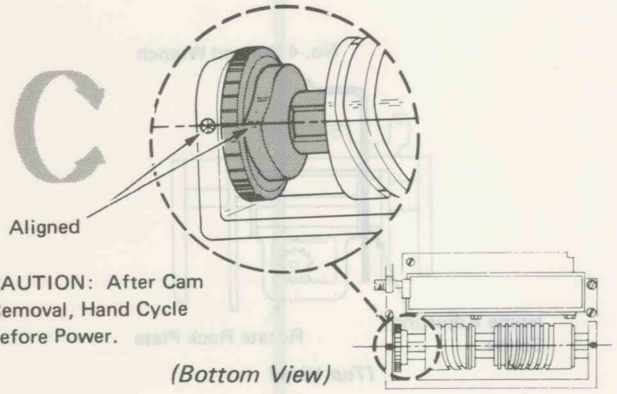
8. *Selection Cam Preliminary* – This is a preliminary adjustment which sets the selection cam position so large changes to the selection drive gear will not have to be made when adjusting selection cam fine timing. Use this adjustment as a reference when install ing the same cam assembly.



To adjust selection cam preliminary:

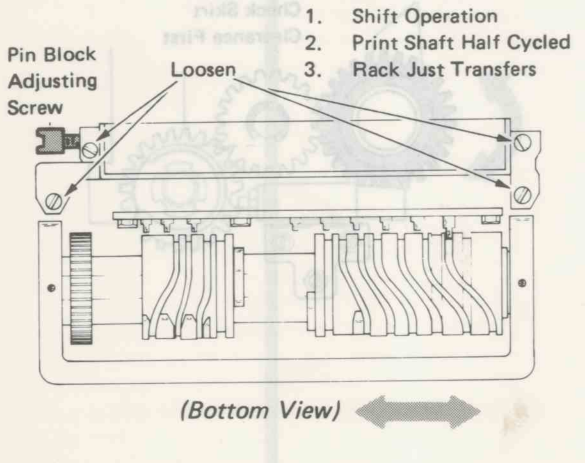
a. Time the print shaft.
b. Install the selection cam assembly by aligning the gear tooth next to the beginning of the high point of the leadscrew lock cam with the setscrews.
c. Tighten the setscrews on the flats of the selection sleeve shaft.

CAUTION: Always tighten the 2 setscrews before operating the machine. If the setscrews are not tight, the shaft can slide out in as few as 2 revolutions of the print shaft, and cause parts damage.



(Bottom View)

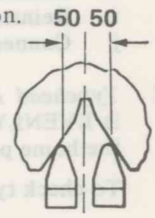
9a. *Pin Block Left To Right* — This adjustment sets the typehead drive. Too much typehead drive will cause malselection and selection cam breakage. It can also cause the shift cam surface to transfer the rotate rack plate when a +5 rotate character is selected. This will cause the timing marks on the rotate rack plate and rotate pinion to get out of alignment or jam. An indication of maladjustment is that the plating is worn off the rotate 6 typehead teeth.



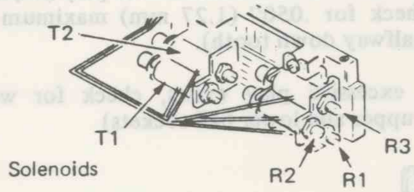
(Bottom View)

To check pin block left to right:

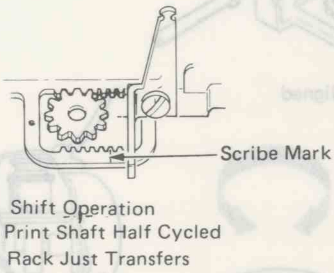
a. Be sure these adjustments are correct:
   1. Print sleeve end play.
   2. Rocker end play.
   3. Rotate shaft end play
   4. Rotate rack plate home position.
   5. Typehead homing (head play).



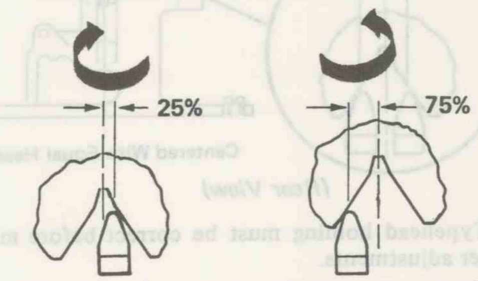
b. Depress the R-2 solenoid.



c. Half cycle the print shaft until the rack JUST transfers.



d. Check for 25%–75% detenting.



Headplay Removed In The Clockwise Direction

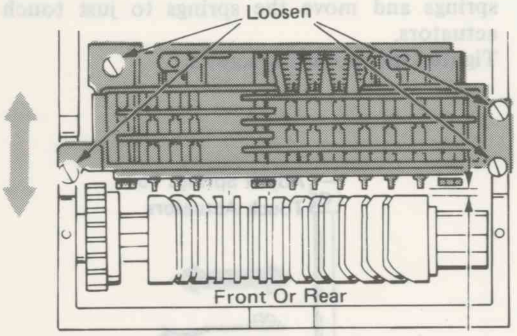
Headplay Removed In The Counter-Clockwise Direction

(Rear View)

To adjust pin block left to right:

a. Loosen the four pin block mounting screws (leave friction tight).
b. Turn the adjusting screw until the selection pins are evenly centered over their tracks.
c. Depress the R-2 solenoid.
d. Half cycle the print shaft until the rack JUST transfers.
e. Turn the adjusting screw to obtain the 25%–75% detenting condition. Turning the adjusting screw in will decrease the 25% and increase the 75% detenting.

9b. *Pin Block Front To Rear* – This adjustment ensures that the selection pins will restore reliably. If there is too little clearance, a selection pin can bounce back and fail to be latched by the vanes in the pin block. If there is too much clearance, a pin can intermittently fail to latch. Either of these conditions can cause malselection or parts breakage.



(Bottom View)

To adjust pin block front to rear:

a. Place a tab card between the pins and cams to obtain proper clearance [.006"-.009" (0.15-0.23 mm)].
b. Tighten four screws. Cycle the print shaft back to rest.
c. Recheck adjustments.

SERVICE TIPS

Typehead sequence of motion:

1. Print shaft rotates selection cams
2. Selection pins drop into cam track
3. Selection cams move laterally
4. Rack plate cam follower follows the moving cams
5. Rack plate moves left to right
6. Pinion gear follows rack plate
7. Motion is carried up from the pinion gear to the upper ball socket and element

Adjusting the pin block to the RIGHT INCREASES motion to the element.

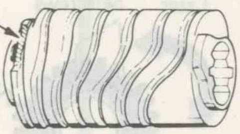
Adjusting the pin block to the LEFT DECREASES motion to the element.

Pin Block L To R Maladjusted Or Bent Rotate Cam Follower

1. Home Position

Failure of the rotate rack to transfer fully in the home position results in a break in the left side of the rotate cam follower track next to the pin restoring surface.

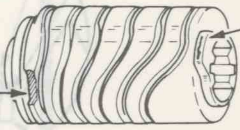
If the pin block (L to R) is maladjusted or the rotate cam follower is bent, the selection pins will move the cams laterally in the restore position: this will allow the rack to be away from the stop screw. As the cams rotate and rack transfer is required, the pinion will become engaged with both the negative and positive teeth. This failure can be identified by breakage as shown and a groove in only **one** of the cam follower surfaces.



2. Shift Position

Failure of the rotate rack to transfer fully in the shift position is generally caused by the pin block (L to R) maladjusted or a bent rotate cam follower.

As the rotate cam is driven to the +6 position, the shift cam surface contacts the shift cam follower. The rack then transfers from +6 to -6. If pin block (L to R) is maladjusted or the rotate cam follower is bent, the pinion will become engaged with both the negative and positive teeth.

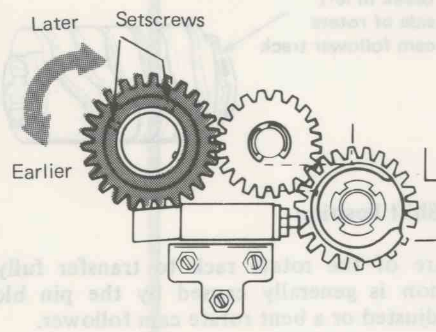


10. *Selection Cams (Fine Timing)* – This adjustment times the selection cams with the typehead detent cam. If the detent is pulled out of the typehead teeth too early, it will also enter the typehead teeth too early. This can cause the detent to enter the typehead tooth before the character is completely selected. If it is pulled out too late, the detent will drag heavily on the tooth as the typehead starts to rotate back toward home. This may result in broken cams, worn elements, and malselection. (The plating will wear off the R-6 typehead tooth if the rotate detent operates too early or too late.)

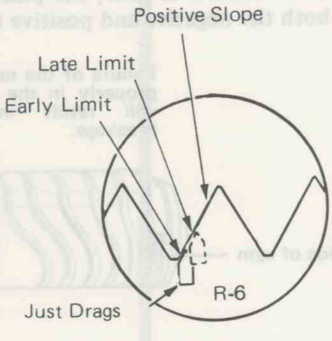
To check selection cams fine timing:

a. Make sure that these adjustments are correct.
   1. Print sleeve end play.
   2. Rocker end play.
   3. Typehead skirt clearance.
   4. Rotate shaft end play.
   5. Rotate rack plate home position.
   6. Typehead homing (head play).
   7. Selection cam preliminary.
   8. Pin block left to right.
b. Half cycle a -6 rotate character (typehead must be fully detented).
c. Slowly hand cycle the print shaft and observe that the rotate detent just drags on the positive slope of the tooth at or between the 2 rotate detent positions shown for R-6. After the detent touches, it will drag the rest of the way down the tooth.

The illustration shows the two positions that the rotate detent will start to drag when adjusted to the early and late limit.



(Right Side View)



(Rear View)

To adjust selection cams fine timing:

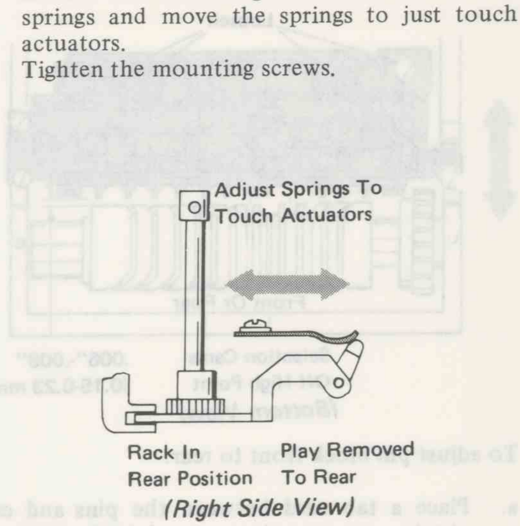
a. Loosen the setscrews (2) in the selection drive gear and rotate the print shaft to make the rotate detent contact the typehead earlier or later.
   Earlier = top to rear.
   Later = top to front.
b. Tighten both setscrews, then check the adjustment.

CAUTION: Be sure not to lose the print sleeve endplay while making this adjustment. The gear can bind against the inside of the carrier frame. Also, do not tighten a setscrew in the print shaft keyway.

11. Rack Transfer Detent Springs – These springs hold the rotate rack in either the front or rear position.

To adjust the detent springs:

a. Manually move the rotate rack to the rear position
b. Remove the play in the rack transfer bracket to the rear.
c. Loosen the mounting screws to the two detent springs and move the springs to just touch the actuators.
d. Tighten the mounting screws.



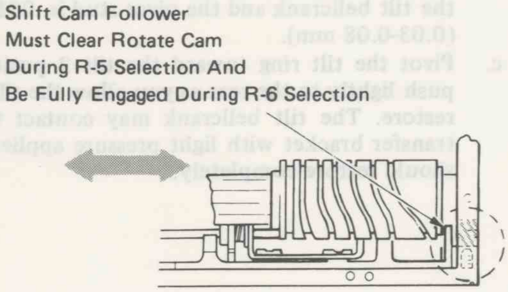
(Right Side View)

12. Bail Shaft Bushing – This adjustment positions the rack transfer bracket assembly left or right to meet two conditions:

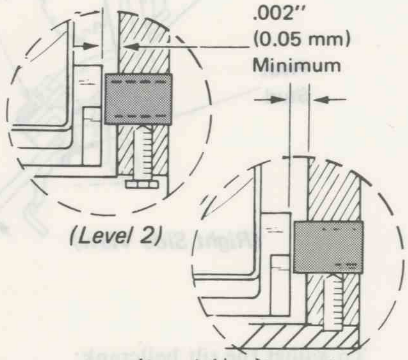
a. So the rack transfer cam followers will track on the selection cams by the thickness of the followers. If the followers do not track correctly, you will have intermittent rack transfer failures.
b. So the shift cam surface will not contact the shift cam follower when a rotate 5 character is selected and will have full contact when a rotate 6 operation is selected. The timing marks on the rotate pinion and the rotate rack plate will get out of alignment if this is incorrect.

To check the bail shaft bushing:

a. Hold the rack transfer bracket to the right against the bail shaft bushing.
b. Check that a .002" (0.05 mm) feeler gauge will slide between the **carrier** frame and the shift cam follower. Feeler gauge should contact the bail shaft bushing.
c. Check that there is minimum end play with no binds in the rack bracket.
d. Hand cycle a rotate 5 character and observe that the **right** end of the rotate selection cam does **not** contact the **left** side of the shift cam follower.
e. Rotate the print shaft several times and check that the negative and positive rack transfer followers track on the selection cams by the thickness of the followers.



(Bottom View)



To adjust bail shaft bushing:

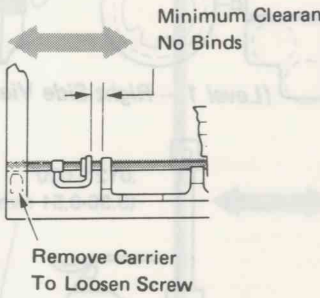
a. Remove the carrier assembly.
b. Loosen the bail shaft bushing setscrew, and the left bail shaft screw.
c. Move the rack transfer bracket assembly left or right to meet 3 conditions:
   1. For a minimum of .002" (0.05 mm) clearance between the carrier side frame and the right side of the shift cam follower. Rack transfer bracket must touch the bail shaft bushing.
   2. So the rack transfer followers track on the selection cams by the thickness of the followers.
   3. So the shift cam follower does **not** contact the right side of the shift cam surface on the rotate selection cam when a 5 rotate character is hand cycled.
d. Tighten the bail shaft bushing setscrew then adjust the rack bracket end clearance.
e. Check positive cam follower adjustment before installing carrier.

SERVICE TIP

Rack Transfer Bushing — Retaining Screw

All new-build carriers will be shipped with an extra hex head screw (P/N 1206605). Use this screw to replace the setscrew that holds the rack transfer bail shaft bushing (03-44) on early level machines. Early level machines do not have the frame cut out by the leadscrew drive clutch. On new level machines, the adjustment can be made through the undercut in the frame near the leadscrew drive clutch.

13. *Rack Bracket End Clearance* — This adjustment prevents the rack transfer bracket assembly from moving too far to the left during normal operation. If the bracket moves too far to the left, the negative rack transfer cam follower can track on the outside surface of the tilt cam intermittently and fail to restore. This will cause intermittent rack transfer failures because the negative rack transfer cam follower will not restore and prevent the rack transfer solenoid plunger from operating. Also, on some machines the rotate selection cam will contact the shift cam follower during a rotate 5 character. This will transfer the rotate rack plate and cause the timing marks on the plate and rotate pinion to get out of alignment.



(Bottom View)

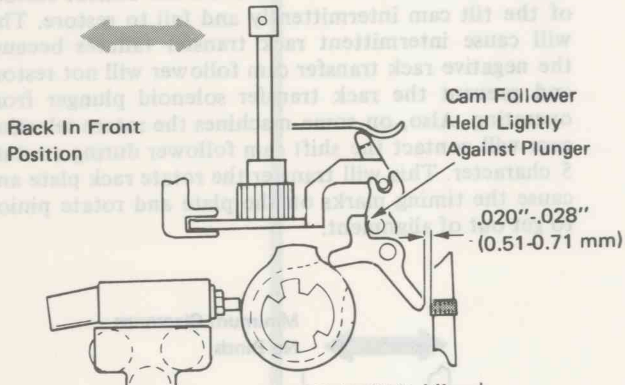
To adjust rack bracket end clearance:

a. Remove the carrier.
b. Loosen the bail shaft setscrew.
c. Slide the bail shaft to the right so the "C"-Clip just touches the leadscrew lock cam follower and the leadscrew lock cam follower just touches the left side of the rack transfer bracket.
d. Tighten the bail shaft setscrew.
e. Check the positive cam follower adjustment before installing the carrier.

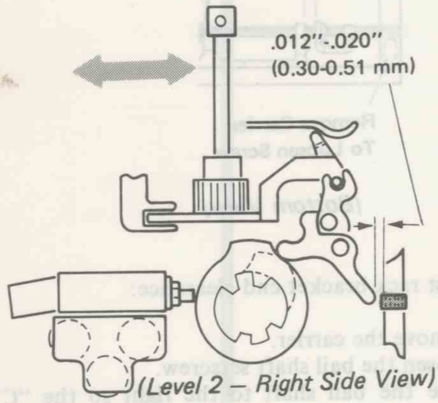
14. *Positive Cam Follower* – This adjustment prevents the positive rack transfer cam follower from restoring too far. If this adjustment is too wide, the positive rack transfer cam follower will prevent the rotate selection cam from restoring freely. This could cause parts breakage in the carrier. If there is little or no clearance, the positive rack transfer cam follower may be held against the rack transfer solenoid plunger and cause it to fail intermittently.

To check the positive cam follower:

a. Transfer the rotate rack plate to the front (negative rack engaged).
b. Pivot the positive rack transfer cam follower against the rack transfer solenoid plunger.
c. Check that there is .020"-.028" (0.51-0.71 mm) clearance between the lower end of the follower and the stop screw.



(Level 1 – Right Side View)



(Level 2 – Right Side View)

To adjust the positive cam follower:

a. Remove the carrier.
b. Rotate the selection cams to the rest position.
c. Transfer the rotate rack plate to the front (negative rack engaged).
d. Pivot the positive rack transfer cam follower against the rack transfer solenoid plunger.
e. Adjust the stop screw in or out so it clears the lower end of the positive rack transfer cam follower by .020"-.028" (0.51-0.71 mm).
f. The carrier may now be reinstalled in the machine.

NOTE: The new level rack transfer assembly (steel bracket) does not have a positive cam follower adjustment. It is preset by the bracket.

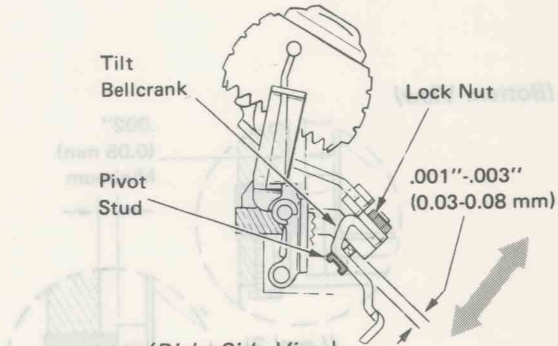
15. *Tilt Bellcrank* – This adjustment positions the tilt bellcrank pivot stud so the tilt bellcrank does not contact the rack transfer bracket assembly and there is a minimum of lost motion to the tilt ring.

The more the pivot stud is turned in, the closer the tilt bellcrank will get to the rack transfer bracket. If the pivot stud is turned in too far, the tilt bellcrank can get caught on the rack transfer bracket.

If the clearance between the pivot stud and the tilt bellcrank is too wide, it will be difficult to get the correct tilt motion distribution.

To check the tilt bellcrank:

a. Remove the selection cams.
b. Check that the clearance between the bottom of the tilt bellcrank and the pivot stud is .001"-.003" (0.03-0.08 mm).
c. Pivot the tilt ring toward the tilt 3 position and push lightly to the rear as you allow the tilt ring to restore. The tilt bellcrank may contact the rack transfer bracket with light pressure applied but, it should restore completely.



(Right Side View)

To adjust the tilt bellcrank:

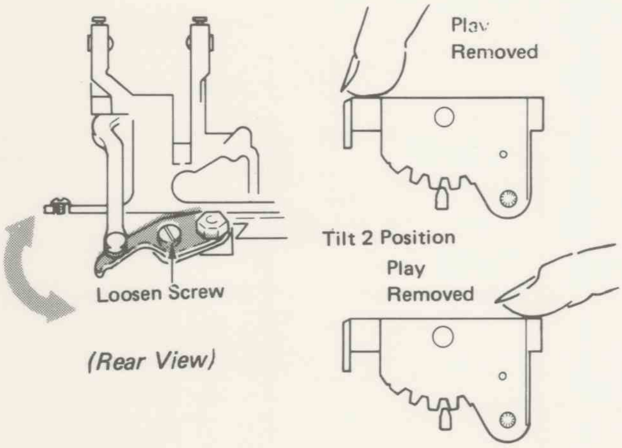
a. Remove the selecton cams.
b. Loosen the lock nut.
c. Turn the pivot stud in until it clears the bottom of the tilt bellcrank by .001"-.003" (0.03-0.08 mm).
d. Hold the pivot stud and tighten the lock nut.
e. Check that there are no binds between the tilt bellcrank and the pivot stud.

16. *Tilt Ring Position* – This adjustment sets the tilt cam follower bellcrank so there is enough motion to detent the tilt ring in tilt 1, tilt 2, and tilt 3. Tilt 0 will be set later. Tilt 1, tilt 2, and tilt 3 do **not** have to match. If the tilt detent fully engages in the tilt ring in all 3 positions without contacting the tip of a tilt ring tooth, the adjustment is good.

If the tilt cam follower is bent or the pin block left or right adjustment is incorrect, the tilt motion will be incorrect after making this adjustment and the following adjustment.

To check the tilt ring position:

a. Remove typehead
b. Half cycle a tilt 2 character.
c. Hold the tilt detent out of the notch while lightly pushing down on the front of the tilt ring. Allow the detent to enter the tilt ring and check the detent entry.
d. Hold the tilt detent out of the notch while lightly pushing down on the rear of the tilt ring. Allow the detent to enter the tilt ring and check that there is equal detent entry.
e. Check that the tilt detent completely engages in tilt 1 and tilt 3.



(Rear View)

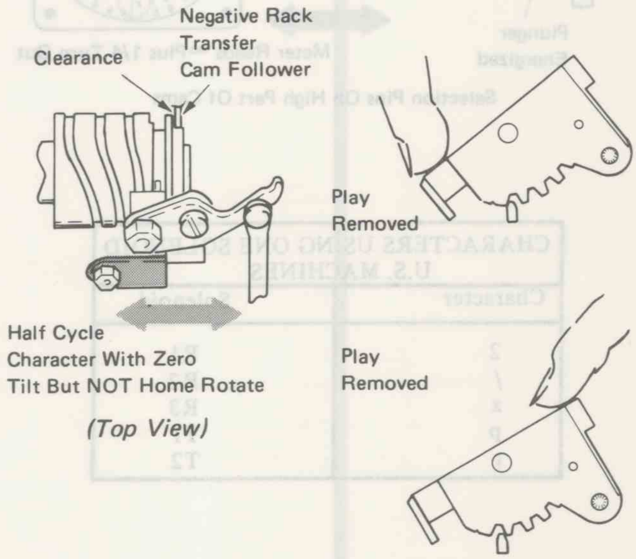
To adjust the tilt ring position:

a. Remove the typehead.
b. Half cycle a tilt 2 character.
c. Loosen adjusting screw.
d. Hold the detent out of the tilt ring and pivot the tilt ring to rest on the tip of the tooth between tilt 2 and tilt 3.
e. Tighten the adjusting screw.
f. Check the tilt ring positon adjustment and repeat as necessary until the detent entry matches with the play removed in both directions.

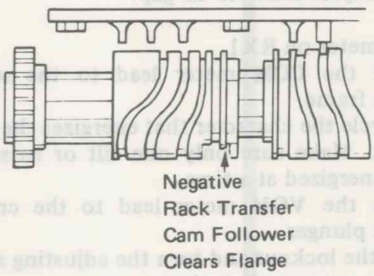
17. *Tilt Bellcrank Stop* – This adjustment sets the rest position for the tilt ring and the tilt selection cam. If this adjustment is incorrect, the negative rack transfer cam follower can track on the outside surface of the tilt selection cam. This will cause intermittent rack transfer failures.

To check the tilt bellcrank stop:

a. Make sure that these adjustments are correct:
   1. Pin block left to right.
   2. Bail shaft bushing.
   3. Rack bracket end clearance.
   4. Tilt ring position.
b. Half cycle any tilt 0 character except a rotate 0. This will move the rotate selection cam to the right so it will not affect your adjustment check.
c. Make sure that the tilt detent does not contact the tip of a tilt ring tooth and that the rear of the tilt ring has approximately .010" (0.25 mm) rise.
d. Check that the negative rack transfer cam follower tracks on the tilt selection cam by at least the thickness of the follower and cannot track on the outside surface of the tilt selection cam.



(Top View)

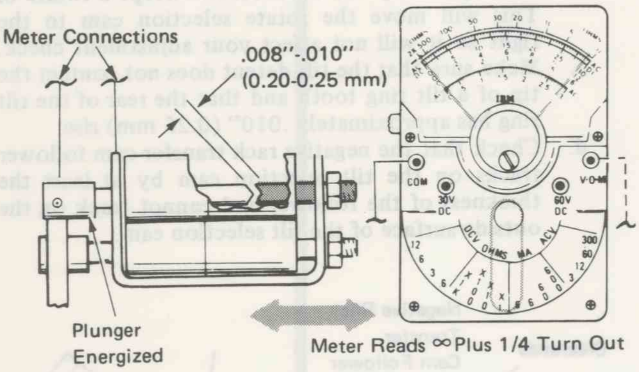


(Bottom View)

To adjust the tilt bellcrank stop:

a. Remove the typehead.
b. Half cycle any tilt 0 character, except rotate 0.
c. Match the tilt detent entry with the play removed to the front, then to the rear (approximately .010" [0.25 mm] rise). If this causes a problem with the negative rack transfer cam follower, get as close as possible. Loosen the nut that holds the tilt bellcrank stop (**friction tight**).
d. Make sure that you move the stop laterally and not radially. Use a tool to tap or slide the stop left or right until the detent entry is the same when the tilt ring play is removed in either direction.
e. Tighten the nut and recheck the adjustment.

18. *Selection Solenoid Air Gap* – This adjustment sets the solenoid so it has the most power and the quickest operation. To check the air gap, the adjustment must be made. Do not keep the solenoid energized for more than 5 minutes.

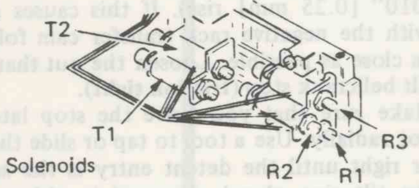


Selection Pins On High Part Of Cams

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

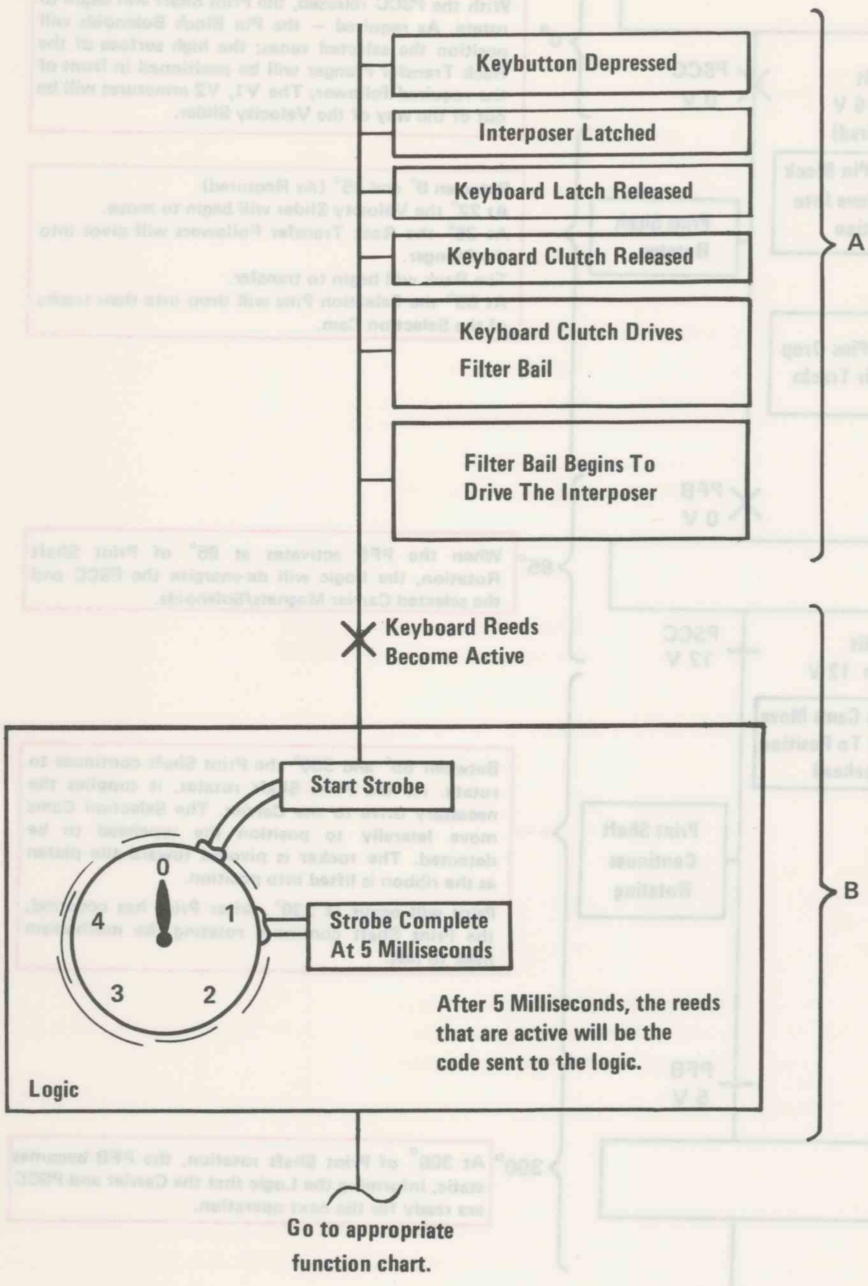
To check or adjust solenoid air gap:

a. Set the meter on RX1.
b. Connect the **COM** meter lead to the selection solenoid frame.
c. Hand cycle the character that energizes the correct solenoid. Make sure only one tilt or rotate solenoid is energized at a time.
d. Connect the **VOM** meter lead to the energized solenoid plunger.
e. Loosen the locknut and turn the adjusting screw in until the meter reads 0 ohms.
f. Tighten the locknut friction tight and hold it while you back the adjusting screw out. Back the adjusting screw out until the meter reads infinity (∞).
g. Back the adjusting screw out 1/4 of a turn and hold it while you tighten the locknut. This sets the .002"-.005" (0.05-0.13 mm) plunger clearance.



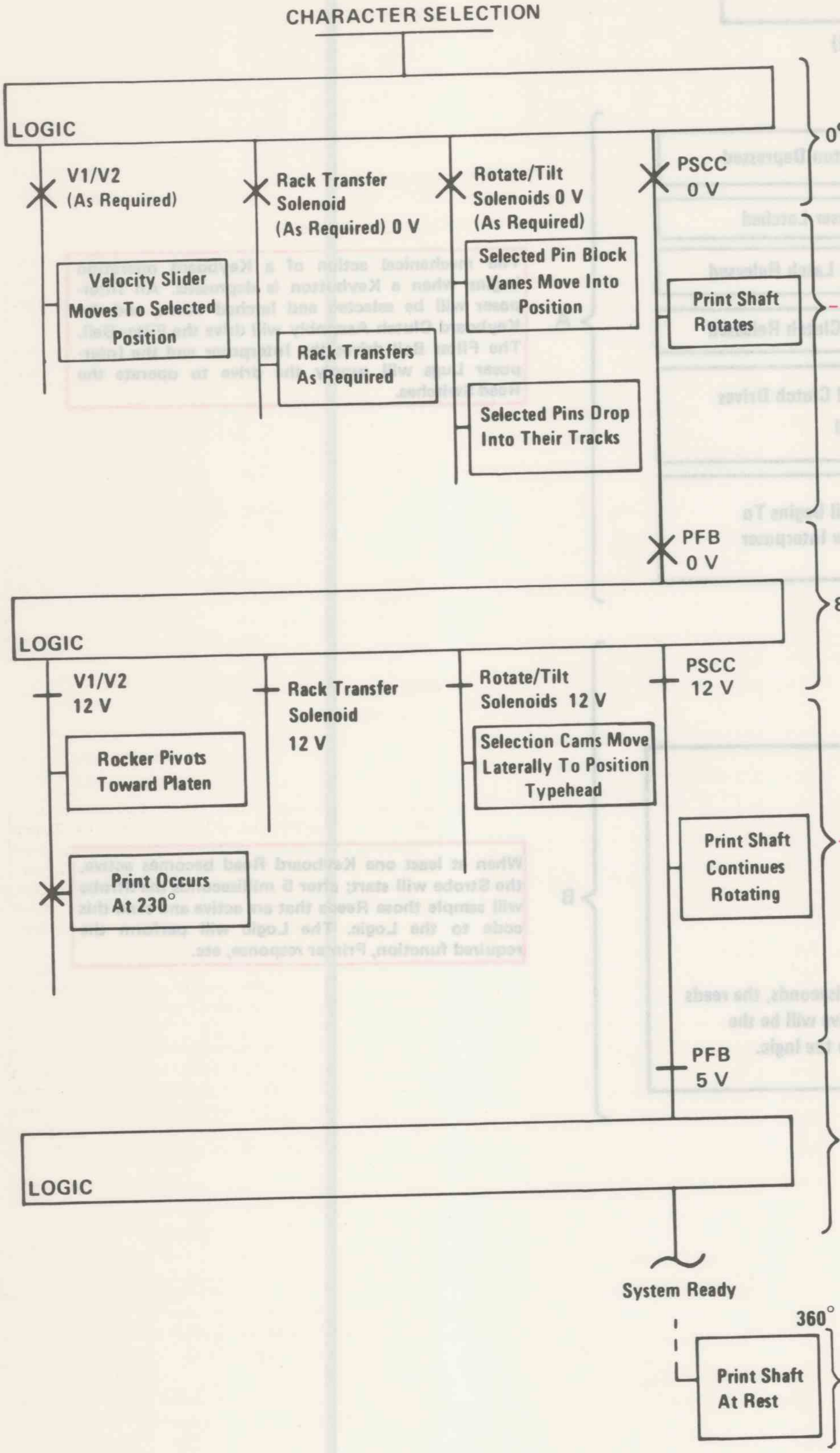
FUNCTION CHARTS

KEYBOARD OPERATION (STROBE)



The mechanical action of a Keyboard operation begins when a Keybutton is depressed. An Interposer will be selected and latched down, and the Keyboard Clutch Assembly will drive the Filter Bail. The Filter Bail drives the Interposer and the Interposer Lugs will supply the drive to operate the Reed Switches.

When at least one Keyboard Reed becomes active, the Strobe will start; after 5 milliseconds the Strobe will sample those Reeds that are active and send this code to the Logic. The Logic will perform the required function, Printer response, etc.



The Electronics initiates a Character Selection Operation. A Character Selection begins with a ground shot to the PSCC and the Rotate, Tilt, Rack Transfer, Velocity Magnets as required.

With the PSCC released, the Print Shaft will begin to rotate. As required – the Pin Block Solenoids will position the selected vanes; the high surface of the Rack Transfer Plunger will be positioned in front of the required follower; The V1, V2 armatures will be out of the way of the Velocity Slider.

Between 0° and 85° (As Required)
At 22° the Velocity Slider will begin to move.
At 35° the Rack Transfer Followers will pivot into the Plunger.
The Rack will begin to transfer.
At 55° the Selection Pins will drop into their tracks of the Selection Cam.

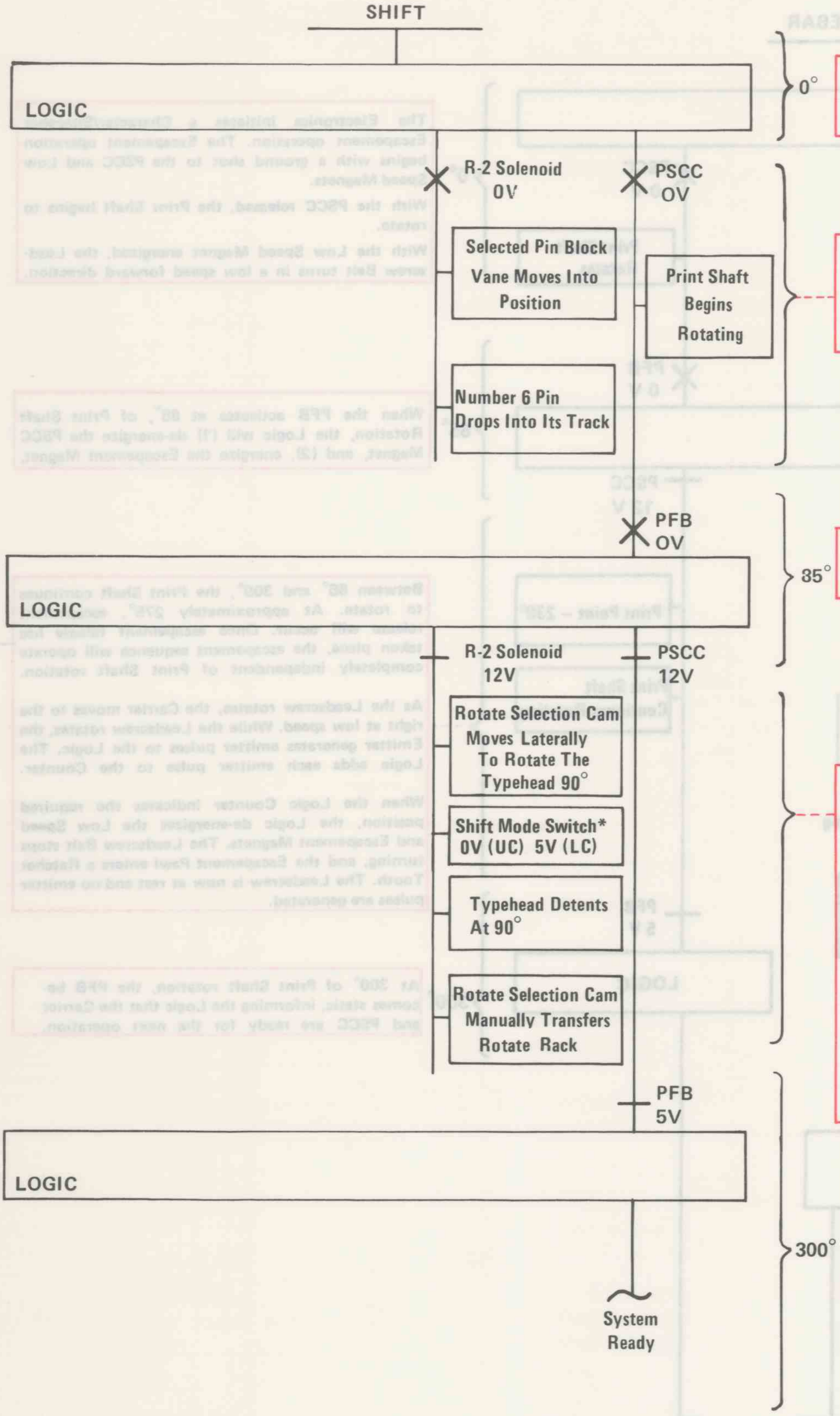
When the PFB activates at 85° of Print Shaft Rotation, the Logic will de-energize the PSCC and the selected Carrier Magnets/Solenoids.

Between 85° and 300° the Print Shaft continues to rotate. As the Print Shaft rotates, it supplies the necessary drive to the Carrier. The Selection Cams move laterally to position the typehead to be detented. The rocker is pivoted toward the platen as the ribbon is lifted into position.

Print will occur at 230°. After Print has occurred, the Print Shaft continues rotating the mechanism back to rest.

At 300° of Print Shaft rotation, the PFB becomes static, informing the Logic that the Carrier and PSCC are ready for the next operation.

The Print Shaft restores to rest after 360° of rotation.



The Electronics initiates a shift operation. A shift operation begins with a ground shot to the PSCC Magnet, and the R-2 Solenoid.

With the R-2 Solenoid and PSCC Magnet energized, the Selected Pin Block Vane moves into position to drop the (6) Pin and the Print Shaft begins to rotate. As the Selection Cam rotates away from its high dwell, the (6) Pin drops into its track in the cam.

When the PFB activates at 85° of Print Shaft Rotation, the Logic will de-energize the PSCC Magnet and R-2 Solenoid.

As the Print Shaft drives beyond 85°, the Rotate Selection Cam moves laterally to rotate the typehead 90°. Just before reaching 90° of typehead rotation, the cam surface, on the hub of the Rotate Pinion, reaches its high dwell (lower case), or low dwell (upper case), and operates the Shift Mode Switch.

At 90° of Typehead Rotation, the Shift Cam contacts the lower extension of the Rack Transfer Bracket and manually transfers the Rack.

After the Rack mechanically transfers, the Rotate Selection Cam, still following the (6) Pin, restores laterally back to its rest position. Since the rack is now driving on its opposite side, the restoring motion of the Selection Cam will rotate the Typehead the additional 90° to complete the 180° shift operation.

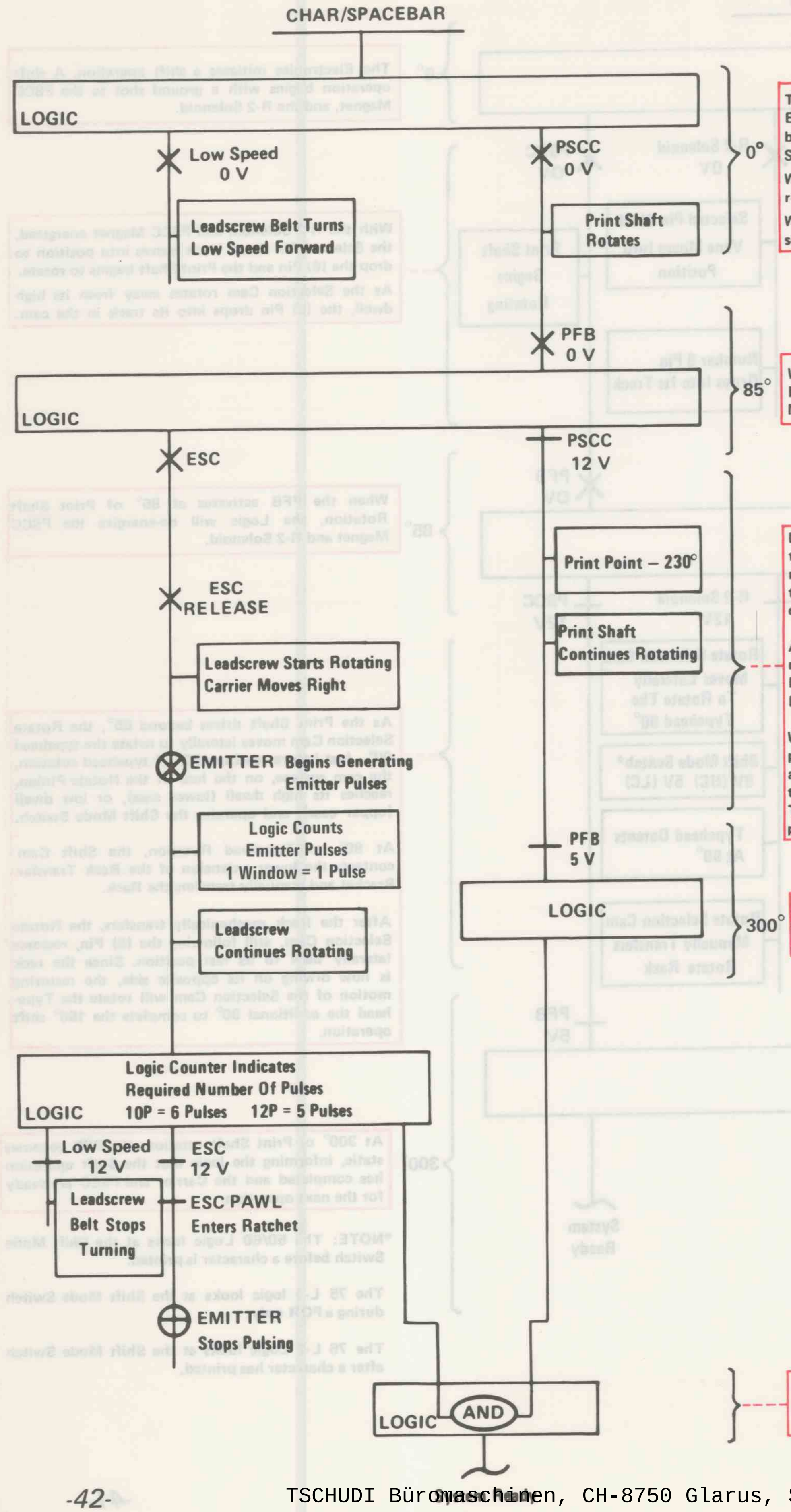
At 300° of Print Shaft rotation, the PFB becomes static, informing the logic that the Shift operation has completed and the Carrier and PSCC are ready for the next operation.

*NOTE: The 50/60 Logic looks at the Shift Mode Switch before a character is printed.

The 75 L-1 logic looks at the Shift Mode Switch during a POR only.

The 75 L-2 Logic looks at the Shift Mode Switch after a character has printed.

ESCAPEMENT



The Electronics initiates a Character/Spacebar Escapement operation. The Escapement operation begins with a ground shot to the PSCC and Low Speed Magnets.

With the PSCC released, the Print Shaft begins to rotate.

With the Low Speed Magnet energized, the Leadscrew Belt turns in a low speed forward direction.

When the PFB activates at 85°, of Print Shaft Rotation, the Logic will (1) de-energize the PSCC Magnet, and (2), energize the Escapement Magnet.

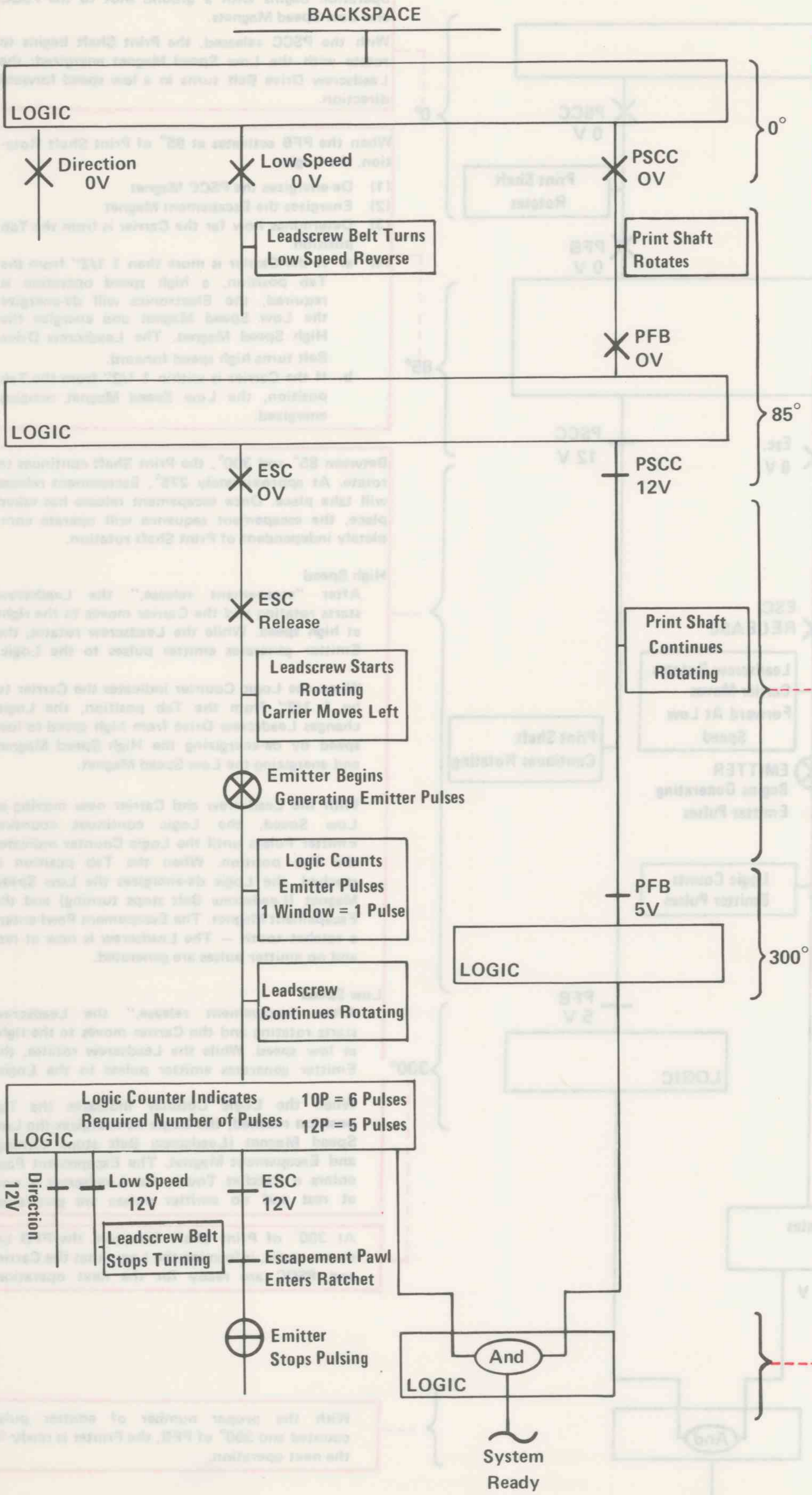
Between 85° and 300°, the Print Shaft continues to rotate. At approximately 275°, escapement release will occur. Once escapement release has taken place, the escapement sequence will operate completely independent of Print Shaft rotation.

As the Leadscrew rotates, the Carrier moves to the right at low speed. While the Leadscrew rotates, the Emitter generates emitter pulses to the Logic. The Logic adds each emitter pulse to the Counter.

When the Logic Counter indicates the required position, the Logic de-energizes the Low Speed and Escapement Magnets. The Leadscrew Belt stops turning, and the Escapement Pawl enters a Ratchet Tooth. The Leadscrew is now at rest and no emitter pulses are generated.

At 300° of Print Shaft rotation, the PFB becomes static, informing the Logic that the Carrier and PSCC are ready for the next operation.

With the proper number of emitter pulses counted and 300° of PFB, the Printer is ready for the next operation.



The Electronics initiates a Backspace operation. A Backspace operation begins with a ground shot to the PSCC, Low Speed and Direction Magnets.

With the PSCC released, the Print Shaft begins to rotate.

With the Low Speed and Direction Magnets energized, the Leadscrew Belt turns in a low speed reverse direction.

When the PFB activates at 85° of Print Shaft rotation, the Logic will (1) de-energize the PSCC Magnet and (2) energize the Escapement Magnet.

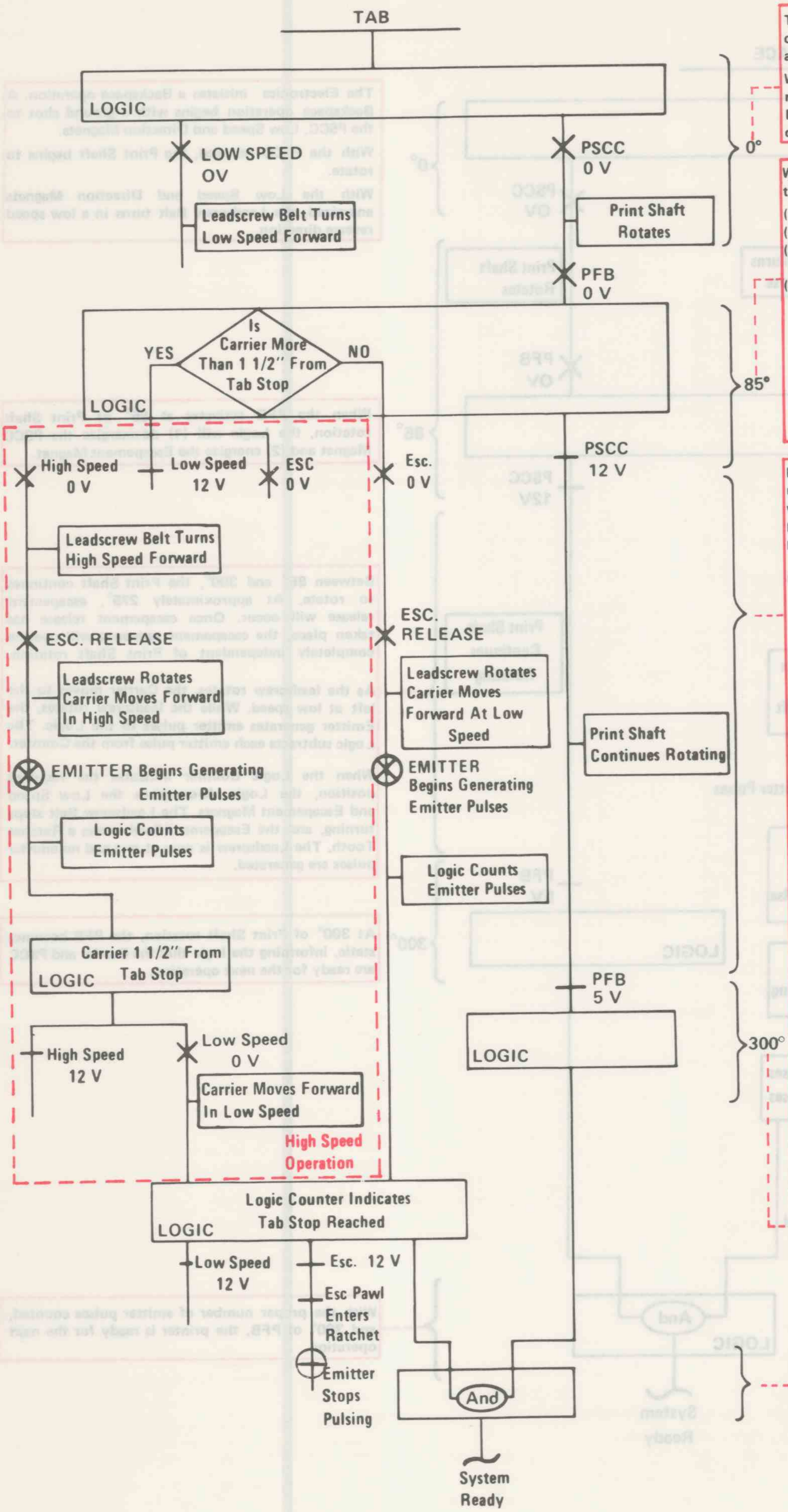
Between 85° and 300°, the Print Shaft continues to rotate. At approximately 275°, escapement release will occur. Once escapement release has taken place, the escapement sequence will operate completely independent of Print Shaft rotation.

As the leadscrew rotates, the Carrier moves to the left at low speed. While the leadscrew rotates, the Emitter generates emitter pulses to the Logic. The Logic subtracts each emitter pulse from the Counter.

When the Logic Counter indicates the required position, the Logic de-energizes the Low Speed and Escapement Magnets. The Leadscrew Belt stops turning, and the Escapement Pawl enters a Ratchet Tooth. The Leadscrew is now at rest and no emitter pulses are generated.

At 300° of Print Shaft rotation, the PFB becomes static, informing the logic that the Carrier and PSCC are ready for the next operation.

With the proper number of emitter pulses counted, and 300° of PFB, the printer is ready for the next operation.



The Electronics initiates a tab operation. A tab operation begins with a ground shot to the PSCC and Low Speed Magnets.

With the PSCC released, the Print Shaft begins to rotate with the Low Speed Magnet energized; the Leadscrew Drive Belt turns in a low speed forward direction.

When the PFB activates at 85° of Print Shaft Rotation, the Logic:

(1) De-energizes the PSCC Magnet
(2) Energizes the Escapement Magnet
(3) Determines how far the Carrier is from the Tab position.
(4) a. If the Carrier is more than 1 1/2" from the Tab position, a high speed operation is required, the Electronics will de-energize the Low Speed Magnet and energize the High Speed Magnet. The Leadscrew Drive Belt turns high speed forward.
    b. If the Carrier is within 1 1/2" from the Tab position, the Low Speed Magnet remains energized.

Between 85° and 300°, the Print Shaft continues to rotate. At approximately 275°, Escapement release will take place. Once escapement release has taken place, the escapement sequence will operate completely independent of Print Shaft rotation.

High Speed

After "escapement release," the Leadscrew starts rotating and the Carrier moves to the right at high speed. While the Leadscrew rotates, the Emitter generates emitter pulses to the Logic.

When the Logic Counter indicates the Carrier to be 1 1/2" from the Tab position, the Logic changes Leadscrew Drive from high speed to low speed by de-energizing the High Speed Magnet and energizing the Low Speed Magnet.

With the Leadscrew and Carrier now moving at Low Speed, the Logic continues counting Emitter Pulses until the Logic Counter indicates the Tab position. When the Tab position is reached, the Logic de-energizes the Low Speed Magnet (Leadscrew Belt stops turning) and the Escapement Magnet. The Escapement Pawl enters a ratchet tooth – The Leadscrew is now at rest and no emitter pulses are generated.

Low Speed

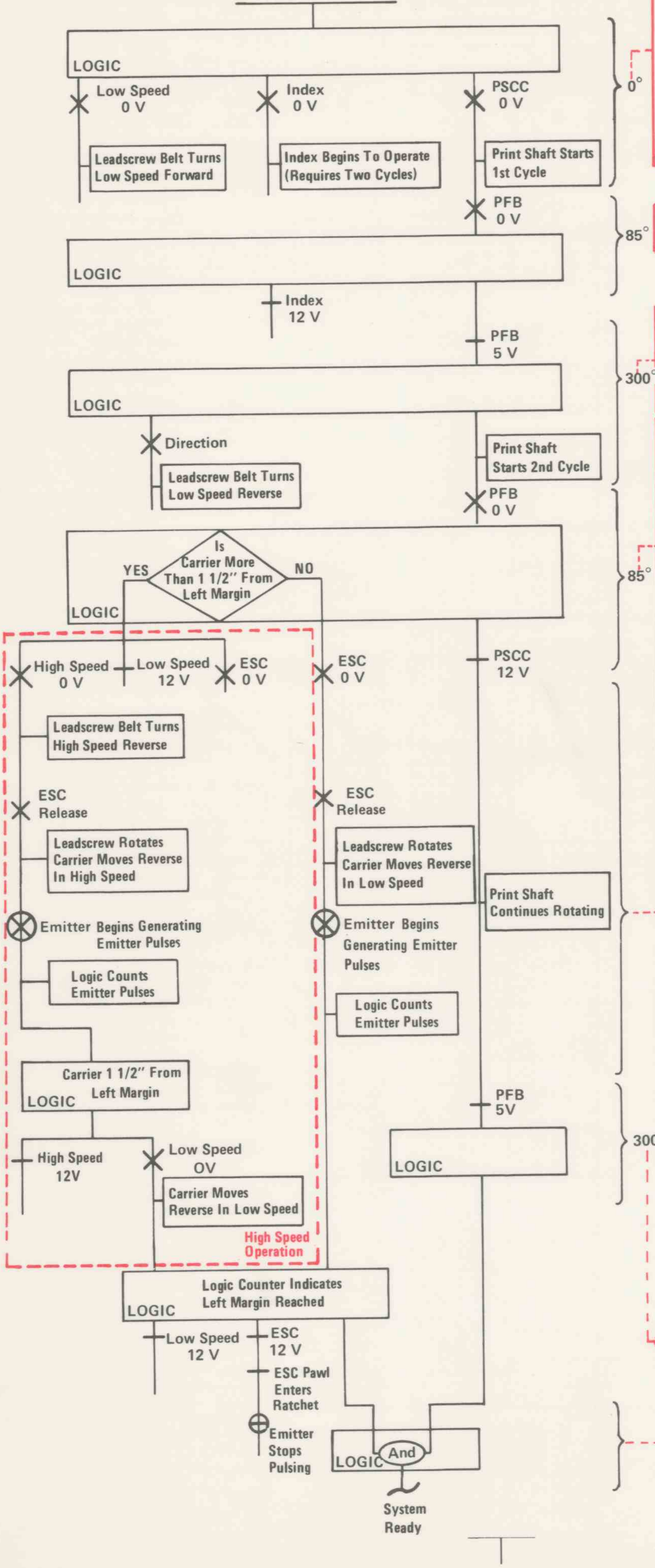
After "escapement release," the Leadscrew starts rotating and the Carrier moves to the right at low speed. While the Leadscrew rotates, the Emitter generates emitter pulses to the Logic.

When the Logic Counter indicates the Tab position reached, the Logic de-energizes the Low Speed Magnet (Leadscrew Belt stops turning) and Escapement Magnet. The Escapement Pawl enters a Ratchet Tooth, the Leadscrew is now at rest and no emitter pulses are generated.

At 300° of Print Shaft Rotation, the PFB becomes static, informing the Logic that the Carrier and PSCC are ready for the next operation.

With the proper number of emitter pulses counted and 300° of PFB, the Printer is ready for the next operation.

CARRIER RETURN



The Electronics initiates a carrier return operation. A carrier return operation begins with a ground shot to the PSCC, Index and Low Speed Magnets. An index operation requires 720° of Print Shaft rotation (2 Cycles). With the PSCC released, the Print Shaft begins to rotate. With the Index Magnet energized, the Index Cam will begin to rotate, to supply the necessary motion to the Index Pawl to rotate the Platen.

With the Low Speed Magnet energized, the Leadscrew Belt will rotate in a low speed forward direction.

When the PFB activates at 85° of Print Shaft rotation, the Logic will de-energize the Index Magnet.

When PFB becomes static at 300°, the Logic knows that the first half of Index occurred and is ready to return the Carrier. Since the PSCC is already energized, the Logic supplies the ground shot to the Direction Magnet. The Leadscrew Drive Belt turns in low speed reverse direction.

When the PFB activates at 85° of Print Shaft rotation, the Logic:

(1) De-energizes the PSCC Magnet.
(2) Energizes the Escapement Magnet.
(3) Determines how far the Carrier is from the left margin.
(4) a. If the Carrier is more than 1 1/2" from the left margin, a High Speed operation is required. The Electronics will de-energize the Low Speed Magnet and energize the High Speed Magnet. The Leadscrew Drive Belt turns High Speed forward.
    b. If the Carrier is within 1 1/2" from the left margin, the Low Speed Magnet remains energized.

Between 85° and 300°, the Print Shaft continues to rotate. At approximately 275°, escapement release will take place. Once escapement release has taken place, the escapement sequence will operate completely independent of Print Shaft rotation.

High Speed
After "escapement release," the Leadscrew starts rotating and the Carrier moves to the left at high speed. While the Leadscrew rotates, the Emitter generates emitter pulses to the Logic.

When the Logic Counter indicates the carrier to be 1 1/2" from the left margin, the Logic changes Leadscrew Drive from high speed to low speed by de-energizing the High Speed Magnet and energizing the Low Speed Magnet.

With the Leadscrew and Carrier now moving at Low Speed, the Logic continues counting emitter pulses until the Logic counter indicates the left margin position. When the left margin is reached, the Logic de-energizes the Low Speed Magnet (Leadscrew Belt stops turning) and the Escapement Magnet. The Escapement Pawl enters a Ratchet Tooth. The Leadscrew is now at rest and no emitter pulses are generated.

Low Speed
After "escapement release," the Leadscrew starts rotating and the Carrier moves to the left at low speed. While the Leadscrew rotates, the Emitter generates emitter pulses to the Logic.

When the Logic Counter indicates the Left Margin reached, the Logic de-energizes the Low Speed Magnet (Leadscrew Belt stops turning) and Escapement Magnet. The Escapement Pawl enters a Ratchet Tooth, the Leadscrew is now at rest and no emitter pulses are generated.

At 300° of Print Shaft rotation, the PFB becomes static, informing the logic that the Carrier and PSCC are ready for the next operation.

With the proper number of emitter pulses counted, and 300° of PFB, the printer is ready for the next operation.